
Remediation Method Statement

At: Woodcote Grove,
Ashley Road, Epsom,
Surrey, KT18 5BW

For: Canbury Construction
Ltd

Report Reference: LP2353/RMS

Report Date: 14 December 2020



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FOREWORD

This report has been prepared by Leap Environmental Ltd on the basis of information received from a variety of sources which Leap Environmental Ltd believes to be accurate. Nevertheless, Leap Environmental Ltd cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

Leap Environmental Ltd has used all reasonable skill, care and diligence in the design and execution of this report, taking into account the manpower and resources devoted to it in agreement with the Client. Although every reasonable effort has been made to obtain all relevant information, all potential contamination, environmental constraints or liabilities associated with the site may not necessarily have been revealed.

The conclusions reached in this report are necessarily restricted to those which can be determined from the information consulted and may be subject to amendment in the light of additional information becoming available. These conclusions may not be appropriate for alternative schemes.

This report is confidential to the Client and Leap Environmental Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Leap Environmental Ltd beforehand. Any such party relies upon the report at their own risk.

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Date:	14 December 2020
Revision:	Issue 1

EXECUTIVE SUMMARY

Leap Environmental Ltd (hereafter referred to as **LEAP**) was appointed by Canbury Construction Ltd to produce a Remediation Method Statement (RMS) for a site referred to as Woodcote Grove, Ashley Road, Epsom, Surrey, KT18 5BW.

At the time of the previous investigation, the c. 1.13ha, irregular 'L' shaped site comprised the location of engineering and management consultant Atkins' former office, conference and reprographics facilities. The wider area is largely residential.

It is proposed to redevelop the site with 98 residential dwellings. Fourteen units will be low density with private gardens.

The geology at the site is mapped as comprising Lambeth Group in the west, Thanet Formation in the central region and Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation in the east. No superficial deposits are mapped. The site is located across the boundary an inner and outer groundwater source protection zone.

The Manor House has been present since at least 1840. Historically, there were some buildings of undisclosed nature in the northwest. These were demolished to make way for the commercial buildings constructed along with the office building in the south in the late 1960's / early 1970s. No significant changes were evident thereafter.

The site has been subjected to a single phase of intrusive site investigation in 2020 by **LEAP**.

Based on the results of the intrusive investigation, it was concluded that localised made ground soils present in the north western region of the site were contaminated with lead and benzo-a-pyrene. No risks to controlled waters or risks from land gases have been concluded.

Remediation measures will comprise the application of 600mm and 150mm of imported clean cover soils in private gardens and north western areas of soft landscaping respectively.

Measures are set out for the reporting and assessment of unexpected contamination. Requirements are set out for imported material, waste disposal and reporting.

A INTRODUCTION AND BACKGROUND

I Introduction

Leap Environmental Ltd (hereafter referred to as **LEAP**) was appointed by Canbury Construction Ltd to produce a Remediation Method Statement (RMS) for a site referred to as Woodcote Grove, Ashley Road, Epsom, Surrey, KT18 5BW.

The following reports refer to the site and should be read in conjunction with this Remediation Method Statement:

- Phase I Environmental Site Assessment (for Stonegate Homes Ltd). WDE Consulting Ltd. Document Ref: 20907R1, dated July 2019;
- Phase II Site Investigation Report. **LEAP** Environmental Ltd. Report Ref: LP2353/Phase 2 dated, 7th December 2020.

2 Objective

The objective of this document is to provide a scheme of remediation to ensure that no unacceptable risks exist to future site users and other identified receptors. This scheme should be submitted for approval to Epsom and Ewell Borough Council in accordance with the relevant planning condition.

3 The Site

3.1 Site Location and Description

The c. 1.13ha, irregular 'L' shaped site is located off Ashley Road in Epsom, Surrey, KT18 5BW. The site is located within a primarily residential area as shown in Figure 1, Appendix A.

The approximate National Grid Reference of the site is TQ 20851 59762. The site lies at an estimated elevation of 59-62m Above Ordnance Datum (mAOD).

The site comprised the location of Atkins' former office facilities. The large office building in the south of the site has recently been demolished. This will be the site of the new apartment block with basement (Building F housing 65 apartments). The remaining (now vacant) buildings comprised (from north to south along the western site boundary):

- An irregular shaped building with courtyard formally used as a reprographics centre. This building will be demolished and replaced with an apartment building (Building A) comprising 8 apartments;

- The former Manor House stables (nature of recent usage unknown) which will be retained and converted into 4 apartments (Building B) as the building is Grade II listed;
- A conference and café facility which is to be demolished with 14 low density houses with gardens to be constructed in its place (Buildings C and D); and
- The Victorian Manor House (formally used as offices) to be converted into 7 apartments (Building E) as the building is Grade II listed.

To the north of the site is the new (replacement) Atkins office building and associated parking facilities (with a junior school to the further northeast), to the east / southeast is woodland with open fields beyond. To the south and west are residential properties.

3.2 Proposed Development

It is proposed to redevelop the site with 98 residential dwellings as described in the previous section and shown as Figure 2, Appendix A.

3.3 Site History

The Manor House has been present since at least 1840. Historically, there were some buildings of undisclosed nature in the northwest. These were demolished to make way for the commercial buildings constructed along with the office building in the south in the late 1960's / early 1970s. No significant changes were evident thereafter.

3.4 Geology, hydrogeology and hydrology

The geology at the site is mapped as comprising Lambeth Group (clay, silt and sand) in the west, Thanet Formation (sand) in the central region and Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation in the east. No superficial deposits are mapped. The Lambeth Group and Thanet Formation are classified as Secondary (A) Aquifers whilst the Chalk is classified as a Principal Aquifer. The site is located within an Inner Source Protection Zone I (the Chalk in the east) and an Outer SPZ II (Lambeth Group and Thanet Formation areas). The nearest drinking water abstraction is c. 1,350m to the north. There are no surface water features within 250m. The site is reportedly at low risk of flooding.

3.5 Soil profile as encountered during site investigation

Table 1: Summary of soils encountered

Depth From (m)	Depth To (m)	Soil Type	Description
GL	0.05 / 0.2	HARDCOVER	Concrete, asphalt or bonded resin (western site region only)
GL	0.1 / 0.3	TOPSOIL	Dark brown silty sand TOPSOIL (WS6, TPI, IA and 2 in western site region only)
GL / 0.3	0.4 / 2.9	MADE GROUND	MADE GROUND composed of silty, clayey and/or gravelly sand with brick, asphalt, concrete and other anthropogenic inclusions
0.4 / 1.65	0.9 / 2.6	SANDY, SILTY CLAY	Generally, quite narrow band of stiff sandy and / or silty CLAY encountered locally between the MG and silty sand LAMBETH GROUP
0.2 / 1.7	1.5 / 3.8	SILTY SAND	Medium density silty fine to medium SAND with highly variable gravel content LAMBETH GROUP
3.4 / 3.7	3.9 / > 4.0	SANDY, SILTY CLAY	Generally, quite narrow band of stiff sandy and / or silty CLAY encountered locally between the silty sand and the underlying Fine Sand (Thanet Formation) LAMBETH GROUP
1.5 / 3.9	3.9 / 5.0	FINE SAND	Medium dense to dense grey and locally orangish fine SAND. THANET FORMATION
5.0	> 23.0	CHALK	Off white CHALK with occasional narrow flint bands.

3.6 Groundwater

Groundwater was struck at 12.90m (seepage) and again at 20.60m (slow inflow) during the drilling of the cable percussion boring. During return monitoring, groundwater was measured at a depth of 16.01m on 26th October 2020 and 15.72m on 3rd November 2020.

3.7 Contamination

3.7.1 Visual and Olfactory Evidence

Limited evidence of contamination was recorded during the site investigation as per the following Table:

Table 2: Summary of Visual and Olfactory Evidence of Contamination

Hole ID	Depth (m)	Olfactory Evidence	Visual Evidence
WS1	2.55-2.75	None	Patchy black inclusions
WS2	0.20-0.80	None	Clinker
WS5	0.25-0.50	None	Patchy black inclusions
WS8	0.20-0.80	None	Clinker and charcoal
WS9	0.00-0.60	Organic odour	None
WS10	1.60-1.80	Slight organic odour	Black staining
WS12	0.00-0.75	None	Clinker
WS13	0.00-1.65	None	Clinker
BH1	0.00-0.60	Organic odour	None

3.7.2 Metals

During the recent site investigation, 18 samples of made ground, 2 samples of topsoil and 1 sample of naturally occurring soil were tested for heavy metals.

The test results for each population were screened against two sets of Generic Assessment Criteria (GACs); residential with home-grown produce (houses with private gardens) and public open space; residential (high density units).

When considering the public open space (residential) assessment criteria which is applicable to high density residential accommodation which comprises all proposed units except Buildings C and D (Plots 13-26), just two exceedances for lead were recorded in made ground. These comprised the area surrounding the former conference centre and café in the west of the site. No exceedances for heavy metals were recorded in the topsoil samples or the natural soil sample.

When considering the more stringent residential with home-grown produce criteria which is applicable to low density residential units with private gardens i.e. Plots 13-26, there were nine exceedances for lead and one exceedance for arsenic in made ground. There were also two exceedances (one marginal) for lead in topsoil (no exceedances were recorded in the sample of natural soil). However, only samples collected from WS4-7 (refer to Figure 3, Appendix A) were located in the region of the site where the low density units are proposed. Samples from all four of these locations exceeded the assessment criteria for lead. The remaining five lead exceedances and one arsenic exceedance can therefore be discounted as

these regions of the site are scheduled for high density units and the heavy metal concentrations do not exceed the Public Open Space (Residential) criteria.

3.7.3 Polycyclic Aromatic Hydrocarbons (PAH)

The same number of samples were tested for PAHs as heavy metals.

When considering the public open space (residential) assessment criteria, three exceedances for Benzo-a-pyrene were recorded in made ground. These comprised the area surrounding the former conference centre and café and stable block in the west of the site. No exceedances for PAHs were recorded in the topsoil samples or the natural soil sample.

When considering the more stringent residential with home-grown produce criteria, there were seven exceedances for Benzo-a-pyrene in made ground. No exceedances were recorded in the topsoil samples or in the sample of natural soil. However, only samples collected from WS4-7 were located in the region of the site where the low density units are proposed (see Figure 3). Samples from three of the four locations exceeded the assessment criteria for Benzo-a-pyrene. Two of the remaining three Benzo-a-pyrene exceedances can be discounted as these regions of the site are scheduled for high density units and the PAH concentrations do not exceed the Public Open Space (Residential) criteria. The WS2 sample cannot be discounted as it exceeded both assessment criteria.

3.7.4 Petroleum Hydrocarbons

No exceedances of either assessment criteria were recorded in any sample. The highest result was from WS4 at 0.15-0.4m which returned a total petroleum hydrocarbon result of 793 mg/kg. This sample also recorded the highest total PAH result (1,580 mg/kg). There was no evidence however, that this contamination persisted beyond the extent of the made ground. The carbon banding within the TPHCWG results indicated no 'light end' / volatile hydrocarbons to be present and hence no evidence of any potential vapour inhalation risk in buildings.

3.7.5 Asbestos

All of the soil samples tested were screened for the presence of asbestos containing materials and/or loose asbestos fibres. No positive detections were returned.

3.7.6 Invasive Plant Species

No invasive plants species were observed during the intrusive site investigation.

3.7.7 Land Gas

The CSM identified no potential offsite sources of land gases. Hence, the pragmatic approach to ground gas assessment¹ was utilised to make an assessment of the risk posed by land gases originating in made ground. As the average thickness in the western region of the site was

¹ Card G., Wilson S, Mortimer S. 2012. A pragmatic approach to ground gas risk assessment. CL:AiRE Research Bulletin RB17.

under 1.0m and the development in the southern region of the site encompasses a basement (where made ground will be excavated and ventilation measures will be installed), no unacceptable risks from land gases were concluded and no bespoke gas protection measures were considered to be required.

3.7.8 Controlled Waters

Due to the considerable depth to groundwater and limited potential sources of contamination identified in the CSM which could present a significant risk to controlled waters, a single sample of groundwater was taken and screened against the UK Drinking Water Standards. Very minor exceedances were recorded for TPH, benzo-a-pyrene and Total PAH. This was not considered to be indicative of a source or unacceptable risk and hence, no further assessment or remediation with respect to controlled waters was deemed necessary.

B REMEDIATION STRATEGY

The contamination recorded is considered to pose a potentially unacceptable risk in areas of the site which are proposed to become soft standing i.e. private gardens and north western areas of soft landscaping. In these areas, contamination may impact human health through the direct ingestion, inhalation, skin contact and/or plant uptake pathways that would be present in a residential setting. The contamination may pose a risk to incoming water via permeation into supply lines should the supply pipes be run through impacted made ground (i.e. should the made ground not be removed as part of the redevelopment). Should this be the case then the water supplier should be contacted for further guidance with respect to installing Protecta-Line™ pipework.

In areas below buildings the recorded contamination is not considered to pose a risk as direct contact pathways will be severed by the presence of hardstanding and the recorded contaminants are not volatile and hence the indoor vapour inhalation pathway is not active.

4 Remediation of On-site Contamination

The following summarises the remedial activities that are proposed for the site.

- Application of 600mm clean cover soils in private gardens;
- Application of 150mm clean cover soils in areas of soft landscaping in the northwest of the site;
- Verification of the clean cover systems.

4.1 Clean cover systems in private gardens and soft landscaping

Made ground soils should be excavated to 600mm below final levels in areas of private gardens. Soils should be excavated to 150mm below final levels in the areas of soft landscaping located between Buildings A and B and around Building B (the former stable block). Soils should undergo any additional laboratory geochemical (such as waste acceptance criteria - WAC) testing in order to allow them to be classified and disposed of in accordance with the Duty of Care. Where possible, varying materials should be segregated to reduce disposal costs.

In areas of soft landscaping in the north west of the site the provision of 150mm of certified clean imported topsoil will be required. In private gardens a minimum of 300mm of certified clean topsoil will be required with the remaining 300mm made up of subsoil (600mm total).

NOTES:

Should made ground be less than 600mm thick in any area scheduled to become private gardens then (as an alternative to 600mm of imported clean cover), the made ground could be removed, the formation levels tested by the consultant and, when advised to be free from

unacceptable levels of contamination, an equivalent depth of imported clean cover topsoil (matching that removed but minimum 300mm thickness) would be acceptable.

In areas of soft landscaping (communal open spaces), clean cover may require localised deepening to accommodate trees pits / larger shrubs in accordance with the requirements of the landscaper.

The testing of topsoil undertaken to date has indicated that topsoil present on site (which is located primarily around the former Manor House) is not suitable for re-use in private gardens. It is however suitable for re-use in areas of soft landscaping and hence, may remain in-situ around the Manor House and/or be re-used in other areas of soft landscaping as/where required.

4.2 Discovery strategy

As with any redevelopment site there is the risk of hitherto undetected contamination. The groundworkers should be briefed regarding the potential presence of additional, undiscovered contamination and the need to contact their supervisor in the event of discovering odorous, coloured or stained soils or evidence of asbestos. This is especially applicable during the formation of excavations for new foundations and for groundworks within the footprints of buildings which, at the time of writing, were due to be demolished and could not be accessed during the time of the intrusive site investigation.

Should any visual or olfactory evidence of previously undetected contamination be discovered then the works will cease and the groundworkers supervisor will contact the environmental consultant (EC) for guidance. Any further remedial works will take place with the prior agreement of the Local Planning Authority.

5 Provision of Imported Soil

Clean topsoil is required in areas of soft standing to meet the requirements of this RMS, the NHBC and the landscaper. There is no topsoil suitable for re-use in private gardens present at the site and hence, this material will need to be imported potentially along with subsoil to underlie the topsoil in private gardens.

5.1 Specification of imported Soils

In general terms all imported soils should be approved by the EC **prior to importation**. The proposed sources should be assessed on the basis of either a detailed site investigation or laboratory test results in the case of a manufactured topsoil or as dug natural soils. In the absence of these data then the EC will then advise what further testing, if any, is required **prior to importation**.

Further verification testing will then be required as soil is imported to site.

All imported soils will be subject to the test parameters attached in Appendix B and will require that a materials management plan is in place (refer to Section 7.1) unless a manufactured product is purchased in the case of topsoil or an 'as dug' product is purchased in the case of subsoil.

6 Waste Disposal

It is the duty of the waste producer, in this case Canbury Construction Ltd, to ensure that all waste is disposed of appropriately and that any that is sent to landfill is sent to an appropriately licensed one. All waste sent to landfill must be classified and must be pre-treated. The form of pre-treatment should be documented. There are various forms of pre-treatment that are acceptable.

Waste soils awaiting testing, classification and disposal will be placed on plastic sheeting, segregated by fencing and labelled appropriately. Any potentially hazardous or inert soils will require waste acceptance criteria (WAC) testing. Some WAC test data and commentary on likely waste classifications is available in the 2020 site investigation report.

Based on the laboratory test results to date, the naturally-occurring soils should be suitable for disposal as inert waste. The majority of made ground at the site will require disposal as non-hazardous waste with the exception of the material represented by the sample taken from WS4 (on the southern corner of Building B – the former stables) which maybe hazardous on account of the total PAH content.

C VERIFICATION WORKS

7 Site Works

During the remediation, the EC will observe and verify the following:

- Verification of the chemical nature and suitability of proposed clean cover soils; and
- Laying of topsoil and subsoil and confirmation of clean cover thickness.

The EC will also be available to visit site and provide guidance should any previously undiscovered contamination be encountered. The EC will also be available to attend site to test formation level soils in the event that made ground is less than 600mm thick in any areas of proposed private gardens.

7.1 Verification testing of imported soils

As stated in the remediation strategy above, the EC will approve imported soil sources prior to use based on site investigation and/or test results.

Once a source has been approved for importation the EC will complete onsite inspection and verification testing. Imported topsoil will be tested at a frequency of a **minimum of one sample per 150m³ of imported soil with a minimum of three samples per source of material.**

All imported soils will be required to meet the specification as given in Appendix B irrespective of the depth at which they are to be placed.

NOTE: The re-use of any imported topsoil 'site-won' from another site will require a Materials Management Plan (MMP) with a declaration signed by a Qualified Person (QP) in accordance with the CL:AIRE Definition of Waste Code of Practice (DoW CoP). Manufactured topsoil with appropriate end of waste certification is exempt from the CoP.

7.2 Depth of clean cover

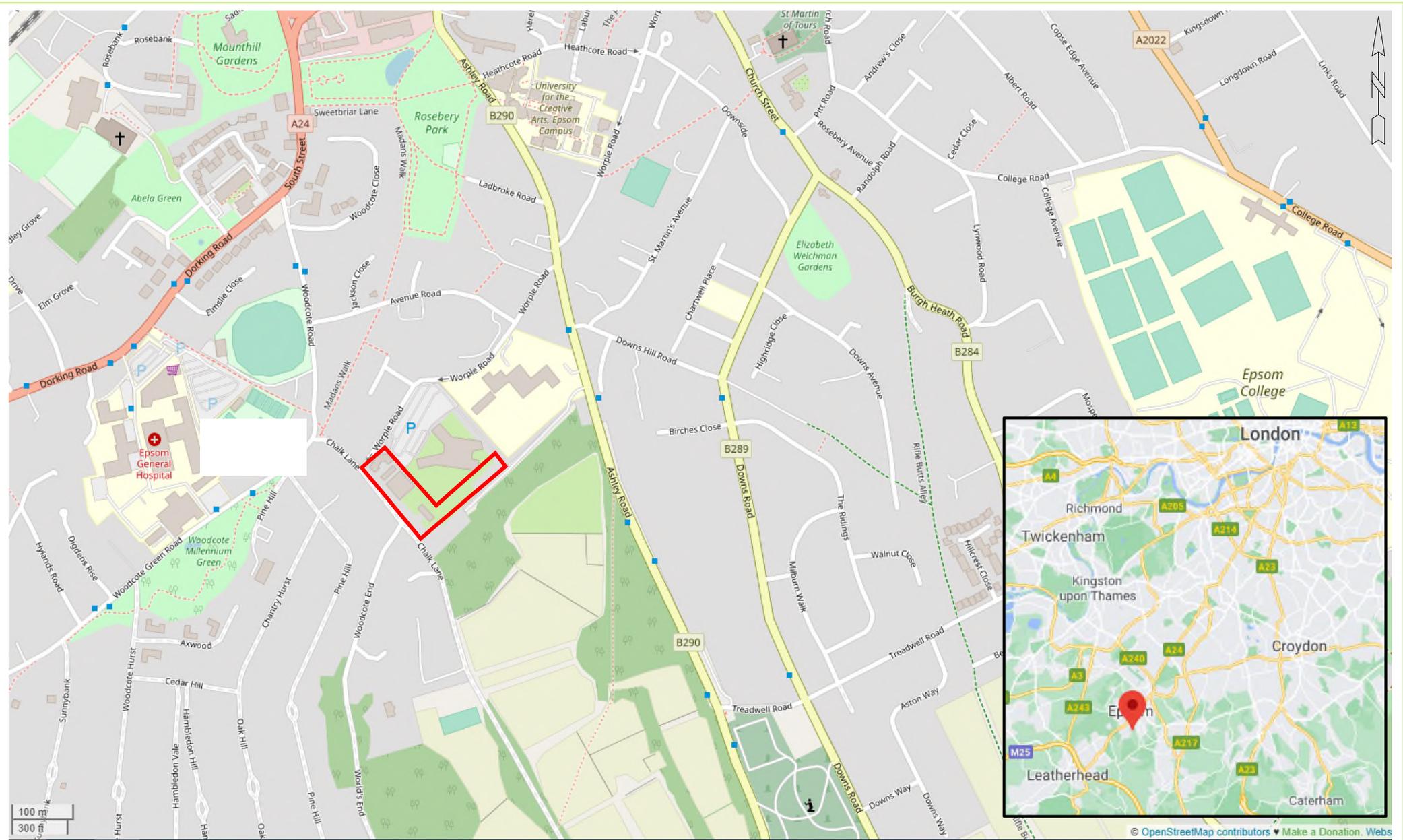
The depth of the placed topsoil layer in private gardens and the soft landscaped areas in the northwest of the site will be verified by the EC by excavation of hand dug holes through completed areas. This depth will be specified to meet the requirements of this RMS as well as the NHBC and the landscaper. These verification holes will be randomly positioned at a rate of 1 location per rear garden, c. 4 locations in the soft landscaping between Buildings A and B and one location in any other significant area of soft landscaping around Building B.

8 Verification Report

Interim verification certificates will be issued as/where required to allow the phased sign off and occupation of the buildings. All verification works will be presented in a final verification report upon completion. This report will include: source certificates and test results of imported soils and photographic records of the depths of clean cover. On receipt, the verification report should be submitted to the LPA to enable the discharge of the relevant planning condition.

APPENDIX A

Figures

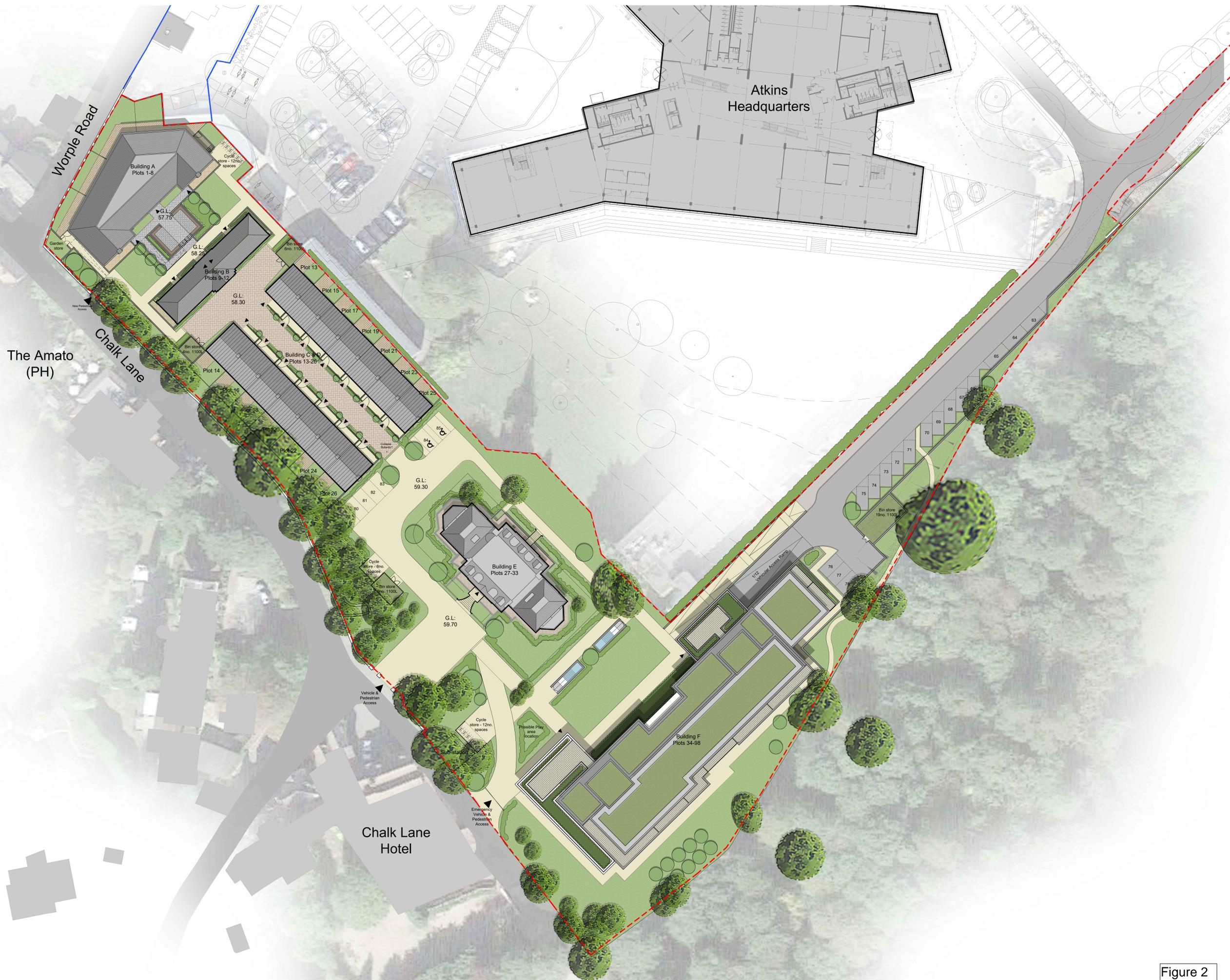


Basemap: © OpenStreetMap



Client:	Canbury Construction Ltd	Date:	29/10/2020	Project ID:	LP2353
Project:	Woodcote Grove, Epsom	Title:	Site Location Plan	Fig. No.	1

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Rev	Date	Revision Details	DR	CH
O	05.02.20	Updated landscaping	NK	NF
N	27.01.20	Updated layout	NK	NF
M	24.01.20	Updated layout	NK	NF
L	18.01.20	Update to Access road parking and path	NK	NF
K	17.12.19	Update to Block A ramps	NK	NF
J	16.12.19	Update to pedestrian footpath connections	NK	NF
I	11.12.19	Update to Block F roof plan	NK	NF
H	02.12.19	Updated to Planners comments	NK	NF
G	01.11.19	Updated to Planners comments	NK	NF
F	05.09.19	Updated Boundary Line	NF	NK
E	12.08.19	Updated Parking	NF	NK
D	31.07.19	Updated layout	NF	NK
C	24.07.19	Updated emergency access arrangement	NF	NK
B	11.07.19	Updated layout and building footprints	NF	PF
A	21.05.19	Revised Emergency Access Position	JR	NF

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Client's Name
Stonegate Homes

Job Title
Woodcote Grive, Epsom

Drawing Title
Proposed Site Plan

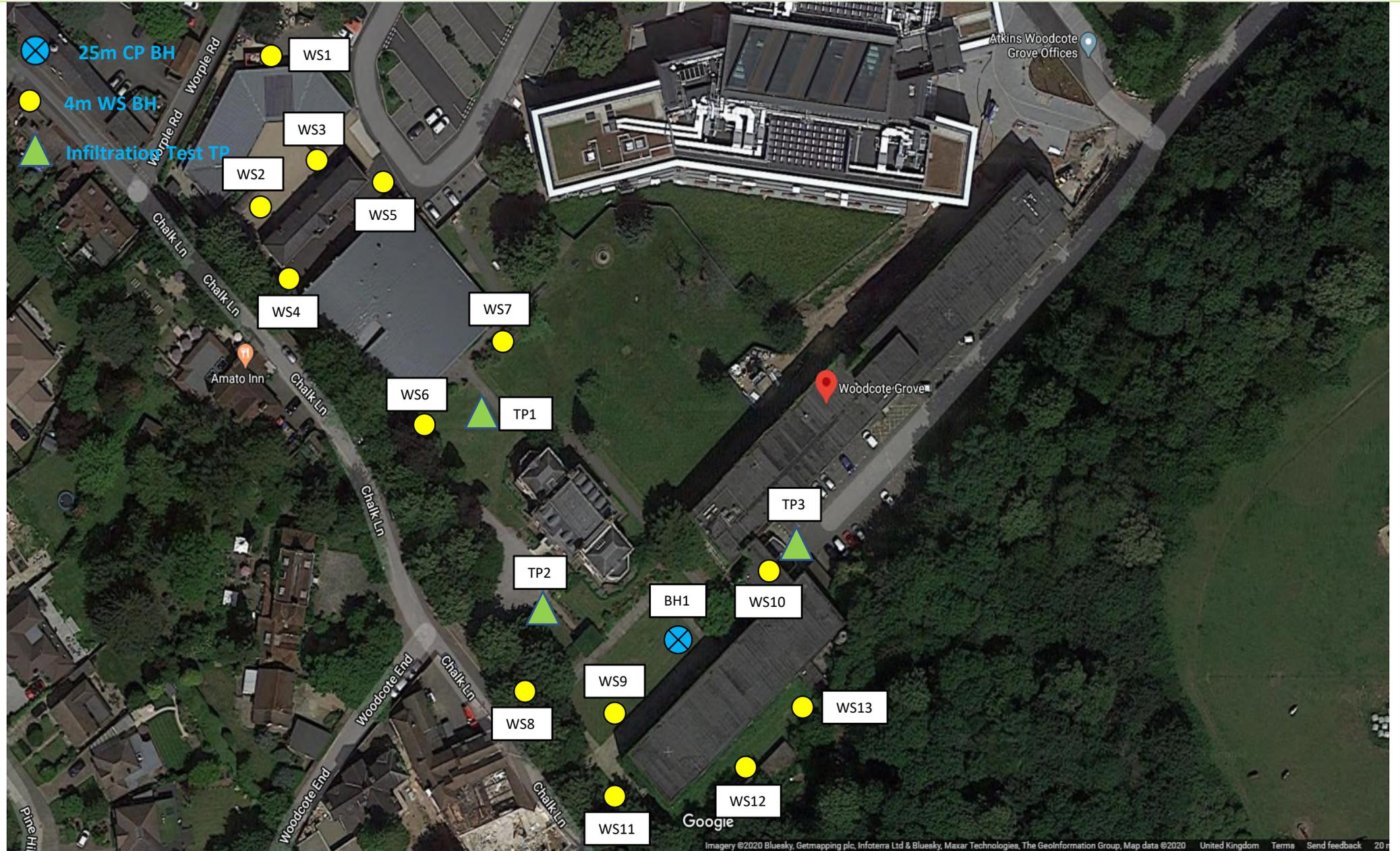
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1:250 @ A0 / 1:500 @ A2

Drawn	Checked	Date
NK	NF	16.05.19

Job No	Drawing No	Rev
6721	011	O

Status
APPROVAL

Figure 2



Basemap: © Bluesky, Getmapping plc
 Note 1: Exploratory holes shown are not to scale
 Note 2: Elevations not shown



Client:	Canbury Construction Ltd	Date:	29/10/2020	Project ID:	LP2353
Project:	Woodcote Grove, Epsom	Title:	Exploratory Hole Locations	Fig. No.	3

APPENDIX B

Specification for Imported Soils

LEAP SPECIFICATION FOR PLACEMENT OF IMPORTED FILLS AND PROCUREMENT OF IMPORTED TOPSOIL AND SUBSOIL

1 Fills

1.1 General

Filling shall be carried out in accordance with the recommendations of BS 6031:2009¹ and the CL:AIRE Definition of Waste Code of Practice (DoWCoP)².

Fill shall be maintained and protected in a satisfactory condition at all times until final completion.

Any material rendered unsuitable or unsatisfactory after being placed in the works shall be repaired or replaced as appropriate so that all the completed filling is in accordance with the specification.

1.2 Dimensions

Fills shall be constructed to achieve the finished levels of the development with an allowance for shrinkage and consolidation of the material subsequent to completion, and in order that the minimum clean cover as specified in the remediation method statement is achieved.

The excavated levels shall be recorded before the commencement of filling. The level of the filled areas shall be taken and recorded after filling.

2 Types of Fill

There are potentially two types of fill to be used. These are as follows:

- Topsoil
- Subsoil

The capping of landscaped areas will comprise 300 mm topsoil to finished garden or landscaped area level. Underlying subsoil thicknesses will be as required to achieve the overall finished levels and to provide the required cover layer thicknesses as detailed in the main body of this report.

¹ BS6031:2009 Code of practice for earthworks

² CL:AIRE The Definition of Waste: Development Industry Code of Practice Version 2, March 2011

2.1 Topsoil

It is recommended that imported topsoil complies with the requirements of BS 3882:2015³ for a Multipurpose Purpose Grade material.

The topsoil shall be free from fragments of glass, bricks, concrete, wire or other potentially hazardous matter.

Manufactured topsoil shall not be made from waste materials.

The topsoil shall be subject to the additional limitations set out below.

2.2 Subsoil

Imported manufactured or modified subsoil shall comprise certified clean material which satisfies the conditions set out in BS8601:2013⁴. Subsoil arising from site or from a certified direct transfer (e.g. under DoWCoP) shall comprise clean natural arisings from construction activities which have been confirmed acceptable by the Engineer.

2.3 Sources of Materials

Imported materials may be obtained from any source unless otherwise stated in the Drawings or in the Specification.

It shall remain the responsibility of the Contractor to obtain only fill material complying with the Specification and Method Statement, notwithstanding any tests which may be accepted by the Engineer.

The Contractor shall demonstrate to the Validation Engineer's satisfaction that the fill materials from each source are uncontaminated by submitting to the Validation Engineer a chemical analysis of material or evidence of such other tests as the Validation Engineer may require for all proposed sources of fill, and if necessary sampling and analysing materials as they are delivered to stockpiles or the fill location on site.

Sampling rates shall be a minimum of one sample per 150 cubic metres of imported soil with a minimum of three samples per source of material, unless otherwise agreed with the Engineer. Such tests for chemical composition as may be agreed by the Engineer shall be carried out on each sample and the results of tests shall be forwarded to the Engineer. Testing for contamination on samples taken shall be carried out at a testing laboratory approved by the Engineer and shall be to appropriate MCERTS standards. The Contractor shall maintain records of the location in the Works of fill from each source and the date of delivery to the site and shall submit these records to the Engineer as requested. Chemical analysis on the imported fill material shall include testing for the contaminants listed in Table I as a minimum.

³ BS3882:2015 Specification for topsoil

⁴ BS8601:2013 Specification for subsoil and requirements for use

Contaminant concentrations shall be below those listed in Table I (attached) unless agreed otherwise by the Engineer. Additional analyses may be requested depending on the source and nature of the material. The concentrations in Table I are derived from available assessment criteria which are considered to represent uncontaminated concentrations of soil - Suitable for Use Levels (S4ULs)⁵ for a residential land use with private gardens where produce may be grown and, in the case of the phytotoxic metals copper, nickel and zinc, the topsoil specification in BS3883:2015. The concentrations in Table I assume that no significant contaminant linkage to controlled waters exists that could pose an unacceptable risk.

The S4ULs represent near-minimal risk to human health. In the case of cadmium, hexavalent chromium and benzo(a)pyrene, Category 4 Screening Levels (C4SLs)⁶ also exist which are higher than minimal risk but are still strongly precautionary. In instances of persistent failures of the S4ULs for these chemicals, regulators may allow the C4SL to be used instead. This approach shall require regulatory agreement before being implemented. In addition, the following shall be deemed as unacceptable for replacement fills:

- Peat, materials from swamps, marshes and bogs.
- Logs, stumps and perishable material.
- Materials in a frozen condition.
- Clay having a liquid limit determined in accordance with BS17892-12:2018⁷;; exceeding 90% or plasticity index determined in accordance with BS17892-12:2018, exceeding 65%.
- Material susceptible to spontaneous combustion.

2.4 Practical Considerations

2.4.1 Formation Level / Subgrade Testing

Where made ground from previous site usage remains present at formation level then subgrade / formation level testing will be required to confirm the necessary thickness of subsoil and / or topsoil to be placed, as per the agreed remediation method statement. Sufficient time should be allowed in the programme for this testing to be completed prior to the requirement for clean cover to be laid. The standard turnaround for laboratory testing is 5 working days from the date of receipt at the laboratory.

2.4.2 Preparation of Subgrade

All pile mat, scaffold base and/or waste materials must be removed in their entirety from the surface of areas to become gardens or public open space / soft landscaping prior to the

⁵ The LQM/CIEH S4ULs for Human Health Risk Assessment, Nathaniel P et al, 2015. Copyright Land Quality Management Ltd, reproduced with permission: Publication Number S4UL3509

⁶ Defra 'SPI010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document' December 2014.

⁷ BS EN ISO 17892 Geotechnical investigation and testing. Laboratory testing of soil. Determination of liquid and plastic limits

application of clean cover soils. This aspect of the works will be inspected and validated by the Engineer.

2.4.3 Out of Specification Materials

Notwithstanding the specification for maximum allowable contaminant concentrations provided in Table I, no materials will be accepted that are odorous, stained or contain visible product as is required by DoWCoP.

Should the Contractor proceed with stockpiling or spreading of fill prior to receiving approval from the Engineer of results for the above tests, and the results of such tests show that the fill is contaminated above acceptable levels, the Contractor shall remove all contaminated material and replace it with acceptable material at his own cost as part of the main contract.

2.4.4 Suitability of Materials in Gardens

Materials laid as clean cover in private gardens must not only meet the requirements to be protective against land contamination but they must also be suitable for gardening. Hence, topsoil should not contain more than the British Standard-specified percentage of clay as exceeding this value may result in poor drainage and the failure of turf to establish. Subsoil should contain sufficient nutrition and be of sufficient depth to allow for the establishment of larger shrubs and trees and hence, a subsoil exceeding the British Standard-specified percentage of sand (i.e. an as-dug sand) would be unsuitable.

TABLE 1: CHEMICAL CONTAMINANT SPECIFICATION FOR IMPORTED MATERIALS

Determinant	Assessment Criteria mg/kg
Arsenic	37
Cadmium	11 ¹
Trivalent Chromium	910
Hexavalent Chromium	6 ¹
Copper	100
Lead	200
Mercury (inorganic)	40
Nickel	60
Selenium	250
Zinc	200
Benzo(a)pyrene ²	0.79 ³
Naphthalene ²	2.3 ³
Asbestos	No asbestos detected

Notes to table

1. C4SL also available.
2. Surrogate markers for all PAHs.
3. Higher assessment criteria are possible and may be agreed with the regulator on a case by case basis, for example, depending on the Soil Organic Matter content of the imported material.