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A REPORT TO CAPITA SYMONDS

Agronomic Assessment of the Existing Pitches at the Fleets
and Feasibility Report for the Proposed Development of Mini-
Pitches at Belle Vue and the Fleets Sites on Behalf of Barnsley
College

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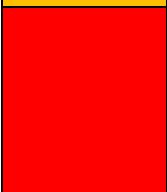
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1.0 Executive Summary

KEY:  No action required  Action may be required  Action required

Site Information

Existing Football Pitches – The Fleets

	1. Two football pitches are currently marked out at the Fleets. The pitch to the South is sufficiently large for national league/ county standard. The smaller pitch to the North is used less frequently by pub league standard teams. The area is open access but goal posts are taken down after fixtures are played.
	2. There is existing pipe drainage although drainage backfill has become contaminated and the surface of the drains are capped with clay soils exhibiting poor infiltration. The pipe drains are widely spaced.
	3. The soils are heavily compact with a very poor structure. There is evidence that the ground has been “made” with significant small stones and fragments of ash, glass, pottery etc.
	4. Turf quality was poor, exhibiting weak growth and significant infestation of broad leaved weed. Root growth was shallow (associated with the compact condition of the underlying clay subsoil).
	5. Levels were generally satisfactory although there was some evidence of minor settlement creating shallow depressions. General falls on the pitches were satisfactory.
	6. The final pipe outfalls could not be detected on site.
	7. The final point of outfall to the adjoining lake needs to be checked and verified to ensure that there is a positive outfall. Appropriate planning consent may also need to be approved.
	8. To increase capacity for play, minimise the risk of cancellation during poor weather conditions and enhance surface quality, additional drainage would be advised to counter the poor drainage of the existing soils. A system of pipe drainage would be needed as a minimum, however, supplementary slit drainage should also be considered.
	9. An effective maintenance regime is essential to maximise performance. This will include adequate sub aeration to address compaction, scarification to remove surface fibre and sand dressing. Selective weed treatment must also be implemented in conjunction with over-seeding and sufficient fertiliser input.

Mini Pitch Development – The Fleets

	1. The area under review is currently open access and is currently grass land (infrequently cut).
	2. Topsoil quality equates with the existing established football pitch areas i.e. poorly drained clay loam soils with significant contamination (made ground).
	3. The ground undulates with uneven slope.
	4. There is no existing drainage infrastructure.
	5. Surfaces will need to be graded to achieve acceptable levels for the mini pitches.

	Maximum extent of the two pitches would be nominal 35 x 24 m (plus run-off margins). Grading works must be carried out under dry conditions.
	6. Following grading/replacement of topsoil there must be thorough stone/debris removal operations. A clean sandy loam protective layer should be installed over the surface prior to grass establishment or an adequate layer of sand incorporated (to minimise the risk of future injury due to the extent of contamination within the topsoil).
	7. A system of pipe drainage is needed as a minimum to improve playing capacity of the pitch areas and preserve a reasonable standard of play.
	8. A positive outfall will be needed from the pitch drainage.
	9. Adequate maintenance will be needed following pitch establishment to maintain pitch performance.
	10. Supplementary slit drainage may be needed depending on levels of play and pitch standards demanded.
	11. To accommodate a satisfactory outfall (to connect the existing drainage of the main pitches) vegetation clearance along the adjoining bank may be needed. Allow for back drop man holes on the steeper slope to reduce the severity of pipe gradient.

Mini Pitch Development – Belle Vue Site

	1. The grassed area under consideration is currently <u>not</u> used for sports and consists of grass land (infrequently cut).
	2. Topsoils consist of sandy loams overlying coarse granular subsoils and sand stone.
	3. There are feature trees in close proximity to the proposed playing surfaces.
	4. Assessment of levels indicates that the area slopes from South-West to North-East. Slopes are not consistent. There is a significant embankment around the margin of the sports building to the East.
	5. The proposed sports pitch areas will need to be graded (stripping topsoil and adjusting subsoil surfaces prior to replacing topsoil) to provide acceptable gradients on the proposed mini pitches.
	6. The soils are naturally well drained however additional pipe drainage is advised to counteract the effects of grading works.
	7. There are no positive drainage outfalls evident from the preliminary survey. The capacity for discharge to ground for infiltration needs to be verified through appropriate soak-away tests.
	8. Intensive maintenance including sand dressing is necessary to maintain the function of the drainage and performance of the pitch areas.
	9. The effect on the adjoining trees needs to be considered so there may be local conflict with the underlying root systems. Layout/size of the pitches may need to be adjusted to minimise any potential conflicts.
	10. Presence of underground services needs to be checked and verified before works commencing. This includes the power supply to the existing lighting poles.

2.0 Introduction and Objectives

STRI was commissioned by Capita on behalf of Barnsley College to carry out an agronomic assessment of the existing football pitches at the “Fleets”, as well as providing a feasibility assessment for the proposed mini pitches at both the Belle Vue and Fleets sites.

The principal objectives and outcomes for the study and report are defined as follows:

- Determine the capacity of the existing pitches at the Fleets to cope with increased play in order to compensate for the loss of the Carrington Avenue Pitches and outline requirements to increase playing surface resilience to cope with increased usage.
- Provide guidance on development and construction requirements for the proposed mini pitches based on detailed site analysis, aligned to Sport England guidance notes.

3.0 Existing Pitch Assessment – The Fleets

3.1 Site Layout (refer to appendix)

There are two fields, separated by an intermediate hedge, with a single pitch marked out on each with approximate parameters as follows:

Northern Pitch – 91x60 m

Southern Pitch – 97x68 m

The larger pitch equates with national league/county standard although the smaller adult pitch, while within FA guidelines for an adult pitch, is only used for teams of lower adult standard.

NOTE: there is scope to re-orientate the southern pitch- west to east to provide a pitch of 100 x65m (to equate with existing) and mark out a pitch of nominal 50 x80m (youth pitch) as well to the south. Orientation is not ideal but 2 pitches could be fitted on this area

3.2 Climate

The average annual rainfall for the Barnsley area is approximately 680 mm per annum.

3.3 Soils and Trial Pit Information

Trial holes excavated from both the Northern and Southern pitch areas revealed acutely compacted clay loam topsoil containing a substantial amount of small stone, ash, brick and other fragments. The immediate surface layer (to approximately 30 mm depth) is sandier in texture (due to partial amelioration with sand as part of previous remedial works on the site). Topsoil depth was indistinct however is generally 170-250 mm.

The subsoils consist of clays with inherently poor drainage qualities.



Fig 1: Trial Pit - Northern football pitch



Fig 2: Turf layer/upper profile



Fig 3: Topsoil –showing stone and other debris



Fig 4: Drain excavated

3.4 Topography/Surface Levels

A topographic survey carried out over the two pitch areas and surrounds indicated that the Northern pitch is graded from the North-West corner to South-East with slope ranging between 1/85-1/100.

The Northern pitch essentially sloped from West to East with slightly less grade of around 1/98-1/138. There was evidence of some minor, broader scale depressions, however overall levels appeared reasonable. Micro-levels (measured under a 2 m straight edge) did not deviate by more than 10 mm except locally in the goal mouths (up to 20 mm).

Both pitches have been formed by cut and fill in the past with associated steep bankings to the West of the pitches (cut) and fill banks to the East.

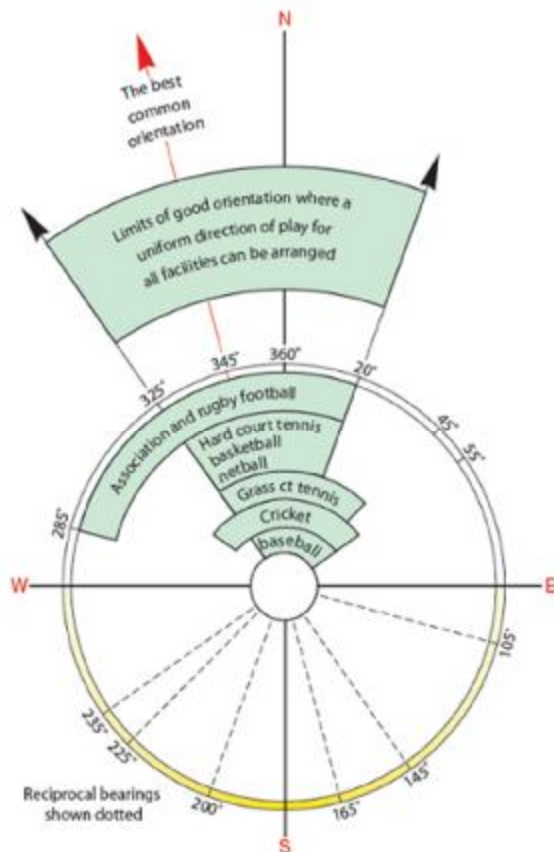
3.5 Pitch Orientation/Grading

Overall slopes are satisfactory (ref table 1) with respect to Sport England guidance.

Table 1: Summary of maximum recommended slopes for sports pitches as specified by Sport England compared with actual gradients measured on site.

Pitch	Sport England Guidance		Measured on site	
	<i>Along length</i>	<i>Across width</i>	<i>Along length</i>	<i>Across width</i>
Football pitch	1.25%	2.00%	0.28-0.95%	0.72-1.03%

The orientation of the pitches also lies within the preferred range published by Sport England as shown in a figure below.



Recommended pitch orientation- Sport England

3.6 Existing Drainage Infrastructure

The presence of drainage lines could easily be detected from surface examination. On both the Northern and Southern pitches the drainage intervals were approximately 9 metres. The pattern of drainage was not consistent.

In addition to lateral drainage main drains had also been installed previously. On the Southern pitch a main drain could be detected running through the centre of the pitch in a West to East direction comprising a 150 mm drain.

The presence of additional manholes was obscured by the growth of vegetation on the adjoining surrounds/banks.

Depth to the aggregate backfill over the pipe drainage was measured at approximately 170 mm although the limestone aggregate (nominal 5-10 mm gauge) was heavily contaminated through the surface layers (fig 4). The soil immediately over the drains was compacted, creating an impermeable layer and significantly compromising the function of the drainage.

3.7 Agronomic Assessment

Turf cover on both pitches was assessed with 1 metre square sections. Sward quality was poor with approximately 34% broad leaf weed growth, 56% grass cover and 10% bare or dead growth.

Grass species consisted mainly of perennial rye grass with patches of annual meadow grass (notably weaker sections) with broad leaved weeds comprising mainly of clover, plantain, dandelion and a small amount of creeping buttercup.



Fig 5: Dry area of pitch- turf drought stressed



Fig 6: Close up weak grass cover plus weed



Fig 7: Wear in goal mouth – south pitch



Fig 8: Area of better growth

There was not much evidence of significant wear and tear through goal mouths and centre circle areas partly due to the natural recovery of the surfaces during the summer and restricted playing levels over the autumn and winter season.

On the lower pitch area, total cover was approximately 88% with 62% grass cover, 26% broad leaved weed and 12% bare/dead ground.

Traction values were between 15 and 25 (feet/pounds) which is satisfactory to good. The lower values were recorded on the weaker/thinner sections of turf.

Hardness readings (measured with the Clegg impact hammer) ranged from 121-153 (Northern pitch) and 122-166 (Southern pitch). These values, while within the acceptable range, (refer to performance quality standards in the appendix) are on the high side however this reflects the very dry and hard soil conditions. Moisture levels recorded with the Theta probe indicated moisture levels of between 7.9-14.7% which are low to very low (reflecting the very dry recent conditions)

Grass root depth was shallow with general depth of around 60 mm to a maximum of 90 mm. The depth of the fibrous mat or thatch layer was measured at approximately 12-18 mm at the turf base.

3.8 Remedial Requirements

3.8.1 Main Factors Influencing Requirements

The main factors which need to be addressed include:

- Acute compaction of the topsoil- requiring effective aeration procedures
- Supplementary drainage to help mitigate the inherently poor drainage characteristics of the soil. The existing drainage is largely ineffective due to wide spacing of the drains and fine nature of the soil over the drains- limiting infiltration.
- Adequate remedial management including over-seeding of weak areas and sufficient fertiliser dressing to improve fertility
- Reinstatement of a positive outfall for drainage
- Broad leaved control

3.8.2 Principal Recommendations

Drainage Works

Given the limitations of the pitches as outlined in the site assessment, significantly increased playing capacity and improvement in surface standards could only be achieved through supplementary drainage works. Even with an increase in maintenance intensity there will still be periods when the use of the pitches will be compromised during wet weather and they will be vulnerable to damage and deterioration of the playing surfaces during these periods. The existing drainage is largely ineffective due to capping of the surface with heavy clay soil and distance apart of the drainage. Therefore the recommendation would be to install intermediate drains between the existing to achieve a spacing of approximately 4.5 metres between the drainage lines. To bypass the very poor topsoil (and connect with the clean aggregate below over the pipe drainage) a secondary system of sand/ gravel filled slit drains would be appropriate. These are normally installed at around 1 metre centres although as a minimum requirement install at 1.5 metres across the line of the lateral drains. The depth of these (approximately 250mm) would be sufficient to connect with the permeable backfilling over the new and existing drains.

Sport England considers the following to represent a reasonable estimation of the likely usage for a range of construction types (Ref: Natural Turf for Sport, 2000, ISBN 1 86078 103 9 – 2nd Edition, 2011) (Table 2).

Table 2: Estimated Usage Levels

Drainage status	Adult weekly use* (hours)
Undrained	Under 2
Pipe-drained	2 - 3
Pipe-drained with mole drains	2 - 4
Pipe-drained with sand grooves	3 - 6
Pipe-drained with slit drains	3 - 6
Pipe-drained with topsoil and drainage layer	3 - 6
Pipe and slit drained	3 - 6
Pipe-drained with suspended water table	4 - 6

**The usage levels shown will increase by 50 % for players 15 years of age and under.*

Consideration must be given to the provision of an effective maintenance regime if these levels of play are to be achieved without deterioration of the playing surface.

Maintenance

An effective maintenance regime would improve the overall playing surface quality of the pitches and improve durability although this would not address the primary limitations of drainage. Of particular importance is the need for adequate aeration works in the form of vertical aeration with the Verti-drain which can be augmented with linear sub-aeration with "Earthquake", "Shatter-master" or comparable unit. This must be timed for when the soils are uniformly moist but not wet. An appropriate programme of maintenance is given in the appendix to the report.

4.0 The Fleets – New Mini Pitch Development

4.1 Site Location, Layout and Features

The area which has been defined for mini pitch development is immediately to the West of the current, Northern pitch and is bounded by houses to the West, community building to the North and footpath to the South. To the East of the linear grassed area is established vegetation and scrub which has developed along the steep embankment. The area can be accessed by the general public.

4.2 Surface Levels/Topography

A topographic survey was completed on the area (refer to appendix). The slope generally is from West to East with gradients of approximately 1/20 to 1/42. Slopes are not consistent with undulations throughout the surface. There is a distinct bank which bisects the proposed Southern Pitch. The proposed Upper pitch exhibits a more uniform surface but still requires grading.



Fig 9: Proposed mini pitch area



Fig 10: Scrub/embankment below the area

4.3 Soil Characteristics and Drainage

Trial pits excavated within the Southern and Northern part of the area revealed similar soil characteristics. These comprised 150-200 mm depth of topsoil consisting of a clay loam soil. Representative analysis is shown in the appendix. There is a very high fines content (very fine sand to clay fraction) which inhibits drainage. There was substantial stone ash, brick, glass and pottery fragments through the topsoil and underlying subsoil (nominal 25-30%).



Fig 11: Trial pit



Fig 12: Stone and debris in topsoil

Chemical analysis of a representative soil sample is given below:

Source	pH	P2O5 (mg/l)	K2O (mg/l)
Topsoil Mini Pitch Site (The Fleets)	6.2	34	134

4.4 Agronomic Assessment

4.4.1 Turf Characteristics

Length of grass was approximately 75 mm and appeared to have been infrequently cut. The grass mixture mainly comprised perennial rye grass with meadow grasses. Colour and vigour were reasonably uniform.

Broad leaved weed accounted for approximately 25-30% of the total cover.

Grass roots extended to approximately 80-90 mm depth (slightly more than the established football pitches but below desired levels).

Depth of fibrous thatch at the turf base was approximately 20 mm.



Fig 13: Grass cover and weed growth



Fig 14: Turf section

4.4.2 Surface Hardness, Moisture and Traction Measurements

Clegg readings (surface hardness) ranged from 97-111 (ft/lbs). This is within the desirable range however conditions were very dry and soils hard and this does not reflect potential values over the autumn and winter which will be substantially lower. The moisture levels range from 12.2 to 17.8 (below the desired range). The traction values were +25 which is acceptable.

4.5 Development Requirements

4.5.1 Main Factors

- Topsoil and subsoil characteristics are very poor therefore to achieve reasonable usage levels additional pipe drainage will be required as a minimum. To increase playability, minimise cancellations due to poor weather and increase the resilience of the turf, secondary drainage (slit drainage or sand banding/grooving) would be appropriate to bypass the topsoil and make connection with the drainage aggregate over the pipe drainage
- Surface uniformity and overall surface gradients do not conform to Sport England guidance (reference table 2). Extent of cut and fill (estimated +/- 0.2 metres on the Northern mini pitch and +/- 0.5 metres on the Southern pitch) will require stripping of topsoil, grading in subsoil and replacement of topsoil.
- The amount of contamination within the topsoil poses a potential risk due to possible injury to players. Therefore thorough stone raking and picking operations will be needed to remove material above 25 mm. In addition there should be allowance for a protective layer of clean sandy loam over the surface of the pitches and run-offs. Alternatively sand should be applied and carefully worked into the surface to achieve a similar “protective” layer. This will also provide a more permeable immediate surface.
- The amount of stone and debris within the subsoil may require excavation of drainage trenches with a mechanical excavator and this could affect costs.
- There is no drainage infrastructure within the immediate vicinity. Infiltration to ground is unlikely to be successful due to the nature of the soils and this method could also result in contamination issues as water moves through the filled ground to the pipe drainage system. The most viable option would be to connect to the drainage in the pitches below.

4.5.2 Indicative Development Procedures

Pitch areas of maximum 23/24 metre wide by 35 metre long could provisionally be accommodated on the existing area of land. Run-off margins should be a minimum of 2 metres with 5 metre separation between the pitches.

The ground needs to be re-contoured to achieve gradients of around 1/70 (cross fall). This will provide acceptable levels as well as contributing to surface run-off – a factor which is an important part of overall drainage performance. The main procedures are outlined as follows:

1. Cut down the existing grass and remove the vegetation.
2. When there are signs of fresh grass growth and regeneration, spray the turf with a total herbicide to kill off.
3. Thoroughly cultivate the turf to break up any organic layer and strip existing topsoil as cleanly as practical. Place in heaps away from the working area.
4. Re-grade subsoil to desired levels.
5. Surrounding banks should be no greater than 1 in 3 with 1 in 5 preferable.
6. Rip (subsoil cultivate) the subsoil base removing any large stone or other debris and trim the surface on completion.
7. Re-spread topsoil to uniform depth.
8. Cultivate topsoil and remove stones and other debris of 25 mm or more from the top 100 mm.
9. Supply and spread an imported clean sand/sandy loam layer to a minimum 50 mm firm depth over the pitch areas and immediate run off margins.

10. Install pipe drainage system consisting of lateral drains at 4 metre centres, connected to a main drain.
11. Prepare seedbed and seed with a suitable perennial rye grass mixture.
12. Maintain the new grass surfaces up until opening of the pitches for play.
13. Apply sand dressings as required and continue maintenance.

Note: There may be requirement for slit drainage or sand banding to bypass the topsoil and connect with the proposed pipe drainage depending on playing levels on the pitch and drainage performance after preliminary pipe drainage. If a higher standard is demanded then slit drainage /sand banding should be implemented during pitch construction to minimise secondary disturbance.

4.6 Programme of Works

A late summer/early autumn seeding is generally preferred following summer construction works. Works could be done in the spring (when the ground has dried out sufficiently) but there is increased risk of drought stress following a spring sowing. A minimum of a year should be allowed before the new pitches are brought into play. This will be dependent on weather and ground conditions during the establishment phase and also standards of maintenance which are applied to the new pitch surfaces.

4.7 Indicative Costs

Indicative costs have been set out in the appendix based on current contractor's rates for similar works. It should be noted that these can vary significantly according to current contractor's workloads and availability of materials at the time of tendering.

5.0 Belle Vue Site– Mini Pitch Development

5.1 Site Location, Layout and Features

The area designated for the new mini pitches forms part of the college grounds at the Honeywell site. The area comprises established grass land with trees to the North, West and South boundaries.

There are several feature trees adjoining the area with significant canopy spread (refer to survey information).

There is palisade/picket fencing along the Western and Northern boundaries.

There are lights and lighting poles at intervals along the site boundary and also adjoining the current footpath (which is in the process of being diverted to the site boundary).

There is a distinct embankment around the current sports pavilion.



Fig 15: Belle Vue site



Fig 16: bank adjoining building

5.2 Surface Levels and Topography

The site slopes from the South-West corner to the North-East with change in elevation of approximately 6 metres. Existing slopes from South to North are of the order of 1 in 30 to 1 in 50 with cross falls of approximately 1 in 20.

There are also more local undulations through the surface with in excess of 50 mm deviation under a 2 metre straight edge.

5.3 Soil Characteristics and Drainage

Representative soil pits were excavated. Topsoil depth varied from 180 mm (Southern area) to approaching 300 mm depth (Northern area). Topsoils comprised a friable sandy loam (dark coloured). This contained significant stone – up to 40 mm in size. There was the odd particle of ash but no indication of significant made ground. The topsoil characteristics are conducive to reasonable levels of drainage.

The underlying subsoil consisted of a sandy granular soil with increasing stone at depth. The subsoil became increasingly hard and less fragmented with depth. At around 1 to 1.5 depth there is bedded sand stone.



Fig 17: Topsoil



Fig 18: Upper sub soil layer

5.4 Soil Analysis

Chemical analysis of a representative soil sample is given below:

Source	pH	P2O5 (mg/l)	K2O (mg/l)
Topsoil Belle Vue Site (Mini Pitch Area)	6.3	73	121

5.5 Agronomic Assessment

Grass cover was long with significant amount of grass clippings on the surface (indicating infrequent cutting). Grass growth lacked density. Perennial ryegrass was the dominant species with a few finer grasses of fescue and bent. The turf exhibited signs of drought stress. Broad leaved weed growth accounted for approximately 5-10% of the total cover with the predominant species present being plantain, dandelion and clover.



Fig 19: Grass showing clumps of dead growth



Fig 20: Perimeter trees

5.5.1 Surface Hardness, Moisture Levels and Traction

Hardness levels (measured with the cleg impact hammer) ranged from 76-86 which is satisfactory. Moisture levels were on the low side (12.5-17.8) but given the very dry conditions prior to the visit and the sandy nature of the soils, these values were not surprising.

Traction measurements ranged from 18-20 which is in the satisfactory range. The turf was reasonably well anchored with grass roots penetrating to a nominal 90 mm depth.

5.6 Development Requirements

5.6.1 Main Factors

- Soils at the Belle Vue site are naturally reasonably well drained due to the sandy loam nature of the topsoil and subsoil.
- The topsoil does contain numerous stones but the bulk of these can be removed by stone raking and picking. There does not appear to be significant contamination with foreign material.
- There is a reasonable depth of topsoil across the site.
- The slope on the existing ground is in excess of Sport England guidelines. This can only be corrected by stripping the topsoil, re-grading the base and replacing the topsoil. This will provide more acceptable levels.
- Introduction of supplementary drainage would be advised in order to counteract the effects of grading works (soil movement/grading tends to destroy natural soil structure). As a minimum install pipe drainage at 5 metre centres with 4m intervals advised
- There is a significant depth of fibrous thatch material at the base of the turf. This is best removed by Koro treatment (this equates to a very vigorous scarification treatment to physically remove the material from the base of the turf). This will need to be done prior to topsoil stripping.
- The surrounding trees and extent of the canopy/root spread does impose restrictions on pitch layout. If all existing trees are to be retained then care needs to be exercised to avoid impacting on the underlying root structure of the trees during grading operations and pitch formation works.
- There are no viable surface water features into which the proposed drainage can link. Therefore consider alternatives i.e. infiltration to ground via soakaways. This needs to be confirmed by appropriate soakaway tests. Given the native sandstone which under pins the area this should be a viable proposition although it needs to be confirmed by appropriate tests.

5.6.2 Pitch Layout

It would be preferable to orientate both pitches North-South (refer to preferred pitch orientation guidelines). Given the extent of the surrounding tree canopies the North-South orientation is preferred for the Northern most pitch (U7/U8) with parameters of approximately 24 x 35 m. Maximum cut and fill for this pitch would be of the order of +/- 0.4 m depth.

For the larger pitch to the South (up to U9/U10 age group) the maximum pitch area would be around 30 x 48 m to accommodate the pitch area, surround run-offs and graded banks. Maximum cut and fill would be more significant here i.e. of the order of +/- 1 m depth in order to achieve falls of around 1 in

100 along the length and 1 in 70 along the width i.e. maximum gradient of around 1 in 60. This would be acceptable for play as well as facilitating surface run-off/drainage.

5.6.3 Outline Development Requirements

The following summarises the main operations needed to develop the pitch areas. This does not constitute a specification:

1. Apply the Koro Field Topmaker to remove the upper 20 mm depth of fibrous thatch. Dispose of arisings.
2. Cultivate and strip existing topsoil.
3. Re-grade subsoil to desired levels in accordance with Sport England guidelines and design levels. Surround banks should be no greater than 1 in 3.
4. Replace topsoil.
5. Cultivate topsoil and remove stones and other debris of 25mm diameter and above through the upper 100 mm depth of topsoil.
6. Install pipe drainage at 5 metre centres and direct to outfall/soakaway.
7. Prepare seedbed and seed.
8. Maintain.
9. Apply sand dressings as required and continue maintenance.

5.7 Programme Considerations

Programme considerations would be as described for the new pitches at the Fleets site. As there is no supply of irrigation establishment of the surfaces would largely be dependent on the prevailing weather conditions and rainfall.

5.8 Indicative Costs

The costs for developing the mini pitches at the Belle Vue site are provided in the appendix.

6.0 Implications of Works on Future Maintenance, System Longevity and Usage

6.1 Maintenance Issues

The standard of turf maintenance will have a direct effect on the speed of recovery of the pitch after installing the drains and would have an impact on the long term performance of the playing surface. It is essential that a comprehensive renovation and maintenance programme is implemented on completion of the drainage works.

There is a possibility of shrinkage of soils after drainage installation (notably on the clay based soils of the Fleets) therefore provisions should be made for the contractor to return to site to top up drainage, and if required over seed. Given that there is not a ready supply of water for irrigation purposes and costs of installing an effective system is likely to be prohibitive there may well be a requirement to over-seed to restore grass cover which will influence timescales for bringing the pitches into play.

6.2 System Longevity

It is essential that appropriate man holes are installed as part of the design and that these are cleared to prevent build-up of silt. Pipe drainage systems should have a reasonably long lifespan i.e. in excess of 25 years although their function is largely dependent on ensuring that water reaches the pipe drain. This can only be achieved by maintaining a good permeable link between the surface and clean drainage aggregate over the pipe drain.

With slit drainage installation it is imperative that adequate sand dressings are applied to maintain a clean surface otherwise the benefits of the slit drainage will largely be negated. Dressings need to be applied of the order of 70 tonnes per hectare on an annual basis.

6.3 Usage

The use of newly developed pitches must be carefully controlled during the first year following establishment. The turf will require time to develop a strong and mature root system to provide a satisfactory, stable playing surface. As the turf matures the use of the pitches can be increased according to the level and standard of maintenance.

Research has demonstrated that a surface will deteriorate when subject to levels of adult usage between 5-10 hours per week. The actual limit will depend on the level of maintenance and the effectiveness of the construction and drainage system. The potential levels indicated in the accompanying table should be used as an indicative guide when the grass has become well-established.

6.4 Preliminary Risk Assessment

The following potential hazards have been identified during the site study and in the preparation of this report:

- Made ground – unknown contaminants
- Delivery and haulage of bulk materials onsite
- Movement of construction plant
- Excavation of trenches
- Use of chemicals

- Working near to steep slopes
- Presence of underground services

The Fleets is an open site therefore there is potential for conflict with the general public and appropriate measures need to be put in place to minimise potential safety issues.

Appendices

Appendix I	Performance Quality Standards
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Appendix 1 – Performance Quality Standards

Client: Capita Symonds

Project Title: Barnsley College – Existing pitches FLEETS
Physical Site Survey Date: 05/08/2014

ELEMENT	LIMITS	METHOD OF TEST	Visit 1	Visit 2
Ground cover %	>70 for SH 25-30 >80 for SH 30-35	BS 7370 : P3 A6	ü	
Broad-leaved weeds %	<10	BS 7370 : P3 A6	ü	
Sward height mm	20-60 PS 20-75 SM	BS 7370 : P3 A3	ü	
Thatch depth mm	<5	BS 7370 : P3 A7	ü	
Hardness in g	35-200	STRI method of test using a 0.5 kg Clegg Impact Hammer from a drop height of 0.55 m	ü	
Water infiltration rate mm h ⁻¹	5	BS 7370 : P3 A8	ü	
Evenness (2 metre straight edge)	<20 mm	BS 7370 : P3 A6	ü	
Slope: Direction of play Across play	<1.25% <2.00%	BS 7370 : P3 A5	ü ü	
pH value	5.5 – 7.5	ISO 10390		
GUIDANCE FOR ROOTZONE LAYER				
Maximum diameter	<32 mm	Particle Size Distribution		

KEY: SH = Sward Height PS = Playing Season SM = Summer Maintenance

Visual assessment is an acceptable alternative method of testing, if undertaken by a turfgrass consultant who is able to satisfy the selection criteria identified within the Turfgrass Consultants – Construction/Upgrade Brief.

Assessment
undertaken by:

Jonathan Tucker

Consultancy:

STRI

Appendix 2 - Indicative Costs

The Fleets - Existing Pitches

The following is based on approximate areas as follows (including run off margins):

Pitch 1	6,208 m ²
Pitch 2	7,420 m ²
Pitch 3	4,000 m ²
Total Pitch Area	17, 628 m ²

Pipe Drainage	£28,760
Slit Drainage (1.5 m centres)	25,854 m ²
Sand Dressing (100 t/ha) x 2	£10,576
Total	£65,190

Remedial maintenance for the above pitches (Verti-Draining, Overseeing, Scarification, Topdressing with sand x 2, Weed killer, Mowing x 6, Mobilisation and site set-up)	£22,153
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The Fleets – Mini Pitch Development

The following cost estimates are based on pitch areas as follows (including margins):

2214 m² (2 pitches)

Working area for the above estimated 2904 m²

Preliminaries (Total weed killer application plus cultivations)	£1,452
Earthworks	£9,293
Drainage – Pipe Drainage	£12,100
Blec Sand Bands	£2,214
Importation and spread of sandy loam layer (50 mm depth)	£7,749
Seeding	£2,323
Total	£35,131
Maintenance for the above (First year) including verti-draining, fertiliser treatment, overseeding of thin areas, sand topdressing (x 2), topping up drainage lines and initial mowing (x6), weed killer application	£6,010

Belle Vue – Mini Pitch Development

The costs are based on the following parameters:

Pitch 1 (including margins)	1,120 m ²
Pitch 2	1,872 m ²
Total Pitch Area	2992 m ²
Working Area	3,992 m ²

Preliminaries (Koro Treatment plus cultivations)	£1,996
Earthworks	£12,774
Drainage (at 4 m centres)	£12,300
Supply and spread of sand layer	£3,980
Seeding	£3,194
Total	£34,154

*The above does not include the cost of an infiltration trench (circa £2000)

Maintenance for the above (including Verti-draining x 2, fertiliser dressings, sand dressing x 1, preliminary mowing and weed killer treatment during the first year)	£4,620
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Appendix 3 – Outline Maintenance Recommendations

Mowing. The grass shall be maintained between heights of 25 - 40 mm using cylinder mowing equipment. The grass should never be allowed to exceed a height of 50 mm. If the grass does become too long, the height of cut should be reduced gradually over 3 – 4 cuts allowing some time for recovery in between. N.B. On no account should the grass height be reduced by more than 50% on any one occasion. Overall, approximately 30 mowing operations may be required each year, depending on weather and growing conditions.

Fertiliser application. Allowance should be made for a sufficient number of fertiliser applications to maintain healthy growth and colour. The fertiliser regime should be based on the results of annual soil sampling to determine nutrient concentrations, but the following programme is provided as a guide:

April	12:6:6 at 350 kg/ha
September	5:5:20 at 350 kg/ha

Fertiliser shall be applied with appropriate equipment that ensures a uniform distribution.

Weed control. Apply a selective herbicide in the spring (if required) to combat the weeds present. This to be applied at least two weeks after the first fertiliser treatment (April) and at a time when grass growth is strong and healthy. NB. Do not apply herbicide during periods of potential turf stress, i.e. if the weather is hot and dry or if frosts are forecast. Apply herbicide strictly according to the manufacturers label recommendations and only by suitably qualified personnel.

Pesticide/Fungicide [If required]. A pesticide/fungicide application may be required should disease be present within the grass sward. An approved fungicide should be used with activity against the pathogens present and be applied following the manufacturers label recommendations by suitably qualified personnel.

Aeration / Compaction Alleviation. Verti-drain (or other similar de-compaction treatment) the pitches on at least two occasions in the spring and autumn. Use 18 mm diameter solid tines working to a minimum depth of 200 mm below the surface set to provide some heave. Verti-draining must not be carried out if ground conditions are too soft or during frost.

Additional aeration treatments (e.g. slitting or spiking) during the playing season would also be highly beneficial to maintain surface drainage rates. These treatments should only be undertaken when ground conditions are suitable.

Sand topdressing. Supply and spread approved medium-fine sand suitable for sports use during the renovations period (e.g. mid May) at the rate of approximately 65 t/senior-sized pitch. After each application, the sand should be worked into the surface with brushes or drag mats.

Overseeding. Overseed the pitch areas and safety margins as required at the application rate of approximately 200 kg/ha immediately after the topdressing application in May. Use at least three cultivars of perennial ryegrass chosen from the latest Turfgrass Seed booklet with live ground cover and visual merit ratings of 6.5 or more. Make at least two passes with seeding equipment designed to place

the seed approximately 5 mm below the surface.

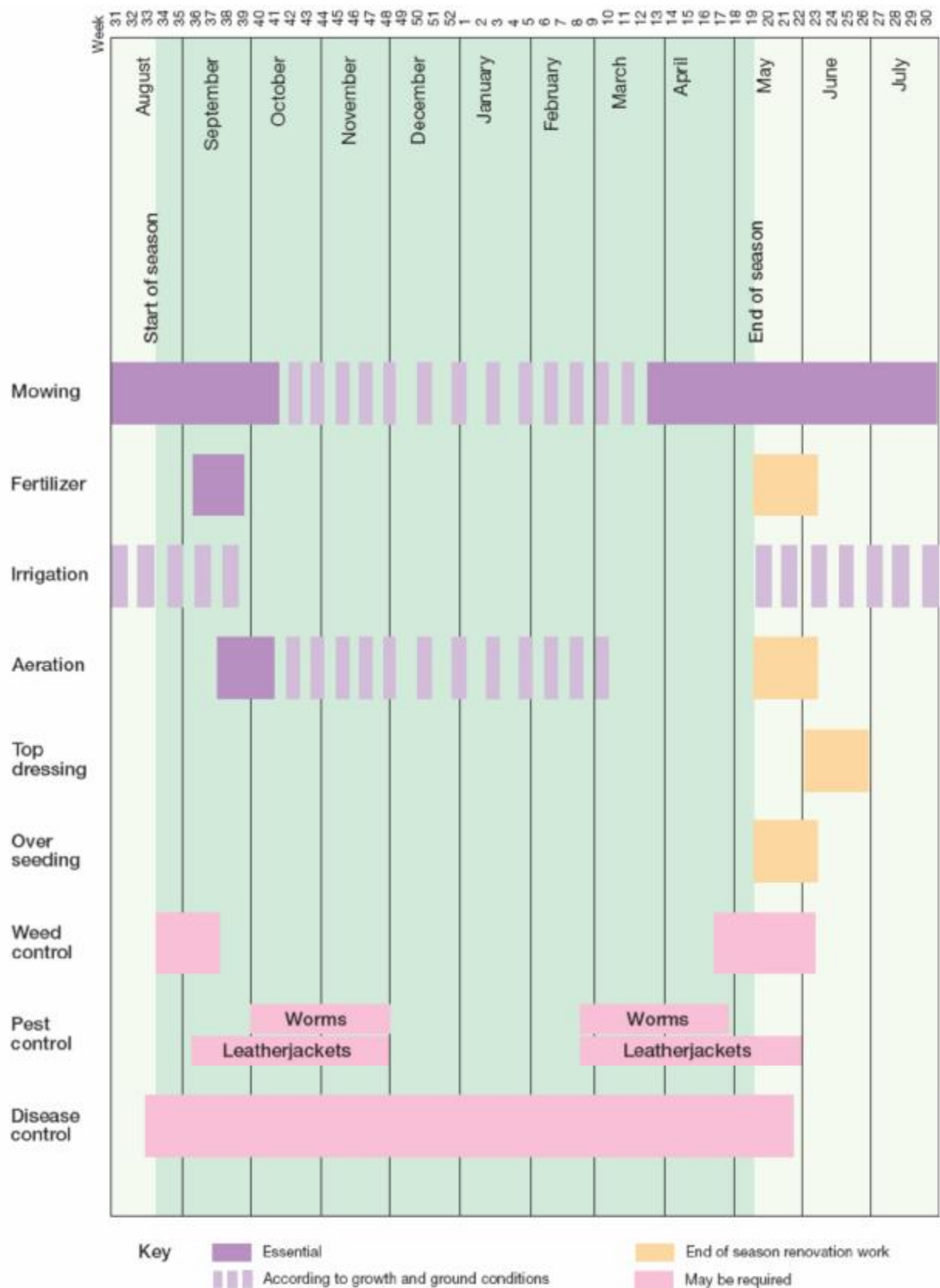
Harrowing [Playing season as required]. To maintain surface levels, it is recommended to chain harrow / drag mat the pitch as opposed to flat rolling which tends to compact the pitch surface and exacerbate undulations. This should only be undertaken under suitable ground conditions.

Divot repair [Playing season]. After each match, divot and tread the divots back into position. This will remove any bare soil which allows weeds and weed grasses to germinate. Filling in divots with seed/soil mix will help to maintain better grass coverage.

Renovation of worn areas [Playing season]. Areas of high wear, e.g. goal mouths, should be dressed and seeded using a divot repair mix (seed/root zone) during the playing season as required in order to maintain good grass cover. These areas should be hand watered (if necessary) to ensure rapid grass germination and establishment.

Line Marking [Playing season]. Line marking should be undertaken on a weekly basis during the playing season.

Goal post safety. The posts should be regularly checked for damage and re-painted / re-paired as necessary following the manufacturer's guidance.



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SOIL PARTICLE SIZE ANALYSIS

THE FLEETS

CATEGORY	DIAMETER mm	%
Stones	>8	5
Coarse gravel	8-4	3
Fine gravel	4-2	4

Particle size distribution of mineral matter smaller than 2mm

Very coarse sand	2-1	3
Coarse sand	1.0-0.5	4
Medium sand	0.50-0.25	9
Fine sand	0.250-0.125	12
Very fine sand	0.125-0.050	14
Silt	0.050-0.002	40
Clay	<0.002	18
Loss on ignition (% of oven-dry fine earth)		8.1
Calcium carbonate	%	NIL
SOIL TEXTURE		CLAY LOAM

T = TRACE

THESE RESULTS PERTAIN ONLY TO THE SAMPLE(S) SUBMITTED AND TESTED



Appendix 6 – Topographic Survey – Belle Vue Site



Topographic Survey Legend

Legend

- Property Boundary
- Drainage
- Topography
- Vegetation
- Structures
- Utilities
- Survey Points
- Contours
- Spot Elevation
- Grade
- Flow Direction
- Water Body
- Other

Drainage/Utilities Legend

- Drainage
- Utilities
- Other

Notes

- 1. This map is a topographic survey of the site shown and is not a plan of the site.
- 2. The map is based on a survey of the site conducted on 10/10/2014.
- 3. The map is based on a survey of the site conducted on 10/10/2014.
- 4. The map is based on a survey of the site conducted on 10/10/2014.
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- 8. The map is based on a survey of the site conducted on 10/10/2014.
- 9. The map is based on a survey of the site conducted on 10/10/2014.
- 10. The map is based on a survey of the site conducted on 10/10/2014.

FIRST POINT SURVEYS

Topographical Survey

Boundary College

Scale

North Arrow

Stationing

Station	Point	Elevation	Notes
1	100	100	
2	100	100	
3	100	100	
4	100	100	
5	100	100	
6	100	100	
7	100	100	
8	100	100	
9	100	100	
10	100	100	