Once the field has been hand picked, Daily finds that a Buffalo Blower (a pull-behind blower used on golf courses) works best at blowing debris up against the field walls. He says that the Billy Goat Vacuum works well at picking up the peanut shells, fluff from the cheerleaders' pom-poms, and other debris.

At Boston College their synthetic turf field is used year round. Matt Hayes, assistant supervisor of athletic facilities, says they have students hand pick the field after each game during football season. It takes four to five workers about an hour to do the job.

Their stadium is unique in that, in the winter, they erect an inflatable bubble over the field. There is constant hydrostatic air being pumped in from late December to late March. Once the bubble goes up, the field is used for 18 hours a day. It sees more traffic in the off-season than the in-season, Hayes says. The school's sports teams, outside colleges, camps and clinics use the field constantly.

"We choose to spray a disinfectant to cover our bases." — Matt Hayes

The field is hand-picked every day. They have nothing mechanical to help with the cleaning.

"We cannot stay on top of the maintenance due to the amount of usage and our limited access to the field. We do some maintenance in-house, but have recently had to contract out to Northeast Turf to fix seams," Hayes says.

Once a year, they have an outside contractor come in to clean and groom the field.

Cleaning equipment

There are several different pieces of equipment recommended by the synthetic turf field manufacturers for field cleaning. According to Darren Gill, director of marketing for FieldTurf Tarkett, they leave an estate sweeper with each field sold. This is a lightweight sweeper designed for litter removal: picking up peanut shells, paper, confetti etc., he explains.

This kind of sweeping is quick and easy and should be done on an "as needed" basis, but generally once a week during heavy use.

A-Turf, a synthetic turf provider, recommends a Parker Sweeper to help sweep debris off the field. How often it is used is a function of how often the field is used.

Another STC recommendation for effective maintenance is to have the infill materials evenly distributed. Gill says that FieldTurf has a very heavy fill of sand and rubber that is unlikely to float, even in heavy rain. But routine grooming of the field will assure that the infill is uniformly distributed at all times over the entire field surface.

FieldTurf recommends the GroomAll for all maintenance needs. The GroomAll is equipped with a sweeper component, grooming component, and brush component. It is the only all-in-one machine available in the marketplace today.

Boston College has a FieldTurf system in place. On Friday night before every home game, the field is groomed. Hayes used to use a Greens Groomer, but found "it was very abrasive on the turf. We have all inlaid lines and it was very aggressive to the seams, hashes, and logos."

He chose to go with a less aggressive grooming machine, a Coco Mat. "It doesn't dig in as much, or displace as much rubber, and it stands the field turf straight up."

The Bengals use a GreensGroomer. It has three layers of brushes, each angled at different positions. Daily finds it helps to level out the rubber infill and loosens the top granules.

"When watered, it firms the field up to how players like it," says Daily. In season, the field will be dragged twice a week, three times if there is a home game. This will give an attractive striping effect that looks just like natural grass.

During the off-season they will drag the field every 7-10 days depending on activity.

The Shoe boots turf

The Buckeyes of Ohio State University do things in big ways. The school is huge, the stadium enormous. So the decision by OSU to go from a natural turf to artificial turf has to be seen as one of the more significant switches in recent years. This happened at a University noted for its turf management research and academic major.

Ohio State selected FieldTurf for installation its legendary Ohio Stadium. The new field at the Horseshoe made its debut when Ohio State hosted Youngstown State on September 1. FieldTurf uses a patented infill mix of silica sand and cryogenic rubber and a patented layering process that delivers a system which emulates natural grass. Additional benefits are found in flexibility for conversion — allowing stadium managers to quickly change from one sport to another or to host concerts and other special events on the surface, according to FieldTurf. The move to artificial emphasizes a more broad-based return to artificial turf. There are 40 NCAA universities with FieldTurf in their stadiums. Many practice on artificial turf. Universities who use it in their football stadiums include Nebraska, Boston College, Rutgers, Oregon, Washington, Kansas State, Louisville, Syracuse, Texas Tech and Missouri. In addition, 21 of the National Football League's 32 teams have it at their stadiums and/or practice complexes.

The Buckeyes had played on natural grass since 1990. Before that, OSU played on an artificial turf surface from 1970-89. This move makes the Buckeyes the fourth Big Ten university to have FieldTurf in their football stadium, joining Michigan, Minnesota and Wisconsin. With the exception of Michigan, all of the Big 10 schools are land grant colleges with a long tradition of ag and turf research.

"Building a synthetic field all starts from underneath. If you have a good base, the field will perform well." — Darian Daily

Contaminants, germs

Removing airborne contaminants and disease vectors from the field is another STC objective. There are products available to field managers that will remove everything from staph infections to AIDS.

The Bengals have not put any disinfectants on their field. Daily says that there are possibilities of having staph in synthetics. However, they haven't seen any documented cases. So spraying would be a significant investment when it has not been proven that players can contract staph from the synthetic fields.

Daily says that they would be more concerned if their stadium was in a climate-controlled, indoor setting. He feels that the heat (up to 120 degrees) and cold extremes they get from having an outdoor stadium help them. Water cannons are used anytime blood, vomit, or other potential disease-causing waste is on the field.

Hayes states, "We choose to spray a disinfectant to cover our bases." The night before a game the entire field is sprayed with a disinfectant.

When not in season, the field is sprayed once a month.

"The disinfectant neutralizes immediately. It is not something that sits there and disinfects everything that touches it. It's a one-time application. It will kill anything on the field at that point in time. So the next day if someone bleeds on the field, it's not covered." During a game there is always a spray bottle of disinfectant on hand for blood.

A-Turf does not recommend any sort of spray to treat against staph. Jim Dobmeier, President and Founder of A-Turf, Inc. and sister company, Surface America, Inc. says that there are no documented cases of staph infections coming from synthetic turf.

Where it starts

"Building a synthetic field all starts from underneath. If you have a good base, the field will perform well," says Daily.

This base includes an effective drainage system. STC recommends effective drainage of surface water be maintained throughout the life of the field's surface. The Bengals' synthetic field uses the same drainage system as the old field. This, along with a solid base, has kept them from having many maintenance issues.

The few problems they had were par for the course, requiring the field to settle. Then they were easily solved.

The field at Alumni Stadium is watered the night before a game. They have encountered some irrigation issues.

"We have little dips in the field that can be felt when grooming. There will be standing water in those depressions after a heavy rain. If it pours during the game, we are out there with a squeegee to get rid of the puddles," Hayes says. He adds that fine materials may have worked their way down to the nap of the turf and formed a barrier in the drainage system. ■

Rebecca Roach and Chris Harrison are freelance writers with experience in the turf industry.

The Buckeyes are the fourth Big Ten University with FieldTurf in their football stadium, joining Michigan, Minnesota, and Wisconsin.

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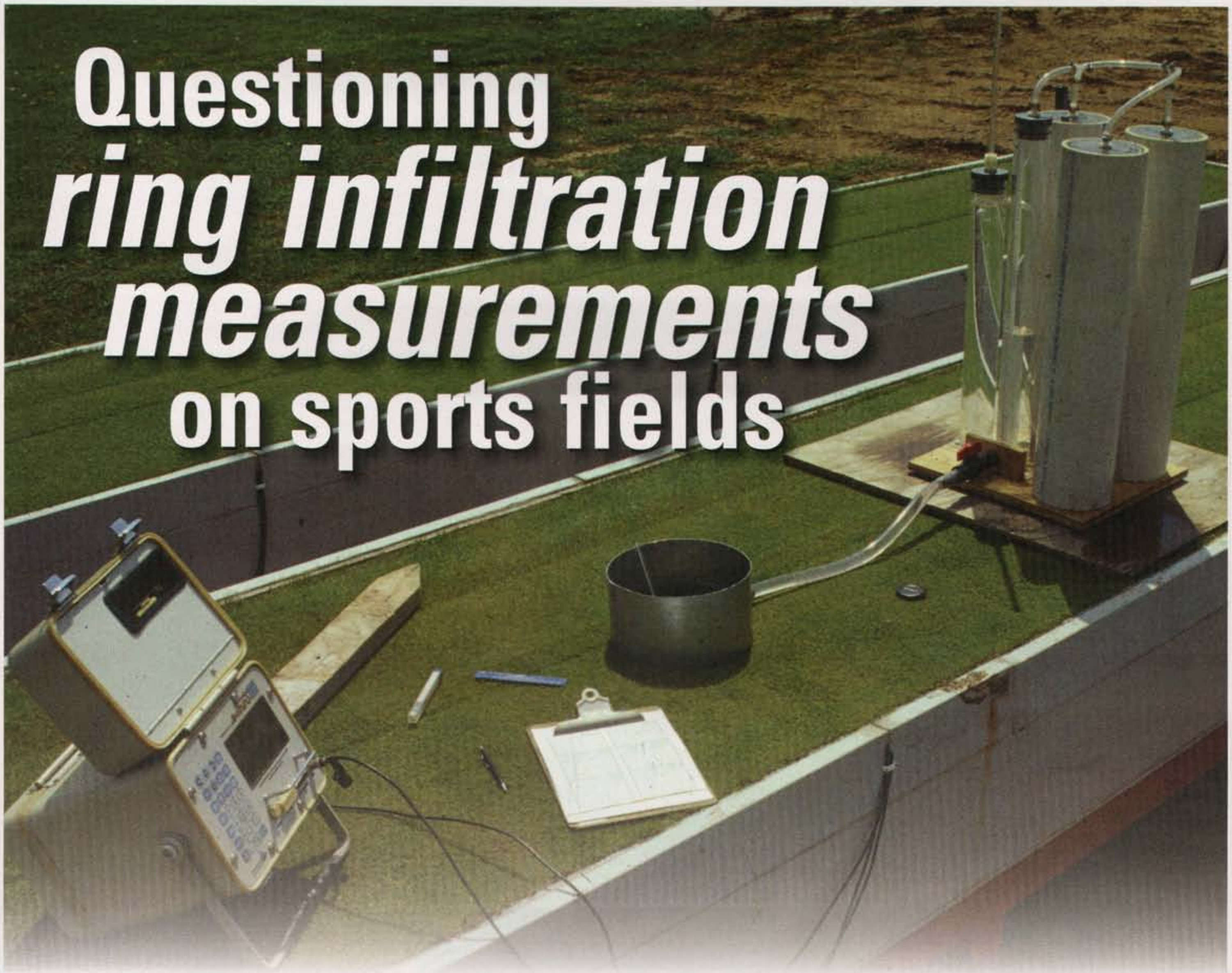

Questioning *ring infiltration measurements* on sports fields

By Dr. Ed McCoy

In a previous article (Prettyman & McCoy, 2003) we observed a small but significant effect on our double ring infiltration measurements of profile layering 12-inches below the surface. This got me thinking about the possible effect on ring infiltration measurements of shallower layering that may occur in some layered athletic field soils and push-up greens.

Double ring infiltration measurements have long been used in research, and more recently by athletic field managers, to determine the permeability of soils and whether water flow limitations exist. It is a relatively simple measurement and does not require sophisticated equipment, but as is generally true with simple soil physics measurements, its validity rests on satisfying certain assumptions.

The measurement is essentially conducted like this: Concentric 6-inch and 12-inch diameter rings are insert about 1-inch into the soil surface and both are provided water sufficient to maintain a shallow ponding within each ring. Following a period of equilibration that can range from 15 minutes to 8 hours, the volume rate of water entering the soil from the inner ring is measured, and knowing the surface contact area of the inner ring, the infiltration rate is determined. Similar ponding of water in the outer ring is required only to satisfy a basic assumption of the measurement, that the path of water flow within the soil below the inner ring is uniformly vertical.

To explore this issue further, I spent a weekend constructing and running a simulation model of soil water flow associated with a double ring

ren·o·vate *vb,*

1: to make like new again 2: put in good condition 3: to restore

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Top layer† Ks (cm h-1)	Bottom layer† Ks (cm h-1) 20	4	2	0.4	0.2	0.04
20	27	14	11	7	6.5	6
4		4.3	4	2.3	1.8	1.5
2			2.2	1.6	1.3	1.0
0.4				0.43	0.4	0.3
0.2					0.2	0.2
0.04						0.04

† The top layer was 4-inches thick and the bottom layer was 20-inches thick.

Table 1

infiltration measurement. The simulation model I used has widely been proven as a valid tool to investigate water flow and the simulation approach allowed me to investigate a wide range of soil layering situations.

The essential results of this study are listed in Table 1 where observed infiltration rates are given for a range of soil layering situations. Reading across, the results show that whereas the infiltration rates decline, they do not show nearly the reduction as the corresponding bottom layer permeability; when in fact it is this lower layer permeability that should control the double ring infiltration process. Consider for example, the scenario with a top layer permeability of 20 cm h-1 and the bottom layer permeability of 0.2 cm h-1. In this case, the infiltration rate should be comparable to the most flow limiting layer and have a value near 0.2 cm h-1. Yet the observed infiltration rate of 6.5 cm h-1 was over 32 times greater.

Table 1. Infiltration rates (cm h-1) from the inner ring of an infiltrometer as a function of soil layer permeability (Ks). The top layer and bottom layer Ks values correspond to those expected of a sandy root zone, a sandy loam soil, a silt loam soil, a clay loam soil, and a silty clay loam soil; respectively. Values are only given for the situation where a coarser textured soil overlays the same or a finer textured soil, and values on the diagonal are for the same soil within both layers.

The top layer was 4-inches thick and the bottom layer was 20-inches thick.

Also notice that the deviation between the observed and the expected infiltration rates increase as the contrast between the individual layers increases. Yet even when the permeability difference between the layers is as little as 5-fold, the observed infiltration rate is four times greater than expected.

The explanation for inaccuracy of double ring infiltration measurements in layered soils comes from examining the water flow paths within the soil beneath the infiltrometer rings (Figure 1). Because of the proximity of the flow limiting lower layer to the ground surface, the flow paths within the soil below the inner ring are not vertical but curve laterally. This violates a basic assumption of the measurement; and the measured infiltration rate from this scenario would more reflect the resistance to radial outward flow within the top layer than the permeability of the bottom layer.

Figure 1. The paths of water flow as a function of radial distance from the center of a double ring infiltrometer and depth in the soil. The region

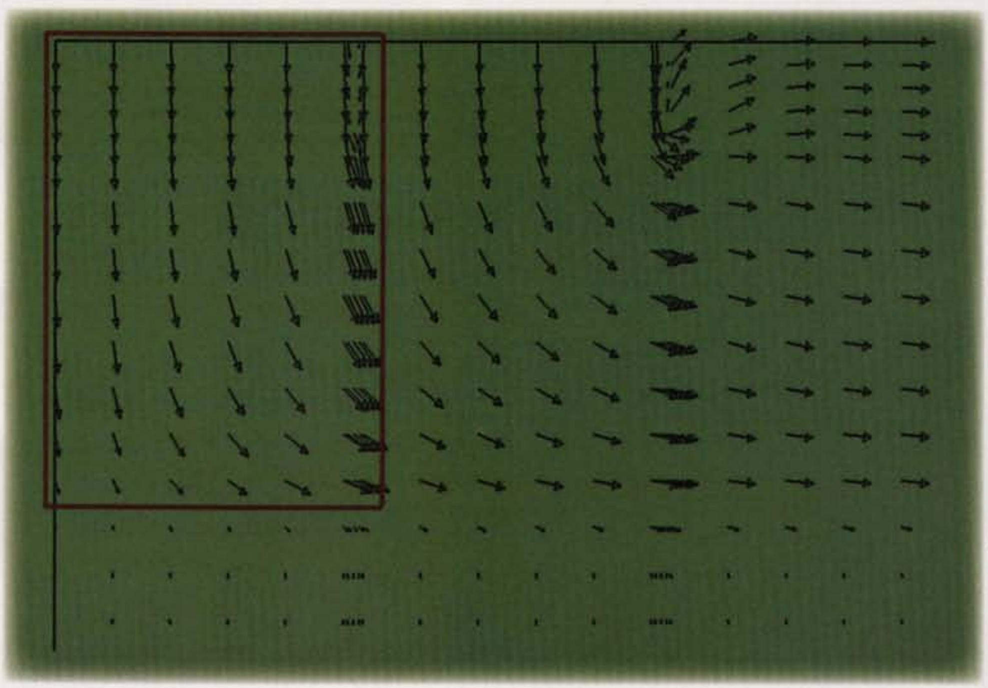
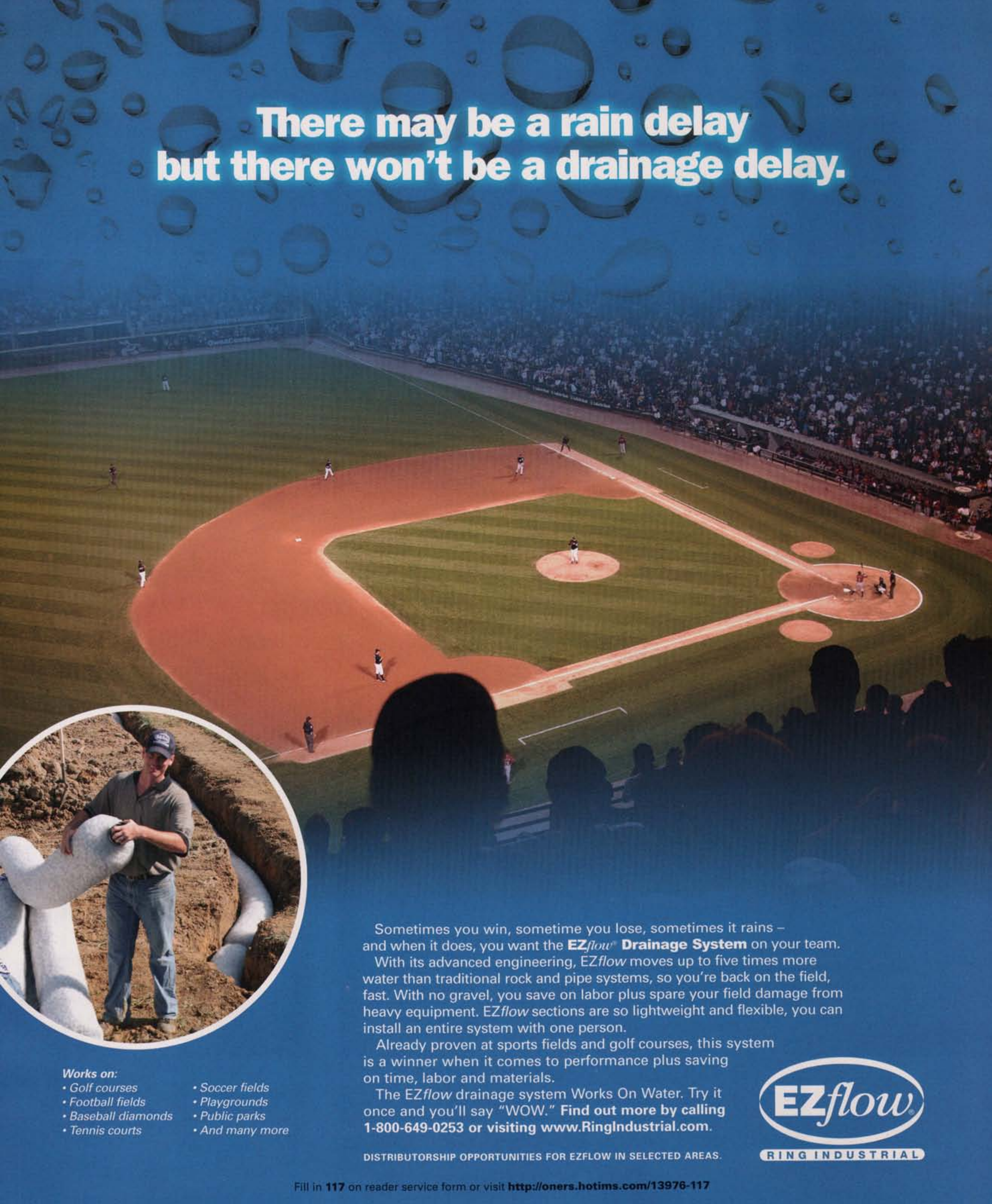


Figure 1



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The measurement validity is questionable when the layer interface is near to the ground surface.

outlined in red is the soil of the top layer within the radius of the inner ring. The scenario of this view is a sandy root zone top layer with permeability of 20 cm h-1 and a clay loam bottom layer with permeability of 0.2 cm h-1. Also, this view corresponds to 2 hours following the start of the measurement when infiltration rates were acceptably close to equilibrium.

Thus, one has to question the validity of double ring infiltration measurements in layered soils, and particularly so when the layer interface is near to the ground surface.

The double ring infiltration technique is an example of an unconfined measurement because flow paths within the soil are not limited to any particular direction. Confined measurements methods are those that restrict the flow paths to a specific (usually vertical) direction.

I also conducted a separate, layered soil simulation where flow was confined to only occur vertically, and infiltration rates were, as expected, comparable to the permeability of the bottom and most limiting layer. An example of a confined measurement approach is that commonly used when working with a testing lab. In this case, an undisturbed core confined within the sampling tube is taken from the green or athletic field and sent to the lab for measurement. The results from the confined infiltration rate measurement in the lab are a valid representation of the soil permeability regardless of any soil layering.

This analysis demonstrates that in addition to being a poor method to measure the permeability of layered soils, it is also a poor method to assess the influence of spaced-apart drainage elements placed in greens or athletic fields having shallow soil layering. ■

Reference:

Prettyman, G.W. and E.L. McCoy. 2003. Profile layering, root zone permeability and slope affect on soil water content during putting green drainage. Crop Sci. 43:985-994.

Dr. Ed McCoy is Associate Professor of Soil Science, School of Environment & Natural Resources, The Ohio State University.

John Mascaro's Photo Quiz

Can you identify this sports turf problem?

Problem:
Torn up grass on baseball infield

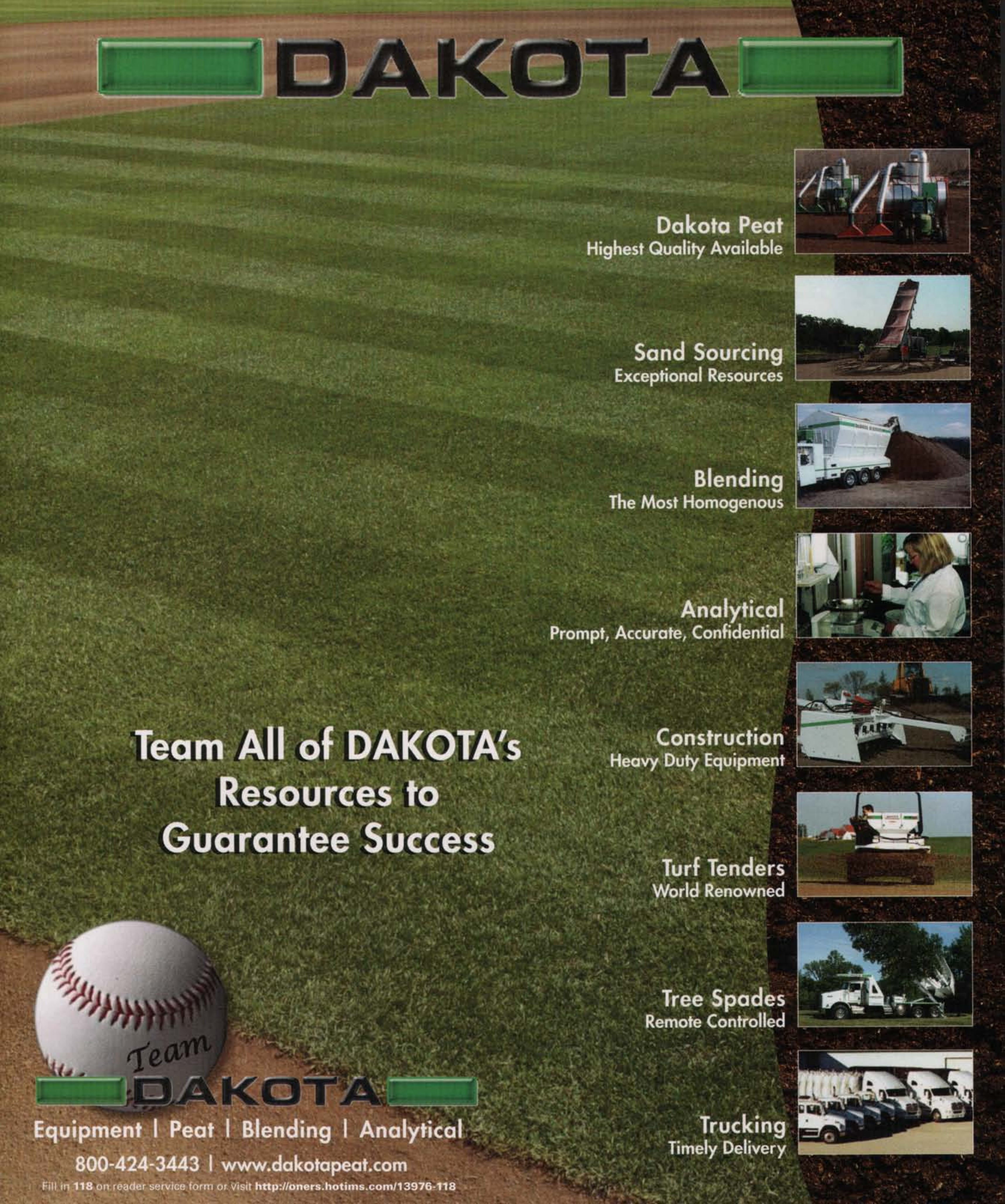
Turfgrass Area:
FirstEnergy Stadium

Location: Reading, PA

Grass Variety: Kentucky Bluegrass

Answer to John Mascaro's Photo Quiz on page 45

John Mascaro is President of Turf-Tec International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Installing drainage for a synthetic race surface

By Tori L. Durliat

In horse racing, horse and jockey safety is top priority. Racetracks across the world are continually looking for ways to make their racing surfaces safer and more consistent.

With conventional dirt tracks, water drains horizontally, which can compromise the track's condition by allowing it to freeze in cold temperatures or become muddy after hard rains. These types of conditions could lead to a decrease in the number of starters, increase in the number of injuries and in the number of cancelled racing days, all of which can contribute to unappealing wagering and reduced track attendance.

Some racetracks are turning to other drainage and synthetic racing surfaces to help solve the problem.

For example Polytrack is made up of a blend of fibers, recycled rubber and silica sand covered with a wax coating that allows water to flow vertically through the top surface to the sub-layers below and helps avoid a freezing or inconsistent racetrack. The sub-layers include porous macadam and dense aggregate rock that provide a solid foundation while the vertical drainage system carries water away from the track. Together they work to provide a safer, more consistent racing surface.

Three North America racing facilities have announced that they will install this type of system, including Keeneland in Lexington, KY.

In the heart of Kentucky's Bluegrass Region, this storied racetrack was originally built in the 1930s and has since played host to some of the greatest races in the history of the sport. Keeneland's grandstand, concessions and wagering technology had all been modernized, but the main racetrack's design and layout had stayed the same.

In 2006, Keeneland Association Officials made the decision to replace it with the vertical drainage system and Polytrack combination. "Our track has not changed much since it was laid out and constructed using mules prior to our first race meeting in 1936. The time had come for us to take advantage of the latest, cutting edge advancements to create the safest racing environment possible, furthering the mission outlined by our founders to build a model racetrack," says Keeneland's President and CEO Nick Nicholson.

Keeneland's existing dirt track was not having drainage problems. The reason the new vertical drainage system was installed was because it's a prerequisite to the Polytrack. One needs the other to function properly and the success of the final product is totally dependent on the two working in unison.

Installation

The project began in May and needed to be complete by the end of August, in time for

Three runs of perforated pipe were put in, running parallel to each other around the track, spaced 20 feet apart.