
FORD LANE
YAPTON, WEST SUSSEX
SOIL RESOURCE SURVEY

Prepared on behalf of:

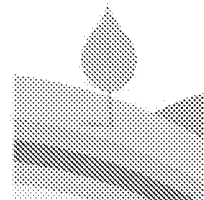
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1.0 EXECUTIVE SUMMARY

The Ford Lane, Yapton site comprises construction of a number of housing units with associated infrastructure, soft landscaping and residential back gardens. The purpose of this investigation is to assess the quality of the existing site soils and to advise on their suitability for re-use in residential back gardens and other soft landscape areas on the development.

At the time of this survey, a part of the site topsoil was in-situ and undisturbed with the topsoil within the western and northern portions of the site having been stripped and stockpiled as part of the archaeological survey and construction of the site compound.

1.1 Summary of Soil Conditions

The following table summarises the soil conditions encountered. Text highlighted in **bold** indicates properties that, without suitable soil management implementations, may have negative effects on the re-use potential of this site soil.

In-situ Topsoil and Stockpiled Topsoil	Chalk
Neutral to slightly alkaline Non-saline Very slightly calcareous Heavy soil texture (silt) Slightly stony Weak soil structure Slightly low to low organic matter and fertility status for landscape purposes	Slightly alkaline to alkaline Non-saline Very slightly calcareous Heavy soil texture (silt) Moderately high stone content Low organic matter

The topsoil contained within the stockpiles was moist to very moist, very plastic in consistency and displayed a severely degraded soil structure (structureless).

1.2 Potential Limitations and Management Options

Major Issues

Physical Degradation

The topsoil within the stockpiles (*Stockpiled Topsoil*) showed signs of physical degradation following operations to strip and store the topsoil. In its current condition, this topsoil will suffer from a lack of drainage and aeration, and should be expected to result in waterlogging after periods of rainfall and anaerobism (oxygen depletion). These conditions make the topsoil unsuitable for landscape purposes. The topsoil could be improved for re-use by 'reconditioning' to restore its soil structure and reaerate the topsoil.

Heavy Textured Soils

The heavy texture of these soils, and subsequent low permeability, could lead to future drainage issues in landscape areas, including residential back gardens. Management solutions to consider include drainage installation, topsoil mounding, sand amelioration, and/or sourcing an alternative topsoil. Plant species selected should be tolerant of heavy, moisture retentive soils.

Weak Soil Structure

The weak structural strength of these soils makes them prone to self-compaction following excavation and respreading. They also do not respond well to mechanical cultivation and tend to settle soon afterwards. These factors, combined with poor drainage properties, result in a soil which is moisture retentive and poorly aerated.

Minor Issues

Low Organic Matter, Total Nitrogen, Phosphorus, Potassium and Magnesium Reserves in Topsoil

A suitable compost application will be required to address the low organic matter, phosphorus and potassium levels.

Moderately High Stone Content In Subsoil

Stones should not restrict the use of this soil where reasonable depths of topsoil (300mm+) are to be placed over the subsoil (eg. tree pits and shrub planting beds). However, the stones may have an impact where a thinner layer of topsoil is placed over this subsoil (i.e. less than 300mm).

1.3 Compliance with the British Standard

The *In-situ Topsoil* and *Stockpiled Topsoil* were largely compliant with the requirements of the British Standard for Topsoil (*BS3882:2015 – Specification for Topsoil – Table 1, Multipurpose Topsoil*) with exception of the deficiencies in organic matter, total nitrogen, extractable phosphorus, extractable potassium and extractable magnesium.

The analysed *Subsoil* horticultural parameters were fully compliant with the requirements of the British Standard for Subsoil (*BS8601:2013 – Specification for Subsoil – Table 1, Multipurpose Subsoil*).

1.4 Overall Soil Quality

Based on our findings, the overall quality (high, moderate, low, very low) of the site soils for re-use on this development are indicated as follows:

Soil Type	Overall Quality
In-situ Topsoil	Low
Stockpiled Topsoil	Very Low
Subsoil	Low

2.0 INTRODUCTION

Tim O'Hare Associates (TOHA) LLP was commissioned by LEAP Environmental Ltd to undertake a Soil Resource Survey at the Ford Lane, Yapton site.

The authority to carry out the work was confirmed via email correspondence with Martin Weil of LEAP Environmental Ltd, dated 2nd December 2020, including official Purchase Order number LPO-2959.

2.1 Purpose

TOHA understands that a residential development is to be constructed at this site, which will comprise the construction of a number of residential units, with associated infrastructure, soft landscaping and residential back gardens.

As part of the development strategy, the site topsoil will be stripped and stored in temporary stockpiles before it is re-used for landscape purposes.

The existing site is currently arable land and, as such, contains significant reserves of topsoil and subsoil. However, there is currently no information available on the horticultural quality, variability and suitability of the soil for landscape purposes within this development.

Therefore, the purpose of this survey is to assess the quality of the site soil to advise on its suitability for re-use for landscape purposes, including residential back gardens.

2.2 Actions

TOHA has evaluated the quality and suitability of the soils for general landscape purposes by a combination of desk study review, on-site investigation and laboratory analysis.

This report issues the findings of the Soil Resource Survey for the Ford lane, Yapton site, including the site observations and soil descriptions, results and interpretation of all analyses, discussion on the soil's quality and its suitability for future landscape construction.

3.0 DESK STUDY REVIEW

3.1 Documents Reviewed

Prior to commencing the site investigation work, the following documents were reviewed:

- *Soil Map of England and Wales - Sheet 6 – South East England (1:250,000);*
- *British Geological Survey Website (Geology of Britain);*
- *Redrow, Clients Pre-Construction Information, Ford Lane, Yapton, Groundworks Phase, Ref: RSC/FLY/GW, October 2020;*
- *Geoff Perry Associates Limited, Ford Lane, Yapton (Southern Parcel), Planning Layout, Drawing No. 065, 02/09/2020.*

3.2 Summary of Findings

Soils and Geology

The Soil Map of England and Wales (1:250,000 scale) classifies the soils as follows:

Major Group	<i>Brown Soils</i>
Group	<i>Argillic brown earths</i>
Subgroup	<i>Typical argillic brown earths</i>
Series	<i>HAMBLE 2 (571z)</i>

Brown soils have dominantly brownish or reddish subsurface horizons with no prominent mottling or greyish colours above 40cm depth. Typical argillic brown earths are loamy or loamy over clayey soils with a subsurface horizon showing significant clay enrichment with unmottled subsoil.

The HAMBLE 2 series is composed of 'Deep, stoneless, well drained, silty soils and similar soils affected by groundwater.

The British Geology Survey shows that the bedrock geology of the area is part of the *Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation And Portsdown Chalk Formation (undifferentiated) - Chalk*, comprising sedimentary bedrock formed approximately 72 to 94 million years ago in the Cretaceous Period.

Superficial deposits were recorded across the entire site, and comprised *River Terrace Deposits (undifferentiated) - Sand, Silt And Clay*, formed up to 3 million years ago in the Quaternary Period. No other superficial deposits were recorded across the site.

Proposed Landscape Uses

The landscape design is at an early stage and was not provided for review. As such, at this stage the soft landscape scheme is likely to include the following:

- Domestic grass lawns;
- Tree planting;
- Shrub beds;
- Communal amenity grass areas.

The majority of these landscape types are undemanding in terms of soil pH and fertility requirements. Several landscape types have specific requirements in terms of soil fertility and drainage requirements and as such, comments regarding the suitability of the soils for these types have been incorporated into the Results of Analysis and Discussion sections of this report.

4.0 SITE INVESTIGATION

4.1 Site Visit

The site visit took place on 8th December 2020, following a period of cold, changeable weather.

The site is located to the north of Yapton, West Sussex and was accessed via a Ford lane. The site was bordered by agricultural land to the north and east, woodland and residential and commercial buildings to the south and North End Road to the west.

The site comprised a single arable field which was reasonably flat and level. The site was vegetated with adventitious weeds. At the time of the site visit a portion within the north of the site had been stripped as part of the archaeological survey and construction of the site compound, as indicated on the site plan as **Appendix 1**.

A total of 3 no. topsoil stockpiles were located within the western and northern parts of the site. These stockpiles were approximately 1 – 1.5m high and devoid of vegetation. The surface of each stockpile appeared to be been 'sealed' by vehicular tracking.

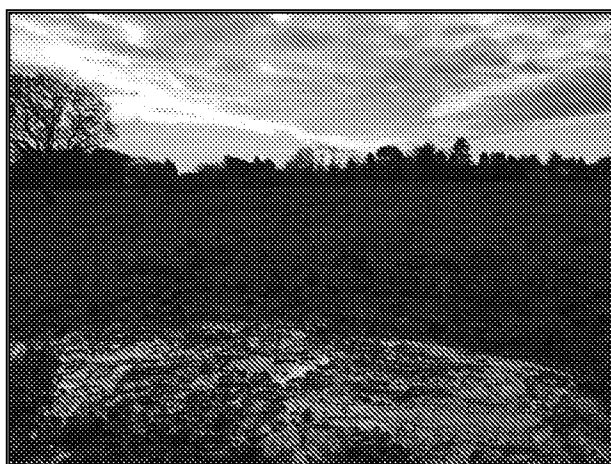


Plate 1: View across site looking east.

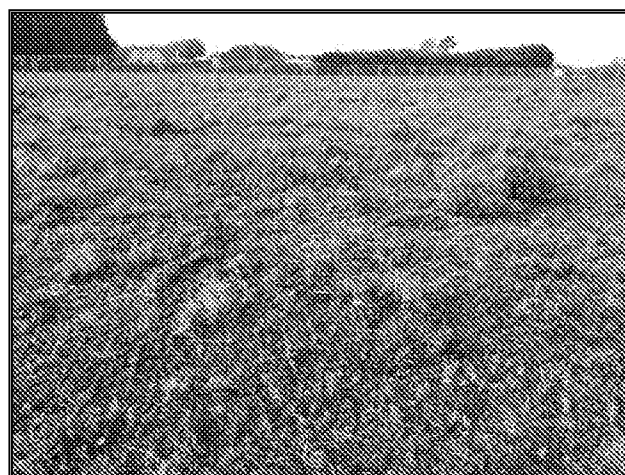


Plate 2: View across site looking south.

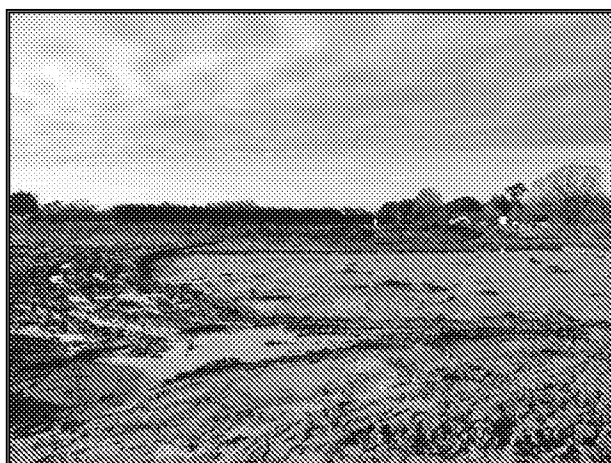


Plate 3: Area of Archaeological survey

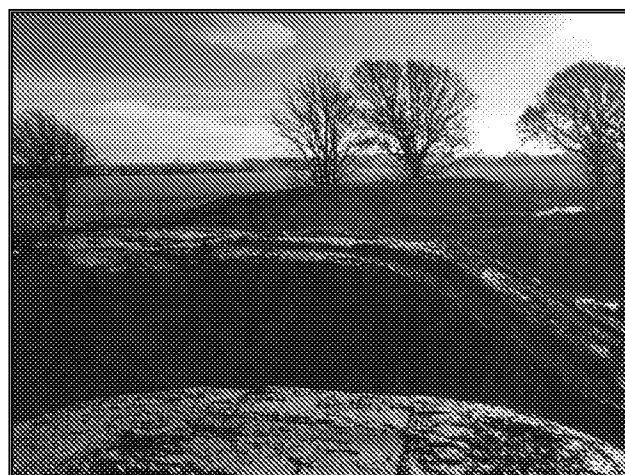


Plate 4: Stockpiled Topsoil.

4.2 Soil Examinations

The soils were examined by constructing a total of 7 No. hand-dug trial holes (TH) at representative locations within the survey areas. Trial holes were dug to a maximum depth of 1000mm where possible. A composite sample was also taken from the stockpiles that were on site at the time of visit.

The locations of our trial holes and existing stockpiles are indicated on the site plan in **Appendix 1**.

At each trial hole, the soils were examined with reference to the Soil Survey Field Handbook. Important physical soil characteristics were recorded, including soil texture, soil structure, compaction, waterlogging, anaerobism, topsoil depths, stone content and the presence of deleterious materials. At the same time, representative soil samples were taken for laboratory analysis.

4.3 Soil Descriptions

In-situ Soil Profile

The in-situ soil profile was consistent in appearance between trial hole locations and was described as below:

Topsoil (All trial holes) GL – 310/390mm Average depth: 340mm	Brown (Munsell Colour 10YR 4/3), slightly moist, friable to slightly plastic, very slightly calcareous SILTY CLAY LOAM with a well-developed, fine to coarse sub-angular blocky structure. Slightly stony, including occasional stones up to 30mm in length. No observable deleterious materials were recorded.
Subsoil (All trial holes) 310/390 – 1000mm	Yellowish brown (Munsell Colour 10YR 4/6), slightly moist to moist, slightly plastic, very slightly calcareous, moderately stony, SILTY CLAY LOAM with a moderately developed structure (weak structural strength). No observable deleterious materials were recorded.

Stockpiled Topsoil

The Stockpiled Topsoil was described as below:

Stockpiled Topsoil	Wet at surface. Slightly moist from below surface, plastic to very plastic, very slightly calcareous SILTY CLAY LOAM, with a poor to massive structure (structureless). Slightly stony, including occasional stones up to 25mm in length. No observable deleterious materials were recorded.
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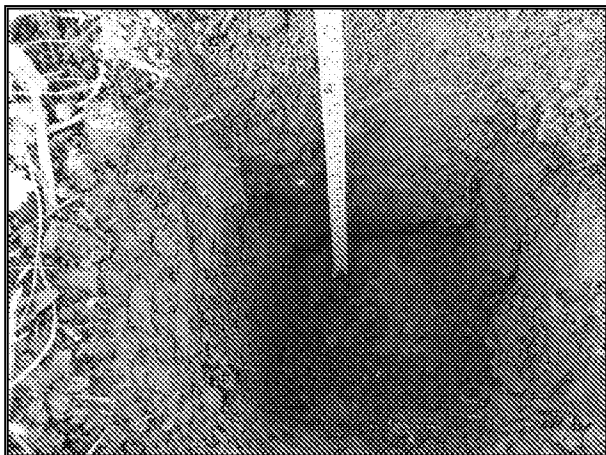


Plate 5: Trial pit at TH1 showing in-situ topsoil

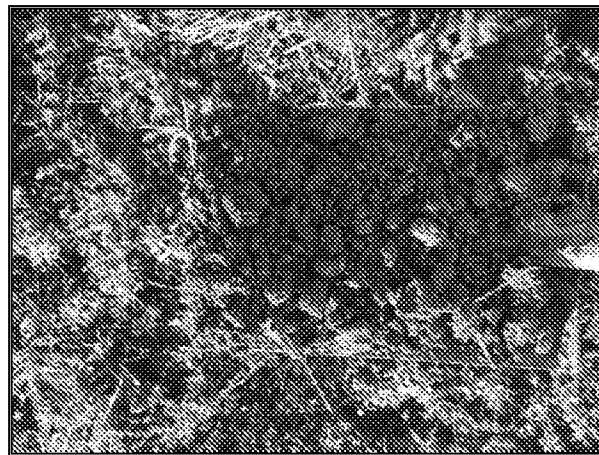


Plate 6: Typical *In-situ Topsoil* arisings.



Plate 5: Typical *Subsoil* arisings.

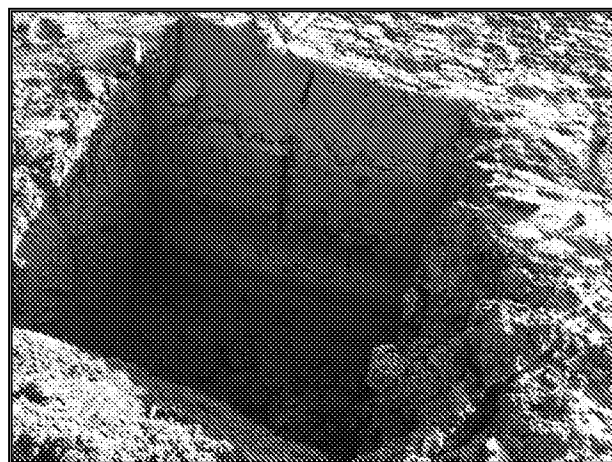


Plate 6: Example of excavation within topsoil stockpile, showing poor soil structure.



Plate 7: Typical *Topsoil* arisings from stockpile.



Plate 8: Example of plastic condition of stockpiled topsoil.

4.4 Topsoil Depths

The following topsoil depths (mm) were recorded during the survey:

Trial Hole Ref.	Topsoil Depth (mm)
TH1	380
TH2	390
TH3	320
TH4	310
TH5	330
TH6	340
TH7	320
Average Depth	340

4.5 Soil Sampling

A total of 6 No. composite samples of were collected from site; 3 No. *Topsoil* and 3 No. *Subsoil*.

The following table details the locations of the sub-samples for each of the composite samples.

Sample Reference	Sub-Sample Trial Hole Locations
<u>Topsoil</u>	
<i>Topsoil Sample 1</i>	TH1, TH2, TH3, TH4
<i>Topsoil Sample 2</i>	TH5, TH6, TH7
<i>Topsoil Sample 3</i>	Stockpiled Topsoil
<u>Subsoil</u>	
<i>Subsoil Sample 1</i>	TH1, TH2
<i>Subsoil Sample 2</i>	TH3, TH4
<i>Subsoil Sample 3</i>	TH5, TH6, TH7

The trial hole locations can be viewed on the site plan located within **Appendix 1**.

5.0 LABORATORY ANALYSIS

5.1 Analytical Schedule

Representative samples (3 No. *Topsoil* and 3 No. *Subsoil*) were submitted to the laboratory for analysis. The samples were analysed in accordance with the following schedule:

- particle size analysis (clay, silt, sand) (*Topsoil* only);
- stone content (2-20mm, 20-50mm, >50mm);
- pH value;
- electrical conductivity values;
- major plant nutrients - N, P, K, Mg (*Topsoil* only);
- organic matter content;
- C:N ratio (*Topsoil* only).

The results are presented on the Certificates of Analyses in **Appendix 2** and an interpretation of the results is given below.

5.2 Results of Analysis

Particle Size Analysis

The *Topsoil* and *Subsoil* samples fell into the *silty clay loam* texture class and would be described as heavy in texture.

Such soils have physical limitations for use in soft landscaping purposes, in particular residential back gardens, areas of amenity grass with high footfall and other demanding uses e.g. backfilling tree pits. Silty soils typically have low structural strength and are therefore prone to structural degradation and self-compaction if excessively handled (e.g. topsoil stripping, storage and respreading). In addition, unlike clay soils, silty soils do not possess the same ability to 'self-repair' by the *shrink* and *swell* mechanism (an important structure forming process), and they usually do not respond well to conventional cultivation. As a consequence, once structurally damaged, it can be difficult to improve the physical condition of silty soils, particularly in the short-term, to a level fit for landscaping.

If these soils are to be used for the proposed landscape purposes, we recommend that only hardy species tolerant of heavy, moisture retentive soil are selected for planting. In addition, smaller plant stock, such as whips and transplants, would be more suited than containerised or rootballed stock, as they tend to be more tolerant of adverse soil conditions. The soils would probably not be suitable for use as a backfill material for tree pits or plants / planting environments that require light or free-draining soil.

The soils are unlikely to perform well in residential back gardens, where they will be prone to compaction and at higher risk of waterlogging, surface water ponding and poor grass growth.

Stone Content

The *Topsoil* samples were slightly stony, including occasional stones up to 30mm in length. As such, it is advisable to remove all stones greater than 50mm in length for soft landscaping areas and stones greater than 20mm in length for residential back gardens and seeded areas of amenity grass.

The *Subsoil* samples had moderately high stone contents and exceeded the limit given in *BS8601:2013 – Table 1*. Stones should not restrict the use of this soil where reasonable depths of topsoil (300mm+) are to be placed over the subsoil (eg. tree pits and shrub planting beds). However, the stones may have an impact where a thinner layer of topsoil is placed over this subsoil (i.e. less than 300mm), for example, in amenity grass lawn areas.

pH and Electrical Conductivity

The *Topsoil* and *Subsoil* samples were neutral to alkaline in reaction (pH 7.0-7.6), with a pH range that would be suitable as subsoil for general landscape purposes.

The electrical conductivity (salinity) values (water and calcium sulphate extracts) were all low, which indicates that soluble salts were not present at levels that would be harmful to plants.

Organic Matter and Nutrient Status

The table below summarises the organic matter contents and fertility status for each *Topsoil* sample.

	Topsoil Sample 1 In-situ Topsoil	Topsoil Sample 2 In-situ Topsoil	Topsoil Sample 3 Stockpiled Topsoil
<i>Organic Matter</i>	x	x	x
<i>Total Nitrogen</i>	✓	o	x
<i>Extractable Phosphorus</i>	✓	✓	o
<i>Extractable Potassium</i>	xx	xx	xx
<i>Extractable Magnesium</i>	x	x	x

✓✓ - well supplied; ✓ - adequately supplied; o - slightly deficient; x - deficient; xx - very deficient

The deficiencies in organic matter and nutrients can be addressed by a routine compost application.

The C:N ratios of all *Topsoil* samples would be considered suitable for re-use in residential gardens.

The organic matter contents of the *Subsoil* samples were low (<2.0%) and consistent with that of subsoil.

6.0 DISCUSSION AND RECOMMENDATIONS

A residential development is to be constructed at the Ford Lane, Yapton site, which will comprise the construction of a number of residential units, with associated infrastructure, soft landscaping and residential back gardens.

The purpose of this investigation is to assess the quality of the site soils by visual examination and laboratory analysis and to advise on their suitability for re-use for landscape purposes, including residential back gardens.

6.1 Summary of Findings

The majority of the site topsoil was 'in-situ' and undisturbed (an average depth of 340mm over the site) and a part of the topsoil had been stripped and stored within 3 no. stockpiles.

From the site visit and subsequent laboratory analysis, the *In-situ Topsoil* and *Stockpiled Topsoil* were found to be relatively consistent in *composition* and may be described as neutral to slightly alkaline, non-saline, very slightly calcareous SILTY CLAY LOAMS with a low stone content, including stones up to 30mm in diameter. The *In-situ Topsoil* and *Stockpiled Topsoil* displayed slightly low to low organic matter and overall fertility status for landscape purposes

The *In-situ Topsoil* displayed a well-developed structure and the *Stockpiled Topsoil* had a significantly degraded soil structure (structureless).

The *Subsoil* was reasonably consistent in character and may be described as a slightly alkaline to alkaline, non-saline, very slightly calcareous, SILTY CLAY LOAM with a moderately high stone content and moderately developed structure (weak structural strength) and low organic matter content.

6.2 Soil Suitability for Re-Use

Physical Limitations

The site Topsoil (in-situ and Stockpiled) is very heavy in texture (silt dominated) which makes it particularly problematic and of a low quality for back garden use. Soil such as this is characterised by being moisture retentive and very poor draining in winter.

Stockpiled Topsoil

The topsoil stored within the stockpiles was moist and plastic in consistency, and now possesses a very poor soil structure. It appears that the *Stockpiled Topsoil* has been physically degraded during stripping/stockpiling. It was most likely wet and plastic in consistency when stripped, and it remains so now with little definable soil structure.

In addition, this *Stockpiled Topsoil* will most likely become anaerobic over time. Persistent anaerobic conditions can subject plants to significant stress. A lack of oxygen can reduce the

roots ability to uptake water and nutrients, and aerobic bacteria are replaced by anaerobic bacteria which produce harmful gases such as ammonia, hydrogen sulphide and methane that can be toxic to plants.

In its current condition, the Stockpiled Topsoil is not suitable for landscape purposes and will require considerable work and time to restore its physical condition to a standard for any landscape purposes. Once reconditioned, the soil's inherent properties will render it a low quality topsoil.

In-Situ Topsoil

If handled and stockpiled correctly, this Topsoil may retain its soil structure and therefore offer some potential for re-use. However, as previously highlighted, the high silt content of this topsoil makes it inherently low quality for landscape re-use and especially in back gardens. Such soils must retain a good soil structure, but at the same time, they are prone to structural degradation when handled. **The outcome is that using this type of topsoil in back gardens carries a considerable risk with it, and there could still be problems with flooding and poor lawn establishment even if the topsoil's soil structure is of a satisfactory quality.**

6.3 Options for Garden Construction

The *Subsoil* is anticipated to offer severe drainage restrictions following the normal construction phases. **Therefore, for all options below, we recommend that the subsoil is thoroughly decompacted and prepared prior to spreading the topsoil.**

Drainage installation may be required for all options at vulnerable locations, e.g. base of slopes and tree pits, as well as other measures to avoid flooding, including sloping patios and gardens away from houses and installation of interceptor drains between topsoil and pathways/patios.

For Option 2 and Option 3 (lower topsoil layer), the *Stockpiled Topsoil* must be fully reconditioned first and it may be preferable to 'screen in' a suitable source of green compost with the *In-situ Topsoil* and *Stockpiled Topsoil* prior to spreading. This operation could be done in combination with removing large stones and would require the topsoil to be in its 'optimum condition', with a well developed soil structure as well as being dry and friable in consistency.

Option 1 – Placement of 300mm Imported Topsoil

Imported topsoil should be a '*sandy loam*' or '*loamy sand*' texture and be compliant with *BS3882:2015*.

Option 1 would be considered to be most preferable in relation to the quality of the completed gardens (and therefore customer satisfaction) and present the lowest 'risk' of delays due to bad

weather during construction. The completed gardens would be **compliant with the British Standard for topsoil (BS3882:2015)**.

This option potentially generates unusable site topsoil as surplus spoil which would need to be accommodated on-site or incur disposal costs off-site. Additional costs for imported topsoil would be incurred.

Option 2 – Placement of 150mm Imported Topsoil over 150mm Site Topsoil

An imported 'sandy loam' or 'loamy sand' BS3882:2015 compliant topsoil and placing 150mm of this material over 150mm of the site-won topsoil.

This option allows for some of the site topsoil to be re-used which reduces the potential volume of surplus spoil. The completed gardens would be **compliant with the British Standard for topsoil (BS3882:2015)**.

This option is reliant on the *In-situ Topsoil* and *Stockpiled Topsoil* having an adequate 'soil structure' following stripping storage and respreading. If the earthworks programme dictates the *In-situ Topsoil* to be stripped and stored during the wetter periods of the year, this option may not be viable due to the damage (compaction) caused to the structure of the topsoil by intensive soil handling. Once the topsoil is damaged, this option could still be feasible if the topsoil can be successfully 'reconditioned' prior to placement.

Additional costs are incurred to import topsoil. Where site-won topsoil cannot be accommodated on-site, any surplus topsoil may need to be disposed of off-site with the associated costs.

Option 3 – Re-Use of 300mm Site Topsoil

If the site topsoil is to be used for the full topsoil depth (300mm).

For this option we recommend that the **upper 50mm** of the upper topsoil layer is ameliorated with a suitable source of sand. The aim is to improve the physical condition of the topsoil surface to help turf establishment.

The sand used should be dominated by *medium sand* (0.25 – 0.50mm) and should be a washed quarried sand. Marine dredged sand or a recycled sand should not be used.

This option allows for the maximum re-use of the available site topsoil, with additional costs for importation of sand only.

As for Option 2, the success of this option is completely dependent on the physical condition of the topsoil being maintained through the earthworks stages. Therefore, this option carries the highest risk of delays through inclement weather and/or severe damage being caused to the structure of the topsoil where the topsoil is handled when moist/plastic.

This treatment will not improve the overall drainage capacity of the topsoil, and therefore the final quality of the gardens should be anticipated to be not as good as Option 1 or Option 2, with the highest risks of waterlogging, turf failure and customer complaints. Following amelioration with compost to address the deficiencies the topsoil will be **compliant with the British Standard for Topsoil (BS3882:2015)**.

6.3 Tree Planting

The following consideration is given to the re-use of the site soils for semi-mature trees.

Semi-mature trees are the most demanding planting environment to construct. Trees of this size and age have grown accustomed to optimum growing conditions in the nursery, and these need to be replicated when the rootballed or containerised tree is planted in the pit. In particular, aeration and drainage around the rootball as well as moderate to high fertility status are critical. Without these properties, trees will very quickly suffer and possibly die during their first few growing seasons after planting.

All rootballed trees should be planted with well-aerated and free-draining soils to the full rooting depth (normally considered to be 1.0m).

Given the anticipated poor drainage properties of the site 'subsoil', it would be important that tree pits do not act as sumps for surface draining water. As a minimum, an appropriate free-draining sand or sandy subsoil should be used as subsoil. Consideration should be given to constructing tree pits with appropriate drainage media and positive drainage where necessary. Other measures such as shallow topsoil mounding should also be considered where necessary.

6.4 Soil Structure & Physical Degradation

It is essential to provide a structured, uncompacted soil profile for the successful establishment and subsequent growth of plants and grass. Adequate soil structure is a key element for healthy plant growth to ensure aeration and drainage within the rootzone. Where the site's development programme requires the soils to be disturbed by activities such as excavation, storage and respreding, soil structure can easily be destroyed by compaction, as can be seen for the Stockpiled Topsoil. The damage sustained to the Stockpiled Topsoil will reduce its drainage rate.

The remaining *In-situ Topsoil* is particularly prone to structural damage if handled and moved when wet due to its silty soil texture. In this situation, the larger (air containing) soil pores are destroyed and replaced by smaller (water retentive) pores. This will restrict gaseous exchange with the atmosphere and cause the topsoil to become anaerobic (oxygen depleted). In addition, the lack of larger pores prevents effective drainage and results in an increased risk of waterlogging.

6.5 Topsoil Handling & Programming

If the site topsoil is to be re-used successfully, structural degradation must be kept to a minimum. In order to achieve this, it is considered best practice to only handle the topsoil when it is reasonably dry and friable in consistency.

The most appropriate time to carry out the topsoil strip will therefore be during the summer months (May/June to September/October), and then only when the topsoil is dry. If the topsoil is dry when it goes into the temporary stockpile, it can be kept dry until it is respread.

If the development's programme requires the topsoil to be handled when moist/wet and plastic, it is inevitable that significant damage is likely to occur to its structure. This damage will be potentially irreparable (particularly in the short to medium term), and planning the programme of earthworks should therefore be carefully considered by the project team at the earliest stage.

Should the topsoil become damaged through wet handling, it may still be possible to repair the damage provided there is sufficient time and dry weather. It will therefore be essential that the *Topsoil Respreading Phase* take place during a summer season, to allow enough time for the soil to dry out effectively and be thoroughly cultivated before soil cultivation and planting/seeding/turfing takes place in autumn (grass seeding) and winter (planting).

If the project's programme results in wet topsoil being respread for planting/seeding/turfing in the wetter/colder winter or following spring months, there is unlikely to be any opportunity to recondition and prepare the topsoil to address the structural degradation caused by the stripping/stockpiling process. Planting into such adverse conditions is likely to result in poor establishment rates and possibly plant failures.

6.5 Conclusion

In summary, the following observed conditions may limit the re-use potential of the soils in their current state:

Major Issues

- Degraded physical condition (*Stockpiled Topsoil*)
- Moisture retentive soil characteristics ('silty' in character);
- Poor drainage properties and high risk of surface water ponding and flooding;
- Weak soil structure;
- High risk of compaction;
- High risk of lawn failures in residential back gardens;

Minor Issues

- Deficiencies in organic matter, total nitrogen, extractable phosphorus, extractable potassium and extractable magnesium;
- High proportion of >20mm stones in subsoil.

The anticipated poor drainage and aeration of these soils once disturbed makes them problematic and with a low potential for re-use for landscape purposes and residential back gardens.

6.6 Soil Management Plan

Careful management of topsoil and subsoil is an important aspect for the sustainable use of soils. With reference to the DEFRA's *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* (2009), a **Soil Management Plan** will be prepared.

The Soil Management Plan will include the following:

1. Treatment of existing vegetation.
2. Methods for stripping and stockpiling soils.
3. Methodology for reconditioning degraded topsoil.
4. Appropriate topsoil depths.
5. Methods for resspreading soils.
6. Soil treatment techniques to ensure a well-structured, uncompacted rooting zone is provided for future landscape construction.
7. Soil amelioration measures including options to improve the quality of the soils by adding fertiliser, compost or sand etc.

We would like to thank Leap Environmental Ltd for entrusting the practice with this commission. We trust this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned for further assistance.



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Soil Scientist



Tim White
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Senior Associate

For & on behalf of Tim O'Hare Associates LLP

Report Qualifications

TOHA's interpretation of the soil conditions is based on observations made during the site investigation and the results of laboratory tests. This report presents TOHA's site observations and test results and the interpretation of those observations and results. On any site there may be variations in soil conditions between these exploratory positions. TOHA can therefore not accept any responsibility for soil conditions that have not been exposed by this investigation.

This investigation considers the re-use of the site soils for back garden and landscape purposes at the Ford lane, Yapton site. It should not therefore be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of the client Leap Environmental Ltd. No warranty is provided to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon by a third party or is used in circumstances for which it was not originally intended.

Appendix 1

Appendix 1 – Site Plan Showing Site Layout and Trial Hole Locations



Site boundary

Archaeological excavation areas

Stockpiles

Trial Hole Locations



TIM O'HARE ASSOCIATES
Soil & Contaminants Consultancy

Client:	Leap Environmental Ltd		
Project:	Ford Lane, Yapton		
Job ref no.	TOHA/21/6563/ML		
Drawing no.	6563/1		
Drawing title	Soil Resource Survey		
Date:	January '21	Scale:	NTS
Drawn by:	ML	Checked by:	TW

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Appendix 2

Appendix 2 – Laboratory Analysis Results



Client:	Leap Environmental Ltd
Project:	Ford Lane, Yapton
Job:	Soil Resource Survey
Date:	January 2021
Job Ref No:	TOHA/21/6563/ML

Sample Reference		
Trial Hole Locations		
Soil Type		

		Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.063mm)	%	UKAS
Sand (0.063-2.0mm)	%	UKAS
Texture Class (UK Classification)	--	UKAS
Stones (2-20mm)	% DW	GLP
Stones (20-50mm)	% DW	GLP
Stones (>50mm)	% DW	GLP

pH Value (1:2.5 water extract)	units	UKAS
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS
Electrical Conductivity (1:2 CaSO ₄ extract)	uS/cm	UKAS
Exchangeable Sodium Percentage	%	UKAS

Organic Matter (LOI)	%	UKAS
Total Nitrogen (Dumas)	%	UKAS
C : N Ratio	ratio	UKAS
Extractable Phosphorus	mg/l	UKAS
Extractable Potassium	mg/l	UKAS
Extractable Magnesium	mg/l	UKAS

Sample 1
TH1-TH4
Topsoil

19
61
20
ZCL
2
4
0

Sample 2
TH5-TH7
Topsoil

25
60
15
ZCL
2
3
0

Sample 3
Stockpiles
Topsoil

25
57
18
ZCL
3
2
0

7.3
120
2040
0.8

7.2
71
2037
0.9

7.0
56
2025
1.2

3.6
0.16
13
27
93
35

3.2
0.14
13
34
92
33

2.8
0.10
16
14
60
49

ZCL = SILTY CLAY LOAM

Results of analysis should be read in conjunction with the report they were issued with



Matthew Lowry
BSc MSc
Soil Scientist

Client:	Leap Environmental Ltd
Project:	Ford Lane, Yapton
Job:	Soil Resource Survey
Date:	January 2021
Job Ref No:	TOHA/21/6563/ML

Sample Reference		
Trial Hole Locations		
Soil Type		
		Accreditation
Clay (<0.002mm)	%	UKAS
Silt (0.002-0.05mm)	%	UKAS
Sand (0.05-2.0mm)	%	UKAS
Texture Class (UK Classification)	--	UKAS
Stones (2-20mm)	% DW	GLP
Stones (20-50mm)	% DW	GLP
Stones (>50mm)	% DW	GLP
pH Value (1:2.5 water extract)	units	UKAS
Electrical Conductivity (1:2.5 water extract)	uS/cm	UKAS
Organic Matter (LOI)	%	UKAS

Sample 4	Sample 5	Sample 6
TH1-TH2	TH3-TH4	TH5-TH7
Subsoil	Subsoil	Subsoil
27	28	27
59	60	57
14	12	16
ZCL	ZCL	ZCL
7	11	18
38	35	20
1	0	0
7.6	7.4	7.3
147	66	53
2.0	1.9	2.0

ZCL= SILTY CLAY LOAM



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Results of analysis should be read in conjunction with the report they were issued with