

An assessment of the current quality and carrying capacity of the natural turf sportsfield at The Cowplain School

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1.0 Summary

Due to the proposed development of part of the sportsfield at the Cowplain School it is necessary to try to offset the loss of this section of sportsfield. As there is no space on site to construct a new sportsfield of equal size and quality to the area proposed for development, the only option is to improve the remaining area of sportsfield to offset the loss of use that developing the section of sportsfield would result in. The area proposed for development is similar in quality to the rest of the site due to similar maintenance, use and soil type. The quality level is poor in respect to weed content, grass type and thatch levels in the soil. The area is poorly drained due to the high clay content of the soil. The school report that the sportsfield cannot be used typically between November and March and can provide booking data to support this if required. The classic indicators of wet soils are visible on this site with mottling in the topsoil and subsoil, high levels of thatch at the soil surface and the extensive presence of wetland species such as Buttercup within the sward.

As the key limiting factor for increased use is poor drainage, there is scope to improve the remaining area by draining the sportsfield and by improving the management and maintenance of the newly drained pitches, the increase in use possible following drainage can be sustained. The size of the area earmarked for development is around 0.4 ha and is triangular in shape providing space for a 5 a side pitch or training grids of similar size. Working on the basis of the school records of use and Sport England guidance for typical sustainable use for pitches on such soils it is estimated that the current sustainable level of use this area can support in a year is around 130.5 hours.

If the remaining area is improved by drainage using a combination of lateral drains and sand grooves (a Sport England Type 4 design) then based on having an adult 11 x 11 pitch and a youth 9 x 9 pitch the increase in use is around 103.5 hours of use per pitch or an increase of 207 hours in total. This is well in excess of the 130.5 hours of use that will be lost if the area earmarked for development is built on. These figures are based on using a mid-point value for sustainable hours of use for a Type 4 system of 4.5 hours per pitch per week. This approach cannot mitigate the loss of simultaneous play as an area of sportsfield will still be lost along with a small-sided pitch that could fit in this space.

As the improved carrying capacity must be maintained into the future the maintenance of the remaining sportsfield must also be significantly increased, allowing for regular decompaction works, weed control, overseeding, fertilisation and sand top-dressing. Allowance should be made to re-groove the area after 7 – 10 years to retain effective drainage function. This will add significant cost to the school maintenance budget and should be included in the financial planning for this project.

Draining soils that are high in clay content and that shrink on drying and swell on wetting is difficult as it is impossible without irrigation to prevent settlement of the drain runs post-installation. Though this can be mitigated in the design, in dry periods the drain backfill will settle and the surface can become uneven. This means drain lines will need topping up from time to time. Regular decompaction and top-dressing will also help to maintain safe surface levels. Drainage will increase the risk of drought damage in dry years with the loss of grass cover this can result in. Without an effective watering system, the school should plan for occasional times where the sportsfield may need overseeding in autumn to replace the grass lost through drought stress in summer.

The development proposal reduces the overall size of sportsfield and the overall carrying capacity of the site for simultaneous use. That said, the improvements suggested in this report will allow a significant amount of additional use of the remaining sportsfield, including use through winter which will aid delivery of the curriculum and also provide additional pitches for local clubs to use.

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Limitations of this report.

Any recommendations contained within this report are not a specification of works, nor can they be guaranteed to fully correct any issues or concerns found.

2.0 Introduction

Due to a proposed building project, part of the school playing field will be built on. Some mitigation in the form of new provision of sports field of the same size and quality, or improvements to the remaining field that will off-set hours of play lost on the area earmarked for development will be needed. As there is no space on site to construct a new sportsfield to offset the loss of the proposed area, then increasing the number of hours that the remaining field can be used for is the only mitigation option available to for this site. This investigation was commissioned to identify the current quality of the area of sportsfield earmarked for development and the quality of the remaining sportsfield. In addition, limitations to use such as poor drainage were also considered and used to identify the likely number of hours per year that the sportsfield can currently sustainably support. If improvements to the remaining field can be made and maintained, then the hours of potential additional use will also be calculated to determine whether this is sufficient to offset the use lost should the development go ahead.

3.0 Site assessment

3.1 Site history and natural soils

The site is located off Hart Plain Avenue, Cowplain Waterlooville, Hampshire UK, PO8 8RY, Grid Reference 468366, 110714.

The playing field has a usable area of around 2.5 ha in total and this area is used for general sports within the current PE curriculum and informal sport during breaks. The site also has extensive MUGA facilities and a full-size 3G pitch used to support the delivery of the curriculum when the sportsfield cannot be used. The school allows external letting but there are no bookings for the sportsfield in winter (November to March) due to waterlogged ground conditions. The school can provide evidence of this from before and after the pandemic on request. Likewise, there is no use of the sportsfield for curriculum delivery in the winter months for the same reason. The approximate area of the part of the site earmarked for development is around 4000 m² and is in a triangular section of the sportsfield at the north eastern end of the field. This will require the relocation of the jumping pit as part of any proposed works.

The site falls at a gentle gradient of around 1.2% from north east to south west but there is also a ridge running through the centre of the field which gives some cross fall to both the north west and south east. This will make any drainage works more complicated, requiring the use of laser-controlled trenchers to maintain the grade of drains cut through the field.

The natural soils are mapped as belonging to the Windsor Soil Association, which is described as containing “Slowly permeable, seasonally waterlogged clayey soils mostly with brown subsoils. There are some fine loamy over clayey soils and fine silty over clayey soils.” In addition to being poorly drained, these soils are also prone to significant shrinkage on drying and swelling on wetting.

The underlying geology of the site is mapped by the British Geological Survey as being over the London Clay Formation, a silty to very silty Clay. There are some Head deposits on site which are comprised of a mix of clay, silt and sand deposits washed on to site from higher ground. Such deposits can be stony.

Borehole records from the site show a significant depth of London Clay underneath the site. The use of groundwater for irrigation is unlikely to be possible at this site.

The site has a Standard Average Annual Rainfall of 792 mm and a 1 in 1 year greenfield runoff rate of 4.7 l sec ha. The site is situated entirely within Flood Zone 1 land and is not part of a functional river floodplain. The playing field is mapped as being at very low risk of surface water flooding generally but at low risk in the lowest part of the site.

3.2 Assessment methods

The area assessed is shown in Figure 1 along with the location of pitch quality testing points and trial pits dug as part of the assessment. Pitch quality was assessed against nationally recognised quality standards published by the Grounds Management Association. The standards for football were used in this assessment as the aim is to

increase use of the site for winter sports post-works, should this be accepted by Sport England.

The assessment methods for pitch quality included the following:

3.2.1 Quadrat

BS 7370-3: 1991: Appendix A.A6

A standard 1 m² quadrat was used to assess sward density and quality. Six quadrat assessments were taken in the proposed development area and six taken in the remaining area. These were used to assess grass cover, bare ground, disease incidence, grass type, worm casting and weed incidence.

3.2.2 Core samples

BS 7370-3: 1991: Appendix A.A7

Six 50 mm diameter core samples were taken in the proposed development area and six taken in the remaining area to assess rooting depth and thatch depth.

3.2.3 Surface evenness

BS 7370-3: 1991: Appendix A.A6

Surface level variation under a 2m straight edge was measured using a tape measure in the same locations as the previous measurements.

3.2.4 Sward height

BS 7370-3: 1991: Appendix A.A3

Measured at the same test locations used for the previous assessments.

3.2.5 Infiltration rate

BS 7370-3: 1991: Appendix A.A3

This was not measured as the soil was very dry and it can take over 1 week for clay soils such as those on site to wet-up and swell such that a reasonable saturated hydraulic conductivity value can be determined. As a result, soil morphological and textural indicators of poor drainage were used as an indicator of the drainage status of the soil. If needed, infiltration rates can be measured in winter once the soil is close to saturation.

The location of the quality testing points, soil trial pits and auger borings are noted on Figure 1 along with the indicative outline of the development area.



Figure 1. Site location, indicative development area (red line area) and sampling points.
Soil trial pit / auger hole ▲
Pitch quality measuring point ●

4.0 Observations

4.1 Surface quality

The results of the quality assessment are presented in Tables 1 and 2. Some simple descriptive statistics have been used to identify key patterns and findings within the collected data. The mean has been calculated for each pitch to give a useful guide to the general condition of each pitch. To better understand how characteristics vary within and between points, the standard deviation and coefficient of variation have also been calculated. These measures help to understand how useful the mean is when looking at all the data collected. For instance, if the results for weed cover were all 5 %, the average would be 5 and the standard deviation and coefficient of variation would be 0 because the average is the same as the individual results recorded. If there is a wider range of results

such as 0, 5 and 100 for example, then the average would be a poor description of the results but the high degree of variation shown would tell us something important – in this case that the distribution of weeds across the pitch was very variable and as a result grass quality would also be variable. Both coefficient of variation and standard deviation should be considered together. For instance, if 5 results are 0 and one result is 1, the coefficient of variation will be high but the actual deviation will be very low, so the variation must be set in the context of the actual deviation from the mean.

This approach to analyzing the results can seem unnecessarily complicated but it is useful when monitoring longer term changes in pitch condition and performance. Not only will it allow absolute pitch quality to be monitored but also variability within and between pitches to be monitored. Groundstaff will be able to see whether the overall quality is improving uniformly and whether variability between areas is reducing over time. Ideally, quality will get better and variability within the area will reduce. This means the playing field will play more uniformly (so one area will be no better or worse than any other) and the high wear areas will continue to offer as good a playing surface as the lower wear areas. The purpose of this assessment is to measure elements of current surface quality against GMA Performance Quality Standards for football in the playing season (Appendix 1).

Table 1 Surface quality for the proposed development area

Turf Characteristic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Average	St Dev	CV (%)
Bare areas (%)	4	2	1	6	2	1	2.67	1.97	73.74
Desirable grass (%)	35	42	48	60	73	65	53.83	14.55	27.03
Poa Annua (%)	65	58	52	40	37	35	47.83	12.32	25.75
Ground cover (%)	96	48	99	94	98	99	89.00	20.18	22.67
Weeds (%)	18	45	30	13	22	50	29.67	14.98	50.48
Moss (%)	0	1	1	0	1	3	1.00	1.10	0.00
Algae / lichen	0	0	0	0	0	0	0.00	0.00	0.00
Height of cut (mm)	55	55	40	50	35	52	47.83	8.38	17.51
Surface evenness (mm)	15	17	16	11	24	3	14.33	6.98	48.67
Pests and diseases									
Fungal diseases (%)	1	1	3	1	1	1	1.33	0.82	61.24
Worm casts (%)	2	1	2	4	1	0	1.67	1.37	0.00
Turf pests (%)	0	0	0	0	0	0	0.00	0.00	0.00
Soil profile									
Rooting depth (mm)	155	165	170	160	165	170	164.17	5.85	3.56
Thatch depth (mm)	25	32	10	3	28	45	23.83	15.22	63.88

GMA PQS class: Elite Level, High Level, Advanced Level, Good Level, Basic Level, Poor.

Figures in **red bold** denote values falling outside the Sport England recommendations for natural turf pitches.

Table 2 Surface quality for the remaining sportsfield area

Turf Characteristic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Average	St Dev	CV (%)
Bare areas (%)	1	0	2	3	1	15	3.67	5.65	153.96
Desirable grass (%)	30	60	20	60	35	20	37.50	18.37	48.99
Poa Annua (%)	70	40	80	40	65	80	62.50	18.37	29.39
Ground cover (%)	99	100	98	97	99	85	96.33	5.65	5.86
Weeds (%)	28	27	5	30	20	23	22.17	9.15	41.29
Moss (%)	0	0	0	0	0	0	0.00	0.00	0.00
Algae / lichen	0	0	0	0	0	0	0.00	0.00	0.00
Height of cut (mm)	35	45	50	58	60	45	48.83	9.28	19.01
Surface evenness (mm)	14	19	21	18	2	12	14.33	6.89	48.07
Pests and diseases									
Fungal diseases (%)	4	2	1	1	2	2	2.00	1.10	54.77
Worm casts (%)	1	0	1	1	1	3	1.17	0.98	0.00
Turf pests (%)	0	0	0	1	0	0	0.17	0.41	0.00
Soil profile									
Rooting depth (mm)	185	165	170	155	170	175	170.00	10.00	5.88
Thatch depth (mm)	16	55	1	55	23	15	27.50	22.47	81.69

GMA PQS class: Elite Level, High Level, Advanced Level, Good Level, Basic Level, Poor.

Figures in **red bold** denote values falling outside the Sport England recommendations for natural turf pitches.

4.1.1 Analysis of the results

The quality of the area identified for development is poor in respect to weed content, the percentage of desirable grasses to undesirable grass and the depth of thatch. This allows the surface cover value to be very good but as weeds and Annual Meadow Grass wear quickly under play, this gives a false idea of how much play this area will support. The amount of thatch suggests the area has not been used extensively as play wears thatch out of the surface quite effectively. Thatch is a problem as it tends to hold water and as it is composed mainly of organic matter it is compressible, releasing water when walked on. As a result, games can be called off as water will appear around a shoe when the ground is walked on, even if the soil below the thatch layer is dry. Also, if it is allowed to dry out, it can become hydrophobic leading to patches on the field that will not wet following rainfall. This can lead to further loss of grass and an increase in drought tolerant weeds. Finally, thatch tends to build up more when the soil is wet as grass prefers to root within an aerated zone in the soil. To create a good rooting environment, it produces more surface roots which if not managed by scarification, play and verti-cutting can allow thatch to build up. Thatch depths like those seen on this site indicate very wet ground conditions for prolonged periods.

To improve wear tolerance and carrying capacity the thatch will need to be removed as part of any works. Grass quality and thatch depth is equally poor on the area to be retained which is unsurprising as it is managed in the same way, has similar use levels and has similar soil.

The high percentage of undesirable grasses indicates a lack of overseeding as part of the routine maintenance of the area. This will result in a weak sward which will not tolerate wear. As previously noted, overall cover was very good but that is due to poor grasses being present and the high weed content.

Grass length is good, suggesting the field is mown regularly, rooting depth is also excellent and this reflects a mix of tap rooted weeds, a lack of play and a high plant density. Finally, the surface was generally even and as such was safe to use.

In summary, the quality of both the area earmarked for development and the rest of the site is poor – indicating a lack of routine maintenance beyond mowing and marking. Should Sport England be amenable to a mitigation that involves improving the remaining playing field to support more play, then the ongoing maintenance should also be improved to sustain the improvements made and the play that is possible. This should include regular weed treatment, overseeding, fertilisation and decompaction works alongside mowing and marking. This will require increasing the sports pitch maintenance budget.

4.2 Soil pits

Three soil pits were dug over the area to determine the soil type and the likelihood that the carrying capacity of the retained area can be sustainably improved.

Pit 1 revealed a soil profile with a dark greyish brown Clay Loam topsoil extending to a depth of 220 mm with a 26 mm deep layer of thatch at the surface. The topsoil was well structured with an interlocking pattern of small granules leading to larger prismatic soil aggregates with depth. The topsoil was also heavily mottled. Mottling is the pattern of orange patches occurring within the general grey soil matrix and is caused by patches of fully oxidised Iron (Fe^{3+} or Ferric Iron) occurring within a background of soil where the Iron present is in the reduced form (Fe^{2+} or Ferrous Iron). The presence of reduced Iron in the soil means that the soil must be anaerobic for prolonged periods with no free oxygen available to accept electrons. In the absence of oxygen, the Ferric Iron accepts electrons and becomes reduced, changing colour as it does so from orange to colourless or grey. This means that whenever mottles like this are visible in the soil then the soil is or has been waterlogged for extensive periods with the resultant creation of anaerobic conditions. This helps to explain the depth of thatch in the soil and supports the school's comments on the pitches not being usable between November and April in most years.

Between 220 mm and 240 mm was a thin layer of chalk pebbles, deposited within the Head deposits the soil has formed within. This was underlain by a layer of very mottled greyish yellowish-brown Clay. Below this the soil became initially yellow in colour, though still mottled but then blueish grey below 700 mm to the base of the pit at 750 mm. There was no evidence of a shallow water table, despite being in the lowest part of the sportsfield.

Pit 2 was very similar to Pit 1 with a thatchy topsoil around 200 mm deep. The topsoil was a light greyish brown, mottled, Clay Loam. This sat over a yellowish grey, mottled, Clay with few stones within it. Between 460 mm and 660 mm was yellowish grey, heavily mottled Clay which became grey below 660 mm to the base of the pit at 720 mm.



Figure 2. A very thatchy topsoil typical of both areas of the sportsfield.



Figure 3. Note the orange mottles around root channels that are indicative of prolonged waterlogging in winter.

The final pit was located within the area designated for development. It was very similar to the previous two pits with a thatchy, greyish brown, slightly stony, mottled topsoil to 200 mm. Between 200 mm and 380 mm was a dark greyish yellow, mottled stiff Clay which was sat over a yellowish grey, heavily mottled Clay to 570 mm. Between 570 mm and the base of the pit at 820 mm was a plastic, mottled, grey Clay with very rare stones.

Soils of this type are likely to be very poorly drained due to slow infiltration rates resulting in water sitting on the pitch surface for long periods of time. The mottling present throughout the soil profile indicates that the soil is waterlogged for much of most winters to depths of at least 500 mm.

4.3 Existing drainage

Given the nature of the soil and the clay content it is unsurprising that the field has been drained in the past. The site has a system of lateral drains falling into a collector drain running alongside the MUGA / 3G and along the bottom of the field in the south western corner. Both these drains fall into the extensive and somewhat confusing network of surface water drains that run under the wetland area below the 3G pitch. The lateral drains are spaced at around 10 m centres and are typically 420 mm to the top of 80 mm diameter plastic perforated pipes backfilled with 5-25 mm gravel to 150 – 180 mm of the surface and then backfilled with topsoil. There was no evidence of surface water drainage and it may be possible that this system was designed to be mole drained but it is unlikely that this has happened for some time. The gravel over the piped drains was badly contaminated with soil and as a result mole drainage may now not work very well as water

may not move quickly from the gravel in the drains into the pipes, given the amount of soil in the gravel. That said, if funds were very limited this approach would be better than nothing as some water will still be removed from the surface though the field is likely to remain unusable for periods every winter.

The existing system outfalls into the surface water drains that run through the wetland area. These are comprised of two 450 mm diameter storm water systems that most likely take water from the school to the receiving drain or water course. In addition to these two large drains are a series of smaller surface water drains that appear to be taking water from the 3G pitch and also from the existing sportsfield drainage system. Given the number of drains with associated covers, it will not be practical to change this part of the playing field into formal sports pitches as the area will need raising, thus all the covers will need lifting and as there are so many covers, any pitch created will have inspection chamber covers present within it. It is never sensible to bury chamber covers as they are designed to provide access to maintain the underlying system.

A new drainage system can be let into one of the existing systems via an existing connection. If the diameter of the existing inlet pipe is not increased then no additional attenuation should be required as the overall volume of water entering the outfall cannot be higher than the current inflow rate from the sportsfield. It is good practice, however, to provide some betterment to the current situation in any new design work and thus the flow from a new pitch drainage system should be collected in a small detention basin located in the south western corner and let into the receiving drain via an existing connection at the 1 in 1 year greenfield rate of 4.7 l sec. This will offer considerable betterment over the current unrestricted outfall pipe which is a 150 mm diameter pipe. This outfall system should be designed to the 1 in 100 year event plus 40% uplift allowance for climate change. The flow should be restricted using a hydrobrake or similar device.

4.4 Soil analysis results

Table 3. Soil texture and nutrient status

Sample	Sand %	Silt %	Clay %	Class	P Index	K Index	Mg Index	pH
Pit 1 topsoil	15	53	32	Silty Clay Loam	0	1	4	7.1
Pit 1 400 mm	12	53	35	Silty Clay Loam	0	1	7	8.0
Pit 2 topsoil	14	51	35	Silty Clay Loam	0	2-	4	6.7
Pit 2 400 mm	6	49	45	Silty Clay	0	2+	7	5.6
Pit 3 topsoil	30	41	29	Clay Loam	0	2-	3	6.2
Pit 3 400 mm	23	39	38	Clay	0	2-	6	6.8

The topsoil varies between Silty Clay Loam and Clay Loam as the amount of sand and silt varies around the site. This is due to variable amounts of Head superficial deposits present around the site and this also affects pH. The subsoil varies between Silty Clay, Silty Clay Loam and Clay, again due to variations in silt mainly. The topsoil is dominated by Clay in respect to its physical and chemical characteristics. The Clay content is high and thus the topsoil is likely to be poorly drained.

The topsoil in general is deficient in Phosphorus and slightly deficient in Potassium. The soil pH is very variable depending on the presence of chalk fragments in the topsoil and

upper subsoil but is generally within the ideal range for sportsturf, excepting Point 1 which is a little high but which cannot be easily changed.

To raise levels of Phosphorus to sufficiency around 92 kg ha of P_2O_5 should be applied (around 190 kg ha of Triple Superphosphate which should be applied separately when the soil is cultivated). To raise the levels of Potassium to sufficiency, it should be applied at a rate of 170 kg K_2O ha. This can be added at the same time as the Triple Super Phosphate.

Nitrogen levels are not checked from soil analysis as they are too unreliable. Generally, 20 - 25 kgs N per ha per growing month are required to maintain healthy grass growth. This should be split between a controlled release application applied in spring and again in late summer to provide a base feed which can be topped up with conventional feeds as needed to reflect weather related changes in growth.

5.0 Recommendations

The key limiting factor on the usefulness and carrying capacity of the playing field is poor drainage due to the presence of a clay-dominated subsoil. Water can infiltrate into the well-structured topsoil but cannot move into the subsoil and thus gradually fills up the pore space in the topsoil until it is saturated. Depending on weather conditions this may happen as early as October or as late as December, but once saturated the soil is unlikely to dry appreciably until spring, typically in March / April, again dependant on the weather. The result is a sportsfield that cannot be used for most of winter and sometimes from late autumn through to the middle of spring. This is an issue for the school who cannot use it for the wellbeing and education of their students, nor let it out to local clubs to use.



Figure 4. Pit 1, heavy mottling in the subsoil.



Figure 5. An example of an existing lateral drain. Note the soil contaminated gravel over the drain pipe

To increase the usefulness of the remaining part of the field such that it can compensate for the lost area, then improving drainage is the key issue as maintenance works cannot materially improve the area. Once drainage is improved, the field can be better maintained through winter and the issues with thatch more easily addressed.

The playing field can only support use in spring, summer and early autumn. For most of late autumn and winter the area cannot be used for football or other winter sports due to persistent waterlogging and standing water. This has an ongoing impact on surface quality and thatch which further reduces the overall quality of the field. The quality of the area designated for development is the same as the remaining area and can currently support the same amount of play. The current carrying capacity of the sportsfield, without a significant loss in quality, is as follows:

- Zero hours use per week between November and March in most years.
- 1 – 2 hours use per week without significant loss in quality for early spring.
- 4 - 6 hours use per week in summer and early autumn without a significant loss in quality.

Given this, the total hours of use that need to be made up to compensate for the loss of the land earmarked for development is **130.5 hours** based on one small sided pitch being lost which is reasonable given the size and shape of the area. The details of this calculation are shown in Table 4.

Table 4. Estimated hours of sports use lost should the area earmarked for development be built on (excludes ad-hoc play and assumes current levels of maintenance).

Period	Average hours of use per week	Average hours of use per year
March - April	1.5	13.5 (9 weeks)
May to August	4.5	76.5 (17 weeks)
Sept to Oct	4.5	40.5 (9 weeks)
Nov - Feb	0	0 (17 weeks)
Year		130.5

Table 5. Estimated hours of sports use should the remaining pitches be improved by drainage and sand grooving (a Type 4 drainage design, excludes ad-hoc play and assumes current levels of maintenance).

Period	Average hours of use per week	Average hours of use per year
March - April	4.5	40.5 (9 weeks)
May to August	4.5	76.5 (17 weeks)
Sept to Oct	4.5	40.5 (9 weeks)
Nov - Feb	4.5	76.5 (17 weeks)
Year		234

As there is no room on site to create a new sportsfield to compensate for the area lost the only option is to improve the carrying capacity of the remaining sportsfield by draining the pitches to allow use year-round. Based on values for sustainable play given in Natural Turf For Sport (2011) Sport England, then using a Type 4 pitch design around 234 hours of sustainable use can be expected (Table 5). This is an increase over the current amount of 103.5. This is not enough to offset the hours lost by developing the area earmarked for development. However, this assumes that the remaining sportsfield of around 2.1 ha is

only one pitch. In most years there are two winter sports laid out on the area and there is space to allow one full sized football pitch (or equivalent sized rugby pitch) and one 9 v 9 pitch. In this case the hours of use per pitch would double the total hours given in Table 5 to **468 hours**, more than compensating for the loss of a small sided pitch in the area earmarked for development. The increased hours of use depend on the effective ongoing maintenance of an improved sportsfield. This will require an enhanced year-on-year maintenance budget for the sportsfield. A guide to the required operations is given in Section 6 of this report. An example layout of how two football pitches can be fitted into the remaining area is given in Figure 6.

It is noted that by losing some land it will not be possible to support an 11 x 11, a 9 x 9 and a 5 x 5 football pitch on the site and though total hours of use can be compensated for by draining the remaining area and improving the ongoing maintenance accordingly, there will remain a loss of potential simultaneous use and only 2 games could be supported at any given time rather than the current 3 games.

5.1 Improving the remaining area

The following is a guide to the likely works needed to improve the remaining sportsfield such that sufficient compensatory use can be provided by the improved area. This is not a specification of works nor should it be used as a specification.

It should be noted that draining soils that shrink and swell on wetting and drying will result in settlement of the drain lines at the surface. This will be mitigated by mixing soil over the lateral drains to encourage grass establishment but settlement will still occur in dry years. The only way to prevent this is to irrigate in dry periods but it is unlikely the school will have funds to do this. Otherwise, the drain runs will need topping up from time to time. The field will drain poorly in the first year until the sand grooves are installed the following summer. This is to be expected and should not be a cause for concern. The grooves must be installed into an established grass sward if they are to be effective.

To maintain the function of the sand grooves for as long as possible, as part of the summer renovations the drained area must be dressed with the same sand as used in the grooves. This is around 115 tons with rough costs of around £9 – 9.5 k per annum ex VAT. With this dressing the sand grooves will function well up to between 7 - 10 years post installation. The area will then need re-grooving to reinstate the hydraulic connection between the surface of the pitches and the underlying drains. The cost of this should be built into the business plan.

Draining the area will allow winter use but will create droughty conditions in summer dry periods. This is likely to result in the development of uneven ground and the loss of ground cover in very dry, hot summers. In such years unless the field can be watered an autumn overseed and decompaction will be needed to offset the loss of grass cover and surface levels.

Table 6. Indicative works required to improve the remaining field

Description
Mobilisation and setting out
Services search
Site clearance and preparation
Remove old synthetic cricket pitch and base along with goal sockets and dispose off site at a suitably licensed site
Mow grass and dispose off site
Apply total herbicide
Topsoil strip, subsoil cut and fill, grading, ripping and topsoil replacement
Strip upper 10 mm of vegetation and thatch dispose off-site
Apply gypsum
Topsoil cultivation repeatedly to break down thatch and mix through upper 100 mm
Stone bury
Final box grading of the surface
Installation of drains
Supply and install 160 mm collector drain including backfill at 600 mm nominal depth, dispose of arisings on site
Supply and install 225 mm carrier drain, dispose of arisings on site
Supply and install 80 mm lateral drains including backfill at 500 mm nominal depth at 4m centres, dispose of arisings on site
Supply and installation pre-cast inspection chamber Class B ductile lid (600 x 450 and 1.0m deep)
Supply and install a hydrobrake chamber restricted to 4.7 l sec
Drain junctions
Excavate and shape a detention basin of approx. 115 m ³ , dispose of arisings on site
Supply 100 mm carrier drain to existing outfall chamber from hydrobrake chamber
Supply and install precast GRC / pre-cast headwalls and install in basin sides
Reinstatement of drain runs
Agronomic works
Supply and spread 5 mm of specified sand material
Decompaction and loosening works
Supply and apply specified fertiliser
Supply and drill specified seed
Supply and use temporary irrigation
Easement
Strip topsoil to temporary pile
Place arisings
Replace topsoil
Reinstatement including fertilisation and seeding
Install sand grooves (Installed the following year into an established sward)
Install sand grooves using a Blec Vibramaster or similar
Apply a 3 mm sand top-dressing using the same sand as used in the grooves
Fertiliser application and overseed at 30 g m ²
Relocate long jump pit
Remove the existing long jump pit to dispose off site and replace with new system.

Maintenance to handover (12 months)
Maintain to achieve minimum standard at handover (GMA Good and Sport England)
Completion
As built plans

This assumes that the goal sockets will be removed and goals will be mobile goals rather than fixed goals. The cost of new goals is not included.

6.0 Implications for ongoing maintenance

The increase in usage suggested in this assessment will be primarily dependent on effectively draining the area. A sustainable increase in use can only be achieved by ensuring the area is maintained to the GMA “Good” standard. The following works should be part of the maintenance of the site as a minimum if the area is to be maintained at the GMA “Good” standard or better.

- Maintain sward height between 30 - 50 mm, cutting frequently enough to avoid any build-up of clippings and using self-mulching mowers where possible.
- Decompact using a Vertidrain, Wiedenmann or similar machine once during March and May and again between August and October when the soil is in the right condition, working at different depths and with differing tine patterns and diameters. This operation should be done slowly and with heave.
- Spray the area using a suitable selective herbicide in accordance with the manufacturer’s instructions and in accordance with a suitable risk assessment and COSHH assessment. This may be easiest to do by using a specialist contractor. This should be done at least 2 weeks ahead of overseeding and should be repeated until weeds are controlled at less than 10% of the total cover. Weed treatment should not take place within 8 weeks of new grass emerging following an over-seeding operation.
- Over-seed the area at a rate of 25 - 30 g m² using a suitable specialist seed drill such as a Vreedo or equivalent, ideally in three directions. The seed mix should be a blend of at least 3 different high-quality varieties of dwarf perennial ryegrass ranked in the top 10 for wear tolerance, appearance and red-thread resistance in the latest seed handbook.
- Top-dress the area with the same sand as used in the grooves. For a 3 mm depth this is around 115 tonnes for an area of 21000 m². The sand should be applied when the sward is dry and the grass is growing strongly. It should be thoroughly brushed into the base of the sward.
- Fertilise as required based on the recommendations made from the soil analysis (Section 4.4). Re-testing the soils every 2 – 3 years is recommended as Potassium levels may vary over this time. This should be done with a high quality, finely prilled fertiliser and is likely to be a combination of a controlled release fertiliser applied in spring and then again in mid to late summer, topped up with conventional feeds as needed to get the sward through peak growth periods without undue stress. Care should be taken not to over-feed the area as this will produce weak, excessive growth and the development of thatch.
- Mark as required.
- Move goals as needed.
- Water as needed to establish and maintain a strong sward.

Appendix 1 – Performance Quality Standards for football

Performance Standard		Unit		Elite	High	Advanced	Good	Basic	Poor
1	Length of grass/cutting height	mm	Range	22-25	25-40	25-50	30-60	30-70	<22 & >70
2	Total ground cover	%	Minimum	95	90	80	70	60	<60
3	Desirable grasses	%	Minimum	98	90	80	70	60	<60
4	Undesirable grasses	%	Maximum	2	10	20	30	40	>40
5	Bare Areas	%	Maximum	5	10	20	30	40	>40
6	Weeds	%	Maximum	0	3	5	10	15	>15
7	Pests & Diseases	%	Maximum	2	3	5	10	15	>15
8	Thatch	mm	Maximum	0	3	5	10	15	>15
9	Root depth	%	Minimum	100	100	90	85	70	<70
10	Rootzone / soil profile*	mm	Minimum	200	150	125	100	90	<90
11	Goal posts	Visual	Compliance	Compliant	Compliant	Compliant	Compliant	Compliant	Non-compliant
12	Line marking	%	Minimum	100	95	90	80	70	<70
13	Hardness	g	Range	75-90	65-120	55-140	35-200	35-200	>
14	Infiltration rate/hr	mm	Minimum	150	50	10	5	2	<2
15	pH	No	Range	5.5-7	5.5-7	6-7.5	5-8	5-8.5	<5.5 & >8.5
16	Soil qualities - Phosphate	Index	Range	2-3*	2-3*	2-3*	2-4*	2-5*	<2 & >5*
17	Soil qualities - Potash	Index	Maximum	2-3*	2-3*	2-3*	2-4*	2-5*	<2 & >5*
18	Pitch surface levels/evenness	mm	Maximum	5	10	15	20	25	>25
19	Surface debris	%	Maximum	0	1	2	3	5	>5