

HERTS & ESSEX SITE INVESTIGATIONS

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GEOTECHNICAL ASSESSMENTS – ENVIRONMENTAL ASSESSMENT - DESKTOP STUDY – CONTAMINATED LAND

Report For :

NFC Homes Ltd

PHASE IV –VALIDATION REPORT

Site location :

***Land Adjacent to
94 George Street,
Reading
RG1 7NT***

***August 2021
Report No. 16550***

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DOCUMENT INFORMATION AND CONTROL SHEET

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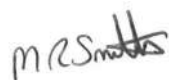
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1	1	HESI, (File Copy)	Paper	1	August 2021
2	1	NFC Homes Ltd	PDF	1	August 2021
3					
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1 Introduction

1.1 Aims and objectives

At the request of NFC Homes Ltd, Herts & Essex Site Investigations have been employed to undertake validation works within the site in order to provide evidence and documentation to support the removal of any risk from the site development as a result of site investigation works undertaken and risk assessments completed as a result of these investigations. This has been completed based on the proposed land use of the site is residential with home grown produce.

The main objectives of the remediation works and validation works undertaken are as follows:

- To anticipate regulatory action and provide necessary data to remove risk;
- To assess the site for Part IIA;
- To ensure development is 'suitable for use' status, (status being residential land use);
- To assess the site in other regulatory contexts;
- To inform acquisition, transfer or sale plans;
- To support funding decisions;
- For valuation purposes;
- For insurance purposes

1.2 Current Planning Status

This report has been prepared with the below application in mind with Reading Council.

Application Number : 180798

Proposal : Erection of a two-storey (and roof space accommodation) building comprising 4 (2x1 & 2x2-bed) residential units (Class C3) with associated bin and cycle storage, landscaping and associated works.

Decision : Granted

Condition 11

No development shall take place until a detailed remediation scheme to bring the site to a condition suitable for the intended use by removing unacceptable risks to human health, buildings and other property and the natural and historical environment has been submitted to and approved in writing by the Local Planning Authority. The scheme must include all works to be undertaken, proposed remediation objectives and remediation criteria, an appraisal of remedial options, and proposal of the preferred option(s), and a timetable of works and site management procedures. 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 the intended use of the land after remediation.

Reason: To ensure the development is suitable for its end use and the wider environment and does not create undue risks to occupiers of the site or surrounding areas in accordance with Policy CS34 of the Reading Borough LDF Core Strategy 2008 (Altered 2015).

Condition 12

The remediation scheme shall be implemented in accordance with the approved timetable of works. A validation report (that demonstrates the effectiveness of the remediation carried out) must be submitted to and approved by the Local Planning Authority prior to construction of the development. Reason: To ensure the development is suitable for its end use and the wider environment and does not create undue risks to occupiers of the site or surrounding areas in accordance with Policy CS34 of the Reading Borough LDF Core Strategy 2008 (Altered 2015). 15 13. In the event that contamination is found at any time when carrying out the approved development not previously identified, development must be halted on that part of the site and it must be reported in writing to the Local Planning Authority.

Following that an assessment of the nature and extent of contamination must be undertaken and where remediation is necessary a remediation scheme, together with a timetable for its implementation, must be submitted to and approved in writing by the Local Planning Authority. The measures in the approved remediation scheme must then be implemented in accordance with the approved timetable. Following completion of measures identified in the approved remediation scheme a validation report must be submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure the development is suitable for its end use and the wider environment and does not create undue risks to occupiers of the site or surrounding areas in accordance with Policy CS34 of the Reading Borough LDF Core Strategy 2008 (Altered 2015).

1.3 Site Details

The site is located within a residential area of Reading the details of which are summarised in Table 1 with the location plan of the site shown in Appendix 2, Sheet 1.

Table 1 Site Detail

Site Address :	Land Adjacent to 84 George Street, Reading, RG1 7NT
Site assessed under	Site Owners Request - Aid as part of planning application
Current use of land :	A site walkover was undertaken at the Site on 12th May 2017; a detailed description of the current land use is provided in the Phase 1 Contaminated Land Assessment Report (Ref: 70012984 Issue 2), herein referred to as the "Phase 1 Report". In summary, the Site comprises a flat, irregular-shaped plot (366 m2) of undeveloped, heavily vegetated, vacant land, located to the north of 94 George Street. The Site was cleared of vegetation in early spring 2019, in order to facilitate the intrusive investigation. A concrete slab of a former site building is present across the eastern portion of the site
Previous use of site, (if known)	Unknown
Grid Reference	NGR 470548, 173591
Site Area	0.46 Hectares
Local Authority	Reading Council
Gradient of the site	The site forms a level area of land with an embankment leading up to the railway line to the northeast.
Proximity of Controlled Waters, (if known)	A number of drainage ditches are present to the north of the Site, at the base of the railway embankment. There are no surface water abstraction licenses recorded within 500m of the Site. The closest rivers to the Site are the River Kennet and the River Thames which are both over 1km from the site to the southeast and northeast respectively.

1.4 Previous Reporting

The extent of former report which has been undertaken relating to the site is confirmed as follows :-

Table 2 Report Details

Report	Developed by with Reference	Date	Submitted to Local Authority	Approved by Local Authority
Planning Application Number 180798				
Desk Top Study	WSP 'George Street, Reading, Phase 1 Contaminated Land Assessment' (March 2018), Report Reference: 70012984 Issue 2	March 2018	Yes	Yes
Environmental Report	WSP 'George Street, Reading, Phase 1 Contaminated Land Assessment' (March 2018), Report Reference: 70044279	May 2019	Yes	Yes
Remediation Report	TEC Remediation Scope	Unknown	Yes	Yes

In order to gain a full understanding of the site and site history, a review of these documents should be made.

1.5 Review of Reports

1.5.1 Site Description

A site walkover was undertaken at the Site on 12th May 2017; a detailed description of the current land use is provided in the Phase 1 Contaminated Land Assessment Report (Ref: 70012984 Issue 2), herein referred to as the "Phase 1 Report". In summary, the Site comprises a flat, irregular-shaped plot (366 m2) of undeveloped, heavily vegetated, vacant land, located to the north of 94 George Street.

The Site was cleared of vegetation in early spring 2019, in order to facilitate the intrusive investigation. A concrete slab of a former site building is present across the eastern portion of the site. Surrounding land use comprises a railway line to the north, a community centre and recreation ground to the east (on the other side of George Street), residential land to the south and an allotment to the west. A narrow strip of land runs along the northern site boundary, which permits pedestrian access to the allotments.

1.5.2 Brief Site History

On-site: The Site was historically associated with residential land use, comprising two dwellings from circa 1932 to pre-1988. A single building was present on-site post 1988 to pre 2016; due to its size and shape, this could have been a commercial property or light industrial unit.

Off-site: Since the late 19th Century railway land has occupied land to the north of the Site, comprising two tracks lying along an embankment. Residential land use predominantly occupied the surrounding land to the south, east and west since the late 19th century.

1.5.3 Desk Top Study Conclusions

- Published data indicates the Site to be underlain by superficial deposits of Alluvium (clay, silt, sand and gravel), underlain by Taplow Gravel (sand and gravel) and the solid geology of Seaford Chalk and Newhaven Chalk Formation (undifferentiated).
- The alluvium is designated by the Environment Agency as a Secondary A Aquifer strata and the chalk is designated as a Principal Aquifer. The Site does not lie within a groundwater Source Protection Zone. However, there is a groundwater abstraction licence for potable water supply recorded 460m northeast of the Site.
- A number of drainage ditches are present to the north of the Site, at the base of the railway embankment. There are no surface water abstraction licenses recorded within 500m of the Site. The closest rivers to the Site are the River Kennet and the River Thames which are both over 1km from the site to the southeast and northeast respectively.

- There is a Recorded Pollution Incident 80m east of the Site. The incident occurred on 23 July 2007 and involved oils and fuel, resulting in a Significant (Category 2) impact on land and a Minor (Category 3) impact on water.
- The allotment to the west of the Site (and associated access path adjacent to the northern site boundary) are designated as Contaminated Land under Part 2A of the Environmental Protection act (1990), reportedly following the identification of Benzo(a)Pyrene in Made Ground and compost

On Site

- Historical coal-fire ash disposal (polycyclic aromatic hydrocarbon compounds (PAHs) and heavy metals).
- Highway pavement and Made Ground associated with past development (organic and inorganic compounds including hydrocarbons, asbestos, heavy metals and metalloids).

Off Site

- Contaminated Land determined under Part 2A to north and west: localised migration of benzo(a)pyrene (BAP);
- Railway line to the north: PAHs, phenols, metals, PCBs, herbicides, glycols, asbestos;
- Recorded pollution incident 80m to the east: hydrocarbon compounds.

1.5.4 Scope of site investigation Works completed

Preliminary Testing

The investigation works completed are as detailed below :-

1. The focus of the investigation was to confirm risks from the site which are detailed as follows :-
 - a. Assessment of soils across the site area;
2. Spatial sampling around the remainder of the site to provide a general assessment.

Initial Investigation – September 2018

- Clearance of all proposed exploratory hole locations by a specialist service tracing company using ground penetrating radar (GPR) and a CAT and Genny to locate all services on the site.
- Setting out of all proposed ground investigation locations.
- Advancing 7 No. hand-dug pits to 1.5m bgl for service inspection.
- Advancing 2 No. rotary boreholes to 15m bgl to prove intact chalk for geotechnical information. Groundwater monitoring wells to be installed within the chalk.
- Advancing up to 5 No. window sample boreholes up to 5m bgl. Up to 5 No. installed as gas monitoring wells.
- Taking 3 no. surface soil samples (<0.05m bgl), from perspective garden areas.
- Surveying coordinates and levelling in all window sampling borehole investigation locations.
- One return visit to purge all groundwater monitoring installations.
- One return visit to undertake groundwater monitoring.
- Six return visits to undertake ground gas monitoring.
- Laboratory analysis of recovered soil and groundwater samples.

1.5.5 Geology

The site has been reviewed and we can confirm that the geology within the site is as follows :-

Table 3 Geological Profile

Reference	Location	Completed Works	Installation
BH001	Located at the eastern end of the northern Site boundary. Located within proposed building footprint.	Drilled to 12.75m bgl to prove competent chalk strata. In-situ SPT testing (1.5m, 3.0m, 4.5m, 6.0m, 7.5m, 9.3m, 10.8, and 12.3m) and collection of samples for laboratory testing.	Groundwater. Targeted strata - Chalk. Response zone 9.3m – 12.3m
BH002	In the southeast corner of the site. Located within proposed building footprint	Drilled to 12.7m bgl to prove competent chalk strata. In-situ PID testing (0.3m, 0.5m, 1.6m, 2.2m, 5.9m, 11.0m); In-situ SPT testing (1.5m, 2.1m, 4.5m, 6.0m, 7.5m, 9.0m, 11.2m, 12.7m) and collection of samples for laboratory testing	Groundwater. Targeted strata - Chalk. Response zone 9.5m – 12.5m.
WS001	In western corner of the Site, to provide site coverage. Nearest point to adjacent allotments. Located within proposed garden area.	In-situ PID testing (1.6m, 2.5m, 3.5m); In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Gas monitoring well. Targeting ground gas within Made Ground strata. Response zone 0.5m – 0.9m.
WS002	In west part of the Site, located to provide site coverage. Located within proposed garden area.	In-situ PID testing (2.0m, 3.0m). In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.6m – 5m. Targeted Strata – groundwater within the Alluvium (Gas within unsaturated Alluvium deposits and groundwater vapours)
WS003	Located towards the centre of the Site, located within the proposed building footprint. (Location moved to western extent of building footprint for sewer easement)	In-situ PID testing (1.7m, 3.0m, 3.8m); In-situ SPT testing (2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.6m – 3m. Targeted Strata – groundwater within the Alluvium (Gas within unsaturated Alluvium deposits and groundwater vapours)
WS004	In the centre of the Site. Located within the proposed building footprint.	Exploratory hole not drilled due to time constraints. Located on former building slab.	NA
WS005	In the northeast corner of the Site. Located within the proposed building footprint.	In-situ PID testing (1.6m, 1.8m, 2.5m, 3.5m, 4.5m); In-situ SPT testing (1.6m, 2.0m, 3.0m, 4.0m and 5.0m) and collection of samples for laboratory testing.	Groundwater and gas monitoring well. Response zone 1.7m - 4m. Targeted Strata – groundwater within the Alluvium

Soil samples, comprising disturbed samples were generally collected from each stratum at all intrusive locations. Where visual or olfactory evidence of contamination was observed, additional samples were obtained for laboratory analysis. All samples for chemical laboratory testing were collected in appropriate containers stored in cool boxes (where appropriate) and sent to the laboratory

In-Situ and Field Testing A hand-held Photo-Ionisation Detector (PID) fitted with a 10.6eV lamp and calibrated against 100 ppm isobutylene standard gas was used in the field to provide a semiquantitative indication of the presence of volatile organic compounds within soil samples. The readings are taken through headspace measurements and are used assist with sample selection for chemical analysis and type of analysis. Standard Penetration Tests (SPT) were carried out at regular intervals in all locations to provide data on the in-situ density/strength of the strata.

Laboratory Analysis All samples were collected in accordance with current industry best practice and on-site sampling procedures were designed to minimise the potential for cross-contamination. Samples were collected in labelled containers and sent directly to ALS Environmental under a digital chain of custody. The samples were suitably preserved and all testing was completed under relevant UKAS and MCERTS accreditations. The chemical testing strategy was underpinned by the preliminary conceptual site model and by on-site observations. Selected soil samples were analysed for:

- Asbestos identification and quantification;
- Metals and metalloids including hexavalent chromium;
- Inorganics;
- Ammoniacal nitrogen;
- Cyanide
- Phenols;
- Polyaromatic hydrocarbons (PAHs);
- Total petroleum hydrocarbons (TPHs);
- Polychlorinated biphenyls (PCBs);
- Volatile organic compounds (VOCs) and semi-organic volatile compounds (SVOCs).

Selected groundwater samples for analysed for:

- Metals and metalloids including hexavalent chromium;
- Inorganics;
- Ammoniacal nitrogen;
- Cyanide;
- pH;
- Phenols;
- Polyaromatic hydrocarbons (PAHs);
- Total petroleum hydrocarbons (TPHs); and
- Volatile organic compounds (VOCs) and semi-organic volatile compounds (SVOCs).

Groundwater and Ground Gas Installations, Sampling and Monitoring

All groundwater installations were developed following the drilling works on 11th April. A total of three times the well volume were purged and collected within an intermediate which was later collected for off-site disposal to a licenced facility.

Six rounds of ground gas monitoring were undertaken on all four window sample locations with response zones in the Made Ground and Alluvium on the following dates: 11th, 16th and 25th April, and 3rd, 9th and 16th May 2019. In addition, BH001 and BH002 were accidentally monitored for gas readings; results from these boreholes in the first two rounds have been exempt from assessment. Gas monitoring results are contained within Appendix H.

Ground gas monitoring was undertaken in locations WS001, WS002, WS003, WS005. Initial and steady state concentrations of methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide were measured using a GFM435 gas analyser, along with the gas flow rate and atmospheric pressures at each monitoring location.

One round of groundwater monitoring was undertaken on the 16th April 2019.

Groundwater levels and depth to base of the boreholes were recorded using an oil interface probe in all exploratory hole locations following the gas monitoring. Groundwater samples were taken from all exploratory hole locations and sent for laboratory analysis.

1.5.6 Human Health Source Conclusions

Risk based on assessments of the site confirm that risk is in place as follows :-

Table 4 Soil Contamination Risks

Risk Factor	Risks in place	Remediation
Targeted Risks	Barium Beryllium Arsenic Fuels Asbestos	Remediation Strategy Works Proposed
Spatial Risks	Lead Benzo(a)pyrene	

Summary

- Various metals, PAHs and TPHs were recorded in exceedance of the screening criteria for a residential end use in all exploratory hole locations across the Site. With the exception of some TPHs recorded in the Alluvium in WS005, the contaminants recorded in exceedance of the screening criteria are limited to the Made Ground on-site.
- Metals recorded above the screening criteria include lead, arsenic, barium and beryllium. Recorded concentrations are either considered marginal or to be representative of natural background concentrations.
- BAP is considered as a marker indicator for petroleum hydrocarbons. Recorded concentrations of BAP exceed the screening criteria in all exploratory hole locations, including the three surface soil samples. Naphthalene was also recorded in exceedance of the screening criteria in Made Ground in one location (BH002). All exceedances of BAP were found in the Made Ground. The source of BAP could be associated with the adjacent allotment land to the north and west (from application of soil improver used in the allotments, historical domestic ash disposal and land known to have been impacted by railway run off) or from historic on-site activities (domestic ash or previous industrial site uses).
- Various carbon bands of TPH were recorded in excess of the screening criteria in the Alluvium in WS005 (at 1.8 and 2.5m bgl) where hydrocarbon stained soils were observed, and in Made Ground from BH002 at 0.3m bgl. Concentrations within the alluvium of WS005 predominantly comprise low to medium range bandings of aliphatics (C8-10 to C12-16) and aromatics (C8-10 to C16-21). No known sources of hydrocarbons have been identified on site in association with the sites former use. Impacts of hydrocarbons were noted at the groundwater surface; no notable impact of hydrocarbons were noted from ground level or within the unsaturated zone above the groundwater. The potential sources of hydrocarbons could therefore be from an off-site source; from the railway land to the north of the site, or associated with the historic pollution incident.
- Chrysotile asbestos fibres were identified in two (BH001 and WS005) out of 15 Made Ground soil samples analysed. Suspected ACMs were also noted in the form of cement sheeting at the surface of the site. A bulk sample from the site surface of the suspected ACM was taken and tested and proven to be asbestos cement containing chrysotile asbestos.

1.5.7 Ground and Surface Water Risks

All groundwater analytical results have been screened against the relevant vapour screening criteria for a residential exposure scenario for a sandy soil type (most conservative). The screening criteria and screening table are provided in Appendix I. All concentrations are presented in µg/l unless otherwise stated.

In addition to the soils assessment included above (which accounts for the potential for vapour generation from soil sources) the data from the groundwater samples have also been screened against GACs for the protection of human health associated with potential vapour generation from any groundwater source.

No exceedances of the residential GAC were recorded.

It should be noted that groundwater data from the recent investigation is limited to the single monitoring round.

1.5.8 Land Gas Risks

A total of four shallow window sample locations (WS001, WS002, WS003 and WS005) were installed as soil gas monitoring locations. Following the completion of the intrusive investigation, six rounds of gas monitoring were undertaken. Monitoring works were completed during April and May 2019, to enable a preliminary assessment of the soil gas regime at the Site. Two of the monitoring rounds (11th April & 16th May) were undertaken in periods of falling atmospheric pressure which is therefore considered that worst-case conditions have been monitored at the site.

Ground gas monitoring was undertaken using a multi-gas analyser (GA2000) for methane, carbon dioxide, oxygen, hydrogen sulphide, carbon monoxide, flow rate and atmospheric pressure.

Methane concentrations were negligible at all locations on all monitoring rounds. Measurable concentration of carbon dioxide above atmospheric conditions and depleted oxygen levels were recorded at all locations on at least one occasion. Carbon monoxide was recorded on one occasion at 30ppm in WS005 where hydrocarbon impact was noted; no other detections of carbon monoxide were detected on any other occasion or in any other borehole. It is possible this could have been an erroneous detection. The highest flow rate of 0.7 l/hr was detected during a period of falling atmospheric pressure.

The gas risk assessment for the site is driven by the concentrations of carbon dioxide. The GSV (0.0357 l/hr) and low flow rates recorded alone would characterise the site as a Characteristic Situation 1. However, owing to the concentrations of carbon dioxide recorded in WS002 on one occasion at >5%, the site has been characterised as follows:

Situation A: Characteristic Situation 2 (low risk).

2 levels of protection are required for a residential building. Typical scope of protective measures:

- a) Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft) with at least 1200 g DPM2 and underfloor venting.
- b) Beam and block or pre-cast concrete slab and minimum 2000 g DPM/reinforced gas membrane.
All joints and penetrations sealed.

The site has been characterised as Characteristic Situation 2 (low risk) based on the ground gas concentrations, where all new development requires gas protection measures to be installed. This characterisation is based upon recent gas monitoring data collected by WSP (April and May 2019) on six occasions, and driven by the concentrations of carbon dioxide recorded at >5% on one occasion.

It is noted that the barometric pressure was showing a decreasing trend during the second and sixth rounds of gas monitoring on 11th April and 16th May 2019. It is therefore considered that appropriate conditions have been monitored at the site

1.5.9 Vapour Risks

Concentrations of TPHs and naphthalene in the soils pose an unacceptable vapour risk to future residential end users and future site workers. Therefore, the gas protection measures will have to be suitably adequate to also protect for the ingress of hydrocarbon vapours. In addition, the removal of Made Ground soils in garden areas will remove the risks to future maintenance workers from gases and vapours.

1.5.10 Water Main Risks

Based on an assumption of worst case scenario, we can confirm that in accordance with UKWIR, (UK Water Industry Research – Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites), risk is in place to water main pipework and protective pipework may be required, although in light of the location of the contamination and the proposed remediation options, a conventional water main pipework could be adopted for the site.

- Any pipework should be laid in clean corridors in order to prevent any future workforce or maintenance contractors from encountering potentially contaminated land.

To confirm, Conventional pipework will be required. This should be confirmed with the relevant statutory authority.

1.5.11 Conceptual Site Model

In order to assess the potential risks posed to human health and the surrounding environment from the site condition, a Generic Quantitative Risk Assessment has been used to consider whether risk is in place. This uses Source Pathway Receptor risk assessment methodology in accordance with CLR11.

Table 9-1 – Risk Appraisal based on Future Residential End Use

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
Made Ground Asbestos. TPH, PAH and metals. Soil vapours and ground gases.	Inhalation of asbestos fibres	Human Health: Future residents	Medium	Likely	Moderate Risk	Although ACM has been largely cleared from the site surface, ACMs and asbestos fibres in Made Ground soil are present on site and present a risk to future on-site human health receptors. Mitigation measures will therefore need to be implemented to render the site suitable for a residential end use.
		Future site maintenance workers				
		Off-Site human health receptors	Medium	Low Likelihood	Moderate / Low Risk	Risks to off-site human health receptors have been classified as moderate to low due to the low likelihood of inhaling asbestos fibres from sources on site. The mitigation measures implemented to render the site suitable for residential end use will also reduce risks to off-site receptors to an acceptable level.
	Ingestion, inhalation and dermal contact of soils and dust	Human Health: Future residents	Medium	Likely	Moderate Risk	Exceedances of the human health GAC for metals, TPH and PAHs have been encountered within Made Ground soils across the Site.
		Future site maintenance workers				A potential future exposure pathway is present within proposed garden areas/areas of soft standing. Therefore, mitigation measures will be required as per above.
		Off-Site human health receptors	Mild	Low Likelihood	Low Risk	Risks to off-site human health receptors have been classified as low, however mitigation measures implemented to render the site suitable for residential end use will further reduce risks to off-site receptors to a negligible risk.
	Inhalation of ground gases and soil vapours	Human Health: Future residents	Medium	Likely	Moderate Risk	The ground gas risk assessment has characterised the site as 'Characteristic Situation 2' where basic gas protection measures will be required.
		Future site maintenance workers				Concentrations of TPHs and naphthalene in the soils pose an unacceptable vapour risk to future residential end users and future site workers. Therefore, the gas protection

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
						measures will have to be suitably adequate to also protect for the ingress of hydrocarbon vapours. In addition, the removal of Made Ground soils in garden areas will remove the risks to future maintenance workers from gases and vapours.
		Off-Site human health receptors	Medium	Low likelihood	Moderate / Low Risk	Risks to off-site human health receptors have been classified as moderate / low from ground gases and soil vapours. The ground gas risk assessment classified the site in Characteristic Situation 2 where basic gas protection measure will be required for new dwellings. However, this was based on data from one of the six rounds where one borehole marginally crossed the threshold of 5% for carbon dioxide at a concentration of 5.1%. A soil vapour risk has been highlighted from concentrations of naphthalene and TPH in Made Ground soils in BH002 at 0.3m bgl in the southeast corner of the site adjacent residential properties. It is anticipated that soil vapour risk to off-site residents will not pose a significant risk, however it is recommended that a detailed vapour risk assessment is undertaken to prove this.
	Vertical and lateral migration of leachable contaminants to groundwater.	Groundwater: Secondary A Aquifers (Alluvium & Taplow Gravels)	Medium	Likely	Moderate Risk	Contaminants within the groundwater are present in Made Ground soils; it is therefore likely these contaminants are leaching from an on-site source within the Made Ground. Water quality of the drainage ditch has not been confirmed by sampling and analysis, however it is not considered likely that groundwater from the Site would impact the drainage ditch adjacent to the north as the inferred groundwater flow direction across the Site is to the south, away from the drainage ditch.
		Groundwater: Principal Aquifer (Seaford Chalk Formation and Newhaven Chalk Formation)	Medium	Likely	Moderate Risk	In addition, the depth of the water within the drainage ditch has been inferred from site observations to be at a higher elevation than the groundwater on site, therefore

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
	Lateral migration of leachable contaminants in groundwater to surface waters.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Low Likelihood	Moderate / Low Risk	groundwater is unlikely to be providing a base flow for this surface water. No rivers are present within 1km of the site. No surface water drains are known to be present on site. Further assessment is required to determine if risks posed by contaminants within the Made Ground present an unacceptable risk to the controlled waters environment before remediation or mitigation measures are warranted.
	Surface water runoff and migration via drainage and discharge to surface water.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Low Likelihood	Moderate / Low Risk	
	Direct contact with contaminated soil causing chemical attack.	Property Receptors: Site buildings and structures	Minor	Unlikely	Negligible Risk	Identified sulphate concentrations within the soils would not pose a risk of chemical attack to concrete foundations.
	Direction contact with contaminated soil	Underground drinking water supply pipes	Medium	Low Likelihood	Moderate / Low Risk	The use of alternative material for water supply pipes may be required in areas where Made Ground is present owing to the presence of hydrocarbon contamination (though this is generally at a lower depth than service pipes would be present). This would be subject to requirements of the local water authority.
	Migration of explosive ground gas.	Property Receptors: Site buildings and structures.	Medium	Unlikely	Low Risk	Results of the gas monitoring showed negligible concentrations of methane to be present on site. Therefore a low risk from explosive ground gas has been determined.

Source	Pathway	Receptor	Severity	Likelihood	Risk	Comments
Contaminated Groundwater Containing elevated levels of ammoniacal nitrogen, PAHs & metals above the relevant screening criteria	Lateral and vertical migration of groundwater	Groundwater: Secondary A Aquifers (Alluvium & Taplow Gravels)	Medium	Likely	Moderate Risk	Though metal concentrations were detected above the screening criteria, they were determined not to be significant. The shallow groundwater in the alluvium (Secondary A Aquifer) has identified contaminants above the relevant screening criteria which were not identified within the chalk (Principal Aquifer), specifically ammoniacal nitrogen. Lateral migration of these contaminants could spread to the wider Secondary A Aquifer. Groundwater within the with the two identified aquifers are unconfined, therefore a vertical a contaminant linkage has also been identified to the underlying Principal Aquifer. PAH concentrations were identified within both aquifers.
		Groundwater: Principal Aquifer (Seaford Chalk Formation and Newhaven Chalk Formation)	Medium	Likely	Moderate Risk	
	Lateral migration contaminants in groundwater to surface waters.	Surface Water: Drainage ditch adjacent to north of Site	Medium	Low Likelihood	Moderate / Low Risk	Water quality of the drainage ditch has not been confirmed by sampling and analysis, however it is not considered likely that groundwater from the Site would impact the drainage ditch adjacent to the north as the inferred groundwater flow direction across the Site is to the south, away from the drainage ditch. In addition, the depth of the water within the drainage ditch has been inferred from site observations to be at a higher elevation than the groundwater on site, therefore groundwater is unlikely to be providing a base flow for this surface water. No rivers are present within 1km of the site. Further assessment is required to determine if risks posed by contaminants within the groundwater present an unacceptable risk to the controlled waters environment before remediation or mitigation measures are warranted.

1.6 Collection of Additional Information to Assess Risks

No additional works are required, the site investigation works within the site are sufficient to classify the soil and groundwater risk in place within the site and enable a remediation plan to be written.

2 Remediation

2.1 Remediation Proposals

This section provides summary of the remediation proposals set out in the Remediation Strategy.

The strategy adopted for the remediation of the site are defined as follows :-

2.1.1 Soft Landscaping Areas

The remediation objective shall be achieved by providing pathway-breaks between the contaminant sources and the receptor (future residents), in the form of a cover system in future soft-cover areas and installation of gas / vapour protection measures as part of the building construction.

- The remediation strategy comprises the following principal elements:
- Excavation and removal of a minimum of 600 mm of soil across future soft-cover areas.
- Disposal of soils to a suitably licensed waste facility.
- Installation of a geomembrane at the bases and sides of the excavations to act as a warning / separation layer.
- Reinstatement with suitable imported material; and · Installation of gas / vapour protection measures

Preparatory Work

Decommissioning of the existing borehole and window-sample installations is required prior to the remediation strategy being implemented. The locations of these are shown on Drawing No. 70044279 / 101. Decommissioning shall comprise removal of head-works and infilling with bentonite grout in line with the current Environment Agency guidance.

Excavation and Disposal

The aim is to achieve 100% removal of material within future soft-cover areas, to a minimum depth of 600 mm below final ground levels. The future soft-cover areas i.e. the remediation areas, are shown on Drawing No. 70044279 / 102.

Representative soil samples will be taken from excavated soil materials for laboratory analysis, and the materials classified before being disposed of to an appropriately licensed facility.

Reinstatement

Prior to reinstatement, a geomembrane (e.g. Terram T1000 orange, or similar approved) will be placed over the bases of the excavations and lapped against the excavation sides. The membrane will also require lapping against the bases and sides of any tree pits excavated within future soft-cover areas.

Reinstatement shall be in accordance with the landscaping design. Where the specified depths of topsoil / subsoil in the landscaping design are less than the 600 mm excavation depth, the difference shall be made-up by increasing the thickness of sub-soil.

Gas / Vapour Protection Membrane

Refer to details included in the building design.

Verification

The excavation levels (formation levels) shall be topographically surveyed and photographed prior to reinstatement. A topographical survey shall then be undertaken post-reinstatement (final ground levels) to demonstrate that sufficient thickness of clean cover has been placed.

The following records shall be provided for inclusion in the Verification Report:

- The sub-contractor shall provide records.
- Specification of selected geomembrane.
- Excavation quantities.
- Waste classification testing data.
- Waste disposal records, including tickets and consignment notes, details of waste disposal facilities
- Details of imported materials used in reinstatement.
- Photographic record; and
- Topographic survey information, including excavation levels and final ground levels

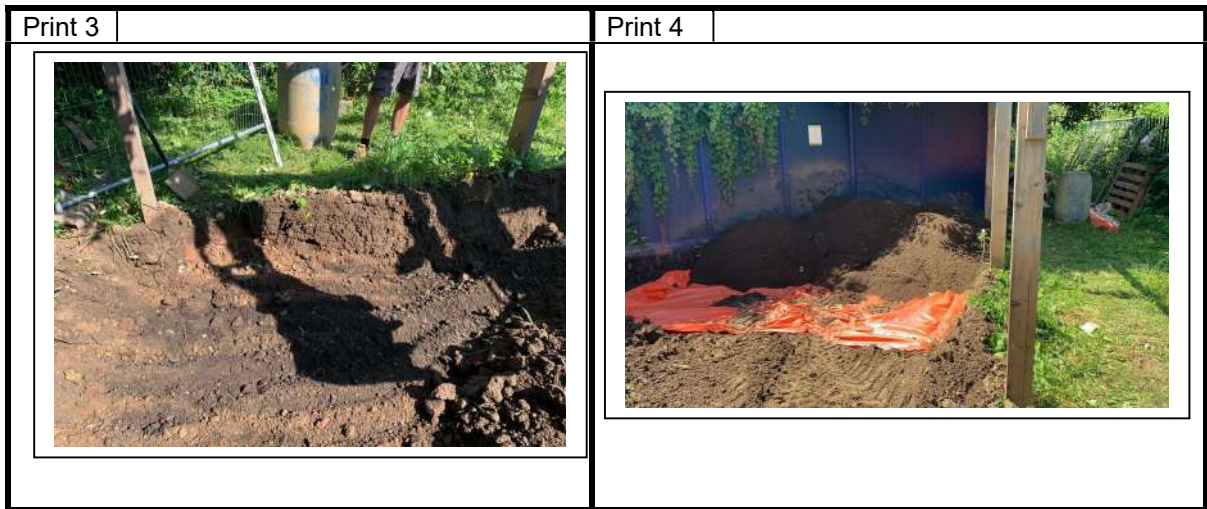
3.0 Validation

3.1 Validation Works Completed by HESI

Via the remediation report the client was informed the of the validation requirements for the validation works. Based on this, the client has provided the validation data for completion of the report these details and information are as follows. Herts & Essex have not been involved in the collection of any data.

3.1.1 Soft Landscaping Areas – Remediation Cell of Soft Landscaping.

Within the area of Remediation Cell removal of a strip of a minimum of 0.60 meters was completed. As shown by the photos provided by the client:-



Print 5



Print 6



Print 7



Print 8



Print 9



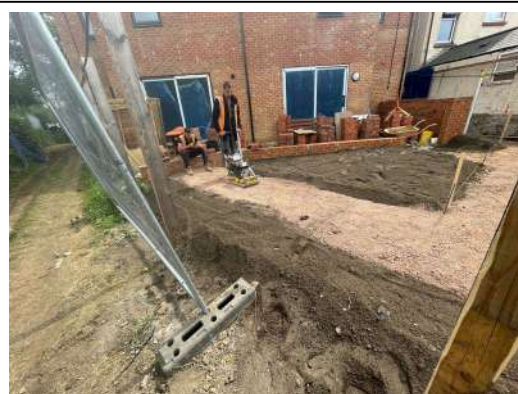
Print 10



Print 11



Print 12



Based on the above, the client has confirmed that the garden areas have been excavated and removed at least 0.60 metres of subsoil to develop at least a replacement 0.60 metres of replacement soils. A demarcation barrier has been installed at the site below all proposed soft landscaping which has been identified as a 609 geotextile orange, (details of which have been provided within appendices of this report).

Topsoil Importing

No insitu validation testing has been completed at the site. The client has provided topsoil document to confirm the contamination status of the soils in line with BS 3882 : 2015, (Specification for Topsoil). By examination of the data recovered, the topsoil criteria meets that of a residential land use with home grown produce.

Based on these assessments, topsoil is acceptable for use within the site. The date of the topsoil certificate is recorded as 25th May 2021.

Excavated Soils

Any excavated soils were disposed off-site to a suitable landfill via an external haulier. Muck Away certificates have been included within this report. This included six muck away certificates.

3.1.2 Water Main Pipework

Water mains have been installed in Protect-A-line water main pipework.

3.1.3 Below Buildings

Land Gas

A third part certificate has been provided for the installation of a gas proof membrane at the site. UK Membranes Ltd have confirm that the installation of a gas proof membrane has been installed in a correct manner to the manufacturers recommendation's.

3.1.4 Groundwater Risk

Groundwater risk has been identified as low based on the assessments completed.

3.2 Conclusions

This report forms a validation report for the completion of the site area and includes validation that the area of PAHs (remediation cell A) within the communal space and has undergone specific excavation and removal of what has been identified as contamination from PAH contamination. This excavation has included the removal of these soils to an off site landfill through a licensed haulier. Photos of the remediation cell have then been recovered and are recorded within this report to provide lines of evidence that all contamination has been removed from the site and that no further human health risk is in place.

It is not proposed to undertake any long term monitoring or maintenance programmes within the site.

APPENDIX ONE

MUCK AWAY CERTIFICATES



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Waste Carrier No: CB/DU171743 • Registered in England 8987070

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Orders Hotline: 07773 428 428

WASTE TRANSFER CONVEYANCE NOTE

Driver Name: TARA DUBB Vehicle Reg: ASH11HGV

Site Address: 94 George St - R917NT

Customer Name:

GRAB ☒	TIPPER ☐	SKIP ☐	ARTIC ☐	Tonnes ☐	Bulk Bags ☐	Material Delivered:
DESCRIPTION OF WASTE						
INERT						17.05.04
BALLAST						01.01.02
CONCRETE/BRICK						17.01.01
CONCRETE						17.01.07
DEMO. WASTE						17.02.01
WOOD						17.02.01
MIXED METAL						17.04.07
MIXED CONSTRUCTION						17.09.04

Tipped At:

Time on Site: 08:05 Time off Site: 08:20

SIC 38.11. By signing I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England & Wales) Regulation 2011.

RECEIVED BY: [Signature]

PRINT NAME: [Signature]

N.B. To Customers, Authorised Agents, Representatives, or Responsible Persons signing this Delivery Ticket. This is in your interest - please read this ticket carefully, and inspect materials, agreeing quantity, quality and that everything is to your satisfaction, before finally signing this receipt note. We regret we cannot under any circumstances entertain any claims concerning quantity or quality, once the vehicle has left the site, and a clear signature has been given.

Certified that the above particulars are true and relate to the bricks being conveyed in the vehicle described, which bricks is being so conveyed in pursuance of a sale.

Signed for and on behalf of the seller. [Signature] Date: 22/07/21

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WASTE TRANSFER CONVEYANCE NOTE

Driver Name: George St R91 Vehicle Reg: ASH11HGV

Site Address: 94 George St - R917NT

Customer Name:

GRAB ☒	TIPPER ☐	SKIP ☐	ARTIC ☐	Tonnes ☐	Bulk Bags ☐	Material Delivered:
DESCRIPTION OF WASTE						
INERT						17.05.04
BALLAST						01.01.02
CONCRETE/BRICK						17.01.01
CONCRETE						17.01.07
DEMO. WASTE						17.02.01
WOOD						17.02.01
MIXED METAL						17.04.07
MIXED CONSTRUCTION						17.09.04

Tipped At:

Time on Site: [Signature] Time off Site: [Signature]

SIC 38.11. By signing I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England & Wales) Regulation 2011.

RECEIVED BY: [Signature]

PRINT NAME: [Signature]

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Certified that the above particulars are true and relate to the bricks being conveyed in the vehicle described, which bricks is being so conveyed in pursuance of a sale.

Signed for and on behalf of the seller. [Signature] Date: 22-7-21

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MacBook

JOHN STACEY & SONS LTD
A JOHN STACEY COMPANY
TIPPER & PLANT HIRE - DEMOLITION
RECYCLED CONSTRUCTION MATERIALS
SILCHESTER ROAD, TADLEY, BASKINGSTOKE WANTS, RG26 3PZ
Tel: (0116) 981 3531 Fax: (0116) 981 3458
This Transfer Note is a copy of the original and must be signed by the Employer
Principle Act 1991. Please ensure the information given is accurate.

C 430837
CONVEYANCE NOTE (MORT and Vol.)
CONTROLLED WASTE TRANSFER NOTE
CUSTOMER COPY
WAT Reg. No. 198 9545 85

DATE: 20-7-21
Crecycle

PLACE OF LOADING: **SENNAH**
VEHICLE REG. No.: **X4K JSS** FLEET No.: **345**
NAME OF PERSON IN CHARGE OF VEHICLE: **SWAN**
CUSTOMER: **EAST THAMES** SITE ADDRESS: **90A GEORGE ST**
READING

Standard Industrial Classification (SIC) Code
Description of Material: **SOIL**

	WEIGHT OR VOLUME	TONNES	Kg
Gross Weight of Vehicle at Weightbridge			
Tare Weight of Vehicle			
Net Weight			

Certified that the above particulars are true and relate to the material being conveyed in the vehicle described, which material is being so conveyed in pursuance of:-
(a) A contract or agreement for the carriage thereof made by weight;
(b) An agreement for the carriage thereof made by weight;
(c) A contract or agreement for the carriage thereof made by volume;
(d) A contract or agreement for the carriage thereof made by weight or volume as applicable.
On behalf of the Seller

Registered Waste Carrier: **CBDU92361** Environment Agency

SIGNED BY PRODUCER/SITE: **L. Welch**
PRINT NAME: **L. Welch**

TRANSFER OF WASTE: **YES** ☐ **NO** ☐
WASTE PRE-TREATED: **YES** ☐ **NO** ☐
SITE LICENCE No.

SIGNED BY TIP OPERATOR: **PZ Brounwa**
SIGNED BY DRIVER: **[Signature]**

The Company will not be responsible in any circumstances for damage to private property in our vehicles when delivering material off the Public Road to Customer's instructions. The above consignment remains the property of the Consignor until payment for the goods has been received. The consignor reserves the right to retrieve these goods when subject of non-payment.

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Orders Hotline: 07773 428 428
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WASTE TRANSFER CONVEYANCE NOTE

Driver Name: **George S - [Signature]** Vehicle Reg: **AS11 HGU**
Site Address: **George S - [Signature]**
Customer Name: **NFC**

GRAB	TIPPER	SKIP	ARTIC	Tonnes	Bulk Bags	Material Delivered
☒	☐	☐	☐	☐	☐	
DESCRIPTION OF WASTE: MUCK						
INERT						
BALLAST						
CONCRETE/BRICK						
CONCRETE						
DEMO. WASTE						
WOOD						
MIXED METAL						
MIXED CONSTRUCTION						

Tipped At: **[Blank]**

Time on Site: **[Blank]** Time off Site: **[Blank]**
SIC 38.11: By signing I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England & Wales) Regulation 2011

RECEIVED BY: **L. Welch**
PRINT NAME: **[Signature]**

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Signed for and on behalf of the seller: **[Signature]** Date: **20-7-21**
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WASTE TRANSFER CONVEYANCE NOTE

Driver Name: TRANSEER Vehicle Reg: AS44HGV
Site Address: 94 GEORGE STREET RAINTON
Customer Name: NFC HOMES

GRAB ☐	TIPPER ☐	SKIP ☐	ARTIC ☐	Tonnes ☐	Bulk Bags ☐	Material Delivered:
DESCRIPTION OF WASTE						
INERT				17.05.04		
BALLAST				01.01.02		
CONCRETE/BRICK				17.01.01		
CONCRETE				17.01.07		
DEMO. WASTE				17.02.01		
WOOD				17.04.07		
MIXED METAL				17.09.04		
MIXED CONSTRUCTION				17.09.04		

Tipped At: Muck Away
Time on Site: 01:20 Time off Site: 03:00
SIC 38.11. By signing I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England & Wales) Regulations 2011

RECEIVED BY: [Signature] PRINT NAME: L. Well

Certified that the above particulars are true and relate to the bricks being conveyed in the vehicle described, which bricks are being conveyed in pursuance of a sale.

Signed for and on behalf of the seller: [Signature] Date: 26/7/21
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Orders Hotline: 0773 428 428

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WASTE TRANSFER CONVEYANCE NOTE

Customer Name: 94 GEORGE STREET RAINTON Vehicle Reg: AS44HGV

GRAB ☐	TIPPER ☐	SKIP ☐	ARTIC ☐	Tonnes ☐	Bulk Bags ☐	Material Delivered:
DESCRIPTION OF WASTE						
INERT				17.05.04		
BALLAST				01.01.02		
CONCRETE/BRICK				17.01.01		
CONCRETE				17.01.07		
DEMO. WASTE				17.02.01		
WOOD				17.04.07		
MIXED METAL				17.09.04		
MIXED CONSTRUCTION				17.09.04		

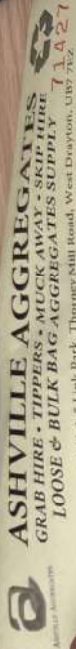
Tipped At: 08:00 AM 26.0
Time on Site: 08:00 AM Time off Site: 08:00

SIC 38.11. By signing I confirm that I have fulfilled my duty to apply the waste hierarchy as required by Regulation 12 of the Waste (England & Wales) Regulations 2011

RECEIVED BY: [Signature] PRINT NAME: [Signature]

Certified that the above particulars are true and relate to the bricks being conveyed in the vehicle described, which bricks are being conveyed in pursuance of a sale.

Signed for and on behalf of the seller: [Signature] Date: 23/07/21
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WASTE TRANSFER CONVEYANCE NOTE

Name: TANANDRAJ Vehicle Reg: AS14 HGV
Address: 94 CARBORO ST BALINT
Customer Name: REC HOMES

GRAB ☐	TIPPER ☐	SKIP ☐	ARTIC ☐	Tonnes ☐	Bulk Bags ☐	Material Delivered:
DESCRIPTION OF WASTE				Muck Away		
INERT						
BALLAST						
CONCRETE/BRICK						
CONCRETE						
DEMO WASTE				Tipped At:		
WOOD				Time on Site:		
MIXED METAL				Time off Site:		
MIXED CONSTRUCTION				SIC 38.11. By signing I confirm that I have fulfilled my duty to apply the waste transfer regulations as required by Regulation 12 of the Waste (England & Wales) Regulation 2011.		

RECEIVED BY: [Signature]
PRINT NAME:

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Signed for and on behalf of the seller: [Signature] Date: 21/07/21

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APPENDIX TWO

DEMARCATIION BARRIER

FASTRACK Orange

Standard Grade (SG) woven geotextile

Based on our popular 609 geotextile, FASTRACK Orange prevents the intermixing of contaminated and uncontaminated soils and its bright colour also alerts users and future users to the potential danger of further excavation. It is designed and manufactured to conform to the old Department of Transport & Highways specification for road and earthworks separation.

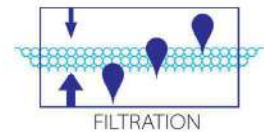
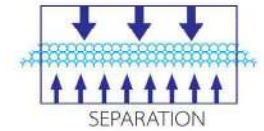
Applications for FASTRACK Orange:

- Highly visible 'Warning layer'
- Separating/Strengthening - layer under access roads and areas of hard standing
- Separation – layers under stone foundations for new buildings
- Separation – layers under new roads, car parks & industrial areas
- Separation – granular fill from sub soils and other fill types

Mechanical properties	Test	Units	FASTRACK Orange
Tensile strength - MD	EN ISO 10319	kN/m	16
Tensile strength - XD	EN ISO 10319	kN/m	11.5
Elongation at break - MD	EN ISO 10319	%	18.5
Elongation at break - XD	EN ISO 10319	%	18.5
CBR puncture resistance	EN ISO 12236	N	1500
Hydraulic properties			
Water flow normal to the plane	EN ISO 11058	l/m ² /s	17
Characteristic opening (pore) size	EN ISO 12956	µm	250
Physical properties			
Thickness under 2 kPa	EN ISO 9863-1	mm	0.4
Weight	EN ISO 9864	g/m ²	75
Roll width		cm	450
Roll length		m	100

Other grades of geotextiles within the Wrekin range include:

High Flow and High Strength woven fabrics and Thermal-bonded & Needle Punched non-wovens.



1. Wrekin Products Ltd reserves the right to alter product specifications without prior notice.
2. It is the responsibility of all users to satisfy themselves that the above data is current.
3. The above figures are average values obtained in testing to current EN geotextiles test standards. Although not guaranteed these results do, to the best of our knowledge, offer a true and accurate record of the product's performance.
4. Polypropylene is the constituent polymer used in the production of Fastrack Orange.
5. Wrekin cannot be held responsible for the performance of these products as conditions of use are beyond our control.
6. Installation details are available on request.

APPENDIX THREE

TOPSOIL IMPORTING

Freeland Horticulture Ltd
Rosedale Nursery
College Road
Hextable
Kent
BR8 7LT

Attention: Philippa Lambourne

Our Ref: 933-SA

25 May 2021

Dear Philippa

Topsoil Analysis Report : Beenham Topsoil –June 2021

We have completed the analysis of the topsoil sample recently taken from the above site and it has been forwarded to an approved laboratory for analysis and have the pleasure of reporting our findings. The purpose of the analysis was to determine the suitability of the topsoil for general landscaping purposes and its compliance with the current British Standard for topsoil (BS3632).

SOIL SAMPLING & EXAMINATION

At the time of our sampling visit the topsoil was stored in a stockpile. A series of 10 hand augered trial holes were constructed across the stockpile for the purpose of soil examination and sample collection. As the soil examination confirmed a consistent topsoil composition, the ten samples were combined together to form one composite sample for analysis purposes. The soil was described as dark brown, slightly moist and friable with a well-developed, fine to medium granular structure. The soil contained a low fraction of small stones and no deleterious materials (eg. building waste materials, glass, roots or rhizomes of pernicious weeds) or unusual odours (eg. hydrocarbons) were recorded.

LABORATORY ANALYSIS

The topsoil sample was submitted to a UKAS and MCERTS accredited laboratory for routine physical and chemical parameters to confirm the composition and fertility of the soil. The following parameters were determined:

- ⊕ pH & electrical conductivity values;
- ⊕ major plant nutrients (N, P, K, Mg) & organic matter content;
- ⊕ particle size distribution and stone content;
- ⊕ heavy metals & potentially toxic elements (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Zn, B);
- ⊕ sulphate, sulphur, sulphide;
- ⊕ total cyanide and total (mono) phenols;
- ⊕ speciated PAHs (US EPA16)
- ⊕ banded aromatic and aliphatic petroleum hydrocarbons (C₅-C₃₅).
- ⊕ Asbestos

The results are presented on the attached Certificate of Analysis and an interpretation of the results is given below.

COMMENTS

pH & Electrical Conductivity (salinity) Values

The sample was alkaline in nature (pH 7.9) with a pH value that would be considered suitable for general landscaping purposes.

The electrical conductivity (salinity) value using the soil:water extract was (2431S/cm) indicating that soluble salts are not present at levels that would be harmful to plants.

The electrical conductivity values by CaSO₄ extract (BS3882 requirement) fell below the maximum specified value (3300µS/cm) given in BS3882:2015.

Organic Matter & Nutrient Status

The sample was rich in organic matter and all major plant nutrients. No further additions of compost or fertiliser are required, or indeed recommended, for at least the first growing season.

The C:N ratio of the sample was acceptable for general landscape purposes.

Particle Size Distribution & Stone Content

The sample contained 85% sand and fell into the loamy sand texture class. This particle size distribution is considered suitable for a broad range of landscape applications, including tree and shrub planting, turfing and seeding.

The sample was Virtually free from stones of 50 mm and upwards in diameter and only contained a slight fraction of smaller stones (7.6%). As such, stones will not restrict the use of the soil for landscaping purposes.

Potential Contaminants

We are not aware of any specified contaminant levels set for the proposed end-use of this topsoil. This includes human health, environmental protection and metals considered toxic to plants. In the absence of any site-specific assessment criteria, the concentrations that affect human health have been compared with the 'residential with homegrown produce' land use in the Suitable For Use Levels presented in 'The LQM/CIEH S4Us' for Human Health Risk Assessment (2015) and DEFRA SP1010: 'Development of Category 4 Screening Levels' for 'Assessment of Land Affected by Contamination – Policy Companion Document (2014)'.
Freeland 01322619161

Of the potential contaminants determined, none was found at levels that would exceed their respective guideline values.

CONCLUSION

The purpose of the analysis was to determine the suitability of the topsoil for general landscaping purposes. From the soil examination and laboratory analysis, the soil is described as an alkaline, non-saline, loamy sand. The organic matter and nutrient levels are acceptable, and no significant contamination was found with respect to the parameters determined. This soil would adhere to the current BS3882 specification for 'multipurpose grade'.

To conclude, based on our findings, the topsoil would be considered well-suited to general landscaping purposes provided the physical condition of the soil is maintained.

We hope this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if you have any queries or comments.

George Longmuir MSc Soil Sci. M.I Soil Sci.

Client	Freeland Horticulture Ltd
Job Name	Topsoil Analysis
Site	Beenham, Berkshire
Month/Year	June 21
Our Ref	0933-SA
Date	25 May 2021

Composite sample

pH Value & Salinity

pH value (1:2.5 soil/water ext)	units	7.9
Electrical Conductivity (1:2.5 soil/water ext)	µS/cm	608
Electrical Conductivity (1:2.5 soil/CaSO ₄ ext)	µS/cm	2431
Neutralising Value (CaCO ₃ equivalent)	%	2.2

Organic Matter & Nutrient Status

Organic Matter (LOI)	%	3.2
Organic Carbon (Derived)	%	1.9
Total Nitrogen	%	0.111
Carbon:Nitrogen Ratio	:1	16.8
Available Phosphorus	mg/l	25.8
Available Potassium	mg/l	585
Available Magnesium	mg/l	83.6

Particle Size Analysis & Stones

Clay (<0.002mm)	%	7
Silt (0.063-0.002mm)	%	8
Sand (2.0-0.063mm)	%	85
Texture Class	UK Class	loamy Sand

Stones 2-20mm	% by DW	7.6
Stones 20-50mm	% by DW	0.0
Stones >50mm	% by DW	0.0

Potential Contaminants

Total Arsenic (As)	mg/kg	11.2
Total Cadmium (Cd)	mg/kg	<0.1
Total Chromium (Cr)	mg/kg	15.6
Hexavalent Chromium (Cr ^{VI})	mg/kg	<0.2
Total Copper (Cu)	mg/kg	5.6
Total Lead (Pb)	mg/kg	10.7
Total Mercury (Hg)	mg/kg	<0.2
Total Nickel (Ni)	mg/kg	<10
Total Selenium (Se)	mg/kg	0.10
Total Zinc (Zn)	mg/kg	26.8
Total Beryllium (Be)	mg/kg	<1
Total Barium (Ba)	mg/kg	19.8
Total Vanadium (V)	mg/kg	26.7
Hot Water Soluble Boron (B)	mg/kg	1.6
Total Cyanide (CN ⁻)	mg/kg	<1
Elemental Sulphur (S)	mg/kg	<5
Easily Liberated Sulphide (S ²⁻)	mg/kg	<1
Water Soluble Sulphate (SO ₄ ²⁻)	mg/l	<40
Total Phenols Index	mg/kg	<1
Asbestos Screen	-	N.D.

Client	Freeland Horticulture Ltd
Job Name	Topsoil Analysis
Site	Beenham, Berkshire
Month/Year	June 21
Our Ref	0933-SA
Date	25 May 2021

Polyaromatic Hydrocarbons

Naphthalene	mg/kg	<0.05
Acenaphthylene	mg/kg	<0.05
Acenaphthene	mg/kg	<0.05
Fluorene	mg/kg	<0.05
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.05
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo[a]anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo[b]fluoranthene	mg/kg	<0.1
Benzo[k]fluoranthene	mg/kg	<0.1
Benzo[a]pyrene	mg/kg	<0.1
Indeno[1,2,3-cd]pyrene	mg/kg	<0.1
Dibenzo[a,h]anthracene	mg/kg	<0.1
Benzo[g,h,i]perylene	mg/kg	<0.1
Total PAHs sum US EPA 16	mg/kg	<1

Banded Petroleum Hydrocarbons

Aliphatic TPH >C ₅ -C ₆	mg/kg	<0.05
Aliphatic TPH >C ₆ -C ₈	mg/kg	<0.05
Aliphatic TPH >C ₈ -C ₁₀	mg/kg	<0.05
Aliphatic TPH >C ₁₀ -C ₁₂	mg/kg	<10
Aliphatic TPH >C ₁₂ -C ₁₆	mg/kg	<10
Aliphatic TPH >C ₁₆ -C ₂₁	mg/kg	<10
Aliphatic TPH >C ₂₁ -C ₃₅	mg/kg	22.0
Aliphatic TPH >C ₃₅ -C ₄₄	mg/kg	14.0

Aromatic TPH >C ₅ -C ₇	mg/kg	<0.05
Aromatic TPH >C ₇ -C ₈	mg/kg	<0.05
Aromatic TPH >C ₈ -C ₁₀	mg/kg	<0.05
Aromatic TPH >C ₁₀ -C ₁₂	mg/kg	<10
Aromatic TPH >C ₁₂ -C ₁₆	mg/kg	<10
Aromatic TPH >C ₁₆ -C ₂₁	mg/kg	<10
Aromatic TPH >C ₂₁ -C ₃₅	mg/kg	25.0
Aromatic TPH >C ₃₅ -C ₄₄	mg/kg	17.0

Total Petroleum Hydrocarbons (C ₅ -C ₄₄)	mg/kg	78.0
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BTEX

Benzene	mg/kg	<0.02
Toluene	mg/kg	<0.2
Ethyl Benzene	mg/kg	<0.04
m- & p- Xylene	mg/kg	<0.2
o-Xylene	mg/kg	<0.1

APPENDIX FOUR

GAS MEMBRANE

CERTIFICATE OF CONFORMITY

CUSTOMER: NFC Homes Ltd
78 Pall Mall
London
SW1Y 5ES

APPLICATION: Gas Membrane Installation
Reading Borough Council, George Street, Reading

MATERIALS: Juta GP1

UK MEMBRANES LTD certifies the following:

That the above products conform to the specification and details on the purchase order and despatch documents.

UK Membranes Ltd also confirm, that the method of installation of the above materials conform to the manufacturers recommended installation procedures and with our Certification Quality Standard Procedures.


.....
PROJECT MANAGER


.....
DIRECTOR

APPENDIX FIVE

SITE PLAN

HERTS & ESSEX SITE INVESTIGATIONS

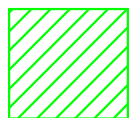
The Old Post Office, Wellpond Green
Standon, Ware, Herts. SG11 1NJ

Telephone: 01920 822233
e-mail info@hesi.co.uk

Appendix No 5
Sheet No 1
Job No 0221871
Date Aug 2021

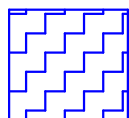
94 George Street, Reading, RG1 7NT

Validation Plan



REMEDIATION CELL 1

ASBESTOS, FUELS, PAH's, METALS.
EXCAVATE 0.60 METRES AND LAY DEMARCATION BARRIER.

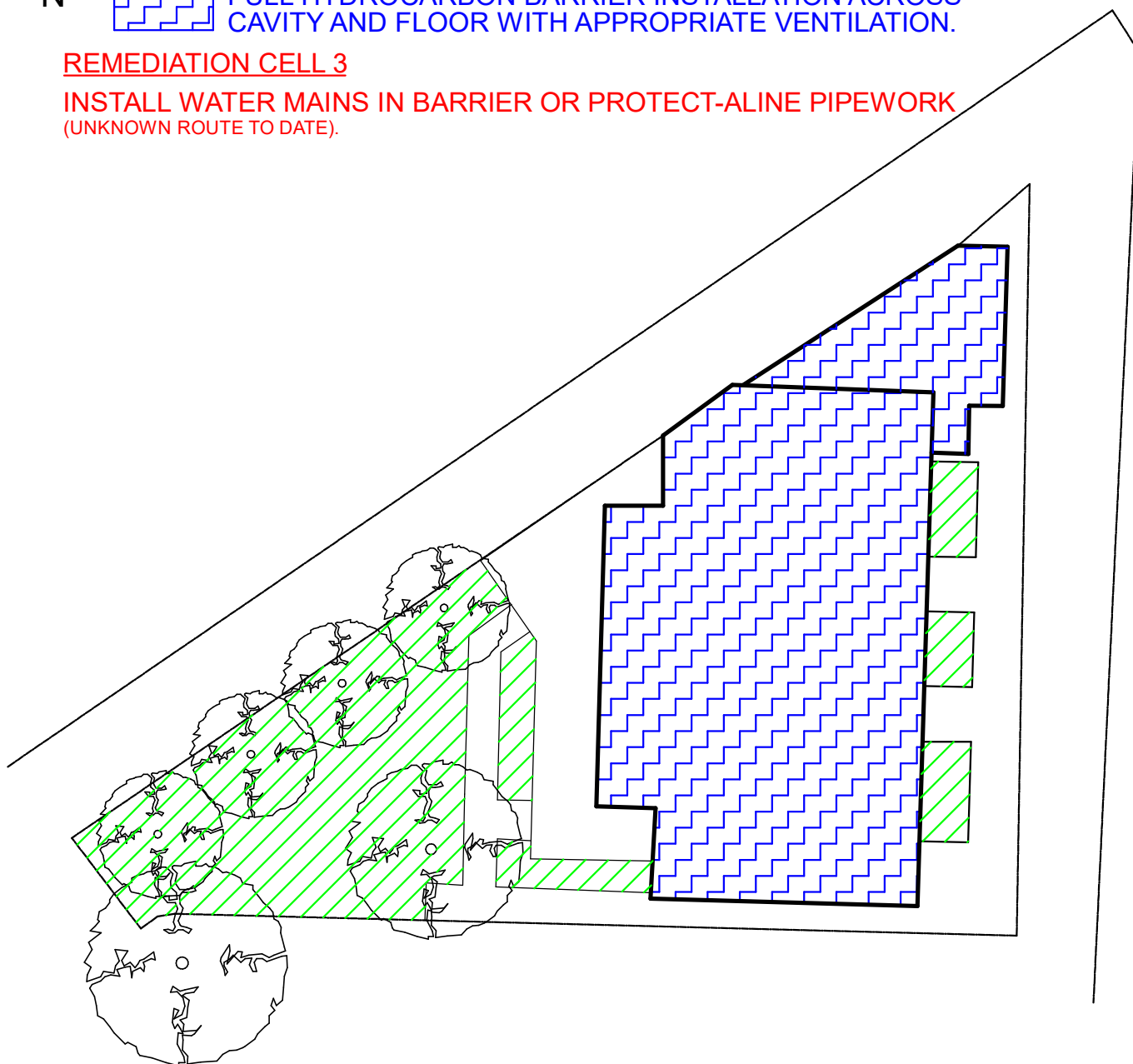


REMEDIATION CELL 2

FULL HYDROCARBON BARRIER INSTALLATION ACROSS
CAVITY AND FLOOR WITH APPROPRIATE VENTILATION.

REMEDIATION CELL 3

INSTALL WATER MAINS IN BARRIER OR PROTECT-ALINE PIPEWORK
(UNKNOWN ROUTE TO DATE).



Not to Scale
Sketch No. : VAL / 0221871/ 05 / 01