

VERIFICATION REPORT

PLOTS 129-135 & 141-144

WOODCROFT FARM, WOODCROFT LANE,

LOVEDEAN, PO8 9QA

on behalf of

VISTRY SOUTHERN

Report:	VERIFICATION REPORT
Site:	PLOTS 129-135 & 141-144, WOODCROFT FARM, WOODCROFT LANE, LOVEDEAN, PO8 9QA
Client:	VISTRY SOUTHERN
Date:	31/05/2022
Reference:	GE19455/VR/PLOTS 129-135 & 141-144/MAY22
Version:	1.0
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AMENDMENT RECORD

Revision ref.	Date	Reasons for amendment	Author's initials	Reviewed by	Authorised by
1.0	31/05/2022	First issue for compiled report for Plots 129-135 & 141-144	FG	GR	LL

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1.0 INTRODUCTION

1.1 General

The site has been subject to several phases of investigation and assessment for the site, as reported in the Phase I Ground Condition Report, ref 21834, dated MMM 2010 prepared by Peter Brett Associates (PBA), which included a desk study and preliminary risk assessment for the overall Woodcroft Farm site; a Factual Report, ref RML 4750, dated October 2011 prepared by Risk Management Limited, which included ground investigation and laboratory test results; and a Geo-environmental and Geotechnical Ground Investigation Report, ref 21834-030-R02, dated July 2013 prepared by PBA, which presented an interpretative assessment of the overall Woodcroft Farm site.

Further Phase II intrusive investigation was undertaken and reported by Geo-Environmental Services Limited and presented in the Soil Contamination Assessment ref. GE16662-FG02-170929, dated 29th September 2017. An additional phase of investigation was also commissioned in 2018 to support development of the remedial strategies and the findings were presented within the remedial strategies for the site (see below). Subsequently, a Detailed Quantitative Gas Risk Assessment (DQGRA) was commissioned from The Environmental Protection Group Ltd (EPG), ref. EPG/8938/2018/DQGRA/V1 dated October 2018, in relation to the infilled former chalk pit located to the west of the farmyard area.

Subsequently Remediation Strategies and Verification Plans (RSVP) were prepared for the three separate areas of the site deemed to require remediation, referenced GE16943/RSVP-FY-V6.0/DEC20 for the Farmyard Area, GE16943/RSVP-CP-V6.0/DEC20 for the Chalk Pit Area and GE16943/RSVP-HA-V6.0/FEB21 for the Horse Arena area.

In line with the remedial strategies for the site, Geo-Environmental Services Limited ('Geo-Environmental') was instructed by 'the Client', Vistry Southern, to prepare a Verification Report to compile the relevant information in relation to the residential development for Plots 129-135 & 141-144, Woodcroft Farm, Woodcroft Lane, Lovedean, Hampshire, PO8 9QA, herein referred to as 'the site' (see Figure 1).

Plots 132-135 and 141-144 lie within the area of the site known as the former chalk pit area (Figure 2), therefore the Remedial Strategy GE16943/RSVP-CP-V6.0/DEC20 for the former chalk pit area is the strategy relevant for the proposed remedial works for these specific plots. Plots 129-131 lie within the area of the site known as the former farmyard area (Figure 2), therefore the Remedial Strategy GE16943/RSVP-FY-V6.0/DEC20 for the former farmyard area is the strategy relevant for the proposed remedial works for these specific plots.

This report relates specifically to the installation and validation of remedial measures within Plots 129-135 & 141-144 in relation to soft landscaping validation. At the time of reporting, private gardens and areas of soft landscaping on further plots on site were not ready for final validation inspections and will be validated within a separate verification (or an updated) report in due course.

Previous phases of validation onsite have already been undertaken and reported for the site under:

- GE19455/VR/PLOTS 79-80/SEP21, which presented the validation of soil cover systems associated with Plots 79-80 only
- GE19455/VR/PLOTS 100-107 and 119-122/DEC21, which presented the validation of soil cover systems associated with Plots 100-107 and 119-122 only
- GE19455/VR/PLOTS 108-112/FEB22, which presented the validation of soil cover systems associated with Plots 108-112 only
- GE19455/VR/PLOTS 113-116 & 139-140/MAR22, which presented the validation of soil cover systems associated with Plots 113-116 and 139-140 only
- GE19455/VR/PLOTS 123-126/APR22, which presented the validation of soil cover systems associated

- with Plots 123-126 only
- GE19455/VR/PLOTS 117-118 & 136-138/APR22, which presented the validation of soil cover systems associated with Plots 117-118 & 136-138 only
- GE19455/VR/PLOTS 127-128/MAY22, which presented the validation of soil cover systems associated with Plots 127-128 only

This report details and compiles all the works independently verified by Geo-Environmental in relation to the installation of a soil cover system in Plots 129-135 & 141-144 completed in May 2022.

This report sets out the works undertaken to date to provide independent verification of the risk mitigation measures incorporated into the development to protect the development and end users thereof. This report provides final validation for works undertaken and independent inspection in relation to Plots 129-135 & 141-144 only. Outstanding validation for other plots will be reported under separate cover (or within an updated report) due course.

1.2 Objectives

A desk study and investigation undertaken by a third party and additional ground investigation undertaken by Geo-Environmental identified the presence of potential hazards and, through a risk assessment process, a series of pollutant linkages were identified which required action to mitigate or otherwise reduce the risk. The Remediation Strategy and Verification Plan (RSVP) for the former chalk pit area and former farmyard area of the site sets out the proposed remedial works to be undertaken within this area of the subject site to support its development for a proposed residential end use.

This Verification Report (VR) presents the details and findings of inspection visits undertaken throughout the construction period by Geo-Environmental and/or to compile data provided by the Client with respect to Plots 129-135 & 141-144 in relation to soils in order to demonstrate that the soil risk mitigation measures were implemented within these specific plots.

1.3 Planning Permission

It is understood that a planning application has been approved for the site by Havant Borough Council under Planning Reference APP/13/00804. The following pre-commencement planning conditions are understood at the time to writing to have been attached to the application which relate to the remediation and validation of land contamination on the site.

11. Prior to the commencement of construction within any specified phase or defined area the development approved by this Planning Permission (as may be agreed in writing by the Local Planning Authority), a scheme to deal with the risks associated with contamination of the site shall be submitted to and approved in writing by the Local Planning Authority. That scheme shall include all of the following elements unless specifically excluded in writing by the Local Planning Authority.

- 1. A scheme of further investigation, based on the previously submitted Geo-Environmental & Geotechnical report. The scope of the investigation shall be sufficient to:*
 - confirm the preliminary assessment of the nature and extent of contamination at the site,*
 - inform an appropriate assessment of the risks to all receptors that may be affected, including controlled waters, and;*
 - enable the appropriate design of remediation and/or risk mitigation measures (if required).*
- 2. The results of the further investigation and risk assessment (1) and if appropriate, a method statement based on these results giving full details of the remediation and/or risk mitigation measures required, and how they are to be undertaken.*

3. A verification report or statement (as appropriate) upon completion of the works set out in (2) [if any], confirming that measures undertaken have been implemented in accordance with the method statement, and have achieved the required performance standards. The verification report/ statement shall provide details of any measures necessary for maintenance, further monitoring and reporting.

All elements shall be adhered to unless agreed in writing by the Local Planning Authority.

Reason: To prevent future occupants of proposed residential properties being exposed to unacceptable risks from identified contamination & soil gas associated with automotive repair and landfill activity previously undertaken at the site, and to ensure that the site does not pose an unacceptable risk to the groundwater Source Protection Zone 1; having due regard to policies and proposals E1 of the Hampshire County Structure plan 1996-2011 (Review), and DM10 of the Havant Borough Adopted Core Strategy (2011), and DM17 of the Draft Local Plan (Allocations) 2012.

12. Prior to the commencement of construction of any part of the development approved by this Planning Permission, a protocol for the identification & assessment of any unforeseen ground conditions shall be submitted to and approved in writing by the Local Planning Authority. The provisions of the approved protocol shall be observed throughout the undertaking of all relevant construction activities.

Reason: For the protection of workers and the general public during the development of potentially contaminated land, and to prevent future occupants of proposed residential properties being exposed to unacceptable risks from unidentified &/or unexpected contamination that may be associated with previous activities undertaken at the site; having due regard to policies and proposals E1 of the Hampshire County Structure plan 1996-2011 (Review), and DM10 of the Havant Borough Adopted Core Strategy (2011), and DM17 of the Draft Local Plan(Allocations) 2012.

13. If, during development, contamination not previously identified at the site is found to be present, then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until the developer has submitted and obtained written approval from the Local Planning Authority for an addendum to the Method Statement required under Condition 1, (2). This addendum shall detail how this unexpected contamination shall be dealt with, and the development shall not be carried out other than in accordance with the approved details.

Reason: For the protection of workers and the general public during the development of potentially contaminated land, and to prevent future occupants of proposed residential properties being exposed to unacceptable risks from unidentified &/or unexpected contamination that may be associated with previous activities undertaken at the site; having due regard to policies and proposals E1 of the Hampshire County Structure plan 1996-2011 (Review), and DM10 of the Havant Borough Adopted Core Strategy (2011), and DM17 of the Draft Local Plan (Allocations) 2012.



2.0 BACKGROUND

This Validation Report has been produced in order to demonstrate that the works required and presented within the Remediation Strategy and Verification Plan (RSVP) for the former chalk pit area and the RSVP for the former farmyard area have been carried out. The RSVP for the former chalk pit and former farmyard areas of the site were developed following several phases of investigation works at the site, including a Phase I Ground Condition Report, ref 21834, dated 2010 prepared by Peter Brett Associates (PBA), a Factual Report, ref RML 4750, dated October 2011 prepared by Risk Management Limited, and a Geo-environmental and Geotechnical Ground Investigation Report, ref 21834-030-R02, dated July 2013 prepared by PBA.

Further investigations were undertaken by Geo-Environmental comprising a Soil Contamination Assessment ref. GE16662-FG02-170929, dated 29th September 2017. An additional phase of investigation was also commissioned in 2018 to support development of the remedial strategy and the findings were incorporated within this report. Subsequently, a Detailed Quantitative Gas Risk Assessment (DQGRA) was commissioned from The Environmental Protection Group Ltd (EPG), ref. EPG/8938/2018/DQGRA/V1 dated October 2018, in relation to the infilled former chalk pit located to the west of the farmyard area. Whilst a summary of these reports is presented below, reference should be made to the full reports for further details.

2.1 Proposed Site Use

The proposed wider development is understood to comprise the construction of 288No. residential units, associated car parking, open space and landscaping. The former chalk pit area covers c. 30-40No. plots (houses and flats) as does the former farmyard area, including associated gardens/areas of soft landscaping.

2.2 Investigation and Assessment

The wider site's previous uses included use as a farm with associated barns and buildings, scrapyard, horse arena and a former chalk pit which was subsequently infilled as an inert landfill. The portion of the site considered specifically herein comprised the former chalk pit infilled with inert landfill and the former farmyard area, as shown in Figure 2.

The ground conditions encountered within the former chalk pit area comprised a variable thickness of Topsoil overlying Made Ground, overlying gravelly clay and sandy clay on the northern boundary of this area and overlying the Chalk in the main body of the former chalk pit. On the periphery of the former chalk pit, Made Ground was not encountered and the ground conditions were found to comprise a mantle of Topsoil overlying gravelly clay and sandy clay with flint gravel.

Made Ground was encountered within the majority of investigation locations at depths between 0.50m bgl and 5.00m+ bgl, and was found to comprise, sandy clay with brick, chalk gravel, concrete, tile, decaying roots, ashy deposits, plastic, wood and charcoal; sandy gravelly clay with brick, tile, slate, wood and glass; firm clay with brick, wood, rope, flint gravel, chalk gravel, plastic chipboard and cement; clayey sandy chalk and flint gravel with tarmac, chalk fragments, brick, tile, charcoal, wood, concrete and glass.

Within the main body of the former chalk pit the Made Ground was underlain directly by the Chalk. Around the outer edges of the chalk pit the Made Ground was found to be underlain by soft to firm clay, gravelly clay and sandy clay with occasional bands of flint cobbles.

The ground conditions encountered within the farmyard comprised Made Ground and/or, in isolated locations, a mantle of Topsoil, overlying sandy clay and clay with occasional bands of sand. Chalk was encountered within two locations, TP215 and TP312. Made Ground was encountered within the majority of investigation locations to depths between 0.25m bgl and 2.20m bgl, and comprised, gravelly clay with brick, concrete, flint cobbles, tarmac and chalk fragments, ash and charcoal; clayey fine to coarse flint and chalk gravel with brick, concrete, tarmac and

pieces of tree; sandy clay with plastic, decaying roots, flint gravel and glass. Cement tile and cement sheet fragments were observed to be present sporadically across the farmyard area following demolition and clearance.

The Made Ground and/or Topsoil was underlain by soft to firm clay and sandy clay in the majority of locations with occasional bands of sand overlying the Chalk. The Chalk was only encountered within two locations, TP215 and TP312, within the farmyard area from a depth of between 1.70m bgl and 2.30m bgl.

Previous investigation and testing by third parties identified the presence of asbestos within the Made Ground in the former chalk pit area of the site. Previous investigation by Geo-Environmental identified elevated concentrations of Beryllium and the PAH compound Dibenzo(a,h)anthracene along with the presence of Asbestos, as well as identifying the need for a detailed ground gas risk assessment based on the presence of Made Ground/landfill deposits of variable composition and limited monitoring data.

The investigation and testing of soils undertaken as part of the development of the RSVP for the former chalk pit area identified contaminant concentrations of concern primarily within the Made Ground in relation to Beryllium, the PAH compound Dibenzo(a,h)anthracene and Asbestos. Therefore, it was considered that remedial action would be warranted to protect end users of a residential development from the soil based contaminants identified.

Previous investigation and testing by third parties identified exceedances of metals and PAH along with the presence of asbestos within the Made Ground in the former farmyard area of the site. The investigation and testing of soils on site undertaken as part of the development of the RSVP identified contaminant concentrations of concern within the Made Ground in relation to Arsenic, Beryllium, Lead, Nickel, PAH and Asbestos. Following further assessment and statistical analysis it was considered that remedial action would be warranted to protect end users of a residential development in this area of the site in relation to the identified PAH and Asbestos (ACMs).

Groundwater was not encountered within any of the investigation locations and was anticipated to be present at depths in excess of 25.00m bgl.

Subsequent to several phases of intrusive investigation and ground gas monitoring, and a surface emissions survey, a Detailed Quantitative Gas Risk Assessment was undertaken by EPG in relation to the infilled chalk pit. The DQGRA concluded that ground gas protection measures were not required for the proposed residential development.

2.3 Conceptual Site Model

The conceptual site model (CSM) developed as part of the various phases of intrusive investigation and risk assessment undertaken for the site identified particular hazards, or potential hazards which were considered to require intervention (remediation) to mitigate the risk of harm.

2.4 Approach for Remediation, Monitoring and Validation

Remediation works were proposed to break the pathways of identified sources of contamination to receptors. The aim of the remediation was not necessarily to remove all contamination from the site but to provide betterment and to reduce the identified risk to an acceptable level with respect to relevant receptors, e.g. human health, the built environment and controlled waters.



3.0 SOILS

3.1 End Users (Shallow Soils)

With reference to the Soil Contamination Assessment undertaken by Geo-Environmental ref. GE16662-FG02-170929, dated 29th September 2017 for the entire site and the Remediation Strategy and Verification Plans for the former chalk pit area of the site, ref GE16943/RSVP-CP-V6.0/DEC21, and the former farmyard area of the site, ref GE16943/RSVP-FY-V6.0/DEC21, through a process of statistical analyses on the results of chemical analyses on both natural and Made Ground soil samples, it was demonstrated that the Made Ground materials in the former chalk pit area were impacted by Beryllium, PAH and Asbestos and Made Ground materials in the farmyard were impacted by PAH and ACMs. Therefore, remedial measures were deemed necessary to protect end users of the proposed properties from soil contamination within private garden and soft landscaped areas within the former chalk pit and former farmyard areas of the site. ACMs and asbestos fibres have been identified (both visually and within laboratory chemical analysis) to be present within the Made Ground.

In areas remote from those designated for tree root protection it was required that a combination of a reduced dig to accommodate the soil cover system in the finished level, or complete removal of the Made Ground where Made Ground was found to be shallower, and the installation of a clean cover system within private gardens and areas of communal soft landscaping was required within the former chalk pit and former farmyard areas.

Table 3.1 below presents the minimum reduced dig depths required to accommodate the soil cover system and achieve the development levels for specific plots within the former chalk pit area.

Plot Number	Minimum Depth of Reduced Dig (m bgl)
100	0.01
101	0.10
102-103	0.23
104	1.11 or full extent of Made Ground if Made Ground shallower than reduced dig depth
105	1.04 or full extent of Made Ground if Made Ground shallower than reduced dig depth
106	1.34 or full extent of Made Ground if Made Ground shallower than reduced dig depth
107	0.85
108	0.62
109-111	0.89
112	0.59
114	0.21
115	0.17
133-135	0.41
136-138	0.44

Table 3.1 Specific plots in former chalk pit area requiring reduced dig



Table 3.2 below presents the minimum reduced dig depths required to accommodate the soil cover system and achieve the development levels for specific plots within the former farmyard area.

Plot Number	Minimum Depth of Reduced Dig (m bgl)
79 -80	0.68 or full extent of Made Ground if Made Ground shallower than reduced dig depth
Former Farmhouse (289)	0.75 or full extent of Made Ground if Made Ground shallower than reduced dig depth
116	0.48 or full extent of Made Ground if Made Ground shallower than reduced dig depth
117 - 118	0.60 or full extent of Made Ground if Made Ground shallower than reduced dig depth
119 - 122	0.44 in areas of proposed soft landscaping
123 - 124	0.52 or full extent of Made Ground if Made Ground shallower than reduced dig depth
125	0.21
126	0.17

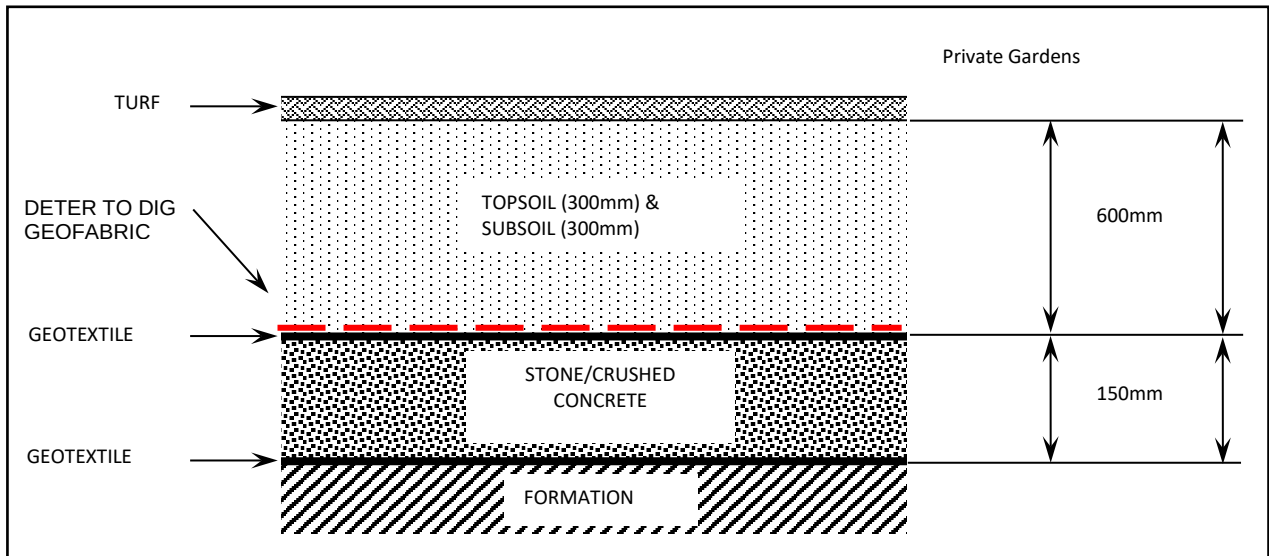
Table 3.2 Specific plots in former farmyard area requiring reduced dig

Where the full extent of the Made Ground soils was removed, validation inspections were to be undertaken at the base and sides of the excavation to demonstrate the full extent of the Made Ground had been suitably removed.

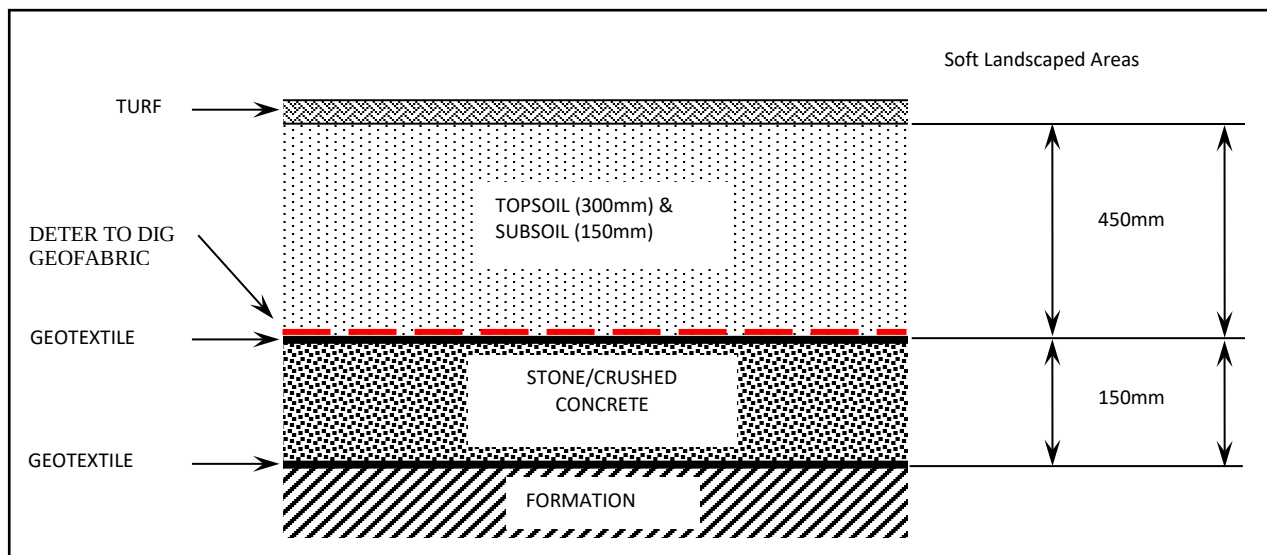
Where Made Ground soils were to remain in private garden areas and areas of soft landscaping, a soil cover system was to be installed. The cover system was required to comprise certifiably 'clean' Topsoil and subsoil. Both aspects of the cover system were required to be both chemically and physically suitable for the proposed end use. A minimum soil cover thickness of 600mm was required in proposed gardens and 450mm in areas of soft landscaping. The upper 300mm of a cover system was required to comprise Topsoil. The cover system was also required to incorporate a capillary break layer comprising 150mm depth of stone or crushed concrete, between two layers of geotextile to be installed beneath the subsoil and Topsoil. A high visibility deterrent to dig geofabric was to be laid over the upper geotextile to provide a visible deterrent to excavation.

Where the reduced dig removed all of the Made Ground, subject to verification inspection and testing, the cover system was required to comprise subsoil and a minimum 300mm thickness of Topsoil.

An example of the recommended cover system for use in private gardens where Made Ground remain in-situ is provided below:



An example of the recommended cover system for use in areas of communal soft landscaping where Made Ground was to remain in-situ is provided below:





4.0 INSPECTION/VALIDATION (SOILS)

An engineer from Geo-Environmental visited the site on several separate occasions prior to, during the remedial works being undertaken and on completion of the works reported herein to check on the progress of the development works.

4.1 Validation inspection of reduced dig and crushed concrete layer

The inspection/validation works to inspect the reduced dig works and the crushed concrete layer of the cover systems installed within the rear garden areas and soft landscaping area associated with Plots 129-130 and 141-144 was undertaken by a Geo-Environmental Engineer on 3rd May 2022. The site diary records and site photographs are presented in Appendix A.

At the time of the visit a reduced dig had been undertaken within the rear garden areas of Plots 129-130 and 141-140. It should be noted that Geo-Environmental did not independently oversee the reduced dig on site (which was undertaken by Statom Group) as part of the inspection visit, but visually inspected the areas on completion of these works. An orange geotextile had been laid above the exposed soils of the reduced dig area within Plots 141-144. Within Plot 129, at the time of the visit, a layer of crushed concrete with black geotextile and orange high visibility geotextile above with a thickness of subsoil, had been installed. The reduced dig within Plot 130 had been completed but works had not progressed further at the time of the visit, therefore the formation level was exposed. It should be noted that no soft landscaping was evident to the front of these plots, nor is it understood to be proposed. The reduced dig area was noted to extend across the entire proposed rear garden area of Plots 129-130 and 141-144.

The materials excavated from these garden areas are understood to have been disposed of off-site under the control of Statom Group. Geo-Environmental understand that the groundworkers (Statom) have copies of waste transfer notes however, Geo-Environmental has not been provided with these to date.

4.2 Validation inspection and sampling of Topsoil and subsoil (cover system) placement

The inspection/validation works of the cover systems installed within the rear garden areas was undertaken by a Geo-Environmental Engineer on 9th and 23rd May 2022. The visual inspection records including site photographs and logs are presented in Appendix B.

Inspection Visit – 9th May 2022

Inspection comprised four locations (Plot 129, Plot 130, Plot 131, and Plot 132). Vertical plastic pipe had been installed by the groundworkers prior to the installation of the Topsoil within Plots 129-132. This was to confirm the thickness of the soil cover system. However, at the time of the inspection visit groundworks were still ongoing to install patio areas and plant was being tracked across the rear garden areas of Plots 129-132. Therefore, the final volume/depth of Topsoil had not been installed within Plots 129-132. As such, it was proposed for an engineer from Geo-Environmental to attend site and re-inspect these garden areas to confirm the final depth of Topsoil once works were complete. Samples of the installed material were collected, and an inspection undertaken of the materials that had been installed. The location of all the inspection pits excavated is presented on Figure 4, photographs and site inspection records taken during this inspection visit are presented in Appendix B, which confirm the depth of the installed subsoil and Topsoil with the cover system installed to date, along with soil logs of the material encountered.

The inspection of Plots 133-135 confirmed the installed of subsoil within the rear garden areas of these Plots. The Topsoil had yet to be installed. Therefore, a sample of the installed subsoil was collected from Plot 134, and it was proposed to re-inspect these gardens once the Topsoil had been installed.

*Inspection Visit – 23rd May 2022*

Inspection comprised eleven locations (Plot 129, Plot 130, Plot 131, Plot 132, Plot 133, Plot 134, Plot 135, Plot 141, Plot 142, Plot 144 (1), and Plot 144 (2)), vertical plastic pipe had been installed by the groundworkers prior to the installation of the Topsoil. This was to confirm the thickness of the soil cover system, works to installed the soil cover system were understood to be complete. The location of all the inspection pits excavated is presented on Figure 4, photographs and site inspection records taken during this inspection visit are presented in Appendix B, which confirm the depth of the installed subsoil and Topsoil within the cover system installed, along with soil logs of the material encountered. It should be noted that at the point of inspection the turf and the soil likely associated with the turf placement had not been laid within any of the areas of soft landscaping at the time of the inspection.

The inspection confirmed that within the inspection pits, subsoil was found to be between 290mm and 460mm in thickness and Topsoil was found to be between 300mm and 340mm in thickness within all the inspected areas. It should be noted that the soil cover system comprised both subsoil and Topsoil and both the subsoil and Topsoil utilised within Plots 129-135 and 141-144 comprised site-won soils which had previously been deemed suitable for re-use, as reported in the RSVP for the chalk pit area (GE16943/RSVP-FY-V6.0/DEC21) and the RSVP for the farmyard area (GE16943/RSVP-FY-V6.0/DEC21).

4.3 Topsoil and subsoil analysis of laboratory test results

Notwithstanding the previous testing of site-won Topsoil, a total of nine samples from Plots 129-132 and 141-144 from the two inspection visits undertaken, were submitted for testing for a suite of commonly occurring brownfield contaminants and asbestos screening.

The collected samples were referenced Plot 129 at 0.10m bgl, Plot 130 at 0.50m bgl, Plot 131 at 0.15m bgl, Plot 32 at 0.10m bgl, Plot 132 at 0.50m bgl, Plot 133 at 0.10m bgl, Plot 135 at 0.15m bgl, Plot 142 at 0.15m bgl and Plot 144 at 0.20m bgl. The laboratory test results are presented within Appendix C.

The results of the analyses were compared to the Suitable for Use (S4UL) Levels for 'private gardens with home-grown produce' (representative of the proposed development end use), which are summarised in Table 4.1 below:

Determinand	Soil Screening Value (mg/kg)	Sample Max. Conc. (mg/kg)	Below Screening Value?
Arsenic	37	12.7	Yes
Benzo(a)pyrene	2.7	0.3	Yes
Beryllium	1.7	1.1	Yes
Boron (Water Soluble)	290	0.6	Yes
Cadmium	11	3.6	Yes
Chromium (Total)	130	38.1	Yes
Copper	2400	20.5	Yes
Hexavalent Chromium	6	<0.8	Yes
Lead	200	26.8	Yes
Mercury (inorganic)	40	<0.5	Yes
Nickel	180	28.5	Yes
Phenols	110	<6	Yes
Selenium	250	<1.0	Yes
Total Petroleum Hydrocarbons	110	14.7	Yes
Vanadium	410	55.8	Yes
Zinc	3700	53.1	Yes

Table 4.1 Summary of chemical analyses (Plots 129-132 & 134 Inspection Visit 09/05/2022, and Plots 133-135 & 141-144 Inspection Visit 23/05/2022)



The results indicated that all of the determinands tested were below the limiting concentrations set within the Remediation Strategy and Verification Plan (RSVP).

All samples were submitted for asbestos screening and returned with no asbestos fibres identified.

In addition, the results of the speciated hydrocarbon analyses were all returned as either below the laboratory detection limits or below their respective human health screening values for the proposed end use.

A further single validation sample was submitted for a physical and nutrient testing suite. The sample was referenced Plot 129 at 0.10m bgl. The results of the soils tested were compared to the Table 1 from BS3882:2015 entitled 'Specification for Topsoil'. The results are summarised in Table 4.2 below:

Parameters	Limits for Multipurpose Topsoil	Sample Range	Within acceptable Limits?
<u>Maximum Coarse Fragment Content (%)</u> Stones >2mm Stones > 20mm Stones >50mm	30 10 0	To Follow	Yes
<u>Mass loss on ignition %</u> Clay 5% to 20%	3 to 20	5.11	Yes
<u>Soil pH</u>	5.5 to 8.5	7.5	Yes
<u>Plant nutrient content</u> Total nitrogen % Extractable phosphate mg/l Extractable potassium mg/l Extractable magnesium mg/l	>0.15 16 to 140 121 to 1500 51 to 600	0.15 63 200 75	Yes
<u>Carbon:nitrogen ratio</u>	<20:1	19:2	Yes
<u>Electrical conductivity µS·cm</u>	<3300	1920	Yes
<u>Potentially Phytotoxic Elements</u> Zn mg/kg Cu mg/kg Ni mg/kg	<200 <135 <110	53.1 16.3 15.6	Yes
<u>Visible contaminants</u> % m/m ...of which plastics	<0.5 <0.25	<0.01 <0.01	Yes

Table 4.2 Summary of BS8332 Topsoil Analysis

The results demonstrate that the soils analysed are in accordance with BS3882:2015 Multipurpose Topsoil.

5.0 DISCOVERY STRATEGY

A discovery strategy remains in place throughout the development works on this site. Geo-Environmental has not been made aware of any discoveries having been made to date and thus the strategy, as set out in the RSVP did not require enacting (to the best of our knowledge). However, the strategy remains in place for the remainder of the development works.

6.0 VERIFICATION

In accordance with the Client's instruction, Geo-Environmental undertook routine and independent inspection during key stages of the construction process. The risk mitigation measures in relation to remedial measures for Plots 129-135 & 141-144, have been inspected and were considered to comply with the requirements of the design and Remediation Strategy and Verification Plan at the point of inspection or defects otherwise noted and subsequently rectified and plots re-inspected. Further plots and validation work for the site will be reported via an updated report or under separate cover in due course.

The inspection of the installed soil cover system was undertaken by Geo-Environmental via the inspection of pre-installed plastic pipes in number of selected locations. There was no visual evidence on the site to indicate that the areas remote from these inspection areas were likely to differ significantly from the inspected areas. However, the confirmation of the presence of a geo-textile membrane, the confirmation of depth and composition Topsoil has only been independently verified by Geo-Environmental within these inspection locations. It has been assumed that these inspection locations are representative of the reused site-won soils within the rear garden areas of Plots 129-135 & 141-144.

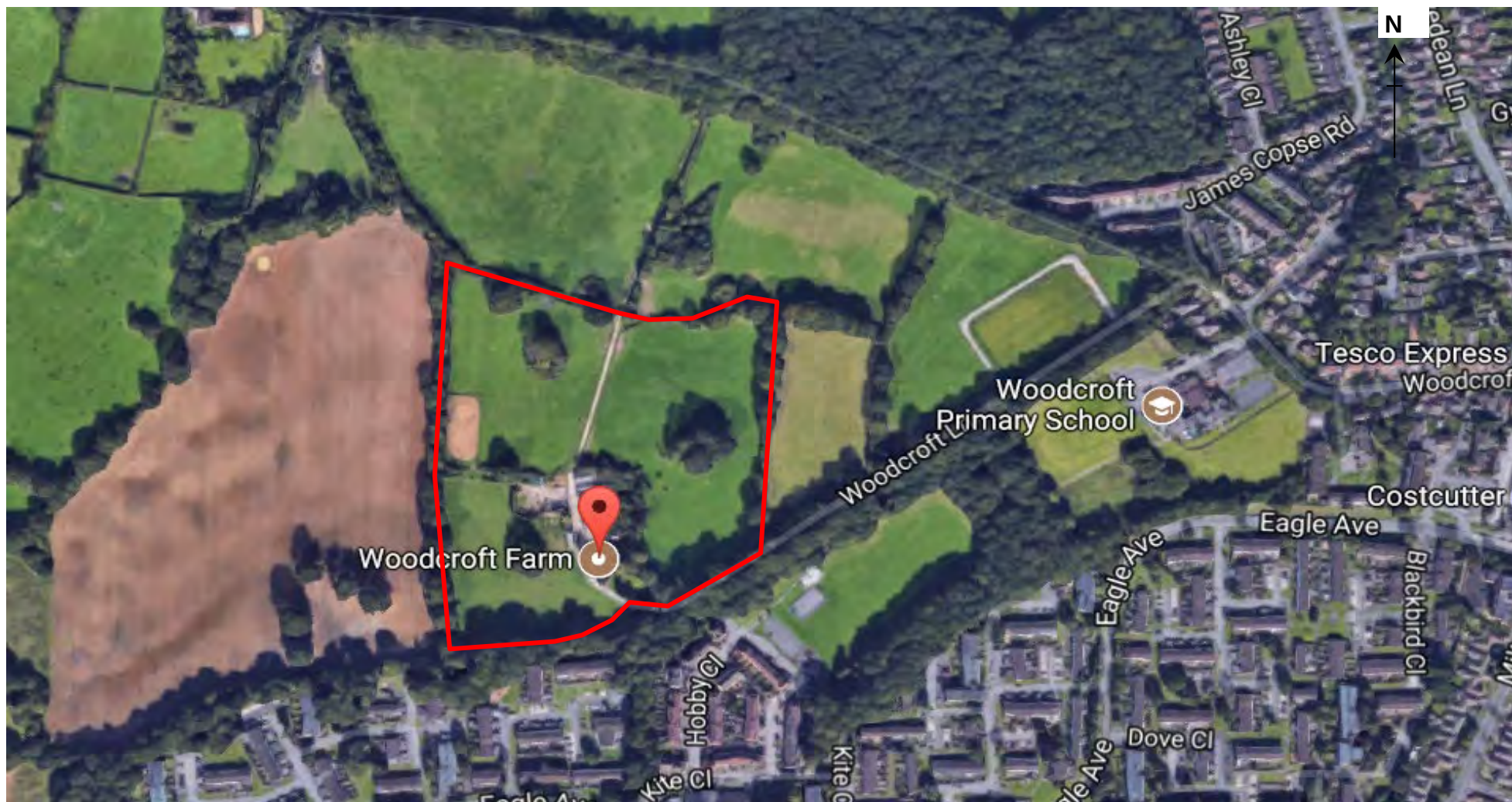
Geo-Environmental can only verify the installation of a cover system at the locations and depths inspected at the point and time of inspections. Geo-Environmental accepts no liability for areas that have not been directly inspected or works that have subsequently been undertaken on the site following our inspection visit(s) that may in any way alter or affect the validation works inspected and reported herein.

The report relates solely to the validation of the soil cover system remedial measures installed within Plots 129-135 & 141-144. Validation with respect to the soil cover systems to be installed within remaining plots will be presented under separate cover (or an updated report) in due course.

This report remains the property of Geo-Environmental and the Client has no rights to, or reliance upon this document or supporting documents until such time as payment has been received in full for all invoices for works undertaken in connection with this report.

FIGURES

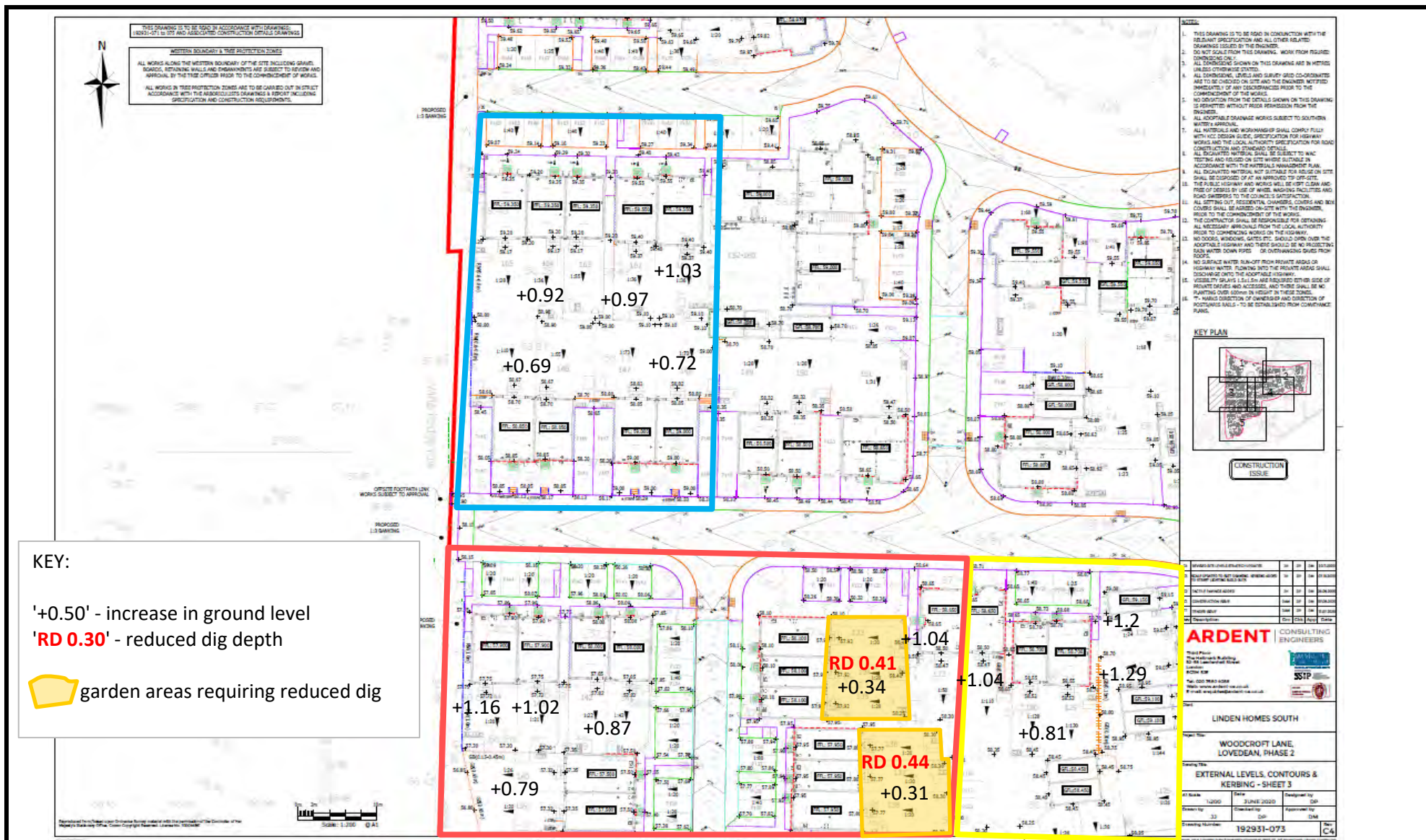




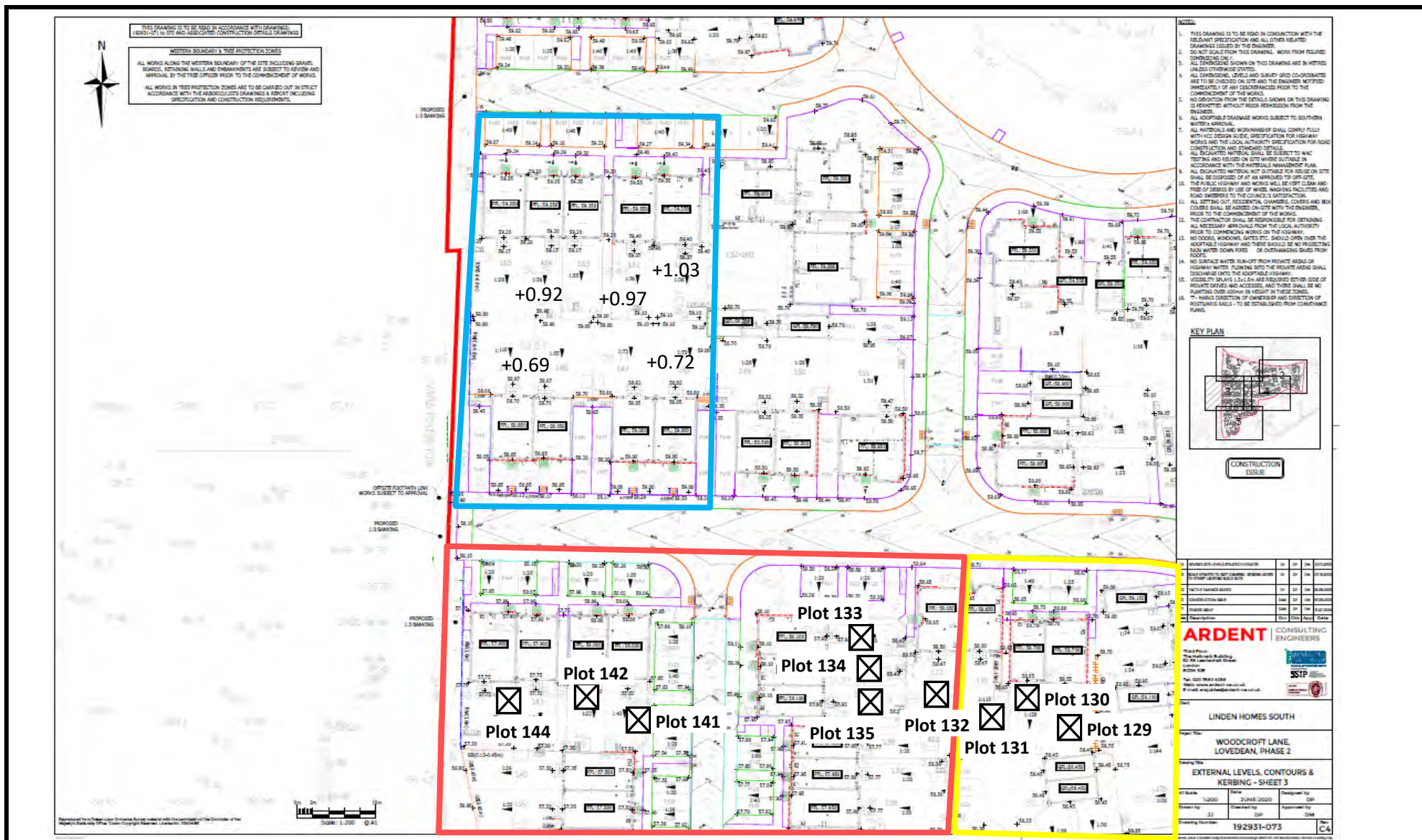
Project:	Woodcroft Farm, Lovedean, PO8 9QA			Title	Site Location Plan	
Client:	Vistry Homes Southern			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net	 Geo-Environmental	
Ref No:	GE19455	Revision:	0			
Drawn:	FG	Date:	16/06/2021			
Figure:	1	Scale:	Not To Scale			



Project:	Woodcroft Farm, Lovedean, PO8 9QA		Title	Areas Requiring Remediation	
Client:	Vistry Homes Southern		Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net		 Geo-Environmental
Ref No:	GE19455	Revision:			
Drawn:	FG	Date:			
Figure:	2	Scale:			



Project:	Woodcroft Farm Lovedean PO8 9QA			Title	Development Levels Plan - Phase 3 Horse Arena, Chalk Pit and Farmyard		
Client:	Vistry Homes Southern			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net		 Geo-Environmental	
Ref No:	GE19455	Revision:	1				
Drawn:	FG	Date:	06/05/2022				
Figure:	3	Scale:	Not To Scale				



Project:	Woodcroft Farm Lovedean PO8 9QA			Title	Validation Location Plan	
Client:	Vistry Homes Southern			Geo-Environmental Services Ltd Unit 7 Danworth Farm, Cuckfield Road Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net		
Ref No:	GE19455	Revision:	1			
Drawn:	FG	Date:	25/05/2022			
Figure:	4	Scale:	Not To Scale			



Geo-Environmental



APPENDIX A

Site Photographs and Site Diary Records



Project No.	GE19455
Project Name	Woodcroft Farm
Client	Vistry
Engineers	
 Gavin Roberts	gavin.roberts@gesl.net
 Fiona Goode	fiona.goode@gesl.net
Location	Plots 129 & 130
Date	03/05/2022

(2 records)

Site Diary	Date & Time	Location	Remarks	Weather	Photograph(s)
	03/05/2022, 14:08	50° 54' 12.92" N 1° 1' 58.847" W	Crushed and membranes laid and subsoil placed on Plot 129	Warm and dry	
	03/05/2022, 14:11	50° 54' 12.887" N 1° 1' 59.286" W	Excavation yo formation in progress Plot 130	Warm and dry	

Time (0 records)

Project No.	GE19455
Project Name	Woodcroft Farm
Client	Vistry
Engineers	
 Gavin Roberts	gavin.roberts@gesl.net
 Fiona Goode	fiona.goode@gesl.net
Location	Plots 141 to 144
Date	03/05/2022

(1 record)

Site Diary	Date & Time	Location	Remarks	Weather	Photograph(s)
	03/05/2022, 14:15	50° 54' 12.824" N 1° 2' 2.086" W	Formation excavation completed and basal membrane laid. Note orange membrane used as black not available.	Warm and dry	

Time	(0 records)
------	-------------



Plate 1 – View of membranes beneath subsoil installed within Plot 129



Plate 2 – View of subsoil installed within Plot 129-130



Plate 3 – Reduced dig undertaken in Plots 131-132



Plate 4 – View of membrane installed above crushed concrete layer across Plots 141-144

APPENDIX B

Visual Inspection Records



ID	GE19455
Project Name	Woodcroft
Client	Vistry
Engineers	
 Fiona Goode	fiona.goode@gesl.net
Project Manager	
 Fiona Goode	fiona.goode@gesl.net
Location	Lovedean
Date	09/05/2022

Details of Hole

5 records

Hole ID	Plot 129
Plot No./Position	Plot 129
Date of Hole	09/05/2022, 16:24
Hole Type	HP
Final Depth	0.6

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
0.3	0.6	Brown slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of flint Taram beneath

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.1		ES	1

Pass/Fail (X) Pass
() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 129

Hole ID	Plot 130
Plot No./Position	Plot 130
Date of Hole	09/05/2022, 16:30
Hole Type	HP
Final Depth	0.76

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
		Brown slightly gravelly CLAY. Gravel is fine to medium sub angular to

0.3	0.76	sub rounded of flint Taram beneath
-----	------	---------------------------------------

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.5		ES	1

Pass/Fail

☒ Pass
☐ Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 130

Hole ID	Plot 131
Plot No./Position	Plot 131
Date of Hole	09/05/2022, 16:35
Hole Type	HP
Final Depth	0.6

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown slightly gravelly CLAY with frequent roots and rootlets
		Brown gravelly CLAY. Gravel is fine to medium sub angular to sub

0.3	0.6	rounded of flint Taram beneath
-----	-----	-----------------------------------

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.15		ES	1

Pass/Fail (X) Pass
() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description		Plot 131
Hole ID	Plot 132	
Plot No./Position	Plot 132	
Date of Hole	09/05/2022, 16:40	
Hole Type	HP	
Final Depth	0.6	
Ground Conditions		
2 records		
Top Depth	Base Depth	General description of stratum
0	0.3	Brown slightly gravelly CLAY with occasional roots and rootlets
		Brown slightly gravelly CLAY. Gravel is fine to medium sub angular to

0.3	0.6	sub rounded of flint Taram beneath
-----	-----	---------------------------------------

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.1		ES	1

Pass/Fail

(X) Pass

() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 132

Hole ID Plot 134

Plot No./Position Plot 134

Date of Hole 09/05/2022, 16:46

Hole Type HP

Final Depth 0.1

Ground Conditions

1 record

Top Depth	Base Depth	General description of stratum
0	0.1	Firm to stiff orange and brown mottled slightly gravelly CLAY. Gravel is fine to medium sub angular to sub rounded of flint

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.5		ES	1

Pass/Fail

(X) Pass

() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Approved By

 Fiona Goode

fiona.goode@gesl.net

ID	GE19455
Project Name	Woodcroft
Client	Vistry
Engineers	
 Fiona Goode	fiona.goode@gesl.net
Project Manager	
 Fiona Goode	fiona.goode@gesl.net
Location	Lovedean
Date	23/05/2022

Details of Hole

11 records

Hole ID	Plot 129
Plot No./Position	Plot 129
Date of Hole	23/05/2022, 09:46
Hole Type	HP
Final Depth	0.6

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with frequent roots and rootlets
0.3	0.6	Firm orange brown gravelly CLAY Taram beneath

Pass/Fail (X) Pass
() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 129

Hole ID	Plot 130
Plot No./Position	Plot 130
Date of Hole	23/05/2022, 09:50
Hole Type	HP
Final Depth	0.76

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
		Firm orange brown gravelly CLAY

0.3	0.76	Taram beneath
Pass/Fail		(X) Pass () Fail
Remarks		
Photo of Spoil		
		
Photo of hole with tape in place		



Photographs

1 record

Photograph



Description

Plot 130

Hole ID	Plot 131
Plot No./Position	Plot 131
Date of Hole	23/05/2022, 09:53
Hole Type	HP
Final Depth	0.65

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
		Firm orange brown gravelly CLAY

0.3	0.65	Taram beneath
Pass/Fail		(X) Pass () Fail
Remarks		
Photo of Spoil		
		
Photo of hole with tape in place		



Photographs

1 record

Photograph



Description

Plot 131

Hole ID	Plot 132
Plot No./Position	Plot 132
Date of Hole	23/05/2022, 09:56
Hole Type	HP
Final Depth	0.75

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
		Firm orange brown gravelly CLAY

0.3	0.75	Taram beneath
Pass/Fail		(X) Pass () Fail
Remarks		
Photo of Spoil		
		
Photo of hole with tape in place		



Photographs

1 record

Photograph



Description

Plot 132

Hole ID	Plot 135
Plot No./Position	Plot 135
Date of Hole	23/05/2022, 09:59
Hole Type	HP
Final Depth	0.64

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
		Firm orange brown gravelly CLAY

0.3	0.64	Taram beneath
-----	------	---------------

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.15		ES	1

Pass/Fail (X) Pass
() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 135

Hole ID	Plot 134
Plot No./Position	Plot 134
Date of Hole	23/05/2022, 10:06
Hole Type	HP
Final Depth	0.34

Ground Conditions

1 record

Top Depth	Base Depth	General description of stratum
0	0.34	Brown gravelly CLAY with occasional roots and rootlets

(X) Pass

Pass/Fail

() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 134

Hole ID Plot 133

Plot No./Position Plot 133

Date of Hole 23/05/2022, 10:09

Hole Type HP

Final Depth 0.6

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
0.3	0.6	Firm orange brown gravelly CLAY

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.1		ES	1

Pass/Fail

(X) Pass

() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plot 133

Hole ID Plot 144 (1)

Plot No./Position Plot 144

Date of Hole 23/05/2022, 10:20

Hole Type HP

Final Depth 0.59

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
0.3	0.59	Firm orange brown gravelly CLAY

Samples

1 record

Top Depth	Base Depth	Sample type	Sample reference
0.2		ES	1

Pass/Fail

(X) Pass
() Fail

Remarks

Photo of Spoil



Photo of hole with tape in place



Photographs

1 record

Photograph



Description

Plots 143-144

Hole ID Plot 144 (2)

Plot No./Position Plot 145

Date of Hole 23/05/2022, 10:23

Hole Type HP

Final Depth 0.61

Ground Conditions

2 records

Top Depth	Base Depth	General description of stratum
0	0.3	Brown gravelly CLAY with occasional roots and rootlets
0.3	0.61	Firm orange brown gravelly CLAY

Pass/Fail (X) Pass
() Fail

Remarks

Photo of Spoil