



Supplementary Soil Suitability Assessment & Remediation Strategy Addendum Report

**Land at Windy Arbor Brow / Windy Arbor Road,
Whiston, Knowsley, L35 1RA**

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Report Title: **Supplementary Soil Suitability Assessment & Remediation Strategy Addendum Report – Land at Windy Arbor Brow / Windy Arbor Road, Whiston, Knowsley, L35 1RA**

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For Quinn Developments Northwest Limited	February 2026

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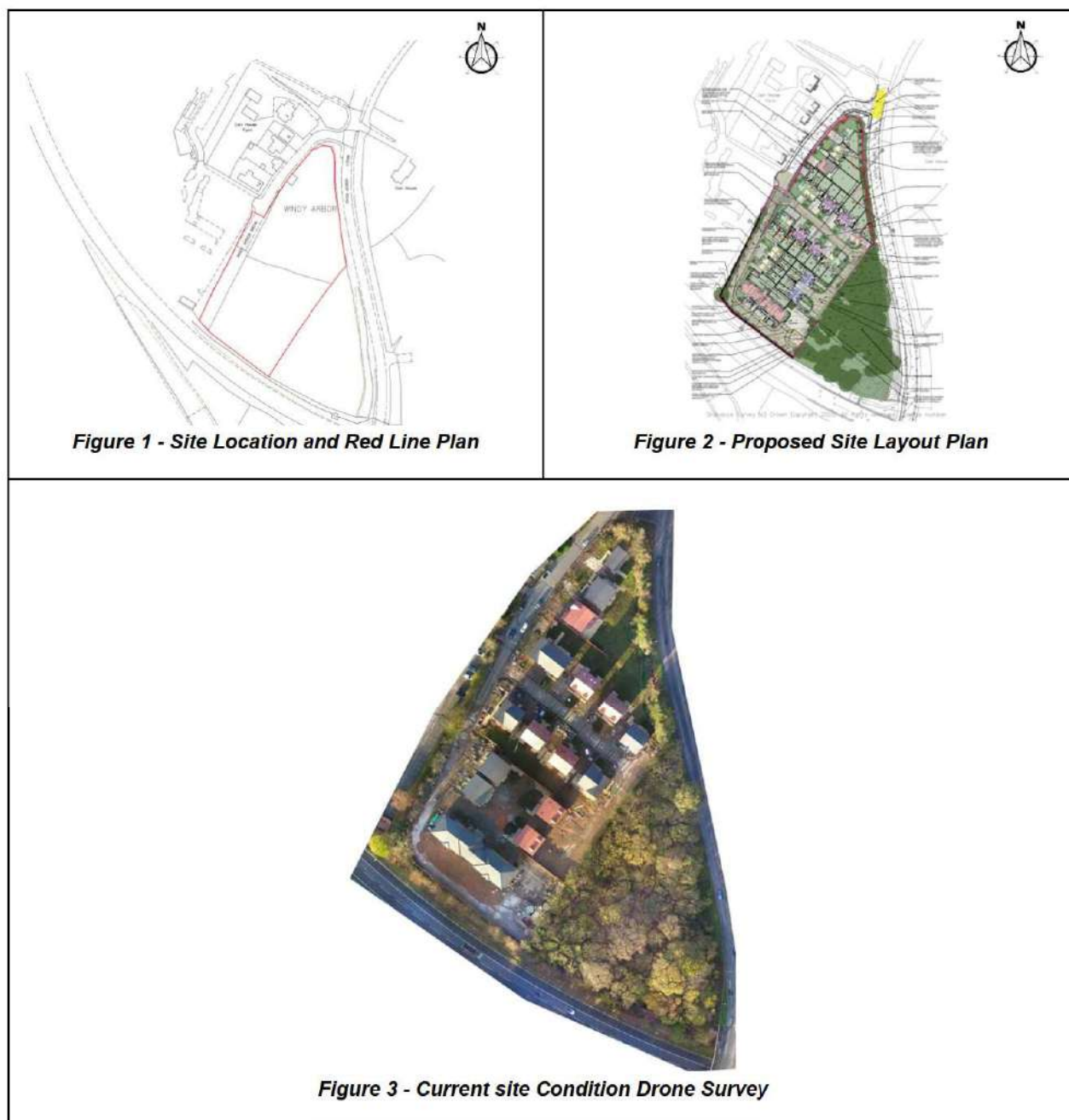
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1 Introduction

Quinn Developments NW Ltd (Quinn) have been commissioned by Vistry Merseyside and Cheshire West to produce a sub-soil assessment relating to the potential re-use of existing site won sub-soil and gather evidence for remediation works Validation Reporting.

This report addresses the condition of approximately 2,500m³ of sub-soil currently present at a site located at Windy Arbor Brow / Windy Arbor Road, Whiston, Knowsley, L35 1RA. This report will also review previous works undertaken at the site and determine the requirements to satisfy contaminated land related planning conditions aligning with current UK guidance and legislation. A site location plan, proposed development plan and current site condition drone photography are included as figures 1-3 and in Appendix A.



2 Background:

Quinn Developments understand the scenario to be as follows:

- 📌 Planning Permission (App. No. 20/00329/FUL) was granted for the erection of a residential development of 43 no. dwellings comprising 14 no. apartments and 29 no. houses together with access, car parking and associated development (demolition of existing barn). Planning Permission was granted by Knowsley Council on 10th July 2020. Full Planning Permission is included in Appendix B.
- 📌 Onward Homes appointed Forth Homes Construction Ltd to undertake the required remediation, civils and building works.
- 📌 Forth Homes progressed with the site works until they were removed from the project by Onward Homes in late summer 2025 with the project left unfinished. Forth Homes appear to still be trading although not active.
- 📌 Vistry Merseyside and Cheshire West were appointed by Onward Homes to complete the project.
- 📌 Quinn Developments have been commissioned by Vistry Merseyside to undertake a review of existing works and undertaken any remedial works for the civils and groundworks elements.
- 📌 As part of these works Quinn has attempted to make contact with the Knowsley Environmental Health team and undertook investigation works to determine the condition and quality of existing soils at the site prior to potential re-use or removal.

3 Planning Permission

Planning Permission (App. No. 20/00329/FUL) was granted for the erection of a residential development of 43 no. dwellings comprising 14 no. apartments and 29 no. houses together with access, car parking and associated development (demolition of existing barn). Planning Permission was granted by Knowsley Council on 10th July 2020. Full Planning Permission is included in Appendix A.

Condition 4 of the Planning Permission related to contaminated land and set out the following requirements:

4. A. Risk Assessment

No development shall take place until an assessment of the risks posed by any contamination has been submitted to and approved in writing by the Local Planning Authority. This assessment must be undertaken by a suitably qualified contaminated land practitioner, in accordance with authoritative guidance (CLR 11), and shall assess any contamination on the site, whether or not it originates on the site.

Moreover, it must include (were relevant):

(i) a survey of the extent, scale and nature of contamination;

(ii) an assessment of the potential risks to:

- *Human health.*
- *Property (existing or proposed) including buildings, crops, livestock, pets, woodland and service lines and pipes.*
- *Adjoining land.*
- *Groundwaters and surface waters.*
- *Ecological systems.*
- *Archaeological sites and ancient monuments.*

B. Ground Gas Risk Assessment

No part of the development shall commence until a scheme to deal with the potential risk of Ground Gas at the site has been submitted to and approved in writing by the Local Planning Authority. The Ground Gas Risk Assessment should consider the provision of a pictorial CSM and take into account all credible on-site and off-site gas sources. It is considered that additional intrusive works are likely to be required to inform this Gas Risk Assessment, specifically to reduce data uncertainty and increase data confidence, notably with respect to on-site/off-site sources.

The Gas Risk Assessment should take into account the proposed foundation and floor slab construction of the residential properties in line with current UK guidance. The protection measures to all buildings proposed as part of the residential development should be passive. No active protection measures should be permitted.

C. Submission of Remediation Scheme

Where land affected by contamination is found which poses unacceptable risks, no development shall take place until a detailed remediation scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme must include an appraisal of remediation options, identification of the preferred option(s), the proposed remediation objectives and remediation criteria, and a description and programme of the works to be undertaken including the verification plan. As a minimum, the scheme must ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to its intended use.

D. Implementation of Approved Remediation Scheme and Verification Report

The approved remediation scheme shall be implemented and a verification report submitted to and approved in writing by the Local Planning Authority, prior to the development (or relevant phase of development) being brought into use.

E. Reporting of Unexpected Contamination

In the event that contamination is found at any time when carrying out the approved development that was not previously identified it must be reported immediately to the Local Planning Authority. Development on the part of the site affected must be halted and a risk assessment carried out and submitted to and approved in writing by the Local Planning Authority. Where unacceptable risks are found remediation and verification schemes shall be submitted to and approved in writing by the Local Planning Authority. These shall be implemented prior to the development (or relevant phase of development) being brought into use.

F. Materials Management Plan

Prior to the reuse of site won materials ('waste' and non-waste) a Materials Management Plan, carried out in line with the CL: AIRE code of practice and signed off by a Qualified Person, shall be submitted to and agreed in writing with the local planning authority. The MMP shall demonstrate that any reuse of contaminated materials do not result in increased risk to the environment or human health.

G. Importation of Soil/Material

No soil is to be imported to the site until it has been tested for contamination and assessed for its suitability for the proposed development; a suitable methodology for testing this material should be submitted to and agreed by the Local Planning Authority prior to the soils being imported onto site. The methodology should include the sampling frequency, testing schedules, criteria against which the analytical results will be assessed (as determined by the risk assessment) and source material information. The analysis shall then be carried out and evidence submitted to and approved in writing to by the Local Planning Authority

Reason:

To ensure contamination is appropriately identified and a strategy is in place before works commence on the site to prevent pollution in the interests of human health and the pollution of the water environment and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy ENV5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

4 Regulatory Correspondence

Knowsley Council have confirmed that the information submitted to date is acceptable and satisfactorily addresses Parts A, B & C of Condition 4. The pre-commencement elements of Condition 4 have therefore been satisfied and works can commence. A letter Ref: 20/00329/FUL dated 15th December 2022 is included in Appendix F.

Quinn sent an e-mail on Friday 28th November 2025 requesting contact details from the environmental health team to discuss the local authority requirements to gain condition discharge and to discuss the proposed solutions given the sites current condition. Follow up e-mail was sent on 4th December to which a response was received from Feargal McEvoy Principal Planner (Development Management) stating 'My understanding is that Environmental Health shared your e-mail with Merseyside Environmental advisory Service (MEAS) and are probably awaiting a response before they reply to you'. A follow up e-mail chasing a response was sent on 9th December 2025. No reply was received as of 18th December 2025 when this report was originally drafted. A reply was received from Merseyside Environmental Advisory Service on 23rd December 2025. Correspondence is included in Appendix F.

5 Previous Reporting

Quinn has been provided with or obtained the following information relating to the Planning Permission Condition 4:

 Swan Environmental – Phase 1 and 2 Geo-Environmental Assessment – Land off Windy Arbour – Dated August 2020 – Included in Appendix C

This report was produced to satisfy Planning Condition 4.A and 4.B. This report included a Preliminary Risk Assessment (Phase 1), intrusive investigation (Phase 2), Generic Qualitative Risk Assessment (GQRA) and Preliminary Ground Gas Risk Assessment.

The Preliminary Risk Assessment (PRA - Phase 1) concluded that there was a risk of contaminants of potential concern being present on site. This was due to the unknown nature of the historical on-site development and demolition of the outbuildings, particularly to the north of the site. The PRA recommended that intrusive investigation works be undertaken to determine the levels of risk present at the site to current, construction workers and future users of the site.

The Intrusive Investigation works, and risk assessment (Phase 2) identified PAH levels to be in excess of the applied GAC screening criteria for soils for a residential land use with plant uptake in boreholes (WS101 and WS105) Lead was exceeding GAC's in WS101, to the north of the site associated with Made Ground only located to the north. It was considered that the risk posed to controlled waters within influencing distance of the site was negligible.

It was noted that Radon measures are not required, as less than 1% of homes are estimated to be at or above the Action Level. No evidence of potential gas creating material was found within any of the boreholes on site. Following gas monitoring regime, Characteristic Situation 1 has been determined and no ground gas protection measures were required.

Following the site investigation, it is deemed that the site is suitable for redevelopment for residential end use with plant uptake, with limited remediation works concerning the PAH exceedance identified in and potentially around WS101 and WS105 and the lead exceedance in WS101.

Upon final design it may be possible to reduce the GAC given to the north of the site in terms of a reduction of risk compared to a residential use without plant uptake. Otherwise it is recommended that a remediation strategy localised to the north of the site should be carried out.

The Phase 1 and 2 Geo-Environmental Assessment and Gas Risk Assessment has been reviewed and accepted by the Local Authority discharging Condition 4.A and 4.B.

Swan Environmental - Remediation Strategy – Land off Windy Arbour – Dated January 2022 – Included in Appendix C

This report was produced to satisfy Planning Condition 4.C. This report presents a remediation options appraisal with a suitable form of remediation scheme, describes the requirements of the remediation scheme, to break the contaminant linkages that have been identified, acknowledge roles and responsibilities of the various parties that will be involved in the remediation and detail how the remediation should be recorded and verified.

The following remediation strategy was devised for the site:

- A programme of cut and fill to achieve development levels which will include the removal and disposal of identified contamination within shallow soils in WS101 and WS105 and Made Ground, and potential retention for any suitable Made Ground (according to suitability) and natural deposits for re-use.
- Re-use and/or Importation, placement and testing of suitable clean soils within landscaping areas to provide a 600mm thick, clean cover layer (150mm topsoil/450mm subsoil) to break pathways to future site users and to allow plant growth.
- A validation report will be produced on completion of the works. This report will serve to confirm the works were undertaken in accordance with the relevant legislation, the remediation strategy, method statements and planning conditions
- For material being re-used an exemption or Materials Management Plan is recommended according to type and volume.

The Remediation Strategy has been reviewed and accepted by the Local Authority discharging Condition 4.C.

Waste Removal Information – Appendix D

During the works undertaken by Forth Homes approximately 466 loads (4,194m³ or 8,388 tonnes) of material was removed from site in March 2023. The waste transfer documentation, carrier licenses and tip permits are included in Appendix D.

The Site Investigation report included a summary of the identified contamination issues with regards to assessment criteria exceedances, reproduced as figure 4.

Exploratory Location	Determinands exceeding GAC	Depth (m bgl)	Strata
WS101	Lead	0.50	WS101 - 0.25 – 0.60m - Reddish brown sandy slightly clayey gravel. Gravel is fine to very coarse sub angular to sub rounded of brick ash and coal. Medium cobble content of brick
	Benzo(a) Anthracene		
	Chrysene		
WS101, WS105	Benzo(b) Fluoranthene	0.50, 0.40	WS105 - 0.30 – 0.60m Fine black clayey gravelly silty Sand. Gravel is fine to coarse, sub angular to sub rounded of brick, sandstone and mudstone
WS105	Benzo(a)Pyrene	0.40	
WS101	Dibenzo(a,h) Anthracene	0.50	

Figure 4 - Summary of Exceedance Locations - Table 20 from Swan Phase 2 Report

Shallow Made Ground deposits were encountered in the north of the site only and was consistent with both former buildings' footprint locations and in type. The elevated concentrations of Lead and various non-volatile PAHs were identified within the shallow Made Ground between 0.25mbgl and 0.60mbgl in the north of the site.

The majority of the material removed from site originated from the north of the site. A cut fill model has been produced with the investigation locations overlayed indicating that the cut in the area of the identified Made Ground and criteria exceedances was greater than the depth of the identified contaminated strata. It is conjectured that the Made Ground has been removed in its entirety thereby removing the potential source of contamination.

In line with Environment Agency Land contamination risk management (LCRM - 2025) guidance A contaminant linkage must be present for there to be a Source-Pathway-Receptor relationship. Without a linkage, there is not a risk – even if a contaminant is present. In this instance the source has been removed from the site and therefore no contaminant linkage is present and the risk to future site users has been removed.

The removal of the source of contamination was a principal requirement of the remediation strategy at the site. The evidence provided by the cut-fill model and Waste Removal Documentation (Appendix D) confirm that the made Ground was more than likely removed from site in its entirety and provides evidence towards the discharge of condition 4.D.

Swan Environmental Plot Validation Letters – Appendix E

Swan Environmental were commissioned by Forth Homes to attend site and undertake Plot Validation Works following placement of soils used in the garden and soft landscaping areas to determine if the soils met the requirements of the Remediation Strategy (RS) produced by Swan Environmental, dated January 2022.

The following reports have been provided to Quinn and are included in Appendix E:

-  Swan Environmental – Windy Arbor Plot Validation, Plots 1 and 3. Dated 22nd August 2024.
-  Swan Environmental – Windy Arbor Plot Validation, Plots 14-29. Dated 8th August 2024

These reports included photographic plates of the placed sub-soils and included chemical analysis testing results. In total 11No. Samples were taken for a range of analysis including metals, PAH16, TOC, Asbestos, BTEX and TPHGCWG. When compared to the generic assessment criteria set out in the remediation strategy no exceedances were recorded which would indicate that the sub-soil placed was chemically suitable for use at the site. The chemical analysis results would suggest that there is no unexpected contamination present at the site following the removal of the Made Ground which provides evidence towards the discharge of condition 4.E.

However, on review of the photographic plates the sub soil appears to be heavily impacted by anthropogenic materials including brick fragments, concrete and even metal screws. It is unclear of the source of the sub soil but anecdotal evidence suggests it was site won natural soils which have not been appropriately managed / segregated to avoid anthropogenic impact during the construction process.

6 Further Investigation Works

As a result of the anthropogenic impact to the existing sub-soil, lack of clarity regarding the source of the soils and absence of a Material Management Plan, Quinn proposed further investigation works to determine the current condition of soils placed in garden and landscaping areas at the site to determine if the re-use of any of this material is viable in line with sustainable remediation provisions of the NPPF.

The outline scope of works was as follows:

- Collection of representative samples for chemical laboratory analysis from the existing 'sub-soil' materials to confirm re-use suitability.
- If any materials are deemed unsuitable then these can be excavated and removed from site under waste duty of care.
- The remaining suitable materials can then be excavated and screened/picked to remove anthropogenic impact.
- An MMP put in place for the re-use of the soils, then the soils placed back in the project as sub-soil with a reduced anthropogenic content.
- Import and testing of topsoil (upper 150mm) preferably from a greenfield source / purchased and placed as late as possible.

These works are designed to provide evidence to satisfy Condition 4.E & 4.F with the information to satisfy condition 4.G collected prior to and during any future clean cover system material import.

A Quinn Geo-environmental Engineer attended site on the 26th – 27th November 2025 to undertake the excavation of 46No. hand dug trial pits within the garden and landscaping areas with collection of 46No. representative soil samples along with logging of the soils, recording trial pit locations and taking photographs. An investigation location plan is included in Appendix A, Photograph plates, sample locations and encountered material descriptions / logs are included in Appendix G and chemical laboratory results are included in Appendix H.

In the northern sector (Plots 1–13), ground conditions are variable, comprised of a mix of Topsoil, Sub-soil, and Made Ground. Topsoil, typically described as dark brown organic clayey sand or sandy clay, is frequently encountered, particularly within back gardens. However, distinct areas of Made Ground are present, notably in front gardens and back gardens of specific plots (e.g. Plots 6-8). These reworked materials contain anthropogenic debris including ash, brick, coal fragments, and occasional metal mixed in to the natural sandy clay sub-soils.

The central (Plots 14–21) and southern (Plots 22–29) areas differ significantly, being dominated by Made Ground rather than natural cover. The middle plots consist largely of light brown gravelly sand containing substantial construction waste, such as concrete, brick, ceramics, glass, and insulation. Similarly, the southern plots and communal areas are characterised by gravelly clay Made Ground containing mixed

lithologies and ceramics. Notably, Topsoil in the southern section was rarely found in-situ, but rather recorded as distinct stockpiles containing organic sandy material.

7 Contamination Assessment

This supplementary investigation provides additional information relating to the shallow ground conditions in the garden and landscaping areas across the site and provides the information to determine if the existing materials are suitable to stay on site or require removal and replacing with imported clean cover soils. The sample locations and photographs are included in Appendix G

7.1 Assessment Criteria

The Generic Quantitative Risk Assessment (GQRA) comprises the comparison of laboratory measured concentrations of contaminants with Generic Assessment Criteria (GAC). The GAC used for the assessment of soil concentrations comprise Soil Guideline Values (SGVs) and values that have been derived using the Contaminated Land Exposure Assessment (CLEA) model adopting the appropriate assumptions and input parameters provided by the Environment Agency / Natural Resources Wales.

In deriving the GAC for use on this site a "Soil" with 2.5% Soil Organic Matter (SOM) has been assumed. The SOM% encountered within the Made Ground on site ranged between 0.57% and 7.78% with an average of 2.84%. An SOM% of 2.5% was chosen as this conservatively represented the near surface soils. It is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM).

The GQRA has been undertaken on the basis that the future site use falls under the '*Residential with Plant Uptake*' S4UL and C4SL assessment criteria, land-use scenarios. It is assumed that any Made Ground will either be removed from site or retained on site beneath hardstanding or clean cover system following redevelopment.

The information gathered during the supplementary intrusive investigation detailed within this report provides sufficient evidence required to undertake the GQRA to complement the information from previous Site Investigation works and regulator approved Remediation Strategy.

7.2 Guidelines for Assessing Human Health Criteria

In 2012 The Department for Environment, Food and Rural Affairs (DEFRA) commissioned the SP1010 project to develop and test methodology to derive Category 4 Screening Levels (C4SL). The SP1010 Report was published in 2014. The SP1010 report included methodology and framework for six land uses and a limited number of contaminants (Arsenic, Cadmium, Chromium VI, Lead, Benzo(a)Pyrene & Benzene) along with policy statements. C4SLs are intended to be used as generic screening values which are protective of human health for six various land-uses.

Additional C4SLs are being developed in stages with the first of which being released in May 2021 for TCE, PCE and Vinyl Chloride. Values for Naphthalene, Cis-1,2-Dichloroethene, Trans-1,2-Dichloroethene, 1,2-Dichloroethane (Ethylene Dichloride) and PFAS were released in 2024.

Category 4 Screening Levels (C4SLs) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A of the Environmental Protection Act. The C4SLs are included as suitable generic screening criteria within the EA LCRM (2023) guidance. The LCRM guidance applies to both Part 2A assessments and assessments made under the planning regime, LCRM states that '*Where an SGV and C4SL are available for the same contaminant, we expect you to use the C4SL*'. The available C4SLs have therefore been adopted as primary assessment criteria in this report.

The National Planning Policy Framework (December 2023) states that 'after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore, by inference, the C4SLs are appropriate for use in the planning context.

For all other contaminants we have used the Land Quality Management/Chartered Institute Environmental Health values published within 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance.

The Suitable 4 Use Levels (S4ULs) screening criteria are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for common contaminants not covered by C4SLs and/or for organic contaminants. Further details are included in Table 1 below:

Table 1 - Assessment Criteria Summary

Assessment Criteria	Land Uses	Details	Contaminants Available
Department for Environment, Food and Rural Affairs Category 4 Screening Levels (DEFRA C4SLs, CL:AIRE, 2014 & 2021)	Residential with plant uptake. Residential without plant uptake. Allotments. Commercial. POS1 – (POS Near Residential Housing) and POS2 – (Public Park)	Derived using modified CLEA model	Arsenic, Cadmium, Chromium VI, Lead, Benzo(a)Pyrene, Benzene, Vinyl Chloride, Tetrachloroethene (PCE), Trichloroethene (TCE), 1,2-Dichloroethane, Naphthalene, Cis-1,2-Dichloroethene, Trans-1,2-Dichloroethene, 1,2-Dichloroethane (Ethylene Dichloride) and PFAS
Land Quality Management / Chartered Institute of Environmental Health Suitable 4 Use Levels (LQM/CIEH S4ULs)	Residential with plant uptake. Residential without plant uptake. Allotments. Industrial/ commercial. Public Open Space (landscaping); and Public Open Space (parks)	Derived in accordance with UK legislation, national as well as Environment Agency policy and using a modified version of the Environment Agency CLEA software. Principal Receptor: 0-6 year old female child. Soil: Sandy loam Soil Organic Content: 1.0%, 2.5% & 6.0%	Beryllium (Be), Boron (B), Chromium (CrIII), Copper (Cu), Elemental Mercury (Hg), Methyl Mercury (Hg+), Inorganic Mercury (Hg2+), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Vanadium (V) and Zinc (Zn)
LQM/CIEH S4ULs	Residential with plant uptake. Residential without plant uptake. Allotments. Industrial/ commercial. Public Open Space (landscaping); and Public Open Space (parks)	Derived in accordance with UK legislation, national as well as Environment Agency / Natural Resources Wales policy and using a modified version of the Environment Agency CLEA software	Polyaromatic Hydrocarbons* (PAHs), Speciated/banded Petroleum Hydrocarbons (TPHCWG), BTEX, Phenols, Explosives, Pesticides
EIC/AGS/CL:AIRE and LQM/CIEH GACs or LQM/CIEH S4ULs	Residential with plant uptake Residential without plant uptake Allotments Industrial/ commercial	Derived using the Environment Agency's CLEA software. Principal Receptor: 0-6 year old female child. Soil: Sandy loam Soil Organic Content: 1.0%, 2.5% & 6.0%	volatile organic compounds (VOCs); and Semi-Volatile Organic Compounds (SVOCs)

The S4ULs, C4SLs, SGVs and GACs are intended for use as a screening tool for the generic quantitative assessment of risk to human health from contaminated land and represent "trigger values" that, if exceeded, could indicate a possibility of significant harm. However, these criteria do not represent the threshold at which there is a significant possibility of significant harm; this determination will normally require further investigation and evaluation of risk to human health and groundwater.

To ensure relevance in the risk assessment, Quinn has adopted the SGVs and GACs derived (as detailed above) for a generic 'Residential with Plant Uptake' end-use scenario.

7.3 Assessing Risk posed by Asbestos Containing Materials or Fibres

There are currently no definitive UK-published guideline values, C4SLs or S4ULs for Asbestos in soils which is the primary method of estimating potential harm from exposure to contaminated soils within the UK. Similarly, there is no UK-published definitive methodology for quantitatively estimating the risks posed by concentrations of Asbestos fibres released into the air from disturbance of Asbestos contaminated soils.

The risk to Human Health from exposure to soils contaminated by Asbestos fibres can however be assessed in line with the Land contamination: Risk Management (EA, 2023) and undertaken using guidance and information from CIRIA Report C733, Asbestos in soil and Made Ground: a guide to understanding and managing risks and following protocols which are detailed within Control of Asbestos Regulations 2012.

Quinn adopts a site-specific risk assessment to determine the risks posed by Asbestos Containing Materials or fibres using the Source-Pathway-Receptor model set out in the LCRM (2025).

7.4 Human Health Risk Assessment - Chemical Analysis Results

The soils were submitted for chemical analysis testing at an independent MCERTS/UKAS accredited laboratory (EnviroLab). The results of the analysis were compared to the industry standard generic assessment criteria for the intended site end land use as described above. The sample locations and photographs are included in Appendix G. Full chemical analysis results are included in Appendix F and summarised in the Table 2 below:

Table 2 - Summary of Chemical Analysis Results Compared to Soil Guideline Values

	Analyte	Number of Samples Analysed	'Residential with Plant Uptake' S4UL and C4SL (Based on 2.5% SOM) (mg/kg)	Number of Exceedances	Location of Exceedances (mbgl)
	Asbestos Identification	46	Detection of fibres in initial soil screen	NONE	N/A
	pH	46	5-11	NONE	N/A
	Boron (Hot Water Soluble)	46	290	NONE	N/A
	Cyanide (Free)	46	34 (Atkins ATRISK (CLEA 1.07))	NONE	N/A
Metals	Arsenic	46	37 (C4SL)	NONE	N/A
	Barium	46	1,300	NONE	N/A
	Cadmium	46	26 (C4SL)	NONE	N/A
	Chromium(III)	46	910	NONE	N/A
	Copper	46	2,400	NONE	N/A
	Mercury (Elemental or Methyl)	46	1.2 or 11	NONE	N/A
	Molybdenum	46	670	NONE	N/A
	Nickel	46	130	NONE	N/A
	Lead	46	200 (C4SL)	ONE	SS1F @ 0.2m
	Antimony	46	550	NONE	N/A
	Selenium	46	250	NONE	N/A
	Vanadium	46	410	NONE	N/A
	Zinc	46	3,700	NONE	N/A
	Chromium (Hexavalent)	46	21 (C4SL)	NONE	N/A
Polycyclic Aromatic Hydrocarbons	Acenaphthene	46	510	NONE	N/A
	Acenaphthylene	46	420	NONE	N/A
	Anthracene	46	5,400	NONE	N/A
	Benzo[a]anthracene	46	11	NONE	N/A
	Benzo[a]pyrene	46	5 (C4SL)	ONE	SS29B @ 0.1m
	Benzo[b]fluoranthene	46	3.3	ONE	SS29B @ 0.1m
	Benzo[ghi]perylene	46	340	NONE	N/A
	Benzo[k]fluoranthene	46	93	NONE	N/A
	Chrysene	46	22	NONE	N/A
	Dibenzo[ah]anthracene	46	0.28	ONE	SS29B @ 0.1m
	Fluoranthene	46	560	NONE	N/A
	Fluorene	46	400	NONE	N/A

	Indeno[123-cd]pyrene	46	36	NONE	N/A
	Naphthalene	46	5.6 (36)	NONE	N/A
	Phenanthrene	46	220	NONE	N/A
	Pyrene	46	1,200	NONE	N/A
Petroleum Hydrocarbons ¹	BTEX, MTBE & Aliphatic and Aromatic Bands	46	Specific for each compound/band	NONE	N/A
	Total Phenols	46	N/A	N/A	Results Less Than Limit Of Detection (<0.1mg/kg)
	VOCs & SVOCs	0	Specific for each compound	N/A	N/A

Notes

1. Total Petroleum Hydrocarbons were assessed using banding of the Criteria Working Group. The Total Petroleum Hydrocarbon (TPH) Criteria Working Group (CWG) was set up in the US to address a large disparity between the clean-up requirements for sites contaminated particularly with hydrocarbon fuels. The bandings are used to determine risk to Human Health, in this case, no failures of specific hydrocarbon bandings were identified and TPH is being used as a summary.
2. 54No. Volatile Organic Compounds (VOCs) and 39No. Semi-Volatile Organic Compounds (SVOCs) were tested for. In this assessment, the concentrations of specific VOCs and SVOCs were compared against relevant criteria. The findings indicate that no exceedances of these guideline values were identified for the assessed determinants.

Table 3 - Summary of Human Health Generic Assessment Criteria Exceedances with regards to a 'Residential with Plant Uptake' End-use Scenario

Location / Sample ID	Depth (mbgl)	Strata	DEFRA C4SL Thresholds S4UL Thresholds (mg/kg)	Contaminant Exceedance (mg/kg)
SS1F	0.2	Made Ground	Lead – 200	Lead – 464
SS29B	0.1	Made Ground	Benzo(a)pyrene – 5 Benzo(b)fluoranthene – 3.3 Dibenzo(ah)anthracene – 0.28	Benzo(a)pyrene – 9.07 Benzo(b)fluoranthene – 9.75 Dibenzo(ah)anthracene – <4.00

7.5 Discussion of Results

Of the 46No. soil samples recovered during the site investigation all 46No were taken from the shallow anthropogenically impacted subsoils. Details of the sample locations and material sampled can be found in Appendix G.

Of the 46No. Made Ground samples two exceedances of the GAC SGVs for a residential (with plant uptake) end use scenario were identified as summarised in Table 3. The Made Ground Samples were assessed as being representative of the Made Ground across the site. A risk assessment for the identified exceedances is detailed below.

7.6 Risk Assessment of Heavy Metal Exceedances

A single exceedance of the GAC with regards to Heavy Metals, specifically Lead, was recorded as summarised in Table 3.

The primary exposure pathways for Heavy Metals have been assessed as direct contact with impacted ground leading to inhalation/ingestion of dust. The lead C4SL indicates that for residential with plant uptake scenario 45% of exposure is from direct ingestion of soil and dust with 30% from oral background, 25% from consumption of homegrown produce and attached soil and 0.11% from inhalation of indoor dust.

The remediation recommendations in Section 8 include details of removal of residual Made Ground due to anthropogenic impact rendering the materials unsuitable for use as sub-soil within a clean cover system.

The clean cover system is designed to break any potential pollutant pathways thereby removing any risk to future site users from the identified elevated Lead concentrations. There can't be any elevated concentrations of Lead within the cover system itself and there is no capacity on site for re-use of the materials in low sensitivity areas.

Following the remediation works outlined in Section 8 the risk posed by residual Heavy Metal impacted Made Ground to future site users will be Negligible.

7.7 Risk Assessment of Non-volatile PAH Exceedances

Exceedances of the GAC with regards to several non-volatile Poly Aromatic Hydrocarbon (PAH) compounds (Benzo(a)pyrene Benzo(b)fluoranthene & Dibenzo(a,h)anthracene) was recorded in 1No. location as detailed in Table 3

The PAH compounds are assessed as being a Non-Volatile Organic Compound which tend to have a higher molecular weight, lower vapour pressure and higher boiling point temperature than Volatile Organic compounds (VOCs). Under normal atmospheric conditions the identified PAHs are unlikely to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air.

A PAH source signature double ratio plot has been undertaken on the samples identified as having elevated concentrations of PAH. The plot shows the likely source of the elevated PAHs to be Coal.

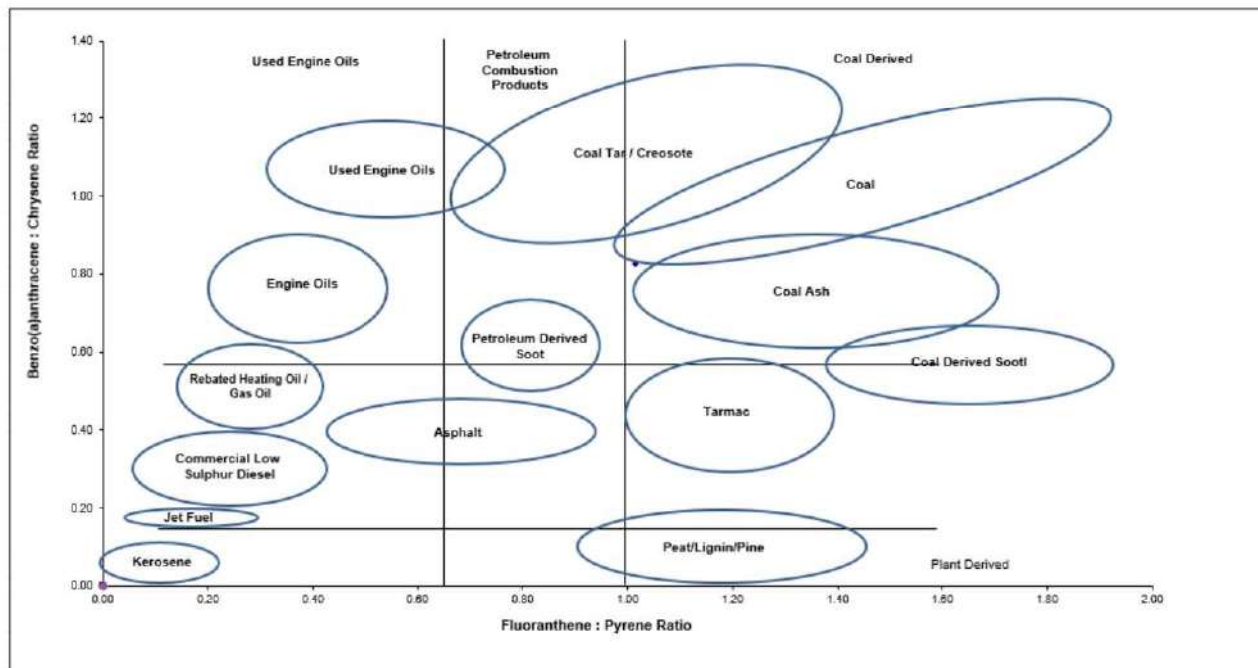


Figure 5 - PAH Source Signature Double Ratio Plot

Although Non and Semi VOCs are less likely to become airborne, they are of concern because of the potential to exist in higher concentrations within soil and dust. The PAHs identified have a primary exposure pathway of direct soil and dust ingestion accounting for 88% of the relative contribution to total exposure.

The remediation recommendations in Section 8 include details of removal of residual Made Ground due to anthropogenic impact rendering the materials unsuitable for use as sub-soil within a clean cover system. The clean cover system is designed to break any potential pollutant pathways thereby removing any risk to future site users from the identified elevated PAH concentrations. There can't be any elevated concentrations of PAHs within the cover system itself and there is no capacity on site for re-use of the materials in low sensitivity areas.

Following the remediation works outlined in Section 8 the risk posed by residual Heavy Metal impacted Made Ground to future site users will be Negligible.

7.8 Human Health Risk Assessment Summary

The Risk Assessment has identified the potential for current active pollutant linkages to exist at 2No. locations within the current shallow material placed within landscaped areas. The anthropogenically impacted soils have the capacity to generate unacceptable risks to Human Health for future site users. This risk potential is largely defined by the presence of man-made materials and previous poor sub soil material management practices undertaken at the site.

Based on the findings of this Assessment any potential risks to future site users will be mitigated through the removal of any residual Made Ground as part of the remediation works followed by the import and placement of clean and validated sub and top soils.

7.9 Waste Classification of Chemical Analysis Results

Prior to the disposal of material as waste the waste should be classified in general accordance with the requirements of Environment Agency / Natural Resources Wales guidelines (Technical Guidance WM3 Version 1.2.GB Edition, dated Oct 2021). A waste classification report is included in Appendix I and summarised in Appendix G.

7.9.1 Waste Classification Discussion

The Waste Classification identified a single location which exhibited hazardous properties (SS1f @ 0.2m due to elevated Heavy Metals (Copper and Zinc). Hazard Property 14: Ecotoxic was triggered. The remaining materials at the site were classified as Non-Hazardous with regards to waste. The single hazardous classification could potentially be downgraded to Non-hazardous following a statistical approach. Careful material management is recommended during the remediation works at this site.

The waste classification provides an overview of the waste characteristics of the material underlying the site. Should off-site disposal be required Quinn recommend that the chemical analysis results be sent to the receiving facility for review in order to confirm the material is acceptable.

8 Remediation Requirements

The remediation of the site must be undertaken in strict accordance with the approved Remediation Strategy (Swan Environmental, 2022). The information contained within this assessment indicates that the management of materials by the previous developer was substandard, resulting in the widespread anthropogenic impact of existing shallow soils.

The existing shallow soils pose an unacceptable risk to human health due to the presence of man-made materials (brick, metal, glass, insulation) and localised chemical exceedances (Lead and PAHs). These soils fail to meet the standards required by the Local Authority and will not be accepted for the discharge of planning conditions. Furthermore, these materials do not conform to the quality standards required by the NHBC or other warranty providers, meaning they would not be signed off for residential occupancy.

The following requirements must be met to ensure the site is suitable for its intended residential use:

-  All existing sub-soils and topsoils currently placed in garden and landscaping areas that contain gross anthropogenic debris (such as brick fragments, concrete, glass, insulation and metal) must be excavated and removed from the site under appropriate waste duty of care.
-  To break potential pollutant linkages, a clean cover system must be placed and validated in all soft landscaping areas. This system must comprise a minimum of 600mm of validated, clean material (typically 150mm of topsoil and 450mm of sub-soil however 300mm of topsoil and 300mm sub-soil would also be acceptable). The cover system can be formed from imported top and sub soils. Sub soils can also be generated from naturally occurring site won superficial deposits (and re-used following validation testing under MMP).

-  Imported materials must be sourced from a specialist supplier, greenfield site (under direct transfer MMP) or certified remediated source and, along with any site won sub-soils, subjected to chemical testing at the frequencies specified in the Remediation Strategy (Table 3) to ensure they are chemically suitable for a 'Residential with Plant Uptake' scenario.

Works should not proceed until written confirmation, or a 'no objection' response is received from the Local Planning Authority regarding this assessment

9 Conclusion

The supplementary investigation confirms that while the initial source of contamination in the north of the site was likely removed during early cut-and-fill operations, the subsequent mismanagement of site-won materials has resulted in a new risk profile. The previously placed shallow soils across the development are impacted by construction-related anthropogenic debris, rendering them unsuitable for use as a growing medium or within the clean cover layer. Chemical analysis has further identified localised exceedances of Lead and Polyaromatic Hydrocarbons (PAHs), which, combined with the physical debris, renders large areas of the existing shallow soils unsuitable for future site users.

To satisfy planning condition 4 and ensure the site meets NHBC (or other warranty provider) standards, the existing shallow impacted materials should be segregated and removed from site and replaced with validated, clean imported or site won natural soils. The installation of the required 600mm cover system will effectively break any residual pollutant linkage, reducing and potential risks to future residents to negligible levels. Upon completion of the removal of unsuitable soils and placement of required clean cover, a comprehensive Remediation Validation Report must be submitted to the Local Planning Authority to formally discharge the outstanding contaminated land conditions and confirm the site is fit for its intended use.

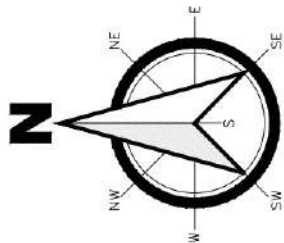
Yours sincerely

For and on behalf of Quinn Developments NW Limited

Phil Sales BSc MSc FGS CSci QP425
Technical Manager (Geo-Environmental)

Appendix A –

Site and Investigation Plans



Revisions	
B	Amended to exclude highways England land
A	Amended to include wall to eastern boundary

Development / Plot Number
WINDY ARBOUR ROAD
Drawing Title
LOCATION PLAN

Drawing No.
FH-LP-01
Revision
B
CROSS SITE AREA RESIDENTIAL DEVELOPMENT 1.1 HA

Scale: 1:1250	Drawn: MNW
Date: 16-10-20	Checked: -



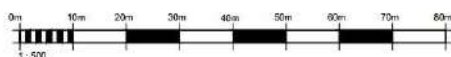
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KEY: APARTMENT UNITS			
HOUSE TYPE	FLOOR AREA GROSS/NET		NUMBER
2BSP APT 3 STORY BLOCK	G009 SQ FT		4 No.
1BSP APT 3 STORY BLOCK	G022 SQ FT		6 No.
1BSP APT 3 STORY BLOCK	G008 SQ FT		2 No.
2SP 6M 3 STORY	G006 SQ FT		2 No.
3SP CORNER 3.5 STORY	G045 SQ FT		1 No.
BUTLER 0.36P 1000 3 STORY	G100 SQ FT		4 No.
BUTLER 0.36P 802 3 STORY	G106 SQ FT		2 No.
WHITMAN 88P 1000 2.5 STORY	G106 SQ FT		4 No.
BYRON 480P 1250 2 STORY	G206 SQ FT		8 No.
TOTAL FLOOR AREA OF UNIT = 36,738 SQ FT GROSS			
KEY: OPEN MARKET UNITS			
MILTON	G1054 SQ FT	G1068 SQ FT	1 No.
TOTAL UNITS			
TOTAL FLOOR AREA OF UNIT = 1834 SQ FT GROSS			
SITE AREA ACRES = 2.51			
GROSS SITE AREA METERS = 10998			
			
TRAIL CHAIRING GARDEN (WED) MILTON ST STORAGE ADJACENT			
VEHICLE CHARGING POINT 26 LITRE SANDWATER BUTTS TO BE PROVIDED TO EACH HOUSE @			



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[illegible]

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DOES NOT WARRANT THE ACCURACY OF THE DATA.



Client: Verity
Site: 10000 Arbor
Project: SUPPLEMENTARY SITE INVESTIGATION WORKS
Title: Supplementary Site Investigation Location Plan
Drawn: J. Smith
Checked: J. Smith
Approved: J. Smith
Date: 10/10/2023
Scale: 1:500
Sheet: 1 of 1
Project: 10000 Arbor

Location	X	Y
SS21B	346322.3623	389736.9382
SS20B	346325.9186	389734.0355
SS1F	346372.4144	389816.6013
SS1S	346381.4003	389817.1134
SS1B	346382.825	389806.2685
SS1B	346380.5443	389802.3416
SS2B	346379.0135	389794.3207
SS2B	346381.5189	389790.9014
SS3B	346374.1322	389787.5382
SS3B	346377.9353	389784.9529
SS4B	346369.3036	389779.1633
SS4B	346376.9863	389773.6247
SS2F	346362.7083	389804.3733
SS3F	346359.2962	389800.6705
SS4F	346354.1741	389792.4802
SS6B	346351.2398	389774.0154
SS7B	346354.9755	389770.6759
SS8B	346365.1901	389764.2148
SS5B	346348.3047	389778.895
SS10B	346377.3849	389755.3103
SS11B	346382.2756	389751.1585
SS12B	346384.7224	389741.8264
SS9B	346371.0141	389762.531
SS5S	346339.2056	389774.436
SS9F	346357.0149	389749.6162
SS10F	346368.8494	389739.5546
SS14B	346361.7806	389702.5545
SS7F	346346.8388	389758.2882
SS13B	346388.3817	389737.3336
SS17B	346343.8322	389718.911
SS16B	346348.7511	389713.3097
SS19B	346332.3023	389727.9347
SS18B	346337.9091	389725.8281
SS15B	346357.2407	389709.3131
SS22B	346331.2697	389715.8469
SS29B	346340.9064	389709.1857
SS23B	346326.4142	389711.4915
SS28B	346338.0195	389705.2271
SS28B	346332.9678	389707.2649
SS27B	346331.1337	389697.56
ComA SS1	346309.2101	389699.2395
ComA SS2	346320.9197	389688.3846
SS22B	346336.2839	389712.4371
SS15F	346369.2929	389722.4882
SS17F	346357.7002	389732.695
SS18F	346346.1044	389739.8717





Appendix B –

Planning Permission (App. No. 20/00329/FUL)



Knowsley Council

**REGENERATION AND ECONOMIC DEVELOPMENT
DEPARTMENT**

TOWN AND COUNTRY PLANNING ACT 1990

This application is subject to a Section 106 Agreement and needs to be read in conjunction with that Agreement.

PLANNING PERMISSION

Application No: 20/00329/FUL

Name and address of applicant

Forth Homes Construction LTD
4 Allerton Road Mossley Hill
Liverpool
L18 1LN
United Kingdom

Name and address of agent

Date of Receipt: 15 June 2020

Date Valid: 10 July 2020

Address/Location of Development:

Land at Windy Arbor Brow / Windy Arbor Road
Whiston
Knowsley

Description of Development:

**ERECTION OF A RESIDENTIAL DEVELOPMENT OF 43 NO. DWELLINGS
COMPRISING 14 NO. APARTMENTS AND 29 NO. HOUSES TOGETHER WITH
ACCESS, CAR PARKING AND ASSOCIATED DEVELOPMENT (DEMOLITION OF
EXISTING BARN)**

The Council of the Metropolitan Borough of Knowsley hereby give notice in pursuance of the above Act(s) that Planning Permission has been **granted** for the carrying out of the development referred to above in accordance with the application and plans submitted subject to the following condition(s):

1. The development granted full planning permission must be begun not later than the expiration of three years beginning with the date of this permission.

Reason: In order to comply with the requirements of Section 91 of the Town and Country Planning Act 1990 (as amended).

2. The development hereby permitted shall be carried out in accordance with the approved plans and documents listed in Schedule 1.

Reason: For the avoidance of doubt.

3. No development shall take place until a scheme for the provision of affordable housing as part of the development has been submitted to and approved in writing by the Local Planning Authority. The affordable housing shall be provided in accordance with the approved scheme and shall meet the definition of affordable housing contained in Annex 2: Glossary of the National Planning Policy Framework or any future guidance that replaces it.

The scheme shall include:

- a) The numbers, type, tenure and location on the site of the affordable housing provision to be made, which shall consist of not less than 25% (11 units) of the total number of housing units;
- b) The timing of the construction of the affordable housing and its phasing in relation to the occupancy of the market housing;
- c) The arrangements for the transfer of the affordable housing to an affordable housing provider or the management of the affordable housing if no Registered Social Landlord involved;
- d) The arrangements to ensure that such provision is affordable for both first and subsequent occupiers of the affordable housing; and
- e) The occupancy criteria to be used for determining the identity of occupiers of the affordable housing and the means by which such occupancy shall be enforced.

The affordable housing shall be provided in accordance with the approved scheme and retained as such thereafter.

Reason: To ensure that 25% affordable housing is retained within the development at all times and to comply with paragraph 65 of the National Planning Policy Framework (2021), Policy CS15 of the Knowsley Local Plan: Core Strategy adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

4. A. Risk Assessment

No development shall take place until an assessment of the risks posed by any contamination has been submitted to and approved in writing by the Local Planning Authority. This assessment must be undertaken by a suitably qualified contaminated land practitioner, in accordance with authoritative guidance (CLR 11), and shall assess any contamination on the site, whether or not it originates on the site.

Moreover, it must include (were relevant):

- (i) a survey of the extent, scale and nature of contamination;
- (ii) an assessment of the potential risks to:

- human health,
- property (existing or proposed) including buildings, crops, livestock, pets, woodland

- and service lines and pipes,
- adjoining land,
- groundwaters and surface waters,
- ecological systems,
- archaeological sites and ancient monuments.

B. Ground Gas Risk Assessment

No part of the development shall commence until a scheme to deal with the potential risk of Ground Gas at the site has been submitted to and approved in writing by the Local Planning Authority. The Ground Gas Risk Assessment should consider the provision of a pictorial CSM and take into account all credible on-site and off-site gas sources. It is considered that additional intrusive works are likely to be required to inform this Gas Risk Assessment, specifically to reduce data uncertainty and increase data confidence, notably with respect to on-site/off-site sources.

The Gas Risk Assessment should take into account the proposed foundation and floor slab construction of the residential properties in line with current UK guidance. The protection measures to all buildings proposed as part of the residential development should be passive. No active protection measures should be permitted.

C. Submission of Remediation Scheme

Where land affected by contamination is found which poses unacceptable risks, no development shall take place until a detailed remediation scheme has been submitted to and approved in writing by the Local Planning Authority. The scheme must include an appraisal of remediation options, identification of the preferred option(s), the proposed remediation objectives and remediation criteria, and a description and programme of the works to be undertaken including the verification plan. As a minimum, the scheme must ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to its intended use.

D. Implementation of Approved Remediation Scheme and Verification Report

The approved remediation scheme shall be implemented and a verification report submitted to and approved in writing by the Local Planning Authority, prior to the development (or relevant phase of development) being brought into use.

E. Reporting of Unexpected Contamination

In the event that contamination is found at any time when carrying out the approved development that was not previously identified it must be reported immediately to the Local Planning Authority. Development on the part of the site affected must be halted and a risk assessment carried out and submitted to and approved in writing by the Local Planning Authority. Where unacceptable risks are found remediation and verification schemes shall be submitted to and approved in writing by the Local Planning Authority. These shall be implemented prior to the development (or relevant phase of development) being brought into use.

F. Materials Management Plan

Prior to the reuse of site won materials ('waste' and non-waste) a Materials Management Plan, carried out in line with the CL: AIRE code of practice and signed off by a Qualified Person, shall be submitted to and agreed in writing with the local

planning authority. The MMP shall demonstrate that any reuse of contaminated materials do not result in increased risk to the environment or human health.

G. Importation of Soil/Material

No soil is to be imported to the site until it has been tested for contamination and assessed for its suitability for the proposed development; a suitable methodology for testing this material should be submitted to and agreed by the Local Planning Authority prior to the soils being imported onto site. The methodology should include the sampling frequency, testing schedules, criteria against which the analytical results will be assessed (as determined by the risk assessment) and source material information. The analysis shall then be carried out and evidence submitted to and approved in writing to by the Local Planning Authority

Reason: To ensure contamination is appropriately identified and a strategy is in place before works commence on the site to prevent pollution in the interests of human health and the pollution of the water environment and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy ENV5 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

5. Notwithstanding the submitted plans, no part of the development shall commence until details of the existing and proposed ground levels (including levels for all vehicular manoeuvring, pedestrian/cyclist and parking areas) have been submitted to and approved in writing by the Local Planning Authority, with full details of adequate mitigation measures to support the adopted highway and public areas as deemed necessary by the Local planning Authority. The submitted details shall include sections across the site. The development shall be implemented in accordance with the agreed details.

Reason: To ensure the impact of the development on adjacent properties and the locality/proposed street scene is acceptable, in the interests of highway and pedestrian safety and amenity of all users of the proposed highway network and to comply with the National Planning Policy Framework (2021), Policies CS2, CS7, CS19, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policies T7 and T10 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan, adopted June 2017.

6. No part of the development, including any works of demolition hereby permitted shall commence until a Demolition/Construction Environmental Management Plan has been submitted to and approved in writing by the Local Planning Authority that details the means of mitigation of construction effects. The Plan shall include timing/implementation details of each phase and shall include, but not be limited to the following:
 - a) Methods for the mitigation of noise and vibration from demolition and building works, including any piling works, and also for the operation of any temporary power generation or pumping plant which will operate overnight.
 - b) Control of transfer of mud out of the site - details of wheel washing facilities including location and type.
 - c) Methods for dust control and suppression.

- d) Details of methods for pest control to be taken during both the demolition and construction phases.
- e) Location and layout of any site compound(s) including identification of areas for the storage of plant and materials, loading/unloading and turning areas for delivery vehicles (for each phase as necessary); and the methods of loading and unloading of plant and materials.
- f) Management of deliveries including prevention of waiting/layover of construction related traffic on the highway; measures for the control of traffic to and from the site; and consideration of any temporary traffic management arrangements which may be necessary during periods of construction. Note reversing on the highway is not permitted without a Banksman.
- g) Identification of permanent on-site contact and/or traffic manager as main point of enquiries or issues arising from construction activities.
- h) An implementation programme of works including phasing if applicable.
- i) The parking of vehicles of site operatives and visitors.
- j) Adequate provision for addressing any abnormal wear and tear to the highway.
- k) Proposed hours of construction which unless otherwise agreed with the Local Planning Authority shall be limited to 0800 to 1800 Monday to Friday, 0800 to 1300 Saturday and not at all on Sundays/Public Holidays.
- l) The details of the design, siting and maintenance of any security hoardings.
- m) There shall be no burning of materials on-site during construction work without the prior written approval of the Local Planning Authority.
- n) No scrub clearance, hedgerow removal, vegetation management or ground clearance is to take place during the period 1 March to 31 August inclusive. If it is necessary to undertake works during the bird breeding season then all scrub, hedgerows and vegetation are to be checked first by an appropriately experienced ecologist to ensure no breeding birds are present. If present, details of how they will be protected are required to be submitted for approval.
- o) A scheme identifying reasonable avoidance measures for hedgehogs:
 - All trenches and excavations should have a means of escape (e.g., a ramp);
 - Any exposed open pipe systems should be capped to prevent mammals gaining access; and
 - Appropriate storage of materials to ensure mammals do not use them.
- p) Site Waste Management Plan:
 - The anticipated nature and volumes of waste that the development will generate
 - Where appropriate, the steps to be taken to ensure the maximum amount of waste arising from development on previously developed land is incorporated within the new development.
 - The steps to be taken to ensure effective segregation of wastes at source including, as appropriate, the provision of waste sorting, storage, recovery and recycling facilities.

- Any other steps to be taken to manage the waste that cannot be incorporated with the new development or that arises once development is complete.
- q) Avoidance and mitigation measures in relation to the Priority Habitat woodland adjacent to the site which shall include: pollution; dust; and debris control methods; appropriate tree protection and buffer zones; and 2 m buffer of retained hedgerow during construction.
- r) Measures to prevent disturbance and spread of Japanese Knotweed as identified in the supporting Extended Phase 1 Habitat Survey and Daytime Bat Survey (June 2020 (Rev. A)).

The development shall thereafter be carried out in accordance with the measures described within the approved Demolition/Construction Environmental Management Plan.

Reason: To ensure a satisfactory development of the site and that appropriate measures are put in place in the interests of the amenity of neighbouring occupiers/areas and in the interest of highway safety and to comply with the National Planning Policy Framework (2021), Policies CS2, CS8 and CS19 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policies ENV2 and ENV3 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, Policy WM8 the Merseyside and Halton Joint Waste Local Plan, adopted 2013 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

7. Prior to the occupation of any dwelling hereby permitted, the recommendations for glazing, ventilation and acoustic fencing as detailed in E3P Noise Impact Assessment, Ref 50-131-R1-4, dated 30th July 2021 shall have been implemented.

For the avoidance of doubt the mitigation measures include:

- a. Whole house ventilation on all plots;
- b. Higher specification of glazing for certain plots, as identified in figure 6 of the Noise Impact Assessment;
- c. Acoustic barriers, that are free from holes, sealed at the base and have a minimum mass of 10kg/m²; and
- d. Retention of the existing stone wall on the eastern boundary.

The agreed mitigation shall be implemented in full in accordance with the agreed details prior to first occupation and maintained as such thereafter.

Reason: To safeguard future occupiers of the approved residential dwellings from noise and disturbance in the interests of residential amenity and to comply with the National Planning Policy Framework (2021), Policies SUE2, CS2 and CS19 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy ENV2 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan, adopted June 2017.

8. Notwithstanding any description of materials in the application, no above ground construction works shall be commenced until samples and / or full specification of materials to be used externally on the buildings (including pumping station), have been submitted to and approved in writing by the Local Planning Authority.

Such details shall include the type, colour and texture of the materials and should be reflective of those identified within Section 2 - Built Form of the Council's Design and

Local Distinctiveness Guide - Built Form Materials Palette. The development shall be carried out only in accordance with the agreed schedule of materials.

For the avoidance of doubt, meter cupboards should be discreetly located on elevations that are not prominent and shall be coloured to match the colour of the elevation on which they are located.

Reason: In the interests of visual amenity and to ensure that the development complies with the National Planning Policy Framework (2021), the National Design Guide (2021), Policies CS2, CS19, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016; the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, July 2020.

9. Notwithstanding the submitted details and any description of materials forming part of the submission, no above ground construction works shall be commenced until the following has been submitted to and agreed in writing by the Local Planning Authority:

Hard Landscaping:

- a) A full specification and samples, where appropriate, of materials to be used for the construction of new public highway and hard surfacing.

Such details shall include the type, colour and texture of the materials and should be reflective of those detailed in the Halsnead Garden Village Design and Local Distinctiveness Guide adopted July 2020.

Soft Landscaping:

- b) A detailed landscaping scheme, the details of which shall relate to all land surfaces not built upon and shall include, but not limited to:
- i. Land-levels and gradients resulting in the formation of any banks, terraces or other earthworks;
 - ii. The exact location and species of all existing trees and other planting to be retained;
 - iii. All proposals for new planting and turfing indicating the location, arrangement, species, sizes, specifications, numbers and planting densities per sqm of all new planting (Emorsgate seed mix shall be at least EM2);
 - iv. For the avoidance of doubt, the scheme shall include replacement of the 23 trees lost with replacement tree planting on a 2:1 ratio;
 - v. An outline specification for ground preparation;
 - vi. The proposed arrangements and specifications for initial establishment;
 - vii. Maintenance and longer-term maintenance of all planted and/or turfed areas.

Such details should be reflective of those detailed in the Halsnead Garden Village Design and Local Distinctiveness Guide, adopted July 2020.

The approved landscaping shall be wholly implemented in its finally approved form within the first available planting season following the substantial completion of development. Any tree or other planting which is lost, felled, removed, becomes diseased, or is substantially damaged within a period of five years thereafter shall be replaced in kind during the first available planting season following the date of loss or damage. The development shall be fully constructed in accordance with the approved scheme in accordance with timescales contained therein.

Reason: In the interests of visual amenity and to comply with the National Planning Policy Framework (2021), National Design Guide (2021), Policies CS2, CS19, CS21, SUE2 and SUE2c of the Knowsley Local Plan Core: Strategy, adopted January 2016 and Saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, adopted July 2020.

10. Prior to the first occupation of any of the dwellings hereby permitted, precise scheme details of the street furniture shall be submitted to and agreed in writing by the Local Planning Authority.

For the avoidance of doubt, the scheme shall incorporate the principles of the Halsnead Design and Local Distinctiveness Guide, July 2020 and shall include details of street signage/lighting.

The agreed details shall be implemented in full to a timetable to be agreed and maintained thereafter.

Reason: To ensure a satisfactory visual amenity and to enhance the character and appearance of the development and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19, SUE2 and SUE2c of the Knowsley Local Plan Core: Strategy, adopted January 2016, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, July 2020.

11. Notwithstanding the details of the boundary treatments as indicated on the submitted drawings, prior to any above ground works, precise scheme details of all walls (including existing to be retained and retaining walls/structures), fences, gates or other means of enclosure to be erected/retained within the development shall have been submitted to and approved in writing by the Local Planning Authority.

For the avoidance of doubt the scheme details shall include, but not be limited to the following:

- The detail shall reflect the recommendations in the Noise Impact Assessment (E3P), Reference: 50-131-R1-4 July 2021;
- The siting of boundary walls/fences shall provide satisfactory highway /pedestrian visibility;
- Evidence to confirm the suitability of the structural strength of high level walls and details of any required reinforcement / supporting pillars;
- Fencing along the Windy Arbor Road boundary shall avoid the concrete posts being visible from outside of the site which should not preclude the use of an acoustic type fencing with posts facing into site and with dark stain;

- Consideration of extending the wall to Plot 1 further along the boundary facing Windy Arbor Road;
- There shall be no 'stepped' arrangement of fencing panels to the sides of dwellings where plot levels differ from adjoining land; Slab on edge should be avoided; and
- Where timber fencing is to be used it needs to be treated and stained in a brown colour.

The agreed details shall be implemented in full before the dwelling to which it relates is first occupied and/or a timetable to be agreed and maintained thereafter.

Reason: In the interests of ensuring an acceptable standard of public realm and visual amenity, to comply with the National Planning Policy Framework (2021), Policies CS2, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Design and Local Distinctiveness Guide, July 2020.

12. Prior to the first occupation of any dwelling located on Plots 5 - 7 precise scheme details for the installation of a lockable gate to the front of the rear access route between dwellings on Plots 5 and 6 shall be submitted to and agreed in writing by the Local Planning Authority.

For the avoidance of doubt the positioning shall ensure that there is no recess. The scheme shall include the precise details of the design, materials and fixings and the gate and any fixings shall be finished Black. The gate shall be fixed in place in accordance with the agreed details prior to the first occupation of the effected plots.

Reason: To provide a secure development; in the interests of visual amenity and to ensure that the development complies with the National Planning Policy Framework (2021), Policies CS2, CS19, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016; Saved Policy DQ2 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, July 2020.

13. Notwithstanding the submitted details, prior to any above ground works, precise scheme details of the proposed pumping station shall be submitted to and agreed in writing by the Local Planning Authority.

The scheme shall include full details of the appearance, including any associated compound enclosure, plant, noise levels and details of the measures in place should the pumping station fail. The agreed details shall be implemented in full prior to first occupation of any of the dwellings hereby permitted and maintained at all times thereafter.

Reason: In the interests of visual amenity; controlling noise / disturbance and odour having regard to protecting residential amenity and ensuring a satisfactory development that accords with the National Planning Policy Framework (2021), Policies CS2, CS19, and SUE2 of the Knowsley Local Plan Core: Strategy, adopted January 2016, Saved Policy ENV2 of the Knowsley Replacement Unitary Development Plan, adopted June 2006; the Halsnead Garden Village Masterplan

SPD, adopted June 2017 and the Halsnead Design and Local Distinctiveness Guide, July 2020.

14. The pumping station shall be designed to a level that is at least 5dB(A) below the existing L_{A90} background noise level as measured during the relevant time-period. Any tonal, impulsive and/or irregular noise would be addressed by imposing a penalty as per the methodology set out in BS 4142:2014+A1:2019, Methods for Rating and Assessing Industrial and Commercial Sound. Noise limits for fixed plant are to apply at a position 1 metre from the closest affected window of the nearest noise sensitive property.

Reason: To ensure that the development does not result in unacceptable noise in the interests of residential amenity and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19 and SUE2 of the Knowsley Local Plan Core: Strategy, adopted January 2016, Saved Policy ENV2 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

15. No development pursuant to this application shall commence until a detailed construction plan working method statement (including Risk Assessment Method Statement) relating to site development earthworks and drainage alongside the M57 M62 Motorway Link Road has been submitted to and approved by the Local Planning Authority in consultation with National Highways (formerly Highways England).

The development shall be carried out only in accordance with the agreed details.

Reason: To ensure that the safety and integrity of the M57 M62 Link Road is not compromised in the interests of protecting National Highways assets and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19 and SUE2 of the Knowsley Local Plan Core: Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

16. No development shall take place until:

- (a) A detailed plan (as depicted in outline on drawing "Windy Arbor Road Site Layout Plan - Planning Drawing 19.044 AL(--)-002 Revision X) showing the alignment and elevational treatment of a close-boarded fence of not less than two metres in height to be erected along the South Western boundary of the development site alongside the M57 M62 Motorway Link road (or at least one metre from any part of the existing motorway fence where the boundary lies within one metre of this) has been submitted to and agreed in writing by the local planning authority in consultation with National Highways; and
- (b) The fence approved by part (a) of this condition shall have been erected in accordance with the agreed details prior to any other work approved by this permission taking place.

Thereafter, the fence shall remain in situ and only be repaired or replaced in accordance with the requirements of this condition.

Reason: To ensure that the safety and integrity of the M57 M62 Motorway Link Road is not compromised in the interests of protecting National Highways assets from construction activities and preventing access between the site and the strategic road network to comply with the National Planning Policy Framework (2021), Policies CS2,

CS7, SUE2 and SUE2c of the Knowsley Local Plan: core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

17. No drainage from the proposed development shall connect into the motorway drainage system, nor shall any drainage from the site run-off onto the M57 M62 Motorway Link Road.

Reason: To ensure that the safety and integrity of the M57 M62 Motorway Link Road is not compromised and to comply with the National Planning Policy Framework, Policies CS2, CS19, CS24, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

18. Notwithstanding the approved drawings, none of the approved dwellings shall be first occupied until details of the development's highway infrastructure, including revised traffic calming measures and revised highway surfacing materials have been submitted to and agreed in writing by the Local Planning Authority.

The development shall be carried out only in accordance with the agreed details.

Reason: To ensure a satisfactory development of the site; the provision of safe and adequate means of access to the development in the interests of highway and pedestrian safety and amenity and to comply with the National Planning Policy Framework (2021); Policies CS2, CS7, CS19, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Design and Local Distinctiveness Guide, July 2020.

19. The areas set aside for parking, servicing, vehicular manoeuvring (including provision for pedestrians and cyclists) indicated on the approved layout plan shall have been surfaced, drained and permanently marked out or demarcated and provided prior to first occupation of the dwellings to which the areas relate.

The development shall be carried out only in accordance with the agreed details and the parking areas shall be made available for its intended use and retained at all times thereafter.

Reason: In the interests of highway and pedestrian safety, to secure adequate parking provision and to comply with Policies CS2, CS7, CS19, CS24, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy T7 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, the Ensuring a Choice of Travel SPD, adopted September 2010, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Design and Distinctiveness Guide, adopted July 2020.

20. Prior to first occupation of the dwellings hereby permitted, they shall be provided with a weatherproof electric vehicle charging point readily accessible from a dedicated parking space in accordance with a scheme that has been submitted to and agreed in writing by the Local Planning Authority.

For the avoidance of doubt the scheme shall ensure that:

Houses: The charging point, where not within a garage, shall, be located discreetly on an elevation that is not prominent and highly visible from the street frontage unless with exception to be agreed by the Local Planning Authority.

Apartments: Points shall be of a design and siting that is discrete and scheme details shall include how the car parking areas will be managed to ensure that EVCs will be made available to all residents.

The charge points shall be:

- a) A minimum of 7KW
- b) at least Mode 3 or equivalent
- c) untethered, and
- d) located in order to comply with the Equality Act 2010 and the accessibility requirements set out in the Building Regulations Part M.

All EV charging points shall be clearly marked as such and their purpose explained to new occupants within their new home welcome pack/travel planning advice. The development shall be carried out only in accordance with the agreed scheme details and shall be retained at all times thereafter.

Reason: In the interests of air quality, promoting sustainable travel opportunities and to comply with paragraph 112 of the National Planning Policy Framework (2021), Policies CS2, CS7, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

21. Notwithstanding the details indicated on the submitted drawings, details of the external cycle storage/parking provision associated with the apartments hereby permitted shall be submitted to and approved in writing by the Local Planning Authority. The cycle storage/parking shall be implemented in accordance with the approved details before the first occupation of the apartments to which they relate and retained and maintained thereafter.

Reason: In the interests of ensuring the provision and availability of adequate cycle storage for future occupiers; promoting sustainable travel opportunities and air quality and to comply with paragraph 112 of the National Planning Policy Framework (2021), Policies CS2, CS7 and CS19 of the Knowsley Local Plan: Core Strategy, adopted January 2016, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Design and Local Distinctiveness Guide, July 2020.

22. Prior to the first occupation of any of the dwellings hereby permitted, precise scheme details for the provision of a crossing point on Windy Arbor Road to provide access to the bus stop on the eastern side of Windy Arbor Road carriageway (S 51098A) shall have been submitted to and agreed in writing by the Local Planning Authority.

The development shall not be brought into use until the off-site highway works relating to the pedestrian crossing point have been carried out in accordance with the agreed details.

Reason: In the interests of sustainable development, pedestrian accessibility and to ensure a satisfactory form of access to the existing bus stop and to ensure compliance with the National Planning Policy Framework (2021), Policies CS2, CS7, SUE2, SUE2c and CS19 of the Local Plan:Core Strategy, adopted January 2016, Saved Policies T7 and T10 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

23. The development hereby permitted shall be implemented in accordance with the submitted the Arboricultural Method Statement Ref TRE/LAWAB/Rev B dated 4 August 2021.

Reason: To ensure that the proper protection of trees has been carried out in the interests of visual amenity and to comply with the National Planning Policy Framework (2021), Policies CS2, CS8, CS19, CS21 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

24. Prior to commencement of any part of the development hereby permitted, at least five working days written notice shall be given to the Local Planning Authority of the intention to commence development.

The protective fencing referred to in the approved Arboricultural Method Statement Referenced TRE/LAWAB/Rev B - 4 August 2021 shall be in place prior to the written notice of the start of development being given to the Local Planning Authority and shall be retained in place until the development is complete.

Reason: To ensure that the proper protection of trees has been carried out and to ensure that the tree protection fencing required pursuant to the approved Arboricultural Method Statement is in place prior to works commencing. in the interests of visual amenity and to comply with the National Planning Policy Framework (2021), Policies CS2, CS8, CS19, CS21 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

25. No trenches, pipe runs for services or drains shall be sited within the root protection areas of trees to be retained without the prior approval in writing of the Local Planning Authority.

Reason: In the interests of the protection of trees and the local amenity and to comply with the National Planning Policy Framework (2021), Policies CS2, CS8, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

26. Notwithstanding the submitted drainage details, no part of the development, including any works of demolition, hereby permitted shall be commenced until full details of a scheme for the provision and implementation of a surface water regulation system to manage the risk of flooding from both overland flow and from the sewer network, has been submitted to and approved in writing by the Local Planning Authority.

In fulfilling this, the following should be considered:

- The maximum rate of discharge, off-site, shall not exceed 5 lit/s
- An exceedance flows plan will be required to identify where the destination of exceedance flows are, where they would pool and flow, and what would be water depth and extent. As a minimum, the 1 in 200 years event plus %40 CC to be sued as an exceedance event.
- Application and details of rainwater butts at property level to be used.

- To consider the application of an on-line attenuation storage instead of off-line given concerns that exist using the offline storage at this scale of development; a matter as has been raised by the United Utilities.

The agreed scheme shall be implemented in full prior to the first occupation of the development and maintained thereafter.

Reason: To ensure that the site is adequately drained and to prevent increased risk of flooding and pollution by ensuring the satisfactory storage of / disposal of surface water from the site in accordance with the National Planning Policy Framework (2021), Policies CS2, CS19, CS24 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and Halsnead Garden Village Masterplan SPD, adopted June 2017.

27. Prior to the first occupation of the development, a Management and Maintenance Plan for the sustainable drainage system relating to the lifetime of the development through an appropriate legally binding agreement shall be submitted to and approved in writing by the Local Planning Authority. This shall include:

- The arrangements for adoption by an appropriate public body or statutory undertaker or details of provision for management and maintenance by a resident's management company.
- A schedule for on-going inspections relating to performance and condition.
- Details for planned maintenance and a mechanism for remedial and urgent repair works. Means of access for inspection and maintenance purposes.

The sustainable drainage management and maintenance plan shall include as a minimum:

- The arrangements for adoption by an appropriate public body or statutory undertaker, or management and maintenance by a Management Company; and
- Arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage systems, including on-site watercourses, to secure the operation of the surface water drainage scheme throughout its lifetime.

The plan shall be implemented in accordance with the timeframes contained within it.

Reason: To ensure effectiveness of the flood risk measures during the lifetime of the development and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19, CS24 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and Halsnead Garden Village Masterplan SPD, adopted June 2017.

28. Precise scheme details of the proposed rainwater butts indicated on the site layout plan referenced 19.044 AL(--)002 Rev. X received 29 October 2021 shall be submitted to and agreed in writing by the Local Planning Authority prior to first occupation of the dwelling to which they relate. The development shall only be carried out in accordance with the approved details and thereafter retained and maintained as such.

Reason: In the interests of minimising surface water flooding and having regard to visual amenity and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19, SUE2, SUE2c and CS24 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policy DQ4 of the Knowsley Replacement Unitary Development Plan, adopted June 2006 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

29. Foul and surface water shall be drained on separate systems.

Reason: To secure proper drainage and to manage the risk of flooding and pollution in accordance with the National Planning Policy Framework (2021), Policies CS2 and CS24 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and Halsnead Garden Village Masterplan SPD, adopted June 2017.

30. No development shall take place, including any works of demolition, until:

- (a) A programme of archaeological work has been completed. The work shall be carried out strictly in accordance with the approved Written Scheme of Investigation (Lanpro July 2020).
- (b) Subsequent phases of work shall be in accordance with a second Written Scheme of Investigation if required which shall first be submitted to and agreed in writing by the Local Planning Authority.

The work shall thereafter be carried out only in accordance with the approved details.

Reason: To ensure the implementation of the required scheme of archaeological investigation and its publication and to comply with the National Planning Policy Framework (2021), Policies CS2, CS19, CS20 and SUE2 of the Knowsley Local Plan Core: Strategy, adopted January 2016, and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

31. Prior to the first occupation of any of the dwellings hereby permitted, a Wildlife Information Pack shall be submitted to and approved in writing by the Local Planning Authority. For the avoidance of doubt this shall comprise:

- a) *Mitigation Measures for European Sites*
Provision of information regarding the presence of and importance of the European sites and how residents can help protect them including an outline 'responsible user code'.
- b) *Mitigation Measures for Recreational Pressure on Local Sites and Ancient Woodland*
Provision of information about the responsible use of Local Sites and their designation features.

The approved Pack shall be issued to new residents on first occupation as part of any sales or rental agreement.

Reason: In order to comply with the Habitat Regulations Assessment Regulations and mitigate increased recreational pressure on European sites to comply with the National Planning Policy Framework (2021), Policies CS2, CS8, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

32. No development shall commence until details have been submitted to and approved in writing by the Local Planning Authority for the provision to be made within the development for accommodating:
- a) bird nesting boxes to be affixed to retained trees and sparrow terraces to be affixed to the approved dwellings;
 - b) bat boxes to be affixed to retained trees and new dwellings;
 - c) retained hedgerows to be gap-filled and enhanced with greater native species diversity and ground flora; and
 - d) tree planting of native species which encourage feeding by birds and bats.

Such agreed details shall be implemented prior to the development first being brought into use.

Reason: To enhance ecology and biodiversity on the site in line with the requirement to achieve a net biodiversity gain from all development and the recommendations of the submitted Extended Phase 1 Habitat Survey & Daytime Survey Report and to ensure that the development complies with the National Planning Policy Framework (2021), Policies CS2, CS8, CS19, CS21, SUE2 and SUE2c of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, July 2020.

33. Prior to first occupation of any of the dwellings hereby permitted, precise scheme details of the proposed lighting to the roads, private communal areas for use by the public including parking areas, footpaths and shared routes shall have been submitted to and approved in writing by the Local Planning Authority.

The details shall include, but not be limited to:

- A detailed description and precise details of the type of lighting;
- Positioning details;
- Details of proposed luminance which shall be designed to protect ecology and does not result in excessive light spill onto habitats.

The scheme shall subsequently be implemented in accordance with the agreed details prior to the dwellings to which the lighting relates first being occupied and/or a timetable to be agreed and shall be retained thereafter.

Reason: In order to minimise the effect of lighting on protected species, in the interests of biodiversity and to ensure the development is safe and convenient for future users and to comply with the National Planning Policy Framework (2021), Policies CS2, CS7, CS8, SUE2, SUE2c, CS19 of the Knowsley Local Plan: Core Strategy, adopted January 2016, Saved Policies T7, T10, DQ2, ENV3 and ENV9 of the Knowsley Replacement Unitary Development Plan, adopted June 2006, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Garden Village Design and Local Distinctiveness Guide, July 2020.

34. The development shall be carried out in accordance with the submitted Energy Statement prepared by Energist Ref: Rev. B, issue date 06/08/2021.

Reason: In the interests of ensuring a sustainable development and to comply with the National Planning Policy Framework (2021), Policies CS22 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

35. No dwelling hereby approved shall be occupied until full details of fibre broadband connections to all proposed dwellings within the development has been submitted to and approved in writing by the Local Planning Authority. The infrastructure shall be installed prior to first occupation of the dwelling to which it relates and made available for use immediately on occupation of the dwelling in accordance with the approved details.

Reason: To ensure that an adequate level of infrastructure is provided in accordance with paragraph 114 of the National Planning Policy Framework (2021), Policies CS2 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

36. The provisions of the Town and Country Planning (General Permitted Development) (England) Order 2015 (or any Order revoking and re-enacting that Order with or without modification) Schedule 2, Part 1, Classes 1 A, AA, B, C, D, E, F and Part 2A, or any amendments made to that Order, shall not apply:
- i. No extensions shall be carried out to dwellings on plots 5, 13, 22-24 (inc.), 26 and 29;
 - ii. No construction of additional storeys;
 - iii. No additions to the roofs;
 - iv. No porches;
 - v. No garages or carports shall be erected within the curtilage of the dwellings;
 - vi. No buildings within the curtilage of the dwellings;
 - vii. No vehicle hard standing space shall be constructed within the curtilage of any of the dwellings; and
 - viii. No gates, walls, fences or other means of enclosure shall be erected between the forward most part of any wall of a dwelling which fronts a highway, carriageway or footpath.

Other than those expressly authorised by this permission, or pursuant to a condition, unless an application to the Local Planning Authority for planning permission for such has been granted.

Reason: The specific circumstances of the site warrant the Local Planning Authority to retain control over any further development in the interests of public safety; to ensure a satisfactory development of the site in the interests of protecting the amenity of occupiers; visual amenity and to safeguard the character of the development in order to comply with the National Planning Policy Framework (2021), Policies CS2, CS7, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016, the Halsnead Garden Village Masterplan SPD, adopted June 2017 and the Halsnead Design and Local Distinctiveness Guide, July 2020.

37. Notwithstanding the provisions of the Town and Country Planning (General Permitted Development) Order 1995 (as amended) (or any Order revising, revoking and re-enacting that Order with or without modification), no internal or external alterations shall take place to the garage of the Milton house type (Plot 4) approved as part of this permission, which would preclude its use for housing motor vehicles without the prior written approval of the Local Planning Authority.

Reason: To ensure that alterations are not carried out which would deplete the provision of car parking facilities within the site and to comply with the National Planning Policy Framework (2021), Policies CS7, CS19 and SUE2 of the Knowsley Local Plan: Core Strategy, adopted January 2016 and the Halsnead Garden Village Masterplan SPD, adopted June 2017.

SCHEDULE 1

Date Received	Ref. No	Version	Drawing/Document Title
29/10/2021	19.044 AL(--)-002	X	Site Layout Plan Drawing
09/09/2021	HRA	-	Habitats Regulations Assessment of Likely Significant Effects Appropriate Assessment 9 September 2021
18/08/2021	662926-1-10-01	A	Swept Path Analysis
10/08/2021	6 August 2021	B	Energy Statement
05/08/2021	TRE/LAWAB	B	Arboricultural Method Statement - 4 August 2021
05/08/2021	TRE/LAWAB	B	Arboricultural Implications Assessment
05/08/2021	3540-1r1	-	Air Quality Assessment
04/08/2021	50-131-R1-4	-	Noise Impact Assessment July 2021
04/08/2021	19.044 AL(--)-003	A	Street Scenes Planning Drawing
04/08/2021	2H800EXT2	-	Proposed Elevations (Plots 8-11)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block - Proposed Elevations Sheet 1 (Plots 30-43)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block - Proposed Elevations Sheet 2 (Plots 30-43)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block Proposed Floor Plans Sheet 1 (Plots 30-43)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block - Proposed Plans Sheet 2 (Plots 30-43)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block - Proposed Floor Plans Sheet 3 (Plots 30-43)
04/08/2021	Windy Arbor Apartment Block	-	Windy Arbor Apartment Block - Proposed Floor Plans Sheet 4 (Plots 30-43)
04/08/2021	4H1832EXT1	-	The Milton - Windy Arbor (Plot 4)
04/08/2021	4H1832PL	-	The Milton - Floor Plans (Plot 4)

04/08/2021	3H887PL/3H943 PL	-	The 3B5P - 3B5P Corner 2020 Edition - Proposed Floor Plans (Plots 5,6,7)
04/08/2021	3H887PL/3H943 PL	-	The 3B5P - 3B5P Corner 2020 Edition - Proposed Elevations (Plots 5,6,7)
04/08/2021	3H943EXT1	-	The Aaron 3B5P CNR - Proposed Elevations Brick (Plot 1)
04/08/2021	3H943PL	-	The Aaron 3B5P CNR - Proposed Floor Plans (Plot 1)
04/08/2021	H943PL/3H887P L	-	The 3B5P Corner 943 - Butler 3B5P 887 2020 Edition - Proposed Elevations (Plots 14,15, 20 ,21)
04/08/2021	H943PL/3H887P L	-	The 3B5P Corner 943 - Butler 3B5P 2020 Edition - Proposed Floor Plans (Plots 14, 15, 20, 21)
04/08/2021	2H800EXT1	-	The Burns 2B4P 2019 Edition - Proposed Elevations (Plots 12, 13)
04/08/2021	2H800PL	-	The Burns 2B4P 2019 Edition - Proposed Floor Plans (Plots 12, 13)
04/08/2021	2H800EXT1	-	The Byron Proposed Elevations (Brick) (Plots 16-19)
04/08/2021	4H1250PL	-	The Byron 4B6P 2020 Edition - Proposed Floor Plans (Plots 8-11, 16-19)
04/08/2021	3H1090EXT1	-	The Whitman 3B5P 2019 Edition - Proposed Elevations (Plots 26-29)
04/08/2021	3H1090PL	-	The Whitman 3B5P 2019 Edition - Proposed Floor Plans (Plots 26-29)
04/08/2021	3H887EXT1	-	The Butler 3B5P 2020 Edition - Proposed Elevations (Plots 24, 25)
04/08/2021	3H887EXTT2	-	The Butler 3B5P 2020 Edition - Proposed Elevations (Render) (Plots 22, 23)
04/08/2021	3H887PL	-	The Butler 3B5P 2020 Edition - Proposed Floor Plans (Plots 2, 3, 22-25)
04/08/2021	June 2020	A	Extended Phase 1 Habitat Survey and Daytime Bat Survey
12/05/2021	Forest Keilder Shed	-	Shed Image - 8 x 6 Forest Kielder Overlap Dip Treated Windowless Apex Wooden Shed
12/05/2021	Shed	-	Shed Specification
12/05/2021	22 August 2019	-	Utilities Search Report
12/05/2021	2265/01 July 2020	-	Written Scheme of Investigation for Archaeological Investigation
31/03/2021	WCG 1901309-T-1:2	-	Topographical Survey (Sheet 1 of 2)
31/03/2021	WCG 1901309-T-2:2	-	Topographical Survey (Sheet 2 of 2)

REASON(S) FOR THE GRANTING OF PLANNING PERMISSION

The decision to grant planning permission has also been taken having regard to the policies and proposals as set out below, and to all relevant material considerations including supplementary planning guidance:-

National Planning Policy Framework

KNOWSLEY LOCAL PLAN: CORE STRATEGY

SD1 - Sustainable Development
CS1 - Spatial Strategy for Knowsley
CS2 - Development Principles
CS3 - Housing Supply Delivery and Distribution
CS7 - Transport Networks
CS8 - Green Infrastructure
CS15 - Delivering Affordable Housing
CS17 - Housing Sizes and Design Standards
CS19 - Design Quality and Accessibility in New Development
CS20 – Managing Heritage
CS21 - Greenspace and Trees
CS22 – Sustainable and Low Carbon Development
CS24 - Managing Flood Risk
CS26 - Waste Management
CS27 - Planning and Paying for New Infrastructure
SUE1 - Sustainable Urban Extensions and Safeguarded Land
SUE2 - Sustainable Urban Extensions Development Principles
SUE2c - Sustainable Urban Extension – South of Whiston and Land South of the M62

KNOWSLEY REPLACEMENT UNITARY DEVELOPMENT PLAN (SAVED POLICIES 2009)

T7 – New Development and Walking & Cycling Routes
T8 - Transport Assessments
T9 - Travel Plans
T10 – Access for the Less Mobile
DQ2 - Security in the Built Environment
DQ4 - Trees and Development
ENV2 - Noise and Vibration
ENV3 – Light Pollution
ENV5 - Contaminated Land

The Joint Merseyside and Halton Waste Local Plan (2013)

WM8 - Waste Prevention and Resource Management
WM9 - Sustainable Waste Management Design and Layout of New Development

Adopted Supplementary Planning Documents (SPD)

Ensuring a Choice of Travel SPD (2010)
Design Quality in New Development SPD (2016)
Trees and Development SPD (2016)
Developer Contributions SPD (2016)
Halshead Garden Village Masterplan SPD (2017)
Amended New Residential Development (2018)
Adding Social Value to Development: Employment and Skills SPD (2018)

This informative is only intended as a summary of the reason(s) for the granting of planning permission. Should you require any further details relating to the decision please contact the relevant case officer (Maxine Wishart on 0151 443 2381)

ARTICLE 35 STATEMENT

The Local Planning Authority has acted positively and proactively in determining this application by identifying matters of concern within the application (as originally submitted) and negotiating with the applicant, acceptable amendments to the proposal to address those concerns. As a result, the Local Planning Authority has been able to grant planning permission for an acceptable proposal, in accordance with the presumption in favour of sustainable development, as set out within the National Planning Policy Framework.

NOTE FOR APPLICANT:

IMPORTANT - PLEASE READ CAREFULLY THE NOTES BELOW AS FAILURE TO COMPLY COULD MAKE THE DEVELOPMENT HEREBY PERMITTED UNAUTHORISED

- 1) This planning permission is granted in strict accordance with the approved plans. It should be noted however that:
 - a) Any variation from the approved plans following commencement of the development, irrespective of the degree of variation, will constitute unauthorised development and may be liable to enforcement action.
 - b) You or your agent or any other person responsible for implementing this permission should inform Planning Services immediately of any proposed variation from the approved plans and ask to be advised as to the best method to resolve the matter. Most proposals for variation to the approved plans will require the submission of a new planning application.
- 2) This permission is granted subject to conditions and it is the owner of the property and the person responsible for the implementation of the development who will be fully responsible for their compliance throughout the development and beyond.
- 3) If there is a condition that requires work to be carried out or details to be approved prior to the commencement of the development this is called a "condition precedent". The following should be noted with regards to conditions precedent.
 - a) If a condition precedent is not complied with prior to the start of development, the whole of the development will be unauthorised and you may be liable to enforcement action.
 - b) In addition, if the requirements of a condition precedent are subsequently not complied with, the development is unauthorised and the only way to rectify the development is the submission of a new application.

If any other type of condition is breached then you will be liable to a breach of condition notice.

NOTE FOR APPLICANT:

The applicant's attention is drawn to the following comments:

1 Cadent (Plant Protection)

In their letter dated 5 August 2020.(appended below)

2 The Coal Authority

The proposed development lies within a coal mining area which may contain unrecorded coal mining related hazards. If any coal mining feature is encountered during development, this should be reported immediately to the Coal Authority on 0345 762 6848.

Further information is also available on the Coal Authority website at: www.gov.uk/government/organisations/the-coal-authority

3 **Waste Audit Site Waste**

The applicant's attention is drawn to the information provided by Merseyside Environmental Advisory Service (MEAS) in relation to available guidance and templates in regard to producing details in respect of the mechanism for managing and monitoring construction, demolition and excavation waste as a requirements of Waste Local Plan WM8 and the National Planning Policy for Waste (paragraph 8, bullet point 3); and is advised for projects that are more likely to produce significant volumes of waste (NPPG, paragraph 49)

Guidance and templates are available at:

<http://www.meas.org.uk/1090>

<https://www.gov.uk/guidance/waste>

<http://www.wrap.org.uk/>

http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8983

4 **Advertisement Consent**

This permission does not grant consent under the Town and Country Planning (Control of Advertisements) 2007 (as amended) for the advertisement(s) shown on the submitted plan, nor does it imply that such consent would be required or forthcoming.

5 **Bats**

The applicant, their advisors and contractors should be made aware that if any bat species is found, then as a legal requirement, work must cease and advice must be sought from a licensed bat specialist.

Lighting

Comment of Merseyside Environmental Advisory Service in relation to scheme for lighting:- It would be helpful for the applicant to refer to Bat Conservation Trust website <https://www.bats.org.uk/news/2018/09/new-guidance-on-bats-and-lighting>

6 **United Utilities**

Comments in the letter of United Utilities dated 21 September 2021. (appended below)

7 **Local Highway Authority**

- a) It should be noted that the developer will be required to secure a Traffic Regulation Order for a 20mph speed limit, to be done as part of the S278/S38 Highway Agreement.

The developer should be aware that implementing the Traffic Regulation Order process can be time consuming and therefore, in order to avoid unnecessary delays in the development being brought in to use, the applicant should take steps to start the process as soon as is practicable. The cost of processing and implementing the Traffic Regulation Order shall be borne by the applicant. In the first instance, the applicant should contact Austin McGowan, t: 0151 443 2234, email: austin.mcgowan@knowsley.gov.uk to discuss this matter further.

- b) It is an offence to carry out any works within the public highway without the permission of the Highway Authority. This grant of planning permission does not negate the need for the submission and approval of highway engineering details for inclusion in an agreement

under s38 and s278 of the Highways Act 1980 (for roads proposed for adoption and off-site highway works respectively). The applicant is advised to contact Mark McCartney, t: 0151 443 2305, email: mark.mccartney@knowsley.gov.uk to discuss the matter further.

- c) It should be noted that the Council operates the Advance Payments Code in accordance with Sections 219 - 225 of the Highways Act 1980. This Code applies wherever a new building is to be erected which will have a frontage onto a new section of road which is to be offered for adoption (or where the Council determines that these areas are potentially adoptable), unless a Road Adoption Agreement under Section 38 of the Act has been concluded, or the street has been declared a private road. Failure to deposit or secure monies with the Highway Authority prior to the commencement of building work in accordance with the Code is an offence, which could lead to the suspension of construction and may lead to prosecution and a fine.
- d) Prior to the commencement of the development, a joint inspection between the applicant and the Council as Local Highway Authority of the condition of the existing footways/carriageways in the vicinity of the site should be carried out. The applicant is advised to contact Mark McCartney, t: 0151 443 2305, email: mark.mccartney@knowsley.gov.uk to discuss the matter further.
- e) The relocation of existing lighting columns and provision of new lighting columns on the existing adopted highway or highway proposed for adoption would need to be funded by the developer and dealt with as part of the S38/S278 highway agreement. All new street lighting and signing to be installed on the existing public highway or highway proposed for adoption will be subject to a commuted sum to cover its future maintenance as part of the Council's Street Lighting and Signing PFI Contract. The relocation of existing street lighting columns will need to be undertaken/agreed by the Street Lighting and Signing PFI Contract Service Provider. The applicant is advised to contact Knowsley MBC Street Lighting Manager Sarah Vose, t: 0151 443 5059, email: sarah.vose@knowsley.gov.uk to discuss the matter further.

8 **Merseyside Fire and Rescue Service**

In their letter dated 4 August 2020 (appended below).

9 **Merseyside Police on behalf of Force Architectural Liaison Unit**

Merseyside Police would welcome an application from the developer for Secured by Design accreditation for this latest site layout.

10 **Liverpool City Region Combined Authority (Merseytravel)**

The comments of Liverpool City Region Combined Authority in their letter of 29 June 2021, in particular:

In order to ensure that the new residential development has appropriate digital connectivity we would request that the developer provides gigabit connectivity to each property and the appropriate ducting as part of the associated highway works (as promoted by the Dig Once approach). This would ensure that all digital infrastructure is laid out during construction rather than the highways and hard landscaping having to be dug up at a later date to accommodate new digital provision.

11 **Drainage**

Any future applications to discharge any conditions applied by the LLFA will require completion of Proforma 2: Sustainable Drainage System: Discharge of Conditions. Guidance on completion of the proforma can be found on the Council's website: Knowsley-Sustainable-Drainage-Completing-your-Pro-Forma-Feb-2019.pdf

A handwritten signature in black ink, appearing to read "Dubai", is positioned at the top left of the page.

Executive Director - Regeneration and Economic Development

Date: 08/12/2021

IMPORTANT NOTES FOR YOUR ATTENTION:

1. This permission refers only to that required under the Town and Country Planning Acts and does not include any consent or approval under any other enactment, bylaw, order or regulation.
2. This permission refers only to those plans submitted as part of the Planning Application a copy of which is retained by the Local Planning Authority. The Local Planning Authority should be contacted in writing if it is proposed to amend these plans in any way as a further permission, may be required.
3. You should ensure that you understand the requirements of all planning conditions and that you fully comply with their requirements. If you are in any doubt about what a condition requires of you, please ask us for assistance. Planning conditions may require you to submit further information to us and await our approval before you can start your development. A failure to do so could result in your development being unlawful and necessitate the submission of a further planning application. A failure to comply with the conditions of the permission/consent may result in the taking of enforcement and potentially legal action, against you to remedy the breach of planning control.
4. A fee is normally payable to discharge planning conditions in accordance with government regulations.
5. This permission does not convey any rights or approval to build on, or develop, any land that is not fully owned or controlled by you, including on party boundaries. You should satisfy yourself that the agreement of any adjoining landowners has been given prior to commencing any building works.
6. If a Building Regulations Consent is required for these works it is your responsibility to ensure that the plans submitted for both the Building Regulations Consent and Planning Permission are the same in all respects. Should the plans relating to one consent vary from the other, it will be necessary for you to submit amended plans to this Department and obtain the relevant approval(s) prior to commencing any works. Knowsley Council's Building Control team are contactable on (0151)-443 2342 and they would be pleased to assist you.

Appeals to the Secretary of State

- If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.
- If you want to appeal against your local planning authority's decision then you must do so within 6 months of the date of this notice.
- Appeals can be made online at: <https://www.gov.uk/planning-inspectorate>.
If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on tel: 0303 444 5000.
- The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.
- The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

Appendix C – Previous SI and Remediation Strategy



Phase 1 and 2 Geo-Environmental Assessment

Land Off Windy Arbour



Revision number: 1

Report status: Final

Date: August 2020

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Windy Arbor, Whiston

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EXECUTIVE SUMMARY

Overview	Swan Environmental Services Limited (Swan) undertook a Phase I PRA and II Site Investigation of land at Windy Arbor Brow, Whiston, Prescott L35 1RA
Site Setting	The site extends to under 1.31 hectares (ha) and is located to the north of Tarbock Island off the M62/M57 at the site of the former Carr Cottage, Windy Arbor Brow, Whiston, Prescott, L35 1RB. (The Site). The grid reference to the centre of the Site is 346335 389701. Access is currently gained by a gate off Windy Arbor Brow.
Environmental Setting	According to the Groundsure Report, the site is indicated to be underlain by superficial drift deposits of Devensian Till, Diamicton and bedrock of Pennine Middle coal measures Formation comprising Sandstone to the north of the site and Mudstone, siltstone and sandstone to the south. The Groundsure report also indicates that the site is underlain by a undifferentiated Aquifer associated with the Devensian Till and a Secondary A Aquifer associated with the Pennine Middle Coal Measures. The Groundsure report records that the nearest surface water feature is Chapel Brook approximately 50m to the south.
Ground Gas	No evidence of potential gas creating material was found within any of the boreholes on site. Following gas monitoring regime, Characteristic Situation 1/ Green NHBC Traffic Light Classification has been determined.
Human Health	PAH levels were found to be in excess of the applied GAC screening criteria for soils for a residential land use with plant uptake in boreholes (WS101 and WS105) Lead was exceeding GAC's in WS101, to the north of the site associated with Made Ground only located to the north. If the apartment block is located to the north a GAVC reassessment may be possible due to the mitigation of removing plant uptake. No asbestos was noted in the soil samples tested.

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Controlled Waters	The site is considered to be located within a low to moderate sensitivity setting in regard of controlled waters on the basis that the site has a presence of low permeability glacial clay which would reduce the migration of mobile contaminants into the underlying undifferentiated and secondary Aquifers, and the nearest surface water feature is located 50m to the south of the site and approximately 200m to the south of the only Made Ground and limited contamination to the north of the site. It is therefore considered that the risk posed to controlled waters within influencing distance of the site is negligible based on the following rationale; Limited, localised contamination is identified at the site within shallow Made Ground and is overlying (circa 1800mm) impermeable clay deposits with no indication of vertical migration; No gross hydrocarbon contamination of the soils has been identified at the site.
Field Observations	Ground conditions identified at the site are summarised in section 10, and essentially comprises either granular Made Ground encountered to a maximum depth of 1.40m bgl in the vicinity of the former and current farm cottage and associated outbuildings or topsoil with an average thickness of 0.4m overlying Glacial Till comprised of interbedded sands, gravels, silts and clays. Solid geology of the Pennine Middle Coal Measures Formation was encountered in no.17 out of the no.20 locations. No visual or olfactory evidence of contamination was observed. No evidence of putrescible materials found on site. Groundwater was encountered during the investigation. Water was found in TP102 and TP/SA110 and was found to rise within the TP102 which after half an hour rose to at least 2.70m bgl and did not soak away within the hour. Water was also identified in TP107 at 1.70m bgl, WS104 at 2.00m bgl, WS106 between 2.00 to 2.20m bgl as perched water within a sand layer. During monitoring visits water varied within the three boreholes with combined ground gas and

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	groundwater monitoring standpipes. No water was encountered in WS101, in WS104 water was found on two of the three monitoring visits, between 1.61 and 1.66m bgl. In WS108 water was found in all three visits between 1.55 to 1.59m bgl. There is a well on site located to the east of the only building remaining to the north west of the site. The site is covered with a very dense vegetation and juvenile to mature trees. Without a mechanical excavator access would have otherwise been restricted.
Infiltration Testing	TP1 demonstrated infiltration rates of 3.07E-05 TP2 demonstrated infiltration rates of 2.99E-05 TP3 demonstrated infiltration rates of 2.34E-06 The rates calculated at granular strata are considered suitable for conventional surface water drainage design with an average infiltration rate of 2.80E-0.5 However, where the depth to the granular unit exceeds the use of regular soakaways, it may be prudent to consider deeper solutions or use of borehole soakaways through location specific design.
Recommendations	Following the site investigation, it is deemed that the site is suitable for redevelopment for residential end use with plant uptake, with limited remediation works concerning the PAH exceedance identified in and potentially around WS101 and WS105 and the lead exceedance in WS101. Upon final design it may be possible to reduce the GAC given to the north of the site in terms of a reduction of risk compared to a residential use without plant uptake. Otherwise it is recommended that a remediation strategy localised to the north of the site should be carried out.

1.0 INTRODUCTION

1.1 Context and Objectives of the Phase 1 Environmental Assessment

Swan Environmental Services Ltd (Swan) was retained by Forth Homes Limited to undertake a combined Phase I (desk based) Environmental Assessment and phase II geo environmental site investigation of the land at Windy Arbor Brow, Whiston, Prescott L35 1RA, including walkover. Walkover Photos are presented as Appendix A. The Site location is shown in Appendix B within historic mapping images (N.B due to site boundary variation the south tip of the site was extended but is not included in the development and therefore information is adjusted accordingly.)

The overall aim of the Phase I Environmental Assessment (Phase 1 Report) is to assess the environmental risk and to assess potentially complete pollutant linkages associated with the site's redevelopment.

It is understood that the proposed redevelopment will involve the development of the partial greenfield site and redevelopment of the former cottage buildings to up to 37 low rise houses and 12No. apartment block with parking, associated parking and landscaping. The Proposed Development Plan (with DCP locations) is presented as Appendix C.

1.2 Scope of Works

A pdf electronic copy of the Phase I and II Report will be provided and the scope of works include:

- A review of published geological, hydrogeological and hydrological information to establish the Site's environmental setting;
- A review of published historical and current Ordnance Survey maps to establish the history of the Site and its immediate surroundings;
- A review of publicly available information from regulatory authority databases, obtained from the Groundsure database;
- Develop a conceptual site model and assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Review of aforementioned Phase 1 Environmental Assessment;
- Preparation of Health and Safety information;
- Completion of no.10 window sample locations;
- Completion of no.10 trial pit locations;
- Completion of the no.3 soakaway tests (BRE365);
- Completion of no.5 DCP tests to interpret a California Bearing Ratio;
- Logging of soil data;
- Soil sampling for laboratory analysis;
- Soil sampling for geotechnical properties;
- Standard penetration testing;
- Groundwater and ground gas monitoring;

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- Assessment of soil concentrations against GAC Screening criteria;
- Report submission of site findings; and
- A summary of conclusions and recommendations
- The scope of works was developed in accordance with the Environment Agency document, 'Model Procedures for the management of Land Contamination.' Contaminated Land Report CLR11.

2.0 INFORMATION SOURCES

One of the objectives of this Phase I Desk Study is to collate:

- Information concerning potential contaminants, pathways and receptors; and,
- Other relevant characteristics of the site and its surrounds.

This involves a study of the site's current and historical land use and is best achieved via a combination of desk-based research and regulatory consultation. In this case, Swan has carried out a desk study, the data gathering exercise is described in the sections that follow.

2.1 Desk Study

Swan has reviewed the following sources of information in order to characterise the site and its surrounds, including:

- Groundsure Report including historical mapping (see Appendix B)
- BGS onshore geo Index <http://mapapps2.bgs.ac.uk/geoindex/home.html>;
- Flooding information <https://flood-map-for-planning.service.gov.uk/>
- Coal Authority Interactive Mapping
<https://mapapps2.bgs.ac.uk/coalauthority/home.html>

2.2 Risk Classification

Swan has utilised the available information, together with our experience to assess the environmental risks. Definitions of the risk terms used are provided on the following table.

Table 1 – Risk Classification

Risk	Description
Negligible	No contamination risk has been identified which are likely to affect development. No investigation is necessary.
Low	No significant contaminated land risks have been encountered that are likely to affect development, it is possible that investigation will be required.
Low-Moderate	There are unlikely to be significant contaminated land issues associated with the site which will adversely affect its re-development. Minor or localised contamination may be present.
Moderate	Some potential contaminated land risks have been identified that require investigation. The risks identified are unlikely to affect the entire site or preclude development.
Moderate-High	Some potentially significant contaminated land risks have been identified that require investigation. The risks are not likely to prevent redevelopment.
High	Significant potential contaminated land risks have been identified. Investigation is required and a remediation strategy is likely to be required.

3.0 CURRENT AND HISTORIC LAND USE

3.1 Site Location

The site extends to 1.31 hectares (ha) and is located to the north of Tarbock Island off the M62/M57 at the site of the former Carr Cottage, Windy Arbor Brow, Whiston, Prescott, L35 1RB. (The Site). The grid reference to the centre of the Site is 346335 389701.

The site is roughly rectangular in shape and is situated off Windy Arbor Brow.

The Site location is illustrated in the current map extracts and aerial photo extract in Appendix B.

3.2 Current Land Use On-site and Surrounding Area

The Site is currently the former Carr Cottage and associated farm land, with the remaining structure to the north west point adjacent to the Windy Arbor Brow. A well is located on site to the east of the remaining building to the north. The majority of the south of the current entrance to the site was used for agricultural use; horses grazed to the immediate south, with pig farming to the far south.

The land use around the site is as follows.

- North – Residential land directly to the north beyond Windy Arbor Brow, Olympic Oils and Stadt Moers Park beyond.
- West – Windy Arbor Brow road leading to a cul-de-sac to the south west, The Village Hotel, M57 with commercial and industrial land use beyond.
- East – Small area of dense trees, Windy Arbor Road, agricultural land, Halsnead Park (with 'Big Water') beyond.
- South – Tarbock Island off the M62/M57 motorways with Tarbock Green beyond.

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3.3 Historic Land Use on Site and Surrounding Area

The Groundsure historical map extracts are presented in Appendix B and the review of the key information is summarised in Table 2 below.

Table 2 – Historical Land Use

Map Edition	Site	Surroundings
1849-50	The site exists as a mixed residential and agricultural plot of land, with 4 buildings occupying the north west corner of the site. The main/ largest building occupies the northern most area with a smaller building to the far north west boundary, a small building in front of the two buildings (thought to be the well house) and a medium sized building to the south of these buildings. Dense woodland is noted in some areas with a boundary line in between the field areas oriented roughly east to west.	Surrounding land use is dominated by agricultural land with sporadic residential land use, mainly associated with the agricultural settings. Chapel Brook is noted to the south of the site flowing roughly north west to south east. Dense woodland is noted to occupy directly adjacent to site in the east. Hollands House and well is located adjacent to the north of site. Halsnead Park occupies the majority of the east of the site with Big water, Potters Pits, Round Clump and The Old Wood as features within. Old Colliery is located approximately 220m to the north east, with coal pit and Halsnead Colliery beyond circa 306m with shafts from 265m to the north east. No.3 ponds are located within 500m: 87m south east, 236m south west, 90m north and 400m south. A mineral Railway enters within 500m to the north west and runs to the Old Colliery 220m to the north east.
1891-92	No significant change	No Significant change.
1904-07	No significant change	No Significant change. Halsnead Colliery is now disused.
1925-27	A greenhouse is now present to the east of an additional smaller building no occupying an area to the east of the main buildings. An additional building is occupying an area to the south west of the main buildings on site. The previous most southern building is no	Old Colliery 220m to the north is east no longer shown as present. The Mineral Railway is now extended from the former location of the Old Colliery to the south east of the site and passes within 110m of the north east of the site's boundary at its closest point and extends to Cronton Colliery >1km to the south east. Additional residential land use is developed in close proximity to the north west and north east of the site. A sewage works is now situated 382m to the north west.

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	longer shown as present.	
1937-38	No Significant change	A tennis court is noted directly adjacent to the south of the site.
1947	No significant change	Increased development particularly residential to the north of the site from circa 250m north.
1955-58	No significant change	No significant change
1966-67	No significant change	All shafts, collieries and mines are now shown as disused within 500m of the site. Cronton colliery remains active. Allotment gardens are now featured approximately 400m to the north. Sewage works are no longer shown a present, a storm outfall is noted in its place and appears to flow into Chapel Brook.
1977-78	The greenhouse and the most eastern building are no longer shown as being present.	Tarbock island associated with the construction of the M62 and M57 is now shown as present and dominates the adjacent land to the south. The M57 is oriented south east to north west and the M62 is oriented south west to north east. There is a works identified approximately 170m to the north. An electricity sub-station is noted 145m north which is aimed to serve a mass of residential properties now developed circa 150m north beyond the (former mineral) railway. A large commercial unit is located circa 300m to the west.
1984-93	The well house is no longer shown as being present.	The railway is now identified as dismantled. A warehouse is now located 232m to the north west. Beyond the M57 to the west, a large area of commercial and industrial has now been developed. Cronton Colliery is a reduced site.
2001-03	No significant change	The hotel to the west of the site is now in situ. Cronton Colliery is no longer present.
2010	No significant change	No significant change
2020	The only remaining building is now the small building to the far north east point adjacent to the north west boundary. Shows current configuration with dense vegetation across site.	Shows current configuration

4.0 CURRENT AND HISTORIC LAND USE/SITE CONDITIONS

4.1 Geology

Based on the information included within the Groundsure Report and the publicly available BGS onshore geindex <http://mapapps2.bgs.ac.uk/geoindex/home.html> accessed on 9th August 2020, the following ground conditions are anticipated:

Table 3 – Geology

Geological Unit	Type	Description
Superficial	Devensian Till	Diamicton
Solid	Pennine Middle coal measures Formation	Sandstone
		Mudstone, siltstone and sandstone

4.2 Historic Mining / Quarrying

The Groundsure report indicates the site is located within an area where there are records of mining, ground workings and natural cavities within 500m of the site.

There are no.3 entries for non-coal mining the nearest is located 12m south west of the site which is in the area of the current M62 motorway, for sporadic vein mineral.

Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered. The nearest fault is located 19m south west as a normal fault inferred ; cross marks on the downthrow side.

There are no.9 entries of Brit Pits within 500m of the site; the nearest is located 270m north east identified as the Halsnead Colliery Bye Pit.

The interactive Coal Authority map <https://mapapps2.bgs.ac.uk/coalauthority/home.html> date last accessed 9th August 2020 shows the site is outside of a high risk development area.

The nearest shaft is located approximately 50m to the north (Fallows Way). The historic mapping identifies a former colliery works to the north east of the (220m) site which is in a Development High Risk Area with Surface mining (past and Current), Past Shallow Coal Mine Workings, Probable Shallow Coal Mine Workings and Coal Outcrops.

Natural ground subsidence risks are summarised in Table 4 below.

Table 4 – Hazard Risk Designation

Hazard	Site Risk Designation
Collapsible Ground	Negligible/Very Low

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Compressible Ground	Negligible (Moderate shown to south however site boundary is extended and therefore only negligible)
Ground Dissolution	Negligible
Landslide	Very Low
Running Sand	Very Low/Low
Swelling / Shrinking Clay	Very Low

4.3 Hydrogeology

4.3.1 Aquifer Characteristics

According to the Groundsure Report, the site reported to be underlain by Secondary undifferentiated aquifer associated with the superficial geology of Devensian Till and Alluvium.

Undifferentiated Aquifers are assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

According to the Groundsure Report, the site is indicated to be underlain by Secondary A Aquifer which is understood to be associated with the bedrock geology of the Pennine Middle Coal Measures Formation.

Secondary Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

4.3.2 Groundwater Abstractions

The Groundsure report indicates that there are no entries for recorded groundwater abstractions within 1km of the site. There are no.2 entries which relate to the same point 1731m south of the site for a historical and active entry for a potable water supply for a United Utilities borehole/pumping station.

4.3.3 Source Protection Zone

The Groundsure report indicates that the nearest Source Protection (Zone 3 – total catchment) is located 146m south west.

4.4 Hydrology

The Groundsure report records that the nearest surface water feature is directly south of the site, namely Chapel Brook, an inland river not influenced by tidal action. Two large surface water bodies are located circa 480m to the north west and to the north east.

4.4.1 Surface Water Abstractions

The Groundsure report indicates that there are no.4 entries for surface water abstractions; three entries relate to the same historical license 570m south east of the site as spray irrigation for the Ochre & Dog Clog Brks, Tarbock Hall. The nearest active entry is for 990m south as spray irrigation for the Ochre & Dog Clog Brks, Tarbock Hall.

4.4.2 Flooding Potential

The government website <https://flood-map-for-planning.service.gov.uk/> accessed on 9th August 2020, identifies the site as being within a Flood Zone 1. A Flood Zone 1 doesn't require a Flood Risk Assessment if the development is smaller than 1 hectare and not affected by other sources of flooding. There may be a requirement for a flood risk assessment of the development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems.

The Groundsure report indicates that there is limited potential for flooding from rivers, coastal and groundwater flooding to occur at the site.

The highest risk on site from surface water flooding is a 1 in 30 year (0.3m – 1.0m) event. Ambiantal Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5-year rainfall event.

Chapel Brook to the south of the site is identified as being in a high risk of flooding area with a flood zone 2 and 3 rating.

The site itself has a low risk of groundwater flooding.

4.5 Waste Disposal Sites

The Groundsure report indicates that there are no.1 historical EA/NRW entry for an Inert, Industrial, Commercial, Household, Liquid sludge facility at Coalgate Lane Landfill 395m north. No.2 historical waste sites include no.2 waste transfer stations 393m and 369m north west of the site respectively. No.5 licensed waste sites are listed on the Groundsure report; the nearest is 345m north west as a transfer station, the remaining no.4 entries relate to the same location 491m north west. There are no.11 entries for waste exemptions, the nearest is 225m north west for disposing of waste.

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4.6 Radon Risk Potential

The Groundsure report indicates that the site is in a lower probability radon affected area, as less than 1% of homes are estimated to be at or above the action level. As such, no radon protective measures are necessary in the construction of new dwellings or extensions.

4.7 Surface Ground Workings

The Groundsure report indicates that there are no.26 entries for ground surface workings within 250m of the site. The nearest is 87m south east and details are for a pond. Other entries include; cuttings, unspecified pits, disused colliery, Old colliery, colliery, unspecified heaps and unspecified ground workings.

4.8 Underground Workings

The Groundsure report indicates that there are no.57 entries for underground workings within 1km of the site. The nearest is a disused colliery 219m north east of the site. Other entries within 500m include; Old colliery, unspecified disused shafts, unspecified old shafts and unspecified disused mine.

4.9 Environmental Sensitivity

Overall, the site setting is considered to be of moderate sensitivity, due to the following reasons:

- The site has been a light agricultural with localised residential land use since at least 1849.
- The potential for localised made ground on site associated with former buildings now no longer present.
- The underlying Secondary undifferentiated Aquifer associated with the Devensian Till and Alluvium.
- The underlying Secondary A Aquifer associated with the Pennine Middle Coal Measures Formation.
- The absence of surface water abstractions within a 500m radius of the site.
- The presence of active potable groundwater abstractions, the nearest is 1731m south of the site.
- The presence of surface water features within 500m of the site Chapel Brook is adjacent to site in the south.
- The presence of licenced waste sites within 500m of the site. A waste station is 345m north west of the site.
- The presence of a groundwater Source Protection Zone 3 – total catchment is located 146m south west of the site. (s); and,
- The residential and agricultural land uses within the surrounding area adjacent to the site.

5.0 REGULATORY INFORMATION AND CONSULTATION

5.1 Regulatory Database

The following environmental data has been obtained from a summary of information databases summarised in the Groundsure Report.

Table 5 Regulatory Databases Summary

Item	0m-249m	250m-500m	Details
Records of Part A(2) and Part B activities and enforcements	0	1	477m north west – Roadstone coating process Part B. Local Asphalt Liverpool.
Environmentally Sensitive Sites (SSSI, SAC, SPA, RAMSAR, LNR)	0	2	There are no SSSI, SAC, SPA, Ramsar or LNR sites within 1km, the site is within a SSSI impact zone. No.2 entries for Ancient and semi-natural woodland. The Old Wood 429 and 457m east and south east respectively. The site is classed as green belt.
Landfill Site, Waste Treatment / Transfer and Disposal Sites	1	18	No.1 historical EA/NRW entry for an Inert, Industrial, Commercial, Household, Liquid sludge facility at Coalgate Lane Landfill 395m north. No.2 historical waste sites include no.2 waste transfer stations 393m and 369m north west of the site respectively. No.5 licensed waste sites are listed on the Groundsure report; the nearest is 345m north west as a transfer station, the remaining no.4 entries relate to the same location 491m north west. There are no.11 entries for waste exemptions, the nearest is 225m north west for disposing of waste.

6.0 PRELIMINARY RISK ASSESSMENT

6.1 Land Quality Risk Assessment

This section of the report uses the information gathered in previous sections and aims to identify the potential Contaminants, Pathways and Receptors present on site. The elements of the Conceptual Model built in the subsections below are also used in Section 7, which considers the Potential Pollutant Linkages, their significance and acceptability in an Environmental Risk Assessment.

6.2 Contaminants (Sources)

The statutory guidance for Part IIA, DETR Circular 02/2000, defines a Contaminant as:

“a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters”. As a result of this review, the following potential contaminant sources have been identified on site:

On-Site

- Made Ground – There is likely potential for made ground to be present on the site from the localised development and demolition of residential and smaller outbuildings to the north of the site.
- There is limited potential for localised metal, PAH and hydrocarbons associated with the machine repairs or storage for agricultural use on site to the north.

Off-Site

- Made Ground associated with the redevelopment of adjacent residential properties.
- Made Ground associated with the construction of the M62 and M57, the embankment is situated to the southern boundary of the site.
- Neighbouring historical and current industrial activities include; no.131 records within 500m, the nearest is 116m north east as cuttings. Other entries include unspecified works (Olympic Oils), electric substations, unspecified pits, railway sidings, nursery, disused colliery, unspecified warehouse, unspecified depot and unspecified ground workings all within 250m.
- The Groundsure report indicates there are no.26 entries for ground surface workings within 250m of the site which includes ponds, cuttings, unspecified pits, disused colliery, Old colliery, unspecified heaps and unspecified ground workings.

6.3 Receptors

The statutory guidance for Part IIA, DETR Circular 02/2000, defines a Receptor as:

“either (a) a living organism, a group of organisms, an ecological system or a piece of property which (i) is in a category listed in Table A as a type of receptor, and (ii) is being, or could be, harmed, by a contaminant; or (b) controlled waters which are being, or could be, polluted by a contaminant”.

Table 6 lists all of the receptors to be considered to be present. Those that are not considered present are excluded from further assessment at this stage.

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Table 6 - Potential Contaminant Receptors

Receptor	Description
Human Health	Future site construction workers Future site users (residents and site visitors) Future site maintenance workers Neighbouring site residents
Controlled waters	Secondary undifferentiated and A Aquifer underlying the site. Chapel Brook to the south of the site.
Other	Buildings and underground services including drinking water supply pipes. Two semi ancient woodland locations have been identified within 500m, no other ecologically sensitive receptors have been identified within 1km of the Site.

6.4 Pathways

The statutory guidance for Part IIA, DETR Circular 02/2000, defines a Pathway as:

"One or more routes or means by, or through, which a receptor: (a) is being exposed to, or affected by, a contaminant; or (b) could be exposed or affected".

Following an assessment of the environmental and geological setting of the site and considering the proposed land use, it is considered that a number of potential pathways for contaminant impact could exist. Table 7 below examines the human and environmental exposure pathways separately and indicate which pathways are considered further.

Table 7 Potential Contaminant Pathway and Linkages

Source	Pathway Description
On-Site Contaminant Sources	There is potential that made ground is present on site resulting from the site's development and demolition of the north of the site. There is limited potential for localised heavy metals, PAH and hydrocarbons associated with the maintenance or storage of agricultural land use on site to the north. Any localised contamination (if present) could represent an unacceptable risk to human health (construction workers or future site users) via ingestion, dermal contact and / or inhalation or dust / volatile vapours.
Off-Site Sources	Made Ground associated with the redevelopment of adjacent residential properties. Made Ground associated with the construction of the M62 and M57, the embankment is situated to the southern boundary of the site. Neighbouring historical and current industrial activities include; no.131 records within 500m, the nearest is 116m north east as cuttings. Other entries include unspecified works (Olympic

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	Oils), electric substations, unspecified pits, railway sidings, nursery, disused colliery, unspecified warehouse, unspecified depot and unspecified ground workings all within 250m. The Groundsure report indicates there are no.26 entries for ground surface workings within 250m of the site which includes ponds, cuttings, unspecified pits, disused colliery, Old colliery, colliery, unspecified heaps and unspecified ground workings.
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7.0 PRELIMINARY CONCEPTUAL MODEL

7.1 Environmental Risk Assessment

This section presents the conceptual model for the proposed redevelopment of the site. Those potential contaminants, pathways and receptors that are present are now integrated within the context of potential pollutant linkages.

Table 8 - Environmental Risk Assessment

Source	Potential chemicals of concern	Receptor	Potential Pathway	Potential Consequence of completed linkage	Likelihood of linkage	Significance of Risk	Explanation
Potential for made ground to be present on the site from the development and demolition of the buildings to the north	Asbestos, unknown fill material, PAH, hydrocarbons and metals.	Future Site Construction workers Future site users Future site maintenance workers	Direct Contact, ingestion and inhalation	High	Moderate	Moderate	There is a risk of contaminants of potential concern being present on site. This is due to the unknown nature of the development and demolition of the outbuildings, particularly to the north of the site. If any contaminants are encountered during the site investigation, remediation can be applied in order to minimise the risk. Site workers can also lower the risk of contamination by using the correct PPE and obeying proper hygiene regulations.
		Neighbouring Site Residents	Direct Contact, ingestion and inhalation	Severe	Unlikely	Low	Limited, localised potential of risk from made ground on site. Closest residential properties are adjacent to the site, however with limited demolition and safe groundworks it's unlikely that any neighbouring site

Source	Potential chemicals of concern	Receptor	Potential Pathway	Potential Consequence of completed linkage	Likelihood of linkage	Significance of Risk	Explanation
		Secondary undifferentiated and Secondary A Aquifer	Leaching or migrating	Moderate	Low	Low	There is limited potential for any contaminants present in any made ground on site to leach into the underlying Aquifer. However, a full site investigation will be carried out to determine whether any contaminants of potential concern are within any made ground is found on site.
Asbestos Fibres within building fabric	Asbestos Fibres	Future Site Construction workers Future site users Future site maintenance workers	Inhalation	Severe	Likely	High	Given the age of the former buildings to the north there is limited localised potential for asbestos fibres to be present within soils. During works appropriate PPE, PRE and dust control measures should be used. There is potential for residual fibres to remain in soils following the demolition if not removed properly. It is understood that asbestos removal will be completed prior to redevelopment.
		Neighbouring Site Residents	Inhalation	Severe	Unlikely	Moderate/low	Unlikely that residents may be present on-site during demolition works for existing building and other buildings have already been demolished. The works should be

Source	Potential chemicals of concern	Receptor	Potential Pathway	Potential Consequence of completed linkage	Likelihood of linkage	Significance of Risk	Explanation
Localised contamination associated with historic maintenance and storage associated with agricultural land use in buildings to the north east.	Metals, PAH's and TPH	Future Site Construction workers Future site users and workers	Direct Contact, ingestion and inhalation	Medium	Low	Low	managed in order to eliminate the potential liberation of fibres. Localised contamination potential associated with the historical agricultural land use within former buildings to the north east. Given the age of the activities and assumed fair condition, widespread contamination is unlikely. However, a comprehensive intrusive investigation is recommended to assess the risk. During the investigation, risk can be managed through the use of appropriate PPE and good hygiene practises in-line with industry best practise.
General off-site sources include Made Ground associated with the redevelopment of adjacent residential properties and the construction of the M62 and M57. Neighbouring historical and current industrial activities and; ground surface workings, within 250m.	Metals, PAH's and TPHs,	Future Site Construction workers Future site users Future site workers	Direct Contact, ingestion and inhalation	Moderate	Unlikely	Low	The proposed hardstanding and building cover across the majority of the site will reduce the infiltration of precipitation and therefore, reduce the mobility of any subsurface contamination. Risk will be lowered due to the historical nature of the works and the age, distance and modified use and subsequent redevelopment of the historic works.

8.0 SITE INVESTIGATION

8.1 General

A ground investigation was designed based on the findings of the desk study with exploratory holes advanced to target specific potential contaminant sources summarised in Section 7.0 and indicated in Table 9 below. In addition, exploratory holes have also been advanced to provide information on baseline conditions across the site and to collect geotechnical information to assist in the design and construction of the development. An Exploratory Hole Location Plan is presented as Appendix D.

Table 9 - Summary of Potential Contaminant Sources

Potential Source	Potential Contaminants	Potential Receptor
Made Ground associated with former demolished buildings on site	Metals, PAHs, hydrocarbons, asbestos and ground gases	Human health, controlled waters and buildings.
Historical use of agricultural storage and repairs.	Metals, Hydrocarbons	Human health and controlled waters
Asbestos Containing Soils from demolition of former outbuildings to north	Asbestos fibres	Human health

The general scope of works comprised the following:

- 10 No. window sample probe holes to circa 5.0m bgl;
- 10 No. trial pits;
- 3No. infiltration tests;
- 3 No. environmental monitoring installations;
- Chemical and geotechnical laboratory analysis;
- In-situ geotechnical testing; and,
- Groundwater and gas monitoring.

8.2 Site Investigation

Exploratory fieldwork was completed between the 16th and 18th July 2020 and the works are summarised in Table 10 overleaf.

The exploratory hole locations have been presented as Appendix D.

The ground conditions encountered and details of monitoring well response zones are indicated on the logs, which are provided in Appendix E.

Return visits were made to monitor installations for groundwater levels and gas concentrations.

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Table 10 - Summary of Fieldwork

Location Hole	Potential Source/Rationale	Type	Maximum Depth (m bgl)	Monitoring Wells Response Zone (m bgl)
WS101	Baseline conditions and ground gas	Windowless Sample Probeholes	2.45	1.00-2.00m bgl
WS102	Baseline conditions		2.45	N/A
WS103			1.45	
WS104	Baseline conditions and ground gas		2.45	1.00-2.00m bgl
WS105	Baseline conditions		2.45	N/A
WS106			3.45	
WS107			2.45	
WS108	Baseline conditions and ground gas		2.45	1.00-2.00m bgl
WS109	Baseline conditions		2.45	N/A
WS110			1.45	
TP101		Trial Pit excavation	3.2	
TP102	3			
TP/SA103	2.5			
TP/SA104	2.3			
TP105	4			
TP106	3.5			
TP107	2			
TP108	3			
TP109	3			
TP/SA110	Baseline conditions and soakaway		3	

Soil samples destined for chemical analysis were collected in appropriate sampling containers. All samples were subsequently stored in cooled boxes prior to submission to analytical laboratory. The samples were collected using appropriate PPE and sampling equipment.

8.3 In-Situ Testing

8.3.1 Standard Penetration Tests

In-situ geotechnical testing was conducted using the Standard Penetration Test at 1m intervals where possible within the windowless sample probe holes. The results are shown on the exploratory hole logs contained in Appendix D, and discussed in Section. 9.1.6.

8.3.2 Soil Infiltration In-Situ Testing

In-situ infiltration permeability tests were undertaken within three trial pit locations (TP/SA103, TP/SA104 and TP/SA110). The results of the in-situ testing are presented IN Appendix H and discussed in Section 9.1.9.

8.4 Laboratory Analysis

8.4.1 Soil Chemical Analysis

Selected soil samples were submitted for a range of chemical analysis comprising, metals, pH, total sulphate, water soluble sulphate (2:1 extract), cyanide, phenols, total and speciated polycyclic aromatic hydrocarbons (PAHs), asbestos, organic content and banded total petroleum hydrocarbons (TPH).

Chemtech Environmental Ltd of Durham undertook the analytical work, the results of which are included in Appendix F and discussed in Section 10.

8.4.2 Geotechnical Laboratory Analysis

Selected soil samples were submitted to Professional Soil Laboratories (PSL) Ltd of Doncaster, where the following geotechnical tests were undertaken:

- 1No. Particle Size Distributions (coarse grading);
- 1No. Atterberg Limits Determinations; and,
- 1No. BRESD1 Suite

The results of the geotechnical analysis are presented in Appendix G and discussed in Sections 9.

8.5 Gas and Groundwater Monitoring

Following the intrusive phase of site works, a total of three gas and groundwater monitoring visits were undertaken within a three-week period from the 24th July 2020 until 7th August 2020.

Gas flow was measured, followed by the sampling of gas for determining the concentrations of methane (CH₄), carbon dioxide (CO₂) and Oxygen (O₂) using an ATEX and MCERTS accredited and calibrated hand-held gas analyser (GFM 426). Gas measurements were recorded for a minimum of sixty seconds at each location, at which point the maximum concentration of CH₄ and CO₂ together with the lowest concentration of O₂ were recorded.

Groundwater monitoring was undertaken using an electronic dip meter.

Ground gas results are discussed in Section 9.3 and the recorded groundwater levels are summarised in Section 9.2.

9.0 GROUND AND GROUNDWATER CONDITIONS

9.1 Ground Conditions

9.1.1 Summary of Ground Conditions

The ground investigation shows the superficial deposits to be more varied than anticipated, with heavily interbedded sand, silt and clay deposits. A summary of the strata encountered is shown below. It is important to note that the site is covered in a dense vegetation and the site investigation would have been hindered had it not been for the presence of the mechanical excavator to facilitate clearance. The mid centre to west of site has immature to mature trees in situ.

Table 11 - Summary of Strata

Strata	Typical Description	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
Made Ground (topsoil)	(Grass over) Blackish brown firm silty gravelly sandy (reworked) clay. Gravel is fine to coarse, sub angular to sub rounded of brick, sandstone and mudstone	0.00	0.00	0.50
MADE GROUND: [Sub-base]	Fine black clayey gravelly silty Sand. Gravel is fine to coarse, sub angular to sub rounded of brick, sandstone and mudstone	0.15	0.50	0.85
MADE GROUND: [Demolition Rubble]	Reddish or Blackish brown very sandy gravel. Gravel is fine to very coarse sub angular to sub rounded of brick ash and coal. Medium cobble content of brick	0.25	0.60	0.55
Topsoil	(Dense vegetation over) Fine greyish black / black silty clayey gravelly SAND. Gravel is fine to coarse sub angular to sub rounded of mudstone	0.00	0.04	0.40
Upper SAND	Fine light brown silty clayey SAND	0.60	0.80	0.50
Upper CLAY	Medium strength stiff reddish greyish (mottled) brown very sandy gravelly CLAY. Gravel is fine to coarse sub angular to sub rounded of sandstone and mudstone. Sand bands throughout	0.30	1.10	1.70
Lower SAND	Fine to very coarse greyish reddish brown silty gravelly SAND. Gravel is coarse sub rounded of sandstone and mudstone. Low cobble content of mudstone	1.00	2.00	>1.45
Lower CLAY	Very high strength very stiff greyish orangish/ yellowish/ purplish brown (mottled) brown silty sandy gravelly CLAY. Gravel is fine to coarse sub angular of sandstone and mudstone	1.00	2.20	>1.80
BEDROCK	Very dense brownish red weathered SANDSTONE	1.70	2.80	>2.30

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Strata	Typical Description	Min Depth to Top of Strata (m)	Max Depth to Top of Strata (m)	Max Thickness (m)
BEDROCK	High strength very stiff reddish greyish brown very clayey laminated MUDSTONE (SILTSTONE)	1.50	2.80	>2.30
BEDROCK	Very dense purplish greyish brown becoming grey weathered slightly clayey MUDSTONE OR (Weathered) MUDSTONE (Arising described as dense greyish brown very sandy gravelly sub angular becoming angular COBBLES)	1.90	3.20	>1.60

9.1.2 Made Ground

Shallow Made Ground deposits were encountered in the north of the site only and was consistent with both former buildings' footprint locations and in type.

Blackish brown firm silty gravelly sandy (reworked) clay located at the surface and was bound with dense vegetation. Upon clearance this material acted as a topsoil however, was clearly Made Ground in nature and was present up to 0.50m in thickness.

Beneath this initial clay layer was a fine black clayey gravelly silty Sand. With brick gravel associated with the demolition material from the former buildings to the north and north west specifically and was encountered between 0.15m and 0.50m with a maximum thickness of 0.85m.

Demolition / construction rubble was encountered to depths between 0.25m and 0.65m with a maximum thickness of 0.55m, described as reddish brown sandy slightly clayey gravel. Gravel is fine to very coarse sub angular to sub rounded of brick ash and coal. Cobbles of brick was encountered in TP101 (0.50 to 1.00m bgl) and TP103 (0.50 TO 0.70m bgl).

Made Ground was found in the following locations and depths WS101 (0.6m), WS105 (0.8m), TP101 (1.00m), TP102 (0.3), TP103 (0.7m) and TP104 (0.4m). It is considered that the area to the north is slightly elevated in current levels compared to final design and therefore the made ground in this area will be removed or re-used as part of the cut and fill process.

The site engineer did not note any olfactory evidence of contamination at any of the exploratory locations.

9.1.3 Topsoil

Topsoil was encountered throughout the mid to south of the site in the remaining no. 14 locations where Made Ground was not located at the surface. Topsoil had a thickness of ~0.40m and in general did not contain any geotechnically unsuitable material, gravel content was typically low and fines of natural lithologies.

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9.1.4 Drift Deposits

The site is recorded to be underlain by Devensian Till (diamicton) the site has some drift deposits which were highly variable across the site and comprised of interbedded sands, silts, sands and clays. Drift deposits typically extended to a depth of between 0.60m to an unproven depth encountered to 1.80m bgl, and was found in all locations.

Sand layers were encountered in TP103, WS101 to WS106 and WS110 in two categories; upper SAND from 0.60m to a maximum thickness of 0.50m and lower SAND from 1.00m bgl with an unproven depth in WS103, WS104.

9.1.5 Solid Geology

Solid geology of the Pennine Middle Coal Measures Formation is reported to be located underlying the site. There is a clear divide on site showing sandstone to be present to the north with a line roughly located in the centre of site subtly oriented north west to south east with mudstone sandstone and siltstone located to the south.

Bedrock appears to be relatively shallow on site and is variable as the Groundsure report suggests. All three types of bedrock were encountered with sandstone being more apparent to the north and mudstone to south with siltstone to the west and south. Bedrock was encountered from 1.50m bgl.

9.1.6 Soil Consistency

Standard Penetration Test results shown in Table 12, overleaf indicates that the interbedded are predominantly composed of medium to very dense sands and medium to very high strength, stiff to very stiff clays. Increase in strength or density is observed with depth and field descriptions indicate that the clay was in two types; upper clay from 0.30m with a maximum encountered thickness of 1.70m, and a lower clay encountered from 1.00m bgl and in WS110 was unproven at 1.45m bgl due to the refusal on high strength very stiff clays which have an approximate undrained shear strength of up to 228 kPa.

9.1.7 Side Stability and Ease of Excavation

The exploratory trial pits were excavated with a JCB 3CX to depths of up to 4.00m bgl, minor instability and side collapse was limited within the trial pits, associated with the sand deposits. This generally occurred due to the introduction of water into the excavation, causing running sands and the sides collapsing.

9.1.8 SPT Results

Table 12 - SPT Results

Boreholes	Start Depth (m bgl)	Strata Type	Geological Unit / Description	CPT/SPT "N" Value	Corrected (N ₁) ₆₀ Value	Relative Density (Granular)	Eurocode Soil strength	Consistency (B55930)	Approximate Undrained Shear Strength (kN/m ²)
WS101	1	Cohesive		10	10	-	Medium strength	Stiff	50
WS101	2	Cohesive		50	45	-	Very high strength	Very Stiff	228
WS102	1	Cohesive		11	11		#N/A	#N/A	
WS102	2	Cohesive		50	45	-	Very high strength	Very Stiff	228
WS103	1	Granular		50	50	Very Dense	-	-	-
WS104	1	Cohesive		7	7	-	Low strength	Firm	35
WS104	2	Granular		49	40				
WS105	1	Cohesive		10	10	-	Medium strength	Stiff	50
WS105	2	Granular		50	50	Very Dense	-	-	-
WS106	1	Granular		7	7	Loose	-	-	-
WS106	2	Cohesive		10	10	-	#N/A	#N/A	50
WS106	3	Cohesive		50	45	-	Very high strength	Very Stiff	217
WS107	1	Cohesive		11	11	-	Medium strength	Stiff	55
WS107	2	Cohesive		50	46	-	Very high strength	Very Stiff	228
WS108	1	Cohesive		9	9	-	Medium strength	Stiff	45
WS108	2	Granular		50	50	Very Dense	-	-	-
WS109	1	Cohesive		10	10	-	Medium strength	Stiff	50
WS109	2	Granular		51	50	Very Dense	-	-	-
WS110	1	Cohesive		53	52	-	Very high strength	Very Stiff	267

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In the values encountered where cohesive soils were present, an increase in strength was noted as the borehole deepened circa 5mbgl. Granular deposits are present between 1.00 – 4.00mbgl which may not be suitable for shallow strip foundations unless excavated to firmer clays beneath and dependant on the location of the granular material in relation to the footprint of any development.

Depending on the design loadings it may be possible to found in the higher strength cohesive deposits for line loads and possibly column loads but this will be subject to settlement profile considerations and will be determined in the final design. If higher loads are expected, then a raft or piles (for column loads) may be suitable depending on strata encountered.

9.1.9 California Bearing Ratio

The California Bearing Ratio (CBR) for the soils were measured using an in situ DCP TRL probe, the results are summarised in Table 13 shows the summary of DCP testing and equating CBR. Test locations are shown on the Site investigation location plan.

CBR results have been averaged from the blow counts across the strata tested and any abnormally high blow counts ignored as these are likely to be from larger granular material and so represent anomalies. In the area of DCP101 and DCP102 the ground was relatively impenetrable due to the compaction created by logistics on and off the site by the excavator and shallow granular conditions, therefore the readings in this area were higher in the area to the north west.

DCP testing was carried out on current levels including the topsoil and does not account for potential cut and fill levels. The Proposed Development Plan with DCP locations is presented as Appendix C.

Table 13 - Summary of CBR Testing

Location	Depth (m)	CBR (%)
DCP101	0.00 – 0.15	26
	0.15 – 0.25	70
DCP102	0.00 – 0.40	48
	0.40 – 0.50	55
DCP103	0.00 – 0.30	3
	0.30 – 0.70	15
DCP104	0.00 – 0.40	8
	0.40 – 0.60	26
DCP105	0.00 – 0.40	3
	0.40 – 1.0	23

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A current average CBR value of 18% is given for the shallow strata at site between 0.00m and 0.40m bgl, and an average of 38% for strata between 0.15 to 1.00m bgl. However, a CBR value of between 1-3% may be achieved following cut and fill levels based on soil type, stone replacement, equilibrium CBR values and plasticity Index according to the Road Pavement Design Guide 2020, however this will be determined upon final confirmation according to design according to levels and cut and fill requirements. The results of the CBR Testing is presented in Appendix I.

9.1.9 Soil Infiltration

In-situ variable head permeability tests were undertaken within three trial pit / soakaway locations (TP/SA103, TP/SA104 and TP/SA110). No staining or odours were observed during the excavation of the trial pits. The results are presented in Table 14 below and subsequent graph results.

Table 14 - Soil Infiltration Results

Location	Depth (m)	Material	Test Type	Soil Infiltration Rate (m/s)
TP/SA103	2.50	(Weathered) SANDSTONE (Arisings described as dense greyish orangish brown very sandy gravelly sub angular becoming angular COBBLES)	BRE365 Infiltration	3.07E-05
TP/SA104	2.30			2.99E-05
TP/SA110	3.00	(Weathered) MUDSTONE (Arisings described as dense greyish brown very sandy gravelly sub angular becoming angular COBBLES)		2.34E-06

It can be concluded that soakaway drainage will be a feasible option for surface water disposal from the site.

In any areas of shallow clay, the target locations will need to be drained via a communal soakaway in public open space outside of a clay area. This should be mitigated by relatively shallow granular bedrock.

Considering the significant volumes of high permeability clay on the site potentially up to 4.00m bgl, it is considered that soakaway drainage may not be suitable for the proposed development in some locations, however is possible within underlying sands and granular sandstone and mudstone strata.

The application of soakaway drainage will ultimately be dependent on the specific requirements of the development.

It is calculated that a site wide infiltration rate of 4.18×10^{-6} m/s has been considered for granular superficial strata where present. Therefore, at this rate the site is considered suitable for infiltration, however it should be noted that shallow perched/groundwater is identified from circa 2m bgl.

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Where the depth to any sand unit exceeds the use of regular soakaways, it may be prudent to consider use of borehole soakaways through location specific design. However, these should be considered in consultation with EA.

All soakaways should be designed in accordance with BRE Special Design 365 - Soakaway Design.

9.1.10 Soil Plasticity

The Atterberg Limits determinations, summarised in Table 15 below, show the clay to be of low to intermediate plasticity with a low volume change potential.

Atterberg Limit Tests were carried out on samples WS105 at 1.00-1.45m bgl and TP105 at 2.00m bgl within the Superficial Clay deposits. Results of the tests reported liquid limit values of 27 and 31%, and plastic limits values of 14 to 16%, resulting in values of plasticity of 13 to 15%. Results are shown below:

Table 15 - Summary of Plasticity Index Test Results

Location	Depth (m bgl)	Natural MC (%)	Plastic Limit (%)	Liquid Limit (%)	Plasticity Index (%)	Plasticity	Modified Plasticity Index	Volume Change Potential
WS105	1.00 – 1.45	14	14	27	13	Low plasticity	12.61	Low
TP105	2.00	14	16	31	15	Low plasticity	14.85	Low

For design purposes, a value of plasticity index = 14% is recommended, based on the results.

In accordance with NHBC Chapter 4.2 Building Near Trees (2003) soils can be classified in terms of volume change potential, using the relationship:

$$Ip' = Ip \times \frac{\% \text{ less than } 425\mu\text{m}}{100\%}$$

Ip' = modified plasticity index,

Ip = plasticity index.

Based on the laboratory test results, the above relationship and Table 1 of NHBC Chapter 4.2, the samples of clay are shown to have Low volume change potential.

9.1.11 pH and Sulphate

pH and Sulphate Testing

To determine the pH Value of Soils in accordance with BS 1377: Part 3:1990 - Clause 9, Electrometric Method and to determine the Sulphate Content of Soil in accordance with BS 1377: Part 3: 1990: Clause 5.5 (Gravimetric Method) the following testing was carried out.

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Table 16 - Summary of Ph and Sulphate Test Results

Sample id/Depth	Soil Description	pH Value	Sulphate Content (Water soluble sulphate as SO ³)
WS106 @ 1.45	Very high strength very stiff yellowish greyish brown gravelly silty sandy CLAY.	5	<0.01%
WS109 @ 2.45m	Very dense yellow weathered SANDSTONE	7.8	<0.01%

Sulphate assessment shows Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).

9.1.12 Particle Size Distribution

Particle Size Distribution testing was carried out on the superficial SAND in sample WS104 at 2.00 – 2.45m bgl described as Brown very silty SAND and GRAVEL. Soil fraction made up 42% Gravel, Sand 40% and Silt/Clay 18% of the sample.

Table 17 - Summary of PSD Test Results

Sample Id	BS Test Sieve Size (mm)	Percentage by Mass Passing
WS104 @3.30m	125	100
	75	100
	63	100
	37.5	100
	20	87
	10	77
	6.3	68
	3.35	61
	2	58
	1.18	56
	0.6	54
	0.3	46
	0.212	29
	0.15	21
	0.063	18

9.2 Groundwater Conditions

Groundwater was encountered during the investigation. Water was found in TP102 and TP/SA110 and was found to rise within the TP102 which after half an hour rose to at least 2.70m bgl and did not soak away within the hour. Water was also identified in TP107 at 1.70m bgl, WS104 at 2.00m bgl, WS106 between 2.00 to 2.20m bgl as perched water within a sand layer.

During monitoring visits water varied within the three boreholes with combined ground gas and groundwater monitoring standpipes. No water was encountered in WS101, in WS104 water was found on two of the three monitoring visits, between 1.61 and 1.66m bgl. In WS108 water was found in all three visits between 1.55 to 1.59m bgl.

The site is considered to be located within a low to moderate sensitivity setting in regard of controlled waters on the basis that the site has a presence of low permeability glacial clay which would reduce the migration of mobile contaminants into the underlying Aquifer which is classed as Secondary undifferentiated within the drift deposits and Secondary A within the deeper bedrock, and the nearest surface water feature within influencing distance is off site, named as Chapel Brook to the south.

It is therefore considered that the risk posed to controlled waters within influencing distance of the site is limited based on the following rationale;

Limited, localised contamination is identified at the site within shallow Made Ground to the north of the site. This Made Ground will likely be removed as part of the cut and fill development and is also overlying (circa 1.20m) impermeable clay deposits with no indication of vertical migration;

No gross hydrocarbon contamination of the soils has been identified at the site; and,

In relation to the Made Ground, the surface water feature to the south of the site is 50m from the southern site boundary and circa 200m from the nearest area of Made Ground in the north of the site.

9.3 Ground Gas

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report C665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007).

Three monitoring visits have been completed over a period of three weeks between 7th August 2020 and 31st August 2020, with atmospheric pressure steady between 1007 to 1015mbar. A maximum concentration of 0.08% v/v carbon dioxide was recorded in WS104. Methane levels were all 0.0% v/v. All borehole flow rates were 0.1l/hr.

In accordance with the methodology outlined with the CIRIA publication C665, Swan have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0000l/hr and for carbon dioxide was 0.0008l/hr (WS104).

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The GSV has been compared to the criteria outlined within CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

CIRIA C665 states that the maximum GSV for carbon dioxide and methane is <0.07 l/hr for Characteristic Situation 1/ Green NHBC Traffic Light Classification and therefore the site would fall into this bracket and no gas precautions need to be adopted for the site.

This is the final classification supplied on completion of all monitoring visits.

9.3.1 Ground Gas

Table 18 - Summary of Ground Gas Monitoring

Well	Date	CH ₄ Initial %v/v	CH ₄ Steady %v/v	CH ₄ GSV l/hr	CO ₂ Initial %v/v	CO ₂ Steady %v/v	CO ₂ GSV l/hr	O ₂ %v/v	H ₂ S %v/v	Atmos. (mb)	Atmos. Dynamic	Flow (l/hr)	Response Zone (mbgl)	Depth to Base (mbgl)	Depth to Water (mbgl)
WS101	07/08/2020	0.0	0.0	0.0000	4.8	4.8	0.0048	17.4	0.0	1015	Steady	0.1	1.00-2.00	2.0	N/A
	24/08/2020	0.0	0.0	0.0000	7.3	7.3	0.0073	6.6	0.0	1007		0.1		2.015	1.66
	31/08/2020	0.0	0.0	0.0000	7.7	7.7	0.0077	12.2	0.0	1008		0.1		2.05	1.55
WS104	07/08/2020	0.0	0.0	0.0000	8.1	8.1	0.0081	9.9	0.0	1015		0.1	1.00-2.00	2.03	N/A
	17/07/2020	0.0	0.0	0.0000	6.0	6.0	0.0060	7.3	0.0	1007		0.1		2.03	N/A
	31/08/2020	0.0	0.0	0.0000	8.5	8.5	0.0085	8.5	0.0	1008		0.1		2.025	1.63
WS108	07/08/2020	0.0	0.0	0.0000	2.2	2.2	0.0022	18.4	0.0	1015		0.1	1.00-2.00	2.02	N/A
	24/08/2020	0.0	0.0	0.0000	1.5	1.5	0.0015	20.9	0.0	1007		0.1		2.018	1.61
	31/08/2020	0.0	0.0	0.0000	2.2	2.2	0.0022	16.9	0.0	1008		0.1		2.015	1.59

10.0 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

Swan has undertaken a Tier II qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

10.1 Human Health Risk Assessment

At a Tier II stage, the long term (chronic) toxicity risk to human health is assessed by utilising appropriate and conservative generic assessment criteria (GAC) to determine whether there are actual or potential unacceptable risks at the site and if any viable pollutant linkages are present.

To undertake the Tier II assessment within the context of the development proposal, Swan has determined that the most appropriate GAC values available will be those based upon a residential land use with the cultivation and ingestion of home-grown produce taken into account.

The following assessment, summarised below and overleaf in Table 19, has primarily adopted the S4UL (Suitable for Use Levels reference values published by LQM/CIEH in 2015, the S4ULs). Currently, no published GAC value is available for cyanide and therefore Swan has utilised the Environmental Agency Contaminated Land Exposure Assessment Tool (CLEA v1.06) to derive the relevant GAC for this proposed land use. Due to the absence of a published lead GAC for direct use within the planning regime, the 2014 Defra C4SL (Category 4 Screening Level) has been used as this value is considered to incorporate the latest toxicological, bioaccessibility and exposure modelling research to date.

**Table 19 - Summary of Toxicity Assessment for a Residential End Use
with Plant Uptake**

Determinand	Units	GAC	GAC Source	n	[mc]	Location	Primary Pathways	Assessment
Inorganics								
Arsenic	mg/kg	37	(i)	10	21	N/A	1	No Further Action
Cadmium	mg/kg	11	(i)		0.8		1, 2	
Chromium (VI)	mg/kg	6	(i)		<1		1, 2, 3	
Lead	mg/kg	200	(iv)		274		1, 2	
Mercury [Inorganic]	mg/kg	40	(i)		<0.5		1, 2	
Nickel	mg/kg	130	(i)		39		1	
Selenium	mg/kg	250	(i)		1.9		1, 2	
Copper	mg/kg	2,400	(i)		104		1, 2	
Zinc	mg/kg	3,700	(i)		197		1, 2	
Asbestos	-	D.	-	6	N/D	3		
Organics – PAHs and Phenol								
Naphthalene	mg/kg	2.3	(ii)		0.27		4	
Acenaphthylene	mg/kg	170	(ii)		<0.02		2	
Acenaphthene	mg/kg	210	(ii)		<0.02		2	
Fluorene	mg/kg	170	(ii)		2.47		2	
Phenanthrene	mg/kg	95	(ii)		34.70	N/A	2	

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Anthracene	mg/kg	2,400	(ii)		11.17	N/A	2	
Fluoranthene	mg/kg	280	(ii)		69.25		1, 2	
Pyrene	mg/kg	620	(ii)		59.00		1, 2	
Benzo(a) Anthracene	mg/kg	7.2	(ii)		26.03	1	See discussion	
Chrysene	mg/kg	15	(ii)		24.96	1		
Benzo(b) Fluoranthene	mg/kg	2.6	(ii)		34.17	1		
Benzo(k) Fluoranthene	mg/kg	77	(ii)		14.12	N/A		
Benzo(a)Pyrene	mg/kg	2.2	(ii)		24.97	1	See discussion	
Indeno (123-cd)Pyrene	mg/kg	27	(ii)		14.37	N/A	1	No Further Action
Dibenzo(a,h) Anthracene	mg/kg	0.24	(ii)		3.80	1	See discussion	
Benzo(ghi) Perylene	mg/kg	320	(ii)	15.34	N/A	1	No Further Action	
Organics – TPHs								
TPH C5-C6	mg/kg	42	(iii)	9	<0.01	N/A	4	No Further Action
TPH C6-C8	mg/kg	100	(iii)		<0.01		4	
TPH C8-C10	mg/kg	27	(iii)		<0.01		4	
TPH C10-C12	mg/kg	74	(iii)		<1		4	
TPH C12-C16	mg/kg	140	(iii)		4		1, 2	
TPH C16-C21	mg/kg	260	(iii)		178		1	
TPH C21-C35	mg/kg	1,100	(iii)		143		1	
Key for Table 19								
[mc]	Maximum Concentration Recorded							
D.	Detected							
N.D.	None Detected (Limit of Detection = <0.0001%)							
Primary Pathways								
1	Ingestion of soil and indoor dust and / or oral background exposure;							
2	Consumption of home-grown produce and attached soil;							
3	Inhalation of dust (background and indoor);							
4	Inhalation of vapour (background and indoor);							
Generic Assessment Criteria (GAC) Source								
(i)	LQM/CIEH Suitable For Use Level (S4UL) (2015);							
(ii)	S4UL – Conservative Assessment Approach of 1% SOM;							
(iii)	S4UL –1% SOM and assumed worst case aliphatic / aromatic compound;							
(iv)	Defra Category 4 Screening Level (2014);							
(v)	CLEA 1.06 Derived Value.							
(vi)	EA Values							

Referring to Table 19, the results of this direct comparison indicates that the screening values have been exceeded for the determinands at the locations and depths as shown in Table 20 below. Out of no.6 Total Organic Carbon samples, the results range from 3.3% to 8.3 % w/w C to an average of 5.6%. Giving an average Organic matter content of 7.8%w/w C.

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Table 20 - Summary of Exceedance Locations

Exploratory Location	Determinands exceeding GAC	Depth (m bgl)	Strata
WS101	Lead	0.50	WS101 - 0.25 – 0.60m - Reddish brown sandy slightly clayey gravel. Gravel is fine to very coarse sub angular to sub rounded of brick ash and coal. Medium cobble content of brick
	Benzo(a) Anthracene		
	Chrysene		
WS101, WS105	Benzo(b) Fluoranthene	0.50, 0.40	WS105 - 0.30 – 0.60m Fine black clayey gravelly silty Sand. Gravel is fine to coarse, sub angular to sub rounded of brick, sandstone and mudstone
WS105	Benzo(a)Pyrene	0.40	
WS101	Dibenzo(a,h) Anthracene	0.50	

10.1.1 Detailed Human Health Risk Assessment**PAHs**

Lead and PAH contamination was recorded within the shallow Made Ground at no.2 locations (WS101 and WS105), with the source of the elevated contaminants considered to be the Made Ground at around the same elevation associated with potential storage and maintenance of agricultural vehicles.

In the case of metals and PAHs the main exposure pathway is soil Consumption of home-grown produce and dust ingestion. It is recommended that the Lead and PAH contamination found within the Made Ground at this location are remediated through the removal of the identified pollutant pathways by the installation of a clean cover system as detailed in the following paragraphs. It is considered that as the area concerned is at a raised level compared to that of the proposed development, a cut and fill process will mitigate this to some extent depending on final finished levels and the cut process.

It considered the risk may be reduced upon final proposed development design from Residential use with plant uptake to residential use WITHOUT plant uptake, as it is considered that the apartment block will be situated within the north of the site in the location of WS101 and WS105.

10.2 Revised Conceptual Site Model

The initial conceptual site model has been revised in light of the ground investigation and is based on the identified contaminant sources and pathways as shown in Table 21 below.

Table 21 - Identified Contaminant Sources and Pathways

Source	Contaminant	Pathway
Made Ground – Reddish clayey gravel & Black clayey sand	Non-volatile PAHs Lead	Ingestion / consumption of home grown produce

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The revised conceptual site model has been developed for the proposed future land use based upon the recommended remedial measures, this summarises the understanding of surface and sub-surface features, the potential contaminant sources, transport pathways and receptors, as detailed below and summarised in Table 22.

Table 22 - Revised Conceptual Site Model

Receptor	Potential Risk	Current Residual Risk	Mitigation
Human Health	<i>Uptake of contaminants by food plants grown in contaminated soil</i>	YES	Provision of a clean cover system and potential GAC reduction will mitigate risk from PAH in and around WS101 and WS105.
	<i>Ingestion</i>	YES	Made Ground in and around WS103 to be placed at least 0.60m bgl due to the risk from ingestion of PAHs which will be mitigated.
	<i>Inhalation</i>	YES	Made Ground in and around WS103 capped with a clean inert soil layer (approximately 600mm thick) if located within a landscaped area; or, Made Ground (WS103) could be excavated and placed beneath proposed hardstanding areas thus removing the pathway to future site users and construction workers.
	<i>Skin contact</i>	NO	N/A
	<i>Irradiation</i>	NO	N/A
	<i>Fire and explosion</i>	UNKNOWN	CIRIA Characteristic Situation 1 / NHBC green. No gas protection measures are necessary.
Buildings	<i>Fire and explosion</i>	UNKNOWN	
	<i>Chemical attack on building materials and services</i>	NO	Soils present at the site are consistent with design sulphate class DS-1 and ACEC AC-1s. Water supply pipes – A risk assessment is required.
Natural Environment	<i>Phytotoxicity</i>	NO	N/A
	<i>Contamination of Controlled waters</i>	NO	N/A

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusion

Based on the information contained in this report, the following conclusions can be drawn:

- The site has been a light agricultural with localised residential land use since at least 1849.
- The potential for localised made ground on site associated with former buildings now no longer present.
- The underlying Secondary undifferentiated Aquifer associated with the Devensian Till and Alluvium.
- The underlying Secondary A Aquifer associated with the Pennine Middle Coal Measures Formation.
- The absence of surface water abstractions within a 500m radius of the site.
- The presence of active potable groundwater abstractions, the nearest is 1731m south of the site.
- The presence of surface water features within 500m of the site Chapel Brook is adjacent to site in the south.
- The presence of licenced waste sites within 500m of the site. A waste station is 345m north west of the site.
- The presence of a groundwater Source Protection Zone 3 – total catchment is located 146m south west of the site.
- The residential and agricultural land uses within the surrounding area adjacent to the site; and,
- The site is not in an area where Radon protection measures are required.

Potential contamination sources are considered to be localised, there is potential that PAH's have leached into the shallow soils on site from historic agricultural activities to the north and that Made Ground is only in situ in the area to the north where current and former buildings have been located.

Based on the information contained in this report and with due regard to the current and future commercial land use, it is the opinion of Swan that the site represents a **Low to Moderate risk** with respect to contaminated land liability issues. Therefore, the findings of this report should not prevent successful redevelopment of the Site.

Following on from the PRA a site investigation was carried out to establish the ground conditions and determine the classification of the site based on the findings within the PRA. The following conclusions are given:

- There was no visual or olfactory evidence of contamination identified during the site investigation.
- Made ground was encountered up to a depth of 1.40m during the site investigation.
- Groundwater was encountered during the investigation. Water was found in TP102 and TP/SA110 and was found to rise within the TP102 which after half an hour rose to at least 2.70m bgl and did not soak away within the hour. Water was also identified in

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TP107 at 1.70m bgl, WS104 at 2.00m bgl, WS106 between 2.00 to 2.20m bgl as perched water within a sand layer.

- During monitoring visits water varied within the three boreholes with combined ground gas and groundwater monitoring standpipes. No water was encountered in WS101, in WS104 water was found on two of the three monitoring visits, between 1.61 and 1.66m bgl. In WS108 water was found in all three visits between 1.55 to 1.59m bgl.
- PAH's (Benzo(a)Anthracene, Chrysene, Benzo(b)Fluoranthene, Benzo(a)Pyrene, Dibenzo(a,h)Anthracene) and Lead were found to be in excess of the applied GAC screening criteria for soils for a residential land use with plant uptake. The GAC may be reassessed upon final design for potential reduction associated with the apartment block to the north.
- No ground gas risk is present on site following three ground gas monitoring visits.
- Considered low risk to controlled waters due to limited, localised contamination within shallow Made Ground which is overlying (circa 1800mm) impermeable clay deposits with no indication of vertical migration;
- A remediation strategy will be required for the Provision of a clean cover system will mitigate risk from PAH and Lead in and around WS101 and WS105.

12.2 Recommendations

Based on the available information, limited, localised land contamination issues have been identified which will be dealt with by way of small-scale remediation which is considered unlikely to prevent development of the site for residential land use with plant uptake, provided appropriate mitigation measures are undertaken. A summary of the recommendations is provided below:

- A Phase 2 Environmental Investigation has been carried out to determine any contamination risks associated with the site's former and current land use.
- Limited contamination has been encountered during the investigation and therefore limited remediation should be carried out.
- Construction workers should adopt appropriate procedures to manage health and safety risks associated with any contamination.
- Asbestos (if any) should be removed from buildings identified for demolition in advance.
- Upon final design it may be possible to reduce the GAC given to the north of the site in terms of a reduction of risk compared to a residential use without plant uptake.

13.0 CLOSURE

This report has been prepared by Swan with all reasonable skill, care and diligence.

This report should be used for information purposes only and should not be construed as a comprehensive characterisation of all site conditions.

This report is based on a variety of third party and some publicly available information. Swan does not and cannot guarantee the authenticity of this information.

This report is for the exclusive use of Forth Homes Limited; no warranties or guarantees are expressed or should be inferred by any third parties. Any such party relies upon the report at their risk.

Swan disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.



Plate 1: View from the mid-east of the site facing north west



Plate 2: View from the north west facing south east toward the cottage building



Plate 3: Facing the current entrance to the north west



Plate 4: View of the location of the well on site with the access road in view on right of shot



Plate 5: View from east toward south west showing dense trees varying in age



Plate 6: View from south east toward north west showing dense vegetation and varying stages of trees

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Plate 5: View of the south of site taken from the south west facing south east



Plate 6: View from mid-east of site facing south east

Windy Arbour Rd,

Order Details

Date: 14/07/2020
Your ref: EMS_621072_827496
Our Ref: EMS-621072_827496
Client: emapsite

Site Details

Location: 346335 389701
Area: 1.31 ha
Authority: [Knowsley Metropolitan Borough Council](#)



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Summary of findings

p. 2 **Aerial image**

p. 8

OS MasterMap site plan

p.13 groundsure.com/insightuserguide