# 2.5 PRELIMINARY ECOLOGICAL ASSESSMENT

A Preliminary Ecological Assessment of Marble Hill Park was carried out on the 9th of June 2015. The purpose of the assessment was to identify existing habitats, carry out a protected species risk assessment and to make recommendations for enhancing the nature conservation value of the site.

**PROPOSED HABITAT IMPROVEMENTS**

Broadleaved woodland currently covers approximately 6 ha. (22%) of the Park. Much of the canopy cover is very dense and as a result shrub and ground layers are limited. Proposals include to diversify 40% of the woodland areas within the park by clearing many self-seeded species to allow more light into the understorey and encourage a more diverse field and shrub layer. Areas of amenity and semi-improved grassland within the Sweet Walk will see an additional 0.5 ha. of shrub and field layer improvements.

Semi-improved grassland makes up 0.98 ha. (3.6%) of the Park. By relaxing the mowing regime in areas of amenity grassland to encourage a more diverse ground flora, a further 1.3 ha. of semi-improved grassland can be contributed. This is proposed mainly along the northern boundary of the Park, in belts across the East Meadow and to the perimeter of the proposed dog-free area extension in the West Meadow.

New areas of wetland habitat are proposed along the southern boundary of the Park, in the East and West Meadow areas which frequently flood. This will involve diversifying areas of amenity and semi-improved grassland to provide 0.7 ha. of new wetland habitat.

New tree planting is proposed within the Pleasure Grounds, in the form of avenues, groves and orchards, occurring in currently open areas of amenity grassland and as part of the broadleaved woodland diversification. Further tree planting is proposed within the extended bands of semi-improved grassland in the East Meadow.

Note: Further specific survey work has been undertaken in relation to bats, refer to the subsequent section. Additional breeding bird surveys will also take place in the appropriate season in 2017, specifically with reference to the Song Thrush.

NOTE: Full Preliminary Ecological Assessment can be found at Appendix 8.11


Proposed habitat

# 2.6 PRELIMINARY BAT SURVEY

The following is a summary of the Preliminary Bat Survey work, undertaken by FOA Ecology between September 2016 and December 2016. Further survey work to be completed is described below.

Initial bat dusk detector survey work was carried out on the 22nd, 26th and 27th of September 2016. In each instance no roosting bats were identified (observed or detected) to emerge from the Coach House, Marble Hill House, the Grotto nor the Ice House, despite the identification of a single small-sized bat dropping within the Grotto.

Nonetheless, some evidence to infer the likely presence of bat roost(s), in the vicinity of at least one of the buildings in addition to the Grotto, namely the Coach House was identified and in order to confirm the presence or likely absence of roosting bats at these buildings, additional further survey work would be required.

In terms of incidental bat activity, a large amount of foraging and commuting bat activity, dominated by soprano and common pipistrelle, was encountered around both the Coach House and Marble Hill House, whilst a similar amount of incidental bat activity was encountered around the Grotto and the Ice House. In addition to the abundant soprano and common pipistrelle passes, passes by the following species were also detected: Nathusius' pipistrelle, Nyctalus species (either noctule or Leisler's), probable Leisler's and also a single possible long-eared bat pass. Based upon the detector survey work, it is clear that the woodland and grassland areas adjacent to both the Coach House and Marble Hill House possess moderate/high value as bat foraging / commuting areas; the vegetated areas which surround the Grotto and Ice House are expected to be of similar value.

Main Recommendations: Based upon the proposed scope of works, the following further bat survey work recommendations for each building, each of which may be affected by the proposed works, are made:

- Marble Hill House – No further survey work necessary, assuming no external work or works that could impact roof/ eaves / loft spaces (directly or indirectly – the latter by noise, vibration, increased external light spillage etc.)
- Coach House – A formal building inspection (internal and external) is recommended, given that increased external lighting is proposed (see separate light spillage minimisation recommendation below). No further bat detector survey work necessary, assuming no external work or works that could impact roof / eaves / loft spaces or indirect impacts as a result of lighting.
- Store building to the side of Coach House – A formal building inspection (internal and external) is recommended along with a minimum of a single bat detector survey, carried out between May - August. Further bat detector surveys may be required if direct evidence of bats is encountered and / or features which afford the building more than low bat roost potential are found.
- Grotto – If the interior of the grotto is to be opened up, giving public access and / or the interpretation board would obscure / block any suitable bat roost feature(s), then further bat survey work will be required in the form of winter daytime hibernation visits and spring 2017 detector survey work.
- Pagoda - A formal (internal and external) building inspection is recommended. Further bat detector surveys may be required if direct evidence of bats is encountered and / or features which afford the building more than negligible bat roost potential are found.
- Disused toilet block - A formal (internal and external) building inspection is recommended along with a minimum of a single bat detector survey, carried out between May - August. Further bat detector surveys may be required if direct evidence of bats is encountered and / or features which afford the building more than low bat roost potential are found.
- Ticket shed - A formal (internal and external) building inspection is recommended along with a minimum of a single bat detector survey, carried out between May - August. Further bat detector surveys may be required if direct evidence of bats is encountered and / or features which afford the building more than low bat roost potential are found.
- Sports block - A formal (internal and external) building inspection is recommended, if this building is to be affected by the proposed works. Further bat detector surveys may be required if direct evidence of bats is encountered and / or features which afford the building more than negligible bat roost potential are found.
- Buildings associated with Marble Hill Adventure playground – if proposed to be affected by the works, specific bat survey work will be required

Trees / Woodland

- Some tree work will be taking place, including felling and tree surgery within the four woodland quarters to the east, west, south-east and south-west of Marble Hill House. A formal daytime ground-level bat roost assessment of all trees to be felled or subject to tree surgery is therefore initially recommended and should be undertaken during winter months (when there are no leaves on the trees). In addition, further bat survey work in the form of climbing inspections and / or bat detector survey work will be required if direct evidence of roosting bats and / or features which afford the tree with medium or high bat roost potential are found.

With respect to the proposed external lighting of the new café in the Coach House, it is recommended that FOA Ecology has ecological input into the preparation of a bat-friendly lighting scheme for the new café, in collaboration with the project team's lighting engineers.

It is strongly advised that bat data from the London Bat Group (LBG) is purchased and collated, as LBG hold roost records and do not share these with GiGL.

NOTE: Full Bat Survey Report can be found at Appendix 8.12

Pipestrelle bat in flight, courtesy of the Natural History Museum

# 2.7 TREE SURVEY REPORT

The following is a summary of the Tree Survey Report, November 2016, Ref CBA 10677 V1.

In total 66 specimen trees were surveyed as part of the survey which focused on those areas of the park where new interventions were proposed.

A further 24 groups across the whole park were surveyed, within which; Group 1, 2 and 3 (Northern Boundary and Sweet Walk) contained a further 100 specimen trees of note; Groups 4 and 6 (The Pleasure Ground avenues) contained 74 specimen trees of note Groups 7, 8 9 and 10 (Woodland Quarters) contained 48 specimen trees of note, these trees are described in more detail below.

The four Woodland Quarters were considered to clearly form a group entity and were surveyed as such. Where individual trees within the groups were of significant status and clearly identifiable they have been presented as individual trees with root protection areas. However, the dense nature of the group canopy meant it was not possible to provide accurate north, south, east and west canopy spread.

BS:5837 at section 4.2.4 states that *'in the case of woodlands or substantial tree groups, only individual trees with stem diameters greater than 150mm usually need be plotted'* and at section 4.4.2.3 *'Trees growing as groups or woodland should be identified and assessed as such where the arboriculturalist determines that this is appropriate. However, an assessment of individuals within any group should still be undertaken if there is a need to differentiate between them, e.g in order to highlight significant variation in attributes (including physiological or structural condition)*.

NOTE: The term 'group' is intended to identify trees that form cohesive arboricultural features either aerodynamically (e.g. trees that provide companion shelter), visually (e.g. avenues or screens) or culturally, including for biodiversity (e.g. parkland or wood pasture), in respect of each of the three subcategories.

Group 7 South East Woodland Quarter - In addition to the notable trees identified and illustrated opposite the group includes a mix of: Pedunculate Oak, Ash, Yew, Robinia, Field Maple, Sycamore, Holm Oak, Hawthorn, Dogwood, Holly,Cherry Laurel, Portugal Laurel, Spotted Laurel, Elm, Snowberry, Norway Maple.

Key:

- Category A tree
- Category B tree
- Category C tree
- Category U tree
- Tree root protection areas

Group 8 North East Woodland Quarter - In addition to the notable trees identified and illustrated opposite the group includes a mix of: Yew, Sycamore, Ash, Oak, Hornbeam, Elm, Hazel, Laurel, Ivy, Butchers Broom.

Group 9 - North West Woodland Quarter - In addition to the notable trees identified and illustrated opposite the group includes a mix of: Sycamore Lime, Oak, Yew, Holly, Cherry, Laurel, Elder, Ash, Rhododendron, Portugal Laurel, Snowberry, Hornbeam.

Group 10 - South West Woodland Quarter - In addition to the notable trees identified and illustrated opposite the group includes a mix of: Ash, Sycamore, Yew, Beech, Laurel, Elm.

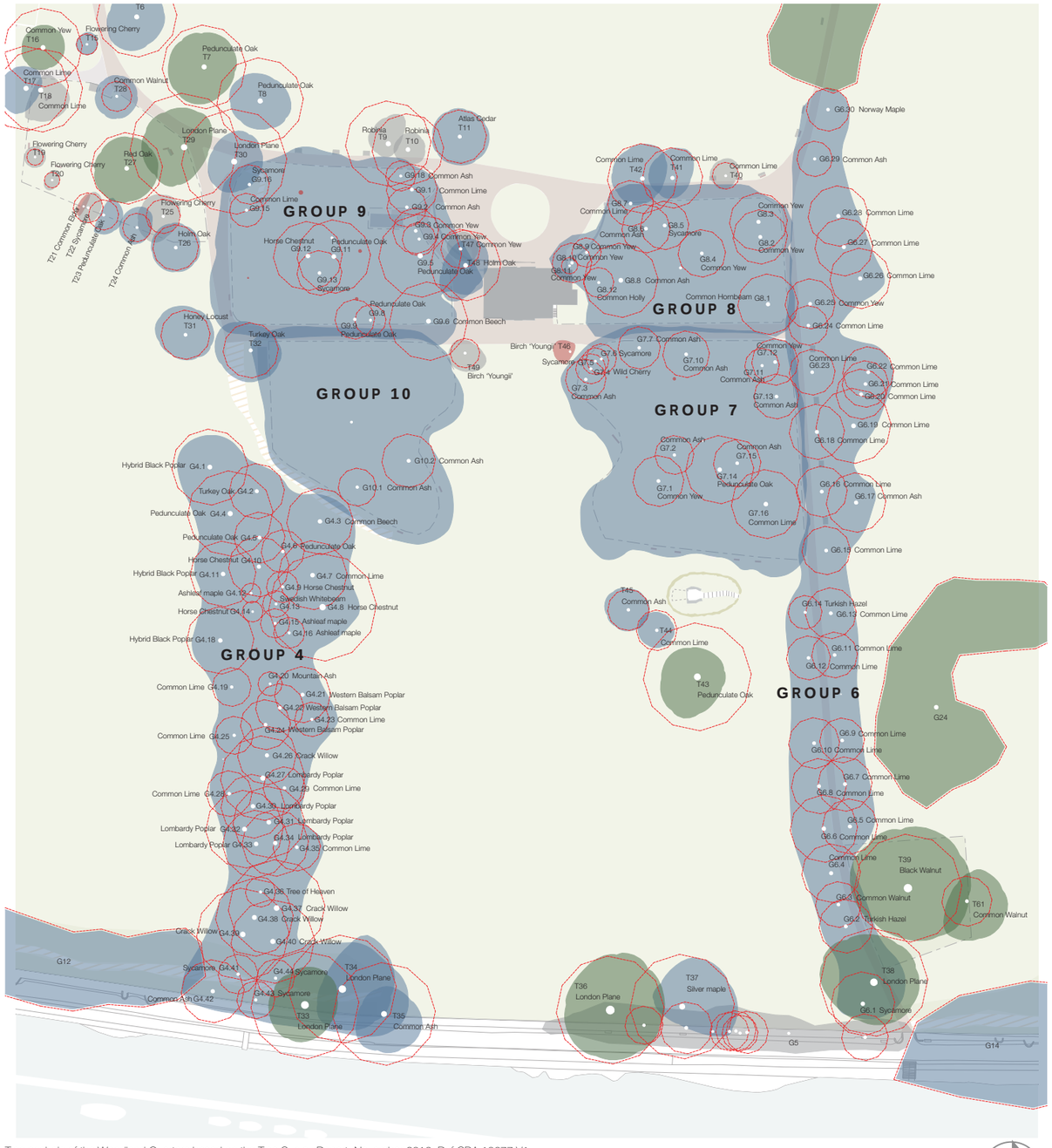
A meeting held with the London Borough of Richmond upon Thames tree officer, representatives from English Heritage, CBA Arboricutural Consultants and J & L Gibbons on January 6th 2017 to review works in advance of a planning application.

The following pre-application advice was provided by the London Borough of Richmond upon Thames:

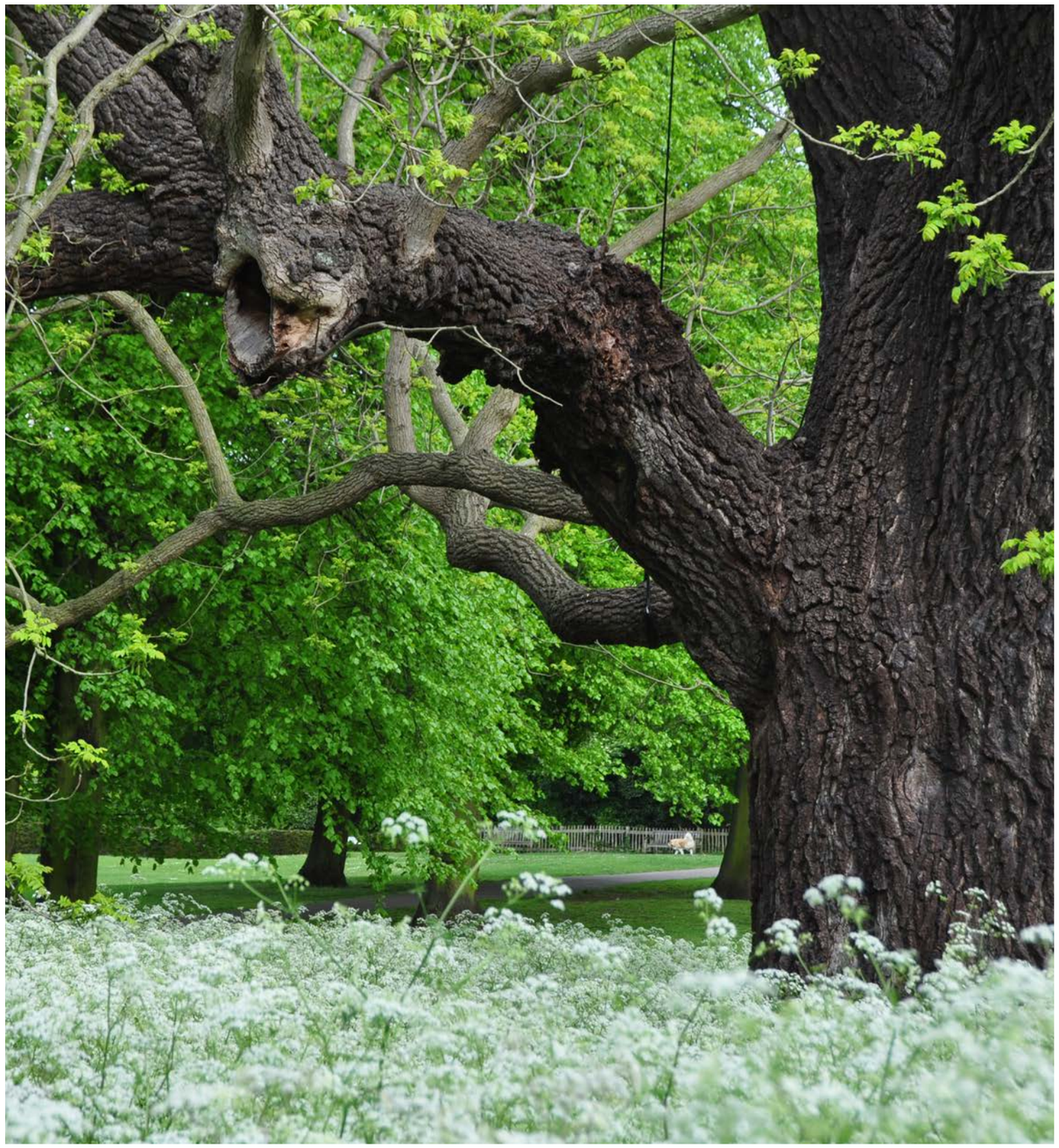
*It is recommended that improvement of the park needs to be done in line with the tree stock:*

- *Any trees of significance in the landscape will be retained as landscape feature and historical reference points*
- *Whilst it is accepted that Sycamore is not native, it is naturalised and therefore should not be eradicated from the landscape. Trees should be measured on their significance and landscape value, rather than species.*
- *A full arboricultural impact assessment is required with a formal submission.*

NOTE: The full Arboricultural limpact Assessment can be found at Appendix 8.13

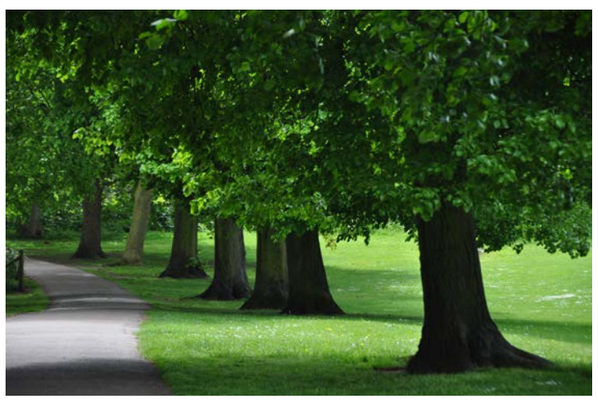



Tree analysis of the Woodland Quarters based on the Tree Survey Report, November 2016, Ref CBA 10677 V1



Black walnut T39

Turkey oak - T65



Lime avenue - G6

Pedunculate oak - T43

# 2.8 SOIL RESOURCE SURVEY

The following is a summary of the Soil Resource Survey Report, December 2016, by TOHA, Ref- TOHA/16/3995/CS

TOHA evaluated the nature of the soils by firstly conducting a desk study review of available information (soil and ecological maps). This was followed by assessing a number of key chemical and physical soil properties by a combination of on-site investigation and laboratory analysis.

**GEOLOGY:**

Bedrock
The bedrock was described as London Clay Formation – Clay and Silt. This consists of sedimentary bedrock formed approximately 34 to 56 million years ago in the Palaeogene Period in a local environment previously dominated by deep seas.

Superficial Deposits
Superficial deposits described as Langley Silt Member – Clay and Silt are located over the majority of the site. These are predominantly wind-blown deposits formed up to 2 million years ago in the Quaternary Period.

In the southern part of the site towards the River Thames, superficial deposits of Alluvium – Clay, Silty, Peaty and Sandy are recorded. These are deposits formed up to 2 million years ago in the Quaternary Period in local environments dominated by rivers.

The site assessment found the soils to be variable in texture over the site, with 3 typical soil profiles encountered, as outlined below:

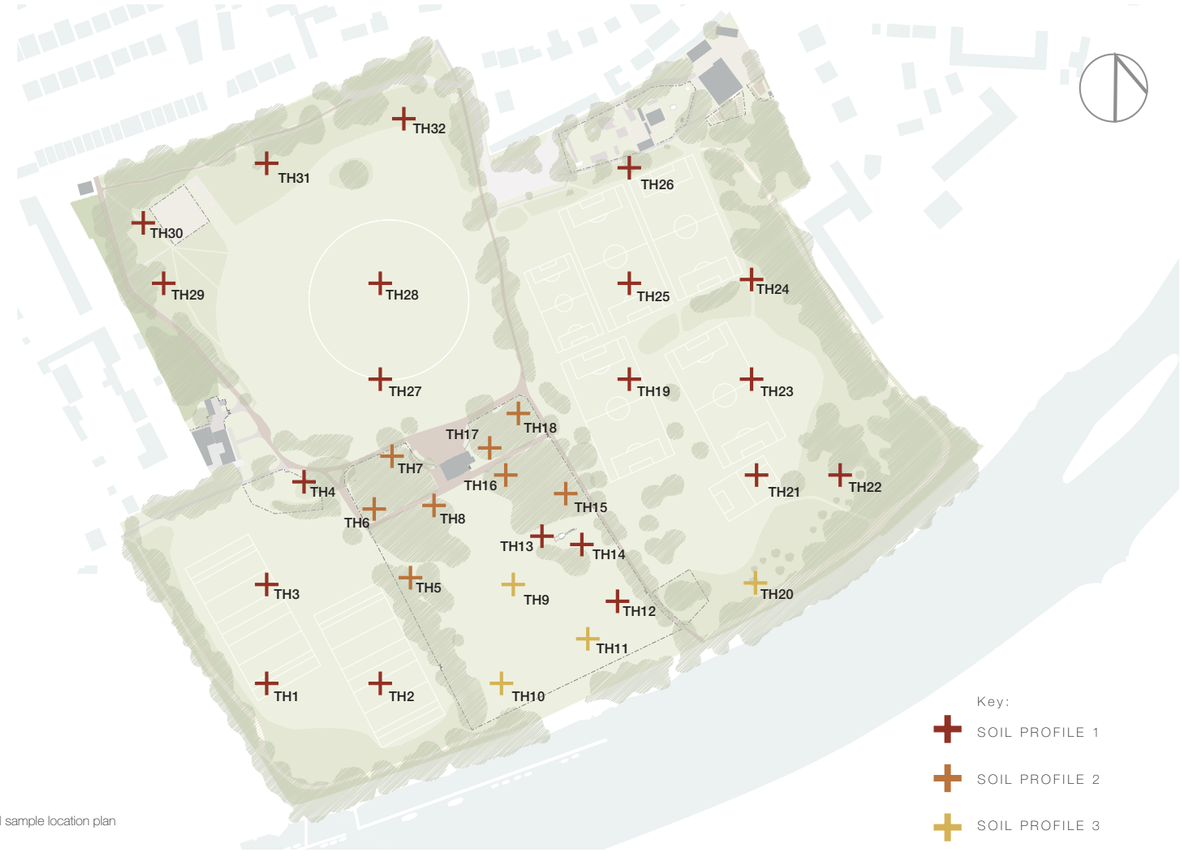
- Profile 1 – Light to Medium Textured Soils. Sandy loam topsoil over sandy loam or sandy clay loam subsoil. This was the most commonly recorded profile and was found at TH1 – TH4, TH19 and TH21 – TH32.
- Profile 2 – Woodland Soils. Similar to Profile 1, including a distinct surface humic layer. Observed within the areas of woodland at TH5 – TH8 and TH15 – TH18.
- Profile 3 – Heavy Textured Soils. Clay loam topsoil over clay loam or clay subsoil. Recorded within the southern part of the site towards the River Thames at TH9 – TH11 and TH20.

**CONCLUSIONS FOR THE RE-USE OF THE SITE SOILS:**

Physical Considerations
Profile 1 and 2 Soils
The 'fineness' and slightly broad particle size distribution of the Profile 1 and Profile 2 soils will make them particularly prone to structural degradation during all phases of soil handling. This would be especially so during and after intensive operations such as topsoil stripping or stockpiling, which are not necessarily going to take place as part of this project, but also includes compaction during initial vegetation removal, cultivation and planting work (e.g. tree pit excavation). At present in their undisturbed state, the soils have sufficient soil structure to enable satisfactory drainage and aeration. However, these structures can easily be lost once such fine textured soil is disturbed.

Provided their physical condition is satisfactory and suitable species are selected, the texture of the Profile 1 and Profile 2 Soils should be suitable for most general landscape applications, including shrub planting, native transplants and grass establishment. The Profile 1 and Profile 2 Topsoils should also be suitable for smaller sized rootballed tree planting, provided they their physical condition is maintained. A suitable imported topsoil would be recommended for larger rootballed trees (e.g. extra heavy standard or semi-mature). The Profile 1 and Profile 2 Subsoils could be prone to self-compaction if placed below the weight of a tree root ball and so are not considered suitable for use as backfill in tree pits for large rootballed trees. An appropriate free-draining, coarser textured sand or sandy subsoil is recommended for backfilling the lower portion of these tree pits.
The presence of glass within the Profile 2 Topsoil inspected could present a safety risk to end users. Appropriate safety precautions would need to be adhered to with regard to presence of glass during any vegetation clearance and subsequent cultivation/planting works. If any of these areas are to be converted to amenity grass, the presence of glass should be considered as the risk of injury to end users may be higher in such areas.

Profile 3 Soils
The heavy texture of the Profile 3 soils and presence of mottling in the subsoil indicates that this soil profile type will be prone to seasonal waterlogging following periods of prolonged or heavy rainfall. It is also likely that these soils will be prone to structural degradation during landscape preparation and planting works which will further reduce their permeability, particularly if they are handled when wet and plastic in consistency. As such, the physical condition of these soils will need to be maintained by careful handling and sensitive soil management to ensure they are fit for planting or seeding.



Soil sample location plan

Provided the soils are left with a satisfactory soil structure, they should be suitable for a range of planting types, provided species tolerant of moisture retentive soils are selected. However, if the structure of the soils is damaged during the landscape works, their usage potential will be reduced significantly.

The heavy texture of the Profile 3 Soils is not ideal for large rootballed tree planting and as such, suitable imported soils are recommended for this purpose.

**CHEMICAL CHARACTERISTICS:**

Soil Reaction
The strongly acid to slightly acid (occasionally slightly alkaline) soil reaction of the Profile 1 and Profile 2 samples (topsoil and subsoil) means that the species selected should ideally have a wide pH tolerance, or have a preference for acidic soils. If it is desired to plant species that prefer or require alkaline soils, a suitable application of lime may be required in the locality of these specimens. However, it would not be practical to amend the pH of the subsoil and therefore, the planting of species that specifically demand alkaline soil is not recommended within the majority of the Park. The Profile 3 soils were alkaline to strongly alkaline in reaction and, as such, specimens planted in the locality of these soils should be tolerant of alkaline soil conditions.

Fertility Status
The topsoils across the site contained sufficient reserves of organic matter and as such, no applications of organic ameliorant (e.g. compost) would be required. The samples contained sufficient levels of total nitrogen and magnesium, with significant deficiencies in extractable phosphorus and potassium recorded within the majority of the samples. The Profile 2 Topsoil contained sufficient levels of all major plant nutrients. The nutrient deficiencies may be addressed by routine fertiliser applications where required.

If it is desired to establish species-rich wildflower grassland habitats as part of landscape improvements, the soil fertility should be considered. Species-rich wildflower grasslands typically require low-nutrient soils, and in particular low phosphorus levels, so that aggressive weeds and grasses such as dandelion, nettle and rye-grass cannot dominate the sward. Moderate to high organic matter and total nitrogen content is desirable to support healthy seed growth. Appropriate management practices (e.g. periodic mowing and collection of cuttings to prevent seed head development) are often necessary to maximise diversity in the sward.

Re-Use Summary
The following section considers the potential to re-use the available soils for a range of general landscape types. It is important to note that for all planting and seeding, the soils must have an adequate structural condition and suitable plant species should be selected.

Further work recommended:
- Soakage tests are recommended for any zones of new tree planting to determine any necessary drainage requirements, particularly if large semi-mature specimens or demanding species are to be selected.
- An additional soil investigation is recommended for the grass areas that are used for events to identify what measures can be taken to improve the physical properties and wear tolerance of the soils. This could also provide input into a grass management plan for these areas.

NOTE: Full Soil Resource Survey can be found at Appendix 8.16

**UXO**
To note: Marble Hill Park has been identified as a site requiring a UXO threat mitigation strategy in place following the report prepared by CET, Explosive Ordnance Threat Assessment (EOTA) January 2017.

Generic Human Health Assessment
In December 2016 CET were instructed to undertake an assessment of shallow soils located beneath two portions of the Marble Hill House study site. The aim of the investigation was to ascertain whether soils exposed by proposed construction works could be impacted by contamination and have the potential to pose a significant risk to human receptors including construction workers and future visitors to Marble Hill House. The portion of the site adjacent to Marble Hill House within which TP06 to TP08 were formed is earmarked for landscaping inclusive of the cultivation of edible plants.

In this instance the assessment criteria that consider a sensitive 'residential with home grown produce' (RwHP) end use have been selected to perform a screen of the data. The recorded concentrations of the various determinants tested were relatively low in all instances and did not exceed the corresponding threshold criteria for either of the end use scenarios considered. Furthermore, asbestos was not encountered in any of the eight samples of Made Ground scheduled for laboratory inspection. Based on the results obtained it is judged that the tested soils are unlikely to pose significant risk to future site users.

Notwithstanding the above it should be noted that a fragment of asbestos was encountered by others in an archaeological trench formed to the immediate east of Marble Hill House. This asbestos is judged to have the potential to pose a risk to future site users by the dust inhalation exposure pathway. In order to provide a better understanding of the risks posed by asbestos in soils we would recommend a supplementary phase of targeted ground investigation to enable to recovery of additional soil samples within the affected area to the east of Marble Hill House.

NOTE: Explosive Ordnance Threat Assessment can be found at Appendix 8.15

| ***Profile 1 – Light to Medium Textured Soils*** | ***Profile 2 – Woodland Soils*** | ***Profile 3 – Heavy Textured Soils*** |
|---|---|---|
| • Sandy loam to sandy clay loam soil textures<br>• Fine textures – significant proportions of 'fines' (very fine sand, clay, silt)<br>• Slightly broad particle size distribution<br>• Virtually stone-free to slightly stony<br>• Acid to slightly alkaline soil reaction<br>• Non-calcareous, with occasionally slightly calcareous subsoil<br>• Non-saline<br>• Topsoil has sufficient reserves of organic matter, nitrogen and magnesium<br>• Topsoil is deficient in phosphorus and potassium | • Humic surface layer – 40-50mm thick<br>• Sandy loam soil texture<br>• Fine textures – significant proportions of 'fines' (very fine sand, clay, silt)<br>• Slightly stony<br>• Strongly acid soil reaction<br>• Non-calcareous<br>• Non-saline<br>• Topsoil has sufficient reserves of organic matter, and all major plant nutrients | • Heavy clay loam to clay soil textures<br>• Virtually stone-free to slightly stony<br>• Alkaline to strongly alkaline soil reaction<br>• Slightly calcareous<br>• Non-saline<br>• Topsoil has sufficient reserves of organic matter, nitrogen and magnesium<br>• Topsoil is slightly deficient in phosphorus and potassium |

Extract of table 1 from the Soil Resource Survey, December 2016

Plate 11: *Profile 1 Topsoil* at TH2 in rugby pitch

Plate 12: Subangular and subrounded, small to medium sized stones within *Profile 1 Topsoil*

Extract of plates from the Soil Resource Survey, December 2016

Table 2: Topsoil Suitability

| *Planting Environment* | *P1 Topsoil* | *P2 Topsoil* | *P3 Topsoil* | *Amelioration / Notes* |
|---|---|---|---|---|
| Larger rootballed trees (extra heavy standard to semi mature) | X | X | X | -- |
| Small rootballed trees (up to heavy standard) | ✓ | ✓ | ✓ | Fertiliser application |
| Containerised shrubs | ✓ | ✓ | ✓ | Fertiliser application |
| Bare root specimens (e.g. trees, shrubs, hedging) | ✓ | ✓ | ✓ | Fertiliser application |
| Amenity grass (not including sports pitches / event spaces) | ✓* | X# | ✓* | Fertiliser application |
| Species-rich wildflower seeding | ✓ | X | ✓ | Post-seeding management recommended |

✓ = *Topsoil* suited to this landscape type provided the topsoil and subsoil are adequately structured, aerated and drained, suitable species are selected and any nutrient deficiencies are remedied through application of an appropriate fertiliser where necessary.

X = *Topsoil* not suited to this landscape type.

* Assuming a low to moderate level of foot-traffic

\# Note, glass present in *P2 Topsoil*, which is not suitable for grass areas

Extract of table 2 from the Soil Resource Survey, December 2016

Table 3: Subsoil Suitability

| *Planting Environment* | *P1 Subsoil* | *P2 Subsoil* | *P3 Subsoil* | *Amelioration / Notes* |
|---|---|---|---|---|
| Larger rootballed trees (extra heavy standard to semi mature) | X | X | X | Drainage assistance may be required depending on species requirements and soil physical condition.<br><br>To be confirmed by soakage tests |
| Small rootballed trees (up to heavy standard) | O | O | X | |
| Containerised shrubs | ✓ | ✓ | ✓ | |
| Bare root specimens (e.g. trees, shrubs, hedging) | ✓ | ✓ | ✓ | -- |
| Amenity grass (not including sports pitches / event spaces) | ✓ | ✓ | ✓ | -- |
| Species-rich wildflower seeding | ✓ | ✓ | ✓ | -- |

✓ = *Subsoil* suited to this landscape type provided the soil is adequately structured, aerated and drained and suitable species are selected.

O = *Subsoil* may be suitable for this landscape type, provided consideration is given to improving the drainage potential.

X = *Subsoil* not suited to this landscape type.

Extract of table 3 from the Soil Resource Survey, December 2016

Plate 13: Yellowish brown *Profile 1 Subsoil*

Plate 14: Strong brown *Profile 1 Subsoil*

Extract of plates from the Soil Resource Survey, December 2016

# 2.9 SPORTS PITCH AGRONOMY SURVEY

Football pitches
The football pitches are currently hired by around 17 different teams, ranging from under 8's up to senior age groups, with varying frequency throughout the year. Four senior sized pitches, one junior and one 5-a-side pitch are currently marked out for hire in the east meadow. The pitches do not suffer from flooding problems, however would benefit from pitch leveling and grass sward improvements. A complementary summer sports programme would enable an extended period of activity and revenue generation on these fields. This programme will be worked up in the development phase.

Rugby pitches
The rugby pitches are hired regularly by three senior teams. There are two rugby league pitches marked out in the west meadow. The pitches do suffer from flooding, making them unusable in some cases. The pitches would benefit from field drainage, decompaction and grass sward improvements.

Cricket pitch
The cricket pitch is currently hired by twelve teams with varying frequency. One pitch is marked out on the Great Lawn to the north of the House and has a synthetic wicket. The pitch would benefit from decompaction and grass sward improvements.

Hard tennis courts (x2)
Two tennis courts are located in the north-west corner of the park. They can be hired on a casual basis, but are also frequently used by private tennis coaches. The synthetic court surface is beginning to deteriorate and would benefit from improvements.

Cricket nets (x2)
Two practice cricket nets are available for hire. The wickets and nets are in need of refurbishment. The nets like the tennis enclosure are visually intrusive and require screening to more sensitivity integrate them into the park landscape.

Sport pitch studies, winter configuration option one - existing

Sport pitch studies, summer configuration option one

Sports fields in the east meadow

The following is a summary of the Sports Pitch Agronomy Survey Report, December 2016, by TOHA.

In December 2016, TOHA carried out an agronomic assessment to ascertain the current condition of the existing pitches and cricket field in line with Sport England guidelines to assess surface evenness, rooting depths, ground cover, weeds, pests and disease.

The survey included a reinterpretation of the findings from the existing Soil Resource Survey (ref. TOHA/16/3995/CS, dated 03/11/2016), to provide information on soil fertility, soil depths and types, compaction and aeration. In-situ topsoil infiltration tests have also been carried out as part of the site work.

**RECOMMENDATIONS**

Levels - subtle regrading

Levels and Microrelief
Major modifications to the overall levels of the pitches are not required, although selective re-grading is recommended, particularly across the football pitches, to remove surface undulations and to create a suitably flat playing surface.

Flooding
The south-western part of the site is susceptible to flooding from the River Thames, which can disrupt use of the rugby pitches whilst the area is flooded.

The most significant problems associated with flooding, aside from disruption of fixtures, are 'silt capping' resulting in loss of surface connection to any new drainage system, together with damage to the grass sward. If a drainage system is to be installed in this zone, it would be sensible to allow for the re-installation of secondary drainage (e.g. sand grooves) following flooding events to maintain the surface connection with the primary drains.

Shade
The rugby pitches and many of the football pitches may be susceptible to shade and leaf fall. As such, the selection of additional seed mixes and maintenance operations would need to take this into account.

Pitch Orientation
The current orientation of Pitch 6 (Junior 7 v 7 pitch) would fall outside the recommended range, however, nearby mature trees to the south alongside the river and to the west may mitigate the effects of low sun in the west.

Soil Quality
The main limitation posed by the topsoil within the sports pitches is associated with its fine texture and broad particle size distribution. Such soils typically have low structural strength and are therefore prone to structural degradation and compaction, especially when they are in a wet and plastic state. These conditions affect the function and usage of the sports pitch, and this is exacerbated if the usage hours over the winter months are high. This is demonstrated by the reduced infiltration recorded in Football Pitch 1, which is understood to be heavily used.

The soils may restrict drainage from the overlying topsoil during periods of heavy or prolonged rainfall. As such, the overall proportions of stone should not constitute a limitation for the sports pitches, provided the soil profile remains undisturbed and good grass cover is maintained. If any regrading is proposed in future, it may be prudent to carry out a stone reduction exercise during the works.

The chemical composition of the soils is generally acceptable for sports pitch grass cultivars, provided the nutrient levels are supplemented by an appropriate annual fertiliser regime. The soil pH in the cricket outfield area was found to be strongly acid (pH 5.0) and as such, application of agricultural grade lime could be beneficial. Perennial ryegrass typically prefers a slightly acid to slightly alkaline pH range (pH 5.5 – 7.5).

Turf Quality
The overall quality of the turf is moderately high in relation to use for the sports catered for. Evidence of wear was observed in play 'hotspots', such as football goal mouths and centre circles. Significant surface undulations were recorded within these hotspots and as such, localised infilling and regrading may be necessary here.

With reference to the supplied background information, the existing maintenance schedule is fairly comprehensive and includes important operations such as aeration, overseeding, localised topdressing and a fertiliser regime. This has achieved a good quality sward on the whole. However, a more intensive maintenance programme may be considered to further improve the resilience of the sward and complement any new drainage infrastructure.

Current Quality and Usage Potential
The overall condition and quality of the existing sports pitches was good, with satisfactory overall ground cover, soil depths, root development and grass species.

Football and Rugby Pitches
The limitations for the winter sports pitches appear to be high usage levels, drainage restriction, and uneven microrelief. The high usage levels on certain pitches have resulted in a deterioration of the playing surface within goal mouths and centre circles. If the same level of usage is to be sustained or increased, additional treatments are recommended to maintain a satisfactory playing surface.

In summary proposals include:

- Selective regrading of football pitches to include stone reduction.
- Drainage to south west pitches and ongoing maintenance of connections to primary drainage.
- Overseed with shade tolerant seed mixes.
- Manage tree canopy to avoid shade issues.
- Fertilize soils.
- Intensify maintenance regime to supplement existing good practice.


Sport pitch studies, pitch study numbering and infiltration locations

Plate 13: Slight wear in goal mouth – Pitch 4

Plate 15: Minor undulation <5 mm

Plate 14: Undulation > 25mm depth – centre circle

Plate 16: Patchy grass colour – cricket outfield

Pitch analysis

**PITCH IMPROVEMENT PROPOSALS**

Football and Rugby Pitches
Football and rugby are winter sports and are therefore often played during wet weather. This means that the grass surface can be subject to wear and tear in unfavourable conditions. Good drainage is essential to support play and potentially increase pitch usage.

In order to increase the quality of the football and rugby pitches and usage hours, a programme of improvements could be considered. A phased approach could be carried out as follows (depending on budget constraints):

- Short-Term Plan
- Medium Term Plan
- Long-Term Plan

Upgraded maintenance (To be implemented)
Surface improvement
Regrading and draining the pitches

Upgraded Maintenance (To be implemented)
Football and Rugby Pitches
In the short term, a more intensive maintenance programme could be considered to encourage a more resilient grass sward to sustain and potentially increase the existing usage levels.

The following additional maintenance treatments are suggested for the football and rugby pitches:

- Topdressing over the whole pitch rather than just the goal mouths
- Two fertiliser applications per annum

Topdressing (To be implemented in part due to budget constraints)
Sand top dressing over the whole of each pitch could be considered rather than just within goal mouths. Sand top dressing, especially when used in conjunction with aeration treatment, improves and maintains water infiltration and surface wear. Application with a drop spreader with drag mat immediately after spiking/verti-draining allows some of the sand to enter the voids created, and encourages grass roots to grow deeper. If it is carried out year on year, it partially replaces the surface soil layer and thereby improves the wear and tear properties of the pitch. Usually an application rate of between 60-80 tonnes per hectare is recommended.

Use of a pure sand topdressing is recommended as opposed to a sand/compost or sand/soil mix. The product should be selected to ensure that the grading of the topdressing sand is compatible with that of the topsoil to reduce risk of particle interpacking.

Fertiliser Application (To be implemented in part due to budget constraints)
At present fertiliser application is carried out once a year during Spring renovation works. Based on the findings of the Soil Resource Survey, the topsoil is deficient in phosphorus and potassium. Phosphorus is important for root growth and potassium is often needed to improve grass wear tolerance and resilience to cold, heat or drought stress. In order to provide greater input of nutrients to the soil over the year, improve colour and prepare the sward for winter, we would suggest also allowing for an Autumn fertiliser application.

Cricket Outfield (To be implemented in part due to budget constraints )
Most of the annual maintenance work to the cricket field focusses on the surrounds of the synthetic wicket (5 metres beyond the edge). This is considered acceptable on the whole as this is where play is typically focused.
An additional fertiliser application is recommended in Spring to prepare the grass for the season.

Lime application is also suggested to raise the pH and improve sward colour. Lime is normally applied every 2 to 3 years. Suitable lime products can include agricultural grade lime or crushed chalk, although some liquid products are also available.

It may be beneficial to carry out fertiliser and lime applications to the whole outfield to improve overall sward quality. Some localised moss treatment may also be necessary in the cricket outfield.

Surface Improvement – Winter Sports Pitches (To be implemented in part due to budget constraints)
Smearing of the topsoil surface on winter sports pitches will reduce infiltration, particularly as the season progresses. Whilst the twice monthly aeration treatment and recommended annual topdressing will help to mitigate this, there are two additional treatments that would improve the general wear tolerance and infiltration of the topsoil. These are topsoil sand amelioration and installation of sand grooves.
Amelioration of the topsoil surface with a heavy application of sand could be made to create a more resilient layer. This would typically involve placing a 25-50mm layer of sand and incorporating it into the upper 25mm of the topsoil surface (e.g. using a power harrow).

To be effective, this operation would necessitate prior removal of the existing grass (e.g. by herbicide application or using suitable equipment such as a Koro Field Top Maker) and followed by establishment of a new sward. The replacement grass will need a period of 'Establishment Maintenance'.

Sand grooves will provide an efficient means of carrying water off the surface and through the topsoil layer. These are small slits (typically 150mm deep and 20mm wide) that are cut into the topsoil at 260mm centres and filled with washed sand. These grooves are forced into the soil with a tine rather than excavating a trench. Therefore, no arisings are created. Sand grooves usually need to be reinstalled every 3-5 years and topdressing is important to retain the integrity of the surface to reduce smearing and capping over the sand grooves.

Sand groove installation alone would not necessitate prior removal of the grass sward, although overseeding is recommended afterwards.

Effective sand groove installation will require the topsoil to be sufficiently consolidated. Therefore, if these works are carried out in conjunction with topsoil sand amelioration, the replacement grass sward should be allowed to establish satisfactorily before installing the grooves.

Regrading (To be implemented in part due to budget constraints)
The microrelief of the football pitches in particular is currently considered quite variable and will adversely affect ball roll during play. In addition, the presence of hollows could encourage water to collect.

Regrading can be carried out in two main ways, either by regrading the topsoil surface or by first stripping the topsoil and regrading the subsoil beneath, prior to replacement of the topsoil to a smooth even grade. The method used will depend on the topsoil depth and height of the undulations. The existing topsoil depth range is reasonably thick and as such, it is unlikely that the topsoil would need to be stripped beforehand, although deeper hollows (e.g. worn goal mouths) are likely to need infilling. Further modelling of levels and determination of topsoil depths at higher resolution will be required to confirm the extent of any regrading works. These works will disturb stones present in the topsoil and as such, stone removal is recommended prior to final levelling and seeding to remove stones from the surface.

Management of Usage (To be implemented in part due to budget constraints)
Careful management of pitch usage is important to prevent unnecessary damage and prolong the life of good quality playing surfaces.
Natural turf pitches that are used in the non-growing season for four games a week spread out over a seven day period will not wear as fast as pitches that accommodate four consecutive games on the same day or on consecutive days.

Cancelling matches when ground conditions are not suitable will ensure increased use in the long term, as the pitch will not become as severely damaged as if it would if played on in poor weather conditions.

Acceptable limits of usage need to be made so as not to make the game either dangerous or unacceptable, and to enable the structure of the surface to be retained to allow future games to take place without weeks of renovation being required.

When a pitch is played on in poor weather the surface can become denuded very quickly, this may substantially increase the cost of renovation works at the end of the season. One game played upon a pitch after or during inclement weather can seriously destroy the structure of the surface; in some instances making the pitch almost unplayable for the rest of the season.

**ESTABLISHMENT MAINTENANCE**

If the existing grass sward is removed and replaced to allow for sand amelioration or regrading works, a programme of maintenance is essential after seeding and before the pitches are used. This is referred to as the Establishment Period and involves a selection of treatments to encourage the growth and establishment of a tight grass sward. 12 month establishment period required.

Further work
In light of our findings, the following additional input is suggested to inform future improvement works to the sports pitches.

- In order to determine the requirements for regrading and drainage works, detailed assessment and modelling work using the existing topographic survey information would need to be carried out.
- It is recommended that a performance led specification is produced for the selected playing field improvement works to ensure that the work can be priced on a like for like basis and to ensure that the desired standard is achieved.
- Soakage tests are recommended to determine the feasibility of soakaways as a means of drainage outfall.

NOTE: Full Sports Pitch Agronomic Assessment can be found at Appendix 8.17