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Architect/Consultant

Phase II Contaminated Land Risk Assessment

Baytree Lane, Middleton

Feb 2024

Site Ref: 6143/VBL-CLRA v1.00

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Phase II Contaminated Land Risk Assessment

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Phase II Contaminated Land Risk Assessment

1. Introduction

This report is an account of a Phase II Contaminated Land Risk Assessment carried out by GeoAssist Limited at the request of the Client, J Walker Homes Limited, for the proposed development of 5 dwelling houses on land formerly used for parking cars to the rear of the Old Cock Inn on the corner of Baytree Lane and Damson Green, Middleton.

The work was commissioned following the receipt of instruction to proceed issued by the Client on the 15th January 2024.

The purpose of this Phase II investigation is to provide information following the conclusions of the Preliminary Contaminated Land Risk Assessment report, referenced 6143 VBL PCLRA and dated Jan 2023, in order to ensure that the site:

- Is assessed in accordance with the UK government methodology outlined online in Land Contamination Risk Management (LCRM)
- Satisfies the relevant requirements of the Updated National Planning Policy Framework September 2023
- Is suitable for the intended proposed land use. In this case, as a residential development with private gardens to the rear.

The approximate grid reference for the centre of the site is 388560, 406020 and the total area of the site is approximately 1100m². The area of the site scheduled for investigation is outlined with a solid red line on the site plan in Appendix A1. The positions of exploratory holes are also indicated on the plan. The proposed development plan is shown in appendix A2.

2. Description of the Site

2.1 Present

The site is located on intersection of Baytree Lane and Damson Green in Middleton to the rear of The Old Cock Inn on Oldham Road. The site forms a regular square shape and the topography of the site is relatively level with the surrounding ground and streets. There are no permanent structures on site and the ground cover is made up of a metalled/tarmacadam surface with no significant soft landscaping other than a thin strip of grass along the edges. The site boundary is formed by; The Old Cock Inn to the north, Baytree Lane to the east over which a commercial steel stockist and fabrication is located. Damson Green and residential apartments to the south and Residential property to the west. At the time of the site walkover there was no obvious visual or olfactory observations of contaminants noted.

2.2 Proposed

It is understood that the proposed development incorporates:

- The development of 5 number 3 bedroom residential dwelling houses with associated off road car parking to the front and private gardens to the rear. There are no basements associated with this development. The proposed development plan for the Site forms appendix A2 to this report.

3. Review Of Previous Reports

There is no indication that previous subsurface ground investigations have been undertaken on this site.

Significant ground investigations are known to have been carried on adjacent sites in the area for brownfield sites which have been subject to residential redevelopment in recent years. The principal findings of which noted the presence of shallow made ground underlain by superficial drift deposits of sand and gravel and clays upto 36m in depth. Findings of the ground investigations on adjacent sites do not indicate the presence of contamination at levels that would impact the study site.

The issues to be covered in the present investigation are to provide information in respect of any potentially unacceptable geo-environmental risks arising from previous land uses both on site and in the immediate area, and the potential for any sources of contamination to impact both present and future receptors, including:

- Human
- Controlled waters via established pathways
- Property
- Adjoining land

4. Preliminary Conceptual Model

The original outline conceptual model can be found in the Phase I Preliminary Contaminated Land Risk Assessment as referenced in section 1 of this report.

Potential Source /Hazard	Nature of Hazard (Risk Level to site given a Commercial end use)	Contaminants Associated with Source	Potential Pathway	Potential Receptor
<i>Previous & Present ON SITE Land uses:</i>				
1. Former road	Ground contamination Low to Moderate Risk	Heavy Metals PAH	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
Possible infilled / Made Ground along road route	Gas from in-filled ground Low to Moderate Risk	Low Cabon Dioxide & Methane	Vertical and Lateral Migration	Site Users Future Buildings & Services
2. Car Park	Ground contamination Low to Moderate Risk	Heavy Metals PAH	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
<i>Previous OFF SITE land uses within 250m as indicated by Historical Plans Including:</i>				
3. Cotton Mill Chimneys & (Infilled) reservoir	Ground contamination Low to Moderate Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low to Moderate Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
4. Warehouse	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
5. Railway Land	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
6. Fuel Station	Ground contamination Low Risk	See DoE Profiles	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground Low Risk	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
7. Coal Workings & Mineral Extraction	Geotechnical Hazard Low to Moderate Risk	None	Ground Collapse Subsidence	Humans (site users) Future Buildings & Services
	Ground contamination Low Risk	None	None	Site Users Services
	Mine Gas Low Risk	None	None	Humans (site users) Future Buildings & Services

5. Intrusive Investigation

5.1 Intrusive Investigation objectives

The objectives of the site investigation are to collect data to confirm whether or not the soils beneath the site in their current state pose a risk by reason of substances within or under the land that;

- Significant harm is being caused or there is significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

Data to describe the following parameters has been collected at a suitable spatial resolution in accordance with BS10175, 2015:

- Soil Characteristics including type of material
- Chemical profile of the soil.
- Hydrological regime beneath the site
- Ground gas regime

These data will be used to refine a conceptual site model and confirm the existence of any established contaminant linkage in accordance with the UK government methodology outlined online in Land Contamination Risk Management (LCRM) as well as The Environment Agency Requirements for Land Contamination Reports, 2005 where appropriate.

5.2 Intrusive Investigation Strategy

The ground investigation was carried out in accordance with British Standard 5930: 2015 Code of Practice for Site Investigations and BS BS10175: 2015 Investigation of potentially contaminated sites where relevant.

All fieldwork was supervised by suitably qualified GeoAssist Limited Environmental Engineers.

The geotechnical laboratory testing was carried out at GeoAssist's own laboratory testing facility in Stockport. The analytical testing was carried out in an independent UKAS accredited Laboratory.

5.3 Methods Used for Forming Exploratory Holes

The exploratory holes drilled across the Site as part of this investigation were established using:

- § Windowless sampling percussive drilling methods with casing advancement
- § Cable percussive drilling methods with casing advancement
- § Machine Excavated Trial Pit for Soil infiltration rate testing

Information provided by the Client regarding the position of proposed structures areas was used to inform a decision on the actual exploratory hole locations whilst taking account of positions that could be reasonably accessed within operational site office compound/car park.

In general, the windowless dynamic sampling holes were used to determine the shallow soils profile and obtain analytical samples for contamination testing. The deeper cable percussive borehole was used to establish the geotechnical parameters for construction purposes. This exploratory hole were located in positions on the

footprint of the proposed structure. The location of services was also considered during the positioning of the exploratory holes. A plan showing the locations of the exploratory holes established as part of the investigation forms Appendix A1 to this report. A machine excavated trail pit to 2.00m depth was established to obtain soil infiltration parameters for subsequent drainage design by others.

5.4 Exploratory Hole Programme

In total 6 exploratory holes were established across the Site by GeoAssist utilising various exploration techniques as outlined below:

- § Four exploratory holes WS1 to WS4 were undertaken across the Site using windowless sampling
- § One exploratory hole, BH1 undertaken using a light cable percussive rig in the superficial deposits for geotechnical purposes.
- § One machine excavated infiltration test hole. For BRE 365 soakaway testing.

The details of the strata in the exploratory holes were recorded by a suitably qualified Professional Engineer. Upon completion the WS series exploratory holes were converted to shallow depth gas monitoring standpipes. Exploratory holes BH1 and TP1 were backfilled in accordance with the specification to prevent the creation of any preferential pathways.

All intrusive work was carried out in accordance with:

- § British Standard 5930: 2015 Code of Practice for Site Investigations
- § British Standard 10175: 2011 where applicable

The fieldwork for all exploratory holes was completed in late January and early February 2024 in mixed weather conditions. The location of the exploratory holes are shown on the site plan in Appendix A1.

5.5 Field Sampling and Testing

For the windowless sample exploratory holes, a non-targeted borehole layout supplemented by some judgmental sampling was selected as the most appropriate strategy for this site. Representative samples were taken of all the strata encountered in the exploratory holes. Once exposed samples to be subjected to chemical analysis were immediately placed into a suitable container and stored in a cool dark sample box prior to submission to the laboratory in order to prevent alteration of the composition of the samples. In all cases 500ml wide necked amber glass jars were used with a Teflon faced foamed polyethylene cap liner that offers excellent chemical resistance with the compressibility and sealing properties of polyethylene foam. These containers were filled with sample, sealed and delivered to the laboratory for testing. Samples for volatile compounds were placed into appropriate containers with a screw cap and pierceable septum as supplied by the testing laboratory specifically appropriate to the determinand. These containers were filled with sample sealed and delivered to the laboratory for testing. Water samples for screening purposes were collected following the Site operations and stored in Amber glass bottles with cap liners as described previously. These containers were filled with water samples, collected in accordance with the guidance referenced in BS5930:2015+A1:2020 and BS ISO 5667-11 2009, sealed and delivered

to the laboratory for testing. Observations of groundwater conditions were recorded throughout the fieldwork operations.

All other samples were stored in airtight containers and returned to the laboratory for examination and geotechnical testing where necessary.

A photo ionisation detector (PID) with a 10.6eV lamp was used as a screening tool to indicate the likelihood of the presence of volatile organic compounds throughout the profile of the shallow soils in the laboratory. The PID results are all given as isobutylene equivalents and are included within the Exploratory Hole Logs only where elevated readings were noted (10ppm). None were recorded.

6. Laboratory Investigation

6.1 Contamination Testing

In total 8 soil samples were collected and subjected to elements of the suite of chemical testing as outlined below. All tests were conducted by i2 Analytical under UKAS Testing No 4041. The results of all the chemical analysis tests are given in appendix C1.

Soils	
Arsenic	Acenaphthene
Boron (water-soluble)	Acenaphthylene
Cadmium	Anthracene
Chromium	Benzo(a)Anthracene
Chromium VI	Benzo(a)Pyrene
Copper	Benzo(b/k)Fluoranthene
Cyanide(Total)	Benzo(ghi)Perylene
Cyanide(free)	Chrysene
Lead	Dibenzo(ah)Anthracene
Mercury	Fluoranthene
Nickel	Fluorene
pH	Indeno(123-cd)Pyrene
Phenols(Mono)	Naphthalene
Selenium	Phenanthrene
SO4(Total)	Pyrene
Sulphide	BTEX & MTBE (where PID Screening indicates a requirement)
Sulphur(Free)	Speciated TPH (where PID Screening indicates a requirement)
Thiocyanate	VOCs (where PID Screening indicates a requirement)
Zinc	Asbestos ID (screen)

7. Subsurface Stratigraphy

The subsoil profile obtained from the exploratory holes WS1 to WS4 and BH1 consists of thin Tarmac surface over mainly granular mixed sandy gravel, brick and concrete fragments Made Ground overlying intermixed sands and clays.

The Made Ground is generally loose to medium dense in state of compaction generally.

Very soft to soft organic silty clay was present beneath the Made Ground in WS3 from 0.50m to 1.50m depth.

The sand horizons in the interbedded subsoils vary from loose to medium dense in state of compaction with the clay horizons varying from soft to firm in consistency and generally low in plasticity.

The WS holes were terminated in medium dense silty sand with clay inclusions. BH1 was terminated in a silty clay with sand inclusions.

BH1 penetrated a firm very silty clay with sand partings from 9.50m to 12.80m depth and low in plasticity.

Table 7.0 Subsoil Profile Summary

Strata	Depth of Strata (m) below ground level	
	Top	Base
Thin tarmac over Made Ground	Ground Level	0.30 to 1.40
Variable mixed granular		
Intermixed loose to medium dense silty Sand and soft to firm low to medium strength gravelly sandy silty to very silty Clay	0.30 to 1.40	5.00 to 5.70
Medium dense silty Sand with silty clay inclusions	5.00 to 5.70	9.50 BH 1 only
Firm medium strength very silty CLAY with sand partings	9.50 BH1 only	>15.00

Further details of the subsurface stratigraphy can be found in the exploratory hole log sheets which form Appendix B1 to this report.

8. Groundwater

Seepage groundwater was recorded between 2.50m and 2.80m depth in the WS holes during the course of the fieldwork. The groundwater conditions entered on the exploratory hole logs are those observed at the time of the investigation and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.

Groundwater levels associated with the ground gas monitoring in the standpipes installed in WS1 to WS4 on this site indicate that over the monitoring period to date, ground water has been recorded as being present at depths between 1.50m and 2.50m.

Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

9. Ground Gas

Ground gas risk monitoring is presently in process and a separate risk assessment report will be prepared for the site in due course upon completion of the monitoring readings.

10. Part IIA Legislation

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a new regime for the control of specific threats to health or the environment from existing land contamination. In accordance with the Act and the statutory guidance document on The Contaminated Land (England) Regulations 2000, the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only “contaminated land” where it appears to the regulatory authority, by reason of substances within or under the land that

- § Significant harm is being caused or there is significant possibility of such harm being caused; or
- § Pollution of controlled waters is being, or is likely to be, caused.

The guidance defines “risk” as the combination of

- § The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- § The magnitude (including the seriousness) of the consequences.

For a risk of pollution or environmental harm to occur as a result of ground contamination, all of the following elements must be present:

- § A source, i.e. a substance that is capable of causing pollution or harm;
- § A receptor (or target). i.e. something which could be adversely affected by the contaminant; and
- § A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is missing there can be no significant risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

10.1 Assessment Methodology

In order to assess the environmental risk posed by potential contaminants within the near surface soils considering the final levels of the scheme, GeoAssist Limited undertook an initial screen of the laboratory results using GeoAssist Limited Generic Assessment Criteria (GACs) and where applicable Category 4 Screening Levels as given as part of Appendix C2.

The GeoAssist Limited GACs and Category 4 Screening levels (C4SLs herein) are generated in consideration of the proposed end use of the Site, in this case as residential land with gardens. Contaminant concentrations below the GACs and or C4SLs levels are considered not to warrant further risk assessment. Concentrations of potential contaminants above the GACs and C4SLs levels require further consideration of the potential pollutant linkages. It should be noted that exceedance of the GACs and or C4SLs levels does not necessarily mean that the Site requires remediation, although this is dependent on the nature, type and depth of the contaminant and further justification may be required.

10.2 Soils

For assessment of the soil analysis results with regard to potential human health risks, GeoAssist Limited GACs are selected from the following sources which represent minimal risk to site users:

CLEA Soil Guideline Values (SGVs). These values have been developed by the Department of the Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) using the Contaminated Land Exposure Assessment (CLEA) Model, and are considered to be protective of human health (considered to be a potential receptor on site). To date, SGVs have been published for only a limited suite of contaminants, with SGVs derived for each contaminant for three different land use scenarios namely:

- § residential
- § allotments
- § commercial and industrial.

The proposed assessment of this site is as residential land with gardens as this is considered to be the most appropriate land use scenario for the proposed situation on site.

Chartered Institute of Environmental Health Generic Assessment Criteria (LQM CIEH GAC) have been used where available and where CLEA SGVs have not yet been published.

Where CLEA or LQIM CIEH GAC values are not available, Atkins at Risk GAC values have been selected as appropriate all of which represent a minimal risk to receptors.

C4SLs and where appropriate the surrogate marker approach for PAH compounds have been used in preference to LQM S4UL and these represent a Low Level of Toxicological Concern (LLTC herein). LLTC represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as Significant Possibility of Significant Harm.

The CLEA guidelines state that for each contaminant, apart from lead, the upper 95th percentile of the mean measured concentration should be calculated where appropriate and this value should be compared to the applicable screening value (defined here as the GeoAssist Limited GACs).

For Lead impacts the geometric mean should be calculated and compared to the GAC or C4SL.

The CLEA model states that, 'the contamination is assumed to be at or within 1 m of the surface (CLR10 page 10 now withdrawn). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

10.4 Subsoil Deposits

The soils contaminants that were identified above the GeoAssist Limited GACs, SGVs and C4SLs for a residential with gardens end use from the GeoAssist Limited investigations are summarized below.

Table 10.4 Tier one summary of identified soils impacts.

Determinand	GAC (mg/kg) Residential	Total tests / No. of tests in impacted strata (Made Ground)	No. of samples exceeding SGV/GAC/ C4SL	Max Value (mg/kg)	Treat as Hotspot	US95 Value	Further action required
Arsenic	27	8/1	1	50		25	No
Lead	200	8/1	1	370		156	No
PAH Compounds							
Benzo(a)Pyrene sm	5	8/1	1	6.4		2.5	No
Total Petroleum Hydrocarbon Compounds							

sm Surrogate marker approach

The analytical laboratory test results and analysis are presented in appendix C1 & C2 and have identified moderate risks to end users of the Site from elevated levels of anthropogenic contamination within the near surface soils on the Site. Namley; Arsenic, Lead, Benzo(a)pyrene at the location of WS3 at 0.30m depth. Tier one stratified statistical analysis of the Arsenic, Lead and Benzo(a)Pyrene results have confirmed that the 95 percentiles for Arsenic, Lead and Benzo(a)Pyrene do not exceed the applicable assessment criteria and the mean value test has been passed, and the site may be considered not to present a significant possibility of significant harm to human health in the context of Part IIA. Consequently, the upper shallow made ground across the site does not require remedial action.

Asbestos fibres were not detected to be present within any of the samples where tests were conducted. Good practice has been used to ensure that the soil samples submitted to the laboratory are likely to be representative of those found across the site. However, this does not completely preclude the possibility that occurrences of Asbestos or ACM could occur within the made ground on site. Although experience dictates that the make up of the made ground encountered across the site does not give rise to any particular concerns regarding the likely presence of ACM.

The results of all the chemical laboratory analytical tests form appendix C1 to this report and the analysis of the results forms appendix C2 to this report.

There is still evidence that points to the past use of the site as a public house car park namely a metaled surface and this infrastructure will need to be removed from site as part of the site preparation and enabling works.

11. Discussion

The assessment of the chemical laboratory analytical tests has identified that the soils on this site pose little risk to present site end users or proposed development site end users when assessed in accordance with the current UK methodology. Consequently, the risk to end users from ground contamination is classified as low given a residential with plant uptake end use scenario of the site.

The soft landscaped areas of the Site will have a minimum suitable growth medium depth of 100mm. Any imported non first generation soil or aggregate materials will need to be tested at a rate of not less than 1 test per 20m³ of imported material or where imported volumes are less than 60m³ a minimum of 3 tests per source will be required.

Porous surfacing and or soakaway type drainage for the disposal of surface water from rooftops should be assessed by a suitably qualified drainage engineer.

Analysis of drift materials and overlying made ground indicate that the underlying principal aquifer beneath the Site and any close by controlled waters are highly unlikely to be at significant risk from the soils on this site as a function of the low levels and immobility of the determinants identified in the made ground and drift materials. Waste Acceptance Criteria testing (WAC herein) has not been undertaken. The results of the solid soils analysis indicate that soils arising from excavations on site are likely to be classified as inert for disposal purposes. However, It is recommended that the advice of a specialist waste haulage contractor be sought prior to disposal. It should be noted that disposal at landfill is not the only option for materials leaving the Site and off site recycling of all arisings through a recognised EA hub site using the voluntary code of practice (COP) could present opportunities for significant savings over traditional landfilling. It is the duty of the developer to maintain adequate lines of evidence, such as waste transfer notes, that waste movements conform with the current UK regulations.

The results of asbestos fibre screening indicate that Asbestos fibres were not detected in the samples of made ground submitted for analysis. However, this does not completely preclude the possibility that ACM could occur within the made ground on site. Ground works contractors are those most at risk and it is the duty of the principal contractor to apply appropriate measures under the Health & Safety at Work Act 1974 and the Control of Asbestos Regulations 2012 where applicable.

The risk to construction workers from on site generated dusts as part of the site preparatory works is assessed to be low as a function of the age class of the receptor and the anticipated limited exposure durations of this group. Nonetheless, it is recommended that standard PPE & RPE including correctly fitted particulate masks and disposable coveralls and gloves should be worn by operatives as a matter of course during removal of made ground.

The risk to building services from chemical attack is likely to be low given the low risk status of the site. The route of service pipes should be assessed when information for proposed connections become available. It is likely that these will enter the site directly from the street rather than be laid across the site.

12. Remediation

Given the soils on site present a low risk to both, site end user receptors and the wider environment, the production of a remediation scheme is not deemed to be a requirement on this site. GeoAssist do not consider the importation of topsoil/growth medium as a remediation activity and this does not require a remediation strategy. However validation sampling of imported materials will be a requirement. It is the duty of the developer to maintain adequate lines of evidence that imported soils are suitable and failure to provide the necessary evidential information such as waste transfer notes, photographs, delivery notes for imported soils could lead to planning delays and cost increases in the final completion stages of the development for which the developer will be responsible.

13. Conceptual Model

The updated conceptual model based on the information and test results presented in this report including contamination sources, pathways and receptors is presented below.

Table 13 Amended Conceptual Site Model based on information as presented within this report.

Potential Source /Hazard	Nature of Hazard (Risk Level to site given a Commercial end use)	Contaminants Associated with Source	Potential Pathway	Potential Receptor
<i>Previous & Present ON SITE Land uses:</i>				
1. Former road	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
Possible infilled / Made Ground along road route	Gas from in-filled ground See GRA report	Low Carbon Dioxide & Methane	Vertical and Lateral Migration	Site Users Future Buildings & Services
2. Car Park	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA report	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
<i>Previous OFF SITE land uses within 250m as indicated by Historical Plans Including:</i>				
3. Cotton Mill Chimneys & (Infilled) reservoir	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA report	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
4. Warehouse	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA report	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
5. Railway Land	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA report	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
6. Fuel Station	Ground contamination Low Risk	None Identified	Dermal Contact Ingestion Inhalation	Site Users Construction workers Controlled Waters
	Gas from in-filled ground See GRA report	None	Vertical and Lateral Migration	Site Users Future Buildings & Services
7. Coal Workings & Mineral Extraction	Geotechnical Hazard See CMRA report	None	Ground Collapse Subsidence	Humans (site users) Future Buildings & Services
	Ground contamination Low Risk	None	None	Site Users Services
	Mine Gas See GRA report	None	None	Humans (site users) Future Buildings & Services

Only sources that have not been present on site in the past or currently are considered within the off site category. Unless the information is deemed to be pertinent to the analysis.

14. Conclusions

Evidence presented elsewhere within this report indicates that there is:

- A Low Risk to end user receptors from soil contamination at the site in its present condition
- The site presents a Low Risk to controlled waters and the wider environment in its present condition
- The proposed development presents a Low Risk to end user receptors from soil contamination.
- The proposed development presents a Low Risk to controlled waters and the wider environment.

14.1 Supplementary Recommendations

Careful observations will be made during site preparation and foundation works to confirm the current assessment of site conditions. Any evidence of contamination not previously identified will be brought to the attention of the LPA as soon as is practicably possible.



Matthew Benson MSc. GMICE
Geotechnical/Environmental Engineer



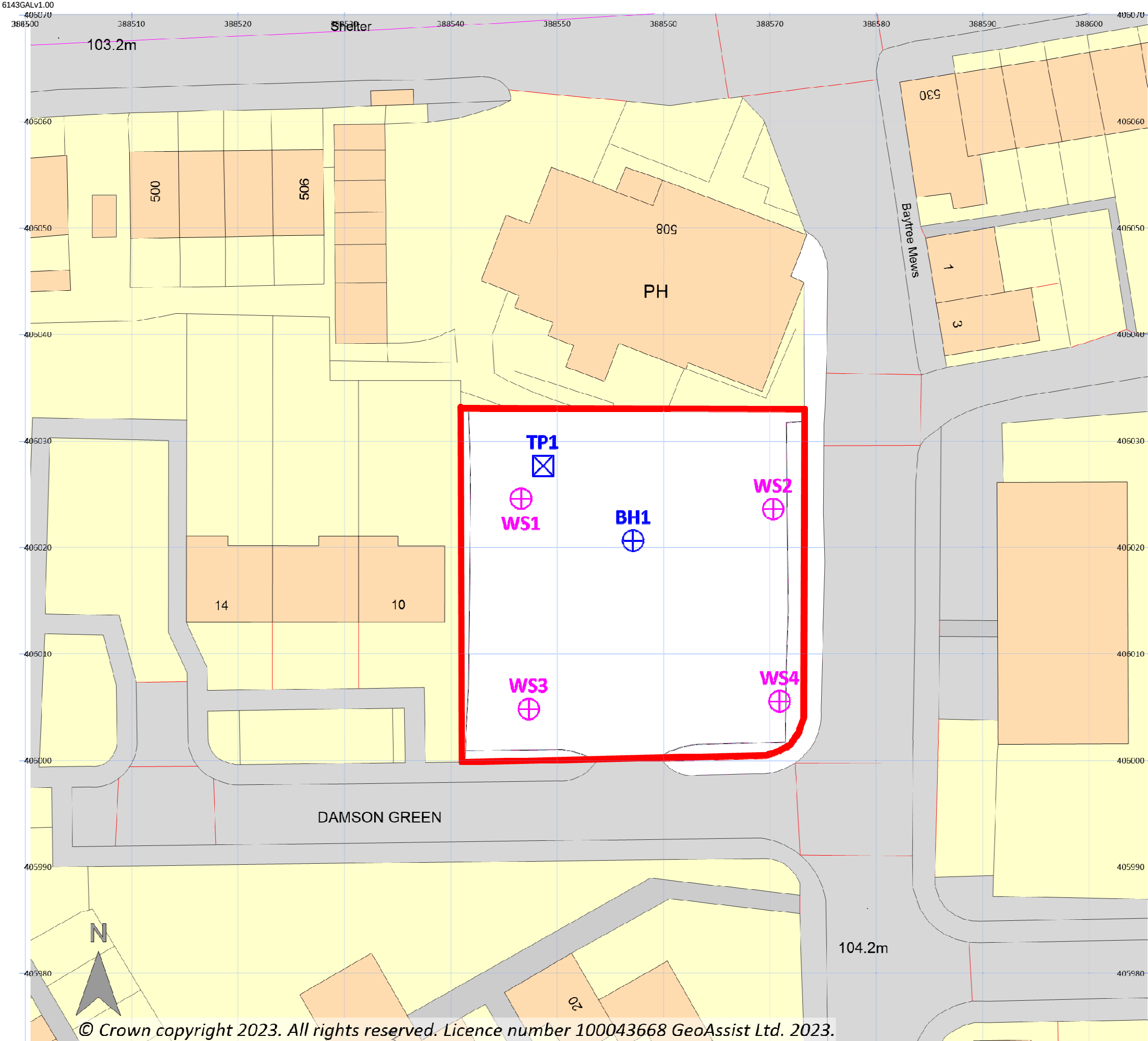
Mark Richardson MSc CEng MICE
Technical Director

Field investigations have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions are, and can be, variable and have only been tested at isolated locations across the site. Therefore, the potential exists for ground conditions to be encountered which are different to those considered in this report. Chemical analysis was conducted for a number of parameters based on an expert understanding of the historical and operational data available at the time and it should not be inferred or otherwise, that other chemical species are not present.

This report has been prepared by GeoAssist Limited with all reasonable professional skill, care and diligence within the terms of the contract with J Walker Homes Limited. The report is confidential to J Walker Homes Limited, their/the named persons, advisors and bankers, and GeoAssist Limited accepts no responsibility of whatever nature to third parties to whom this report may be divulged. GeoAssist Limited owns the copyright in this report. All rights are reserved and unauthorised use is prohibited. J Walker Homes Limited may use the report for their/her/his own purposes.

Appendix A

- A1 Site Plan & Exploratory Hole Locations
- A2 Proposed Site Plan



A1 Site Plan

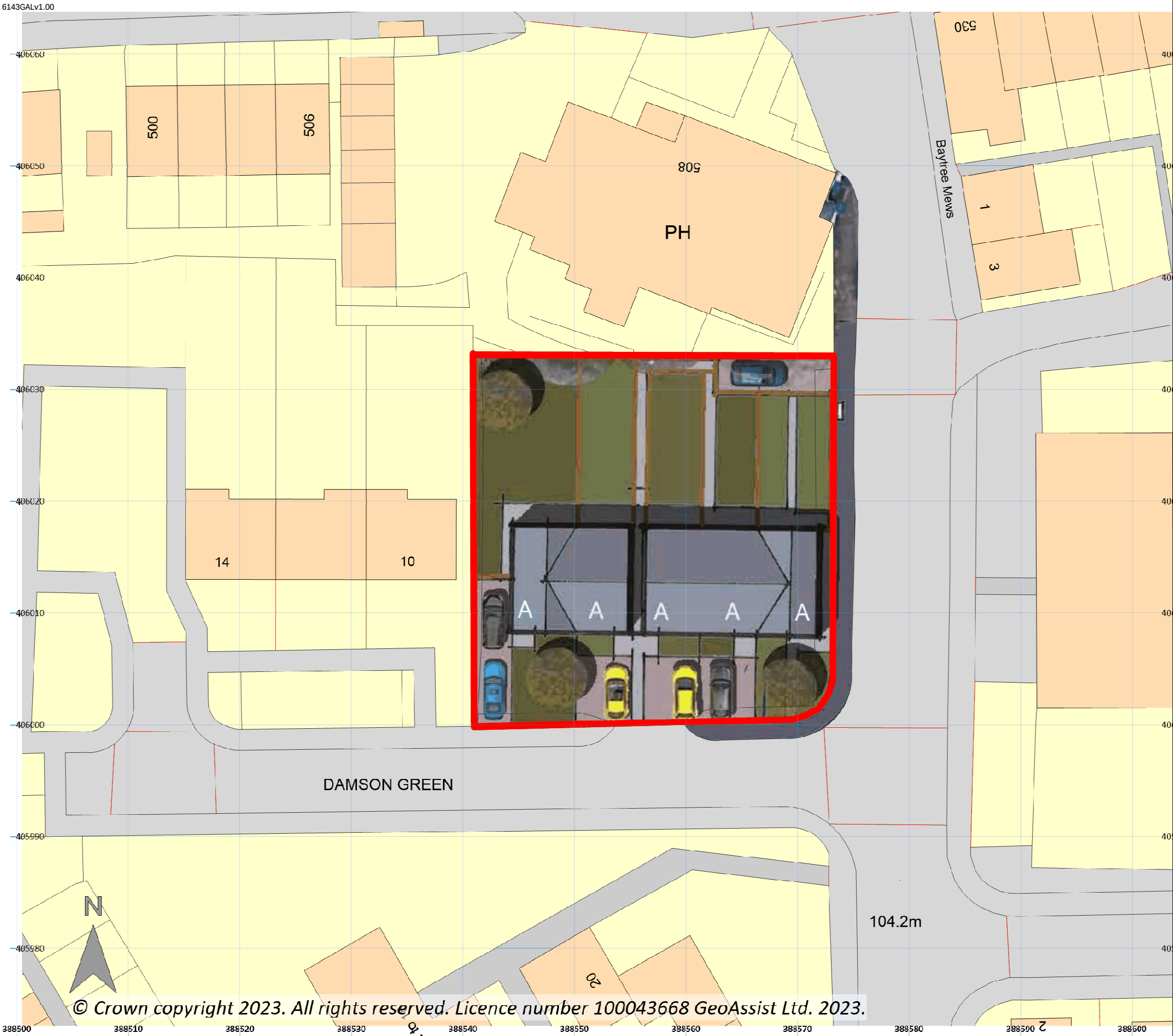
Site Name	Baytree Lane
Location	Middleton
GeoAssist Ref	6143VBL
Client	J Walker Homes Limited
	Joshua House 35 Joshua Lane Middleton Manchester M24 2AY
Planning Consultant	
NGR (centre of site)	388560,406020
Production Date	Feb 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Do Not Scale

A2 Site Development Plan

Site Name	Baytree Lane
Location	Middleton
GeoAssist Ref	6143VBL
Client	J Walker Homes Limited
	Joshua House 35 Joshua Lane Middleton Manchester M24 2AY
Planning Consultant	
NGR (centre of site)	388560,406020
Production Date	Jan 2024
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

Do Not Scale



Appendix B

B1 Exploratory Hole Logs

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: WS1		
Consultant: 0		Project: Baytree Lane Location: Middleton					Sheet: 1		
Client: J Walker Homes Limited		Equipment: Archway Dart Rig				Ground Level: 104.76 m.AOD Co-ordinates: Easting: 388546.6(m) Northing: 406024.6(m) Dates: 24/01/2024 to 24/01/2024			
Drilling Foreman: M Walton Engineer/Geologist: M Benson		STRATUM DESCRIPTION		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests		Field Records
							Depth (m) from to	Sample Type/No	Blow Count N/(U)
0 Thin tarmac over brown sandy gravel with brick fragments and rubble - MADE GROUND		0.30	104.46				0.30 0.40	C1	
Brown slightly clayey silty sand with brick fragments and occasional rootlets - MADE GROUND		0.60	104.16						
1 Medium dense brown silty sand with occasional gravel and cobbles - MADE GROUND		(0.80)					0.80 0.90 1.00 0.90	C2 CP1 C3	15
		1.40	103.36				1.40 1.50	D1	
2 Medium dense orange/brown with light grey and dark grey gravelly silty fine to medium SAND with ironstaining in parts		(1.40)					2.00	CP2	17
		2.80	101.96				2.50 2.60	D2	
3 Soft to firm brown/grey gravelly sandy silty CLAY		(1.00)					3.00	CP3	6
		3.80	100.96				3.50 3.60	D3	
4 Medium dense brown with dark brown silty fine to medium SAND		(0.90)					4.00	CP4	13
		4.70	100.06						
5 Soft to firm grey/brown gravelly sandy silty CLAY with occasional coal fragments		(1.00)					5.00	CP5	12
		5.70	99.06						
6 Medium dense brown silty fine to medium SAND with iron staining in parts		6.00	98.76				6.00	CP6	20
Medium dense silty fine to medium SAND with clay inclusions - Interpreted Stratum									
Dynamic probe only from 6.00m		(2.00)					7.00	CP7	19
7		8.00	96.76				7.90	CP8	12
8 Exploratory Hole complete at 8.00m									
9									
10									
Remarks: 24/01/2024: Inspection pit excavated to 1.00m to avoid services. Breaking out concrete - 30mins							Logged: M Benson Date: 29/01/2024		
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.							Checked: M Richardson Date: 26/02/2024		
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Site Ref: 6143/VBL Scale 1:50		

[illegible]

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: WS3		
Consultant: 0		Project: Baytree Lane Location: Middleton					Sheet: 1		
Client: J Walker Homes Limited		Equipment: Archway Dart Rig				Ground Level: 104.82 m.AOD Co-ordinates: Easting: 388547.3(m) Northing: 406004.8(m) Dates: 25/01/2024 to 25/01/2024			
Drilling Foreman: M Walton Engineer/Geologist: M Benson		STRATUM DESCRIPTION		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests		Field Records
							Depth (m) from to	Sample Type/No	Blow Count N/(U)
0 Thin tarmac over dark brown sand and gravel with slag, cinders brick and concrete fragments and sandstone cobbles - MADE GROUND		(0.50) 0.50	104.32			0.30 0.40	C1		
1 Very soft to soft dark brown slightly gravelly very silty organic CLAY		(1.00) 1.50	103.32			0.80 0.90 1.00	C2 CP1	3	
2 Medium dense light brown silty fine to medium SAND		(0.40) 1.90	102.92			1.50 1.60 1.60 1.70 1.70 1.80	CP2 D1 D2	12	
3 Firm light grey with brown medium strength sandy silty CLAY with sand inclusions		(0.70) 2.60	102.22			2.00 2.50 2.50 2.60	CP3 D3	20	Hand vane at 2.50m - 73kPa Wet at 2.60m depth
4 Medium dense brown slightly gravelly to gravelly silty fine to medium SAND		(1.20) 3.80	101.02			3.00 3.40 3.40 3.50	CP4 D4	17	
5 Firm brown/grey sandy silty CLAY		4.00	100.82			4.00	CP5	8	
6 Loose brown silty fine to medium SAND		(0.40) 4.40	100.42			4.70 4.80	D5		Hand vane at 4.70m - 35kPa
7 Soft to firm grey/brown slightly gravelly sandy very silty CLAY with sand inclusions		(0.60) 5.00	99.82			5.00	CP6	33	
8 Medium dense silty fine to medium SAND with silty clay inclusions - Interpreted Stratum Dynamic probe only from 5.00m		(3.00) 8.00	96.82			6.00 7.00 7.00 7.90	CP7 CP8 CP9	18 26 15	25/01/2024: On completion of exploratory hole at 8.00m. Casing at 4.00m. Standing water level at 3.70m with casing. On withdrawal of casing groundwater/gas monitoring standpipe installed to 4.00m with response zone from 1.00m to 4.00m.
9 Exploratory Hole complete at 8.00m									
10									
Remarks: 25/01/2024: Inspection pit excavated to 1.00m to avoid services. Breaking out concrete - 30mins The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Logged: M Benson Date: 29/01/2024 Checked: M Richardson Date: 26/02/2024 Site Ref: 6143/VBL Scale 1:50		

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: WS4		
Consultant: 0		Project: Baytree Lane Location: Middleton					Sheet: 1		
Client: J Walker Homes Limited		Equipment: Archway Dart Rig				Ground Level: 104.18 m.AOD Co-ordinates: Easting: 388570.9(m) Northing: 406005.5(m) Dates: 25/01/2024 to 25/01/2024			
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests			Field Records	
					Depth (m) from to	Sample Type/No	Blow Count N/(U)		
0 Thin tarmac over brown/dark brown gravelly sand - MADE GROUND		0.30	103.88		0.30	0.40	C1	8	Hand vane at 2.30m - 54kPa Wet at 2.50m depth
1 Loose brown silty fine to medium SAND and GRAVEL		(1.30)			0.80	0.90	C2		
					1.00		CP1		
2 Firm brown medium strength slightly gravelly sandy silty CLAY with sand inclusions		1.60	102.58		1.90	2.00	D1	9	
		(0.90)			2.00		CP2		
		2.50	101.68		2.30	2.40	D2	16	
3 Medium dense brown with black slightly gravelly silty fine to medium SAND		(0.90)			2.80	2.90	D3		
		3.40	100.78		3.00		CP3		
4 Firm brown very sandy silty CLAY with sand inclusions		(1.00)			4.00		CP4	10	
		4.40	99.78						
5 Brown with grey gravelly silty fine to medium SAND		(0.60)							
		5.00	99.18		5.00		CP5	25	
6 Medium dense brown/light brown with black staining silty to very silty fine to medium SAND		(1.00)							
		6.00	98.18		6.00		CP6	31	
7 Medium dense silty fine to medium SAND with silty clay inclusions - Interpreted Stratum									
Dynamic probe only from 6.00m		(2.00)			7.00		CP7	23	
		8.00	96.18		7.90		CP8	27	
8 Exploratory Hole complete at 8.00m									
9									
10									
Remarks: 25/01/2024: Inspection pit excavated to 1.00m to avoid services. Breaking out concrete - 30mins The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Logged: M Benson Date: 29/01/2024 Checked: M Richardson Date: 26/02/2024 Site Ref: 6143/VBL Scale 1:50		
25/01/2024: On completion of exploratory hole at 8.00m. Casing at 5.00m. Standing water level at 6.00m with casing. On withdrawal of casing groundwater/gas monitoring standpipe installed to 5.00m with response zone from 1.00m to 5.00m.									

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: BH1			
Consultant: 0		Project: Baytree Lane					Sheet: 1			
Client: J Walker Homes Limited		Equipment: Light Cable Percussive Rig			Casing Dia. Depth (mm) (m)		Ground Level: 104.43 m.AOD Co-ordinates: Easting: 388557.1(m) Northing: 406020.6(m) Dates: 05/02/2024 to 06/02/2024			
Drilling Foreman: M Walton Engineer/Geologist: M Benson		STRATUM DESCRIPTION		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to Sample Type/No Blow Count N/(U)		Field Records	
0		Thin tarmac over sandy brick rubble - MADE GROUND		(0.40) 0.40	104.03					
		Dark brown/grey clayey silty sand and gravel - MADE GROUND		(0.40) 0.80	103.63		0.50 0.60	D1		
1		Loose to medium dense brown gravelly silty fine to medium SAND		(2.00)			1.00 1.45	P1	15	P1 at 1.00m - (3,3/3,4,5,3)
							1.50 1.60	D2		
2							2.00 2.45	P2	4	P2 at 2.00m - (1,1/1,1,1,1)
				2.50 2.60			2.80 2.90	D3		
3		Brown/grey very sandy silty to very silty CLAY		(0.40) 3.20	101.63		2.80 2.90	D4		
		Loose brown very silty fine to medium SAND		(1.10)			3.00 3.45	P3	11	P3 at 3.00m - (2,2/3,3,2,3)
4							3.50 3.60	D5		
							4.00 4.45	P4	5	05/02/2024: Water strike at 4.00m depth. Standing water level at 3.40m after 20 minutes P4 at 4.00m - (2,1/1,1,1,2)
		Brown/grey sandy very silty CLAY		(0.70) 5.00	100.13		4.50 4.60	D6		
5		Grey/brown very sandy silty CLAY with sand inclusions		(0.50) 5.50	99.43		5.00 5.45	P5	14	P5 at 5.00m - (2,2/3,3,4,4)
		Medium dense brown slightly gravelly silty fine to medium SAND		(2.50)			5.50 5.60	D7		
6							6.00 6.45	P6	14	P6 at 6.00m - (4,3/4,2,4,4)
							6.50 6.60	D8		
7							7.00 7.45	P7*	2	P7 at 7.00m - (3,1/0,1,0,1) P7* impacted by water ingress
				7.50 7.60			8.00 8.45	D9		
8		Grey SILT/CLAY with sand inclusions		(0.50) 8.50	96.43		8.00 8.45	P8	14	P8 at 8.00m - (6,5/4,4,3,3)
		Loose brown silty fine to medium SAND		(1.00)			8.50 8.60	D10		
9							9.00 9.45	P9	5	P9 at 9.00m - (2,1/1,1,1,2)
							9.50 9.60	D11		05/02/2024: Borehole at 9.45m. Casing at 9.00m. Water level at 8.00m
10		Firm brown/grey medium strength slightly sandy very silty CLAY with sand partings		(0.50) 10.00	94.93		9.50 9.60			06/02/2024: Overnight standing
Remarks: 05/02/2024: Inspection pit excavated to 1.00m to avoid services. Breaking out concrete - 30mins The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.										Logged: M Benson Date: 12/02/2024 Checked: M Richardson Date: 26/02/2024 Site Ref: 6143/VBL Scale 1:50

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: BH1		
Consultant: 0		Project: Baytree Lane Location: Middleton					Sheet: 2		
Client: J Walker Homes Limited		Equipment: Light Cable Percussive Rig			Casing Dia. Depth (mm) (m)		Ground Level: 104.43 m.AOD Co-ordinates: Easting: 388557.1(m) Northing: 406020.6(m) Dates: 05/02/2024 to 06/02/2024		
Drilling Foreman: M Walton Engineer/Geologist: M Benson		STRATUM DESCRIPTION		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to Sample Type/No Blow Count N/(U)		Field Records
Continued Stratum. Firm brown/grey medium strength slightly sandy very silty CLAY with sand partings									water at 6.80m P10 at 10.30m - (3,3/3,3,3,4)
-11									
-12									
-13									
-14									
-15									
-16									
-17									
-18									
-19									
-20									
Loose brown clayey silty fine SAND									P11 at 12.00m - (1,2/2,2,3,5) P12 at 13.20m - (1,2/1,2,2,3)
Firm to stiff brown very silty CLAY with fine sand inclusions									P13 at 14.50m - (2,2/4,4,4,7) 06/02/2024: On completion of exploratory hole at 15.00m. Casing at 14.50m. Standing water level at 13.10m. On withdrawal of casing exploratory hole backfilled and reinstated.
Exploratory Hole complete at 14.95m									
Remarks: 05/02/2024: Inspection pit excavated to 1.00m to avoid services. Breaking out concrete - 30mins The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.		Logged: M Benson Date: 12/02/2024 Checked: M Richardson Date: 26/02/2024 Site Ref: 6143/VBL Scale 1:50							

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: TP1			
Consultant: 0		Project: Baytree Lane Location: Middleton					Sheet: 1			
Client: J Walker Homes Limited		Equipment: Machine Excavated				Ground Level: 104.7 m.AOD Co-ordinates: Easting: 388548.7(m) Northing: 406027.7(m) Dates: 07/02/2024 to 09/02/2024				
Drilling Foreman: M Walton Engineer/Geologist: M Benson		STRATUM DESCRIPTION		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests		Blow Count N/(U)	Field Records
0 Thin tarmac over brown/grey sand, gravel and brick - MADE GROUND		(0.40)	0.40	104.30						
Brown clayey silty SAND		0.70	104.00							
Orange brown silty SAND		(1.10)					1.00 1.10	D1		
Brown silty SAND and GRAVEL		1.80	102.90				1.80 1.90	D2		
2 Exploratory Hole complete at 2.00m		2.00	102.70							07/02/2024: Trial Pit excavated to 2.00m. Seepage water at 2.00m. Infiltration test undertaken. 09/02/2024: Trial pit Backfilled.
3										
4										
5										
Remarks: 07/02/2024: Inspection pit excavated to 2.00m to avoid services. Infiltration test undertaken The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.								Logged: M Benson Date: 07/02/2024 Checked: M Richardson Date: 14/02/2024 Site Ref: 6143/VBL Scale 1:25		

GeoAssist Limited	Exploratory Hole Record Sheet					Ref: TP1		
	Project: Baytree Lane					Sheet: 2		
	Location: Middleton							
Consultant: 0	Equipment: Machine Excavated					Ground Level: 104.7 m.AOD		
Client: J Walker Homes Limited						Co-ordinates: Easting: 388548.7(m)		
						Northing: 406027.7(m)		
					Dates: 07/02/2024 to 09/02/2024			
Drilling Foreman: M Walton			Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests		Field Records
STRATUM DESCRIPTION						Depth (m)	Sample	
Engineer/Geologist: M Benson			(m)	(mAOD)	Backfill	from to	Type/No	Count N/(U)

5

Remarks: 07/02/2024: Inspection pit excavated to 2.00m to avoid services. Infiltration test undertaken	Logged: M Benson
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.	Date: 07/02/2024
	Checked: M Richardson
	Date: 14/02/2024
	Site Ref: 6143/VBL
	Scale 1:25

Appendix C

- C1 i2 Analytical Laboratory Test Results Soils
- C2 Analysis of Soils Results with Assessment Criteria



Matthew Benson
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Analytical Report Number : 24-80618

Project / Site name:	Baytree Lane, Middleton	Samples received on:	30/01/2024
Your job number:	6143 VBL	Samples instructed on/ Analysis started on:	30/01/2024
Your order number:	2240129	Analysis completed by:	09/02/2024
Report Issue Number:	1	Report issued on:	09/02/2024
Samples Analysed:	8 soil samples		

Signed:

Izabela Wójcik

Izabela Wójcik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-80618
Project / Site name: Baytree Lane, Middleton
Your Order No: 2240129

Lab Sample Number				2941325	2941326	2941327	2941328	2941329
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				C1	C3	C1	C2	C1
Depth (m)				0.30	1.10	0.30	0.80	0.30
Date Sampled				29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	49
Moisture Content	%	0.01	NONE	16	11	6.9	18	16
Total mass of sample received	kg	0.001	NONE	1	0.4	0.4	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MBI	MBI	MBI	MBI	MBI

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2	7.4	7.8	7.9	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.031	0.011	0.007	0.005	0.124
Sulphide	mg/kg	1	MCERTS	5.9	< 1.0	< 1.0	< 1.0	34
Total Sulphur	%	0.005	MCERTS	0.036	0.009	< 0.005	< 0.005	0.119
Organic Matter (automated)	%	0.1	MCERTS	3.7	-	-	-	4.3

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	1.1	1.1	0.34	0.26	3.9
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.21
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	1.9
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	1.3
Phenanthrene	mg/kg	0.05	MCERTS	0.11	< 0.05	< 0.05	< 0.05	10
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	2.4
Fluoranthene	mg/kg	0.05	MCERTS	0.17	0.08	< 0.05	< 0.05	13
Pyrene	mg/kg	0.05	MCERTS	0.15	0.06	< 0.05	< 0.05	13
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.08	< 0.05	< 0.05	< 0.05	6.7
Chrysene	mg/kg	0.05	MCERTS	0.09	< 0.05	< 0.05	< 0.05	6.6
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.1	< 0.05	< 0.05	< 0.05	7.5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	3.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.06	< 0.05	< 0.05	< 0.05	6.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	3.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.99
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	3.7

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	1.81	1.22	< 0.80	< 0.80	85
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Analytical Report Number: 24-80618
Project / Site name: Baytree Lane, Middleton
Your Order No: 2240129

Lab Sample Number				2941325	2941326	2941327	2941328	2941329
Sample Reference				WS1	WS1	WS2	WS2	WS3
Sample Number				C1	C3	C1	C2	C1
Depth (m)				0.30	1.10	0.30	0.80	0.30
Date Sampled				29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	9.2	3	2.1	1.9	50
Barium (aqua regia extractable)	mg/kg	1	MCERTS	63	22	14	7.7	260
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.49	0.19	0.19	0.17	1.9
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	< 0.2	< 0.2	< 0.2	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	22	15	7.5	4.7	110
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	13	12	7	150
Lead (aqua regia extractable)	mg/kg	1	MCERTS	28	11	6.5	5.2	370
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	10	7.8	4.6	4.2	63
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	18	17	7	6.5	82
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	52	21	14	13	170

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-80618
Project / Site name: Baytree Lane, Middleton
Your Order No: 2240129

Lab Sample Number				2941330	2941331	2941332
Sample Reference				WS3	WS4	WS4
Sample Number				C2	C1	C2
Depth (m)				0.80	0.30	0.80
Date Sampled				29/01/2024	29/01/2024	29/01/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	28	5.3	9.7
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4

Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	N/A	N/A	MBI

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.6	8.1	8.2
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.06	0.006	0.008
Sulphide	mg/kg	1	MCERTS	7.7	< 1.0	< 1.0
Total Sulphur	%	0.005	MCERTS	0.072	< 0.005	< 0.005
Organic Matter (automated)	%	0.1	MCERTS	9.5	0.5	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	3.4	0.36	0.38
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.23	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.23	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.7	0.08	0.22
Anthracene	mg/kg	0.05	MCERTS	0.35	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	2.5	0.11	0.18
Pyrene	mg/kg	0.05	MCERTS	2.5	0.11	0.14
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.4	0.06	< 0.05
Chrysene	mg/kg	0.05	MCERTS	1.6	0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.6	0.08	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.82	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.3	0.06	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.73	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.19	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.85	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	19.4	0.91	0.92
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Analytical Report Number: 24-80618
Project / Site name: Baytree Lane, Middleton
Your Order No: 2240129

Lab Sample Number				2941330	2941331	2941332
Sample Reference				WS3	WS4	WS4
Sample Number				C2	C1	C2
Depth (m)				0.80	0.30	0.80
Date Sampled				29/01/2024	29/01/2024	29/01/2024
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	30	2.3	2.9
Barium (aqua regia extractable)	mg/kg	1	MCERTS	110	13	9.1
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2	0.19	0.31
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	< 0.2	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	NONE	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	24	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	66	18	8.7
Lead (aqua regia extractable)	mg/kg	1	MCERTS	130	6.2	6.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	6.2	6.2
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	38	8.1	10
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	48	17	24

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



Analytical Report Number : 24-80618
Project / Site name: Baytree Lane, Middleton

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2941325	WS1	C1	0.3	Brown sand with gravel.
2941326	WS1	C3	1.1	Brown sand with gravel.
2941327	WS2	C1	0.3	Brown sand.
2941328	WS2	C2	0.8	Brown sand.
2941329	WS3	C1	0.3	Brown gravelly sand with stones.
2941330	WS3	C2	0.8	Brown sand.
2941331	WS4	C1	0.3	Brown sand.
2941332	WS4	C2	0.8	Brown sand.

Analytical Report Number : 24-80618

Project / Site name: Baytree Lane, Middleton

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser.	L080-PL	W	NONE



Analytical Report Number : 24-80618
Project / Site name: Baytree Lane, Middleton

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
 For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
 For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
 Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
 Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Soils Risk Assessment

Site Reference:6143VBL

Project Site:Baytree Lane

Project Location:Middleton

Client:J Walker Homes Limited

i2 Reference	Resi HGP	WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS4
Customer Sample Ref:	C4SL / S4UL	0.30	1.10	0.30	0.80	0.30	0.80	0.30	0.80
	SOM 2.5% GAC	29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024	29/01/2024
Determinand									
Arsenic	37	9.2	3	2.1	1.9	50	30	2.3	2.9
Boron (water-soluble)	290	0.4	0.2	0.2	0.2	0.2	0.8	0.2	0.2
Cadmium	9	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Chromium*	910	22	15	7.5	4.7	110	17	24	18
Chromium VI	21	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Copper	2400	21	13	12	7	150	66	18	8.7
Cyanide(Total)	-	1	1	1	1	1	1	1	1
Cyanide(free)**	34	1	1	1	1	1	1	1	1
Lead	200	28	11	6.5	5.2	370	130	6.2	6.4
Mercury ¹	199	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Nickel	130	10	7.8	4.6	4.2	63	24	6.2	6.2
pH	-	7.2	7.4	7.8	7.9	7.4	6.6	8.1	8.2
Phenols(Mono)	550	1	1	1	1	1	1	1	1
Selenium	434	1	1	1	1	1	1.1	1	1
SO4(Total)	-	0.031	0.011	0.007	0.005	0.124	0.06	0.006	0.008
Sulphide	-	5.9	1	1	1	34	7.7	1	1
Sulphur(Free)	-	0.036	0.009	0.005	0.005	0.119	0.072	0.005	0.005
Thiocyanate	-	0	0	0	0	0	0	0	0
Zinc	3700	52	21	14	13	170	48	17	24
Acenaphthene	510	0.05	0.05	0.05	0.05	1.9	0.23	0.05	0.05
Acenaphthylene	420	0.05	0.05	0.05	0.05	0.21	0.05	0.05	0.05
Anthracene	5400	0.05	0.05	0.05	0.05	2.4	0.35	0.05	0.05
Benzo(a)Anthracene	-	0.08	0.05	0.05	0.05	6.7	1.4	0.06	0.05
Benzo(a)Pyrene ^{3M}	5	0.06	0.05	0.05	0.05	6.4	1.3	0.06	0.05
Benzo(b)Fluoranthene	-	0.1	0.05	0.05	0.05	7.5	1.6	0.08	0.05
Benzo(ghi)Perylene	-	0.05	0.05	0.05	0.05	3.7	0.85	0.05	0.05
Benzo(k)Fluoranthene	-	0.05	0.05	0.05	0.05	3.9	0.82	0.05	0.05
Chrysene	-	0.09	0.05	0.05	0.05	6.6	1.6	0.05	0.05
Dibenzo(ah)Anthracene	-	0.05	0.05	0.05	0.05	0.99	0.19	0.05	0.05
Fluoranthene	560	0.17	0.08	0.05	0.05	13	2.5	0.11	0.18
Fluorene	400	0.05	0.05	0.05	0.05	1.3	0.23	0.05	0.05
Indeno(123-cd)Pyrene	-	0.05	0.05	0.05	0.05	3.4	0.73	0.05	0.05
Naphthalene	5.6	1.1	1.1	0.34	0.26	3.9	3.4	0.36	0.38
Phenanthrene	220	0.11	0.05	0.05	0.05	10	1.7	0.08	0.22
Pyrene	1200	0.15	0.06	0.05	0.05	13	2.5	0.11	0.14
PAH(total)	500	1.81	1.22	0.8	0.8	85	19.4	0.91	0.92
Asbestos	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected	-	-	Not-detected
SOM [‡]	-	4	-	-	-	4	10	1	-
All Units mg/kg unless otherwise stated									
Where no SOM is reported 1% SOM Criteria are used. For individual samples SOM value is used to adjust the assessment criteria accordingly that that sample.									
*Criteria Assumes Chromium III SM = Surrogate Marker Approach Culp et al									
**Criteria is derived considering acute effects on 1-2yo Female Receptor ingesting a single dose of 3g of soil									
***Criteria is derived considering Total TPH (C10 to C35) is formed entirety of a 50:50 Aliphatic and Aromatic Split C8-C10 range									
¹ GAC for inorganic mercury can normally be compared with chemical analysis for total mercury content because the equilibrium concentrations of elemental and methylmercury are likely to be very low									
[‡] Criteria reported to zero decimal places									
Basis of Assessment Criteria:CLEA v1.071EA 2005 WAC (Human Health Value)C4SL									
LQM S4ULAtrisk 06									