HUNTRESS ASSOCIATES
Landscape Architecture & Land Planning

November 13, 2020

Mr. Alex Elvin, General Planner
Martha's Vineyard Commission
PO Box 1447
Oak Bluffs, MA 02557

Re: Martha's Vineyard Regional High School – Athletic Field Improvements (Amended DRI # 352)

Dear Mr. Elvin;

I received your email and staff questions dated November 11, 2020, regarding the MVRHS's Application for an amended DRI, as referenced above. I have coordinated our reply with the MVPS and project team. The following is a listing of your questions and our responses.

1. **Do the federal flammability standards (COD FF 1-70) apply to synthetic fields? Are there other fire safety standards that apply specifically to synthetic fields?**

   Response: No. Synthetic Turf is considered non-flammable. Greenfields/Tencate's Material Data Safety Sheets reference OSHA Hazard Communication 1910.1200.

2. **On the issue of fire safety, please address the toxicity of smoke from a potential fire.**

   Response: Inhalation measures are listed as Non-Applicable referencing the above standard. With guidance for respirators during an indoor scenario.

3. **Is there currently a licensing agreement between HAI and the high school, or between Daedalus and the high school? If so, please provide a copy.** *Response: Neither my office, nor Daedalus, have a licensing agreement with the MVRHS.*

4. **Please provide reference for the STMA 680-820 hours-per-field estimate for grass fields.**

   Response: The annual range of hours recommended for natural grass fields is presented in the article written by Dr. Grady Miller, Professor & Extension Specialist, Department of Crop Sciences, North Carolina State University, entitled "Maximizing the Durability of Athletic Fields" published by North Carolina Cooperative Extension, dated January 2010. Refer to Table 1 of the attached article which shows good field conditions, with localized wear areas up to 600 hours of annual use, and fair field conditions, "expecting significant thinning and wear" when the annual use goes over 800 hours. The topic was further discussed at the 2017 STMA annual conference seminar on January 24, 2017 presented by Dr. Miller and entitled "Management of K-12 Fields in the Transition Zone." I have attached the presentation from the STMA conference for your reference. As discussed at the 2017 STMA seminar, localized conditions that could further impact the range of annual hours include geographic location, turf grass selection, mowing, aerification, fertilization, weed control and irrigation.

Table 1. Expected Field Condition Based on Hours of Field Use per Year

Expected Field Condition	Field Use (Hours per Year)
Sustained good field conditions	200 hours or less
Good field conditions with some thinning of the turf and localized wear areas	400 to 600 hours
Fair field conditions; expect significant thinning and wear.	800 to 1,000 hours
Significant turf loss, field surface damage, increased potential for athlete injury	More than 1,000 hours

Table 1 – Maximizing the Durability of Athletic Fields – NC State University Cooperative Extension.

Further, I have attached an article from Sports Field and Facilities Management (Official publication of the STMA), dated August 2015. Please refer to the article entitle "Study: Field benchmarking and permitting hours" written by Pam Charbonneau and Emily Hartwig. This report documents the hours of use on athletic fields in three different municipalities against several factors, including wear patterns, percent cover of broadleaf weeds, Kentucky bluegrass, perennial ryegrass, % bare and annual bluegrass. The average annual hours of the three athletic fields with passing scores were 527 hours. The authors recommend permitting hours for a single field with a subsurface drainage system and irrigation in the range of 450-600 total annual hours, as shown in table 2.

5. **If later phases of the Athletic Field Master Plan do not proceed (or only proceed after a number of years), what are the implications for the Phase 1 project, in terms of usage, costs, field overlap, usability of remaining fields, etc.?**

   Response: There are no implications to the phase one plan costs should later phases not be constructed. The usage numbers provided on July 15, 2020 are calculated to be at the end of phase one construction. The overlap and usability of the remaining fields are shown on the overall campus circulation plan dated June 2, 2020 submitted to the MVC on June 5, 2020.

6. **Please clarify whether user fees will apply to field use by non-MVRHS students, and provide a copy of the current field use policy.**

   Response: According to Mr. Richard Smith, Assistance Superintendent, MVPS has never instituted fees for participation in MVRHS athletics and does not intend to do so based on the proposed construction. Community organizations using our facilities are required to complete a permit application which requires the user to abide by certain conditions, as well as the payment of a reasonable user fee, in accordance with the policies established by the MVRHS School Committee. A copy of the current MVRHS Field Use Policy will be provided under separate cover.

7. **How much tree and other vegetation clearing is required for Phase 1 (apart from the removal of 4 trees to make room for the bus drop-off)? Would the clearing in the area proposed for the synthetic turf be different if a grass field were proposed for that area?**

Response: As noted in our LUPC hearing on October 19, 2020, no additional tree clearing is required for the improvements associated with Field #1 and Field #2 of phase one. The tree clearing limits would not be any different if a natural grass field were proposed for that area.

8. **Are ongoing additional landscaping costs built into the MVRHS budget?**

   Response: The estimated budget for maintaining the landscape planting areas shown on sheet L-3, details #2, #3 & #4 would range from $6500-$7500 in total, annually. As these are highly visible locations the MVRHS should consider engaging the business community in adopting the care of these spaces in exchange for small and simple signage acknowledging the contribution. We have found other clients to have considerable success using this model on high visibility locations.

9. **Please explain why synthetic turf requires no watering. How do you keep it saturated?**

   Response: Unlike natural grass, the synthetic turf requires no watering for performance or lifecycle. Also, BrockFill, the proposed infill product, does not require moisture. Brockfill makes the entire synthetic turf system hydrophilic in that it absorbs water to help increase the heat reduction on the field, but moisture is not a required component of the BrockFill performance or warranty. How long the synthetic turf system remains wet is determined by the weather conditions but because it absorbs water, the system retains moisture for a longer period than non-hydrophilic materials.

10. **What intensity of storm is the storm drainage system engineered to?**

    Response: As shown in the Stormwater report prepared by Marchionda & Associates, dated January 22, 2020, and revised September 16, 2020, the stormwater calculations provide for no net increase in stormwater for the 2, 10, 25 and 100 year storm events. This information was originally provided to the MVC as part of our DRI application materials on January 28, 2020.

11. **Please detail any specific equipment for installing or maintaining synthetic turf (other than the field groomer and sweeper attachments which are included in the vendor contract) which the MVRHS would require? Are these capital costs included in the cost comparisons provided?**

    Response: Installation will be performed by certified installation crews provided by the selected turf manufacturer. MVRHS will not be required to purchase installation equipment or provide staff to install the turf. The following are the only pieces of specialty equipment needed by MVRHS to maintain the proposed synthetic turf field:

    a. *Field Groomer for routinely brushing the field shall be a drag broom unit equivalent to "Synthetic Sports Turf Groomer" with "Spring Tine Rake" attachment as manufactured by GreensGroomer Worldwide, Inc. PO Box 34151 Indianapolis IN 46234 (888) 298-8852 ext. 500, www.greensgroomer.com, or approved equivalent.*

b. *Field Sweeper for routinely removing debris from the field shall be drag behind unit equivalent to "LitterKat" with magnetic bar attachment as manufactured by GreensGroomer Worldwide, Inc. PO Box 34151 Indianapolis IN 46234 (888) 298-8852 ext. 500, www.greensgroomer.com or approved equivalent.*

All of the equipment noted above is included in the purchase of the synthetic turf field and included in the cost estimates provided to date.

12. Are you recommending and costing out standard grooming or premium? If the former, does the high school have the equipment and training to do the deep cleaning to remove debris and contaminants?

Response: The MVRHS will be provided with the equipment and training to perform standard grooming on a regular basis. I assume that the term 'premium grooming" applies to the scope of work outlined in question #14, below. "Premium grooming" of a synthetic turf field is typically performed by a separate contractor who is trained and authorized to provide those services on behalf of the synthetic turf manufacturer, and is included at no additional cost to MVRHS for a period of two-years. Beyond the two-year term outlined in the project specifications, we recommend that the MVRHS contract that work with a third-party vendor as outline in our response to question #14, below.

13. Do the proposed improvements to the natural grass field (i.e. re-establishing the mid-field crown, improving the topsoil composition and adding infiltration trenches) include any other reconstruction or renovation? Are your recommendations consistent with TURI (or other applicable) recommendations for establishing a grass field capable of moderate to heavy usage with proper maintenance?

Response: All proposed improvements to the natural grass field are shown on the plans and documents provided to date. Improvements proposed for Field #2, which mirror the recommendations provided by TURI in their case study of athletic fields for Springfield, Massachusetts, including the following:

1. ***Soil Testing**: The soil testing results and recommendations were provided by Duane Otto of Turf & Soil Diagnostics and are dated November 5, 2019. The results of the soil testing for Field #2 show a sandy loam with the percent organic matter content at 3.63%, which is within the specifications but is considered a bit low. Also, "the soil has a saturated hydraulic conductivity (infiltration) rate that is low, and the aeration porosity is low and capillary porosity is high….These results suggest that the soils should have poor drainage and potential for low aeration and excessive water retention. With low infiltration rates, these fields should be crowned to ensure adequate surface drainage." The plans provide for a crown at the center ridge line and a 1.5% slope to each sideline.*

2. ***Soil Amendment & Aeration:** Given the above referenced soil testing results we will be stripping, screening and amending the existing topsoil to provide better infiltration and increased porosity. We have previously submitted the sand, soil amendments and athletic field grass seed specifications to the MVC under separate cover. Aeration is*

recommended annually, as determined by existing field conditions and continued soil testing. A subsurface drainage system and new irrigation system will also be included in the renovated field.

3. ***Fertilization and Soil amendments:*** *MVRHS staff presently subcontract the fertilization and soil amendments to Dennis Brolin of Sports Turf Specialties (STS). STS is recognized as one of the best turf and athletic field maintenance companies in the country and continue to work locally on Martha's Vineyard for the MVRHS and several other clients. As per the project specifications, STS will be conducting annual soil testing to determine the condition and needs of the existing topsoil fields and calibrating their equipment to ensure compliance with the MVC's Island Wide Fertilization requirements.*

   More information regarding STS and their capabilities can be found on their website at https://www.sportsturfspecialties.com/

4. ***Mowing:*** *The fields will be mown regularly by MVRHS staff and detailed maintenance will be conducted by STS, as noted above.*

   Given the above outlined scope of work, I can confirm the recommendations will provide for a grass field capable of moderate to heavy usage with proper maintenance.

14. What are the risks of failure to properly maintain synthetic turf (for instance, due to lack of funding; e.g. loss of warranty protection, injuries, etc)?

Response: As stated above, the maintenance equipment and training will be included in the contract. The only cost associated with maintenance moving forward, would be labor. Synthetic turf fields do require grooming and sweeping. The amount of maintenance will depend on the amount of use. The intent of grooming is to keep the playing surface consistent. Consistency throughout a field lends to a safer playing environment for your students. Annual or bi-annual maintenance can be contracted. Our experience is that most schools do this work in-house.

This field will have a Brock PowerBase YSR shock pad underneath the turf so even if the infill is displaced, field users will be protected from surface impact injuries with the use of the shock pad. The Brock YSR pad also includes a 25-year warranty for the Gmax and shock attenuation characteristics of the field.

The project specifications require the selected synthetic turf manufacturer to provide the following routine maintenance for a two (2) year period at no additional cost to the owner:

POST CONSTRUCTION FIELD MAINTENANCE PROGRAM: Subsequent to Final Completion, provide the Owner with two (2) years of Post Construction Field Maintenance Services including but not limited to:

A. A complete inspection of the entire field area to include:

Inspection of seams, inlays, logos, penetrations and connections.

1. *Inspection of Carpet Pile for premature fading, excessive fibrillation, wear and/or decreased height and weight.*
2. *Inspection of the Infill for depth and consistency.*
3. *Inspection of the Infill for consistency of feel and excessive hardness or softness.*
4. *Immediate repair or replacement to correct deficiencies noted during inspection.*
5. *Complete brushing of the field with a motorized rotary broom to redistribute and level the Infill and rejuvenate the Carpet Pile.*
6. *Provide G-Max and HIC testing per the Project Specifications.*

B. *Provide a Complete Field Service Report of all observations and activities to the Owner and Landscape Architect.*

C. *Post Construction Field Maintenance shall be performed a minimum of two (2) times during the first full year after Final Completion. Post Construction Field Maintenance shall be performed at the discretion and approval of the Owner and with at least fourteen (14) days prior notice to the Owner.*

15. **If recycling is not an option at the end of the synthetic field's life, who will decide how, where, and when to dispose of the materials?**
Response: We do not anticipate that recycling would not be an option at the end of life. The current project specifications require a $50,000 cash bond and a guarantee from the turf manufacturer that the product be recycled at the end of its useful life. Further, Joe Fields, President of Tencate America provided two (2) written letters to Adam Turner dated February 4, 2020 and October 15, 2020, each with a guarantee that the field would be recycled at end of life at either their existing recycling facility in the Netherlands, or their planned facility in the United States.

I expect that MVC will place a condition on their DRI approval of the project that the synthetic turf carpet be recycled at the end of life, and that the MVC be provided with the appropriate chain of custody documentation of the entire recycling process.

16. **Is there a lighting shutdown time?** *Response: The MVRHS currently limits the lights to 9pm on weeknights and 10pm on weekends.*

17. **What are the implications, if any, of returning a synthetic field to grass, if that proved desirable?** *Response: The transition from synthetic turf to natural grass surface would require the removal and replacement of the top 12-15" of the field surface. The drainage system and concrete turf anchor for the synthetic turf field could stay in place.*

18. **Please describe what happens to synthetic fibers over time (from wear and tear), including at what point in their life it will occur with MVRHS projected usage. Please also provide photos of synthetic fields after a variety of years of use.** *Response: Over time synthetic turf fibers can fold and lay over. The product we are offering, Ironturf by Greenfields/Tencate is a woven turf. The fibers are woven in bundles, enabling the turf to stay upright. Included in the product are the two most durable fibers in the industry, TenCate XPS and TenCate Diamond.*

We are gathering photos of synthetic turf fields at a variety of years of use and will submit those shortly under separate cover.

19. **Synthetic Turf fibers may resist turf bind and work free at 18 lbs of force. What does that equate to?** *Response: Tuft bind is the amount of force applied to pull a single synthetic turf fiber from the backing. There is no tuft bind for a woven product as the fiber and the backing are woven together as one. Testing has shown that the fiber would break before coming out of the woven backing.*

20. **Infill may not ordinarily go airborne, but what about when it is not saturated, and how often is a non-saturated condition expected to occur? What are the risks if the infill becomes airborne in a heavy windstorm? What about infill "splash"?**

    Response: The Ironturf product is woven in a matrix pattern, not straight rows. The bundles at the base of the weave, coupled with an overall product weight of 59 oz / square yard contribute to minimal infill flyout or "splash".

    All synthetic turf fields have some infill flyout, but this condition is minimized with the use of BrockFill. BrockFill fields have experienced numerous heavy storm events including a recent hurricane in Melbourne, Florida with no infill displacement or movement noted within the system. Since the infill is contained within the turf system, it is below the tips of the turf fibers and settles within the turf system. Additionally, holding moisture increases density helping to contain the infill within the turf fibers. In 100 fields installed, Brock USA has never experienced a field with wind, water or displacement issues.

21. **Warranties and Insurance**

    a. **Are there warranty-voiding conditions?** *Response: No.*

    b. **Provide indications of out-of-warranty costs experienced by other users.** *Response: Basic grooming and regular maintenance are required during the warranty period. Please refer to question & answer #14, above for details.*

    c. **Is there a plan for transitioning maintenance work to MVRHS staff once the product is out of the maintenance agreement AND the warranty period?** *Response: Yes, please refer to question & answer #14, above for details.*

    d. **Who provides indemnities to MVRHS, and what is their insurance coverage?** *Response: The selected turf manufacturer would provide indemnities to MVRHS. The required coverages are itemized below.*

    e. **Is liability insurance for the two options (synthetic and natural turf) the same?** *Response: Yes, and MVRHS has confirmed that the construction of facilities included in Phase One will not increase their present liability coverage expenses.*

As you are aware, this project will be subject to the Massachusetts Public Bid laws found in MGL Chapter 30, Section 39M. As such, our construction specifications for public bid will outline the criteria for acceptance required of any synthetic turf vendor wishing to submit their product as equal to our written specifications. The warranty requirements are contained in several specification sections within the bid documents, including Section 01 78 36 WARRANTIES, Section 32 18 23.29 SYNTHETIC FIELD SPORTS SURFACING, and Section 32 18 23.30 SYNTHETIC FIELD UNDERLAYMENT. I have attached our letter to you, dated July 28, 2020, discussing the relevant sections of the specifications that address warranties for your review and consideration.

The following is the specific warranty information that will be required of the turf manufacturer at the time of bid.

1.09 WARRANTY

A. Warranty: The Infilled Synthetic Turf System Vendor shall provide a third party insured warranty guaranteeing all manufactured and procured Infilled Synthetic Turf System materials and workmanship against damage by climatic conditions or proper and normal use (including the use of cleats) for a minimum period of ten (10) years from the official date of Substantial Completion. In addition, the Infilled Synthetic Turf Warranty shall guarantee all manufactured and procured materials and/or workmanship including such defects as premature decrease in infill height, premature decrease in pile height or weight (stipulated as more than 10% decrease), UV degradation, fading, seam rupture, dislodgement, inadequate drainage or inadequate air transmission. The guarantee shall be in writing, stating the any defects, including the need to remove and replace manufactured and/or procured materials will be repaired at no cost to the Awarding Authority within 7 days written notice of the Awarding Authority. The warranty coverage shall not be prorated nor limited to the amount of the usage. Warranty coverage shall provide for $10 million per year in the aggregate and $5 million per claim minimum.

B. Performance Testing:

1. The Infilled Synthetic Turf System Vendor shall, at their own expense, have G-Max testing performed by an approved and certified independent testing laboratory prior to requesting Substantial Completion. Testing shall consist of shock attenuation per ASTM F-355-A. The Awarding Authority and Landscape Architect shall be provided with copies of all testing.

2. Testing shall be performed at the field's center, the goal locations for all sports and at 10 yards inside each corner of the field. Tests shall also be taken at 4 random spots as chosen by the Landscape Architect or Awarding Authority.

3. At no time shall the G-Max be less than 90 nor exceed 125 at any one point of the field. (Refer to Section 32 18 23.30 SYNTHETIC FIELD UNDERLAYMENT, for additional GMax information)

4. *In cases where the result of a test falls outside the specified values, additional tests shall be taken in 10-foot increments in 4 opposite directions (north, south, east and west) from the failing test point and each subsequent failing test point until all tests fall within the specified values. The failing area shall be marked off, repaired and retested by the Infilled Synthetic Turf System Vendor until all tests fall within the specified values.*

5. *G-Max testing during the remainder of the warranty period will be performed by and at the discretion of the Awarding Authority. Results of these tests will be provided to the Contractor and Infilled Synthetic Turf Vendor.*

Thank you for your time and consideration. Please let me know if you have any questions or require any additional information to begin your review.

Sincerely;
Huntress Associates, Inc.

Christian C. Huntress
President

Cc: Matthew D'Andrea – MVPS Superintendent
Richard Smith – MVPS Asst. Superintendent
Kimberly Kirk – Chair, MVRHS School Committee
Joseph Sullivan – Daedalus Projects, Inc.

Maximizing the Durability of Athletic Fields

Durable athletic fields begin with sound construction and careful planning, and good management practices can increase a field's durability. The basic concepts presented here can help field managers extend the usability of athletic fields.

Field managers are asked to maintain premier turf surfaces knowing that the field will be overused and likely not make it through the playing season. Athletic fields are being used to host more and more events and tournaments. The addition of lights is a major reason for this situation. In some cases, new sports such as lacrosse are being added to fields already overburdened with soccer events. Football fields need to double as general purpose fields for special events. Of course, at some point, a field will begin showing signs of wear. And at some point, the field can fail.

Because field wear is influenced by so many variables, no definitive equation exists to predict when a field will begin showing signs of wear or when it will fail. Such a prediction would be invaluable to schools and municipalities as they face increased legal questions and liability issues regarding injuries associated with poorly designed or constructed facilities, and/or mismanaged facilities. Field managers struggle to accommodate all participating groups without damaging the fields. If fields are overused, then the likelihood of a player becoming injured due to poor field conditions increases. What is a field manager to do?

Ideally, adequate numbers of fields would be available so use could be properly distributed. It is best to have specific game and practice fields dedicated only to one sport to eliminate compound wear from two or more sports. Additionally, a sound turf maintenance program promotes turf growth and recovery. Unfortunately, budgets for field management are often the most limiting factor.

Good fields begin with a sound construction strategy, and careful planning is imperative for long-term success.

ENSURE ADEQUATE DRAINAGE

Several construction strategies can maximize field durability. At the top of the list is adequate drainage. Wet fields are more prone to damage than dry fields. Adequate drainage not only prevents rainouts; it can also prolong a field's life. Drainage can be achieved by using surface flow off fields that are crowned or by using subsurface drainage lines. Subsurface drainage depends on good water infiltration of the field. For this reason, a sand-based field will move the water from the field surface much more effectively than relying on surface flow alone. In addition, sand-based fields are less likely to compact. A compacted field generally has lower water infiltration rates, so the surface may remain wet for longer periods of time following a moderate rain.

SELECT A DURABLE TURFGRASS

Bermudagrass is the ideal turfgrass surface for most of North Carolina's athletic fields. The exception may be fields in the upper elevations in

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the western part of the state. In upper elevations, winterkill of bermudagrass may be a significant concern. Bermudagrasses released since 2000 have increased tolerance to cold temperatures and may offer these areas an opportunity to use bermudagrass.

Bermudagrass forms a tight, resilient playing surface with high wear tolerance and fast recuperative potential. These traits are most obvious in the summer and early fall when the bermudagrass is actively growing. If the turf goes dormant in late fall or winter, the aboveground tissue can be easily worn off during heavy play. Maintaining reasonable fertility practices during the fall can help the turf recover through the winter and spring. Overseeding fields with perennial ryegrass is one option that gives a green playing surface to dormant bermudagrass fields.

TRACK FIELD USE AND CONDITION

How much use can a field withstand? This question is best answered using on-site field-use data from previous years. Field data collection requires some careful documentation of games, practices, and other events. As the demands on fields increase, more managers are starting to track field use. Probably the easiest data to track is the number of hours the fields are in use during the year.

Before a field is ever used, planners, designers, and managers should understand its expected level of use and performance. These expectations should be realistic. Those involved in planning and maintaining a field should consider the maintenance budget, available equipment, and labor. It is often helpful to have one field labeled as a "championship" field and the other fields labeled as "practice" fields. This can help everyone involved define how each field can be managed via maintenance inputs and controlled scheduling to maximize its condition. Often the higher quality championship fields can be used as examples to encourage the construction of new fields that alleviate use or to increase maintenance budgets of existing fields.

Using data from a number of fields located in the Southeast and talking with turf managers and municipality supervisors, I have made a few general estimates relative to field use and condition (Table 1). These educated predictions are for grass fields (such as fields for football, soccer, or lacrosse) that are used nearly year-round. Baseball and softball should be evaluated differently because a large percentage of each game is played on a clay infield. The estimates assume the field is surfaced with a quality bermudagrass and begins the year with good coverage. The values relate to well-constructed fields that receive at least moderate maintenance and are used under reasonable conditions. The reality is that it takes only one extremely wet game to destroy a field. The values are based on all the events that occur on the field, including practices. Practices can also cause appreciable damage due to their repetitive activity in particular areas of a field, so practices must also be put into the equation.

The number of events a field can handle will ultimately depend upon field construction, weather conditions during the season (especially just before and during games), maintenance practices, recuperative periods, and the time of year.

RESTRICT FIELD USE IF NECESSARY

Obviously, the more traffic you put on the field, the faster the turf declines. Also, particular sports cause more severe field damage in localized areas. Football tends to cause extreme wear between the hash marks. Soccer wears the quickest in the middle of the field, in front of the goal mouths, along the sidelines (due to linesmen), and in the corner kick areas. Any repetitive action on the same area of the field accelerates wear. That is why practices and warm-up drills are often more damaging than games. But it is not just the athletes

Table 1. Expected Field Condition Based on Hours of Field Use per Year

Expected Field Condition	Field Use (Hours per Year)
Sustained good field conditions	200 hours or less
Good field conditions with some thinning of the turf and localized wear areas	400 to 600 hours
Fair field conditions; expect significant thinning and wear.	800 to 1,000 hours
Significant turf loss, field surface damage, increased potential for athlete injury	More than 1,000 hours

on the field who can cause wear problems. A marching band is extremely hard on a field because bands tend to march along the same lines all the time, both during a game and in practice. Cheerleaders and pep squads during games may also result in turf damage due to heavy use in a confined area.

Some reduction in traffic damage can be avoided by doing the following:

- Restrict use when soil is very wet.
- Restrict use when soil is very dry and turf is wilted.
- Always have coaches rotate heavy play areas during practices.
- Use portable goals when possible, and move them around the field.
- If possible, move a soccer field's sidelines during the year
- If a space is large enough to accommodate field rotation (see Figure 1), periodically rotate the entire field.
- On game fields, restrict the number of practices to a minimum.
- Have a reduced game schedule when grass is dormant.
- Have regularly scheduled rest times that are used to repair minor damages.
- Do not allow unofficial play.
- Use tarps (covers) on bench areas to reduce severe wear by coaches and team members,
- Use tarps (covers) on sideline areas used by the cheerleaders.

In most cases, field users will need to be informed of potential wear problems. Most users do not understand the damage that they can cause. Although it may be obvious to a field manager that a field is too wet for play, it is not obvious to most field users. Close fields when necessary. If the field manager is not allowed to close the field, the decision-makers should be made aware of the potential short and long-term damage that may result from field use given the situation. Unfortunately, some fields are scheduled the same as basketball courts or hard-surface tennis courts, without consideration of the turf surface's wearability. The field manager is in the best position to decide how much wear is too much.

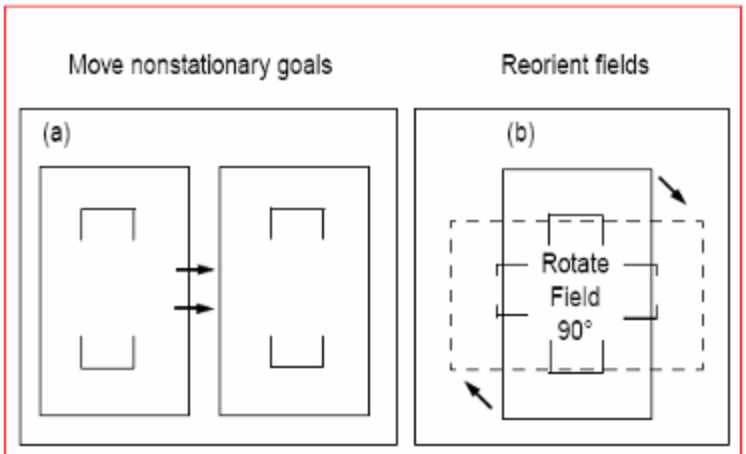

Figure 1. Moving nonstationary goals or reorienting fields can lengthen the life of an athletic field.

USE GOOD MANAGEMENT PRACTICES

Field managers can use a few practices that will maximize a field's ability to handle wear.

First, make every effort to begin the sporting season with 100 percent turf coverage. At the beginning of the year, schedule recuperative times during the season, realizing that non-overseeded bermudagrass fields will not recuperate very quickly in the late fall or winter months. Overseeding can be used to protect dormant bermudagrass if excessive wear is expected during the cooler months. But remember, the overseeding grass often can be a significant competitor with the bermudagrass in late spring to early summer when the bermudagrass is trying to grow. If premier conditions are needed during those months, then the overseed may need to be chemically removed to allow the bermudagrass to more easily re-establish.

Adjust maintenance practices to address the condition of the fields. Increase or decrease inputs (particularly irrigation and fertilization) as dictated by environmental conditions and the turf's growth.

Manage high wear areas differently than the rest of the field. This allows a manager to improve the entire field surface without dramatically increasing the budget. The most helpful practice along these lines is applying supplemental nitrogen fertilizer to the high wear areas to promote recuperation. The bermudagrass will respond to the added fertilization and promote more rapid growth, filling in divots and rip-outs quicker. The same can be done with aerification, soil amendments, and seeding. Think of a field as many parts, rather than just one field. The goal mouths of five fields in close proximity can be core cultivated in the same amount of time as one entire field. If the field routinely has localized standing water after a small shower, aerify those areas

and backfill with an appropriate coarser textured soil amendment (such as sand or calcined clay). Spread seed (if appropriate) in wear areas before games and practices.

Some management practices that can reduce field wear may be more controversial. Advocate that less aggressive cleat patterns be worn by athletes. Studies have shown that cleat design can dramatically influence turf damage. In one study, a trainer shoe produced 37 percent less turf damage than a standard soccer cleat. A 6-stud replacement cleat was 34 percent more damaging than the standard soccer cleat. The numbers are more relative than absolute, but they illustrate the impact on turf damage from something as simple as a shoe. Shoes with a greater number of smaller cleats will cause less wear and compaction damage (more cleats displace weight better) than more traditional cleat design. Of course there is a trade off—reduced traction by the user. The trainer shoe in the above-mentioned study required 47 percent less force to break traction than a standard soccer cleat. This difference may be unacceptable at certain levels of athletic competition.

To maximize field use and durability, there must be open communication among the field manager, the people responsible for scheduling the field, and the field users. Once excessive wear and field overuse results in hazardous and unsafe playing conditions, the field manager must request that the field be closed. Safety of the users is paramount. With good field design, construction, management, reasonable care and maintenance, and proper use, fields can continue to provide an acceptable playing surface.

Prepared by
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STARTING LINEUP

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FEATURES

DEPARTMENTS

On the cover:

See the results on page 8 from our asking turf managers: Do you incorporate hollow-tine, solid-tine, or both? When do you conduct these practices? What are the biggest benefits you observe in turf health with this practice? Are there any problems or challenges associated with these practices? Cover photo courtesy of Scott Stevens, CSFM, Sports Turf Manager, Elon University, Elon, NC.

STUDY: FIELD BENCHMARKING AND PERMITTING HOURS

BY PAM CHARBONNEAU AND EMILY HARTWIG

This project was initiated to attempt to verify the guideline for the permitting hours of five categories of athletic fields (**Table 1**). The information in this table was developed with input from municipal sports turf managers based on their experiences from their respective municipalities. Field performance characteristics (percent cover and surface hardness) data were to be collected three times throughout the field season in 2013 and 2014. Information on permitted hours of play and maintenance practices would also be obtained from all municipalities for all of the fields at the end of each field season and the field performance would be correlated with the permitted hours of play.

In addition, at the end of each field season a group of experts would rate the overall conditions of each of the fields and these ratings would also be correlated with the permitted use to determine what the permitted use should be to maintain a soccer field with an acceptable or passable quality rating. This project could provide municipalities and user groups with information on the impact of the hours of permitted play on sports field conditions and enable them to make better decisions to optimize permitted hours without compromising field performance. The aim of this project was also to supply information to modify the guidelines of the permitting use of the different field categories if needed.

Sports field managers in three municipalities were contacted in May 2013 and meetings were held to discuss possible fields for use in this project. Soil samples were taken from six to eight fields in each municipality and soil texture was determined. Samples were taken from the sidelines as these areas were less likely to have been modified by topdressing compared to the goal mouths or centre circles. In addition, inventories of irrigation, sub-surface drainage and lights were also taken to categorize each of the fields.

This information was combined to accurately categorize each of the fields and then choose fields in the category ranges of 1-5. Once this inventory was completed, it was clear that the three participating municipalities only had category 3-5 fields. Municipalities that participated in this project classified fields according to three classes – Class A, Class B and Class C. This system of classification seems to have more to do with overall facilities at the fields such as lighting, washrooms, fencing, etc. than the field itself, the rootzone and sub-surface drainage. The scope of the project was modified to focus on field categories 3-5 soccer and multi-use fields. Within each of the three municipalities, the goal then was to obtain two fields of each of the three categories. In total, twelve fields from three municipalities were included in this project.

During the initial visit, 4x4 m plots were flagged in six areas of the soccer fields, two each in the goal mouths, centre circle and side lines. At each visit percent species cover (individual turf species, individual weeds species and bare) was measured using four randomized point quadrant drops. All fields were visited three times in each season. In 2013, the field visits did not begin until mid-June and early August. This was because of the time it took to find cooperating municipalities, take soil samples and have them analyzed. Site visits in 2014 began in late May and better reflect the field performance in early, mid and late season.

Sports turf managers in each municipality were asked to supply information on the following for each of the fields in the project: fertility (total N); cultivation frequency; topdressing frequency; and overseeding (frequency and species). Permitting departments in each municipality were asked to supply information on the total permitted hours for each field for the season as part of this project.

Table 1. A summary of the design requirements for the five field categories*

Design Requirements	Category 1	Category 2	Category 3	Category 4	Category 5
Soil (% silt plus clay)	<8.0	<25	25-35	36-45	All soils
Sub-surface drainage system	Yes	Yes	Yes	Yes	No
Irrigation	Yes	Yes	Optional	Optional	No
Lights	Yes	Yes	Optional	Optional	No

*From Sheard, 2012.

At the end of each season experts (four in 2013 and three in 2014) visited all of the fields and rated them using a scale of 1-9 where 1 is bare or dead and 9 is the equivalent to the quality of turf at a sod farm. A score of 6 and higher was considered a passing score and anything below 6 was a failing score. Goal mouths and the centre circle were rated separately and then the entire field was rated for uniformity and density. The uniformity rating was based on the amount of weedy grasses (mostly annual bluegrass) and broadleaf weeds in the field, with a lower score given to fields that had high weed infestation. The density rating was based on the thickness of the turf stand with a lower score given to fields with bare areas. The ratings for the goal mouths, centre circle, uniformity and density were averaged to give an overall score. It should be mentioned that the rating date for Municipality C in 2013 and 2014 occurred the week following a weekend long soccer tournament and the ratings reflect the heavy field use the previous weekend and do not necessarily reflect the conditions of the fields earlier in the season.

Percent cover was broken down by % broadleaf weeds (BLW), % Kentucky bluegrass (KB), % perennial ryegrass (PR), % bare and % annual bluegrass (AB). Not surprising, the percent bare in the goal mouths increased over the season and was generally highest on the fields with the highest use. **Figure 4** shows goal mouths of a category 3 field with moderate permitted hours (442) and **Figure 5** shows a category 5 field with high permitted hours (1349). The exception was Municipality B, Field 2 which was a multi-use field with rugby and football during most of the summer. The wear patterns caused by these sports are different from the wear patterns caused by soccer. Municipality A had the highest number of booked hours and also had the highest percent bare in goal mouths with the two fields with the highest use in this study (1136 hours and 1349 hours) with 91.5 and 98% bare in the goal mouths by the end of the season. The soccer field in Municipality B with the highest use (B4) had 95% bare ground in the goal mouths by the end of the season. Conditions in the goal mouths were much better for Municipality C, but the hours of use were also one half to one third of Municipality A.

As mentioned, Municipality A, Field 2 was sodded in the middle of the summer so the goal mouth at the end of the season only had 40% bare and the hours of use were down because of the one month field closure. Field use for Municipality A, Field 1 was up, probably because this field was in the same complex as Field 2 and games were probably increased on that field to compensate for the closure of Field 2. Even though the use hours were up for Field 1 the percent

▲ **Figure 4.** Goal mouth of category 3 field: Top, July 8, 2013; Middle, Aug. 8, 2013; Bottom, Sept. 12, 2013..

▲ **Figure 5.** Goal mouth of Category 5 field. Top, June 18; Middle, July 23; Bottom, Aug. 14.

bare in the goal mouth was substantially better than the previous season. Municipality A, Field 4 had the most hours of use in 2014 again and had 100% bare ground by the end of the season.

Municipality B, Field 4 performed similarly from 2013 to 2014 and had 758.5 hours and 699 hours of use and 95% and 88.5% bare ground in the goal mouths. For the amount of use, Municipality B, Field 5 (500 hours and 42.5% bare) maintained turfgrass cover well. There were two fields with low numbers of booked hours, Field 1 and Field 6, which had the lowest percent bare (30 and 40.5%) at the end of the season.

Municipality C fields performed similarly in 2013 and 2014. Field 1 had more games but less bare in 2014. There was an increase in PR during the season suggesting that they had a successful overseeding program for their goal mouths on this field.

Data from the centre circle represents a medium wear area on the soccer fields. Municipality A has had success with their perennial ryegrass overseeding program as indicated by the increase in % PR in the centre circles of all of their fields from the beginning of the season to the end of the season in 2013. As indicated earlier, in 2014 Field 2 centre circle was sodded and the field was closed for one month. The PR overseeding program was less successful in 2014 in Municipality A. Municipality B; Field 4 also had a successful overseeding program, increasing the PR in the centre circle from 43.5 to 60.5 % over the season with 699 booked hours.

Municipality C had a successful PR overseeding program for Fields 1 and 2, but had less success in 2013 than 2014.

Due to the different systems of field classifications many municipality Class A fields are actually Category 5 fields. The amount of play that is scheduled on these fields in particular is far above what should be scheduled for that category of field.

Overall, there were very few weeds in most of the fields that were part of this project in spite of the Cosmetic Pesticides Ban. Most of the weeds were in the lower wear areas and by far clover was the most prominent weed. In a few of

Table 2. Recommendations for modification of permitted hours for Category 3-5 soccer fields

Category	Booked hours of fields with a passing score				Avg. booked hours	Recommendation of permitted hours
3	442	570	570		527	450-600
4	500				500	450
5	470	198	180	147	230	200-450

the goal mouths, those with heavy use, there was invasion of prostrate knotweed. In general, Municipality C had the most broadleaf weeds.

There were high percentages of AB in many fields indicating that those fields received too much irrigation. At many of the site visits there was standing water on some of the fields. It would be prudent to perform irrigation audits on those fields to improve the overall quality of the turfgrass.

Sodding of goal mouths with Kentucky bluegrass sod was common at the end of the playing season on heavily worn goal mouths. By the mid-season visit and especially by the end of the playing season, most of the Kentucky bluegrass sod was worn leaving the majority of the goal mouth areas bare. This is clearly a band-aid solution that only provides turfgrass cover for a short period into the playing season.

Based on this two year project, it is recommended that the guidelines for permitting hours of the three categories of athletic fields be modified. It is also more realistic to have a range of hours than one number.

Category 3, 4 and 5 fields that had passing scores in 2013 and 2014 with their respective hours of permitted use are shown in **Table 2** with the exception of Field A2 which was sodded mid-season. Based on this, it is suggested that the permitted hours be modified as in **Table 2** to 450 – 600 hours for category 3 fields. For category 4 fields, there is only one data point so there is not sufficient information on which to change this category and it should remain at 450 until there is more information available. Category 5 fields are the poorest quality fields and play should be limited to 200-450 hours per season to provide fields that have a passing standard of quality.

We would like to thank Sports Turf Canada and OMAFRA for the opportunity to carry out this project. I learned an enormous amount and I hope the information is helpful for municipal sports turfmanagers. I would also like to thank our "experts": Ken Pavely, Lawn Life; Ben Tymchyshyn, MMM Group; Paul Turner, G.C. Duke Equipment; Bob Kennedy, Niagara College; David Smith, DSC Agronomics; and Gord Dol, Dol Turf Restoration. ST

Pam Charbonneau is retired from the Ontario Ministry of Agriculture Food & Rural Affairs; Emily Hartwig was an OMAFRA Summer Experience student.
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Turf & Soil Diagnostics

ACCREDITED TESTING Cert #0797.02

MATERIALS TEST REPORT FOR
Martha's Vineyard High School

REPORT TO: Huntress Sports
Chris Huntress
17 Tewksbury Street
Andover, MA 01810

DATE RECEIVED: Oct-28-2019
REPORT DATE: Nov-05-2019
CONDITION OF SAMPLE: Normal

PARTICLE SIZE (ASTM F1632)

		Soil Separate* (%)			Sieve Size / Sand Fraction Sand Particle Diameter % Retained						
Lab ID#	Sample Name	Sand 2.0 - 0.05 mm	Silt 0.05 - 0.002 mm	Clay < 0.002 mm	No. 5 Gravel 4.0 mm	No. 10 Gravel 2.0 mm	No. 18 V. Coarse 1.0 mm	No. 35 Coarse 0.50 mm	No. 60 Medium 0.25 mm	No. 100 Fine 0.15 mm	No. 270 V. Fine 0.05 mm
45434-1	Phase One - Grass Field	70.1	19.3	5.9	2.2	2.5	6.8	18.5	25.6	11.0	8.2

PARTICLE SHAPE / pH / PARTICLE SIZE PARAMETERS

Lab ID#	Sample Name			USDA Textural Classification	pH[1] 1:1	Uniformity Coefficient Cu	D15 mm	D85 mm	% Organic Matter Dry Wt.**
45434-1	Phase One - Grass Field			Sandy Loam	5.1	96.3	0.01	0.88	3.63

*ASTM F1632 and Determination of Size Factors SOP

[1] ASTM D4972, method A, $CaCl_2$, 25 g sample used

**ASTM F1647 Method A

Samples were tested as received and comments pertain only to the samples shown.
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Samples were received with a transmittal letter.

Reviewed by Duane Otto Digitally signed by Duane Otto Date: 2019.11.05 15:04:50 -05'00'

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CONDITION OF SAMPLE: Normal

PHYSICAL EVALUATION

Lab ID#	Sample Name	Particle Density[1] g/cc	Bulk Density g/cc	Infiltration Rate* in/hr	Infiltration Rate* cm/hr	Total Porosity %	Aeration Porosity %	Capillary Porosity[2] %	Degree of Saturation %	Organic Matter % Dry Wt.[3]
45434-1	Phase One - Grass Field	2.61	1.46	1.2	3.1	43.8	2.7	41.1	94	3.63

*ASTM F1815 40 cm Tension with compaction energy reduced to 5.75 ft lb/sq inch.
[1] ASTM D5550
[2] Determined at 40 cm tension
[3] ASTM F1647 Method A

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Turf & Soil Diagnostics

November 5, 2019

Huntress Sports
Martha's Vineyard High School
TSD File #45434

Enclosed are the laboratory results of the Phase One – Grass Field soil sample. No specifications were provided for this project, but our understanding is that these soils will be used for sports fields.

The Phase One – Grass Field sample is classified as sandy loam per the USDA textural classification scheme. Sandy loam soils typically provide acceptable water and nutrient holding for most turf and landscapes. They provide limited internal drainage and can be prone to excess compaction under heavy use.

Organic matter is another component of topsoil quality. An organic matter content of 3 to 8% by weight is typically recommended for most turf and landscape soils of this type, with organic matter contents towards the lower part of the range for sports fields and towards the upper end for planting beds.

The 40 cm performance testing indicates that the Phase One - Grass Field sample has a saturated hydraulic conductivity (infiltration) rate that is low. Limited internal drainage should be expected such that fields should be crowned to ensure adequate surface drainage. The total porosity is acceptable.

Total porosity is comprised of air-filled (aeration) and water-filled (capillary) pore space. Aeration porosity is made up of relatively large pores that conduct water under saturated conditions. When drained, they are filled with air providing the oxygen necessary for root growth. Capillary porosity is made up of small pores that hold water against the force of gravity, retaining much of it for plant use. Ideally, a root zone mix would contain a nearly equal distribution of air and water filled pore space after free drainage.

The aeration porosity is low and the capillary porosity is high. The results suggest that these soils should have poor drainage and the potential for low aeration and excessive water retention. With the low infiltration rate, fields should be crowned to ensure adequate surface drainage.

As with any soil installation, it will be especially important to control compaction during the placement and grading of the soil. Never handle the soil when wet. Equipment with low ground pressure is recommended for the placement and gradation of the soil.

Please let us know if you have any questions or are in need of further assistance. Samples are generally kept on the premises for 45 days after report date. Thank you for using Turf & Soil Diagnostics, Inc.

Sincerely,

Duane Otto Digitally signed by Duane Otto Date: 2019.11.05 15:05:02 -05'00'

Duane K. Otto
Vice President

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