



Feasibility Report for 4 Winter Sports Pitches at Cefn Cribwr Athletic Club and Cefn Cribwr Boys Club



Prepared by

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Disclaimer

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1. Scope of the Report

Oolong Sports Pitch Consultancy was commissioned to undertake a feasibility study for Cefn Cribwr Athletic Club and Cefn Cribwr Boys Club to assess the quality of the existing grass pitch and to propose improvement works. The assessment was based on the Institute of Groundsmanship (IOG) Performance Quality Standards table (PQS) which provides a minimum quality standard for the construction and maintenance of pitches, refer to Appendices.

The study focused on the drainage situation, the ground surface levels (topography), the soil conditions and grass health. Soil assessment investigations were undertaken to determine soil depths and conditions. Soil samples were sent for laboratory analysis to determine soil fertility status and confirm soil textural class.

Historical information about the site was gained via conversations with club staff on the day of the visit.

Recommendations and outline costings for improvement works are included which take into account the potential future use of the playing surfaces and requirements of Cefn Cribwr Athletic Club and Cefn Cribwr Boys Club

The following table shows the systematic sequence of events required for a successful sports pitch improvement project.

It is essential that a qualified and experienced Sports Pitch Consultant is engaged to undertake these duties as this is a specialised profession. It is not appropriate to use a Civil Engineer or Contractor. The Project Management and Supervisory duties are of particular importance in ensuring the implementation of a successful scheme.

| Item | Description |
|---|---|
| Feasibility Study and Report based on the PQS | Desk study and field assessment of pitch quality including recommendations and outline costings for capital improvement works |
| Design and Specification Document | Details design drawings, materials and workmanship specifications and a Bill of Quantities. The 'Specification' is a stand-alone document used for the competitive tendering process and contract management purposes |
| Project/Contract Management and Works Supervision | To oversee the technical and logistical aspects of the project and manage the contract. To supervise the construction works and react to unplanned events |
| Maintenance Inspection Visits | Post-construction inspection visits |

Table 1 – The essential stages of a successful pitch improvement project

2. Site Visit Details

| | |
|--------------------------|---|
| Client: | Cefn Cribwr Athletic Club and Cefn Cribwr Boys Club The Coalfields Regeneration Trust Bridgend County Borough Council |
| Site Address: | Cae Gof Cefn Road Cefn Cribwr Bridgend CF32 0BA |
| Site Contact: | Mr Ryan Jones (Game On programme manager, the Coalfields Regeneration Trust) |
| Present at visit: | Mr Ray shark (Cefn Cribwr RFC) Mr Peter Jones (Oolong Sports) |
| Date of visits: | 28 January 2020 |
| Consultant: | Mr Peter Watkin Jones (Oolong Sports) |

Summary

Typically the pitches are waterlogged with typically muddy conditions and areas of very poor grass coverage. The lack of active drainage within all 4 pitches means that the ground does not recover well after heavy rainfall events and is reliant on surface run-off and evaporation to remove standing water. As a result the pitch recovery can be slow and games postponed.

All 4 pitches would be significantly improved by installing suitable drainage systems. This should include a primary piped system supplemented with a secondary system of slit drains or sand grooves.

These operations would dramatically improve the pitch quality and increase the reliability of fixtures and, provided an adequate maintenance regime is followed, will give years of dependable performance.

The PQS provides the basic minimum standard for the construction and maintenance of grass turf playing surfaces. Principally this recommends that a natural grass pitch must:

1. Have adequate grass cover
2. Have low levels of weed coverage
3. be reasonably flat
4. Have the ability to drain surface water

It is divided into 3 categories: High, Standard (Mid), and Basic

Currently the main rugby pitch (pitch A), the soccer pitch (B) and the dual-use pitch (Pitch C) generally achieve the basic category within the PQS system but the drainage and grass health aspects are poor and need improvements. Pitch D is historically the wettest ground and was also below the basic threshold for pitch gradients.

The items highlighted within Tables 2 to 4 are of primary concern and require attention.

Pitch A

| Item | PQS Category on the day of the visit |
|-------------------------------|--------------------------------------|
| Ground cover and grass health | Basic - with areas below basic |
| Undesirable weeds and grasses | Mid |
| Root depth | Mid |
| Thatch depth | High |
| Topsoil depth | High |
| Gradient lengthways | Basic |
| Gradient cross pitch | Basic |
| Drainage (Infiltration Rate) | Below Basic |

Table 2 – Pitch A PQS

Pitches B and C

| Item | PQS Category on the day of the visit |
|-------------------------------|--------------------------------------|
| Ground cover and grass health | Basic to Mid |
| Undesirable weeds and grasses | Mid |
| Root depth | Mid |
| Thatch depth | High |
| Topsoil depth | High |
| Gradient lengthways | Basic |
| Gradient cross pitch | Basic |
| Drainage (Infiltration Rate) | Below Basic |

Table 3 – Pitches B and C PQS

Pitch D

| Item | PQS Category on the day of the visit |
|-------------------------------|--------------------------------------|
| Ground cover and grass health | Basic to Mid |
| Undesirable weeds and grasses | Mid |
| Root depth | Mid |
| Thatch depth | High |
| Topsoil depth | High |
| Gradient lengthways | Mid |
| Gradient cross pitch | Below Basic |
| Drainage (Infiltration Rate) | Below Basic |

Table 4 – Pitch D PQS

3. Introduction

The site consists of four grassed winter sports pitches and a bowling green, the bowling green will not be considered in this report.

The northern most pitch (A) adjacent to the main road is situated on an upper bench area formed from a previous land regrading operation and is the home venue for Cefn Cribwr RFC and who currently play within the WRU Division Five South Central. They run a senior and youth team.

The site is also home to Cefn Cribwr FC Boys Club who use the main football pitch (B) at the lower section and is located at the west of the site. There are two other pitches; the lower central pitch is marked for both rugby and football (C). The remaining pitch (D) to the east is marked for football but is rarely used due to extreme waterlogging conditions.

All four pitches suffer from wet surface conditions and poor drainage.

A boundary ditch runs to the SE corner which discharges to the south through agricultural land.



Figure 1 - Outline of the pitches at Cefn Cribwr Athletic Club and Cefn Cribwr Boys Club

4. Methodology

The proposed area has been quantified and a site report compiled by using the following methods and has not been judged through observations taken while a game has been in progress:

- Visual assessment of grass coverage to assess the proportions of grass species and weeds.
- Field assessment of the soil profile down to approximately 400 mm with sampling of the topsoil.
- Non-intrusive investigation into any existing drainage system and outfall facility.
- Laboratory analysis of soil samples recovered from the pitch.
- Use of National Soil Resources Institute Soil Maps
- Information reviewed using Performance Quality Standards (PQS) which are set out by The Institute of Groundsmanship, WRU.

A full copy of the standard can be seen on www.iog.com

5. Ground Conditions

Soil Profiles

Representative soil profiles were assessed using hand augering techniques and topsoil samples sent off for laboratory analysis. All profiles were found to be similar in makeup with topsoil varying from dark brown Clay loam at the top pitch A to Sandy loam at the lower pitches (B to D) and to a minimum depth of 280mm with inclusions of 10 - 20mm stone fragments below 220mm above slightly firmer clay subsoil below, see **Table 5**. Results from the laboratory tests include soil texture, organic matter content and nutrient status.

The British Geological Society classifies the local bedrock geology as SOUTH WALES MIDDLE COAL MEASURES FORMATION - SANDSTONE and SOUTH WALES LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE.



Top 250mm of the profile is soft grey brown Sandy clay loam

Below 250mm is firmer light brown Clay loam with angular stone

Figure 2 - Typical soil profile for Pitch A

Topsoil depths measured in the field were found to be approximately 250mm deep and consistent across the site. The upper 60mm soils were completely de-structured with poor shear strength capacity. Some small fragments of coal were present between 100mm and 250mm.

Subsoil depths were assessed to a maximum of 500mm below ground level using a combination of hand augering and open trial holes, the profiles showed a consistent layer of Clay subsoil throughout. Subsoil textures were classified as Clay loam.

The entire topsoil profile is without structure and shows signs of being unable to react to rainfall events. The rooting depth is typically 80 - 120mm and within the Mid PQS category. The Clay subsoil below 250mm is compact and will impair drainage.



Topsoil profile shows complete lack of soil structure and poor shear strength capacity

Figure 3 – Typical topsoil structure

Nutrient status

The ideal pH value for sports turf grass mixes including Perennial Rye grass is around pH 6.5. This conditions for the optimum availability for (P) Phosphorus, (K) Potassium and (Mg) Magnesium and optimises the availability of micro-nutrients such iron, manganese and zinc. Nutrient status is denoted by the soil index value and the optimum soil index value for amenity grassland is 2.

The presence of organic matter within the topsoil ranges from around 12% for pitches A and B and around 6% for pitches C and D.

Thatch is a layer of intermingled dead and living shoots, stems and roots which develop between the zone of green vegetation and the soil surface and can impede drainage. The observed thatch content was less than 5 mm deep which conforms to the highest PQS category.

Pitch A

The reported soil index values for P, K and Mg is 2 to 3. This suggests that this pitch has received some fertiliser input within the recent past.

The relatively high value of organic matter (OM) at 12% may be symptomatic of a management regime which encourages fine organic residues to accumulate from the breakdown of grass material but the overall effect of these organic matter and thatch levels will have little impact on the overall drainage capacity of the soils.

Pitches B to D

All 3 pitches show soil nutrient index levels between 0 and 2. The levels of thatch and organic matter are insignificant.

| Trial Pit/Lab Ref | Depth (m) | Sand (%) | Silt (%) | Clay (%) | Classification/Comments |
|-------------------|---------------|----------|----------|----------|--|
| Rugby pitch A | 0 - 0.400 | 49 | 28 | 23 | Medium Clay Loam with few 10 - 20mm angular stone fragments from 220mm |
| | 0.400 – 0.500 | | | | Clay loam |
| | | | | | |
| Unused pitch B | 0 - 0.300 | 54 | 27 | 19 | Sandy clay loam |
| | 0.300 – 0.400 | | | | Sandy clay loam with few 10 - 20mm angular stone fragments |
| | 0.400 – 0.480 | | | | Clay loam |
| Middle pitch C | 0 - 0.380 | 67 | 19 | 14 | Sandy Loam with few 10 - 20mm angular stone fragments from 220mm |
| | 0.380 – 0.450 | | | | Clay loam |
| | | | | | |
| Football pitch D | 0 - 0.150 | 72 | 16 | 12 | Sandy loam |
| | 0.150 – 0.280 | | | | Sandy loam with few 10 - 20mm angular stone fragments from 220mm |
| | 0.280 - 450 | | | | Clay loam |

Table 5 – Soil profile textures

Topography

The site can be viewed as two distinct levels. The main pitch A is situated on an upper bench or plateau previously created by re-grading the existing slope, the pitch gradients are highlighted in **Figure 4** below. Pitches B to D are located at the lower part of the site where the original ground levels shallow out, the gradients of pitch D being most significant. In general the pitch gradients assessed against the standards bench marked by the Institute of Groundsmanship (IOG) Performance Quality Standards (PQS) suggest that all pitches meet the basic standard. If a higher standard is required some minor releveling work will be needed which might be addressed through cultivation operations rather than larger earthmoving operations.



Figure 4 – General ground slopes

Grass Coverage

Pitch A

The area has vegetative coverage of ranging from 60 - 90% which falls within the basic PQS standard specification, the approximate coverage is made up of the following grasses:

| | | |
|-----|--------------------|----------------------------|
| 80% | PERENNIAL RYEGRASS | <i>Lolium perenne</i> |
| 5% | BROWNTOP BENT | <i>Agrostis capillaris</i> |
| 5% | RED FESCUE | <i>Feuscia rubra spp</i> |

20% Weed grasses made up of:

| | |
|---------------------|------------------|
| ANNUAL MEADOW GRASS | <i>Poa Annua</i> |
|---------------------|------------------|

Undesirable grass species and broadleaved weeds cause competition between themselves and the essential grass cultivar species present and should be eliminated. Annual meadow grass (*Poa annua*) is considered a weed grass within the sports turf industry, although it remains present in a large percentage of sports surfaces all over the UK.

There were few broadleaved weeds present:

| | |
|-----------|-----------------------------|
| DANDILION | <i>Taraxacum officinale</i> |
| DAISY | <i>Bellis perenis</i> |
| PLANTAINS | <i>Plantago major</i> |



Figure 5 – Pitch A showing areas of poor grass coverage, some broadleaved weeds and saturated conditions



Figure 6 – Pitch A showing evidence of some maintenance operations



Figure 7 - Broadleaved weeds

Pitches B to D

These pitches display vegetative coverage of ranging from 75 - 90% which reaches the basic PQS specification, the approximate coverage is made up of the following grasses:

| | | |
|----------|--------------------|----------------------------|
| 75 - 85% | PERENNIAL RYEGRASS | <i>Lolium perenne</i> |
| 5 - 10% | BROWNTOP BENT | <i>Agrostis capillaris</i> |
| 5 - 10% | RED FESCUE | <i>Feuscia rubra spp</i> |

20 - 30% Weed grasses made up of:

| | |
|---------------------|----------------------|
| ANNUAL MEADOW GRASS | <i>Poa Annua</i> |
| YORKSHIRE FOG | <i>Holcus lanata</i> |

Sedge plants possibly Compact Rush was evident in areas of ground prone to waterlogging and particularly found on the fringes of pitch D.

There were broadleaved weeds present including:

| | |
|-----------|-----------------------------|
| DANDILION | <i>Taraxacum officinale</i> |
| DAISY | <i>Bellis perenis</i> |
| CLOVER | <i>Trifolium</i> |
| PLANTAINS | <i>Plantago major</i> |

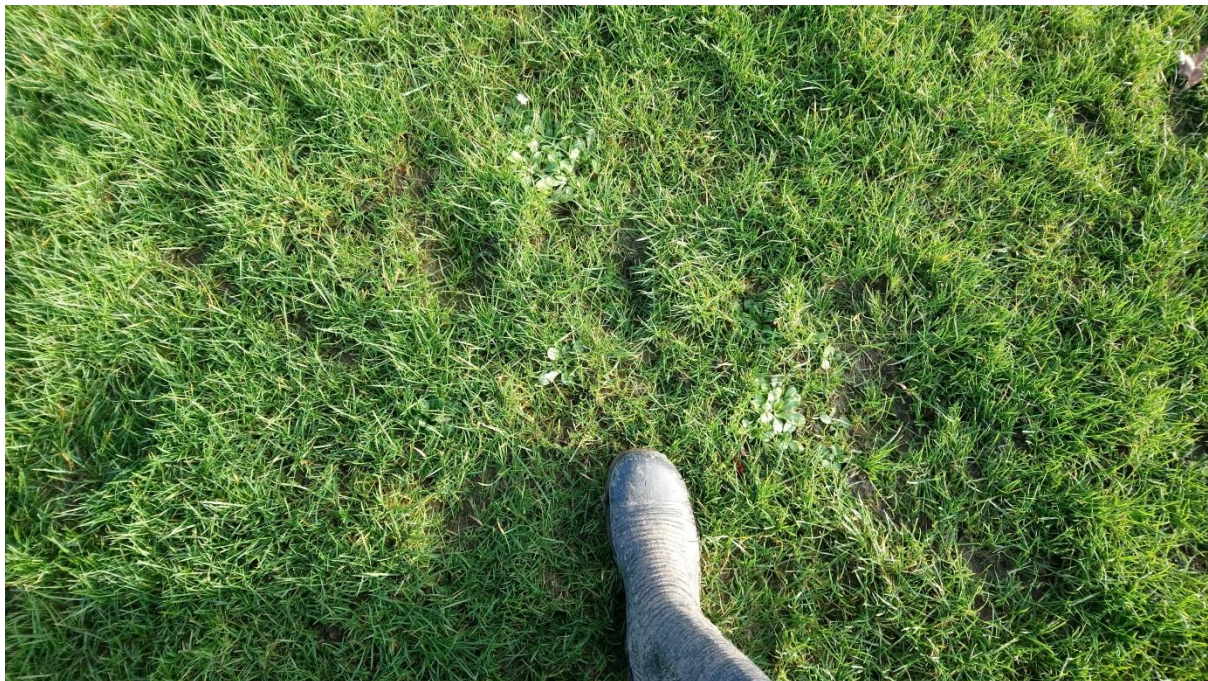


Figure 8 – Pitch C showing reasonable grass coverage and some weeds



Figure 9 - Area of sedge around pitch D



Figure 10 - View of the main football pitch B

Drainage

Information provided at the site visit indicates the existence of an old underdrainage pipe system within the main rugby pitch (pitch A) with the outfall on the southern pitch boundary and is assumed to discharge to some form of soakaway. Due to the potential age and nature of the existing primary underdrainage system and the observed ground conditions it must be assumed that the drainage system may not function efficiently and some form of remediation works are likely required.

There is no evidence of any active drainage infrastructure on any of the lower pitches (pitches B to D). The ground conditions display the characteristic features of a soil profile which is de-structured, has inherent low permeability and has no drainage capabilities and therefore is prone to saturated soil conditions and waterlogging.

There is a drainage ditch situated around the boundary as shown in **Figure 11** which discharges to the south east corner and away through agricultural land. This could be a useful outfall for any drainage system considered in the future.



Figure 11 - Likely discharge point for pitch A, also shows the boundary ditch
Other observations

- Pitch (A) is approximately marked 60m by 100m with margins of approximately 3m to the surrounding railings.
- Pitch (B) is approximately marked 55m by 100m.
- Pitch (C) is approximately marked 60m by 100m.
- Pitch (D) is approximately marked 60m by 80m.
- There are 8 floodlights to pitch (A) and some lighting to pitches (B) and (C).

6. Equipment & Maintenance

Currently only basic and limited maintenance work is undertaken which include grass cutting, line marking and occasional light aeration operations (which are visible on pitch A in the form of tine aeration and shallow slit operations). Site staff currently arranges and manages pitch maintenance operations.

Proper pitch management practices are vital in fulfilling the true potential of any capital works. Inadequate maintenance operations will lead to poor surface performance and in turn will not repay the capital invested in the construction. A full maintenance programme should be provided with any specifications for improvement works.

7. Conclusions

Pitch A

The main rugby pitch shows several characteristics of surface drainage problems. Visually the ground was very muddy underfoot with areas of surface ponding. The grass density was patchy and poor in many areas contributing to unstable surface conditions and lack of traction. Even if the existing primary pipe system is functioning (i.e. pipes remain undamaged and running freely) it is evident that there is a problem with removing surface water through the system (soil profile) to a suitable outfall. Installation of a secondary drainage system and management of the upper soil profile would address these problems.

There is sufficient depth of topsoil over the pitch to satisfy the highest PQS standard. Surface gradients however fall into the basic PQS standard. There are also issues with grass health and sward density.

Pitches B to D

The presence of CLAY soils will reduce vertical infiltration resulting in retention of soil moisture within the upper profile (topsoil) and hence saturated conditions after heavy rainfall events. The ground currently drains naturally as interflow (horizontal movement through the upper soil layer) to a limited degree with a reliance on surface water run-off after particularly heavy storms. Although not consistently waterlogged the ground is subject to major disruption due to standing water and saturated ground conditions and sometimes matches are postponed.

Addressing the pitch drainage would dramatically improve play and increase the reliability of fixtures. It is also fundamental in promoting a healthy grass sward and an improved playing surface.

There is sufficient depth of topsoil over the pitch to satisfy the highest PQS standard. Surface gradients also fall into the category basic/standard PQS standard. There are also issues with grass health and sward density.

8. Recommendations

The main problem associated with these pitches is the lack of adequate drainage. Other issues such as the lack of soil structure and the grass health can only be satisfactorily addressed when the drainage situation improves.

The surface gradients can be addressed if needed during improvement operations by re-profiling the topsoil and reducing the pitch slopes.

The soil chemistry status and grass plant health can be addressed during surface establishment and subsequent maintenance operations.

Having considered the information from the investigations the following are recommended.

Pitch A

1. Further investigate the status of the existing primary drainage system and renew if required
2. Install a new secondary drainage scheme
3. Surface establishment of a suitable grass sward and improve the soil chemistry
4. Re-profile the surface

Pitches B to D

1. Install a new drainage system comprising primary underdrainage pipework with a secondary drainage element.
2. Surface establishment of a suitable grass sward and improve the soil chemistry.
3. Re-profile the surface

A re-profiled sand based grass surface with a new underdrainage system and sand ameliorated secondary drainage, sown with a hardwearing sports grass mix should allow 4-6 hours per week play with a reasonable recovery rate and provide reliable performance.

Improvement works will need a specialist sports pitch contractor to undertake the work. It is not a job for a civil engineering or groundworks contractor.

9. Costings

The estimated capital costs for the recommended pitch improvement works are set out below. The figures are approximate and do not include VAT or Consultant fees.

A figure of 5% of the total cost should be added for any contingencies.

Pitch A

| Item | Description | Estimated cost (£) |
|-------------|--|---------------------------|
| 1 | Supply and install pipe underdrainage system at 5m centres complete (provisional on requirement) | 13 000 |
| 2 | Surface establishment with sand top dressing, aeration, seeding and fertiliser | 8 000 |
| 3 | Install secondary drainage sand grooves | 7 000 |
| 4 | Annual maintenance | 6 000 |
| | Total estimated cost | 34 000 |

Pitches B to D

| Item | Description | Estimated cost (£) |
|------|--|--------------------|
| 1 | Supply and install pipe underdrainage system at 5m centres complete (provisional on requirement) | 13 000 |
| 2 | Surface establishment with sand top dressing, aeration, seeding and fertiliser | 8 000 |
| 3 | Install secondary drainage sand grooves | 7 000 |
| 4 | Annual maintenance | 6 000 |
| | Total estimated cost | 34 000 |

Operations to reduce pitch slopes and re-grade the surface if required would be approximately £15k extra cost per pitch.

Project timing

Suitable ground conditions need to exist before any intrusive improvement works can be undertaken. This generally means commencement between early spring and late autumn when the ground is likely to be workable and grass establishment possible. Late summer or autumn sowing is preferable as there is likely to be better climate and soil moisture conditions for seed germination and grass establishment. There may be some constraints as to working on the fringes of the open season as this may disrupt the home fixture programme but this may be managed accordingly. Some operations would be weather dependent.

Indicative works programme

| Activity | Year 1 | Year 2 |
|----------------------------------|--------------------|--------------------|
| Mobilisation | August | |
| Primary cultivations | August | |
| Install primary drains | August - September | |
| Final cultivations and sow grass | September | |
| Maintenance programme | October through to | September |
| Install sand grooves | | April - May |
| Sand topdressing | | April - September |
| Pitch ready for full play | | August - September |

10. Contact Details

Please use the contact below if you have further questions about the contents of this report or for any other general enquiries.

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Appendices

Soil sample results



| ANALYTICAL REPORT | | | | | | | | | |
|---|----------------|------------|------------|------------|-----------------------|--|-----------------------|--|--|
| Report Number | 85592-20 | | W162 | | PETER JONES | | Client CEFN CRIBWR AC | | |
| Date Received | 07-FEB-2020 | | | | OOLONG SPORTS | | CEFN CRIBWR | | |
| Date Reported | 14-FEB-2020 | | | | CARNFORTH | | BRIDGEND | | |
| Project | SOIL | | | | THE GREEN | | | | |
| Reference | CEFN CRIBWR AC | | | | DENBIGH | | | | |
| Order Number | | | | | DENBIGHSHIRE LL16 5TN | | | | |
| Laboratory Reference | SOIL469150 | SOIL469151 | SOIL469152 | SOIL469153 | | | | | |
| Sample Reference | A | B | C | D | | | | | |
| Defarminand | Unit | SOIL | SOIL | SOIL | SOIL | | | | |
| pH water (1:2.5) | | 5.9 | 6.6 | 6.4 | 7.6 | | | | |
| Available Phosphorus (Index) | mg/l | 21.4 (2) | 6.4 (0) | 15.6 (2) | 8.8 (0) | | | | |
| Available Potassium (Index) | mg/l | 190 (2+) | 87.4 (1) | 68.9 (1) | 56.4 (0) | | | | |
| Available Magnesium (Index) | mg/l | 118 (3) | 69.5 (2) | 66.7 (2) | 36.0 (1) | | | | |
| Sand 2.00-0.063mm | % w/w | 49 | 54 | 67 | 72 | | | | |
| Silt 0.063-0.002mm | % w/w | 28 | 27 | 19 | 16 | | | | |
| Clay <0.002mm | % w/w | 23 | 19 | 14 | 12 | | | | |
| Organic Matter LOI | % w/w | 10.7 | 11.9 | 5.9 | 4.5 | | | | |
| Textural Class ** | | MCL | SCL | SL | SL | | | | |
| Notes | | | | | | | | | |
| Analysis Notes The sample submitted was of adequate size to complete all analysis requested. The results as reported relate only to the item(s) submitted for testing. The results are presented on a dry matter basis unless otherwise stipulated. This test report shall not be reproduced, except in full, without the written approval of the laboratory. | | | | | | | | | |
| Document Control ** Please see the attached document for the definition of textural classes. | | | | | | | | | |
| Reported by <i>Myles Nicholson</i> Natural Resource Management, a trading division of Cawood Scientific Ltd. Coopers Bridge, Braziers Lane, Bracknell, Berkshire, RG42 6NS Tel: 01344 896338 Fax: 01344 890972 email: enquiries@nrm.uk.com | | | | | | | | | |

Performance Quality Standard Table (PQS)

Performance Quality Standard Tables – Association Football

Structural Quality

| Performance Standard | Method of Test | Quality Standard | | |
|---|----------------|--------------------------|-------------------------------|-----------------------------|
| | | High | Standard | Basic |
| A. Herbage | | | | |
| i) Length of herbage: during the growing season | 1 | 25 - 40 mm | 25 - 50 mm | 30 - 60 mm |
| during the non-growing season | 1 | 20 - 40 mm | 20 - 60 mm | 20 - 70 mm |
| ii) Bare area. | 3 | ≤ 10% | ≤ 15% | ≤ 25% |
| iii) Total ground cover | 3 | ≥ 90% | ≥ 85% | ≥ 75% |
| iv) Desirable grass species | 3 | ≥ 80% | ≥ 70% | ≥ 60% |
| v) <i>Poa annua</i> | 3 | ≤ 10% | ≤ 20% | ≤ . 30% |
| vi) Other undesirable grass species | 3 | Nil | ≤ 5% | ≤ 10% |
| vii) Weeds - Large-leaved | 3 | Nil | ≤ 2% | ≤ 10% |
| viii) Weeds - Small-leaved | 3 | Nil | ≤ 5% | ≤ 5% |
| ix) Moss | 3 | Nil | Nil | Max. 2% |
| x) Algae and Lichen | 3 | Nil | Nil | Nil |
| B. Pests and Diseases | | | | |
| i) Diseases | 3 | Nil | ≤2% | ≤2% |
| ii) Earthworms | 3 | ≤1% | ≤5% | ≤10% |
| iii) Pests | 3 | Nil | Nil | ≤2% |
| C. Profile | | | | |
| i) Root depth | 4 | ≥ 150 mm | ≥100 mm | ≥75 mm |
| ii) Thatch depth | 4 | ≤5 mm | ≤10 mm | ≤15 mm |
| iii) Rootzone medium | 4 | ≥ 200 mm | ≥ 150 mm | ≥ 100 mm |
| iv) Rootzone silt & clay content | 14 | ≤ 6% | ≤ 17% | ≤ 25% |
| v) Infiltration rate | 5 | 10 mm h ⁻¹ | ≥ 5 mm h ⁻¹ | ≥ 2 mm h ⁻¹ |
| vi) Evenness: 2m straight edge, or 0.5m straight edge | 2 | ± 15 mm ± 8 mm | ± 18 mm ± 10 mm | ± 25 mm ± 12 mm |
| vii) Soil pH | 15 | 6.0 - 7.0 | 5.8 - 7.5 | 5.8 - 7.5 |
| viii) Soil nutrient level: P ₂ O ₅ | 11 | Index 2 | Index 2 | Index 2 |
| ix) Soil nutrient level: K ₂ O | 12 | Index 2 | Index 2 | Index 2 |
| x) Gradient: Length ways Across the pitch | 16 | > 1:200 1:150 - 1:100 | 1:200 - 1:100 1:100 - 1:80 | 1:100 - 1:80 1:80 - 1:50 |

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