A Preliminary Feasibility Report on behalf of:

Chase New Homes Ltd.

Concerning:

Surface Assessment at Former Friends School Field Open Space and Preliminary Feasibility Study for Ground Improvement:

Date of Submission:

24th April 2025

Author:

[redacted]

Principal Consultant

Sports Turf Consulting Ltd.

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[redacted]

Sports Turf Consulting Ltd, Company Number Company Number 11848233 – Registered in England and Wales
Registered Office: [redacted]

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Object of Visit:

To analyse the site information and make any recommendations as may be required for its suitability for use and/or development into sports pitches to meet Sport England Playing Surface Standards as part of a Feasibility Study.

1. Executive Summary

Key:

	No action required		Action may be required		Action required

1.1 Site Information:

1	Scheme objectives: to investigate the development of new natural grass pitches at the location. The location of the site is Former Friends School Field, Mount Pleasant Road, Saffron Walden, Essex, CB11 3EB
2	This study was completed as a desk study in collaboration and in support of Chase New Homes utilising data from multiple sources to assess the site and its suitability.
3	**Site Location:** The study site is an area of c.1.6Ha. The site is located approximately 91m ASL.
4	**Hydrology:** The development site has no adjacent ditches and water courses to its boundaries. The site does not have an existing positive outlet to an existing drainage scheme. The Standard Period annual average rainfall (SAAR) for this catchment is 590mm/year which is below the national average of 855mm/yr.
5	**Site Land Drainage Output:** Qbar= 7.7L/S/Ha-[1]
6	**Flood Risk:** Based on information sourced from the Environment Agency Flood risk is given as very low risk from surface water, river and sea (<1:1000).
7	**Landfill Risk:** The site is not known to be located over a registered landfill and there are no landfill locations in the near area (within 5km) shown on the DEFRA map.
8	**Groundwater Protection:** The area is above a vulnerable ground water aquifer zone.
9	**Bedrock:** Lewes Nodular Chalk Formation and Seaford Chalk Formation - Chalk. Sedimentary bedrock formed between 93.9 and 83.6 million years ago during the Cretaceous period. **Superficial Geological Deposits:** The Lowestoft Formation forms an extensive sheet of chalky till, together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. The carbonate content of the till matrix is about 30%, and tills within the underlying Happisburgh Formation have less than 20%.
10	**Soil Information:** Soil depth: Deep Parent material: Glacial Till Soil texture: Clay Loam
11	**Soil Sampling:** Soils were found to comprise clay loam textural classification using laboratory testing particle size distribution analysis. Soil water percolation rates are therefore proposed to be low at 1-2mm/hr in normal sports ground usage and therefore not ideal for winter sports but very suitable as base material for the cricket table base construction.
12	**Soil Nutrient and pH Status:** The topsoil has presence of Nitrogen, Phosphorus, Potassium and magnesium mostly within target or marginally excessive values. Soil pH is sufficient to meet the basic needs of a modern sports turf grass seed mix establishing on the land, but borderline. There is a risk of some nutrients being less available due to high soil alkalinity. Soil pH values are appropriate for modern fine leaved perennial ryegrass swards along with other hard wearing grasses like tall fescue, strong creeping red fescue and smooth stalked meadow grass. Soil pH conditions and high calcium content may encourage greater worm casting activity than is desirable.
13	**Agronomic conditions:** The agronomic composition is largely a mix of desirable and undesirable grass species with potential for presence of broadleaved weeds which may have been dormant at the time of site photographs being taken (mid-winter). The surfaces could not be assessed by Performance Quality Standards (PQS) testing due to their overgrown and unkempt condition after being neglected for a number of years as sports pitches.

14	**Performance Quality Standards:** The pitch in the study area would certainly have failed to meet the standard required "basic" quality surface over multiple criteria although it would qualify to do so in other criteria areas. Slope gradient in the playing surface is out greatest concern especially where levels fall away in the SW corner of the site which can be corrected with cut and fill or fill inputs. Soil infiltration rates are likely to be low in a clay loam soil and the predicted rate of infiltration is estimated at 0.255-5.08mm/hr although in our experience such sites would be likely to achieve 1-2mm/hr. New surfaces created by construction work in the concept proposal would exceed basic PQS standards with sound maintenance. Historical images from 2003 and 2005 show the pitches would have failed a number of PQS standards for grass cover and likely other factors such as infiltration and hardness, levels, surface smoothness, etc.
15	**Topography:** The gradients over the site appear to be outside of the Sport England Guidelines and PQS criteria. The proposed project would address this issue to create surfaces to meet standard guidelines for gradients.
16	**Proposed pitch layout and Recommendations:** Recommendations to correct the deficiency in playing surface performance can only be achieved through construction measures to ensure the pitches meet the requirements of the Sport England Guidelines for surface levels and water infiltration and percolation rates. The proposed scheme on the site will require cut and fill or fill works, shallow cultivation, close centred primary drainage scheme at 2.5m maximum spacing with temporary secondary drainage using a VibraSandMaster followed by sand amelioration and seeding. We have generated a draft pitch layout and drainage scheme analysis for the site though there is more detailed work required in Stage 2 Detailed Design & Specification. Drain spacing is suggested at 2.5m with a temporary secondary drainage over it to allow the initial pitch establishment the optimum chance of success. The outlet to the system will be a soakaway design utilising a SuDS systems employing attenuation controlled subterranean cage soakaway. The current system is designed to contain capacity of a 1:100 year output +40% Critical Storm Event. The pitch system is expected to allow infiltration at 5mm/hour and it must be accepted there is a trade-off between fast winter drainage and excessive drought stress on the sward. The site has an annual occurrence of c.15 days of rainfall >10mm/day. It should be accepted that in any greater storm event it will be accepted that the pitches are likely to be closed by their condition in this event.
17	**Pitch Orientation and Size:** The football pitch orientation falls outside approved Sport England parameters for orientation however, the constraints of the site prevent ideal orientation if a cricket table is to be provided. The orientation of the cricket table meets orientation requirements. Safety margin of a minimum 3m is achieved however there is no scope to move pitches around the site therefore maintenance must be particularly careful in restoring football goal mouths at the end of the playing season.
18	**Irrigation:** In view of the dry environment on this site and the need for water supply to the cricket facility and occasional use on the football pitches to aid renovation recovery we have suggested a small scale irrigation system be installed for use on the cricket facility and for small scale use for local irrigation on the football pitches. Football pitch irrigation needs will be mitigated by using drought tolerant grasses, or may not prove necessary at all, except in localised high wear areas. Further investigation work will be required before this can be finalised in both scope and costs and a provisional sum has been shown in cost calculations.
19	**Usage:** Whilst there are no current winter pitches we estimate should there be provision would be likely to provide about 2 hours maximum use per week on this apparently undrained site. Following installation of the scheme we estimate that the capacity of the winter pitches would be increase to between 3-6 hours of play per week. Usage rates are contingent on how the pitches are managed, though this will be less if training takes place which imparts more wear. These values would be up to 50% higher for youth use which generally imparts less damage. The site has no facilities for pitch maintenance currently or equipment which needs to be addressed.

19	Ecology: The client has prepared a separate Ecology Assessment of the site which stands alongside this document.

1.2 Site recommendations:

I. The site in not in possession of a drainage system but it is not currently draining due to good naturalised soil structure and condition aided by high calcium levels in the soil and good plant rooting.

II. Overall grades fail to meet guidelines which is a serious failing in the pitch assessment scheme (PQS). Other PQS factors were not assessed as the site is covered by naturalised grass habitat although it was formerly a school sports ground venue.

III. The soil type is clay loam with good structure. A clay subsoil with flint and chalk fragments is present. We are of the opinion would benefit from an intensive 2.5m spaced primary pipe drainage scheme to achieve efficient land drainage performance requirements without the downside of traditional secondary drainage at 1m centres which would be excessively drought impacting in this low rainfall location. We have proposed a temporary VibraSandMaster secondary drainage treatment to aid establishment and drainage for the first 2 years or so of the facilities life after which the primary close centred pipe drainage system should be sufficient to meet the needs of the site and which can easily be enhanced at a cost of c.£8000 if the need should ever arise (which we do not expect). An attenuation soakaway system is recommended for the outlet as there is no positive outlet possible on this site.

IV. Providing a pitch that would meet Sport England Guidelines for playing surface performance would require a scheme involving:

- ✓ Topsoil strip
- ✓ Potential Cultivation and Re-grading of underlying subsoil or subsoil & topsoil infill in the SW corner of the site.
- ✓ Install drainage at 2.5m centres and attenuated outlet.
- ✓ Significant sand amelioration.
- ✓ Re-establishing turf surface.
- ✓ Improving the grass pitches would increase playability from a maximum of 2 hours per week to 3-6hr/week if managed well (more if juniors playing).

V. Preliminary Cost Estimates without cut & fill or fill estimates are:

PRELIMINARIES	£40,000.00
PART A: EARTHWORKS	£46,356.30
PART A2: CRICKET TABLE	£35,358.00
PART B: DRAINAGE INSTALLATION ON AND OFF PITCH	£92,442.85
PART C: OUTFIELD AND FOOTBALLPITCH AREA SEEDBED PREPARATION, SEEDING AND SAND APPLICATION	£11,712.99
PART D: NON PITCH AREA CULTIVATION AND GRASS ESTABLISHMENT	£2,304.12
PART E: SITE REINSTATEMENT	£1,750.00
PART F: MAINTENANCE	£80,083.47
Part G: MISCELLANOUS ITEMS	£44,889.79
SUBTOTAL	**£354,897.51**
Project Contingency (10%)	*£35,489.75*

TOTAL COST OF CONTRACT (EXCL. VAT) TO FORM OF TENDER	**£390,387.26**

Note:

1. This report should be treated as complimentary document to the IDL report on land drainage for the site.

2. The above costs are very loose guidance to indicate the scale of the costs of site improvement. To create more accurate figures we require further data on outlet constructions and drainage rates at depth and fill/cut and fill analysis. The figures shown are offered to indicate the scale of investment required but should be treated with great caution in these times in increased inflation. .

3. The costs include 12 months initial maintenance but only the first 5 cuts on the new pitches.

4. Project contingency set at 10% but exclude costs of service provision and planning, VAT, other costs e.g. SABS application fees, CLARE administration or professional project management /design fees and planning applications, etc.

5. This report is a preliminary Feasibility Study not a Specification of Works and in no way shall be utilised for specifying works on site as is not the intention of this document.

6. We have not calculated the ecological or other non-pitch related works at this time but it should be born in mind such works can attract further costs. The author is a qualified Ecologist and if you would like our input or liaison we will be pleased to oblige.

Signed:

[redacted]

Director and Principal Consultant
Date: 17th April 2025

2. Introduction and Objectives

Sports Turf Consulting Ltd was commissioned by Chase New Homes Ltd. to investigate the current condition of the site and advise on its potential for potential improvement. The brief was to undertake a Feasibility Study for the improvement of the site to sports pitches to include 2 No. Football Pitches and 1 No. Cricket table (12 strips) natural turf with a practice synthetic pitch. Where appropriate the brief includes advice on outline drainage requirements.

Sports Turf Consulting Limited has endeavoured to uphold normal professional standards in the undertaking of the study and presentation of the findings in this report. We have taken any designs and guidance as far as is possible within the constraints upon us and are confident in the information provided to the client and have identified where further work is required. We stress that we are very keen to help and support and encourage the asking of questions.

3. Scope of Works

The investigation involved:

- Assessment of the existing site conditions.
- Assessment of the areas ability to support usage.
- Where appropriate make comment and outline conceptual appraisal for the feasibility to improve the site to meet Sport England Guidelines for performance requirements.
- To determine the most appropriate development option for the pitch from a technical perspective and/or provide indications of potential options.
- To estimate indicative costs likely to be incurred in the scheme for budgetary purposes and present costed options where appropriate within the scope of information provided by the client.
- To provide an indication of the likely work methodology and work programme in order to present the client the implications of site development works and the duration of the pitch creation process.
- To provide an estimated time frame for pitches coming into playable condition and the post construction maintenance requirements and aftercare required, including pitch usage guidance.
- Advising on the implications for maintenance that the improvement would bring including the requirements for post construction/drainage aftercare.

4. Site Appraisal

The site information provided has been used to assess the site condition to establish feasibility for the development of natural sports turf pitches and is undertaken by [redacted] of Sports Turf Consulting Ltd.

4.1 Location and access

The site address and location is: **Former Friends School Field,**
Mount Pleasant Road,
Saffron Walden,
Essex
CB11 3EB

The development site area is located at:

OS Grid Ref: **TL 54134 37440**

Lat, long: **52.01399, 0.24456**

Elevation: **91 m**

Figure 1: Indicative location of Former Friends School Field Development Site is located by a red boundary. (Not to scale) source 1:25K OS Mapping.

Image Courtesy of Ordnance Survey Licence Number (AC0000861000)

The Former Friends School FieldSports Grounds are accessible from Mount Pleasant Road with the entrance to the site via the north side of the site. Their site shares the following boundaries:

- North – proposed residential property currently open turf field.
- East – residential property
- South – residential property
- West – residential property

Figure 2: Bird's Eye view of the site layout to the former sports ground (the study area is approximately defined with a red outline) with access via the main former school entrance off Mount Pleasant Road.

Image Courtesy of Ordnance Survey Licence Number (AC0000861000)

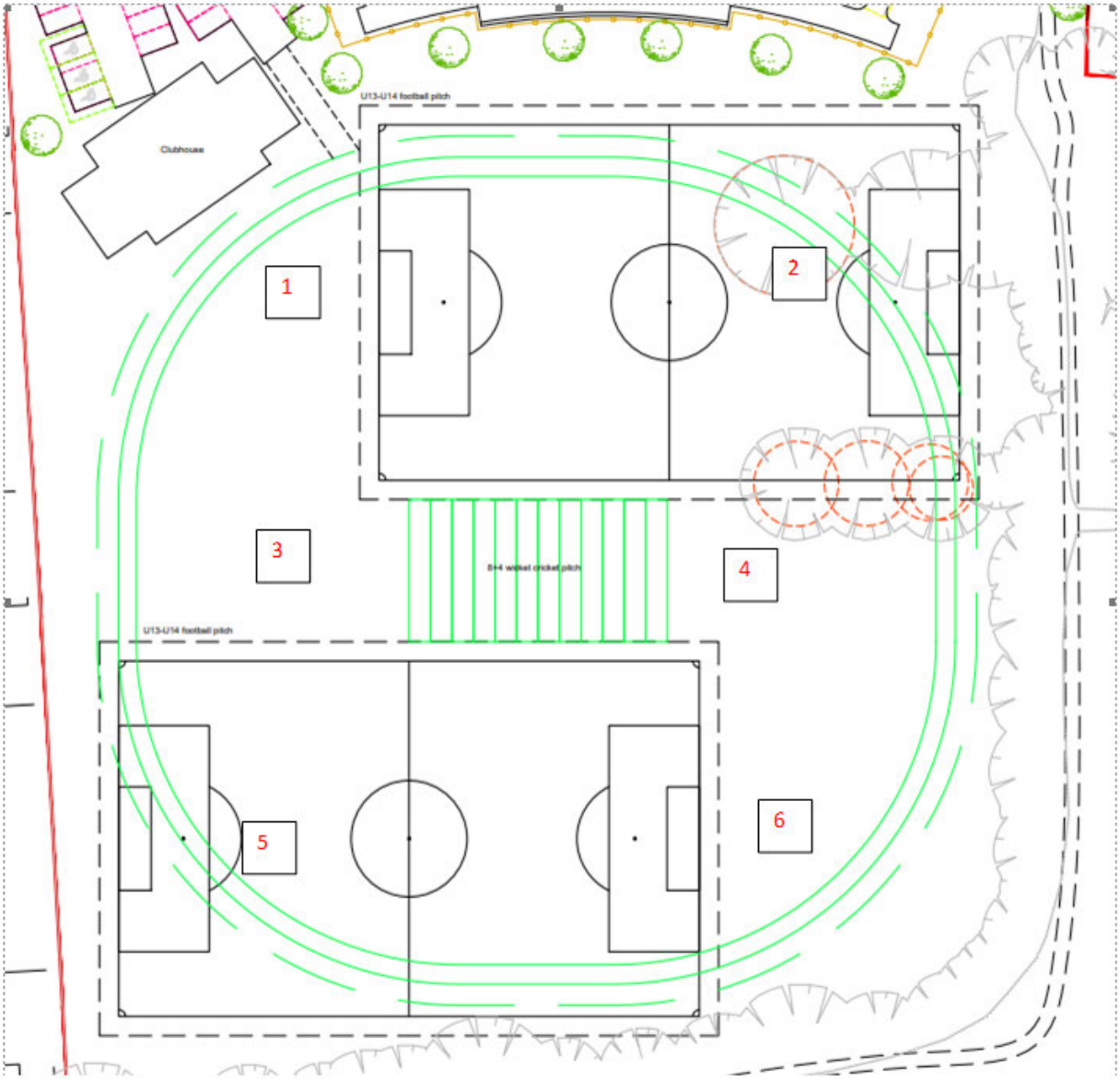
The study site proposal contains

- 2. No. Football Pitch
- 1 No. Cricket table with synthetic pitch

Figure 3: Bird's Eye view of the site with approximate locations approximate test pit investigation locations (pits 1-6). (Areas are indicative and not to scale)

Image Courtesy of Ordnance Survey Licence Number (AC0000861000)

Figure 4: Showing the Proposed Site Layout plan (and approximate locations of soil sample pits)



4.2 Site Photographic Records: Development Area

Plate 1: Location pit 1 showing long grass comprising invasive coarse species e.g. Tall Fescue, Yorkshire Fog, etc. with unkempt and wild growth habit.

Plate 2: Sample location two showing the view north-westwards over the site.

Plate 3: Pit location 3 looking NNW over the site.

Plate 4: Pit location 4 looking North over the site.

Plate 5: Pit Location 5 looking Westerly

Plate 6: View of Soil Pit Location 6 looking North.

Plate 7: Pit One soil profile showing c.30cm of topsoil on site in this location. The soil contains fragments of flint and chalk but mostly is quite clean of material that could be harmful.

Plate 8: Soil Pit 2 showing a clean “fines” dominated topsoil with significant clay and slit is present to a depth of c.200-250mm over the clay dominated subsoil.

Plate 9: Soil pit 3 profile showing clean topsoil to a depth of at least 150mm and topsoil to a depth of c250mm before the brash of chalk and clay subsoil horizon in encountered.

Plate 10: Soil Pit 4 showing a soil profile quite consistent with the other pits shown so far with generally clean topsoil in the top 150mm and increasing stone content of flint and chalk below this depth.

Plate 11: Soil pit 5 showing consistent conditions with the other soil pit excavations.

Plate 12: Soil pit 6 showing consistent conditions with other soil pits on site although it appeared to contain minor brick fragments too and the profile seemed slightly wetter which being a the lower level on the site isn't unexpected.

4.3 Agronomic Vegetation and Site Observation Appraisal

Qualitative Surface Assessment:

General Area:

- The site is an old disused sports field situated on what was a school site. We would estimate it is likely in excess of 5 years since this site was used for sport or received routine turf maintenance.
- There is no evidence of specialist structures or drainage in aerial photographs.
- Turf Length was very variable and in places reached well over the mean height of c.300mm though much of this was old inflorescence spikes and deceased.
- The main grass species were coarse "weed" grasses unsuitable for sports turf facilities and included wild types of Tall Fescue *Festuca arundinacea*, Yorkshire Fog (*Holcus lanatus*), Perennial Ryegrass (*Lolium perenne*), Timothy (*Phleum pratensis*), Creeping Bent (*Agrostis stolonifera*), etc.,
- Broadleaved weeds were not present in any great quantity although the timing of the photographs taken was mid-winter so many species will have been in dormant phase buried within the soil or in seed.
- Growth habit of grass was tall and procumbent simultaneously and a great deal of dead stalks, leaves and senescent growth was present in the base of the sward.
- Organic matter build up was not excessive indicating a positive sign of healthy and well-drained soil.
- Invertebrate pests were not identified during the survey.
- Worms were not noted in any numbers, however in winter time they are often dormant and buried well down in the soil hibernating.
- No signs of phytotoxicity were noted in the vegetation cover observed.

Soil Conditions:

- General levels appeared visually to be of a suitable overall consistent gradient subject to confirmation by levels survey. There was a noticeable surface level reduction in the south west corner of the site.
- Thatch presence was minimal with only a small amounts apparently present which indicates there may be more worm activity at favourable times of year.
- The soil profiles comprise a clay loam or silty clay loam by visual assessment underlain by a clay subsoil with flint and chalk fragments. The profile is very consistent between all the soil pits excavated.
- The pitch shows no signs of drainage installation already being present. However, the length of vegetation and time of year would prevent this being obvious to any observer. We also undertook aerial image assessment and no signs of drainage were present in the pitches study area.
- Topsoil appeared to reach c.250-300mm in depth and largely stone free to 150mm with stone content increasing between 200-300mm depth of a size c.10-30mm. At 250mm+ stone content increased noticeably.
- Underlying subsoil was clay dominated and contained stone and stone fragments comprising chalk and flint pieces and in some profiles traces of baked clay brick or tile fragments.
- Soil samples were submitted for laboratory analysis (see soil testing results below).

4.4.1 Performance Quality Standards (PQS) Assessment of the Proposed Pitch Area

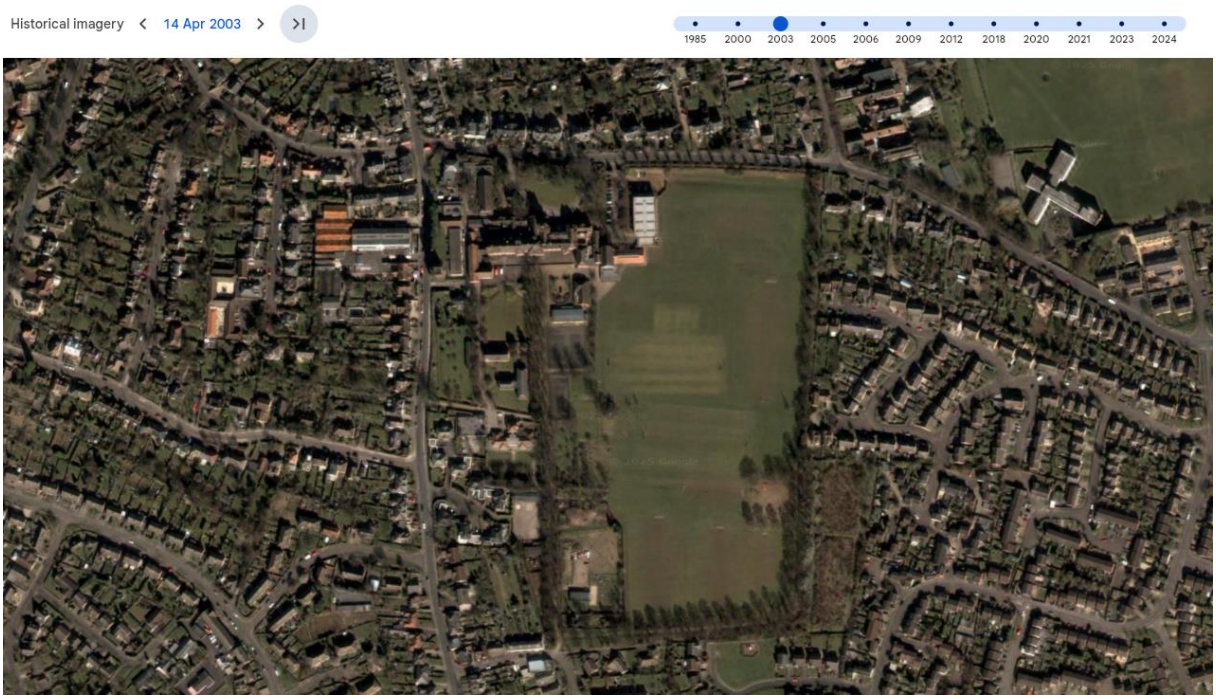
Performance Quality Standards (PQS) are a system of pitch assessment to determine quality of surface and are therefore relevant and useful to the assessment of existing pitches and important in the shaping of their maintenance strategy. Their role in setting out criteria for construction of pitches is important too, especially in areas such as gradient and surface uniformity, defining the finished "product", etc., to ensure the pitch meets suitable standards for use.

The system was created under a collective comprising the Sports Turf Research Institute, National Playing Fields Association and Institute of Groundsmanship and this was adopted by Sport England and the Governing Bodies of Sport (Ref: Appendix 4 of Natural Turf for Sport, 2000 ISBN1 86078 103 9 – 2nd Edition, 2011). Sport England created a pro forma reporting summary for the condition of natural turf sports pitches following the completion of PQS assessment to allow the results to be compared against site minimum acceptable standards.

However, whilst such an approach is useful it could not be deployed at this site such was the condition of the turf surfaces which would render meaningful measurement impossible. We are therefore limited to qualitative and some quantitative commentary of the site but do not consider this hampers the assessment of the site conditions or the recommendations made as a result.

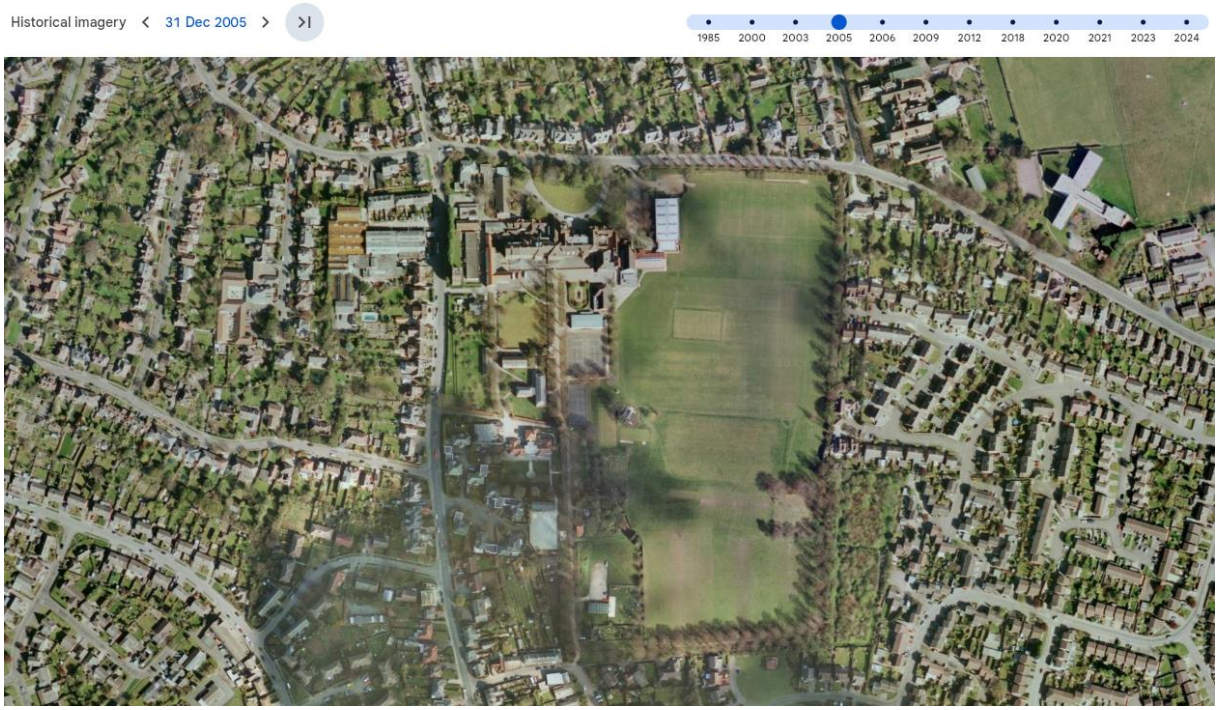
Nevertheless analysis of aerial images of the site in 2003 and 2005 (see below) show very poor grass cover on the pitches and therefore it is likely the pitches would have failed a number of PQS standards for grass cover and likely other factors such as infiltration and hardness, levels, surface smoothness, etc.

Plate 13: aerial view of site in 2003 showing heavy wear on the pitches in the study area.



(credit images: 100% google data attribution – supplied for inclusion by Chase New Homes Ltd.)

Plate 14: aerial view of site in 2005 again showing heavy wear on the pitches in the study area.



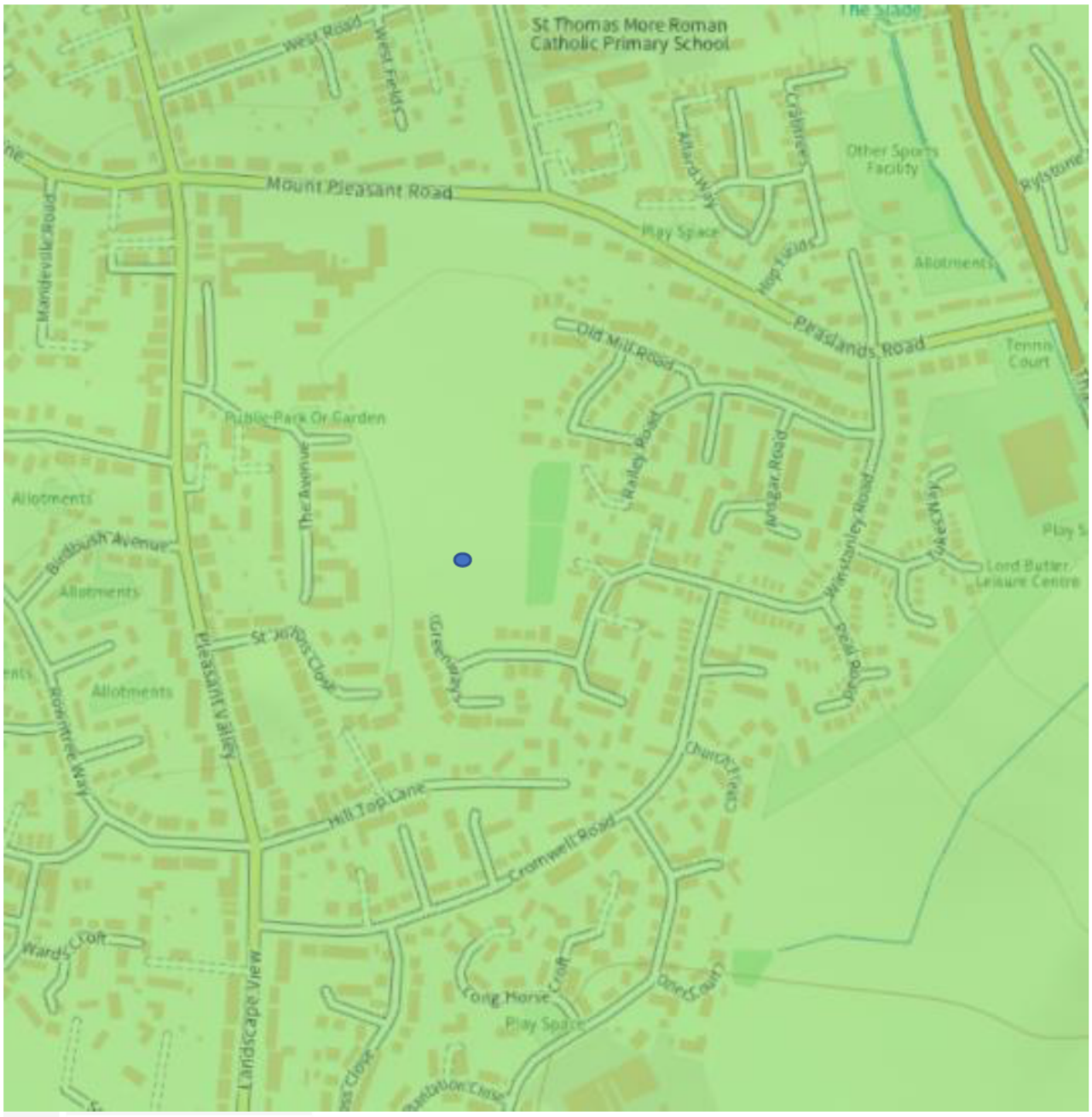
(credit images: 100% google data attribution – supplied for inclusion by Chase New Homes Ltd.)

5. Soils and Geology

5.1 British Geological Survey Data:

Figure 5: Parent Geology of the Site:

Bedrock: Lewes Nodular Chalk Formation and Seaford Chalk Formation - Chalk. Sedimentary bedrock formed between 93.9 and 83.6 million years ago during the Cretaceous period.

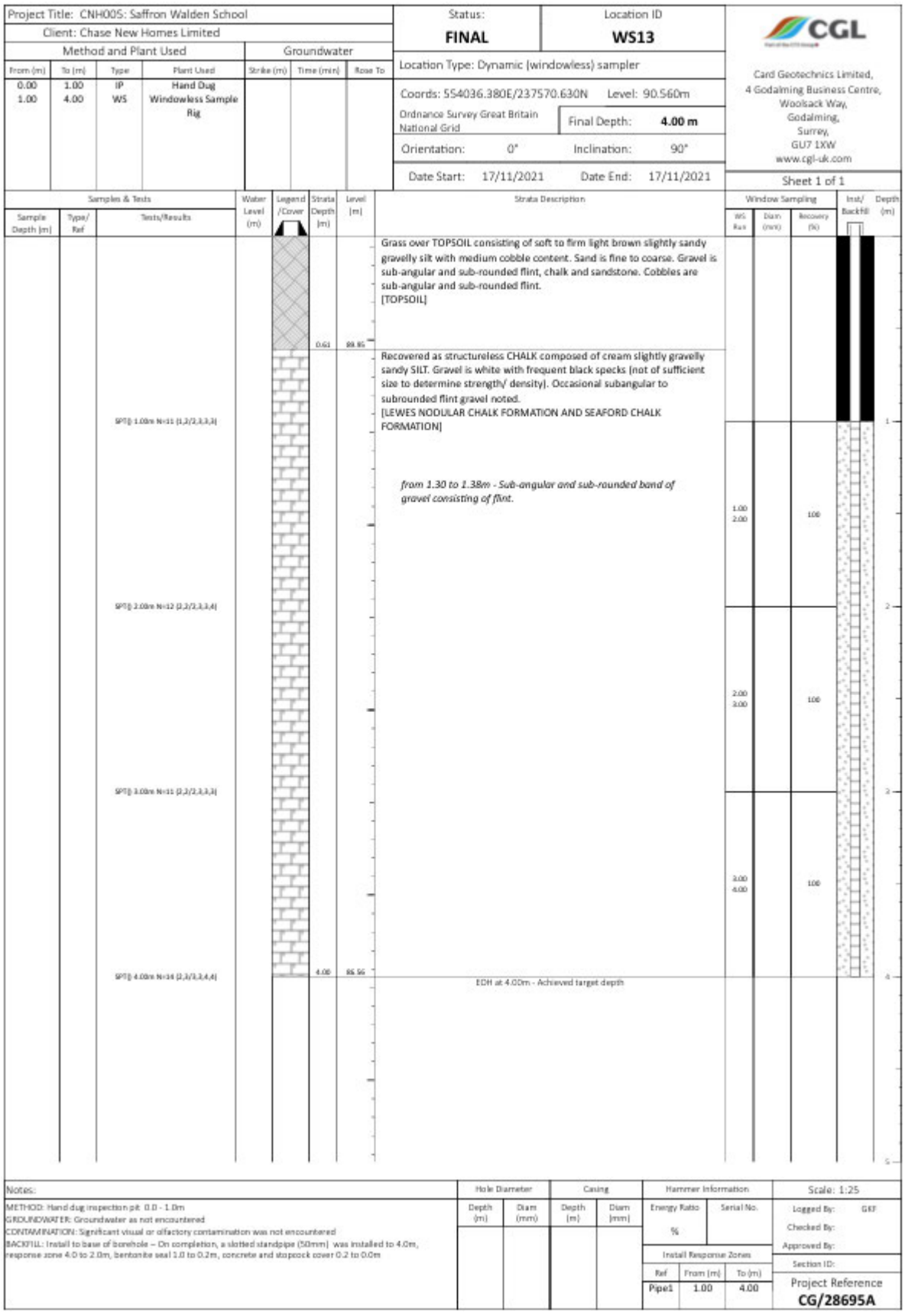


Source: [redacted]

5.2 Borehole Data –

Figure 6: Nearby Borehole Data Sheet: Source CGL "Friends School, Mount Pleasant Road, Saffron Walden Geotechnical and Geoenvironmental Report Feb 2023"

There are no borehole data sheets directly over the sport turf area but the nearest we could locate is WS13 from the above report. It shows c.60cm of native topsoil over structure less chalk to 4mBGL with a thin band of gravel at 1.30-1.38m BGL



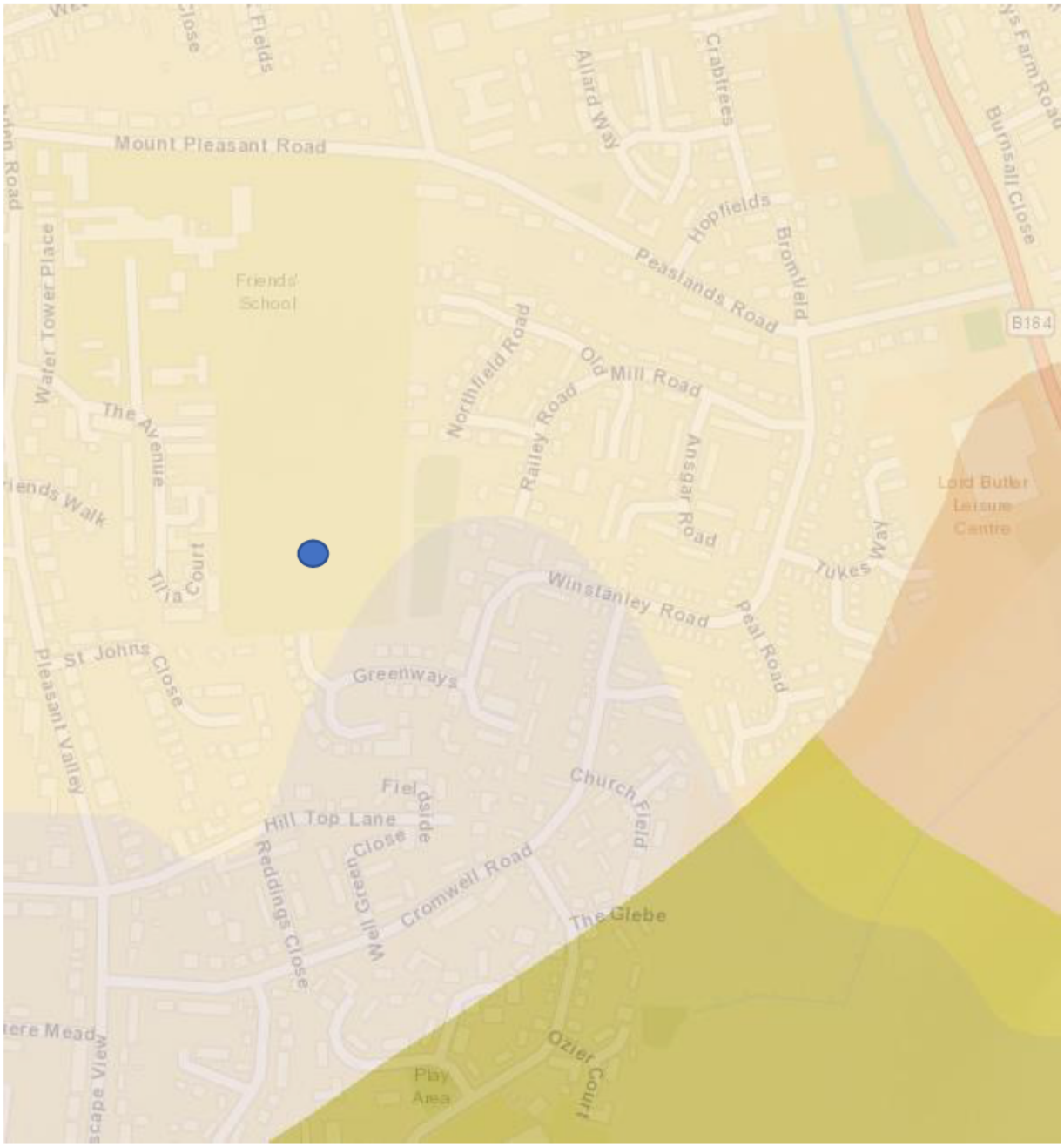
5.3 Superficial Deposits

Figure 7: Superficial Geological Deposits: The Lowestoft Formation forms an extensive sheet of chalky till, together with outwash sands and gravels, silts and clays. The till is characterised by its chalk and flint content. The carbonate content of the till matrix is about 30%, and tills within the underlying Happisburgh Formation have less than 20%.

Source: [redacted]

5.4 Soils Information

Figure 8: Soils Information BGS soils mapping of area:
The soils of the area are largely galcial till derived and comprise a soil texture descirbed as Chalky Silty Loam



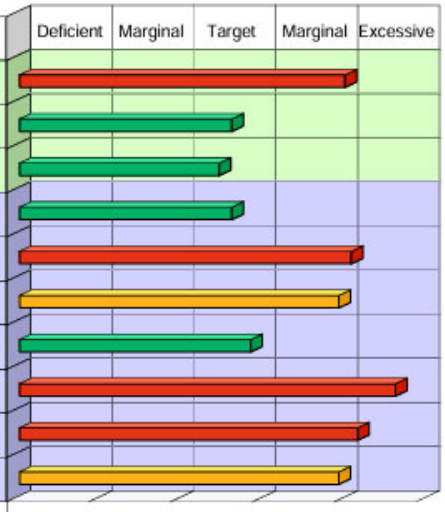
Source: British Geological Survey

5.5 Soil Testing Physical and Chemical Data and Soil Observations:

Sample Ref: PIT 1 TOPSOIL **Soil pH : 7.1**

No cropping details given

	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		45.4
Available Potash - K mg/l	2-		161
Available Magnesium mg/l	2		76
Ammonium Nitrate Extractable Sodium mg/l		1	35.0
Ammonium Nitrate Extractable Calcium mg/l		2	2630.0
Mehlich III Extractable Copper mg/l			6.4
Mehlich III Extractable Zinc mg/l			6.8
Mehlich III Extractable Manganese mg/l		3	117.2
Mehlich III Extractable Iron mg/l		4	253.6
Mehlich III Extractable Sulphate mg/l		5	51.3
Mehlich III Extractable Molybdenum mg/l		6	<0.1
Mehlich III Extractable Cobalt mg/l		7	0.5
Estimated Cation Exchange Capacity meq/100g		8	18.7
Sand (2.00 - 0.063mm) %			30
Silt (0.063 - 0.002mm) %			37
Clay (< 0.002mm) %			33
Textural Classification: Clay Loam		9	



Sample Ref: PIT 1 SUBSOIL **Soil pH : 7.6**

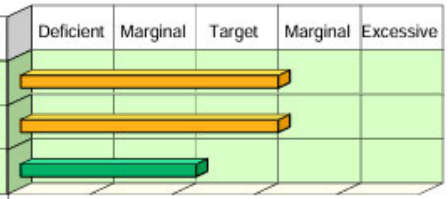
No cropping details given

	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		32.0
Available Potash - K mg/l	2-		132
Available Magnesium mg/l	2		51
Sand (2.00 - 0.063mm) %			31
Silt (0.063 - 0.002mm) %			35
Clay (< 0.002mm) %			34
Textural Classification: Clay Loam		9	

Sample Ref: PIT 2 TOPSOIL **Soil pH : 7.6**

No cropping details given

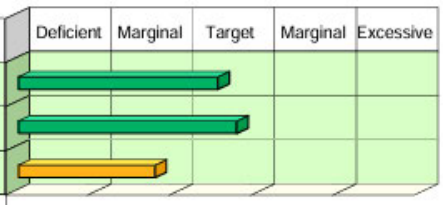
	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		28.8
Available Potash - K mg/l	2+		191
Available Magnesium mg/l	2		58
Sand (2.00 - 0.063mm) %			36
Silt (0.063 - 0.002mm) %			32
Clay (< 0.002mm) %			32
Textural Classification: Clay Loam		9	



Sample Ref: PIT 2 SUBSOIL **Soil pH : 7.8**

No cropping details given

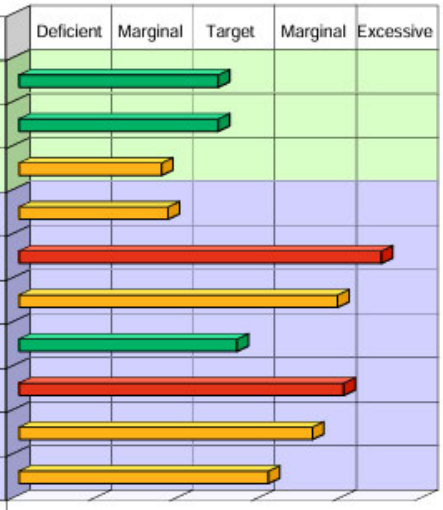
	Index	Notes (*)	Result
Available Phosphate - P mg/l	2		20.0
Available Potash - K mg/l	2-		166
Available Magnesium mg/l	1		44
Sand (2.00 - 0.063mm) %			30
Silt (0.063 - 0.002mm) %			38
Clay (< 0.002mm) %			32
Textural Classification: Clay Loam		9	



Sample Ref: PIT 3 TOPSOIL **Soil pH : 7.9**

No cropping details given

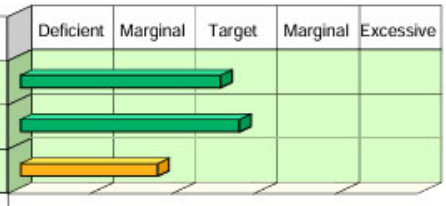
	Index	Notes (*)	Result
Available Phosphate - P mg/l	2		20.2
Available Potash - K mg/l	2-		149
Available Magnesium mg/l	1		45
Ammonium Nitrate Extractable Sodium mg/l		1	22.0
Ammonium Nitrate Extractable Calcium mg/l		2	3220.0
Mehlich III Extractable Copper mg/l			6.4
Mehlich III Extractable Zinc mg/l			6.2
Mehlich III Extractable Manganese mg/l		3	75.7
Mehlich III Extractable Iron mg/l		4	135.8
Mehlich III Extractable Sulphate mg/l		5	39.6
Mehlich III Extractable Molybdenum mg/l		6	<0.1
Mehlich III Extractable Cobalt mg/l		7	0.5
Estimated Cation Exchange Capacity meq/100g		8	22.1
Sand (2.00 - 0.063mm) %			24
Silt (0.063 - 0.002mm) %			51
Clay (< 0.002mm) %			25
Textural Classification: Clay Loam		9	



Sample Ref: PIT 3 SUBSOIL **Soil pH : 8.0**

No cropping details given

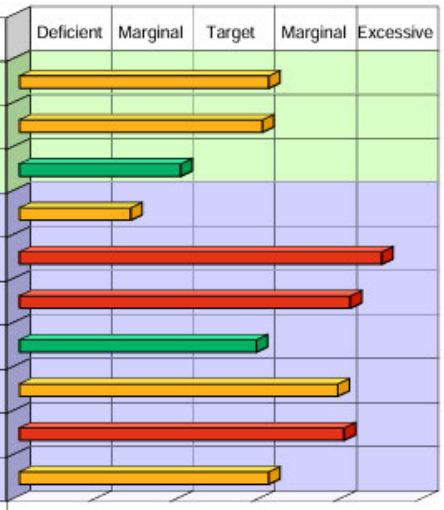
	Index	Notes (*)	Result
Available Phosphate - P mg/l	2		20.2
Available Potash - K mg/l	2-		162
Available Magnesium mg/l	1		43
Sand (2.00 - 0.063mm) %			39
Silt (0.063 - 0.002mm) %			32
Clay (< 0.002mm) %			29
Textural Classification: Clay Loam		9	



Sample Ref: PIT 4 TOPSOIL **Soil pH : 8.0**

No cropping details given

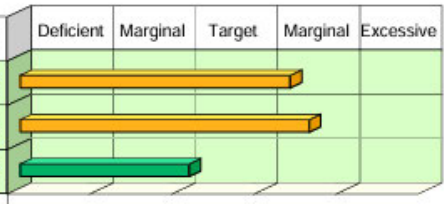
	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		27.4
Available Potash - K mg/l	2+		184
Available Magnesium mg/l	2		51
Ammonium Nitrate Extractable Sodium mg/l		1	15.5
Ammonium Nitrate Extractable Calcium mg/l		2	3275.0
Mehlich III Extractable Copper mg/l			6.9
Mehlich III Extractable Zinc mg/l			7.1
Mehlich III Extractable Manganese mg/l		3	69.5
Mehlich III Extractable Iron mg/l		4	204.0
Mehlich III Extractable Sulphate mg/l		5	39.7
Mehlich III Extractable Molybdenum mg/l		6	<0.1
Mehlich III Extractable Cobalt mg/l		7	0.5
Estimated Cation Exchange Capacity meq/100g		8	22.6
Sand (2.00 - 0.063mm) %			27
Silt (0.063 - 0.002mm) %			46
Clay (< 0.002mm) %			27
Textural Classification: Clay Loam		9	



Sample Ref: PIT 4 SUBSOIL **Soil pH : 8.0**

No cropping details given

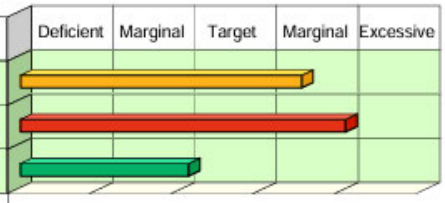
	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		31.8
Available Potash - K mg/l	2+		213
Available Magnesium mg/l	2		56
Sand (2.00 - 0.063mm) %			32
Silt (0.063 - 0.002mm) %			40
Clay (< 0.002mm) %			28
Textural Classification: Clay Loam		9	



Sample Ref: PIT 5 TOPSOIL **Soil pH : 8.0**

No cropping details given

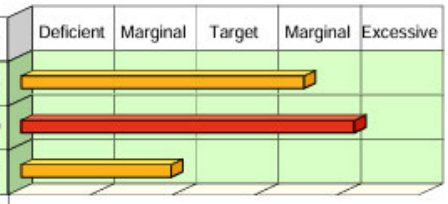
	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		34.8
Available Potash - K mg/l	3		247
Available Magnesium mg/l	2		54
Sand (2.00 - 0.063mm) %			34
Silt (0.063 - 0.002mm) %			38
Clay (< 0.002mm) %			28
Textural Classification: Clay Loam		9	



Sample Ref: PIT 5 SUBSOIL **Soil pH : 8.0**

No cropping details given

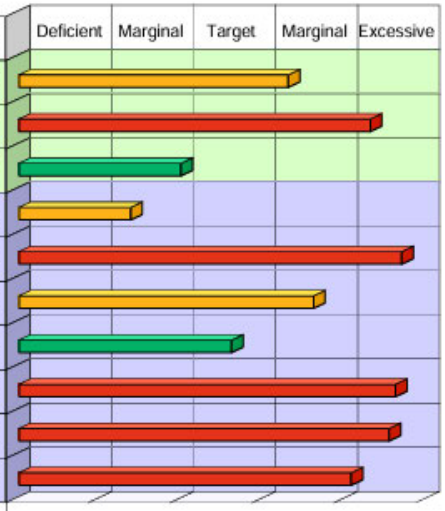
	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		34.6
Available Potash - K mg/l	3		260
Available Magnesium mg/l	1		48
Sand (2.00 - 0.063mm) %			37
Silt (0.063 - 0.002mm) %			40
Clay (< 0.002mm) %			23
Textural Classification: Clay Loam		9	



Sample Ref: PIT 6 TOPSOIL **Soil pH : 8.0**

No cropping details given

	Index	Notes (*)	Result
Available Phosphate - P mg/l	3		32.0
Available Potash - K mg/l	3		293
Available Magnesium mg/l	2		53
Ammonium Nitrate Extractable Sodium mg/l		1	16.0
Ammonium Nitrate Extractable Calcium mg/l		2	3630.0
Mehlich III Extractable Copper mg/l			5.1
Mehlich III Extractable Zinc mg/l			6.0
Mehlich III Extractable Manganese mg/l		3	115.9
Mehlich III Extractable Iron mg/l		4	394.0
Mehlich III Extractable Sulphate mg/l		5	59.1
Mehlich III Extractable Molybdenum mg/l		6	<0.1
Mehlich III Extractable Cobalt mg/l		7	1.1
Estimated Cation Exchange Capacity meq/100g		8	25.3
Sand (2.00 - 0.063mm) %			44
Silt (0.063 - 0.002mm) %			33



Sample Ref: PIT 6 SUBSOIL **Soil pH : 8.1**

No cropping details given

	Index	Notes (*)	Result
Available Phosphate - P mg/l	2		21.8
Available Potash - K mg/l	2+		221
Available Magnesium mg/l	1		49
Sand (2.00 - 0.063mm) %			27
Silt (0.063 - 0.002mm) %			49
Clay (< 0.002mm) %			24
Textural Classification: Clay Loam		9	

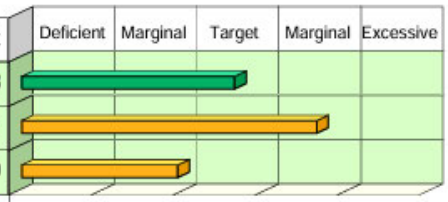
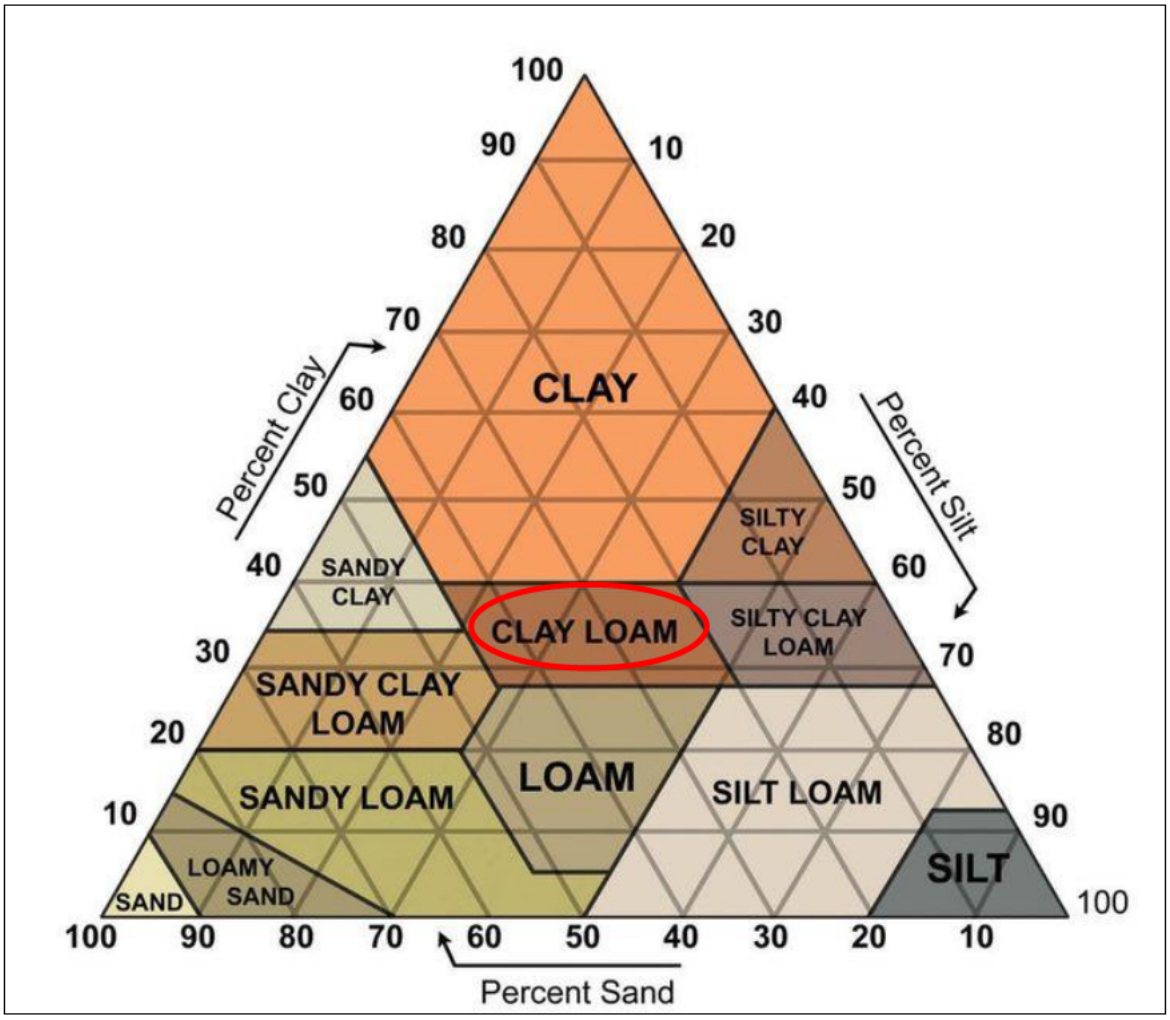


Table 1: Summary Table of Laboratory Data from Field samples

Location	depth	pH	P (Mg/Kg)	K (Mg/Kg)	N (Mg/Kg)	Ca (mg/l)	% OM	sand	silt	clay	Textural Classification
Location 1	topsoil	7.1	45.4	161	76	2630	9.2	30	37	33	Clay loam
Location 1	subsoil	7.6	32	132	51	-	7.6	31	35	34	Clay loam
Location 2	topsoil	7.6	28.8	191	58	-	7.6	36	32	32	Clay loam
Location 2	subsoil	7.8	20	166	44	-	7.5	30	38	32	Clay loam
Location 3	topsoil	7.9	20.2	149	45	3220	6.8	24	51	25	Clay loam
Location 3	subsoil	8.0	20.2	162	43	-	6.5	39	32	29	Clay loam
Location 4	topsoil	8.0	27.4	184	51	3275	6.9	27	46	27	Clay loam
Location 4	subsoil	8.0	31.8	213	56	-	7.1	32	40	28	Clay loam
Location 5	topsoil	8.0	34.8	247	54	-	7.1	34	38	28	Clay loam
Location 5	subsoil	8.0	34.6	260	48	-	6.3	37	40	23	Clay loam
Location 6	topsoil	8.0	32	293	53	3630	6.3	44	33	23	Clay loam
Location 6	subsoil	8.1	21.8	221	49	-	6.7	27	49	24	Clay loam

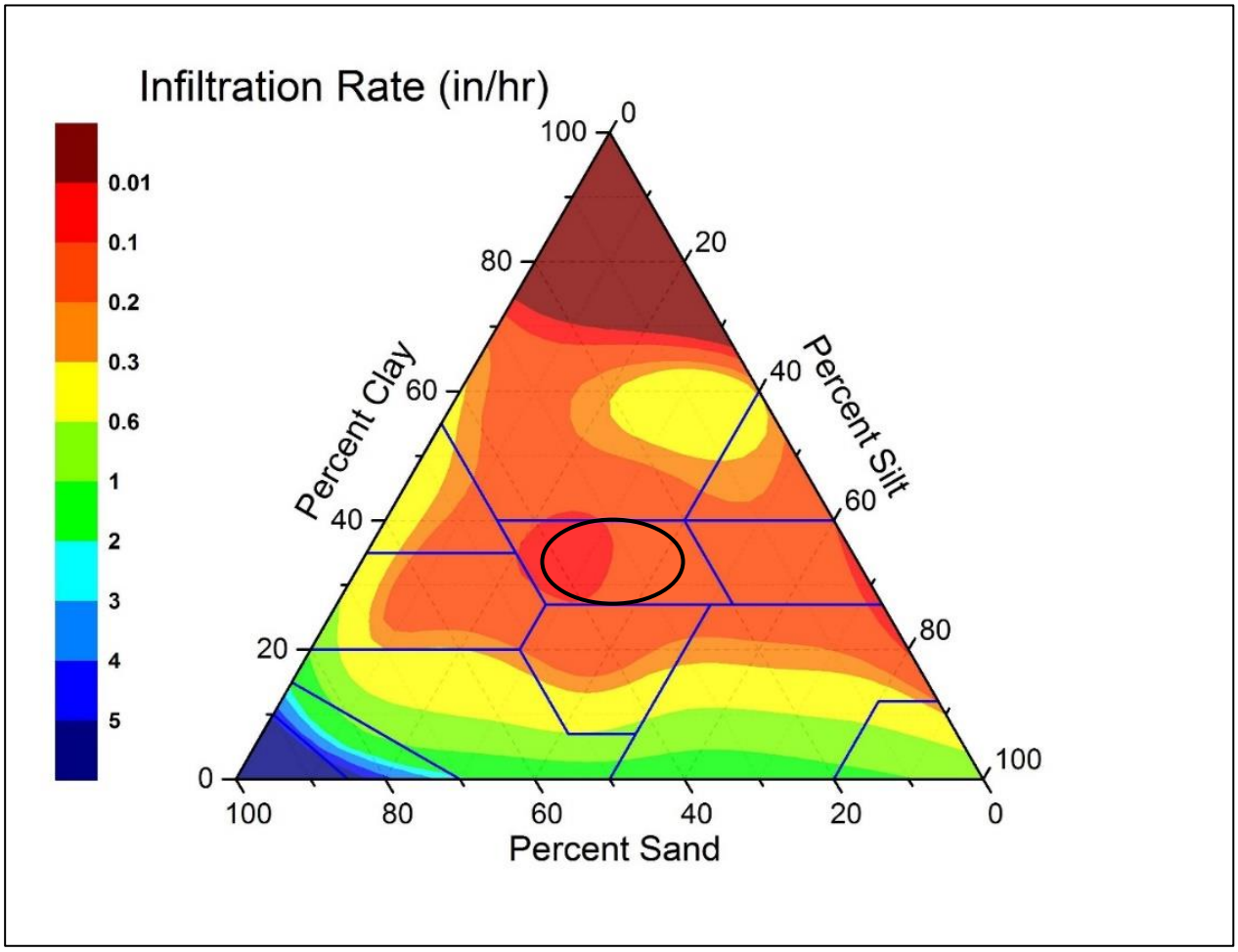
5.6 Topsoil Textural Classification:

Figure 9: Soil textural classification based on testing results shown in the red "circle" identifying the range and spread of soil textural classification found on site which is quite closely associated as clay loam topsoil and subsoil and reflects the sedimentary nature, the mix of the parent material on site and probable movement of soils around the site historically. We are unable to ascertain if the site may have been cultivated and regraded in the past from site observations. The soil type has the correct textural classification for cricket use and this will facilitate the base preparation of the cricket table.



5.7 Interpretation of soil Physical Data: awaiting laboratory data

Figure 10: Utilising the USDA soil triangulation system for infiltration rate estimates.
Based on particle size distribution (note USA system slightly different from UK) the infiltration value is predicted (the Former Friends School Fieldsoil type rough location identified by black circle) to be 0.01-0.2"/hr^{-1} (equating to 0.254 -5.08mm per hour <u>in natural condition</u> with good soil structure. However in a sports ground situation our experience in this type of soil even with high calcium presence which aids soil flocculation is typically equal to or less than 1-2mm per hour in the author's experience.



Source: USDA

5.8 Summary of Soil Data and Implications for Sports Turf Facilities Creation.

The following general themes Identified from the analysis of the data and observations

<u>Topsoil</u>

- Soil profiles are clear of significant stone it appears in the upper 150mm of the topsoil which enhances safety in the playing surface and improves seed bed preparation.

- pH values are on the alkaline side of neutral and this has a number of implications including:

➢ Grass Species Preference - sports turf grass species are typically suited to mildly acid soil types for their preferred zone of tolerance though effectively it is the most

tolerant grasses that succeed in surviving and are most capable of enduring wear and other factors. From an academic perspective the soils are more alkaline than desirable but the parent material and subsoil will for an eternity ensure this is the way of things. For this reason we would suggest seeding with perennial ryegrass, smooth stalked meadow grass and tall fescue on the main football and outfield areas.

- Nutrient availability – soil pH values impact soil fertility. Nutrients that may be limited in high pH (alkaline) environments include:
  - Phosphorus which becomes less available at a pH of 7.5-8.3.
  - Magnesium which is less available at pH values above 7.7 - 7.8 and above
  - Iron which is reduced in availability at pH values above 6.5 and above
  - Manganese and boron which is reduced in availability at pH values above 7.5
  - Copper and zinc are reduced in availability at pH values above 7-7.5

- Nutrient Presence

  - Phosphorous, potassium and magnesium - While pH values impact nutrient availability it is noted the key nutrients of phosphorus, potassium and magnesium are generally present in levels suitably for sports turf or abundant /excessive in the sample data.

  - Calcium values are very high which is in keeping with the parent material below the surface.

  - Organic Matter – These are normal values for natural grassland and effectively we can take this site as natural grassland as it has not been managed for some time.

- Soil Structural Performance – high calcium and organic matter content soils tend to enjoy greater flocculation of finer clay particles together as a result of the clay:humus complex. In this respect the site is benefitted since there is clay and normal soil organic matter present for a natural soil. This may enhance the performance of the soil by better soil structure being present and more easily restored after the damage inflicted by play and maintenance impact on the soil.

- Worm Casting – earthworms, particularly the common Lobworm *Lubricus terrestris*, favours high alkalinity soil types, especially where organic matter supplies are normal or high. Although none showed in the soil profiles on soil pit excavations we anticipate they may have been buried deep in the prevailing conditions and hibernating. Worm casting is therefore expected to be a particular challenge to this site and this poses specific risks to drainage systems, especially those with sand slits or sand grooves which will likely be capped by earthworm casts within a few years.

Subsoil

- Nutrient content is higher than expected but being deep topsoil this may have impacted results somewhat by a degree of cross contamination in sampling. This is not a problem and in time may resolve as grass cropping during mowing occurs.

- Subsoil pH is mostly analogous to the pH of the topsoil as the two are generally related

- Organic matter in the subsoil is higher than expected but not excessive.

- Stone Content – stone content shows more strongly at depths below 150mm but is not very impacted until around 250mm depth. It is essential this stone is not brought to the surface by earthworks during pitch construction operations, especially the angular flint component.

- Soil Particle Size Distribution – Cricket Pitch Implications- the soil is a clay loam and almost ideal for a clay cricket table but with some variability in clay and silt proportions that does not lend itself to use as a cricket table surface as it is. It does however have the properties that make it suitable for use as a cricket table base therefore construction need not be so involved as would be the case on a sandy soil site.

- Soil Particle Size Distribution – Winter Pitch Implications - Clay and silt dominated soils are characteristically poor performers for drainage of winter sports pitches especially where silt is predominant. Ideally on sports pitches dry, firm-ish surfaces with good traction and drainage are required both for turf health and usability. In winter time, or during periods of high rainfall input, the rate of precipitation will likely exceed the indigenous soil's ability to accept water by infiltration and carry it away under gravity by the process of percolation to allow it to "drain" away. Unlike summertime when most water evaporates quickly away and soil pore spaces are largely air-filled as a result of water deficit, in winter time losses to evapotranspiration are minimal. As a consequence the soil will become saturated leading to a slippery and easily damaged surface susceptible to ponding and surface level deterioration. Saturated ground conditions dramatically increases wear to the surface of pitches and this damages water infiltration substantially thereby exacerbating the problem.

- High water contents also impact on plant health and grasses may become susceptible to diseases and suboptimal growth as the plant struggles in saturated ground. Turf condition may therefore become "thin" and the surface soil will become exposed and muddy. On winter pitches this can be highly problematic as unstable surface lead to surface levels becoming disrupted and weeds invade the disturbed soil surface. Furthermore, unstable soil that is exposed is moved on player's feet and this can cap drainage systems with a layer of mud to inhibit drainage still further on sites where drainage is present.

- It is likely that, despite the clay and silt rich character of the indigenous soil being so high, the site drains better in its summer condition than expected on a sports ground. This would be the case because it has lower than normal compaction forces, has been rested and likely aerated and plenty of worm activity keep soil structure in good condition. Furthermore, the presence of high levels of calcium carbonate and calcium in the soil combined with organic matter means the soils will have better aggregation of clay particles (colloidal structures) which create pore spaces that permit through flow of water by percolation under gravity. In autumn and winter time through to March April the wet conditions and playing pressure will lead to a reversal of this situation.

- The slopes on site will lead to surface water being shed down slope during heavy or prolonged rainfall events at the current time and would need only minor trim grading

except in the south west corner of the site where some element of cut and fill is required to create desirable grades.

- If the site were to undergo construction work to improve pitches there are further considerations. During construction work soils, once moved around in cultivation and under compaction experienced in sports use, often suffer decline in hydraulic performance very swiftly. This is because the structure of the soil and the pore spaces fails under compacting forces so only very small pores remain which lose water under gravitational force very slowly compared to the bigger pore spaces. Consequently small pores are filled with mainly water rather than air (ideally 10-15% of soil pore spaces should be filled with air). During earthworks it is therefore important this clay and silty rich soil is handled only during good conditions.

- High silt content soils, as there are on this site, will be prone to the migration of silt particles that can migrate through soil profiles and block the pore spaces that are present in a structured soil. As with soil compaction (which closes pore spaces), the migration of silt can impact drainage performance substantially by physically blocking the pores. Unlike the very small clay particles which carry electronic charges that help them to form aggregated structures in the soil, silt particles carry no such charges and do not behave in this way. The migration of silt can impact drainage systems adversely although this can be offset significantly by good grounds maintenance practices. Any drainage system installed will require maintenance periodically to reduce this risk such as clearing drains via the rodding eyes (e.g. water jets/rodding) and the clearing of silt traps installed in the system on a regular basis (ideally annually for the first few years then on an as-needs basis).

- Projected infiltration and percolation rates are low for the soil types dominating this site in both cultivated and vegetated condition therefore a drainage system to supplement the removal of surface water is recommended.

- Another key characteristic of the soil on site is the high levels of calcium within the soil characterising its pH in the 7-8 range i.e. Alkaline. This tends to favour bacteriological soil communities more than fungal ones. One key issue arising from this is that earthworms favour this type of soil and can be very active in periods where sufficient soil moisture and moderate temperature exist, typically in late winter and early spring and late August until around winter solstice. Earthworms can have considerable impact on the surface of a pitch as they bring up large amounts of soil from below and leave this behind on the surface as worm casts. These can quickly cover and smear a sward surface with the native soil and within just 2-3 seasons render secondary pitch drainage systems largely ineffectual. Even primary drainage schemes can be significantly impacted in as little as 5 years. There are soil conditioning products on the market which lead to worms being expelled for transfer to other areas.

5.9 Soil Conditions Summary:

In summary, the soil type is not ideal for winter sports turf use and will require a drainage system of some sort with quite intensive capabilities. Cut and fill measures will be needed to achieve guideline grades for pitch surfaces. Construction and maintenance would need to be mindful of the high silt and clay content of the soil to ensure playing surface viability is maintained post construction.

6. Site Background Data - Hydrology and climate.

.1 Standard Period Annual Rainfall, Rain days Intensity and Growing Degree Days.

The SAAR is 590mm/yr. The critical storm analysis work, soakaway design and finalising drain spacing occurs when we enter the final design stage 2 works. (further data will follow at the Detailed Design Stage, Sage 2).

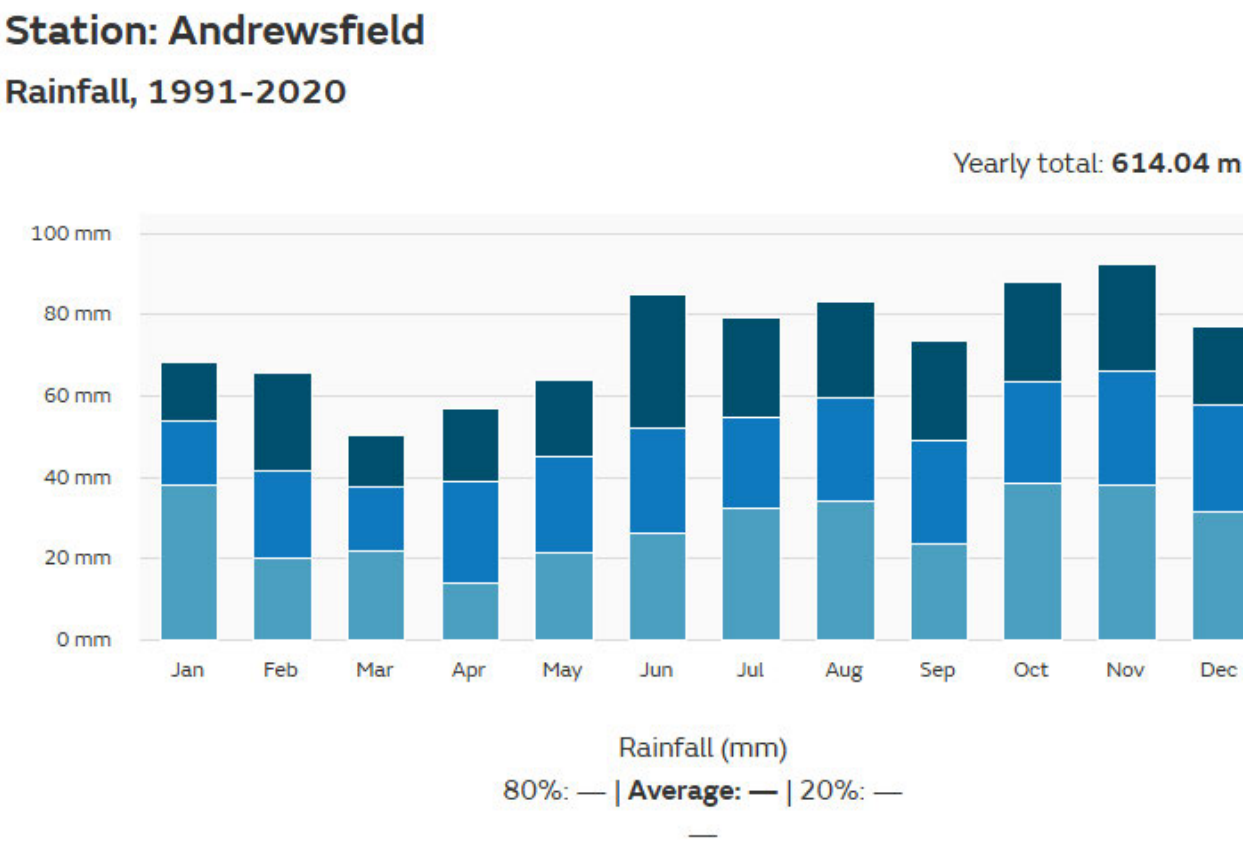
Climate Information for the nearest Met Office recording station is St. Andrewsfield and is shown below. Note this is the nearest station to the site hence the annual return figure is different from the SAAR figure shown above.

Climate period: 1991-2020

Station: Andrewsfield

Month	Maximum temperature (°C)	Minimum temperature (°C)	Days of air frost (days)	Sunshine (hours)	Rainfall (mm)	Days of rainfall ≥1 mm (days)
January	7.12	1.67	9.23	–	53.50	11.59
February	7.63	1.58	9.20	–	40.94	9.56
March	10.33	3.01	4.77	–	37.02	8.74
April	13.56	4.50	2.21	–	38.56	8.53
May	16.72	7.34	0.20	–	44.56	7.60
June	19.75	9.98	0.00	–	51.83	8.37
July	22.53	12.24	0.00	–	54.07	8.17
August	22.31	12.36	0.00	–	59.16	8.99
September	19.00	10.38	0.00	–	48.58	8.89
October	14.58	7.71	0.58	–	62.97	10.56
November	10.24	4.36	3.62	–	65.60	11.57
December	7.48	2.04	9.31	–	57.25	11.41
Annual	14.31	6.46	39.12	–	614.04	113.98

Figure 11: Annual precipitation data for St. Andrewsfield (source metoffice)



Annual Rainfall is therefore below the UK national averages of 1162.7mm and East Anglia region average of 626.5mm. The site is therefore of very low rainfall input compared to the UK as a whole and the East Anglian region which itself is considered a dry area of the country.

Figure 12: Total and Monthly Rain Days exceeding 1mm input.
The rainfall inputs are less than the UK national average of 159.08 days per annum.

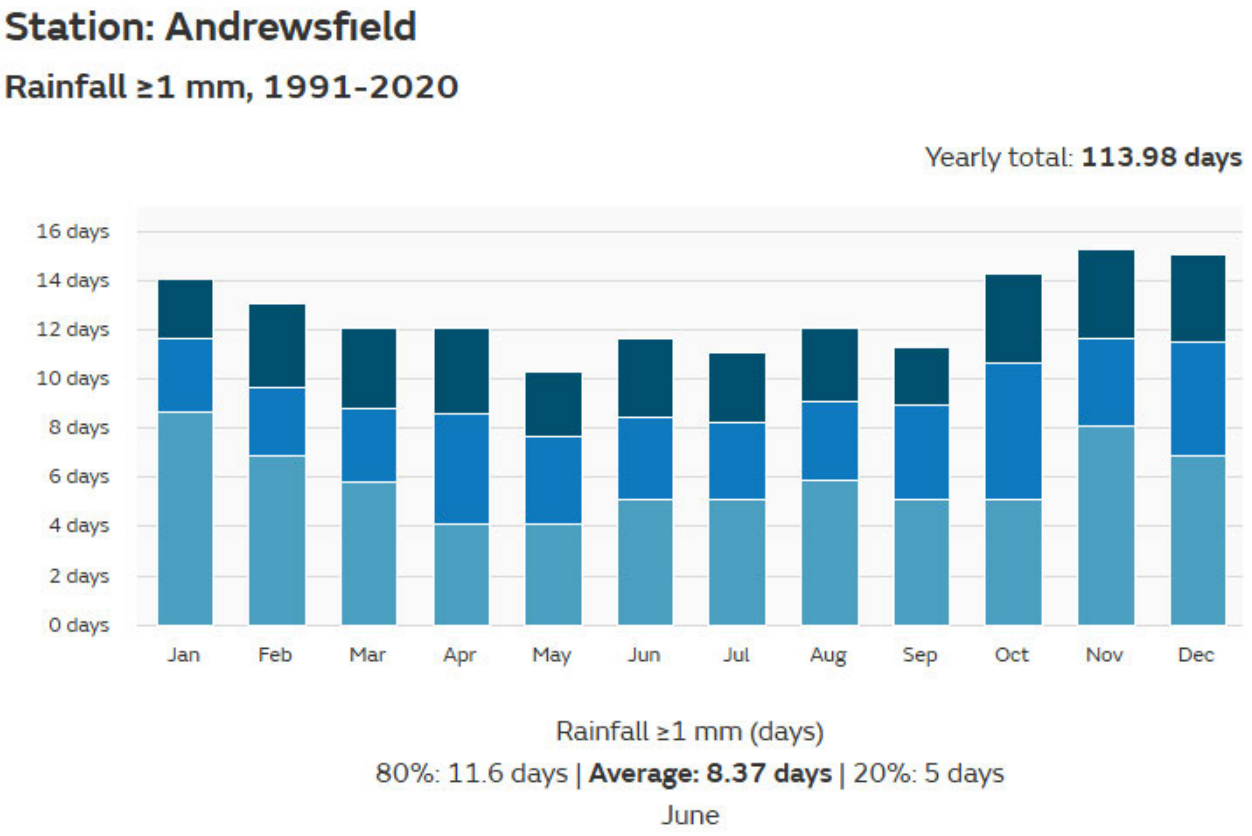
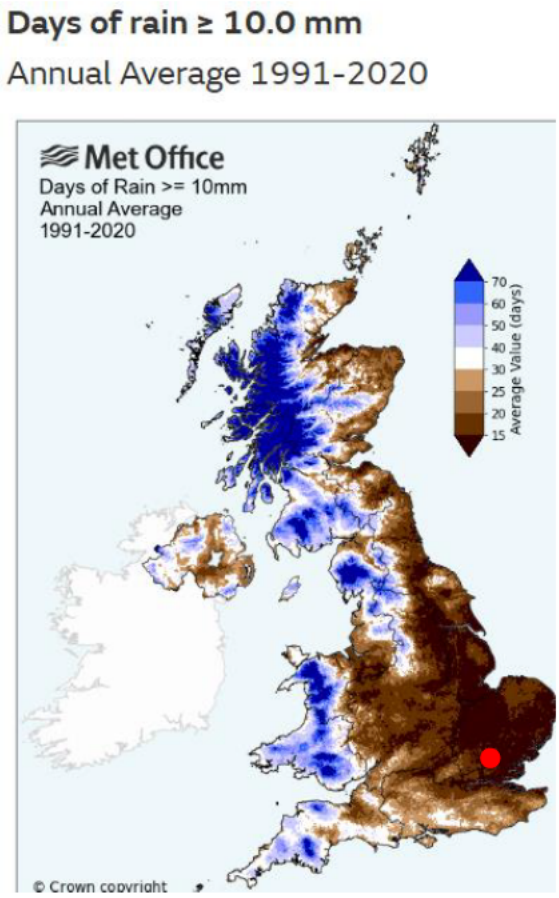
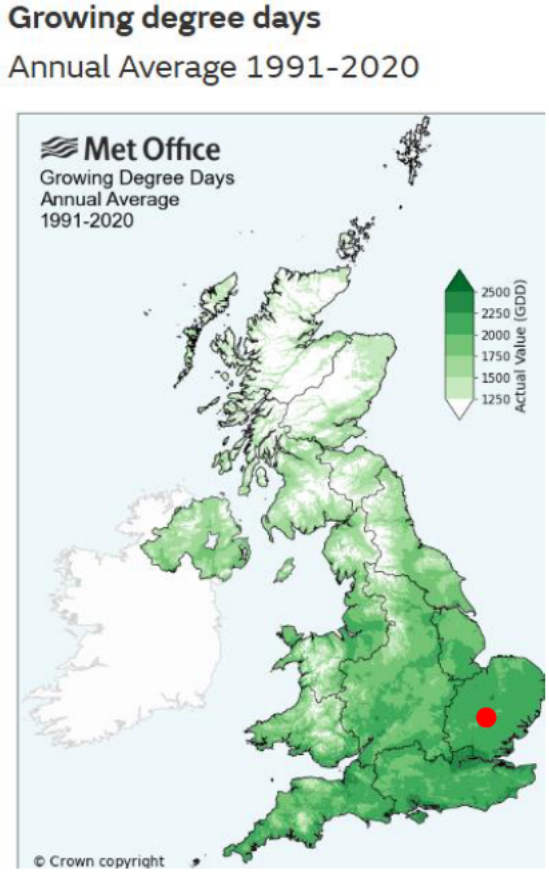


Figure 13: Heavy Rainfall Event Frequency – (over 10mm/day inputs) - The location of the site is approximately in the zone of 15 days or less of rain over 10mm or more per year. Storm input frequency is therefore at the lower end of the scale for the UK.



Source: MetOffice.gov.uk

Figure 14: Growing degree days – the site has a high level of growing degree days of 2000 -2250 GDD which will facilitate good pitch condition.



7 Former Friends School Field Site Hydrological and Drainage Assessment

7.1 Flood Risk from Surface Water and Rivers & Sea

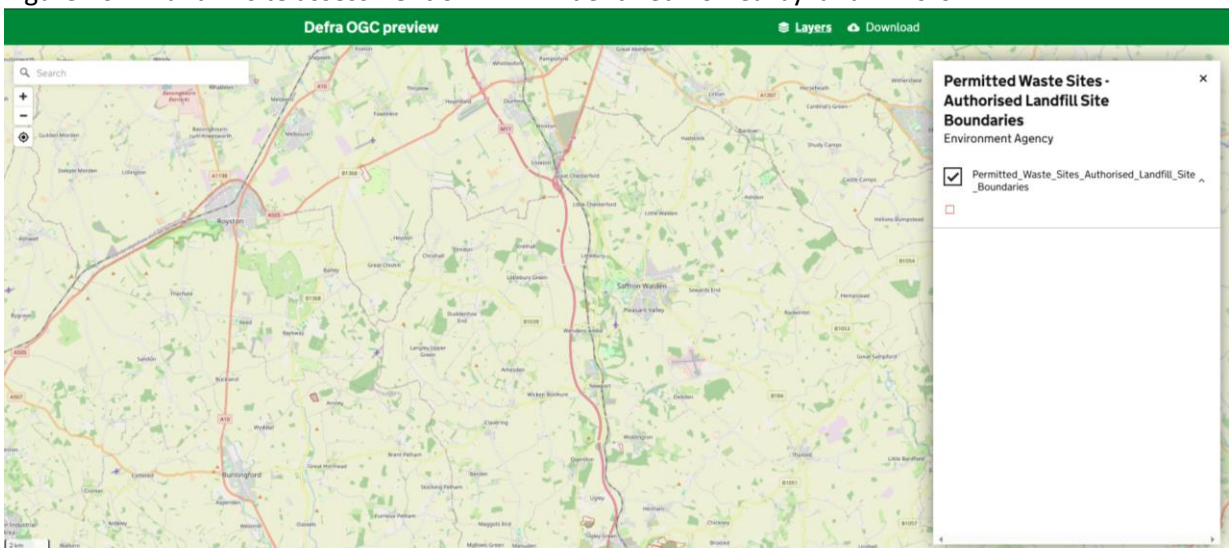
Figure 15: Risk of flooding from surface water at site.

Source: flood-warning-information.service.gov.uk Source: Map – Flood map for planning – GOV.UK
Image Courtesy of Ordnance Survey Licence Number (100064732)

Information sourced from the flood map for planning service indicates very low risk (<0.1% or less than 1:1000 year risk) of surface water, river, small water course or sea flooding for the site. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

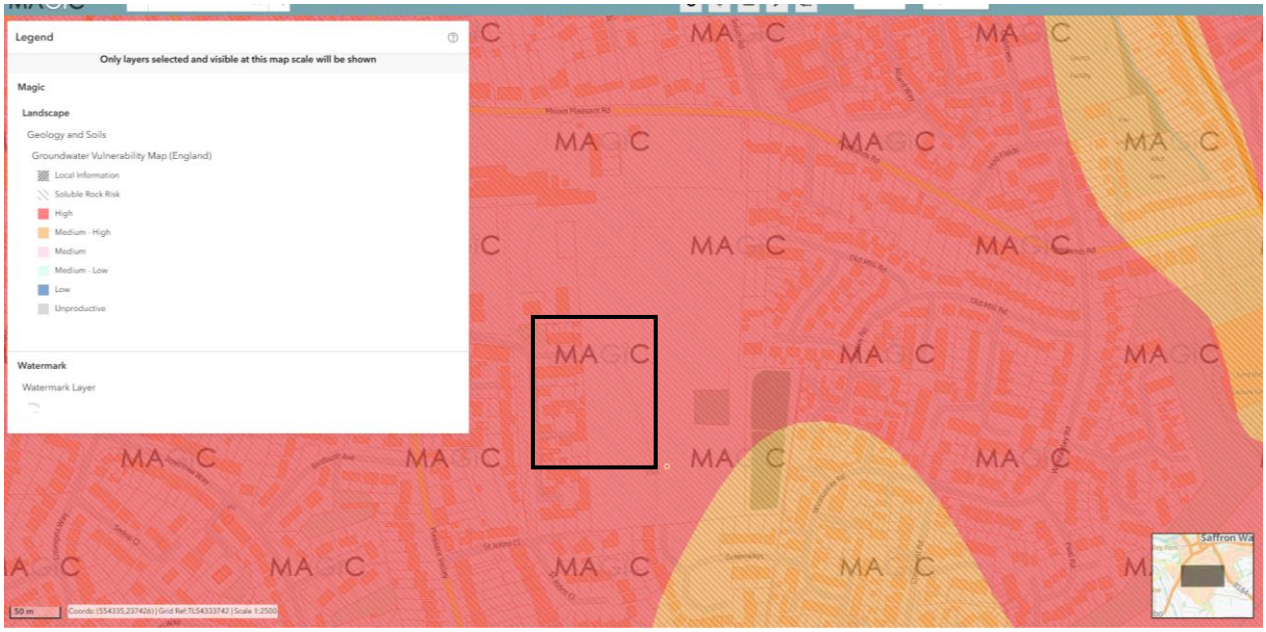
7.2 Landfill Risks

Figure 16: A Landfill site assessment on DEFRA Identified no nearby landfill risks.



7.3 Groundwater Source Protection –

Figure 17: Groundwater Source Protection Map - the site exists over a vulnerable ground water aquifer zone and therefore care will be required in discharge into aquifer supplies though it is anticipated soakaways in the subsoil will be acceptable so long as not interacting directly with aquifer water themselves.



Source: [Magic Map Application]

7.4 Topographical (levels) survey

Figure 18: Topographical Survey –

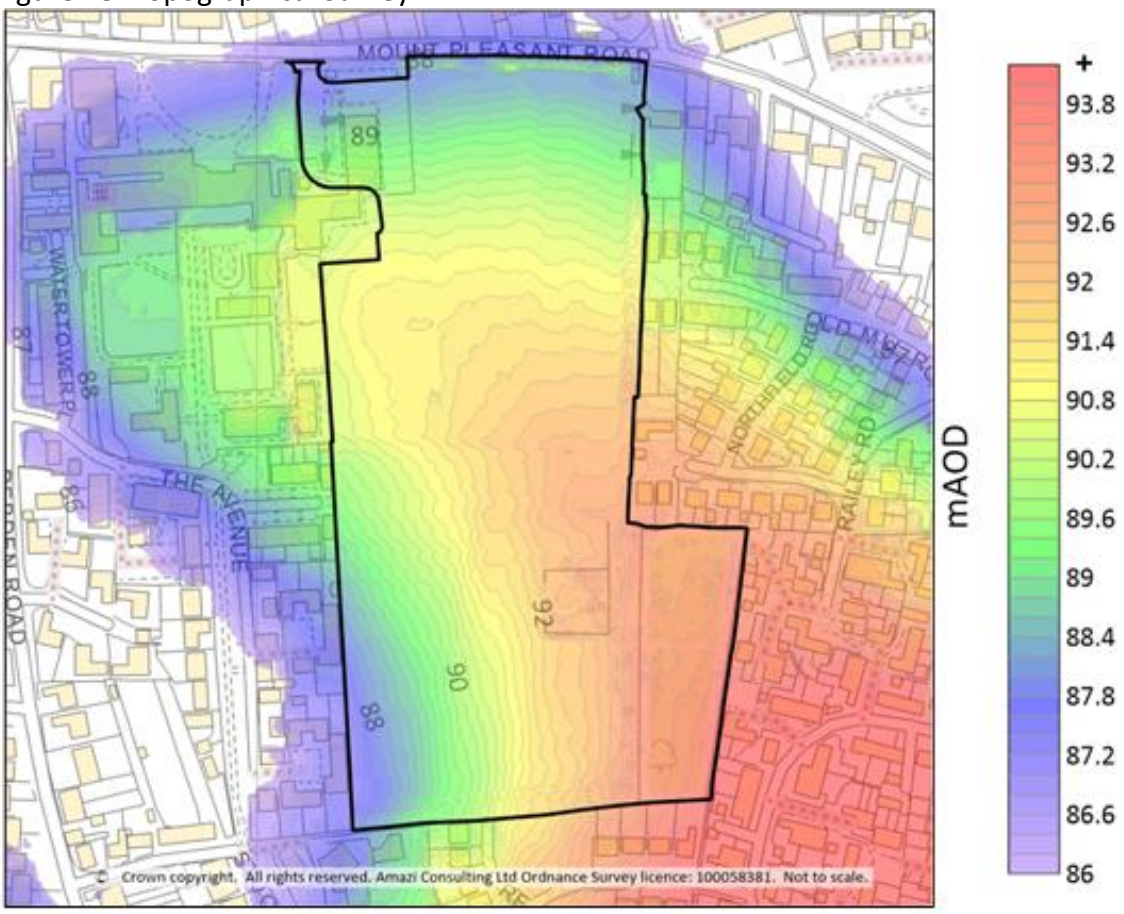


Figure 2.2 - Site contours (mAOD)

(Source: TL53nw.tif, 13 March 2024)

Source Amazi consulting Ltd supplied by Chase New Homes Ltd.

7.5 Wider Area Contours and Drainage Sub-Catchments

Figure 19: Contours in wider area

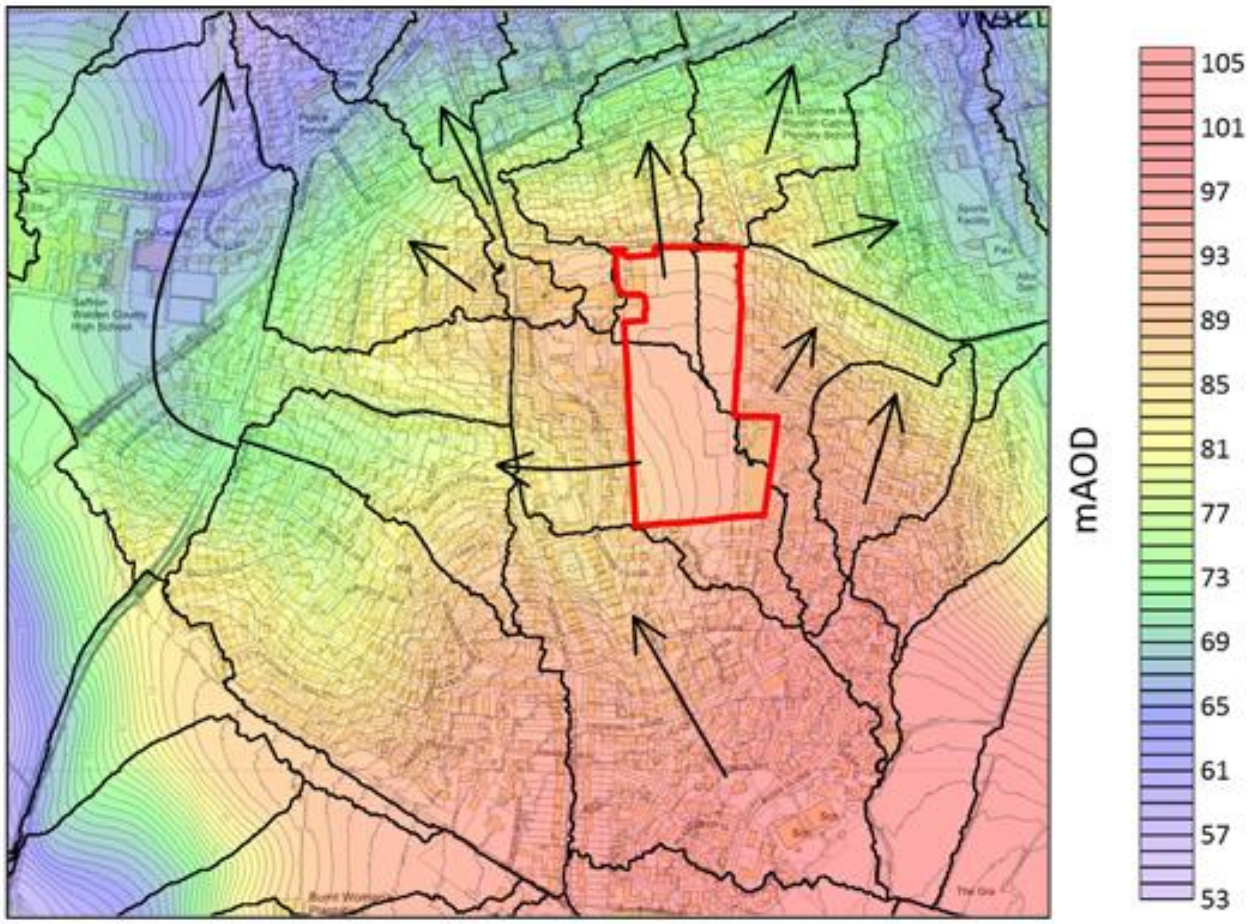


Figure 2.3 - Contours in wider area (mAOD)

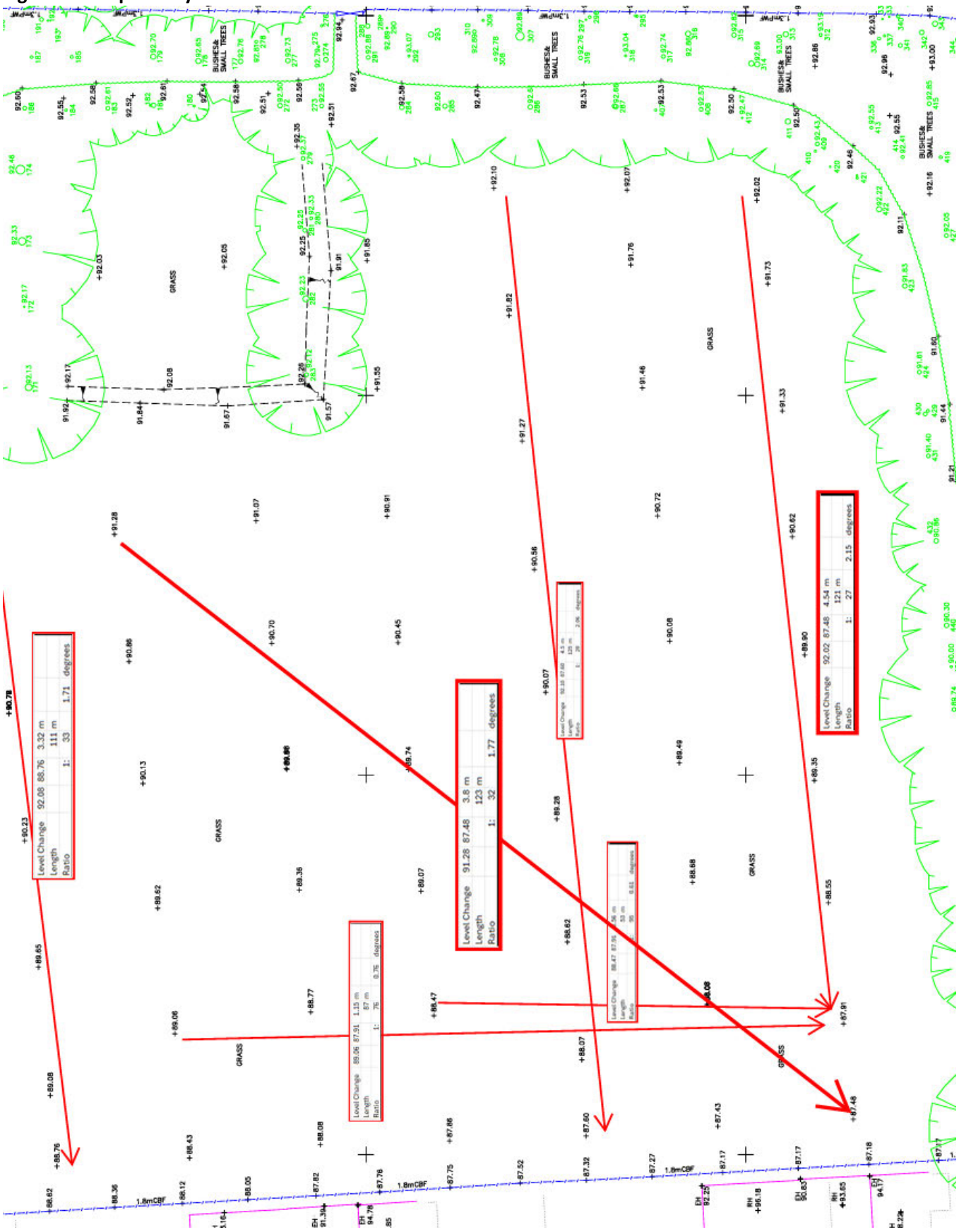
(Source: TL53nw.tif, 13 March 2024)

Shows the approximate outline of topographical sub-catchments (outlined in black).

Source Amazi consulting Ltd supplied by Chase New Homes Ltd.

7.6 On-Site Topography and Gradient Analysis in the Natural Pitch area

Figure 20: Slope Analysis on site:



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Source: Drawing DAT/9.0G DATM Survey Services Ltd courtesy of Chase New Homes (1:500 scale original – not to scale here).

7.7 Topographic (land levels) Utilisation

The existing landscape has gentle gradients in the main and the overall topography is therefore broadly favourable to the work we needed to bring the area back to a natural sports turf facility.

The Sport England recommendation are that the maximum slope along the direction of play should not exceed 1.25%, the maximum cross-fall should not exceed 2.00% and that it is not desirable for both the longitudinal and cross-falls to be at these maximum values. The table 6 below shows the comparison between Sport England guidance against the survey data for the existing pitch areas.

Table 2. Summary of maximum recommended slopes for sports pitches as specified by Sport England compared with actual gradients measured on site.

Pitch area	Sport England guidance gradient (%)		Measured site gradient (%)	
	Along length	Along width	Along length	Along width
North Field Adult	1.25%	2.0%	**2.15**	**1.77**

*Red box denotes gradient is outside Sport England recommendations.

It should be noted that in localised areas on the South West corner of the site the gradient over shorter distances than the 125m length and 86m width assessments are steeper angles than this.

Re-grading work using cut and fill or infill will be required to generate the surface levels and smoothness that are required under Sport England Guidelines due to the low levels in the SW corner of the site.

Where batter slopes are created these can be made in gentle terms to allow ease of post construction care and maintenance to reduce operator risk and maintenance costs. Pitch surfaces will be created to form uniform plateau of ground surface required for sport which will overcome the natural undulation and variation currently in the landscape. The early layout plan for the pitches locations and approximate levels and gradients are shown in the outline proposal section below.

7.8 Existing Drainage

As previously stated the site shows no signs of existing land drainage.

Ground Water Drainage GBR365 Testing (source Chase New Homes Drainage Strategy)

Figure 21. Ground water GBR365 Test locations and data

Figure 22: Data of BRE365 Testing from test locations on site outside the Sports Ground Area.

1.10 The test results indicated infiltration rates between 7.4 x 10-5 m/s and 4.5 x 10-6 m/s.

1.11 No groundwater was observed during the infiltration testing and is expected to exist at considerable depth within the chalk strata.

***Figure 2**–Summary of Soakaway test results*

Trial Pit No:	Infiltration rate	Infiltration m/s	m/hr	Lowest results
SA01-1	8.2X10-5	8.20E-05	0.2952	
SA01-2	7.4X10-5	7.40E-05	0.2664	0.252
SA01-3	7.0X10-5	7.00E-05	0.252	
SA02-1	3.6X10-5	3.60E-05	0.1296	
SA02-2	7.0X10-5	3.10E-05	0.1116	
SA02-3	7.0X10-9	1.80E-05	0.0648	0.0648
SA03-1	7.6X10-6	7.60E-06	0.02736	
SA03-2	4.5X10-6	4.50E-06	0.0162	0.0162
SA03-3	5.7X10-6	5.70E-06	0.02052	

The sample points for the soakaway tests are SA04 & Sa05 in the Sports Ground Area

SA04-1	1.9X10-5	1.90E-05	0.0684	
SA04-2	6.5X10-6	6.50E-06	0.0234	0.0234
SA04-3	1.9X10-5	1.90E-05	0.0684	
SA05-1	4.3X10-5	4.30E-05	0.1548	
SA05-2	2.9X10-5	2.90E-05	0.1044	0.1044
SA05-3	1.3X10-4	1.30E-04	0.468	

1.12 The north part of the site is within groundwater source protection zone 3 (SPZ3), and the south part of the site is located within groundwater source protection zone 2 (SPZ2).

7.8 Summary of Soakaway results:

The BRE365 results from the upper areas of the site are sufficient to be considered for soakaway designs.

To this end we need to consider outlet options:

1. Large linear soakaways
2. Attenuated soakaway chambers
3. Deeper soakaway solutions e.g. Eco90 systems from Groundwater Dynamics which requires further investigative work if considered.

7.9 Hydrological assessment of the site is as follows:

As such the likely outcome is that surface water will be held within the drainage system only slowly draining away out of the entire pitch drainage system. The size of the attenuation required would be determined in Stage 2 detailed design phase. As the site is not in a flood zone this is a positive situation. We also comment that the drainage system will likely reduce surface water run-off from the pitch area which would be a considerable help to the local green space and likely nearby residents in reducing overland flow onto their property during major storm events.

The downside to increasing drainage rates are:

- Irrigation will likely be required to aid football pitch renovation and cricket strip "wicket" preparation for safety reasons. However this site has above average rainfall inputs reducing this requirement.
- Increase fertiliser input requirements.
- Increase maintenance costs for materials and time.

Deep ground soakaway results are slow but workable within a scheme in our opinion allowing for either deep ground soakaway containers or lateral soakaway system within the drainage system design.

8 Irrigation:

Drainage systems will remove water in summer too during high rainfall events and there may be a need to supply water to the pitches via an irrigation system in localised areas to aid the renovation of pitches in the main summer months. Irrigation is quite a challenging area currently and the amounts and areas where it is required might be quite small.

Requirements for the whole site boil down to two main areas of cricket table and football pitches. Our specific view on this is:

Cricket table – The needs of this may be met with an unlicensed borehole supplying up to $20m^3$ per day. The needs and methodology of completing this would require an irrigation engineer to be involved (cost circa £5000 plus VAT) to investigate feasibility, design and set out a system requirement and borehole testing and compliance. The irrigation system itself involving possible tank storage, pump, piping and electricity supply would likely cost in the region of £30,000 plus VAT.

Football Pitches - We will advise on the use of drought tolerant and hard wearing grasses like Tall Fescue, Strong Creeping Red Fescue, Smooth-Stalked Meadow Grass and Tetraploid Ryegrass cultivars with high drought tolerance to mitigate against irrigation needs or avoid it all together. We consider this important in the face of climate change challenges.

Limited irrigation may be needed in goal mouths and the main wear area of the pitches during the period after spring renovation to help germination and establishment of the new seedlings. This should be possible for short periods utilising a system as set out for the cricket pitches although extra hose will likely be needed and supplies will be limited to $20m^3$ per day if an unlicensed borehole is obtained.

A full irrigation system to cover the whole of the football pitches would not be required in our opinion and would be a luxury item. In terms of sward Agronomics it can be detrimental to apply irrigation for lengthy periods as this encourages weak rooted annual meadow grass which outcompetes the tougher drought resistant grasses initially displacing them from the pitch surface but then dies under drought pressure (kindly seeding as it does so to set the next generation off for the future).

It should be remembered that improving the soil texture also allows water to penetrate more easily and therefore can decrease the need to water rather than increase it. This is another reason we prefer the high density pipe drainage primary system to the by-pass drainage systems.

9. Pitch Orientation

For winter games pitches this ranges from 285° to 20° in order to reduce winter season low level sun aspect in the sky that dazzles players. The layout doesn't comply with this orientation guideline but there is no viable alternative unless the cricket table is removed from the scheme.

In contrast the cricket pitches would align with orientation guidelines and this is more important than football orientation as ball injury safety is an issue at low sun angles during later afternoon and evening matches.

It is noted that the pitch orientation has been agreed with local clubs and Sport England and the author considers the proposal entirely workable with the caveat there may be more detail required when undertaking goal mouth repairs and renovation works as pitches cannot be moved due to size limitations.

Figure 23: Sport England Guidance on the orientation of sports pitches. Source: Sport England Design Guidance Note "Natural Turf for Sport updated guidance for 2011".

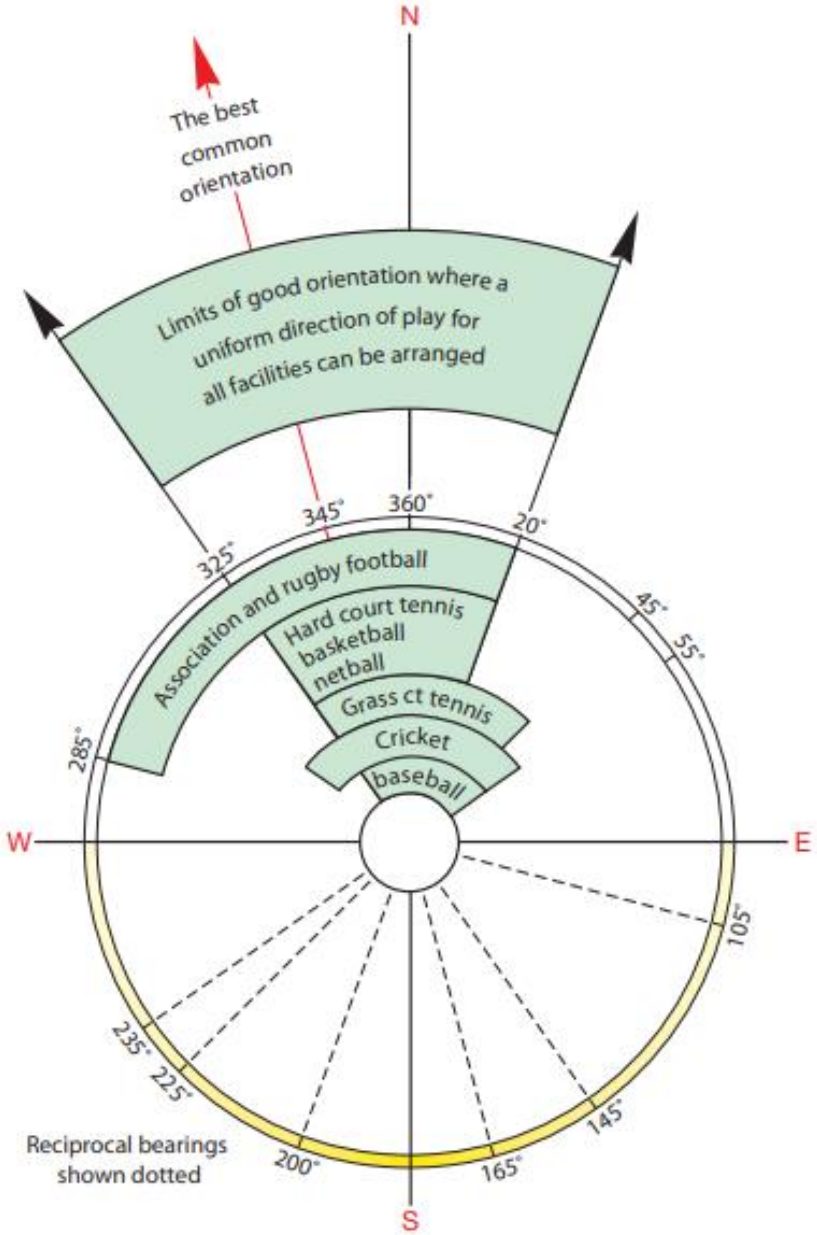
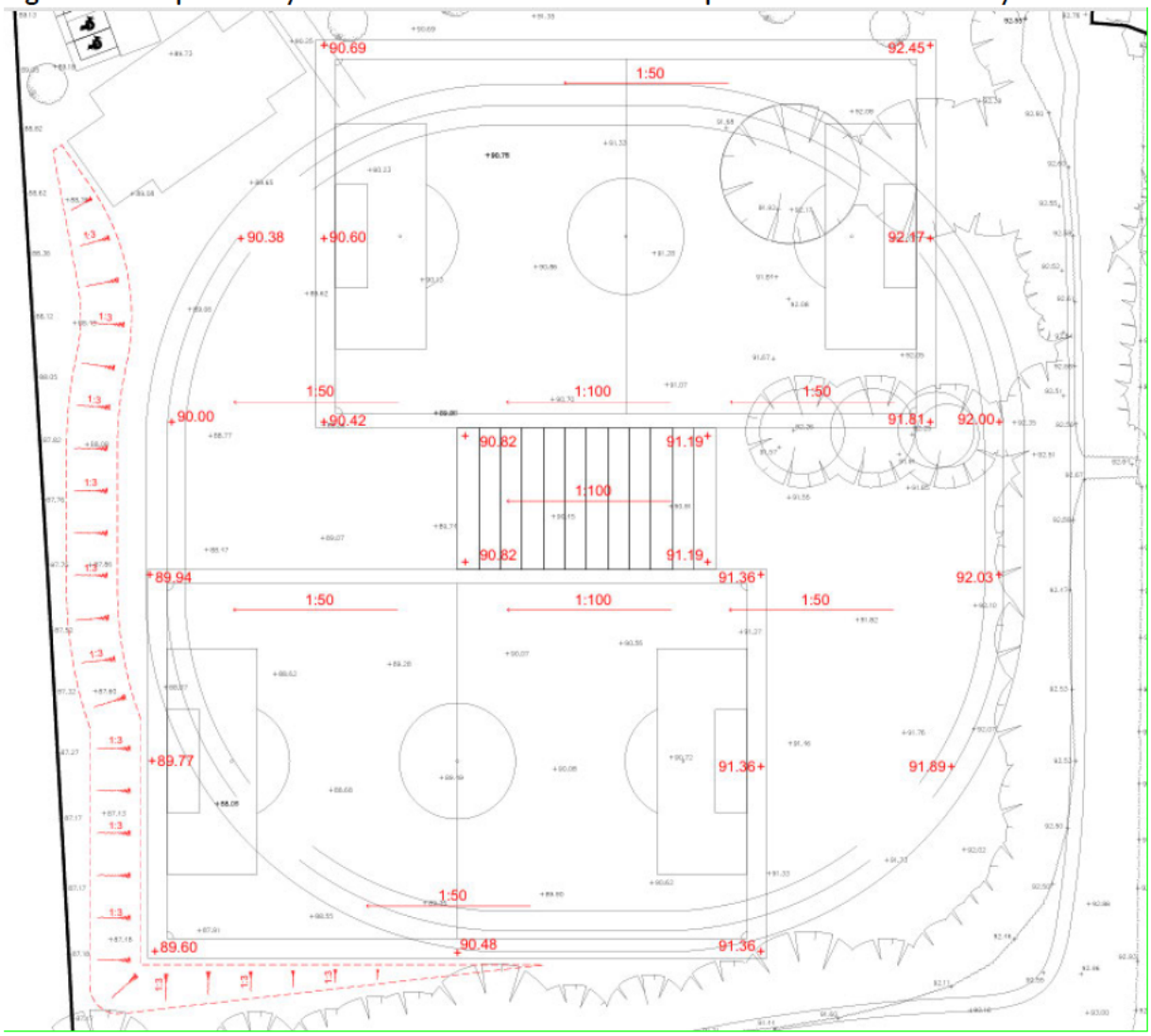


Figure 24: Proposed Layout Plan For The Orientation Of Sports Pitches On Friendly Fields.



In the original plans for the site with just two football pitches these were aligned in the north-south preferred layout to meet the guidelines of the Sport England Guidelines for Natural Turf Pitches (2011). However, this layout prevents the site accommodating a cricket table facility and thus uses the space less effectively. To accommodate the latest design of two football pitches and a cricket table necessitates the orientation of the football pitches be on an east-west angle which while not ideal does give increased site viability for summer and winter sports use. The angle of cricket orientation is correct and meets guideline requirements. In view of the constraints of the site the proposed layout therefore is the best option to optimise use of the site year round.

We understand ball strike analysis has been completed on the site and this would need to be considered for both sports due to the proximity of neighbouring property. There may be a need for a protection netting behind goals and to avoid stray cricket ball shots.

Pitch layout is extremely tight on this site and particular attention will need to be given to high quality pitch repairs both in and out of season as the wear and tear cannot be spread about the site and this should be a key part of the maintenance operator's guidance through pitch maintenance guidelines. We note that Sport England has raised concerns regarding the lack of pitch movement and we are able to reassure that so long as this issue is managed properly we are not concerned about this matter – it is simply a case that high wear areas will need focused attention to this concentrated wear.

10. Ball Strike Analysis

A Ball Strike Analysis has been completed by Labosport on behalf of Chase New Homes Limited for the Former Friends School Field proposed design (Report No: lsuk.25-0134-cba-v2, dated 16.4.2025).

This important element of design safety should be incorporated into the design proposals and their report is therefore an important element of the feasibility proposals and should be treated as an addendum to this report.

11. Assessment Summary

1. The site layout proposal does comply with guideline size requirements including a full 3 metre safety margin for player's safety.

2. The football pitches do not comply with orientation guidelines for football pitches. The cricket pitch layout does comply with guidelines for cricket pitch orientation which takes priority due to the danger of ball sight being blocked by low evening sun. Aside from this reorientation is not available due to site constraints and the proposed design layout is the optimal solution available for the footprint of the site.

3. General gradients on site are variable but can be manipulated with groundworks to achieve normal values for football pitch surfaces with significant cut and fill or fill earthworks especially in the SW corner of the site.

4. The clay loam soil type is not ideal for sports pitch construction, but it is a drainable soil and can be improved with heavy sand dressing and amelioration. If sandy loam topsoil is available from other sites then this may be useful to consider if free of charge or at limited charge subject to testing and particle size distribution analysis. The soil type is very suitable for cricket table base construction.

5. The site will require drainage to be installed due to the soil type. Due to the nature of precipitation in the area and usage the proposal is for a close centred drainage system of pipes at 2.5m centres with initial sand groove installation to aid water ingress while the soils recover from construction activity. Drainage system outlet is to be to soakaway as part of SuDS drainage system.

6. Maintenance – currently the site is in a neglected condition and the new owners or statutory authority will need to carry out a suitable level of maintenance for new natural turf pitches to ensure they do not decline from a satisfactory standard.

7. There may be scope to improve the environs of the site ecologically for the benefit of wildlife and conservation. This has not currently been worked into the scheme and can be if so desired. We anticipate this angle has already been covered.

8. The site is in a low rainfall inputs area and will be subject to drought and more challenging growing and maintenance conditions as a result. The benefits of a better quality construction are considerable and include:
   - ✓ Better pitch playability in wet/damp conditions
   - ✓ Improved turf quality and playing surface performance.

- ✓ Greater ease of water management at all times of year.
- ✓ Improved surface water management during high rainfall inputs.
- ✓ Improvement to groundwater acceptance of high rainfall inputs.
- ✓ Improved ease of maintenance of the pitches.
- ✓ Greater wear tolerance and therefore longer periods of use thus improving facility provision and capacity for sport provision.
- ✓ Greater usability increases business opportunity in the clubhouse/bar improving club financial viability.

11. Construction Options - Outlets

There appears to be no currently installed drainage in the site to drain the pitch effectively. It is possible a system exists but is ineffectual e.g. historic clay agricultural drains, failed system, etc. Given that the superficial soils are identified as clay loam with boulder clay subsoil over chalk (weathered) it is suspected that the soils would suffer slow permeability and infiltration = or <2mm/hr in a compacted soil sports turf situation. The soils may also be prone to shrinkage and have not been tested for this yet.

In our professional opinion the site would require a sports turf drainage solution and this needs also to be tempered with the dry location of the site in a national context. The drainage system collected surface waters have no natural surface water outlet available (unless a system is found during site works) and so discharge to either attenuation chambers with soakaway functions, linear soakaway or to deep ground soakaways e.g. Eco90 therefore remain the only options available at the current time.

Full development of a detailed and fully costed design require a cut and fill analysis which is not currently available and some further site testing is needed to fill in some cost gaps in project design and implementation. However it is possible to discuss concepts and how to progress the improvement of the site conceptually and this information may allow a better start to a formal design process (stage 2 detailed design and Specification). We assess the scheme as most likely to succeed with the approach set out below. It should be noted there are different ways to approach any project and we have suggested the optimal approach below and discussed other options and why we consider these less suitable. We have endeavoured to provide a rough price guide for the scheme and it should be noted there is some further investigation and detailed design element required which would be completed at stage 2 in the design process, specifically the soakaway arrangement and we note the client has a preference for attenuation crate and soakaway solutions and we advise that linear soakaways may be an alternative suitable solution and likely cheaper to install. We await the input from the Civil Engineering Design Team on this matter. A final output mode choice would be a deep soakaway into the chalk parent material (not into aquifer water though) using an Eco90 deep soakaway system but this would require around £5000 of testing (plus VAT) and if viable would cost approximately £95000 plus VAT which would likely be the most expensive outcome.

12. Construction Layout and Drainage Design Proposal:

.1. Addressing surface levels:

The site will require some cut and fill work to address surface levels which fall away in the south west corner of the site where there are excessive gradients. This is required to create suitable overall grades to comply with Sport England Guidelines for pitch construction.

.2. Outline Proposal -

Figure 25: The Outline Layout and Surface Gradients of the Existing Site.

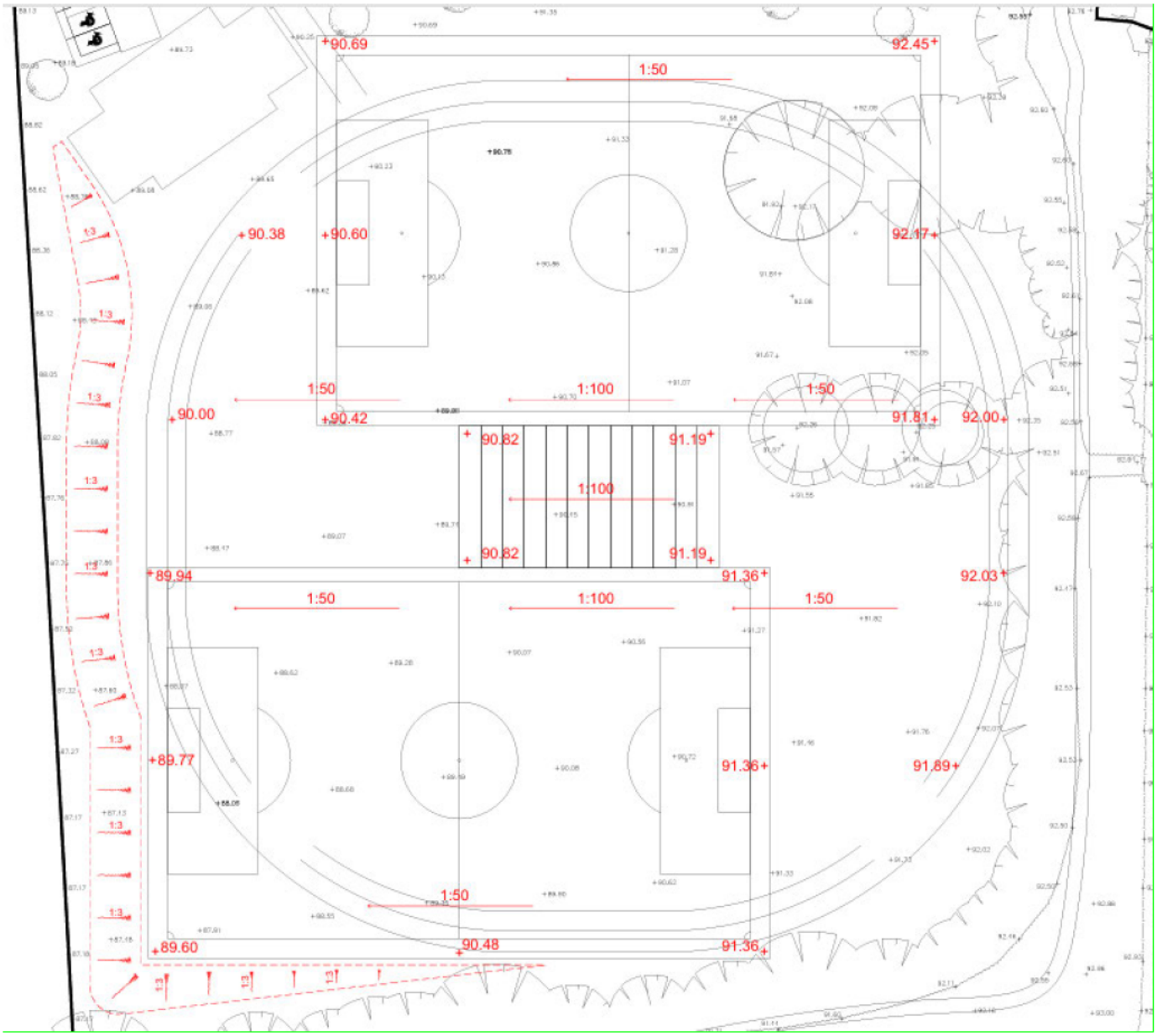


Figure 26: A preliminary drainage plan of the site drawing no: IDL/1229/07/104

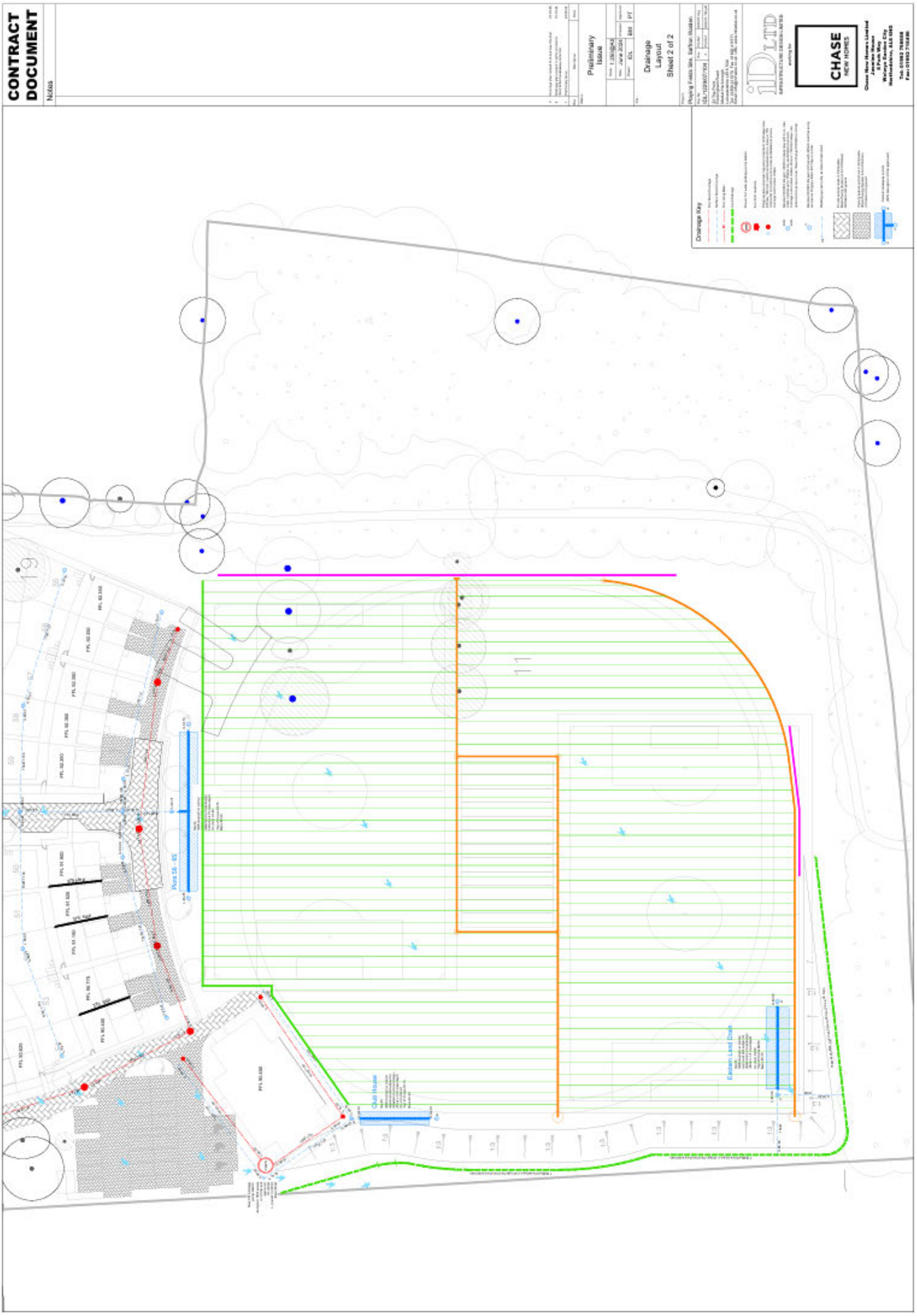
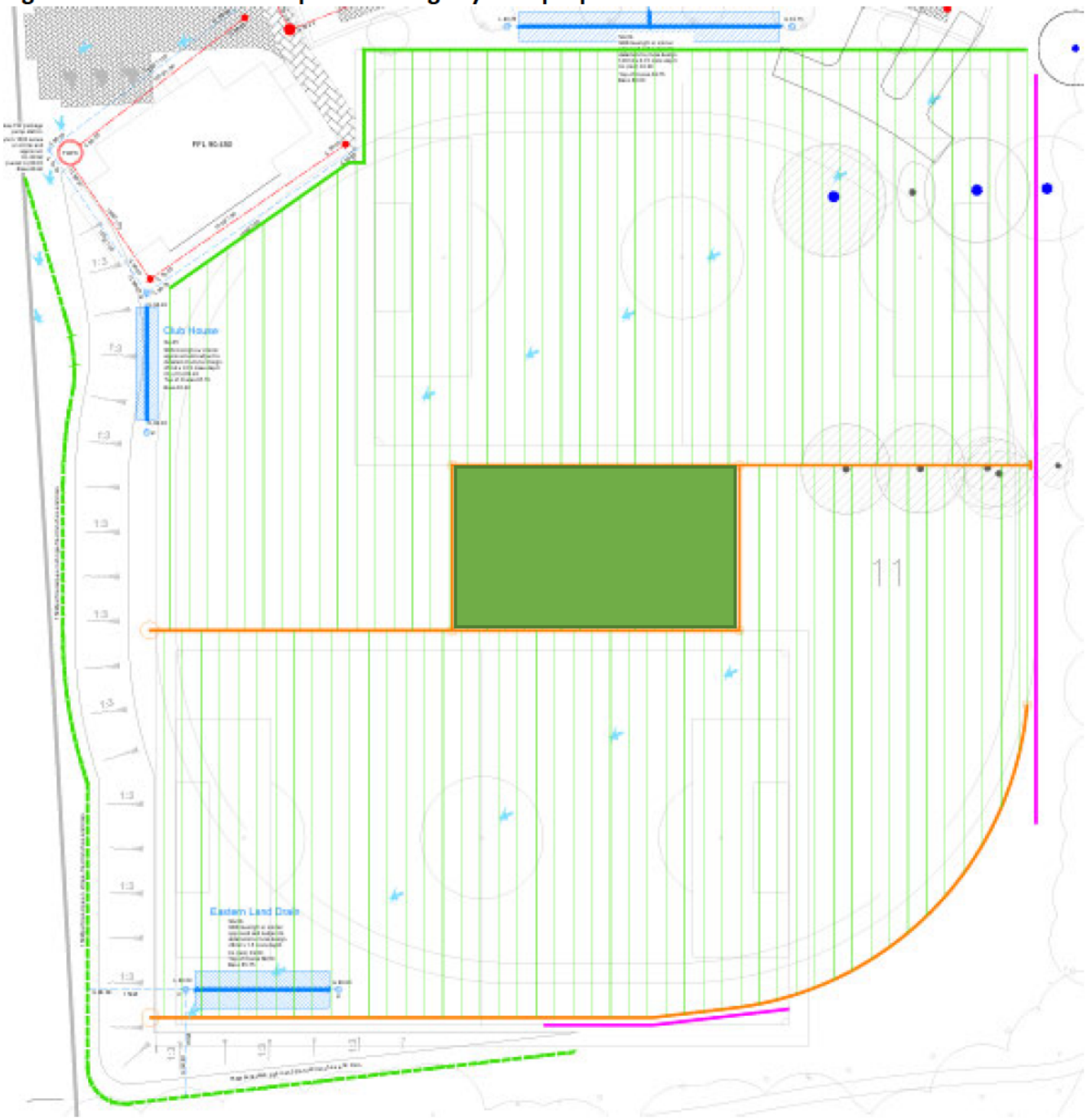


Figure 27: A More detailed pitch drainage system proposal overview



Although this is not a fully modelled situation in this location, looking at the situation present there is a strong case for improvement of the pitch to:

- **Address the overall gradients to within Sport England / PQS guidelines.**
  This would be achievable with regrading works involving stripping off the topsoil, re-grading the deeper topsoil and subsoil followed by consolidating the base. If there is excess material from other building work on site there may be scope to simply fill the SW corner to achieve required gradients but this option is not known to the author currently. The clean topsoil would then be worked to a finale grade and the surface treated with substantial amelioration of appropriate sand material to improve surface

water infiltration, connect drain trenches with the surface and discourage worm casting activity. Overall gradients would comply with Sport England Guidelines.

- **Drainage** – natural drainage on site is compromised by the soil type in place and the likely usage of the site soil profile in construction, the key issues being:
  - There appears to be no existing site drainage.
  - A soil type with 50% or more clay and silt content ("fines") which is not ideal for drainage

  A drainage design is proposed with drains at 2.5 metre centres arranged as far as possible at angles running across the general gradients on site which is quite intensive for a primary pipe-only drainage system. The surface of the pitches would be treated by applying a VibraSandMaster treatment to aid infiltration for the first few years of use adding sand and ameliorating this into the immediate surface. The cricket table is not drained but would have a perimeter drain.

  The more commonly encountered approach is widely spaced primary pipe drainage at between 5-10metre centres supplemented by secondary drainage of sand slits or sand grooves approximately 50mm or 25mm in width respectively. However, these are prone to failure and can be very demanding to get grass cover to take on them in the first few years. Furthermore, should the soil shrink there is a very great distance of topping up work to complete.

  Our preference is the former option for reasons identified later in this report. The objective would be to improve surface water infiltration and the interception of the water off the surface and within the soil. Furthermore, in capturing excess water this is likely to reduce the greenfield runoff rate (Qbar) which is **7.7L/s/Ha^{-1}** which on this site with low permeable soils or saturated soil and a notable slope angle is signifcant. By "storing" water in the drainage system itself as part of a SuDS proposal to aid the reduction of surface water run off which will then percolate away into the deeper subsoil or upper chalk strata on site.

  The outfall from the pitch land drainage is currently designed to a cellular soakaway engineered to meet a 1 in 100 year rainfall event plus 40% with an assumption as a filter bed construction of 0.6 factor draining naturally through the soil or evaporating without being part of the drainage system capture. In any event this is primarily for the sole purpose of controlling water output off site in a critical storm or heavy rainfall input scenario. Any rain input exceeding 5mm per hour will likely exceed the natural pitch's ability to accept surface water resulting in the pitches becoming unfit for use in such a scenario.

4.2 Predicted Drainage Outfall Rates:

Outfall rates have been calculated using FEH (Flood Estimation Handbook) Software and are shown in table 5 below. The Greenfield Runoff Rate (Qbar) is given as 7.7.1L/s/Ha^{-1}. Further predictions for Qbar for a 1:1, 1:30, 1:100 and 1:100 +40% Critical Storm inputs are also shown in table 5 below.

Table 5: Small Catchment Drainage Outfall rates for the pitches and whole development area comparing output event rates with Greenfield run-off values.

Area /Name	Greenfield run-off rates and outputs for Former Friends School Development Site				
	Litres per second rate per hectare L/S^{-1}	Litres per hectare per hour * L/Ha/Hr^{-1}	Greenfield run-off rate Per unit area (m^3/ha/hr^{-1})	Outfield and cricket table area (15000m^2) output m^3/Hr^{-1}	**Critical storm event in mins/season per period discharge m^3**
return period/area (m2)	1 year/ 10000	1 year/ 10000	1 year/10000	**1 year/15,000**	**15000m^2**
QBAR standard greenfield runoff rate	7.7	27720	27.72	**41.58**	
1:1	6.5	23,400	23.40	**35.10**	**360min summer/ 90.98m3**
1:30	18.5	66,600	66.60	**99.90**	**240min winter/ 297.92m3**
1:100	24.6	88,560	88.56	**132.84**	**240min summer 327.17m3**
1:100+40%	30.37	109,332	109.33	**163.99**	**180min winter/ 402.18m3**

*= rounded to nearest whole value

The total area of pitch development is approximately 13,483m2. Rounded to 15,000 m^2 for calculations above. A value of 60% of the FEH Q values has been allowed as a filter bed construction due to some of the surface water simply draining out through the natural soil profile.
Allowance in design has also been given for infiltration and percolation through the base of drainage trenches and is shown in the drainage design statement to accompany this document.

The peak volume calculated has been applied to the storage and soakaway design employed to ensure that during a 1:100 year rainfall event the storage has capacity to meet this plus 40%.

The proposed system creates a SUDS system and will not result in surface water leaving the site by overland flow in excess of greenfield run-off rates that occurs at present in exceptional rainfall events. Indeed the addition of a pipe drainage system can be argued to reduce the risk of surface water flooding because it will provide a mechanism by which

greenfield run-off (surface water) is intercepted, stored within the drainage backfill and pipework and fed into the natural deep ground drainage. It should be noted that the natural pitches will have a field capacity of drainage of c.5mm/hour and if rainfall inputs exceed this then overland flow will occur.

*Greenfield Runoff Rate is the amount of water that would leave a site by surface runoff during a rainfall event. However, much of the surface water from this scheme where infiltration is below field capacity will be discharged into soakaway below ground thus while GRR/Qbar is of interest is more a passing academic interest where below ground soakaway systems are engaged.

13. Outline Method Statement (not a specification of works).

Having considered the site and technical data so far available our conceptual proposal would be to:

- Removal of trees within the site footprint to allow the pitches to be fitted into the site confines. This would include stump grinding and excavation on large tree roots which will impinge on cultivation of the soils and drain trenching works (the developer will require planning permission and may need to achieve mitigation measures to achieve this therefore a specialist Arboriculture and Planning consultant may need to be engaged with on this front.
- Note - we have modified tree root trenching and drainage layout to ensure minimal impact on the TPO trees around the perimeter of the development. It is essential that tree roots do not penetrate the drainage system, especially main drains, or blockages will occur that will disrupt the entire drainage system in a relatively short time (2-5 years).
- Cut and collect excess vegetative coverage and remove any deleterious material from the site.
- Remove any on-site debris or unwanted materials.
- Desiccate vegetation.
- Either import fill to the SW corner or carry out cut and fill work to strip the topsoil to depth of c.150mm and stack to one side for finishing works and complete cut and fill operations.
- Potential re-Grade the deep topsoil / subsoil and any drainage excavated material as part of a cut and fill operation to create a consistent fall free of water collecting undulations in accordance with Sport England pitch gradient guidance. This will require landscaping of batter slopes. Note- soakaway chambers may need to be installed prior to cut and fill operations.
- Replace the screened 150mm depth of stripped topsoil and grade out to overall falls required.
- Install cricket table loam to finish surface off over the existing suitable site soil.
- Install a modern drainage system with high density pipe drainage 2.5mm centres.
- Install an irrigation system.
- Drainage system would discharge to underground attenuation and discharge through these to ensure the current greenfield run-off values are maintained or reduced.
- Apply 25mm depth of clean medium/fine sand and ameliorated sand into surface 25mm or so of topsoil (total amelioration depth of 50mm) and trim grade & roll.
- Undertake VibraSandMaster installation.
- Re-establish a pitch surface with grass by overseeding and fertiliser application.

Note: This is not a specification and should not be used as such.

Remodelling sites involving significant earthworks will inevitably damage soils even with good practice of working in dry conditions as much as possible and it is essential good construction practice and good post construction establishment of pitches is achieved. This involves re-structuring the soil, compaction relief works, successfully establishing vegetative cover as quickly as possible and ensuring that the vegetation continues to establish well.

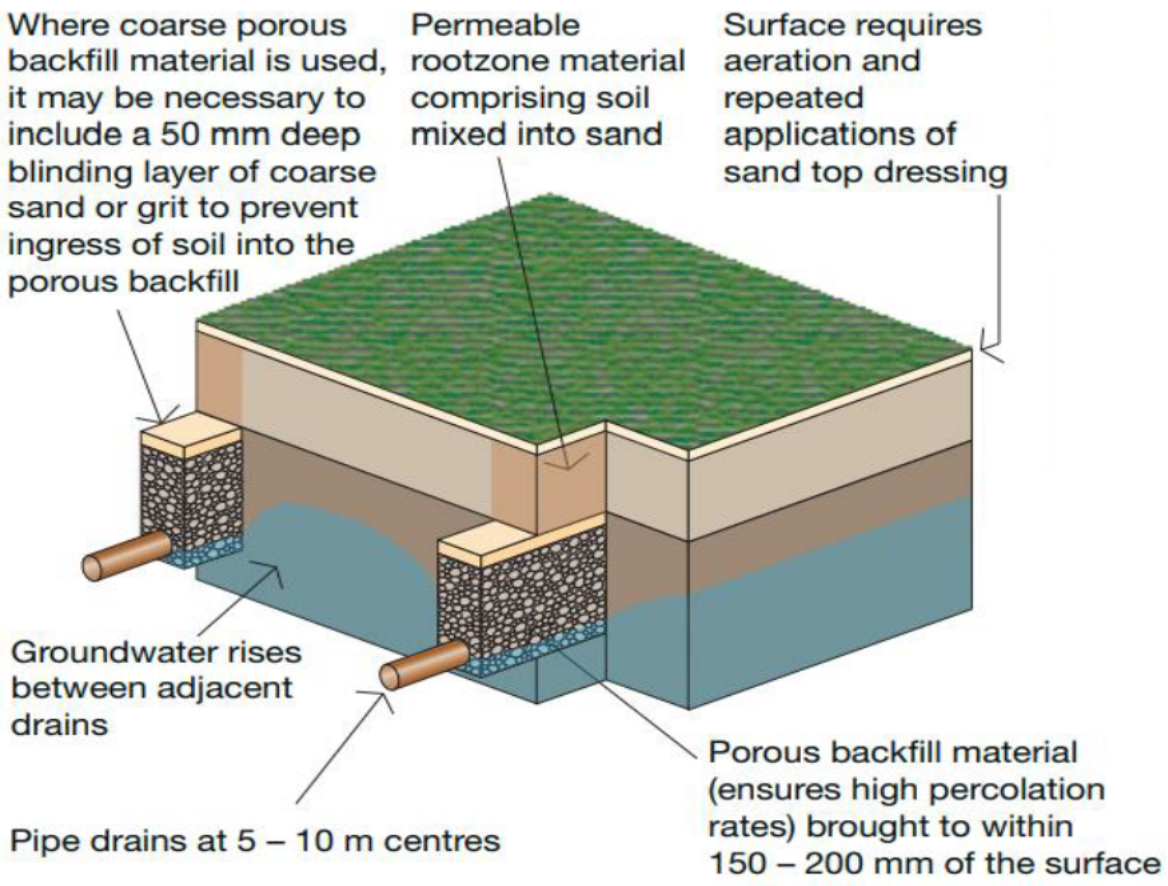
A more typical system of "off the shelf" pitch drainage may be considered but we have not proposed this. This typically involves pipe drainage at wider centres, usually 5 metres, which are then connected to a secondary drainage system of sand grooves 1-2" width at 1 metre centres. We have not proposed this due to the likelihood of earthworm casting covering the secondary system and the very high rate of water by-pass typically encountered in such systems in dry, clay loam soil dominated situations.

Note: In either drainage scenario the provision of irrigation is likely to be necessary to ensure successful renovations of football pitches and preparation of cricket pitches in the summer months. We would also recommend very specific optimised drought resilient sports turf grasses for this location.

It should be noted that this system is slightly different to the Sport England Design Guidance model (shown in figure 5 below) being of a higher drainage pipe density - although the basic principles are the same the pipework is slightly more intensive.

Figure 28: Drainage Construction Techniques for Natural Pitches – A Primary Drainage System Schematic. (Source Sport England Natural Turf for Sport – Guidance Design Note 2011).

Option 1: Primary Pipe Drainage system – installing a close centred primary drainage system is the preliminary step in drainage design. The density of drain pipes 2.5metre centres.



Pipe drainage construction on cultivated topsoil

Our opinion on this site is that a close centred primary pipe drainage system will be required to ensure water removal from the clay loam soil. The purpose being to:

- Ensure access with maintenance equipment such as mowers, rollers, etc., especially in the early spring period.
- Reduce time of lost play.
- Minimise soil cracking caused by soil shrinkage between drains.
- Improve sward condition by improving soil quality and growing environment.
- Increase uniformity of soil moisture presence across the playing surfaces.
- Improve public accessibility to the site and usability – which is key to club commercial success.

There is the option to increase drainage still further by adding secondary drainage sand grooves/slits if required. The benefits of this are:

- Increase drainage rates further by by-passing the soil's natural drainage.
- Greater certainty in meeting the 5mm/hr drainage (infiltration) rate required by Sport England parameters.

The disadvantages of secondary drainage are that:

- The pitch will be very dry in summer creating greater drought stress in the grass and increase the need for irrigation.

- The clay loam soil and clay base will be prone to shrinking (exacerbated if secondary open top sand groove or sand slit lines were installed) which can creating a trip hazard and as such there are likely to be maintenance problems keeping the surface safe for users and the public, free of animal excavations, droughting out of grass cover, etc.

14. Drainage System Parameters and Outline Design Version

The premise for the drainage system is to provide a close centred primary pipework based system in order to remove surface water effectively from the playing surfaces to the drainage system without making the surface too drought prone and high maintenance. The outlet will be confirmed at stage 2 Detailed Design with a slow draining subterranean attenuated soakaway outlet.

Sport England stipulate that drainage capacity should exceed 5mm per hour and this demands an intensive system of pipes and potentially secondary drainage, especially in the early years of use, to meet this target. The system thus comprises (from outlet to surface):

1. Output Discharges to attenuation / slow soakaway SuDS system.

2. Lateral drains at 2.5m centres connecting to carrier/main drains.

3. Sand amelioration into the existing clay loam soil on site to increase infiltration rates by increasing soil porosity.

4. Use of a VibraSandMaster to aid the initial surface water removal as a temporary secondary drainage layer while soil structures are restored by compaction relief and grass rooting into the soil.

5. Sand topdressing – Sand dressing to 25mm post construction is an essential element of the post earthworks process. This takes the form of required regular sand topdressing to remain viable with at least 3x8mm depth of sand applied in the first 12-18 months after construction to retain functionality and 1x8mm annually. **Grass cover stability must also be retained or the system will suffer as indigenous topsoil contaminates the sand. Worm management is important and sand dressing deters them and the use of "soil conditioners" also discourages surface earthworm activity and casting. Longer term the continued annual topdressing with suitable sand must be a key priority of management and be factored into the long term on-going facility management costs/budgeting for the site.**

In our experience close centred main pipe drainage produces a good result (sand grooves or slits can be added later if drainage performance isn't up to the standard required or, as is the case with our proposal, used during the establishment phase while the soil restructures to aid pitch condition). Sand grooves/slits are vulnerable to misuse and damage and will require replacement after time if relied upon as part of the long term drainage solution. In our experience avoiding secondary drainage systems or only installing them for the initial establishment period reduces water deficit / drought problems for turf and creates a more consistent surface that is more easily managed by clients. Furthermore, on sites such as Friendly Fields, with high calcium presence worm casting can be very challenging to the lifespan of sand grooves and sand slits often leading to their "capping" with natural soil quickly (within 2-3 years sometimes) which completely compromises the drainage system as

a whole where it relies on secondary sand slits or sand grooves as a functional support to the primary drainage system. While primary drainage only systems can also suffer this fate the width of the drain lines cut into the soil makes this a slower process and their greater depth in the soil creates more drawn down under gravitational forces to surface and soil percolating water.

Outlets:
Output from the drainage system will be to deep soakaway outlets. This is an area requiring further research and borehole drilling but desktop study suggests the site is suitable for either:

1. Attenuated Soakaway chambers

Or,

2. Deep lateral soakaway structures.

Or,

3. Deep borehole drainage output.

This approach allows us to reduce the risk of surface water flooding by storing water at peak discharge to drain away to ground in SuDS methods to deep ground water. The drainage system itself will offer a considerable volume for storage of water once intercepted off the surface as well.

The current iteration of drainage layout utilises the first option of attenuated soakaway chambers but it is our responsibility to identify alternative options within a feasibility study.

15. Indicative Work programme:

.1 Reasons for Start Date suggestion:

Although projects can commence at any time we suggest project commencement on the ground commence in spring and summer no later than early July for the following reasons:

- For the last 5 years springs have been a lot drier than long term average allowing work to start sooner.

- Should conditions not be suitable (which is quite easily possible) then there is still the rest of summer to catch up.

- It puts the project in the start of the construction work "queue" with the contractor so less chance of other jobs holding up the start of this project due to delays elsewhere.

- It provides the longest lead in period before pitches are put into play.

- Greatly reduces the chance of the project being delayed if compared to if works started in August when rainfall inputs begin to rise. Delays in August/September inevitably roll projects into the next season. Having noted all these above points it is important to acknowledge this site is in one of the driest parts of the UK but soil type on site is highly vulnerable to becoming unworkable in the event of wet conditions.

- The only drawback is that in summer the surface may require irrigation and this can be a significant effort and expense. An irrigation system within the scheme for helping establishing turf by hiring a system for summer would probably cost in excess of £25K plus water. Having an irrigation scheme may even permit very limited early use of the site in the first winter, especially with younger children (although we advise it is better not to use it if at all possible). Security of use and management oversight in use are challenges that add to the expense. A licensed borehole would be required to provide enough water to irrigate football pitches but an unlicensed borehole would be sufficient to meet the needs of the cricket table in our opinion ($20m^3$/day). However, the author stresses this is opinion and all matters concerning irrigations should involve a specialist in this area to carry out the requisite studies and make appropriate recommendations.

- The following schedule is an estimate of the required works likely to be needed on site and an attempt to schedule these into the calendar. It should be noted that the operations start and finish dates can be manipulated contingent on a start date being set.

- The following indicative work programme is not a specification of works and should never be treated as such.

.2 Indicative Work Programme: Former Friends School Field Football and Cricket Project

	Operation/Year	Year 1												Year 2											
A	General area / month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1	Mobilise Contractor																								
2	Setting out																								
3	Remove tree roots if required																								
4	Close cut and clear area																								
5	Glyphosate development areas																								
6	Test and Drill borehole																								
B	Main Field Earthworks																								
1	Strip topsoil to c.150mm and stack to one side																								
2	Cultivate remaining topsoil c.100mm,																								
3	Undertake cut and fill as required – may use drainage spoil																								
4	Break up clay base and create approved gradient pitch base & model environs.																								
5	Replace 150mm of stripped and screened topsoil to even depth to follow grades.																								
6	Stone bury																								
7	Trim grade																								
8	Install cricket table base																								
9	Install cricket table heavy loam																								
10	Install attenuation/soakaway																								
11	Install primary pipe drainage @2.5m centres																								
12	Drain spoil for soil to reuse on cut and fill/landscape areas and topsoil batter slopes.																								
13	Final stone clear of surface																								
14	Install irrigation supply to cricket table																								
15	Apply 50mm depth med/fine sand and ameliorate to 75mm																								
16	Final trim grade and seed bed preparation																								
17	Roll																								
18	Overseed all surfaces																								
19	Fertiliser all surfaces																								
20	Apply sand dressing																								
C	Post construction operations																								
1	12 months maintenance																								
2	Sand topdressing																								
3	Fertiliser and over-seeding																								
4	Compaction relief																								
5	Install goal post sockets																								
6	Install ball strike netting if required																								
	Pitch ready for use *										*	*									+				
	month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
	Notes: orange box indicates potential start of use date if works completed well but may be subject to weather and quality of maintenance and the need to limit unofficial usage.																								

*if sward established sufficiently.

+ preferred start date

.3 Initial Sports Turf (Agronomic) Maintenance

Following construction the first 12 months will be important in establishing the pitches with a reliable sward and conditioning the surfaces ready for their first use. This includes the following items:

1. Mowing
2. Fertiliser application
3. Compaction relief (spike and heave type or rotary de-compactor – either used parallel with sand grooves).
4. Overseeding
5. Sand topdressing
6. Irrigation (potentially) or localised irrigation.
7. Selective herbicide control
8. Insecticide or fungicide control for pests and diseases (potentially)

16 Indicative Cost Estimates

Important note: Cost estimating is always challenging in normal times but the combination of events in the last five years, inflation jumps, Trade wars/threats and new legislative positioning in areas such as requiring contractors to use normal "white" diesel rather than the current "red" diesel is making contractors very cautious in pricing works.

We have done our utmost to use current approximate market rates and the author cautions that volatility in the market place and fuel prices could impact matters considerably. Our costs are therefore indicative only and the only reliable cost is that obtained from competitive tender. We have no estimates to work on for the volume of material to be moved in cut and fill analysis.

This illustration is thus very much on the basis of giving a scope of costs rather than an accurate price.

Without a fully worked up design on the scheme any attempt to give cost estimates is fraught with problems our best estimate in the current financial climate is shown overleaf:

Cost Estimates of Regrading and Close Centred Pipe Drainage at 2.5m Centres, Installation of Cricket Table, Estimate of Irrigation Installation Costs and Full Overseeding.

PRELIMINARIES

Item	Description	Unit	Number		Cost (£)
P1-P5	Preliminaries	Item	1		£40,000.00

TOTAL TO SUMMARY (EXCL. VAT)	**£40,000.00**

PART A: EARTHWORKS					
Item	**Description**	**Unit**	**Number**		**Cost (£)**
P1-P5	Transport and Preliminaries	Item	**1**		As Prelims Tab
1	**Setting Out**				
1	Setting out working area	Item	**1**		£1,000.00
2	**Site Clearance**				
i	Heras or site fencing not required as already installed	m	**0**		£0.00
	Vegetation Clearance				
ii	trees and major roots over 75mm already removed	item	**0**		£0.00
iii	cut and remove vegetation on site	item	**0**		£0.00
iv	Spray Total Herbicide and remove existing vegetation on working area	m^2	**16,932**		£1,523.88
3	**Preparation of Formation Level**				
i & x	Cut earthworks: topsoil strip to 150mm and store to side. Then cut and place subsoil and transport to placement area. Drain trenchings allowed for in figure for use on batter slopes.	m^3	**0**		£0.00
i & x	Fill earthworks: Placement of subsoil followed by laser grading fill to proposed levels before replacing 150mm of topsoil to even depth. Drain trenchings allowed for in figure for use on batter slopes. Cut/fill neutral.	m^3	**0**		£0.00
iii	Raking and ripping of formation and removal of debris	m^2	**13,483**		£3,370.75
iv	Proof rolling and repacking as required	m^2	**13,483**		£876.40
v -vi	Final trimming	m^2	12,747		£1,912.05
vii	Debris / stone pick	m^2	12,747		£3,824.10
viii	Decompaction	m^2	12,747		£1,274.70
ix	Formation surface levels check	m^2	**13,483**		£1,348.30
4	**Sand Application**				
i-iv	Supply and apply medium/fine sand to form 25 mm layer (after drainage works)	tonnes	**540**		£33,750.00
	Note: The intent is the project will be cut/fill neutral. Arisings from drainage trenching is to be used to ease the north facing batter slopes and excess topsoil to be used in general landscape grading.				
TOTAL PART A TO SUMMARY (EXCL. VAT)					**£46,356.30**

4	**Part A2:Cricket table formation**				
i.	Prepare base ideally having minimal disturbance of natural soil.	m^2	**736**		£368.00
ii.	Create levels -50mm below surrounding outfield levels uniform grade +/- 12mm	m^3	**37**		£1,850.00
iii.	Import 50mm depth of heavy loam topsoil (Ongar loam)	m^3	**37**		£1,850.00
iv	cultivate 75mm to achieve mixing of native and imported loam 1:2 ratio evenly	m^2	**736**		£3,680.00
	consolidate with roller	m^2	**736**		£3,680.00
	re-tilth surface and grade to +/- 6mm	m^2	**736**		£18,400.00
v	Import 50mm depth of heavy loam topsoil (Ongar loam) and apply evenly to surface	m^3	**37**		£1,850.00
vi	roll to consolidation the surface ensuring height is 25mm over the outfield surface levels to tolerance +/- 5mm	m^2	**736**		£3,680.00
TOTAL PART A" TO SUMMARY (EXCL. VAT)					**£35,358.00**

PART B: DRAINAGE INSTALLATION ON AND OFF PITCH

Item	Description	Unit	Number		Cost (£)
1 - 9	**Installation of drainage infrastructure**				
4 i-vi	Carry out deep soakaway drilling investigation	Nr.	**0**		£0.00
	potential option Borehole drainage installation & attenuation	item	0		£0.00
	potential option linear soakaway	m	?		£0.00
	attenuation and soakaway chamber	item	?		£0.00
	supply and install 450mm dia. inspection chamber at junction of cut-off drain and collector/carrier drain.	Nr.	6		£3,900.00
4 vii	supply & install rodding eyes to main/carrier drains	Nr.	2		£206.40
5 - 10	**Note:** all drainage spoil to be stored and stacked on site for use in batter slopes to minimise slope angles to less than 1:4 and other areas requiring landscaping e.g. around manholes, etc.				
5-10	Supply and install 160 mm dia as carrier & cut-off drain including backfill. - Grade in trench to connect to collector drain. Note slight swale form over drain. May require trenching by excavator near dugouts.	Lin. m	**341**		£13,674.10
5 - 10	Supply and install 80 mm dia. Lateral drains including backfill. DEPTH = 0.500 m.	Lin. m	**5,393**		£64,716.00
8	**Junctions and Connections**				
i-ii	Supply and install junctions (80/150)	Nr.	**103**		£2,163.00
10 vii	Topping-up drain lines on one occasion	Lin. m	**5,393**		£5,123.35
					£0.00
11	**install tree root barriers**	Lin. m	**133**		£2,660.00
TOTAL PART B TO SUMMARY (EXCL. VAT)					**£92,442.85**

PART C: OUTFIELD AND FOOTBALLPITCH AREA SEEDBED PREPARATION, SEEDING AND SAND APPLICATION

Item	Description	Unit	Number		Cost (£)
	Outfield and football pitch surface preparation				
1	**Cultivations, Sand Application and Seeding**				
i	Earthquake/Shockwave in between drain runs	m^2	12,747		£1,147.23
	tilth amelioration of sand into soil - depth of operation 35mm	m^2	12,747		£3,186.75
2	**Fertiliser Application**				
i	Pitch area Supply and apply fertiliser	m^2	12,747		£1,274.70
4	**Seeding**				
i-ii	Supply and drill seed at 50g/m2 total applied rate	m^2	12,747		£5,098.80
iii	Rolling	m^2	12,747		£446.15
	Cricket Table Surface Preparation				
2	Fertiliser Application				
i	Pitch area Supply and apply fertiliser	m^2	736		£73.60
4	Seeding				
i-ii	Supply and drill seed at 50g/m2 total applied rate	m^2	736		£264.96
iii	Rolling	m^2	736		£220.80

TOTAL PART C TO SUMMARY (EXCL. VAT)	**£11,712.99**

PART D: NON PITCH AREA CULTIVATION AND GRASS ESTABLISHMENT

Item	Description	Unit	Number		Cost (£)
1	**Cultivation of Vegetated Area**				
i	Cultivate and grade topsoil to specified tolerances on batter slopes	m^2	2,743		£685.75
ii	Stone removal (if required)	m^2	2,743		£246.87
2	**Fertiliser Application**				
i	Optional operation assuming grass cover - Supply and apply specified 8:12:8 Pre-seed fertiliser (batter slopes and landscape areas) at 25g/m2	m^2	2,743		£274.30
4	**Seeding**				
i-iv	Optional operations assumed grass cover - Supply and apply grass seed to achieve 50g/m2 application rate and press the seedbed to consolidate the surface.	m^2	2,743		£1,097.20

TOTAL PART E TO SUMMARY (EXCL. VAT)	**£2,304.12**

PART E: SITE REINSTATEMENT

Item	Description	Unit	Number		Cost (£)
	Site Reinstatement	Item	1		£1,750.00

TOTAL PART E TO SUMMARY (EXCL. VAT)	**£1,750.00**

PART F: MAINTENANCE

Item	Description	Area	Unit	Number		Cost (£)
	Outfield and Winter Pitches					
i-v	Mowing (pitch)	12,747	Nr	5		£1,625.00
i-v	Mowing (landscape areas)	12,747	Nr	5		£1,250.00
vi	Rolling	12,747	Nr	1		£446.15
vii	Fertiliser as specified	12,747	Nr	2		£1,300.00
	Secondary VibraSandMaster	12,747	m^2	12,747		£32,632.32
viii	Compaction relief	12,747	Nr	2		£850.00
ix	Supply and apply sand topdressing as 3 x 8 mm (3 x 80 tonnes) applications (Pitch & touchlines only)	12,747	T	180		£11,700.00
		12,747	T	180		£11,700.00
		12,747	T	180		£11,700.00
	supply and install permanent pitch markers		pack	2		£250.00
i-v	Install Goal posts		pair	2		£2,800.00
	install goal post Sockets		4 pack	2		£900.00
	Cricket Table					
i-v	Mowing (pitch)	736	Nr	5		£500.00
vi	Rolling	736	Nr	4		£400.00
vii	Fertiliser supply and apply	736	Nr	2		£330.00
	Establishment renovations					
	cut table close at 2-3mm HOC	736	Nr	2		£200.00
	Verticut surface minimal 3 passes	736	Nr	3		£300.00
ix	Supply and apply heavy loam topdressing as 2 x 6 mm applications worked in with level lawn lute	tonnes	2	**5**		£1,200.00
				TOTAL PART F (excl. VAT) TO SUMMARY		**£80,083.47**

PART G: ADDITIONAL ITEMS

Item	Description	Area	Unit	Number	£/unit	Cost (£)	Total Cost (£)
	As-built survey (Inc. in adult pitch section)		item	1	950.00	£950.00	
	As-built O&M & H&S file		item	1	400.00	£400.00	
	subtotal						£1,350.00
	Ball Stop Fencing						
	install ball stop netting/fence @ 3m height		lin. m	27	EST	£9,990.00	
	install ball stop fence @ 1m height		lin. m	91	?		
	subtotal						£9,990.00
	create irrigation system (estimated)						
	bore hole feasibility test and investigation		item	1	£7,935.01	£7,935.01	
	irrigation system design		item	1	£3,500.00	£3,500.00	
	#NAME?		item	1	£22,114.78	£22,114.78	
	Total Irrigation system costs Subtotal						**£33,549.79**
TOTAL PART G (excl. VAT) TO SUMMARY							**£44,889.79**

- Note Orange Cell colouring indicates further verification of costs required

PRELIMINARIES	£40,000.00
PART A: EARTHWORKS	£46,356.30
PART A2: CRICKET TABLE	£35,358.00
PART B: DRAINAGE INSTALLATION ON AND OFF PITCH	£92,442.85
PART C: OUTFIELD AND FOOTBALLPITCH AREA SEEDBED PREPARATION, SEEDING AND SAND APPLICATION	£11,712.99
PART D: NON PITCH AREA CULTIVATION AND GRASS ESTABLISHMENT	£2,304.12
PART E: SITE REINSTATEMENT	£1,750.00
PART F: MAINTENANCE	£80,083.47
Part G: MISCELLANOUS ITEMS	£44,889.79
SUBTOTAL	**£354,897.51**
Project Contingency (10%)	*£35,489.75*
TOTAL COST OF CONTRACT (EXCL. VAT) TO FORM OF TENDER	£390,387.26

Notes:

I. The costs include 12 months initial post construction maintenance costs although only the initial cutting of 5 cuts is included – though this can be adapted.

II. The project contingency set at 10% but exclude costs of service provision and planning, VAT or professional project management /design fees and planning applications, etc.

III. The costs are developed on very loose estimates of the project activity and full design and selection of the multiple options will allow further fine tuning. In particular the installation of SuDS outputs to this scheme are currently to be finalised.

IV. Costs are based on the assumption that spoil from land drainage will be disposed of on-site either in manipulating surface levels, creation of “borrow pits” or in creation of bunds to boarder the site.

V. Costs are based on recent contractors rates obtained in discussion with contractors to be as current as possible or on works completed in 2025/26. There is considerable volatility in the market place due to inflation, material and fuel costs and the adage that “the tender price is the real price” has not been so true in 30 years.

VI. Costs are based on an estimation of the works required. If the job is altered or sub-divided in any way then the costs will inevitably increase in nearly every instance and the works will need to be repriced. There may be inclusion of optional items in the scheme which give some opportunity for value engineering the project and works can be completed in-house in some areas potentially which may also allow a saving in some areas.

VII. Project Management and associated professional fees are not included. Sports Turf Consulting Ltd. is now in a position to develop these more accurately if required.

VIII. Included in the pricing is the estimate of 3m height ball protection netting. We have not included a price for 1m height ball protection netting as this may be achieved by a variety of means.

IX. Included in the pricing is an estimate for the cost of irrigation consulting, borehole investigation and irrigation system design.

X. With all items in this section and notional cost estimates these figures are to give some appreciation of the scope and cost of a project of this type. Only with more detailed proper CAD-3D design work of cut and fill operations can specification development fully occur and we can we arrive at more accurate summation of works and costs.

17 Long Term Impact of Works for Future Maintenance, System Performance/Lifespan & Usage

Current and Future Use Levels

There is little data on the predictability of hours of play and training pitches can withstand and much depends on how a site is used in variable weather conditions, the age and size of participants, the intensity of maintenance applied, control of pests and diseases, sward nutrition, etc. Match play versus training is an important distinction in use and wear tolerance too. Unofficial usage can also be a factor in busy urban park environments. Sport England present data on this issue (Ref: Natural Turf for Sport, 2nd Edition 2011).

Table 3 Sport England estimated usage levels on natural turf pitches of varied constructions

Drainage Status	Adult weekly use* (hours)
Undrained (current condition)	**Under 2 (often unplayable on silty clay soils)**
High Density Pipe drained with drainage layer **(proposed)** to mimic pipe drained with sand slit secondary drainage	**3+ hours per week** (higher value expected due to close spacing of drains more likely **3-6hours/week**)
Pipe drained with mole drains	2-4
Pipe drained with sand grooves	**3-6**
Pipe drained with topsoil and drainage layer	3-6
Pipe drained with slit drains	3-6
Pipe drained and slit drained	3-6
Pipe drained with suspended water table construction	4-6

- The usage levels shown were estimated to increase by c.50% for players 15 years of age or under. However, much depends on the size of the players.
- Usage levels shown do not represent training use which anecdotally we estimate to be at least twice as intense and damaging to turf as normal match play. Training in areas off pitches is recommended wherever possible.
- Sports Turf Consulting advises that a pitch able to support 3-6 hours use per week by adults may support 4.5-7 hours use by under 12's and 4 – 6 hours for 12-15 year olds.
- Being in a dry region of the country the pitches may be able to support marginally more wear than those pitches in other areas thus the site may support more play than other facilities.

Based on the above we estimate that following should be possible if the pitches are well maintained:

Table 4: Comparison of existing provision and capacity for use of football pitches.

Current Pitch Provision	Current perceived football pitch use capacity	Use levels in hours per week **per pitch** in good condition with drainage (play not training)
Pitch 1 & 2	n/a	3-4.5

* match play wear is less than training use wear therefore training will cut these values by around 50%

** Training grid excluded from total

Sports Ground Current Use

- Although the site was a sports ground previously the current condition of the site is such that no current use values are relevant as it is fallow.

18. Pitch Maintenance:

The aftercare of the facility is often overlooked in the rush to complete the capital spend on the creation engineering of the project. However, the maintenance of a good quality modern sportsground is a demanding task and not without a need to commit to the necessary resources and expense. Failure to undertake the maintenance works needed will result in the swift decline of facilities and we urge the owners of the new facilities to ensure they retain competent agronomic advice on at least an annual basis to ensure the facility remains optimal.

Construction of a sports ground imparts its physical characteristics and it takes years for the soil physical properties to recover and the associated soil ecology to stabilise after the disruption to the ecosystem and its modification. To avoid potential failure of new grounds we strongly recommend the support of agronomic supervision follows on after construction.

We have included a generic winter games (football) pitches maintenance programme in Appendix A and Cricket Table Maintenance in Appendix B for further guidance. We stress this is generic and may not be optimal for the scheme we propose here – its purpose is simply for illustrate and promote understanding of the likely demands to maintain sports grounds. On-going appraisal and adaptation of the maintenance programme is likely to be required to get the optimal results.

- **Sand dressing** – The critical importance of good maintenance has been stressed through the report and this is critical to maintaining surface water and soil drainage systems. Annual sand dressing serves to protect drains, sand grooves or sand slits from contamination from indigenous soil and dilute the worst impacts of worm casts and soil kicked up by player's feet. In the early years the author recommends the dressings are around 80-100 tonnes for an adult pitch but after about 5 years this can be reduced to 60-80 contingent on use and conditions. The scheme also includes areas that will likely be used as training grids off the pitch area therefore the whole site should be treated to 8mm sand dressing application not just the pitches. It may well be the case that after a period of time the sand dressing can be stopped on cut down to work through the 6 yard boxes and centre or a system of soil recycling by hollow tinning and recycling of the cores can be adopted to increase sustainability. It should be noted that over time sand dressing can build up to a point where the pitch surface becomes "soft" and prone to tearing up. Routine agronomic inspections will help identify if this is becoming an issue requiring backing off on the application of sand dressings.

- **Land drain settlement** – it is common that drainage backfill will settle with time despite the best efforts of contractors to settle and compact backfill and regular sand dressing over the surface of the drains/pitch area as a whole. Generally settlement is not uniform and occurs in sections though can impact all drain trenches. This happens as soils expand, shrink and move with drying, rewetting and freezing processes and is entirely normal. It is therefore important that the site operator is

aware that this is a normal process of maintenance and budgets for it accordingly. The contractor will top up drains for a period of 12 months after the construction is deemed complete (normally the date that seeding is completed) known as the Defects Liability Period.

- **Typical maintenance costs** – Depend significantly on the standard of facility and usage levels. With greater understanding in consultation with stakeholders we can advise on this further at the design stage which will allow more time to develop accurate projection on costs. Be aware that there are funding support opportunities from certain sports governing bodies and specialist funding consultants.

- **Drainage System Longevity -** Provided the system is maintained with the regular clearing of silt traps (an maximum 6 monthly task, ideally check at 3 months after construction) and collector drains being flushed periodically we would anticipate the lifespan of a drainage system to be at least 25 years and probably longer. The site does have a silty content soil which can compromise systems sooner. A great deal depends on how the site is used and control of worm casting and diligence with sand application.

  In our experience many clients, and clubs in particular, do not maintain good financial control and changing committees will lose sight of these recommendations. The system we have recommended with closer pipe spacing will therefore be less prone to long term decline than a standard approach of sand grooves/slits which quickly fail if maintenance is not be up to standard or the system is abused by play in poor weather conditions which damage the pitch surface excessively.

19. Introductory Project Risk Assessment:

All construction projects face risks and it is important that we identify where these can occur in an outline statement:

I. **Soil and Weather conditions:** Working with soil, especially those with high “fines” (silt and clay) contents requires that the conditions are dry and favourable. Timing of works commencing and finishing is crucial and even a few hours delay in seeding can put a project back months or even 6-8 months. Projects involving soil movement need to take place in dry spring and summer conditions as a general rule. Seedbeds are particularly vulnerable to sudden downpours and storms (a lower risk on this site due to days with >+10mm rainfall being quite low) or faults in irrigation supplies. Drought can also hamper a project preventing seedlings establishing or forcing a germination to fail requiring over seeding. These items are why project funding indicates a contingency fund and this is nominally set at 10% but on some projects needs to be higher.

II. **Unexpected soil or geological conditions:** although rare, unexpected soil or geological conditions can occur which can include subsidence, slumping, destabilisation due to soil water movements, sink hole development, etc. and these can impact project costs due to their unpredictability and while every effort is made to identify such risks they can arise with no warning on rare occasions.

III. **Timeliness:** It is essential that works are undertaken on time with agreed start dates, access assured and all resources available. Unlike civil engineering projects, the

whole of the natural turf pitch process is in the natural environment – there is no foundation upon which the project can keep going on if the weather turns. The weather issue can delay contractors coming in from other jobs, disrupt supplies and delay stages in your job e.g. wash out drain backfill, cause problems with dust, etc. as can human interference, thefts, etc. We have suggested scheduling the job for early in the year to reduce this risk. While it is possible the project may well start later there is a whole summer to catch back up on operations whereas starting in July or August means rain can delay the project easily until the following year.

Operational challenges can occur whenever piped drainage is installed since backfill installed in the drains will settle and getting grass establishment in drain runs is challenging were nutrient leaching and drought impacts can occur. We design mitigations into our system by cultivating over the top of drains and ameliorating sand and soil together in the upper profile surface. In this system we have added a short term VibraSandMaster treatment to help the initial pitch establishment and drainage process while the soil recovers its natural structure. Irrigation and fertiliser inputs over drains and the pitches as a whole are important during the establishment phase.

IV. **Spoil** – Spoil from excavations and drainage installation is ideally to remain on site during this project unless the client determines that off-site disposal is required in order to meet planning levels. The material can be utilised for building up required ground levels with screening prior to spreading topsoil. Bunding is not needed but if necessary though must be made in keeping both visually and ecologically with the local environment and would be subject to planning approval. This element of construction design "fine tuning" is only worth making allowance for at a later date during the detailed design and specification moment when final details of soil cut and fill are available.

V. **Bomb Risk (UXB)** – unexploded ordnance is a real risk on sites near industrial and target areas from WW2 and we have not allowed for this at the current time in view of this having formerly been a countryside area. However, we raise awareness of the issue as trenching equipment is the ideal machinery to detonate a "live" UXB buried in the soil. We advise the client that this risk exists, albeit at very low levels, but cannot identify what the severity of risk is. We can supply contact to assist with this risk if desired.

VI. **Services Search**: At the current time we have not conducted a services search but are expecting this location has been assessed by the construction company for subterranean services. A full search should be conducted if the scheme is considered viable and is progressed.

VII. **Operational Financial Requirements:** The client and the recipients of the grounds on hand-over need to be aware of the financial demands to successfully manage the sports grounds that would be created from the scheme following the outline general maintenance schedule. Skill, time and financial outlay need to be accounted for to ensure the success of the pitches in future and we strongly recommend the maintenance of an independent Agronomy support service on completion of the project to ensure it establishes well and gets the necessary inputs needed for the first five years at least. The new grounds would be a very different sports ground setting

compared to the original and require a new approach in most aspects of maintenance.

20. Miscellaneous Items

A number of challenges can arise during natural sports pitch construction which can impact the construction process and delivery of the project. Whilst we take all reasonable steps to minimise the potential for these the very fact we work in the natural environment can have implications for projects, areas of challenge include:

I. **Services** – It is recommended to our clients that a full services check is undertaken through accessing services plans that are up to date before development works commence. Services can inhibit the works either in planning the project or when works are underway, especially where site remodelling and land drainage works are undertaken.

II. **Footpaths** – The site does not have public access (Right of Way) to diverting the site although has clearly had some unofficial access around the facility and there is therefore no required planning consent regarding Rights of Way as we understand it. Nevertheless, during construction works large plant /equipment may be on site and may present a hazard to the public whose protection is paramount, even if they are officially excluded from the area.

III. **Planning Permission** – Where cut and fill remodelling works and installation of land drainage schemes are required we advise the client to approach the local planning authority for guidance from the local planning department as to whether planning permission needs to be granted for the development. Increasingly this may include information to be presented on drainage system discharges into the wider environment and data on flood risk analysis and approval from Sport England planning officers. Our schemes seek to fulfil all the relevant guidelines for sports pitch construction as far as is possible at this stage and avoid problems of scheme approval when put to scrutiny with Sport England Planning Consultants.

IV. **Irrigation** – Natural turf pitches rely on good weather conditions to sustain growth both during establishment phase following construction and on an on-going basis thereafter. It is the responsibility of the client to provide a source for irrigation and to provide sufficient irrigation for the duration of the construction phase of the project. Sports Turf Consulting can arrange for such services if instructed by the client and can be specified within the project brief. In this instance we have shown a cost for Irrigation Consultancy Services within the price schedule and the estimates for the work we anticipate may be required but this needs further fine tuning.

V. **Outfall(s)** – When discharging drainage outputs into natural drainage features like ditches, streams, rivers and lakes it may be necessary to obtain consent within discharge permissions from the Environment Agency, Local Authority, Land Owner or lead flood authority. This process inevitably can take time and delay the start of projects or even require redesign under some circumstances. While we work to minimise flood risk and employ sound engineering principles the ultimate discretion rests with the above authorities and it therefore requires the client to obtain any required consent licences through the planning process. Where existing drainage

infrastructure and outfall exists there may be "drainage rights" in place and this is not the case with this project it seems.

Sports Turf Consulting undertakes to employ Sustainable Drainage Schemes (SuDS) such as balancing ponds / soakage swales / subterranean attenuated soakaway either at shallow depth or into permeable strata where desk study shows this is viable. Where drainage outlets are not available in-site solutions are developed to optimise any outlet requirements from a drainage system where at all possible. However, soils and geological constraints can compromise available options, especially in Groundwater Protection Zones. Greater detailed specification on outlets arises at the detailed design phase (stage 2).

VI. **Plant Operation During Construction** – Moving soil on site during construction requires large and powerful earthmoving equipment such as bulldozers, soil scrapers, graders, 360^{o} excavators, dumper trucks and cultivation equipment. The movement of soil inevitably impinges on the natural structure that soils have and reduces pore spaces within it. Furthermore, it destroys natural structures such as worm channels, cracks and fissures in the soil and subsoil, root channels and the aggregating effect roots have on soils. The loss of structure reduces permeability of soils and therefore drainage rates reduce, often to very low values, rendering the soil almost impervious to infiltration and percolation of water under gravity. The installation of a drainage system whilst there for long term benefits also helps overcome this initial challenge and avoids the site becoming unmanageable. In time the drainage of the soils naturally recover as they restructure as grass rooting systems and grounds management practices are employed. Worm activity in small amounts is tolerable but large numbers may threaten the viability of drainage if not managed.

VII. **Settlement of Drain lines** – Land drains usually settle as the backfill material in them shifts through wetting and drying and the movement of surrounding soils to moisture and temperature. This is usually prevalent most noticeably in the first 1-2 years after construction and can occur over time and at any time after construction, especially in response to harsh weather conditions, and is perfectly normal. It tends to occur more on high clay content soils due to their shrinkage in dry weather. To combat this challenge the topping up of drain runs is normally carried out under the contractor's duties within the contract during the first 12 months after seeding. Thereafter the responsibility rests with the site operator/client and allowance needs to be made within the maintenance programme to address this requirement from time to time.

VIII. **Maintenance Schedule** – Any natural or semi-natural turf pitch requires good quality maintenance to care for both the grass and soil/rootzone present in its construction. Failure to implement the recommended maintenance schedule under the right conditions will result in a deterioration in playing surfaces with attendant reduction in playability and drainage performance. We include a generic turf maintenance schedule in the Appendix to illustrate the type of management that pitches may require – however we strongly advise that this should not be considered as maintenance advice for a new or established pitch system and only a specific maintenance schedule should be applied in consultation with a professional, commercially independent, Sports Turf Agronomist, especially in the first 5 years after construction.

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21. Final Comments

We trust this advice is clear and concise, but if you have any further queries please do not hesitate to contact me on my mobile 07739 505862.

Signed

[redacted]

[redacted]

Director and Principal Consultant
17th April 2025

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Appendix A: Generic Football Pitch Maintenance Programme

1. **Mowing** – Cut between 30-40mm height of cut with a cylinder mower, or roller mower, if cylinder cutting is not available. Cutting should take place at least once per week in the growing season, often twice weekly is necessary. Changes to the height of cut should be undertaken gradually ideally changing the height of cut no more than 10% between cuts and never more than 30% on any single cut. Mowing should be allowed for on at least 30 occasions per year and greater frequency is required in mild weather or warmer locations and where rainfall is more uniform through the seasons. Specific requirements exist for new pitches and introductory cutting regimes.

2. **Fertiliser:** Application of fertiliser will be required on a minimum of 2 occasions per annum and depending on construction as many as 4 times per annum. We consider it generally irresponsible to recommend particular products at this stage but as an indicator of the type of products that might suit a generic setting the very least fertiliser application in:
   - April/May of 12% nitrogen based minigranular at 35g/m^2
     And
   - September of 5-7% nitrogen based minigranular at 35g/m^2

   This would be the bare minimum requirement for almost any pitch. Fertiliser must be applied evenly using a uniform delivery spreader.

3. **Weed Control** – the use of an appropriate selective fertiliser is likely to be needed, the product will be determined by those species present within the turf. Application should follow maker's instructions to the letter and must only be completed by PA certificate holders in line with legislation whether in-house or by contractor.

4. **Fungicide** – Although it is unusual for football pitches to suffer disease attack it is not impossible. Good plant husbandry should avoid the need for fungicide use on winter and cricket games pitches. Any disease activity which is not recognised with absolute certainty should be consulted on with a grass diseases specialist or an Independent Sports Turf Agronomist, either of which should be BASIS registered.

5. **Pesticide** – Invertebrate pests have reached record levels in recent times with the removal of generic pesticide products from the market. Very specific control measures are available and it is essential to consult an Independent Sports Turf Agronomist for the optimal control measures. Only one chemical control is available at the time of writing and only then following strict stewardship controls. Worm casting control will require specific and careful measures using a variety of maintenance techniques.

6. **Aeration / Compaction Relief** – Management of the soil is required to relieve soil compaction that arises from sports use and machinery traffic that causes loss of pores in the de-structured soil. Work must take place at the surface and at depth. Spike and heave decompaction or rotary decompactors must be used with care as they may, over time, lift stones through the soil profile and agronomist advice on this site is required before commencing to avoid this. Upper surface solid or slit aeration measures are normally employed and assist in maintaining topsoil surface infiltration and percolation. Any aeration treatment must only be undertaken when ground conditions are suitable.

Where either permanent or of temporary intent where secondary drainage is present the compaction relief treatments must run parallel with the sand grooves or slits installed.

7. **Sand topdressing** – The application of sand topdressing is essential to pitch care and should be applied at a rate of at least 80 tonnes/adult pitch during spring renovations ideally (applications at other times of year tend to create challenges) and should be applied to the whole outfield area not just pitch areas. Sand should be worked into the soil surface using drag mats or brushes to evenly distribute the material. Low drain runs may need targeted topdressing.

8. **Overseeding** – At least once per annum (typically spring) the pitches should be overseeded using a mix similar to or identical to the seed mix employed during initial sowing. Though perennial ryegrass may be the main species employed other species may suit the site well after construction e.g. Smooth Stalked Meadow Grass, Tall Fescue, etc. and good independent Agronomic advice from an independent Sports Turf Agronomist should be sought if deviating off the original seed mix or periodically to ensure the best cultivars are employed.

   Seed may be applied by broadcast, dimple or drill seeding methods though the latter depth of operation must be carefully set so it is appropriate for the grass species selected, generally 5-12mm depth is appropriate but each species has an optimum. Other than broadcast seeding when drill seeding carry out at least 3 passes over the site to achieve an application rate of between 200-350kg/ha. Seed with pre-treatment often offer enhanced establishment and survival benefits. Second seeding treatments may also be needed.

9. **Harrowing** – traditionally harrowing of pitches has been completed using a smooth side of a chain harrow or drag mat to smooth pitch surfaces under dry ground conditions.

10. **Rolling** – Rolling is generally best avoided but there are circumstances where it can be useful to restore a pitch surface but specific guidance is required in such situations. Rolling routinely damages soil structure and impedes drainage.

11. **Divoting** (Divot repair) – after matches and training divots should be trodden back into place and any scarred areas may be teased back using a narrow hand fork (often pole mounted by pitch groundsmen). Adding sand and seed divot mix can be helpful in repairing areas, especially in mild weather above 5-8^{o}C.

12. **In season Repairs** – extensive damage to the surface can occur in high rainfall or if the pitch is exposed to higher levels of use than recommended. Such damage should be restored by overseeding (if temperatures are high enough) and potentially the application of sandy topdressing mix in order to try to re-establish grass cover. It is best obviously if pitches are not played in very wet conditions as the surface may be damaged for months afterwards compromising playing quality and drainage performance.

13. **End of Season Renovation** – End of season repairs and renovation are normally carried out in late spring (first week or two of May) and determined by prevailing weather and ground conditions. Climate change is requiring far more thought to this process and is

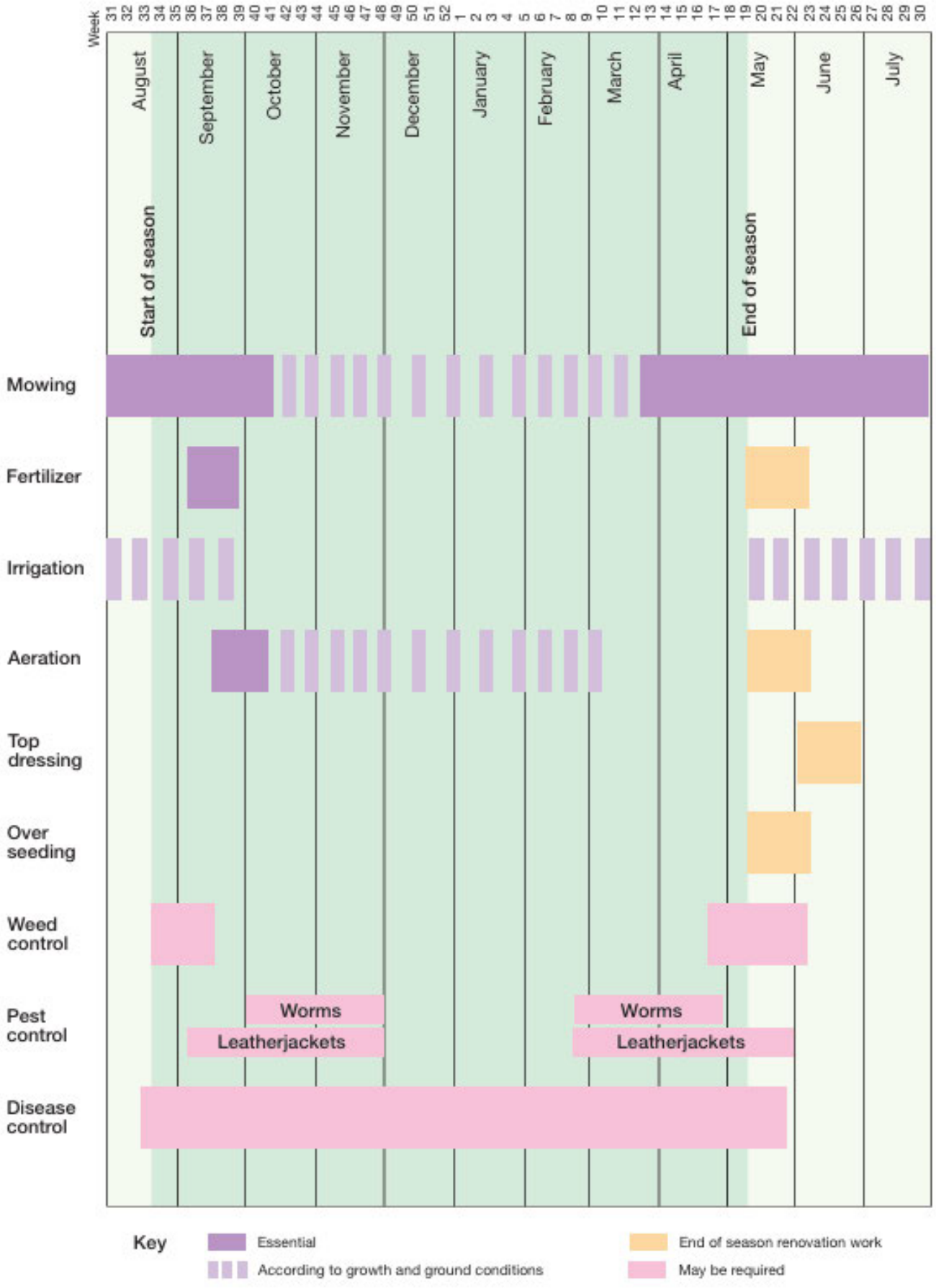
an area Sports Turf Consulting strives to meet the challenges facing sports ground managers. Irrigation is likely to be necessary to ensure seedling success post renovation.

14. **Irrigation** – may be needed in the summer months to ensure optimum turf health. over watering should be avoided and a volumetric water content of approximately 20% is healthy.

15. **Line Marking** – Line marking should be performed using approved pitch line marking products for good results and to ensure materials use compliance. Pitch sizes should be accurately set out (ideally initially using a GPS based system) appropriate to the team size and age group of players.

16. **Goal Post Safety** – Approved goal post systems shall be employed on sports pitches for safety reasons. Any posts or post system should be checked regularly (minimum weekly) and any damage repaired or re-painted. Stability and safety are very important qualities in goal posts.

Table 5: Summary Table of Winter Pitch Management for Natural Football and Rugby Pitches (source: Natural Turf for Sport - Design Guidance Notes. (May 2011)



Winter Football and Rugby League: Summary pitch maintenance programme

Appendix B - Generic Cricket Table Maintenance Programme

Mowing – mow the cricket table at 12-20mm through the year except after renovation when the height of cut can be as high as 32mm on seedlings. Close cutting must be employed only for pitch preparation. Clippings should always be removed.

Scarification – in spring and late summer the surface will require scarification as part of renovation works. Scarifying, verticutting and brushing will be required as part of pitch preparation.

Compaction Relief / Aeration – this work is undertaken from the end of the season until New Year as a general rule. The type and depth of aeration work needs to be chosen in response to prevailing conditions. Normally at renovation time solid tines of around 12mm diameter are employed and these are suitable through the winter until New Year.

Overseeding – damage to crease ends should be repaired with underpacking and as removed from use overseeding. The whole cricket table should be overseeded at least once per year and individual pitches can be overseeded after sarrel rolling during the playing season if so desired. Specific advice on cultivars and species should be sought from an independent sports turf Agronomist.

Topdressing – After scarifying and overseeding topdressing should be applied at the end of the playing season. The type of topdressing heavy loam relates entirely to the construction and loam type and clay contents employed and should be consistent with this.

Fertiliser – apply a winter fertiliser in September or October as the square comes out of renovation and the grass leaves have reached the 2-4 leaf stage. Soil analysis will determine the correct fertiliser product to use. In autumn and winter a product of 2-5% Nitrogen content will suffice and in summer a product of 8-14% nitrogen will be sufficient though 2-3 applications will likely be required to sustain growth and condition. Application rates of 20-35g/m2 will suffice.

Pest and Disease – vigilance should be maintained for turf blemishes and appropriate approved products used to control issues that arise applying these in strict accordance with maker's instructions. For support and advice contract an independent sports turf Agronomist or disease specialist.

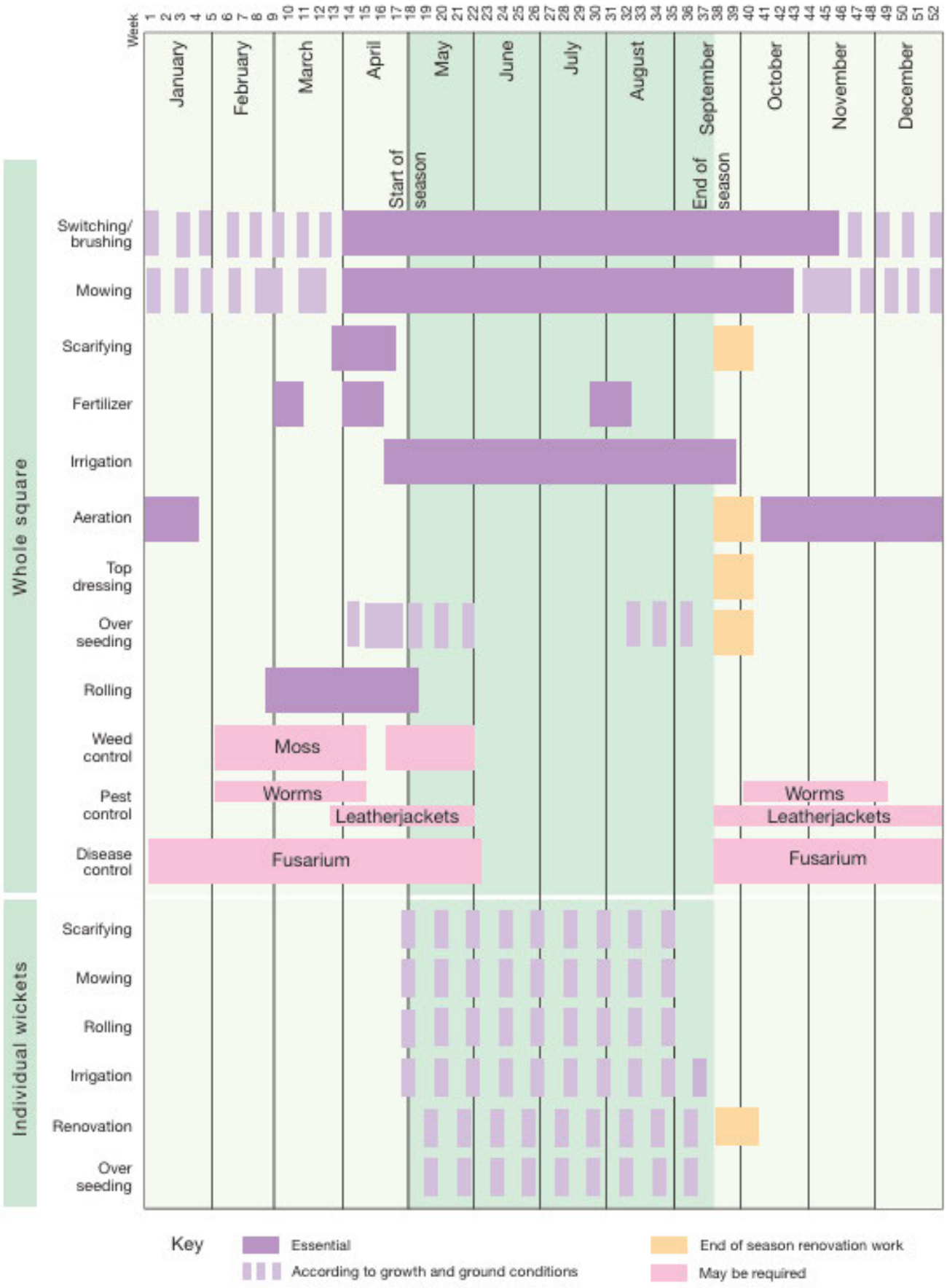
Selective Herbicide – apply a product suitable for the weed presence observed and if in doubt discuss with contractor, sales representatives or contact an independent sports turf Agronomist for further advice.

R**olling** – Rolling should be carried out in spring when soil conditions are moist to settle the table for the season's play. Irrigation and watering are a normal part of cricket table preparation for matches.

Preparing Pitches: This is a very individual task depending much on the cricket table and how it responds to drying conditions, the time of year and standard of play. Generally the key elements are:

- Pre-season Rolling to settle the square after winter frost and water accumulation – this may proceed from February onwards as ground conditions allow.
- Spring renovations – usually verticutting or light scarifying suffice with mowing to collect arisings.
- During the playing season pitch preparations:
- Mowing – about 5-10 days before a match the pitch area is cut down to around 2mm height of cut.
- Scarifying – light scarifying then takes place repeatedly followed by further mowing to remove the lateral stalks and dead organic matter.
- Brushing and mowing take place to improve on the work with the scarifier.
- Watering and rolling may be needed contingent on surface conditions
- Covers may be needed to protect the surface from very fast drying or summer rainfall
- The process of pitch preparation is a uniquely skilled task for a good grounds person and it is difficult to fully explain the process in words… much is contingent on skill and understanding how the surface reacts to conditions over time.

Table 6: Summary Table for Cricket Table Management (source: Natural Turf for Sport - Design Guidance Notes. (May 2011)



A summary maintenance programme for cricket squares