

Jaclyn Murphy
Persimmon Homes (Thames Valley) Ltd
By email only



1st October 2021

Our ref MW/21/LP2711_Rev_1

Dear Jaclyn

Re: LP2711 land parcel B6, Addendum Report, land off Toddington Lane, Hampton Park, Littlehampton, BN17 7GD

1 Introduction

Leap Environmental Ltd (hereafter referred to as **LEAP**) was appointed by Persimmon Homes (Thames Valley) Ltd to undertake further site investigation at land parcel B6, land off Toddington Lane, Hampton Park, Littlehampton, BN17 7GD. This was per email instruction from Jaclyn Murphy dated 9th September 2021. This letter report presents the findings of the additional site investigation, as per recommendations in report ref: **LEAP** Phase III Site Investigation Report, Zone 3, Toddington Lane, North Littlehampton LP2128 dated April 2020.

2 Proposed Development

The site is subject to the development wide outline planning application ref: LU/47/11. Specific to land parcel B6 we understand that the proposed development comprises a 2 to 3 storey apartment block in the northern part of the site and five 2-storey private residential properties in the southern part of the site. The development includes access roads, car parking, public open space landscaping and private garden areas. The proposed layout is provided on drawing ref: Site Layout – Colour – 46 units Rev K in Appendix B.

3 Project Scope

LEAP was commissioned to undertake further site investigation and soil sampling for laboratory analysis in an area where made ground was previously identified.

Leap Environmental Ltd
South Coast Regional office
Premier House, Victoria Road,
Burgess Hill, West Sussex

Head Office : Brook House, Vincent Lane, Dorking, Surrey, RH4 6HW

4 Previous Reports

The site has been subjected to a previous site investigation by LEAP the reader is referred to this earlier report, which should be read in conjunction with this report:

- LEAP Environmental Ltd *Phase III Site Investigation Report, Zone 3, Toddington Lane, North Littlehampton, West Sussex BN17 7PP* for Persimmon Homes Ltd ref: LP2128 dated 9th April 2020.

5 Site Location and Description

A summary of the site description, layout and its historical uses is provided in Table 1, below. Further information can be found in the report listed above in Section 4.

Table 1: Summary of the Site Setting and its History

Subject	Details
Site Location	Land south of Toddington Lane, Littlehampton, West Sussex, BN17 7GD
Site Usage	Undeveloped plot of land, which has been recently used as a sub-contractors compound for the Lyminster Bypass, adjacent to the west. At the time of the site investigation a contractors cabin was present to the north of centre and land north of the cabin was also covered in blacktop hardstand. Land south and west of the cabin comprised uncovered bare ground with scrub vegetation. A thin band of scrub vegetation was also present along the eastern boundary. A small, oblong shaped partially vegetated stockpile (~10 m x 1.5 m x 1.5 m) of silty gravelly material was present in the central part of the site, south of the cabin and extended to the eastern boundary. It was noted to contain bricks, concrete, wood fragments, plastic pots and plastic bags.
Site Area	0.31 ha Rectangular parcel of land
Topography and Elevation	The site is generally level at approximately 7.5 m AOD, although Toddington Lane to the north and a railway line to the south are both in cuttings, lower than the site by approximately 1.0 m and 1.8 m, respectively.
Surrounding Area	The site is situated in a predominantly residential area. The immediate surrounding land uses are as follows: • North: Toddington Lane, aligned east to west, Hampton Park development beyond; • East: residential land use. • South: railway line aligned east to west and allotment land use beyond. • West: Lyminster By-pass aligned north to south and land parcel A2 (residential land use) beyond.

Subject	Details
Site History	- Historical maps from the late 19th Century to the early part of the 21st Century show the site as undeveloped land. From the early 2000's the site is mapped as a nursery. Greenhouses and a residential property are present on aerial imagery for the B6 land parcel from 2001-2018. After 2018 the land is shown as bare ground, with the exception of a row of conifer trees in the northern part of the site. A large excavation presumed to be associated with an archaeological excavation is shown across the majority of land parcel A2 on aerial imagery from 2018. This is not shown to extend onto B6. - A stockpile of material presumed to be associated with archaeological excavations was partially present on the southwestern corner of the site during a site investigation by LEAP in 2020. This was not present in the recent investigation.
Unexploded Ordnance (UXO)	Land parcel B6 is not located in an area at high risk of UXO

6 Previous Reports

The 2020 Site Investigation in land parcel B6 comprised two machine excavated trial pits, TP135 and TP136 to 3.00 m and 3.20 m below ground level (bgl) respectively and BH102 to 10.50 m bgl. The trial pits comprised grass over silty sandy topsoil and subsoil to between 0.30-0.50 m, over brown silty clay to 1.70 to 2.10 m, becoming medium dense brown to orange-brown clayey silty sand to the full depth of the trial pits. In BH102 the medium dense sands were proven to 5.0 m, becoming loose gravelly sand to ~6.20 m, at which a gravel silt was recovered. The chalk head was encountered from 7.00 m, becoming medium to high density chalk. The borehole was terminated at 10.80 m due to refusal on high density chalk. Made ground was identified in BH102 to 0.60 m and comprised grey to dark grey medium to coarse rounded gravels of flint with occasional brick cobbles and plastic.

Laboratory testing of the soil samples collected from B6 did not identify contaminants of concern at concentrations above screening criteria for residential with home grown produce land use. However, the made ground located at BH102 was not sampled and tested. As such the report recommended in soft landscaped areas either removal of made ground to 0.60 m / natural soils or further testing of made ground soils.

7 Fieldwork

7.1 Methodology

The additional intrusive investigation was carried out on 13th September 2021 and included the following tasks:

- 5 x machine excavated trial pits to 1.0 m around BH102 and in proposed soft landscaped areas.

- 1 x soil sample collected from the stockpile of made ground.
- Collection of soil samples for laboratory analysis including 6No. LEAP standard soil suite tests.

We note that our proposal allowed for shallow hand excavated pits for the collection of made ground soils for laboratory analysis. At the time of the site works a groundworks contractor (HGH Groundworks Ltd) was undertaking drainage excavations at land parcel B6 and made available a tracked excavator to LEAP for the duration of the additional investigation, as such all pits were machine excavated. HP102 was moved to the east on an uncovered area, as the proposed location was in the blacktop covered.

Soil samples were sent to The Environmental Laboratory in Hastings and were tested for LEAP's standard soil suite that includes asbestos, heavy metals, pH, total organic carbon and polycyclic aromatic hydrocarbons (PAHs).

The weather during the visit was dry and sunny. A site plan for the location of each excavation is presented on Figure 2 of Appendix B a photographic record of the site is provided in Appendix C.

8 Geology

The excavated trial pits (HP301-305) were logged and samples were collected. The logs for each trial pit during this phase of investigation are presented in Appendix D. The ground conditions encountered during this phase of investigation comprised made ground over brown sandy, silty CLAY. A summary of the logs is provided in Table 1, below:

Table 1: Summary of Encountered Geology

Depth	Geology	Description
GL to 0.10/0.65	Made Ground	Grey brown to brown gravelly sandy Made Ground. Gravel is fine to coarse rounded to subangular flint with occasional tile fragments, concrete and brick gravels. Occasional plastic, wood fragments and rare glass noted.
0.10/0.65 to 0.75*/0.95*	CLAY	Brown sandy clay occasionally gravelly sandy silty clay.

*Depth not proven

Made ground was identified in all locations. Made ground was thickest in HP304 (0.65 m), where a stockpile of material associated with archaeological excavations was present in the previous investigation and in HP305 (0.40 m) south of the location of BH102. A plastic membrane was identified in HP305 at 0.15 m. Aerial imagery dated 2015 shows a residential property over the footprint of BH102 and HP305.

9 Soil Risk Assessment

9.1 Revised Conceptual Site Model

The previous ground investigation identified a plausible contaminant linkage with respect to made ground around BH102. The revised CSM provides an updated understanding of the site based on the findings of the recent site investigation and analytical results and was used to inform the quantitative risk assessment (QRA) undertaken below in the context of the proposed residential land use.

Following completion of the additional site investigation no revisions to the CSM are considered necessary before carrying out the generic quantitative risk assessment (GQRA).

- Potential contaminants are likely to be limited to the variable thickness made ground identified on site. No evidence of gross contamination was identified in any of the additional trial hole locations. Asbestos containing material, discoloured soils, hydrocarbon odours or non-aqueous liquids were not observed during the investigation.

We note that additional investigation in proposed soft landscaped areas in the north of the site was not possible, as it was covered by black top hardstand.

The exploratory logs are provided in Appendix D and a summary of the laboratory analytical results in Appendix E.

Given the nature of the contaminants encountered, plausible contaminant linkages for exposure to future residents and groundworkers at the site are confirmed as follows:

- Ingestion of contaminated soils.
- Inhalation of contaminated soil particles/dust and asbestos fibres.
- Dermal contact with contaminated soils.
- Ingestion of homegrown produce (future residents only).

As no evidence of VOCs was encountered, the inhalation of soil and groundwater-derived vapours was excluded as a plausible contaminant linkage. Risks to future land users from land gases has also been excluded based on the absence of plausible contaminant linkages i.e. no identified onsite or off site sources of land gases.

9.2 Rationale and Approach

The generic quantitative risk assessment (GQRA) for human health was conducted in line with the CLEA methodology by comparing the soil analytical results from the ground investigation with Generic Assessment Criteria (GAC). The GACs were selected using the rationale and assumptions provided in Appendix F.

Sets of soil GACs are available for SOMs of 1%, 2.5% and 6%. In this case, TOC in the Made Ground samples that were analysed ranged from 0.39 to 2.4%. Using the conversion of $SOM = TOC \times 1.72$, this equates to a SOM range of 0.67% to 4.12%. 1% SOM was considered to be appropriate to maintain conservatism.

For some contaminants of concern, direct contact will be the dominant pathway for exposure. In order to support with development options, human exposure to all unsaturated soils, irrespective of depth, has been considered for the purpose of this assessment. This will maximise the information available to the design team on the suitability of all unsaturated material and can support with their materials management options.

The focus of the GQRA was chronic risks to human health because these often occur at lower doses than acute responses to exposure. Groundworkers during construction and future maintenance may be exposed to unacceptable levels of contamination. The CLEA assessment approach is designed to evaluate long term chronic exposure to contaminants and therefore, this approach is not appropriate for groundworkers who will be exposed for short durations on a site. As such, a GQRA was not undertaken to evaluate the potential for unacceptable exposure to groundworkers and future maintenance workers.

9.3 Evaluation of Potential Risks to Future Residents

The soils that were analysed comprised five made ground samples and one stockpile sample. The laboratory analytical results were assessed to determine the potential risks to future site users under a generic residential land use scenario assuming that homegrown produce are consumed (residential with HGP).

The laboratory certificates are provided in Appendix G. A summary table is provided in Table 2 below.

Table 2: Summary of Soil Contamination Test Results from Additional Site Investigation

Determinand	Number of samples	Number >LOD	Maximum Conc. (mg/kg unless otherwise stated)	Generic Assessment Criteria (mg/kg)	Number of Exceedances
METALS					
Arsenic	5	5	17.3	37	0
Cadmium	5	0	<0.5	22	0
Chromium (Total)	5	5	33.7	910	0
Chromium VI	5	5	<0.8	21	0
Copper	5	5	76.4	2400	0
Lead	5	5	53.2	200	0

Determinand	Number of samples	Number >LOD	Maximum Cont. (mg/kg unless otherwise stated)	Generic Assessment Criteria (mg/kg)	Number of Exceedances
Mercury	5	0	<0.5	40	0
Nickel	5	5	27	130	0
Selenium	5	0	<1.0	250	0
Zinc	5	5	121	3700	0
PAHs					
Benzo(a)pyrene	5	4	2.3	5.0	0
Naphthalene	5	0	<0.1	2.3	0
Asbestos					
Asbestos	5	0	0	Detected	0

None of the soil samples tested identified potential contaminants of concern at concentrations above generic assessment criteria (GAC) for residential with homegrown produce land use.

Asbestos containing materials or loose asbestos fibres were not detected in any of the soil samples tested.

10 Waste

Where soils are to be disposed off-site, it is the duty of the waste producer, in this case Persimmon Homes (Thames Valley) 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. There are various forms of pre-treatment that are acceptable. In this case it could include “reduction in volume”, which could be achieved by segregating the Made Ground and re-using part of it on site.

If made ground soils are re-used on site then a CL:AIRE Definition of Waste Industry Code of Practice (DoW CoP)¹ declaration will be required. This also applies if site generated natural soils are to be re-used on other sites. The MMP will be produced before the works commence and will also need to be submitted to a Qualified Person (QP) to complete the declaration in accordance with DoW CoP prior to the movement of any materials. The QP will be independent from and have had no prior involvement with the project.

¹ CL:AIRE ‘The Definition of Waste: Development Industry Code of Practice’. Version 2 2011.

On completion of the works a verification report will be produced documenting whether proposals set out in the MMP were implemented on site, confirming volumes of material reused, reuse locations, and compliance with specifications

11 Conclusions and recommendations

The additional site investigation identified a shallow layer of made ground soils across the site. Soil samples collected and tested from the made ground, and from a stockpile did not identify elevated concentrations of potential contaminants of concern for the proposed land use. On this basis the made ground and stockpile soils do not pose a significant risk to the proposed development in the locations investigated.

However, suitability of the onsite soils for other purposes, such as required planting depths, as a growing medium, or its aesthetic quality for use in gardens was outside the scope of our commission. This will need to be considered by the developer prior to the reuse of the material, with due consideration to applicable guidance and standards (for example BS 3882:2015² and BS8601:2013³).

The recent ground investigation did not extend to soils beneath the hardstand area in the northern part of the site.

We recommend that following the removal of the northern hardstand area formation soils are inspected by the developer's environmental consultant to confirm absence of 'gross' contamination i.e. free product, discoloured soils, strong odours or asbestos containing materials. In addition, if any unexpected suspect soils are encountered during construction (for example odorous or stained materials) the developer's environmental consultant will be informed and works in the area of concern will cease. Where these are encountered during construction, they will be assessed and addressed individually by the developer, in conjunction with the environmental consultant and following appropriate pollution prevention control measures.

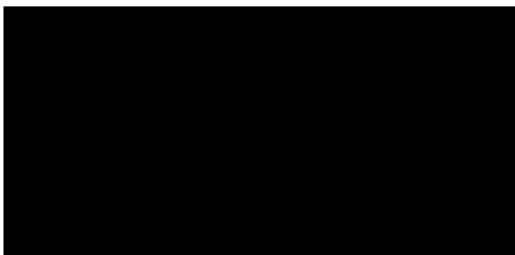
There are no restrictions from a contamination perspective to reuse any site-won 'natural' materials beneath hardstanding, buildings or roadways or in soft landscaped areas provided it meets re-use objectives (planting depth / growing medium / aesthetic quality etc) as described above and engineering requirements for the development.

If manufactured topsoil / subsoils are required in soft landscaped areas the imported material will need to comply with the topsoil / subsoil specification provided in Appendix H.

² BS3883:2015 Specification for topsoil

³ BS8601:2013 Specification for subsoil and requirements for use

Yours sincerely



For LEAP Environmental Ltd

Enc.:

APPENDIX A – Limitations

APPENDIX B – Figures and Drawings

APPENDIX C – Photographic Record

APPENDIX D – Exploratory Logs

APPENDIX E – Analytical Summary

APPENDIX F – Approach to the Selection of Generic Assessment Criteria

APPENDIX G – Geoenvironmental Laboratory Test Results

APPENDIX H – Imported Topsoil / Subsoil Criteria

APPENDIX A – Limitations

Limitations

12 Limitations

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. Unless explicitly agreed otherwise in writing, this report has been prepared under LEAP's standard terms and conditions, as included in the quotation for this works.

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. LEAP cannot be held responsible for any disclosures or changes in regulation that are provided post production of this report, and will not automatically update the report.

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.

The extent of the exploratory holes, laboratory testing and monitoring undertaken may have been restricted due to a number of factors including accessibility, the presence of buried or overhead services, current development and site usage, timescales or clients specification. The exploratory holes only assess a small proportion of the site area with respect to the site as a whole, and as such may only provide an overall assessment of ground conditions on site. The presence of hotspots of undisclosed contamination or exceptional and unforeseen ground conditions cannot be discounted.

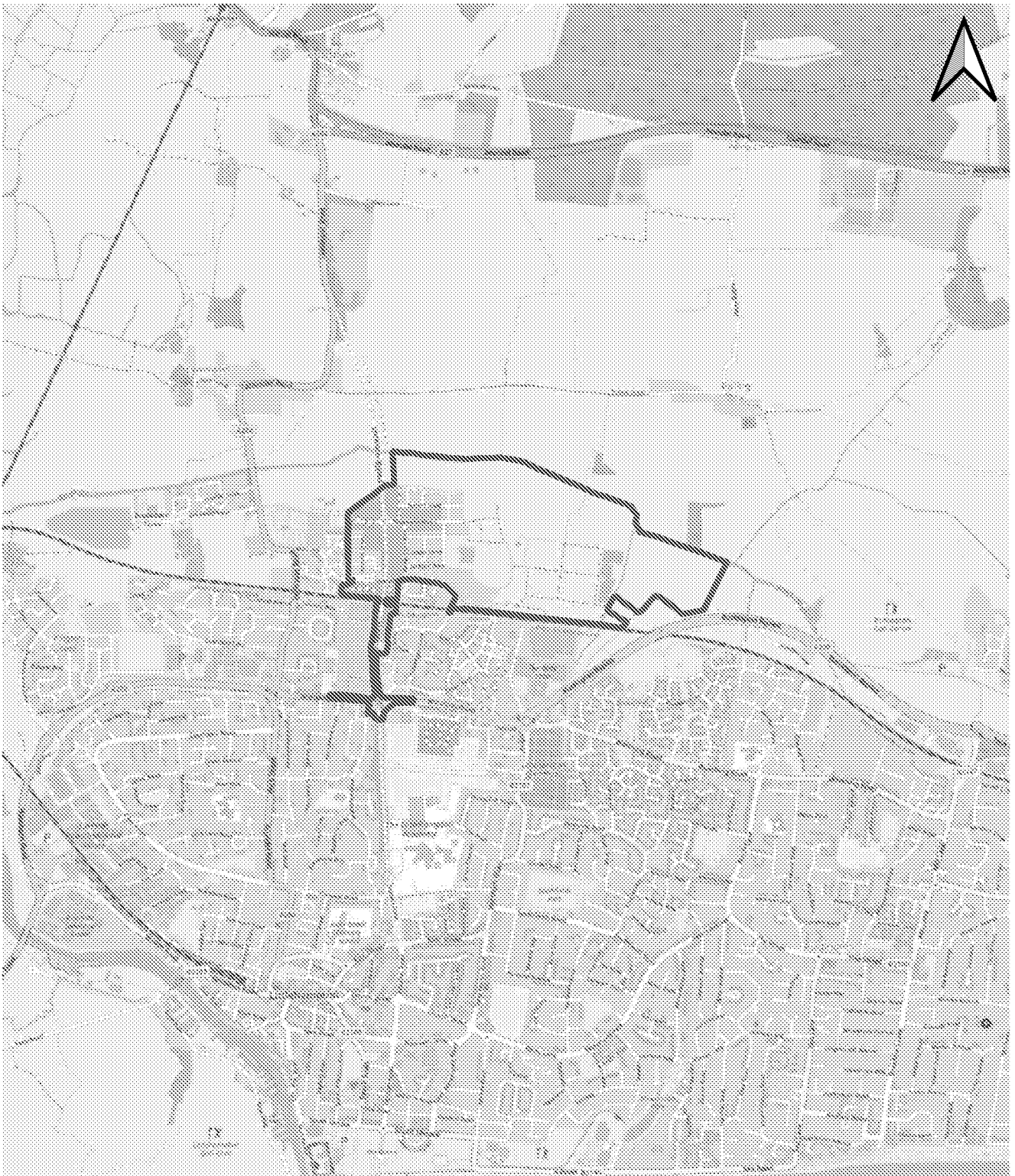
Eurocode 7 gives guidance on the type of sampling, sample quality, number and spacing of intrusive investigations, and number of laboratory tests required. It is intended that the Geotechnical Information section of this report will fulfil the general requirements of the Ground Investigation Report as set out in section 6 of Eurocode7⁴, although this is subject to the restrictions imposed on the investigation as listed above. For geotechnical design, Eurocode 7 requires the Geotechnical Design Report to address both the geotechnical and structural aspects of the geotechnical design for both the limit and serviceability states. The Geotechnical Appraisal section of this report will not meet the requirements of a Geotechnical Design Report (GDR), and should therefore be used for preliminary guidance only.

⁴ BS EN 1997 Eurocode 7- Geotechnical Design - Part 1: General Rules (2004) and Part 2: Ground Investigation and Testing (2007)

The presence of asbestos may be noted during the site walkover survey, intrusive investigations and/or from the results of contamination testing. However, this report does not constitute an asbestos survey. On this basis, the presence of asbestos on site cannot be discounted and a full asbestos survey should be undertaken.

APPENDIX B – Figures and Drawings

Figures and Drawings



Basemap: (c) OpenStreetMap contributor



Client: Persimmon Homes
(Thames Valley) Ltd

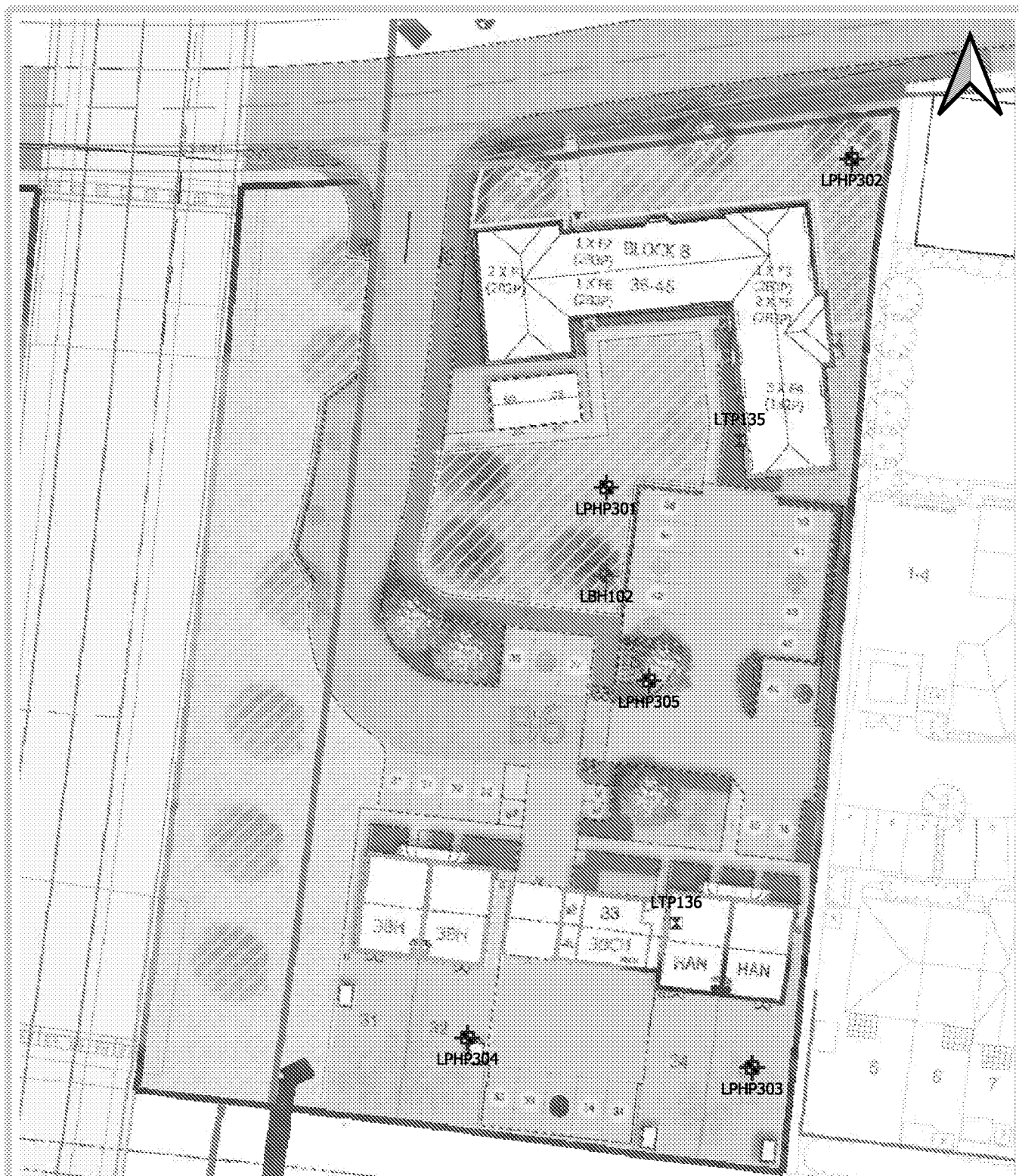
Project: North Littlehampton
Land Parcel B6

Title: Development
location plan

Date: 30/09/21

Project ID: LP2711

Figure No. 01



Basemap: Client supplied

Note 1: Exploratory holes have been positioned by local measurements made by site engineer and should therefore only be taken as approximate

Note 2: Exploratory holes shown are not to scale

Note 3: Elevations not shown

✦ LP2128 Boreholes (2020)

⊠ LP2128 Trial pits (2020)

✦ LP2711 Trial pits (2021)



Client: Persimmon Homes (Thames Valley) Ltd

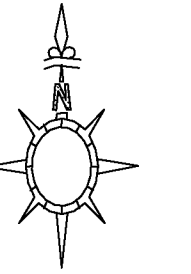
Project: North Littlehampton Land Parcel B6

Title: Exploratory hole location plan

Date: 30/09/21

Project ID: LP2711

Figure No. 02

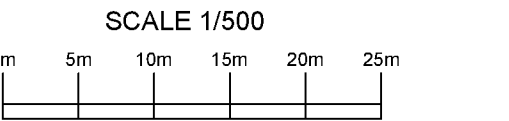


Littlehampton Phase 3 Parcel A2, B6				
	Ft²	NO.	BEDROOMS	STOREY
Market:				
ALN	638	1	2 BED	2
HAN	761	6	3 BED	2
ASH	874	6	3 BED	2
HAT	969	6	3 BED	2
DER.CR	969	1	3 BED	2
CLA / CLA.CR	999	4	3 BED	2
3BCH (Coach House)	990	1	3 BED	2
F1, 2bed, 3 person	704	2	2 BED	
F2, 2bed, 3 person	661	1	2 BED	
F3, 2bed, 3 person	687	1	2 BED	
F4, 1bed, 2 person	538	3	1 BED	
F5, 2bed, 3 person	687	2	2 BED	
F6, 2bed, 3 person	670	1	2 BED	
Total Market		35		
HA				
3BH	761	4	3 BED	2
HA-F1, 2bed, 4 person	742	2	2 BED	
HA-F2, 2bed, 4 person	755	2	2 BED	
HA-F1-WH, 2 bed, 3 person	742	1	2 BED	
HA-F2-WH, 2 bed, 3 person	755	1	2 BED	
Total HA (20%)		10		
TOTAL ON SITE		45		

LEGEND	
	Open Space Area = 4383m² Required: (2.4x45=108 residents) x 37m² = 3996m²
	Chimney Location

LEGEND - PARKING ALLOCATION	
	Allocated Parking 80 spaces total
	Visitors Parking 10 spaces total
	Unallocated Parking 6 spaces total
	Unallocated Visitor Motorcycle Parking 5 spaces total
	Cycle Visitor Parking 11 spaces total (min required 1/2 = 6)
	Hatching / 'D' mark Mobility impaired parking spaces

Total of 96 car parking spaces proposed on site.
Total of 35 required on site as per the demand on
Parking Calculator.



K	Further layout changes made - Plots 10-18 re-designed as per LPA comments.	07.02.20
J	Further layout re-design made due to LPA comments - Block A revised	06.01.20
H	Further layout re-design made due to LPA comments - Block B revised Bin/Cycle store detached. Dwellings reduced to 45 units.	11.11.19
G	Redline amended to include access into Parcels A2 & B6.	25.10.19
F	Further layout re-design made due to LPA comments. Dwellings reduced to 45 units.	13.06.19
E	Further layout re-design made due to LPA comments. Additional unit added to Toddington Lane street frontage and pair of HAN semi's removed from main road replaced with CLA & HAT to enhance street scene. Access road to plots 1, 5&7 repositioned to become parking courtyard to serve these plots. LEAP moved further away from Bypass.	06.06.19
D	Further layout re-design made due to LPA comments.	21.03.19
C	Further layout re-design made due to Engineer's comments.	13.02.19
B	Further changes made due to Engineer's comments. Plots 6 - 8 reconfigured due to parking conflict with site access.	02.11.18
A	Planning Layout re-designed at the request of the Planning Officer.	08.10.18
Rev		Date

PERSIMMON
Together, we make a home

Persimmon Homes Thames Valley
Persimmon House, Knoll Road,
Camberley, Surrey GU15 3TQ
Tel: 01276 808080

Site:	PHASE 3 Littlehampton Parcel A2.B6	Date:	July 2018
Scale:	1:500 @ A1	Orig No:	544_PL_101

Drawing Title:
Site Layout - COLOUR - 46 units

Drawing Status:	Drawn: AT	Checked: ME
	Rev: K	

SUBMITTED

APPENDIX C – Photographic Record

Photographic Record

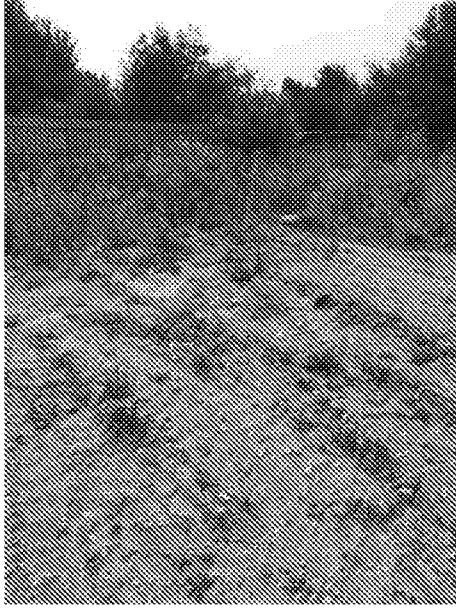


Plate 1 -- Facing SE to HP303



Plate 2 -- HP305



Plate 3 -- B6 facing N

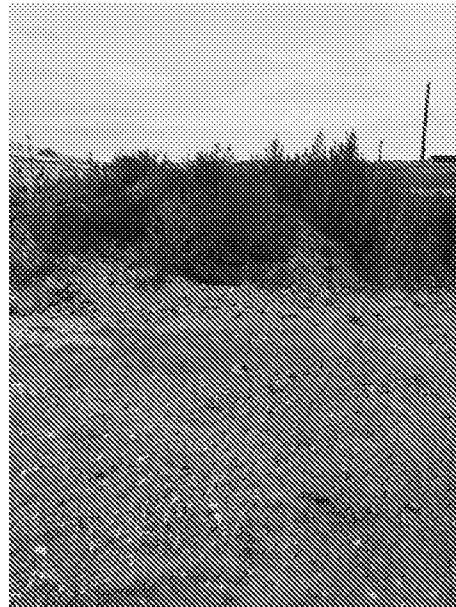


Plate 4 -- Central Stockpile



Plate 5 -- HP305

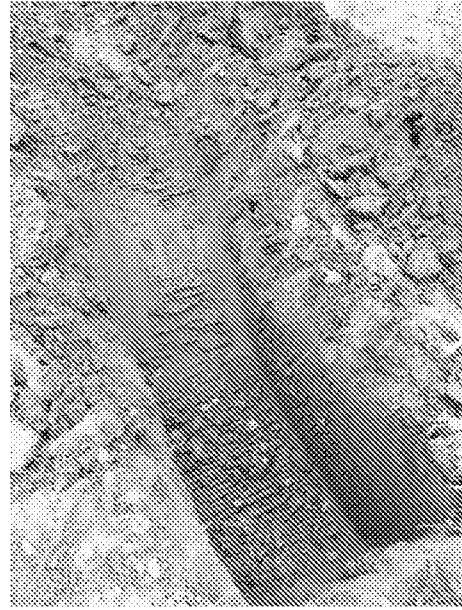


Plate 6 -- HP303

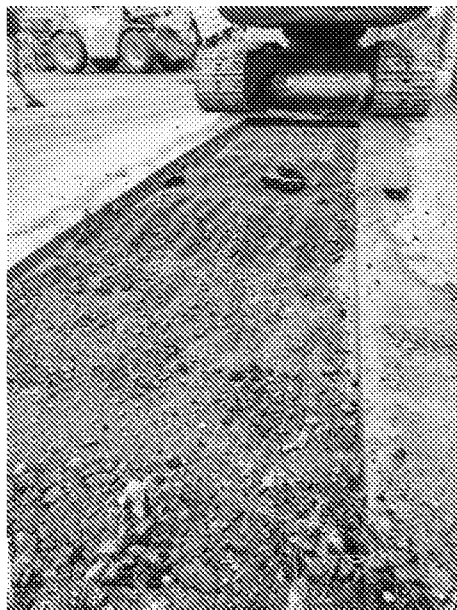


Plate 7 -- Beneath blacktop



Plate 8 -- HP302 location

APPENDIX D – Exploratory Logs

Exploratory Logs

Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA				Trial Pit Log				Trialpit No HP301 Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6		Project No. LP2711		Co-ords: - Level:		Date 13/09/2021			
Location: Wick, Littlehampton, BN17 7PP				Dimensions (m): Depth 0.75		Scale 1:25 Logged KT			
Client: Persimmon Homes (Thames Valley) Ltd									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.05	ES				Brownish grey gravelly sandy silty MADE GROUND with occasional rootlets. Gravel is rare glass, fine to coarse angular to subangular flint, fine to coarse concrete, blue plastic fragments, wood fragments. Brown very sandy CLAY with rare medium to coarse angular flint.			
	0.30	ES		0.25					
				0.75					
							End of pit at 0.75 m		
									1
									2
									3
									4
									5

Remarks: Trial pit remained stable and was backfilled with arisings.

Stability: Stable

Trial Pit Log

Trialpit No

HP302

Sheet 1 of 1

Project Name:	North Littlehampton Additional Testing B6
---------------	---

Project No.
LP2711

Co-ords: -

Level:

Date

13/09/2021

Location: Wick, Littlehampton, BN17 7PP

Dimensions
(m):

Depth

0.10

Scale
1:25

Logged
KT

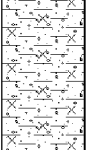
Client: Persimmon Homes (Thames Valley) Ltd

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.10			Brown gravelly sandy silty MADE GROUND. Gravel is fine to coarse angular to subangular flint, fine to medium brick, occasional tile fragments. End of pit at 0.10 m	

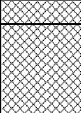
Remarks:	Trial pit remained stable and was backfilled with arisings. Area is very heavily vegetated so limited access.
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Stability:	Stable
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AGS

 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH41 1YA				Trial Pit Log				Trialpit No HP303	
								Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6			Project No. LP2711		Co-ords: - Level:		Date 13/09/2021		
Location: Wick, Littlehampton, BN17 7PP					Dimensions (m): Depth 0.80		Scale 1:25 Logged KT		
Client: Persimmon Homes (Thames Valley) Ltd									
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.05	ES		0.10		 Brown gravelly sandy silty MADE GROUND. Gravel is fine to cobble rounded to angular flint, fine to coarse concrete, occasional plastic fragments and tile fragments.			
				0.80		 Brown slightly gravelly sandy silty CLAY. Gravel is fine to medium subrounded to angular flint. <i>Tree root noted at 0.4m.</i>			
							End of pit at 0.80 m		
								1	
								2	
								3	
								4	
								5	
Remarks: Trial pit remained stable and was backfilled with arisings.									
Stability: Stable									

 Leap Environmental Ltd The Atrium, Curtis Road [Redacted Address]		Trial Pit Log			Trialpit No HP304 Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6		Project No. LP2711		Co-ords: - Level:		Date 13/09/2021
Location: Wick, Littlehampton, BN17 7PP				Dimensions (m):		Scale 1:25
Client: Persimmon Homes (Thames Valley) Ltd				Depth 0.85		Logged KT

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05	ES		0.08		 Greyish brown sandy gravelly MADE GROUND. Gravel is fine to coarse concrete, fine to coarse subrounded to angular flint, occasional tile fragments, occasional strips of black plastic membrane, rare glass.  Brown slightly gravelly sandy REWORKED CLAY. Gravel is rare medium subangular brick.  Brown slightly gravelly sandy clayey MADE GROUND with occasional dark grey staining and odourless. Gravel is rare angular flint.  Brown sandy CLAY.	
	0.45	ES		0.40			
	0.60	ES		0.65			
				0.85			
End of pit at 0.85 m							

Remarks: Trial pit remained stable and was backfilled with arisings.		
Stability: Stable		

 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA				Trial Pit Log				Trialpit No HP305 Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6				Project No: LP2711		Co-ords: - Level:		Date 13/09/2021	
Location: Wick, Littlehampton, BN17 7PP						Dimensions (m): Depth 0.90		Scale 1:25 Logged KT	
Client: Persimmon Homes (Thames Valley) Ltd									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.05	ES					Greyish brown gravelly sandy MADE GROUND. Gravel is fine to coarse rounded to subangular flint, occasional fine tile fragments, fine to coarse concrete. Brown gravelly sandy slightly clayey MADE GROUND. Gravel is fine to medium brick, fine to medium subrounded to subangular flint, fine to medium concrete. <i>Black plastic membrane at 0.15m.</i> Brown sandy CLAY.	
	0.20	ES		0.15				
				0.40				
	0.50	ES						
				0.90			End of pit at 0.90 m	

Remarks: Trial pit remained stable and was backfilled with arisings.



Stability: Stable

Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH41 1YA				Trial Pit Log				Trialpit No HP303 Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6				Project No. LP2711		Co-ords: - Level:		Date 13/09/2021	
Location: Wick, Littlehampton, BN17 7PP						Dimensions (m): Depth 0.80		Scale 1:25	
Client: Persimmon Homes (Thames Valley) Ltd								Logged KT	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.05	ES		0.10			Brown gravelly sandy silty MADE GROUND. Gravel is fine to cobble rounded to angular flint, fine to coarse concrete, occasional plastic fragments and tile fragments. Brown slightly gravelly sandy silty CLAY. Gravel is fine to medium subrounded to angular flint. <u>Tree root noted at 0.4m.</u>		
				0.80					
							End of pit at 0.80 m		
							1		
							2		
							3		
							4		
							5		
Remarks: Trial pit remained stable and was backfilled with arisings.									
Stability: Stable									

 Leap Environmental Ltd The Atrium, Curtis Road Red Lion Square, BML1 1YA				Trial Pit Log				Trialpit No HP304	
								Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6				Project No. LP2711		Co-ords: - Level:		Date 13/09/2021	
Location: Wick, Littlehampton, BN17 7PP						Dimensions (m): Depth 0.85		Scale 1:25 Logged KT	
Client: Persimmon Homes (Thames Valley) Ltd									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.05	ES		0.08		 Greyish brown sandy gravelly MADE GROUND. Gravel is fine to coarse concrete, fine to coarse subrounded to angular flint, occasional tile fragments, occasional strips of black plastic membrane, rare glass.  Brown slightly gravelly sandy REWORKED CLAY. Gravel is rare medium subangular brick.  Brown slightly gravelly sandy clayey MADE GROUND with occasional dark grey staining and odourless. Gravel is rare angular flint.  Brown sandy CLAY.	
	0.45	ES		0.40			
	0.60	ES		0.65			
				0.85			
							End of pit at 0.85 m

Remarks: Trial pit remained stable and was backfilled with arisings.		
Stability: Stable		

Leap Environmental Ltd The Atrium, Curtis Road Reading, RG1 1AA				Trial Pit Log				Trialpit No HP305 Sheet 1 of 1	
Project Name: North Littlehampton Additional Testing B6				Project No. LP2711		Co-ords: - Level:		Date 13/09/2021	
Location: Wick, Littlehampton, BN17 7PP						Dimensions (m): Depth 0.90		Scale 1:25	
Client: Persimmon Homes (Thames Valley) Ltd								Logged KT	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.05	ES					Greyish brown gravelly sandy MADE GROUND. Gravel is fine to coarse rounded to subangular flint, occasional fine tile fragments, fine to coarse concrete. Brown gravelly sandy slightly clayey MADE GROUND. Gravel is fine to medium brick, fine to medium subrounded to subangular flint, fine to medium concrete. <i>Black plastic membrane at 0.15m.</i> Brown sandy CLAY.	
	0.20	ES		0.15				
				0.40				
	0.50	ES						
				0.90			End of pit at 0.90 m	

Remarks: Trial pit remained stable and was backfilled with arisings.	
Stability: Stable	

APPENDIX E – Analytical Summary Table

Analytical Summary Table

LP271 Land Parcel B6, North Littlehampton											
Soil Analytical Results and Human Health QRA - Residential with Homegrown Produce											
					NOTES						
					Sample Location:	HP301	HP302	HP303	HP304	HP305	Stockpile 1
					Depth (m):	0.05	0.1	0.05	0.6	0.2	0.2
					Matrix:	MG	MG	MG	MG	MG	MG
				N	Date Sampled:	13/09/2021	13/09/2021	13/09/2021	13/09/2021	13/09/2021	13/09/2021
Determinand	Units	LOD	Screening Value*		Source						
Miscellaneous											
pH	pH units	0.1	n.v.		n.a.	8.4	8.3	8.7	8	8.4	10.1
Total Organic Carbon	%	0.1	n.v.		n.a.	2.4	0.48	0.85	0.39	0.94	0.49
Soil Organic Matter (calculated)**	%	-	n.v.		n.a.	4.13	0.83	1.46	0.67	1.62	0.84
Metals											
Arsenic	mg/kg	2	37	6	C4SL	16.7	13.9	13.7	10.5	14	17.3
Cadmium	mg/kg	0.1	22	0	C4SL	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Chromium	mg/kg	0.5	910	6	S4UL	30	25.9	23.3	22	33.7	33.1
Chromium VI	mg/kg	1	21	0	C4SL	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Copper	mg/kg	2	2,400	6	S4UL	76.4	29.1	23.3	17.3	36.5	35.4
Lead	mg/kg	2	200	6	C4SL	42.5	25.7	28.8	14.4	53.2	45.7
Mercury	mg/kg	1	40	0	S4UL	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel	mg/kg	0.5	130	6	S4UL	27	20.1	17.9	17.8	22.7	24.1
Selenium	mg/kg	3	250	0	S4UL	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	mg/kg	2	3,700	6	S4UL	120	80.1	82.2	62.3	121	119
Asbestos											
Asbestos Identification	-	-	Presence		n.a.	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Quantification	%	0.001	Presence		n.a.						
Polycyclic Aromatic Hydrocarbons (USEPA 16)											
Benzo(a)pyrene	mg/kg	0.1	5.0	5	C4SL	0.4	0.2	0.2	< 0.1	2.3	0.9
Naphthalene	mg/kg	0.1	2.3	0	S4UL	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	0.1	n.v.		n.a.	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	0.1	n.v.		n.a.	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Fluorene	mg/kg	0.1	n.v.		n.a.	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Phenanthrene	mg/kg	0.1	n.v.		n.a.	0.2	< 0.1	0.1	< 0.1	1.1	0.3
Anthracene	mg/kg	0.1	n.v.		n.a.	0.1	< 0.1	< 0.1	< 0.1	0.4	0.1
Fluoranthene	mg/kg	0.1	n.v.		n.a.	0.6	0.2	0.3	< 0.1	2.7	1.1
Pyrene	mg/kg	0.1	n.v.		n.a.	0.5	0.2	0.3	< 0.1	2.4	1
Benzo(a)anthracene	mg/kg	0.1	n.v.		n.a.	0.4	0.1	0.2	< 0.1	1.9	0.7
Chrysene	mg/kg	0.1	n.v.		n.a.	0.6	0.2	0.2	< 0.1	2.3	0.7
Benzo(b)fluoranthene	mg/kg	0.1	n.v.		n.a.	0.7	0.2	0.3	< 0.1	2.3	1
Benzo(k)fluoranthene	mg/kg	0.1	n.v.		n.a.	0.5	0.2	0.3	< 0.1	2	0.8
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	n.v.		n.a.	0.4	0.1	0.2	< 0.1	1.7	1
Dibenzo(ah)anthracene	mg/kg	0.1	n.v.		n.a.	0.1	< 0.1	< 0.1	< 0.1	0.3	0.2
Benzo(ghi)perylene	mg/kg	0.1	n.v.		n.a.	0.4	0.1	0.2	< 0.1	1.5	0.7
Total PAH (16)	mg/kg	0.1	n.v.		n.a.	5.1	1.6	2.5	< 0.4	21.4	8.7

* Assuming 1% SOM for organic compounds

** - Soil Organic Matter = Total Organic Carbon x 1.72

NAD = No asbestos detected

MG = Made Ground

n.v = no published value available

APPENDIX F – Approach to the Selection of Generic Assessment Criteria

Approach to the Selection of
Generic Assessment Criteria

LEAP Approach to the Selection of Generic Assessment Criteria

Chronic Risks to Human Health

Defra and the EA have published a limited number of Soil Guideline Values (SGVs)⁵ that represent minimal chronic risk to human health. CL:AIRE has published a limited number of Category Four Screening Levels (C4SLs)⁶ which represent a low but still strongly precautionary level of chronic risk to human health. Both the SGVs and C4SLs have both been derived for a Soil Organic Matter (SOM) content of 6%, which is not always representative of the low SOM that are encountered within Made Ground on brownfield sites.

Land Quality Management Ltd. (LQM) responded to the demand for a more comprehensive set of screening values and for a wider range of SOM by producing Suitable for Use Levels (S4ULs)⁷ which are a hybrid of SGVs and C4SLs. The S4ULs have been endorsed by the Chartered Institute of Environmental Health (CIEH).

A smaller set of 35 GACs was published by CL:AIRE in association with AGS and EIC in 2010. These were based on the exposure scenarios that were used to derive the SGVs. These exposure scenarios have since been superseded, in part, by the publication of the C4SLs and the S4ULs. A second phase of C4SLs is currently under development.

LEAP uses C4SLs where they are available as generic assessment criteria to quantitatively assess the potential chronic risks to human health. Where C4SLs are not available, the S4ULs or CL:AIRE GACs are used. It is noted that S4ULs are not equivalent to C4SLs in all their exposure assumptions but are generally more conservative. To ensure the greatest possible consistency in LEAP's human health GQRAs, the physicochemical and toxicological input parameters that were used to derive the CL:AIRE GACs have been re-modelled using the exposure parameters selected by LQM to derive the S4ULs.

For the organic compounds benzene and benzo(a)pyrene for which C4SLs are available for a SOM of 6% only, LEAP has calculated equivalent C4SLs for 1% and 2.5% SOM. SOM does not affect the inorganic contaminants.

In accordance with current Public Health England (PHE) guidance⁸, LEAP carries out the assessment of PAHs using a surrogate marker approach, whereby the assessment of risk from benzo(a)pyrene also captures potential risks from other carcinogenic PAHs that may be present. The alternative S4ULs for PAHs using the Toxic Equivalent Factor (TEF) approach are not used because this approach is likely to under predict the true carcinogenicity of PAHs and is not advocated by PHE. The threshold PAHs have been assessed similarly, by using naphthalene as a marker compound due to its high volatility relative to other PAHs.

⁵ Environment Agency Science Report SC050021 series.

⁶ CL:AIRE Final Project Report. 'SP1010 – Development of Category 4 Screening Levels for assessment of land affected by contamination'. CL:AIRE, December 2013

⁷ '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.

⁸ HPA 'Contaminated Land Information Sheet. Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)'. Public Health England, 2017.

Total phenols are assessed by LEAP against the S4UL for phenol and total chromium is assessed against the S4UL for trivalent chromium.

LEAP does not consider the theoretical soil saturations in the evaluation of organic compounds and as such, some of the S4ULs for the less sensitive exposure scenarios are lower than their more sensitive equivalents.

Risks to human health from inhalation of vapours derived from groundwater are evaluated by LEAP using the SoBRA groundwater GAC_{gwwap} ⁹.

Acute Risks to Human Health

Cyanide has not been modelled using CLEA because it has high acute toxicity and CLEA is designed to evaluate chronic risks. Assuming an acute risk and based on a single dose of 3 g of soil, an assessment criterion of 33 mgkg⁻¹ free inorganic cyanide and 544 mgkg⁻¹ complex cyanide has been calculated by LEAP. At this stage LEAP has chosen to adopt a conservative screening value of 20 mgkg⁻¹ for total cyanide (essentially the sum of free and complex cyanides) to highlight any potential risks to human health.

Risks to Controlled Waters

RTM (2006)¹⁰ requires receptor-specific Water Quality Standards (WQS) to be used to determine potentially unacceptable risks to water bodies in England and Wales. It requires appropriate criteria to be taken from a hierarchy of sources, where they are available as follows:

1. UK published values
2. EU published values
3. WHO published values

Drinking Water Resources

For groundwater and surface waters that are abstracted for potable supply LEAP uses:

- UK Drinking Water Quality Standards (DWS) from *The Water Supply (Water Quality) Regulations* 2016 (England).
- *The Water Supply (Water Quality) Regulations* 2010 (Wales) as amended in 2016.
- World Health Organisation *Guidelines for Drinking Water Quality*, Fourth Edition, Volume 1, (2011).

Where the groundwater is not abstracted for potable supply, this is a precautionary approach which protects the potential future exploitation of the groundwater.

⁹ Society of Brownfield Risk Assessment (SoBRA) 'Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater' Version 1.0. February 2017.

¹⁰ EA 'Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination' 2006.

Surface Water (Ecological) Receptors

For surface waters as ecological receptors, LEAP uses the Environmental Quality Standards (EQS) from The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015. There are no appropriate EU or WHO standards available.

Petroleum Hydrocarbons

There are no current UK standards available for petroleum hydrocarbons, either for groundwater or surface water receptors, so an initial assessment criterion of 10µg/l, based on the former target concentration for dissolved or emulsified hydrocarbons, is used to represent a conservative preliminary screening value for total petroleum hydrocarbons.

Where considered appropriate, LEAP then follows the guidance of CL:AIRE 2017¹¹ for the further assessment of the petroleum hydrocarbon fractions and derivatives. For a drinking water resource, the WHO guidelines are used. For surface waters as ecological receptors, proxy compounds are used to select appropriate EQS based on recommended indicator compounds, as follows:

- Aromatic EC5-EC7 – benzene
- Aromatic >EC7-EC8 – toluene
- Aromatic >EC8-EC10 – ethylbenzene
- Aromatic >EC10-EC12 – naphthalene
- Aromatic >EC12-EC16 – no proxy
- Aromatic >EC16-EC21 – anthracene
- Aromatic >EC21-EC35 – benzo(a)pyrene

¹¹ CL:AIRE, 2017. 'Petroleum Hydrocarbons in Groundwater: Guidance on assessing petroleum hydrocarbons using existing hydrogeological risk assessment methodologies'. CL:AIRE, London. ISBN 978-1-905046-31-7.

APPENDIX G – Geoenvironmental Analytical Laboratory Certificates

Geoenvironmental
Analytical Laboratory
Certificates



Unit A2
Windmill Road
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BY

THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 21-35995

Issue: 1

Date of Issue: 21/09/2021

Contact: Kleri Tantele

Customer Details: Leap Environmental Ltd
Book House
Glebelands Centre
Dorking
Surrey RH4 3HW

Quotation No: Q14-00063

Order No: LPO-4391

Customer Reference: LP2711

Date Received: 15/09/2021

Date Approved: 21/09/2021

Details: Plot B6 Littlehampton

Approved by:

Mike Varley, Technical Manager

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

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Sample Summary

Report No.: 21-35995, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
251034	HP301 0.05	13/09/2021	15/09/2021	Silty loam	
251035	HP302 0.10	13/09/2021	15/09/2021	Silty loam	
251036	HP303 0.05	13/09/2021	15/09/2021	Silty loam	
251037	HP304 0.60	13/09/2021	15/09/2021	Silty clayey loam	
251038	HP305 0.20	13/09/2021	15/09/2021	Silty loam	
251039	Stockpile 1 0.20	13/09/2021	15/09/2021	Silty loam	
251040	HP301 0.30	13/09/2021	15/09/2021		
251041	HP304 0.05	13/09/2021	15/09/2021		
251042	HP304 0.45	13/09/2021	15/09/2021		
251043	HP305 0.05	13/09/2021	15/09/2021		
251044	HP305 0.50	13/09/2021	15/09/2021		



Results Summary

2683

Report No.: 21-35995, issue number 1

ELAB Reference	251034	251035	251036	251037	251038	251039
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	HP301	HP302	HP303	HP304	HP305	Stockpile 1
Sample Depth (m)	0.05	0.10	0.05	0.60	0.20	0.20
Sampling Date	13/09/2021	13/09/2021	13/09/2021	13/09/2021	13/09/2021	13/09/2021
Determinand	Codes	Units	LOD			
Soil sample preparation parameters						
Material removed	N	%	0.1	76.1	32.8	25.9
Description of Inert material removed	N		0	Stones	Stones	Stones
Metals						
Arsenic	M	mg/kg	1	16.7	13.9	13.7
Cadmium	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Chromium	M	mg/kg	5	30.0	25.9	23.3
Copper	M	mg/kg	5	76.4	29.1	23.3
Lead	M	mg/kg	5	42.5	25.7	28.8
Mercury	M	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Nickel	M	mg/kg	5	27.0	20.1	17.9
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	120	80.1	82.2
Inorganics						
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8
Miscellaneous						
pH	M	pH units	0.1	8.4	8.3	8.7
Total Organic Carbon	N	%	0.01	2.4	0.48	0.85
Polyaromatic hydrocarbons						
Naphthalene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Fluorene	M	mg/kg	0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	M	mg/kg	0.1	0.2	< 0.1	0.1
Anthracene	M	mg/kg	0.1	0.1	< 0.1	< 0.1
Fluoranthene	M	mg/kg	0.1	0.6	0.2	0.3
Pyrene	M	mg/kg	0.1	0.5	0.2	0.3
Benzo(a)anthracene	M	mg/kg	0.1	0.4	0.1	0.2
Chrysene	M	mg/kg	0.1	0.6	0.2	0.2
Benzo(b)fluoranthene	M	mg/kg	0.1	0.7	0.2	0.3
Benzo(k)fluoranthene	M	mg/kg	0.1	0.5	0.2	0.3
Benzo(a)pyrene	M	mg/kg	0.1	0.4	0.2	0.2
Indeno(1,2,3-cd)pyrene	M	mg/kg	0.1	0.4	0.1	0.2
Dibenzo(a,h)anthracene	M	mg/kg	0.1	0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	M	mg/kg	0.1	0.4	0.1	0.2
Total PAH(16)	M	mg/kg	0.4	5.1	1.6	2.5

Tests marked N are not UKAS accredited.

The Environmental Laboratory Ltd. Reg. No. 3882193

Page 3 of 6



Unit A2, Windmill Road, Ponswood Industrial Estate, St Leonards on Sea, East Sussex, TN38 9BY
Tel: +44 (0)1424 718618, Email: info@elab-uk.co.uk, Web: www.elab-uk.co.uk

Results Summary

Report No.: 21-35995, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
251034	0.05	HP301	Brown Soil, Stones, Clinker, Concrete	No asbestos detected	n/t	n/t	n/t	n/t
251035	0.10	HP302	Brown Soil, Stones, Clinker, Concrete, Glass, Brick	No asbestos detected	n/t	n/t	n/t	n/t
251036	0.05	HP303	Brown Soil, Stones, Clinker, Concrete	No asbestos detected	n/t	n/t	n/t	n/t
251037	0.60	HP304	Brown Soil, Stones	No asbestos detected	n/t	n/t	n/t	n/t
251038	0.20	HP305	Brown Soil, Stones, Clinker, Concrete	No asbestos detected	n/t	n/t	n/t	n/t
251039	0.20	Stockpile 1	Brown Soil, Stones, Clinker, China, Concrete, Plant Material	No asbestos detected	n/t	n/t	n/t	n/t



Method Summary

Report No.: 21-35995, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Hexavalent chromium	N	As submitted sample	17/09/2021	110	Colorimetry
pH	M	Air dried sample	17/09/2021	113	Electromeric
Aqua regia extractable metals	M	Air dried sample	17/09/2021	118	ICPMS
PAH (GC-FID)	M	As submitted sample	17/09/2021	133	GC-FID
Total organic carbon/Total sulphur	N	Air dried sample	20/09/2021	210	IR
Asbestos identification	U	Air dried sample	20/09/2021	280	Microscopy

Tests marked N are not UKAS accredited



Report Information

Report No.: 21-35995, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"

LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.
-----	--

Deviation Codes

-
- | | |
|---|--|
| a | No date of sampling supplied |
| b | No time of sampling supplied (Waters Only) |
| c | Sample not received in appropriate containers |
| d | Sample not received in cooled condition |
| e | The container has been incorrectly filled |
| f | Sample age exceeds stability time (sampling to receipt) |
| g | Sample age exceeds stability time (sampling to analysis) |

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month

All water samples will be retained for 7 days following the date of the test report

Charges may apply to extended sample storage

APPENDIX H – Imported Topsoil / Subsoil Criteria

Imported Topsoil / Subsoil
Criteria

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 a minimum of 150 mm of topsoil and a maximum of 300 mm 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 typical of one sample per 150 cubic metres of imported soil – as per the frequencies stated in the main body of the report - 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

³ BS3882:2015 Specification for topsoil

⁴ BS8601:2013 Specification for subsoil and requirements for use

include testing for the contaminants listed in Table I as a minimum. 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 'SP1010: 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.