

# Information about Plant-Based Infills (PBI): Cork, Coconut and Corkonut Infills

## SYNTHETIC TURF Skin Injury References

EXPOSED SKIN/BODY EFFECTS

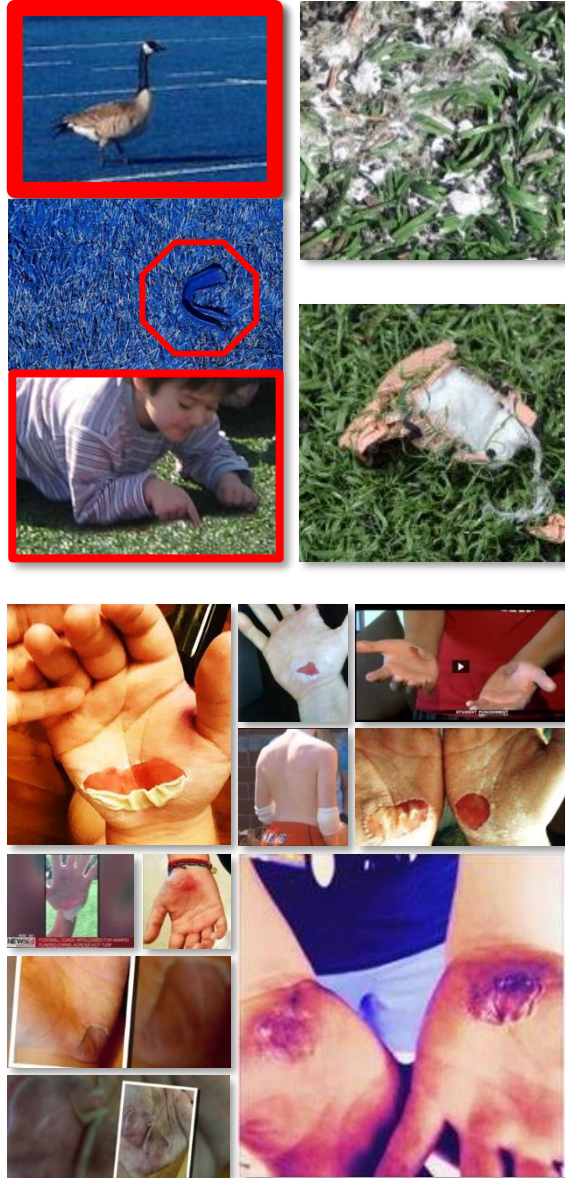
\*MSHSAA Guidelines  
\*\*Universities like BYU: athletic fields unusable above 120° F.

**105 °F\*** (heat index)  
cancel sport  
115 °F  
burns, heat stroke

**122 °F\*\***  
<10 MINUTES  
injure/burn  
131 °F  
2nd degree burn

**140 °F**  
3 SECONDS  
2nd degree burn  
5 SECONDS  
3rd degree burn

**162 °F**  
human tissue  
destroyed on  
contact,  
may cause  
nerve damage



**Marquette High School (kids playing at Lafayette)  
7/2016**

Grass = 111 °F      FieldTurf with GreenPlay (corkonut) = 140 °F

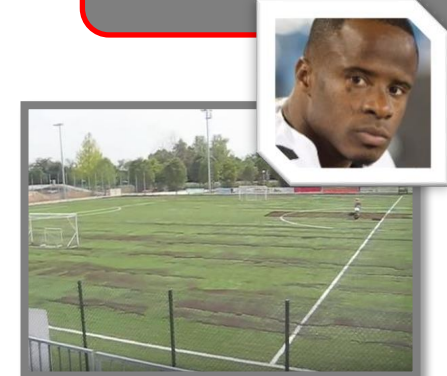
Air Temp = 97 °F

**CALIFORNIA PROPOSITION 65 WARNING**  
This product contains crystalline silica which is "known to the State of California to cause cancer and other substances which are known to the State of California to cause cancer, birth defects and reproductive harm".



"The **skin is all ripped off**; it's pretty **disgusting**. It's like **walking on hot coals** with your **skin ripping and slowly cracking, constantly**."  
– Australia NT Striker, Michelle Heyman<sup>50</sup>

"I don't want no **FieldTurf**. It's **bad on your knees**." – Steelers CB, Ike Taylor!



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## Summary



If you are reading this document, you have come for answers. This document provides just that. It has information about professionally built/maintained real grass athletic fields – the actual solution to neglected grass fields. You will see how professionally built/managed real grass compares with synthetic turf (ST). Then we investigate the numerous, known dangers of ST topped with plant-based infills (PBI) such as cork, coconut and corkonut. Specific details about PBI are also provided including brands, maintenance protocols, and the wide range of health concerns and environmental risks that ST presents. Finally we explore costs.

***You will discover that replacing tire crumb with PBI just trades one set of unregulated carcinogens for another!***

***"I think everybody wants to keep the grass."***  
– Steelers WR, Hines Ward<sup>1</sup>



***"For us, there's a lot more injuries on [synthetic] turf."*** –  
Steelers WR, Hines Ward<sup>1</sup>

## Conclusion

***Real Grass Is the Edge and Advantage!***

***College/professional athletes overwhelmingly say they NEED real grass fields – safety, play of game, career-lengthening. Choosing real grass fields prepares our children for elite levels of play!***

***Choosing synthetic turf is choosing a disadvantage!***

The following information sheds light on the successes of real grass athletic fields, the reality of synthetic turf and the conditions under which our children are needlessly suffering. Real grass fields are and should be the gold standard when it comes to children's health, money savings and maintenance. Specifically, real grass athletic fields offer:

- **Surface is loved overwhelmingly** by both professional athletes and children
- **Performance is competitive** with examples of 1,000 hours/year on each field
- **Injury rates much lower** than synthetic turf (according to independent studies, not funded by industry)
- **Cost is millions cheaper in short and long term** when considering installation, maintenance and replacement (according to independent studies, not funded by industry)
- **Boost children's immune and respiratory systems, lower prevalence of allergies and asthma, and improves mood**
- **Cleans itself** because of the soil system that naturally sanitizes
- Field care can utilize an **organic (third-party certified), systems-based approach**
- **Temperatures are safe and enjoyable, always 30-50 degrees cooler than ST**, any sunny day, anywhere in the world!
- **Absorbs 16.9 tons of CO<sub>2</sub>**
- Environmental benefits – improving where we live, eat and drink – it slows water infiltration to **recharge water tables**; it **allows healthy ecosystem exchange** between roots, bacteria, soil, and water

**ALL synthetic turf, including PBI, is dangerous and toxic no matter what.** Specifically, on synthetic turf:

- **Surface is hated overwhelmingly** by both professional athletes and children
- **Performance is irrelevant** when considering toll on children's bodies
- **Injury rate is 88% higher for ACL sprains** (according to independent studies, not funded by industry)
- **Injury rate is 22% higher for concussions** (according to independent studies, not funded by industry)
- **Cost is millions more expensive in short and long term** when considering installation and maintenance (according to independent studies, not funded by industry)
- **Children exposed to lead in carpet** due to friction from play and abrasive silica sand
- **Respiratory problems** include lung damage, fluid build-up in lungs, silicosis
- **Carcinogenic exposures**
- **Field care requires the use of many various chemicals**, at least one identified by EPA as a high human health risk
- **Temperatures are 140 °F and higher on sunny days.**
- **2<sup>nd</sup> and 3<sup>rd</sup> degree burns** occur at high rates
- **Cleats and water bottles melt**
- **Deep abrasions (turf burns)**, where layers of skin are removed, occur at high rates
- **Staph/MRSA bacteria thrive** (according to independent studies, not funded by industry)
- **Athletes are at 7x risk of Staph/MRSA infection**
- Carbon footprint so enormous, for each ST field, it takes **planting 1,861 trees every 10 years to offset carbon emissions**
- Environmental impacts – **where we live, eat and drink – is negatively affected by its runoff**

**PBI, such as cork, coconut and corkonut (ALL of the left column synthetic turf problems) PLUS the following:**

- **False advertising** – marketed as “organic” but unregulated chemicals sprayed at factory and required after installation
- **Much higher cost** than tire crumb
- **Requires more maintenance**
- **Must be watered**, requiring purchase of equipment and infrastructure
- **Requires annual top off** due to floating/migrating particles
- **Requires higher percentage of silica sand** than tire crumb. Silica sand is a **known carcinogen**, with known respiratory problems include lung damage, fluid build-up in lungs, silicosis
- **Materials are abrasive**, further breaking down plastic turf fibers, exposing lead
- **Chemical treatments** such as pesticides, antimicrobials, pre-emergent herbicides, flame retardants and antifungal/antimold agents used in addition to those required for ST maintenance
- **Breakdown, compaction, loss of infill, early degradation leaves students at greater injury risk**

*Let's give our children **THE BEST** – better than what we may have had growing up, and better than they have now – **REAL GRASS FIELDS DONE RIGHT!***

## Real Grass Athletic Fields

We must be reminded of why we are here discussing fields in the first place. We have forgotten, or perhaps not considered, what we are looking for – an authentic, enjoyable experience for our children. A sports field that holds up to wear and tear, that allows as many games, practices and events as possible. Real grass athletic fields actually do work. **REAL GRASS FIELDS DONE RIGHT** are what we have been searching for the whole time!

### *Licensed Professional Agronomists*

*There is more than one type of real grass field:*

- **Built/managed by outside professionals SUCCEED**
- *Managed by in-house school staff or other non-professionals typically fail.*

There is more than one type of real grass field: those built/managed by outside professionals succeed; those managed by in-house school staff or other non-professionals have a higher risk of failure. Licensed professional agronomists can provide site analysis and specific recommendations for real grass athletic fields to ensure they are built properly, using soil and grass appropriate for local conditions and needs. Agronomists can also recommend the utilization of technology such as a drainage system, more frequent aeration to alleviate compaction, compost tea, over-seeding, and fraze mowing. Getting a proper perspective on current field conditions is crucial. Testing and data can help identify what exactly is needed: infiltration rate, shock absorption, energy restitution, vertical deformation, rotational resistance and even plant activity mapping. Agronomists can also recommend a wear management plan to keep field healthy. Suggestions such as these make a huge difference in field wear: change daily location of practices on the field, use portable goals (anchored), use the far end of the field, line up for drills on uncommon yard lines like 22. Well-known licensed professional agronomists in the U.S. include Jerad Minnick and Chip Osborne. There are others locally as well, such as Sports Turf Managers Association (STMA) Certified Sports Field Managers (CSFM).<sup>2, 3, 4</sup>

### *Fraze Mowing: Successful Fields and Cost Savings*

“If there is **proper maintenance, the management of organic (earthy material layer) does not require a resod**. If the field already has a large organic build up and it requires removal, a fraze mow removal and or complete removal could be required. But that does not mean that sod is required.”<sup>5</sup>

**Real Grass Athletic Fields Can Last Forever!** *There is no lifespan. Technologies such as fraze mowing and seeding with proper grass variety mean that **resodding is not necessary for all fields.***

<sup>1</sup> <http://www.nfl.com/news/story/09000d5d8049f968/article/steelers-players-lobby-against-artificial-turf>

<sup>2</sup> [http://www.wellesley.ma.gov/pages/wellesleyma\\_nrc/IPM%20Report.pdf](http://www.wellesley.ma.gov/pages/wellesleyma_nrc/IPM%20Report.pdf)

<sup>3</sup> <http://www.growinginnovations.net/testing-data>

<sup>4</sup> [http://www.mokanstma.org/uploads/1/8/1/8/18188203/newsletter\\_spring\\_2014.pdf](http://www.mokanstma.org/uploads/1/8/1/8/18188203/newsletter_spring_2014.pdf)

<sup>5</sup> <https://growinggreengrass.net/2015/04/07/always-improving-university-of-portlands-merlo-field-universe-fraze-mow-2-results/>

### ***Seeding with Appropriate Variety of Grass: Successful Fields and Cost Savings***

Here is an example of how with the right grass variety, a real grass field succeeds without resod. The project was completed in 2012.<sup>6</sup>

In areas like Maryland, Patriot Bermuda grass is a great option. "Patriot: Performed consistently and strong. Sod quality was great. Establishment was fast. Wear tolerance was excellent. Late season growth and color were excellent. We got exactly what we expected from the Patriot, showing why it is used on 7 other fields at SoccerPlex able to host over 1000 hours of play per season."<sup>7</sup>

In areas like Missouri, Bermuda grass is an amazing option now as well. "It can be sprigged and grown-in in as few as 4 weeks in the summer."

### ***Playing through Rain***

***Real Grass Athletic Fields Can Play through Rain!*** Consider the Maryland SoccerPlex, whose 8 real grass fields played through nearly 6 inches of rain!

Maryland SoccerPlex stayed open amid six inches of rain.<sup>7</sup>

"Fuelled in large part by the remnants of Tropical Storm Karen as it stalled in the Atlantic Ocean just offshore from the Mid-Atlantic coast" there was "heavy, sustained precipitation" yet at the Maryland SoccerPlex, it was almost business as usual: **"The vast majority of the Discovery Cup youth tournament went ahead as scheduled on eight of the facility's natural-grass fields despite more than six inches of rain in some areas."**

"[Other] complexes closed due to saturated playing surfaces, tournaments had to be cancelled or curtailed. Even D.C. United were affected, as their match against the Philadelphia Union at RFK Stadium became a soggy mess in monsoon-like conditions on Saturday night."

"It is remarkable in view of the amount of rain, **5.85 [inches] in five days...** From a historic standpoint this was one of the most challenging situations. Not only did we have a **significant accumulation of rain but we also had no drying.** It was cloudy, cool and continued to drizzle or

mist the entire weekend."

"But over the summer Minnick and his staff **converted Fields No. 14 and No. 17 to a sand base and laid down four new varieties of Bermuda to test their performance side-by-side.** Elsewhere, five other native-soil fields were **equipped with an innovative system of underground drainage channels** to speed water away from the playing surface **so play could continue under a wider variety of weather conditions."**

"Our goal was to be able to play in up to three inches [of rain]. We played after six," said Minnick of the five adapted native-soil fields."

"Since their completion, none of the refurbished fields have been closed due to rainfall."

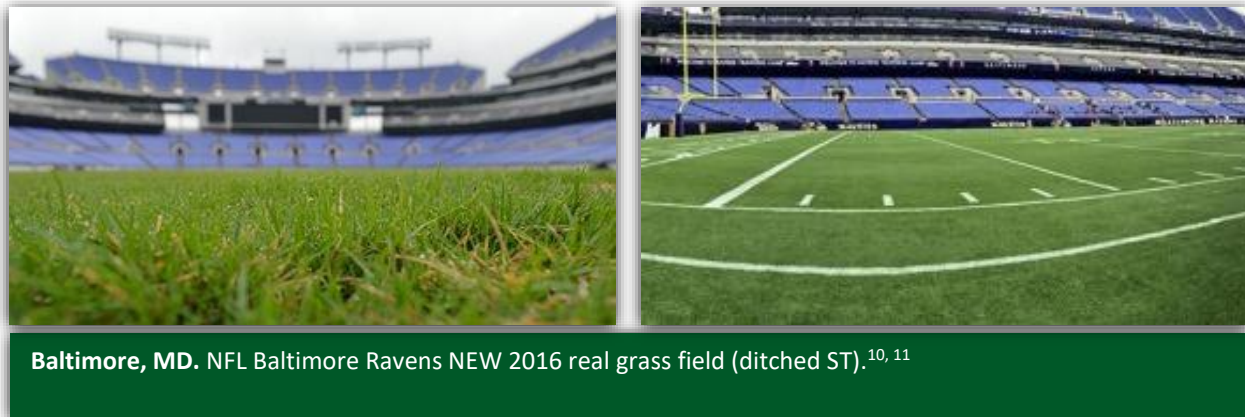
**Schools and communities should require licensed professional agronomists to present options for real grass athletic fields, instead of just buying into the synthetic turf (ST) marketing hype.**

***Real Grass Athletic Fields Can Handle over 1,000 Hours of Play!*** Consider Chesterfield Valley Athletic Complex in Chesterfield, Missouri and Maryland SoccerPlex in Boyds, Maryland.

<sup>6</sup> <http://sturf.lib.msu.edu/article/2014jun20.pdf>

<sup>7</sup> <https://soccerplexgem.wordpress.com/>

**Examples of Professionally Built/Managed Successful Real Grass Athletic Fields, including 1,000 Hours Play/Year**



<sup>8</sup> <http://www.chesterfieldlifestyle.com/2015/06/30/picnic-and-play-in-our-parks/>

<sup>9</sup> <https://huckfinultimate.wordpress.com/field-information/>

<sup>10</sup> <http://athleticturf.net/baltimore-ravens-join-natural-grass-club-thanks-to-new-technology/>

<sup>11</sup> <http://www.baltimoreravens.com/news/article-1/New-Field-Gets-Rave-Reviews-From-Players-After-Stadium-Practice/1f593309-8a25-42af-9b68-6e7c57bbf7f1>

<sup>12</sup> <https://growinggreengrass.net/page/2/>

<sup>13</sup> <https://soccerplexgem.wordpress.com/>



**Examples of Professionally Built/Managed Successful Real Grass Athletic Fields, including 1,000 Hours Play/Year (continued)**



**Seattle, WA.** Seattle University Championship Field. Men’s, women’s varsity soccer practice/game field, training sessions, special events for MLS, NWSL, National teams, and English Premier League. Boasts over 14 days hosted 17 events; logged 81 hours of use with minimal wear.<sup>14</sup>



**Greensboro, NC.** Proehlfic Park. Soccer, lacrosse, football, baseball, softball. Over 1,000 hours play/year. Fields thrive, even being in one of the worst winter kill areas in the U.S. 3 multipurpose - soccer, lacrosse, football, 2 softball, 1 baseball field. Park has 11-12 acres of real grass. Low-budget complex with very few resources.<sup>15, 16, 17</sup>



<sup>14</sup> <http://sturf.lib.msu.edu/article/2014aug40.pdf>

<sup>15</sup> <http://www.greensborounited.org/Default.aspx?tabid=546130>

<sup>16</sup> <http://proehlficpark.com/our-facility/>

<sup>17</sup> [https://www.facebook.com/permalink.php?story\\_fbid=1778057812518195&id=100009419807972](https://www.facebook.com/permalink.php?story_fbid=1778057812518195&id=100009419807972)

Real Grass Field Makeover<sup>18</sup>

Danville, VA. Hampden-Sydney



A real grass field can be reworked into a successful one. Utilizing the expertise of licensed professional agronomists and others, Hampden-Sydney College is now reaping the benefits of hard work, just **21 DAYS into the process!**<sup>18</sup>

"Without a doubt probably the **proudest I have been** in my 10yr career. To **flip this field around in 21 days** and have **ryegrass established in 14 day** is amazing! It's far from perfect but I feel **confident playability** will be great. Many thanks to Thomas Kirkpatrick and Anzel for their **hard work and efforts**. Rodney Hopkins for **advice on leveling the field**. Finally I want to call out Jerad Minnick for his **tech support and wisdom!** He was a key player in this **#grasscantakemore** process. You will notice there is a ribbon mowed on the 50. It is a privilege to utilize the tools and skills my job offers to honor a dear aunt who recently passed of cancer. My duty is done so let's Roll Tigers! Sports Turf Managers Association (STMA) Virginia Turf" – Jonathan Hall, Sports Turf Manager at Hampden-Sydney College<sup>18</sup>

<sup>18</sup> [https://www.facebook.com/permalink.php?story\\_fbid=673063426187162&id=100004505327239](https://www.facebook.com/permalink.php?story_fbid=673063426187162&id=100004505327239)

Heard from Professional Athletes

"Natural grass is so much better to play on – players love playing on the natural grass compared to a [synthetic] surface."  
– Steelers QB, Ben Roethlisberger<sup>19, 20</sup>



**NFL Players say<sup>24</sup>**

- Nearly **70% prefer grass**
- **75% NFL Groundskeepers play Very Significant role in NFL grass surfaces.**

Arizona blames [synthetic] turf at Metrodome for torn ACLs suffered by two wide receivers.  
**"I'd love to see that stuff gone."**  
– Cardinals RB, Michael Pittman<sup>23</sup>

"If that game had been on grass, I guarantee you that Rob and Coby would still be playing right now."  
– Cardinals RB, Michael Pittman<sup>23</sup>

**"[FieldTurf], it ain't my friend.**  
Just as far as my health is concerned, I need to think about that and **how my body can and will respond,**" – former Jets NT, Kris Jenkins<sup>22</sup>



**"I'm glad we weren't on FieldTurf.** That grass – you know, the soft Heinz Field – might've helped a little bit.  
Quarterback, Ben Roethlisberger suffered a mild concussion, hitting Heinz Field (grass).<sup>25</sup>

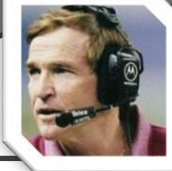
**Brady wants real grass at Gillette!**  
"I think everybody likes grass ...And we practice on grass every day...easier to land on the grass than landing on the [synthetic] (turf). I think everybody would love a good grass surface to play on. That'd be great. All those European soccer teams get all the grass when they come to (Gillette)Stadium [sic]. **Good point, right?**" – Patriots QB, Tom Brady<sup>21</sup>



**"I need the grass.** I like the mud. I like the sloppiness ...can we please keep the grass?" – Steelers CB, Ike Taylor<sup>1</sup>



"...all I know is we've **lost four players the last two times we've played on it, and three of them were no more than the player getting a shoe caught in the [synthetic] turf.**"  
– Cardinals coach Vince Tobin<sup>23</sup>



Bennett and Rashod Swinger also suffered torn ACLs on the Georgia Dome [synthetic] turf.  
**"How many more blown-out knees is it going to take before the league does something about this stuff?"** – Cardinals SS, Tommy Bennett<sup>23</sup>



**"I don't want no FieldTurf. It's bad on your knees."** – Steelers CB, Ike Taylor<sup>1</sup>



Broncos coach Gary Kubiak says Peyton Manning's foot injury lingering.  
**"It's just really sore coming off the [synthetic] turf [in Indianapolis]. His foot has bothered him for a couple of weeks, been sore and I think it's coming off of that turf. It just seems like, when you play on [synthetic] turf, you get a lot more things going on."**<sup>26</sup>

**NFL Players say<sup>24</sup>**

- **82% [synthetic] turf contributes more to injury**
- **90% [synthetic] turf shortens career**

<sup>19</sup> <http://bigben7.com/interview-with-kdka-this-evening/>  
<sup>20</sup> <http://profootballtalk.nbcsports.com/2012/08/28/ben-roethlisberger-real-grass-is-the-safest-surface-for-football/>  
<sup>21</sup> <http://offthemonstersports.com/2016/11/tom-brady-wants-to-see-gillette-stripped-of-turf-and-replaced-with-grass/>  
<sup>22</sup> <http://profootballtalk.nbcsports.com/2011/03/30/kris-jenkins-unlikely-to-return-to-jets-because-of-fieldturf/>  
<sup>23</sup> [http://articles.sun-sentinel.com/2000-08-27/sports/0008260347\\_1\\_salary-cap-artificial-turf-simeon-rice](http://articles.sun-sentinel.com/2000-08-27/sports/0008260347_1_salary-cap-artificial-turf-simeon-rice)  
<sup>24</sup> [http://www.stma.org/sites/stma/files/pdfs/2010\\_NFL\\_Survey.pdf](http://www.stma.org/sites/stma/files/pdfs/2010_NFL_Survey.pdf)  
<sup>25</sup> [http://www.steelers.com/assets/images/imported/MediaContent/2009/01/06/05/clips\\_1\\_6\\_09\\_101658.pdf](http://www.steelers.com/assets/images/imported/MediaContent/2009/01/06/05/clips_1_6_09_101658.pdf)  
<sup>26</sup> <http://profootballtalk.nbcsports.com/2015/11/11/kubiak-says-peyton-manning-foot-has-been-bothering-him-for-a-couple-of-weeks/>

**NFL Baltimore Ravens 2016 get real grass (switch from synthetic turf)**

"It's **top of the line**. It's **premium** right now."

"That **grass was phenomenal**. I'm **very pro grass**. My **knees feel better** after practice, and there was good traction all night." – Ravens FB, Kyle Juszczyk<sup>27</sup>



"The [grass] **field held up really well**. It **looked good**. It's **exciting**."

– Ravens Head Coach, John Harbaugh<sup>27</sup>



"I **love the field**. It makes the **cuts easier** and I **like it**." – Ravens RB, Terrance West<sup>27</sup>



"I thought it was a **great decision**. With my surgeries that I've had, I can tell after the game if I've played on that hard [synthetic] turf or have played on grass. It's a **black-and-white difference**." – Ravens CB, Lardarius Webb<sup>28</sup>

"It kind of **epitomizes what Baltimore is all about**, the history of football in Baltimore. To me, a **Baltimore football team should be playing on a grass field** in Baltimore." – Ravens Head Coach, John Harbaugh<sup>28</sup>

**Webb tore ACL** playing on M&T Bank Stadium's [synthetic] surface in 2009, 2012.

Asked whether playing on [synthetic] surfaces lead to more injuries,

"They say **injuries happen more on [synthetic] turf than on grass**. Simple as that."

– Ravens CB, Lardarius Webb<sup>28</sup>



<sup>27</sup> <http://www.baltimoreravens.com/news/article-1/New-Field-Gets-Rave-Reviews-From-Players-After-Stadium-Practice/1f593309-8a25-42af-9b68-6e7c57bbf7f1>

<sup>28</sup> [http://www.espn.com/blog/baltimore-ravens/post/\\_id/24177/john-harbaugh-switching-to-grass-field-epitomizes-what-baltimore-is-all-about](http://www.espn.com/blog/baltimore-ravens/post/_id/24177/john-harbaugh-switching-to-grass-field-epitomizes-what-baltimore-is-all-about)

**Ole Miss 2016 gets real grass (switch from synthetic turf)**

"Thank God. **Ankles every where rejoice** 😂"  
– former Ole Miss RB, Kenyan Drake<sup>29</sup>

(Oct. 4, 2014 Drake suffered season-ending broken leg on synthetic turf at Vaught-Hemingway Stadium.)<sup>30</sup>



"It's 130 degrees on that [synthetic] turf; **I like grass...I think we are in Mississippi and we ought to be able to play on grass.**"  
– Ole Miss Head Coach, Hugh Freeze<sup>31</sup>



"It's the **right thing to do** for our program on many levels. [Grass] It's the **preferred playing surface of our players and coaches.** – Ole Miss Athletics Director, Ross Bjork<sup>31, 32</sup>



"**Grass fields** can now be constructed with such thickness and **drainage** that a few **minutes** after **even heavy rain** stops, **they are playable.** I have been a high school coach for 30+ years. Our teams have played on both surfaces...**our players highly prefer grass.**

I would value the opinion of the **coaches whose living depends on the outcome** and who must **convince recruits** to play in their stadium..."  
– GrandOleReb<sup>33</sup>

Beaver Stadium has beautiful grass for Penn State football! Wow! After first setting foot on it, linebacker Brad Bars didn't want to leave!

"It was unbelievable. I really didn't even think it was grass because it was that **perfect of a playing surface.** Those guys over there, they're unbelievable. **Same with our practice field.** It's the **best surface that I've ever played on.** The **grass is perfect,** everything about it is great and **everything you'd want as a college football player.**"

– Pennsylvania State LB, Brad Bars<sup>34</sup>



<sup>29</sup> <https://twitter.com/KDx32/status/738750561856655361>

<sup>30</sup> [http://www.al.com/sports/index.ssf/2016/06/kenyan\\_drake\\_gives\\_thumbs-up\\_t.html](http://www.al.com/sports/index.ssf/2016/06/kenyan_drake_gives_thumbs-up_t.html)

<sup>31</sup> <http://at.scout.com/1hQWvtg>

<sup>32</sup> [http://djournal.com/sports/vaught-hemingway-gets-grass-field-next-fall/#\\_ga=1.204993296.1698692100.1441215922](http://djournal.com/sports/vaught-hemingway-gets-grass-field-next-fall/#_ga=1.204993296.1698692100.1441215922)

<sup>33</sup> <http://www.scout.com/college/ole-miss/forums/1103-ole-miss-insiders/14042393-ole-miss-football-going-back-to-natural-grass-in-vhs-in-2016>

<sup>34</sup> [http://www.centredaily.com/2014/09/06/4340877\\_laying-the-groundwork-beaver-stadium.html?rh=1](http://www.centredaily.com/2014/09/06/4340877_laying-the-groundwork-beaver-stadium.html?rh=1)

ALL MLB ballparks use real grass except two. At least one plans to convert to real grass by 2018. All future ballparks intend to use grass. What's interesting is that at one point, 10 teams used ST, but "ultimately decid[ed] grass fields were the better option. The reasons for doing so have included concern for player health, and the aesthetics of the field!"<sup>35, 36, 37, 38</sup>



This is how much the Toronto Blue Jays want REAL GRASS!

- Year-one study commissioned, signed with Univ. of Guelph, to grow grass in stadium; installation goal 2018.
- Further research to be funded if club likes findings, determines it's possible to modify Rogers Centre enough to grow grass.<sup>36</sup>

"Good riddance, personally, I just wish it [synthetic turf] would have been gone a long time ago."  
 – Hall of Famer, Andre Dawson  
 "Dawson played 11 seasons on [synthetic] turf, which led to 12 knee surgeries, proving that [synthetic] turf does create health problems."<sup>35</sup>

Having synthetic turf is now considered a "competitive disadvantage. It causes lingering injuries."<sup>35, 39</sup>

[FieldTurf] "like running in sand" and hurt his hamstrings, lower back, knees and calf muscles..."It takes me like a month and a half to really get over some of the soreness that you have after the season." – former Twins, Torii Hunter  
 "Hunter, who left the [synthetic] turf of the Metrodome for Anaheim's grass... can't wait until it's all gone."<sup>38</sup>

"I played real aggressively on [synthetic] turf for nine years. I'm lucky I'm still walking the way I'm walking now. I'm still walking, at least." – former Rays, Carl Crawford<sup>42</sup>

"...clear around MLB that [synthetic] turf is...unattractive aspect of the game... hazardous to the safety of players."<sup>35</sup>

"I played hard and had some problems with the [synthetic] turf and my hips that had my hamstrings barking on me, which I haven't dealt with in the past...The [synthetic] turf has taken a little toll on me in the past couple of years." – Blue Jays, Colby Rasmus<sup>40</sup>

"...I'm personally very happy that they're [synthetic turf fields] gone ...I think the players are better off and I think that the game is better, so I'm happy..." – Baseball Commissioner Bud Selig<sup>38</sup>

"...It's unfortunate but it seems like us and the Rays we all have to deal with more injuries than normal, more banged up, maybe because of the [synthetic] turf. I mean it's the only two stadiums left..." – Blue Jays, Jose Bautista<sup>43</sup>

"His ankles aren't good to this day because of the [synthetic] turf at [old] Busch Stadium...He'd soak his feet in buckets of water while the Cardinals batted."  
 "On day games the thermometer would read 148 off the [synthetic] turf. Reggie Smith... had rubber cleats, and he had to call time out. They had melted.  
 "If I wore the metal spikes, [synthetic turf] would have me branded...it would sunburn my heel and the balls of my feet..."Why are my feet on fire?" –former Cardinals, Keith Hernandez<sup>38</sup>

"I would be shocked if, at the big league level, you could ever get guys to say they like a synthetic-turf field. If we went out and showed scientifically that everything was exactly the same, I still don't think we'd get approval." – AstroTurf's director of research, Matthew Boggs<sup>41</sup>

<sup>35</sup> <http://www.baseballessential.com/news/2014/12/21/why-astro-turf-no-longer-belongs-in-baseball/>

<sup>36</sup> <http://www.sportsnet.ca/baseball/mlb/inside-blue-jays-push-natural-grass/>

<sup>37</sup> [https://en.wikipedia.org/wiki/List\\_of\\_Major\\_League\\_Baseball\\_stadiums](https://en.wikipedia.org/wiki/List_of_Major_League_Baseball_stadiums)

<sup>38</sup> [http://www.espn.com/espn/wire/\\_/section/mlb/id/4500598](http://www.espn.com/espn/wire/_/section/mlb/id/4500598)

<sup>39</sup> <http://sportsturfonline.com/2015/02/17/university-of-guelph-takes-lead-to-find-natural-grass-solution-for-blue-jays-and-rogers-centre/6803/>

<sup>40</sup> <http://www.beyondtheboxscore.com/2014/9/24/6836755/colby-rasmus-toronto-blue-jays-2014-defensive-metrics-BABIP>

<sup>41</sup> <http://articles.latimes.com/2013/sep/11/sports/la-sp-0912-baseball-astro-turf-20130912>

<sup>42</sup> <http://www.latimes.com/sports/dodgers/la-sp-dodgers-report-20160427-story.html>

<sup>43</sup> <http://www.beyondtheboxscore.com/2014/11/28/7296843/artificial-turf-age-curve-blue-jays-rays-baseball-woba>

"...the team manager revealed that the **decision to have a high-quality grass pitch is paramount to achieving this goal...**" "Do you think if we have plastic pitches that doesn't impact on whether a player signs or not? When we are trying to **get better players in**, do you think he says he wants to play on a plastic pitch? **They want to play on a top-quality grass pitch.** It impacts recruitment, players, coaches, supporters – it impacts everyone," Warburton said.

He added that when the Professional Footballers' Association surveyed players across four divisions, **73 per cent of respondents would take a bad grass pitch over a [synthetic] pitch...**<sup>44</sup>



**"It should be grass stains, not blood."**  
– USWNT Forward, Abby Wambach<sup>45</sup>

**More than 70 national team players** from at least 17 different national teams petition FIFA for natural grass in 2015 WWC.<sup>46</sup>



Playing biggest tournament, 2015 WWC, on synthetic turf: "...is **unacceptable.** The game is completely different. **It's FAKE,** so you **don't know how it's going to bounce,** you don't know how the ball's going to run, **it's terrible on your body,** the constant pounding, it's you know, you're **running pretty much on cement.** Yeah we've **tried to fight it.** We're the Guinea pigs. The **men would NEVER play on [synthetic] turf,** would never. Some men don't even travel in the MLS to play in places that have [synthetic] turf because they don't play on that..." – USWNT Forward, Sydney Leroux<sup>47</sup>



**"...an outrage...a disgrace.** The game changes...**less fun as an athlete.**" – Abby Wambach<sup>45</sup>

"From a defender's standpoint the ability to go **to the ground, you have to think about it,** and you don't want to have to think when you're out there. The **ball bounces differently.**

And I think the fact that there's now 7 games instead of 6 - you know, **it's [synthetic turf] harder on your body.**" – former USWNT Defender, Heather Mitts<sup>48</sup>



**Lawsuit against FIFA for gender discrimination over ST.** FIFA vows **never to hold World Cups on ST again** after 2015's WWC. The **conditions were unbearable.**<sup>49</sup>

**"The skin is all ripped off; it's pretty disgusting.** It's **like walking on hot coals** with your **skin ripping and slowly cracking, constantly.**" – Australia NT Striker, Michelle Heyman<sup>50</sup>



**"They are not playing on [synthetic] turf. Period."**

...It shouldn't need to be a topic we even have to discuss...If there is modicum of respect and concern for the health and safety of the women's national team...

...the federation **hasn't put a men's match on [synthetic] turf since at least 2005...**

...They've **suffered injuries from playing on [synthetic] turf all these years...** But there comes a time when you **can't take it any more.**" – USWNT Union Attorney, Rich Nichols<sup>51</sup>

<sup>44</sup> <http://turfbusiness.co.uk/news/boss-would-choose-1m-pitch-over-1m-player/>

<sup>45</sup> <http://www.cbsnews.com/news/female-soccer-players-file-discrimination-suit-over-womens-world-cup/>

<sup>46</sup> <https://www.coworker.org/petitions/fifa-the-world-cup-should-be-played-on-natural-grass>

<sup>47</sup> <https://youtu.be/mVhoXvZ7ikA>

<sup>48</sup> <http://www.foxsports.com/video?vid=368152643944>

<sup>49</sup> <http://www.msnbc.com/rachel-maddow-show/watch/us-womens-soccer-puts-end-to-fifa-turf-use-460951619836>

<sup>50</sup> <http://www.nbcconnecticut.com/news/sports/Walking-Hot-Coals-Womens-World-Cup-Artificial-Turf-310233051.html>

<sup>51</sup> <https://www.theguardian.com/football/2016/jan/28/uswnt-collective-bargaining-agreement-artificial-turf>

**"Every game, every team should have grass, without a doubt."** – Former Galaxy Midfielder, David Beckham<sup>52</sup>



Red Bull Arena's cover is Kentucky bluegrass. **"[Grass] makes a world of difference... the way things should be."** – Red Bulls Defender, Mike Petke<sup>53</sup>

Former Canada NT Forward, Dwayne De Rosario **"was one of the most outspoken critics of the [synthetic] Field Turf...So he's thrilled to see the grass in its place."**

**"Smell that. Fresh air, man. It smells great. To step on grass in my home town, I can finally say soccer is here at the pro level."**<sup>54</sup>



**"...grass appears to be more 'keeper-friendly.' It just seems to be easier on the joints and better for diving."** – Whitecaps Goalkeeper, Jay Nolly<sup>55</sup>

When asked about playing on [synthetic] turf, **"shook his head and said 'Nobody likes that. It's hard on your legs.'"** – Galaxy Defender/Midfielder, Bryan Jordan<sup>56</sup>

[Synthetic] turf, according to Canales, **"is most detested by those who actually have to perform on it."**<sup>56</sup>

**"I think [synthetic] turf should be outlawed for soccer."** – Red Bulls Defender, Mike Petke<sup>53</sup>



**"...any guy in the league...that's played on [synthetic] turf, trained on [synthetic] turf for a number of years said it's taken years off their career."**

**"Over the course of the season, a lot of injuries occur from playing and training on [synthetic] turf every week. That's pretty obvious."**<sup>56</sup>  
– USNT Forward, Landon Donovan



**"As a footballer, you never want to be on [synthetic] turf, ever."**  
– Red Bulls Striker, Thierry Henry<sup>55</sup>



**"...FIFA should not allow [synthetic] surfaces...no good for the players, and somehow I hope the players...stand up and say we're not playing on this, plain and simple."** – U.S. Soccer Coach, Bob Bradley<sup>57</sup>

**"As a professional athlete, you can't play a game like soccer on that sort of field. You can't...perform at a high level on the FieldTurf. What it does to your body...you're in bits for three days after that."**

**"I think it's a huge factor...because on FieldTurf, playing with my ankle the way it is...it would be dangerous. But with grass, it's a lot more positive for me to play on this."** – Former Galaxy Defender, David Beckham<sup>52</sup>

**MLS: 94% of the players chose FT [3<sup>rd</sup> generation [synthetic] turf] as the surface most likely to increase the risk of sustaining an injury.**<sup>58</sup>

<sup>52</sup> <http://www.theglobeandmail.com/sports/beckhams-turf-war/article20400101/>

<sup>53</sup> [http://www.northjersey.com/sports/pro\\_sports/89346927\\_Bulls\\_prefer\\_new\\_surface\\_to\\_turf.html](http://www.northjersey.com/sports/pro_sports/89346927_Bulls_prefer_new_surface_to_turf.html)

<sup>54</sup> [https://www.thestar.com/sports/soccer/2010/04/13/toronto\\_fc\\_players\\_thrilled\\_with\\_grass\\_field.html](https://www.thestar.com/sports/soccer/2010/04/13/toronto_fc_players_thrilled_with_grass_field.html)

<sup>55</sup> <http://www.vancouversun.com/sports/WEEKEND+EXTRA+long+short+playing+turf/5074789/story.html>

<sup>56</sup> <http://www.goal.com/en-us/news/1110/major-league-soccer/2011/05/06/2473635/canales-corner-mls-players-pay-the-price-for-popularity>

<sup>57</sup> [http://articles.baltimoresun.com/2009-07-02/sports/0907010165\\_1\\_grass-debate-ravens-turf](http://articles.baltimoresun.com/2009-07-02/sports/0907010165_1_grass-debate-ravens-turf)

<sup>58</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4108054/>



Heard from Student Athletes

**"On grass, you get the stains to let you know you're getting down and dirty, you're playing good, you're flying around on the field making plays and it just feels good."**

– LB, RB, Chika Nwabuko



**"You go out on [synthetic] turf, all you get is a turf burn."** – LB, RB, Chika Nwabuko



**"I got these nasty pieces of plastic embedded in me. It took weeks to pull each of them out."** – SUNY College student recalls his experience playing on ST at Long Island High.<sup>59</sup>

**5browncrew** Fullerton College Follow

178 likes 11w

5browncrew With #football in the air I thought I'd share why I hate turf so much. A player dove for a ball on #turf and came up with no skin on his forearm. #turfsucks #ncaa #grassrules #thepain #tattoo #tbt

bcoupdzgns @5browncrew so gross!! Turf sucks!

rcusella51 Nasty

michaelzagaris Thank god I only had to play a few times on it...HATED the rug burns...

pistolita\_54 Oh man that looks nasty and painful AHHH!!

**Josh Aubrey** @thejoshaubrey Follow

New turf GS hottest surface I've been on. 3 SHS players shoes melt and explode during 7 on 7 today #SunBeltbeware

RETWEETS 42 LIKES 39

3:33 PM - 11 Jun 2016

**"When we was little, all we played on was grass, from flag to tiny mite, to mighty mite, we played on grass. It's like a Saturday morning smell."** – RB, Kobe Morrow



**Simmons** @BSmoove\_7 Follow

bruuuh the turf melted my bro @goldan\_child cleats 🤔🤔🤔🤔

**Shrooke** @BrookeTheRook Follow

When the turf is so hot it literally burns and melts your skin :-)

**Lauren E Pratt** @laurenep... just a few of the many... #turfburns

**Patrick Reinhardt** @gasouthernmcm Jun 11 @thejoshaubrey did they water the field to activate the chilling infill? Wasn't even that hot by Boro standards today

**GATA** @sunbeltbullies Jun 12 @thejoshaubrey @TKleinleAD

**Robby Clemenz** @rclem2 Jun 15 @thejoshaubrey @STretera I think it's time for the real stuff! #Turfgrass

**T. A. Davis** @TADavis1 Jun 12 @thejoshaubrey @AStateFanRules that ain't good!

**Chaston Hart** @chastonhart Jun 12 @thejoshaubrey this has to be a joke

**Walker McLeod Bryant** @walkermcbryant Jun 11 @thejoshaubrey @gasouthernmcm that seems safe

<sup>59</sup> <http://www.wfaa.com/sports/high-school/football/playing-on-natural-grass-a->  
<sup>60</sup> <http://www.southshorepress.net/2016/11/08/suffolk-closeup-158/>  
<sup>61</sup> <https://twitter.com/brooketherook/status/648620814884061184>  
<sup>62</sup> <https://twitter.com/LaurenPratt/status/719593748280295425>  
<sup>63</sup> [https://twitter.com/BSmoove\\_7/status/482916504011571200](https://twitter.com/BSmoove_7/status/482916504011571200)  
<sup>64</sup> <https://twitter.com/thejoshaubrey/status/741760200181485568>  
<sup>65</sup> <https://www.instagram.com/p/BJiwBo0h-Bt/>

Heard from Student Athletes (continued)



**Basic Bobo** @basicbobo 4 Sep 2014  
 @mybaeisbay aww bb that's rough. But same for me, 75 max 🙄 also we're running at practice tmrw and it's always 10 degrees hotter on turf 🙄

**Oh that Eq** @mybaeisbay  
 @basicbobo I LITERALLY HATE TURF SO MUCH. it's like the devil created a surface that hell is directly under

10:40 AM - 4 Sep 2014

1 LIKE

Reply to @mybaeisbay

**Basic Bobo** @basicbobo 4 Sep 2014  
 @mybaeisbay it's great when it's not hot out, but when it's over 75ish it's like the deepest, hottest level in Hell possible.

**Starr Harrison** @starrekharrison

Turf burn is like dipping you knee is hell for a second then dipping it in acid 🙄🏈

6:22 PM - 20 Jan 2015

2 RETWEETS 2 LIKES

**NicGloven** @loadingup18

I imagine hell feeling like a turf burn that you just reopened and take a hot shower 🙄🙄

2:25 PM - 26 Aug 2016

**gabbie.** @Gabrielle\_xo

I do not want to play on turf tomorrow 🙄🙄 it's going to be so hot & my feet are about to burn like hell

8:10 PM - 26 Aug 2016

1 RETWEET 1 LIKE

**Clay** @cchapman141

Slide on the turf twice in gym. I got a blue knee and my shin stings like hell

8:25 AM - 23 May 2014

<sup>66</sup> <https://twitter.com/madisonhuskey/status/745115964539174913>  
<sup>67</sup> <https://mobile.twitter.com/mybaeisbay/status/507584104066342912>  
<sup>68</sup> <https://mobile.twitter.com/starrekharrison/status/557724879353831424>  
<sup>69</sup> <https://mobile.twitter.com/loadingup18/status/769284762770874368>  
<sup>70</sup> [https://mobile.twitter.com/Gabrielle\\_xo/status/769371505612492801](https://mobile.twitter.com/Gabrielle_xo/status/769371505612492801)  
<sup>71</sup> <https://mobile.twitter.com/cjchapman141/status/469861684949950464>

Heard from Parents



"I think **they went too far, too far.** He told the coach, '**Coach, I'm hurting, I'm in a lot of pain.**'" – Melissa Sanchez, mother<sup>72</sup>



'...Why recklessly expose them to lead, chromium and a host of other carcinogens as well as injuries and burns from the plastic?...I am not willing to gamble with my children's health or the health of our beautiful bays and sources of water. Synthetic turf is unsustainable—it is a health and environmental hazard period.' – Helen Roussel, mother of three<sup>59</sup>

<sup>72</sup> <http://www.kvia.com/news/Student-suffers-severe-injuries-during-punishment/16233940>  
<sup>73</sup> <http://www.kens5.com/news/s-a-father-outraged-after-son-suffers-blister-blisters-due-to-bear-crawls/301425552>  
<sup>74</sup> <https://twitter.com/Incage2/status/761396785508126721>  
<sup>75</sup> <http://www.nbcconnecticut.com/news/local/Stratford-High-School-Football-Artificial-Turf-Burns-Blisters-Team-Coach-326143921.html>  
<sup>76</sup> <http://www.sfoxaminer.com/synthetic-turf-poses-potential-health-risks/>  
<sup>77</sup> [https://www.youtube.com/watch?v=PYIEhs\\_0Q7o](https://www.youtube.com/watch?v=PYIEhs_0Q7o)

"It wasn't just a hot field; these kids – **their skin melted off their hands.** These kids were getting hurt and you know **they're trained not to say something back to the coach,** so you know, **so I'll say it** [extra training, even a suspension for the coach may be warranted]." – Sean Haubert, Town Councilman<sup>75</sup>



"Every year, I do a **blood test on my daughter.** I just hope and **pray nothing happens** or that she lives through it if she gets it." – local attorney, activist and soccer mom, Kathleen McCowin  
 "McCowin's daughter grew up playing soccer on [synthetic] turf fields in the area."<sup>76</sup>



**PBI is a Big Experiment – Our Children Are NOT Guinea Pigs!!!**  
 "The technology has changed, and we're excited to **experiment with alternate infill,**" – Director Phil Ginsburg  
 "In fact, I **don't think Rec and Park gets the seriousness of the situation** at all."  
 – Kathleen McCowin<sup>76</sup>

**More Exposure to Carcinogens due to More Play on Synthetic Turf**  
 "I don't understand why, **given present-day concerns,** this is something to emphasize. Are we supposed to thank them for **exposing more of us?** Am I supposed be happy **when I find carcinogenic crumbs on my toddler's floor** instead of mud and grass? – Kathleen McCowin  
 "...the department repeatedly emphasized "the health benefits associated with the 90,000 additional hours of annual play and all of the new youth sports teams that have been created because of these fields."<sup>76</sup>

Heard from Pediatricians, a Toxicologist, Other

**“Consider the possibility of maintaining a grass field with an underground drainage system.”**

– Mount Sinai, Children’s Environmental Health Center



“...Schools and towns are running to yet other untested infills and paying even more money to have put them installed.

We will say again -- as we have said before --- **if you would spend 1/2 the money you are going to spend on this synthetic turf field and put in a state-of-the-art grass field** -- you would be **protecting your students’ health** and teaching them good environmental stewardship all at the same time.

– Nancy Alderman, President, Environment and Human Health, Inc.



- **“Beware of greenwashing:** the use of terms like “organic”, “green”, and “Eco” do not guarantee safety.
- In fact, those terms are not regulated for [synthetic] turf products, so **their meaning in this context is at best ambiguous.**
- Insufficient data on **chemical exposures due to limited studies that assess composition, off-gassing, leaching, and associated potential health effects”**

– Mount Sinai, Children’s Environmental Health Center

On PBI, specifically corkonut:

- “Heat studies completed with heat lamp not same as the sun; **heat lamp won’t give you a sunburn, but sun will.**
- Not really a study, they are **selling their product.**
- In addition to other tests on extreme temperatures of synthetic turf fields, a test we could do ourselves is **on a sunny, clear day to stand on a local natural grass field for 20 minutes, measure body temperature. Stand on the synthetic field for 20 minutes, measure body temperature.”**

– Dr. David Brown, Sc.D\*



**“Children depend on adult decisions for health protection.**

Therefore, since the material is inhaled, and we know it is dangerous to inhale, then we are **bound by ethics of a moral society to not use harmful material when exposure is possible.** A civil society does not knowingly present harmful exposures to **children who have no control over their exposure risk.**” – Amy Stephan, mother

On PBI, specifically corkonut:

“...adding another material to the field that has not been tested specifically for respiratory effects.

**Just because it is a natural material doesn’t mean we should be breathing it in.”**

– Dr. David Brown, Sc.D\*

**Federal agencies have not studied PBI; only just beginning on tire crumb.**“...Limited studies have not shown an elevated health risk from playing on fields with tire crumb, but the existing studies do not comprehensively evaluate **the concerns about health risks from exposure to tire crumb...**” – EPA<sup>78</sup>

\*Dr. David Brown, Sc.D. is the Public Health Toxicologist and Director of Public Health Toxicology for Environment and Human Health, Inc. He is the past Chief of Environmental Epidemiology and Occupational Health in Connecticut and was previously Associate Professor of Toxicology at Northeastern College of Pharmacy and Allied Health. He also served as Deputy Director of the Public Health Practice Group of Agency for Toxic Substances and Disease Registry (ATSDR) at the National Centers for Disease Control and Prevention in Atlanta, Georgia. Dr. Brown graduated from Cornell University in Biochemistry, received his MS from the University of California In Environmental Health, and his ScD from Harvard School of Public Health in Toxicology.

<sup>78</sup> [www.epa.gov/tirecrumb](http://www.epa.gov/tirecrumb)

<sup>79</sup> <https://www.cga.ct.gov/2016/KIDdata/Tmy/2016HB-05139-R000216-Sarah%20Evans,%20Icahn%20School%20of%20Medicine%20at%20Mount%20Sinai-TMY.PDF>

<sup>80</sup> [https://www.facebook.com/permalink.php?story\\_fbid=10153735849671975&id=118671496974](https://www.facebook.com/permalink.php?story_fbid=10153735849671975&id=118671496974)

## Comparison of Real Grass Fields and Synthetic Turf Fields

Below you will see why even when choosing plant-based infills (PBI), such as corkonut, the dangers/toxicity of synthetic turf (ST) remain. **Synthetic turf = synthetic turf.** Compare.

| Comparison of Fields  |  |
|---|--|
| Natural Grass   | Synthetic Turf   |
| <p><b>Favorite Surface</b></p> <p><i>NFL Players say<sup>24</sup></i></p> <ul style="list-style-type: none"> <li>Nearly 70% prefer grass</li> </ul> <p><i>MLB ALL real grass except two fields, at least one plans to convert.</i></p> <ul style="list-style-type: none"> <li><b>OVERWHELMING</b> choice is <b>GRASS</b>, from <b>NFL, MLB, USWNT, MLS</b>, etc. (also see quotes).<sup>24, 46, 58</sup> <ul style="list-style-type: none"> <li>NFL teams like Baltimore Ravens are switching <b>back to grass and/or lobby to keep grass</b> like Pittsburgh Steelers.</li> <li>MLB is <b>ALL grass</b> except two teams.</li> <li>MLS <b>ALL grass</b> major tournaments. Several MLS stars refuse to play on ST due to injury risk.</li> <li>USWNT <b>chooses grass</b>; sues FIFA for discrimination over being forced to play on ST.</li> </ul> </li> </ul> <p><i>"Natural grass is so much better to play on – players love playing on the natural grass compared to a [synthetic] surface,"</i><br/>– Steelers QB, Ben Roethlisberger<sup>19, 20</sup></p> | <ul style="list-style-type: none"> <li>Players <b>grudgingly use ST</b> – what they got from decision-makers who will never play on the field and/or <b>ignorance</b> about real grass fields that work.</li> </ul> <p><i>NFL Players say ST<sup>24</sup></i></p> <ul style="list-style-type: none"> <li>82% contributes more to injury</li> <li>90% shortens career</li> </ul> <p><i>MLS: 94% of the players synthetic turf most likely to increase the risk of sustaining an injury.<sup>58</sup></i></p> <p>Arizona blames [synthetic] turf at Metrodome for torn ACLs suffered by two wide receivers.</p> <p><i>"I'd love to see that stuff gone."</i><br/>– Cardinals RB, Michael Pittman<sup>23</sup></p> <p><i>"It [synthetic turf] definitely takes a toll on your body...you play the best you can with it, but it's not easy."<sup>38</sup></i><br/>– former Rays, Carl Crawford</p> |
| <p><b>Performance</b></p> <ul style="list-style-type: none"> <li>Examples: <b>Outside professional management</b> <ul style="list-style-type: none"> <li>Maryland SoccerPlex <b>real grass fields see over 1,000 hours of play per season.</b><sup>13</sup></li> <li>Chesterfield Valley Athletic Complex <b>real grass fields see over 1,000 hours of play per year</b> – soccer/lacrosse<sup>81</sup></li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li><b>Carcinogenic ST<sup>82</sup></b> may yield more hours of activity per year; but <b>athletes pay in damage to bodies and sometimes death.</b><sup>83</sup></li> </ul>   |

<sup>81</sup> Email correspondence with Brian Winka, CSFM 5/2015

<sup>82</sup> <http://www.ehhi.org/chemicals>

## Comparison of Fields

### Natural Grass

#### Management

- **Outside professional** landscaping company builds/manages real grass field **with drainage = successful** and **withstands heavy traffic**, may never need to be resodded.

#### Safety

- **Safer on athletes' bodies.**<sup>84, 85, 86, 87, 88</sup>

"...**grass** appears to be more **'keeper-friendly'**...**easier on the joints and better for diving.**"  
– Whitecaps Goalkeeper, Jay Nolly<sup>55</sup>

"If that **game had been on grass, I guarantee you that Rob and Coby would still be playing right now.**" – Cardinals RB, Michael Pittman<sup>23</sup>

### Synthetic Turf

- Outside professional synthetic turf company builds/manages field with drainage = playable but **carcinogenic field**<sup>82</sup>, must be replaced every 8 years.

- **ACL injuries higher on ST**, at rates of **88% higher**<sup>84, 85</sup> **67%<sup>86</sup> higher** – at least 3 independent studies, confirm.
  - Be aware that Synthetic Turf Council and FieldTurf like to quote biased studies, such as Michael Meyer's, they paid for or just took out of context.
- **More severe**<sup>87</sup>, **22% higher rate of concussions on ST**<sup>88</sup>
- **27% more likely to sustain a lower extremity injury** when the game was played on [synthetic] FieldTurf instead of natural grass.<sup>84, 85</sup>
- **32%<sup>84, 85</sup>, 31%<sup>86</sup> increased risk of an eversion ankle sprain** when playing on FieldTurf
- **22% higher knee sprains** on Field Turf than on natural grass.<sup>86</sup>

"...any guy in the league...that's **played on [synthetic] turf, trained on [it]** for a number of years said it's **taken years off their career.**"

"Over the course of the season, a **lot of injuries occur from playing and training on [synthetic] turf** every week. That's pretty **obvious.**"  
– USNT Forward, Landon Donovan<sup>56</sup>

<sup>83</sup> <http://www.synturf.org/images/AST-Tire-PG-Skin-Injuries-Other-Rev1-20161007.pdf>

<sup>84</sup> <http://www.nfl.com/news/story/09000d5d816e77f1/article/nfl-panel-finds-some-knee-ankle-injuries-more-common-on-turf>

<sup>85</sup> American Academy of Orthopaedic Surgeons Source Reference: Hershman E, et al "American professional football games played on FieldTurf have higher lower extremity injury rates" AAOS 2010; Abstract 692.

<http://www.medpagetoday.com/MeetingCoverage/AAOS/19020>

<sup>86</sup> <http://www.synturf.org/images/sportsmed-036354651245888.pdf>

<sup>87</sup> <http://www.ncbi.nlm.nih.gov/pubmed/11032218>

## Comparison of Fields

### Natural Grass

#### Cost



- Actual costs and studies confirm real grass is cheaper in short- and long-term.<sup>89, 90, 91, 92, 93, 94</sup>
  - Example: Rockwood School District (RSD) could have **saved \$1.7 million in installation year** alone had they chosen real grass! See below for RSD information in costs section.<sup>89</sup>

### Synthetic Turf



- From installations costing \$1-3 million, every 8-year replacements of \$1-2 million, additional ≈\$440,000 in net add-on for choosing PBI like corkonut, to injury and health risks, ST comes out the most expensive in every way.<sup>90, 91, 92, 93, 94</sup>

#### End of Life

- N/A

- 8-12 years, if properly maintained.<sup>93</sup>
  - Tire crumb infill “typically lasts the life of the system (8-12 years).”<sup>93</sup>
  - **PBI, such as corkonut, must be replenished every year.** It “can be warranted for 8 years, but...is not expected to last beyond the warranty.”<sup>93</sup>
- At end of life, synthetic turf carpet and infill must be disposed of properly.
  - **BOTH synthetic turf carpet and infill (tire crumb and PBI, such as corkonut) are sent to a landfill.** It is too cost prohibitive to separate the plastic from the infill.<sup>93, 95</sup>
  - There is both a **cost to dispose of and a cost to replace** the synthetic turf carpet/infill.<sup>93, 95</sup>

<sup>88</sup> [http://www.synturf.org/images/concussion\\_guidelines.pdf](http://www.synturf.org/images/concussion_guidelines.pdf)

<sup>89</sup> <http://www.synturf.org/images/RealThis.pdf>

<sup>90</sup> <http://www.forbes.com/sites/mikeozanian/2014/09/28/how-taxpayers-get-fooled-on-the-cost-of-an-artificial-turf-field/#5f680aaf1bca>

<sup>91</sup> <http://turf.uark.edu/turfhelp/archives/021109.html>

<sup>92</sup> [http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf\\_booklet.pdf](http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf)

<sup>93</sup> <https://lfportal.loudoun.gov/LFPortalinternet/0/doc/199050/Electronic.aspx>

<sup>94</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf)

<sup>95</sup> <http://www.synturf.org/disposal.html>

## Comparison of Fields

### Natural Grass

#### Lead Exposure

- Once bare soil is covered with grass, there is **NO RISK** of lead exposure, even if the soil approached the lead limit.<sup>96, 97</sup>
- Highly doubtful RSD's [prior] grass fields even come close to that amount of lead [limit].<sup>101</sup>

### Synthetic Turf

"Most **existing lead standards fail to protect children.** They provide only an **illusion of safety.**"  
– an author of AAP policy statement "Prevention of Childhood Lead Toxicity", Dr. Jennifer Lowry

"...even low levels of **lead exposure...can cause permanent mental, behavioral and school problems in children.**" – AAP

- Centers for Disease Control (**CDC**) and American Academy of Pediatrics (**AAP**) - **ALL levels of lead are DANGEROUS;** even **low levels** shown to affect IQ, ability to pay attention, and academic achievement. And effects of lead exposure cannot be corrected.<sup>98, 99</sup>
- In 2016 sworn testimony, FieldTurf **admits lead** is still in product.<sup>100</sup>
- **Synthetic turf** fields are the **LARGEST** single source of lead in most towns.<sup>101</sup>
- **Total amount of lead in grams** matters. Turf industry likes to compare other levels of acceptable lead, but this does not account for a **TOTAL** amount of lead.<sup>101</sup>
- Plastic turf fibers can deteriorate to **form dust containing lead** at levels that may pose a **risk to children.**<sup>102, 103</sup>
- **More lead passes through** to children on ST due to frequency of abrasions (**turf burns**).<sup>104</sup>

"Identifying and **eliminating lead sources before exposure** occurs is the **only reliable way to protect children from this danger**". – AAP

<sup>96</sup> Telephone interview, August 3, 2015, EPA Lead Specialist (1-800-424-LEAD)

<sup>97</sup> <http://www.cdc.gov/nceh/lead/tips.htm>

<sup>98</sup> [http://www.cdc.gov/nceh/lead/acclpp/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm)

<sup>99</sup> <http://pediatrics.aappublications.org/content/138/1/e20161493>

<sup>100</sup> <https://www.youtube.com/watch?v=OHpzL9Y7YQw>

<sup>101</sup> Telephone interview, June 11, 2015, Dr. David Brown, Sc.D., public health toxicologist

<sup>102</sup> <http://ehp.niehs.nih.gov/1002239/>

<sup>103</sup> <http://www.cdc.gov/nceh/lead/tips/artificialturf.htm>

<sup>104</sup> <http://www.atsdr.cdc.gov/phs/phs.asp?id=92&tid=22>



## Comparison of Fields

### Natural Grass

#### Respiratory Effects<sup>105</sup>



- Children actually **NEED more REAL GRASS!**
- **More Nature=Healthier Immune, Respiratory Systems**
  - “**Exposure to friendly soil bacteria** could improve mood by **boosting the immune system** just as effectively as antidepressant drugs, a new study suggests...”<sup>106</sup>
  - “...We are proposing that **contact of people, particularly children, with the natural environment and biodiversity could be really important for the development of the immune system**
  - ...Though individuals with allergies lived throughout the study area, the authors found that allergies were tied to the amount of biodiversity around the teenagers' homes; **the more forest and agricultural land, the lower the prevalence of allergies...**” This includes **less asthma.**<sup>107, 108, 109</sup>

### Synthetic Turf



Slice of a lung affected by silicosis

- **ST is FAKE environment and robs children** of necessary nature! In addition, it causes detrimental **respiratory effects.**
  - **Silica sand** is a known carcinogen; used with both PBI such as corkonut, and tire crumb). PBI requires 60-90% silica sand; tire crumb requires 50% silica sand.<sup>93, 110</sup> According to an MSDS<sup>111</sup>:
    - “...**INHALATION:** If inhaled as dust, this product **can cause irritation of the respiratory system** resulting in coughing and/or sneezing. Higher exposures **may cause a build-up of fluid in the lungs** with severe shortness of breath. Inhalation of silica can also cause a **chronic irreversible lung disorder, silicosis. Some medical reports state inhalation of silica dust for prolonged periods may cause lung cancer...**
    - ...Silica sand material contains **fine dust**. If you breathe this dust you **can suffer severe, irreversible lung damage and death.**
    - ...Some medical reports state **inhalation of silica dust may cause lung cancer.** Medical

<sup>105</sup> <https://en.wikipedia.org/wiki/Silicosis>

<sup>106</sup> <http://www.livescience.com/7270-depressed-play-dirt.html>

<sup>107</sup> <http://www.sciencemag.org/news/2012/05/great-outdoors-good-allergies>

<sup>108</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4674907/#CR50>

<sup>109</sup> <https://www.ncbi.nlm.nih.gov/pubmed/10651770>

<sup>110</sup> <http://www.galeassociates.org/wp-content/uploads/2015/03/Alternative-Infills-for-Synthetic-Turf.pdf>

<sup>111</sup> [http://www.synturf.org/images/MDSS\\_June2016.pdf](http://www.synturf.org/images/MDSS_June2016.pdf)

## Comparison of Fields

### Natural Grass

### Synthetic Turf

#### Respiratory Effects

*(continued)*

- reports also link **breathing silica dust to crippling arthritis and skin and eye irritation...**
- You must **never use this material without having a government-approved respirator...**If dusty, use protective goggles...”
  - **OSHA's new limit on crystalline silica is now 5x LOWER because it's such a problem!** Crystalline silica is 100x smaller than beach sand, so more easily inhaled, serious respiratory issue, causes cancer.<sup>112, 113</sup>
    - **“Respirable crystalline silica – very small particles typically at least 100 times smaller than ordinary sand found on beaches or playgrounds – is generated by high-energy operations like...grinding,...or when using industrial sand.”**
    - **“Why is OSHA issuing a new crystalline silica rule? OSHA’s previous permissible exposure limits (PELs) for silica were outdated, inconsistent and did not adequately protect worker health...more recent scientific evidence showing that low-level exposures to silica cause serious health effects, including lung**

<sup>112</sup> <http://www.safetyandhealthmagazine.com/articles/13863-OSHA-releases-long-awaited-final-rule-on-silica>

<sup>113</sup> [https://www.osha.gov/silica/Silica\\_FAQs\\_2016-3-22.pdf](https://www.osha.gov/silica/Silica_FAQs_2016-3-22.pdf)

## Comparison of Fields

### Natural Grass

### Synthetic Turf

#### Respiratory Effects

*(continued)*

**cancer.** In the 45 years since the previous PELs were established, the U.S. National Toxicology Program, the International Agency for Research on Cancer, and the National Institute for Occupational Safety and Health have all identified **respirable crystalline silica as a human carcinogen.**”

- “From 2005 through 2014, silicosis was listed as the underlying or a contributing cause of death on over 1,100 death certificates in the United States, but **most deaths from silicosis go undiagnosed and unreported.** Also, those numbers of **silicosis deaths do not include additional deaths from other silica-related diseases such as COPD, lung cancer and kidney disease.**”
- “While the number of silicosis cases has declined over the past several decades, it is **still a very serious workplace health problem.**”
- American Academy of Pediatricians says “**Buy only natural river sand or beach sand. Avoid products made from crushed limestone, crushed marble, crushed crystalline silica (quartz), other products that are obviously dusty.** When there is doubt, **parents may send a sample to a laboratory to determine whether the sand**

## Comparison of Fields

### Natural Grass

### Synthetic Turf

**contains tremolite or crystalline silica.**

Information about reliable laboratories can be obtained from the EPA Regional and State Asbestos Coordinators...<sup>114</sup>

- **“Athletic Asthma”** – on the Federal Registry created for the Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds 2016, one user noted a high occurrence of what has been named “athletic asthma” – “In the **state of Georgia** there is a limited analysis underway to attempt to grasp the **unusually high level of youth asthma** possibly associated with preschool children playing on playgrounds incorporating [tire crumb] over the last several years, the **same time frame as the increased use of [tire crumb]**. The term "athletic asthma" is becoming far to commonly used by physicians in the Southeast to explain away this increase. The Southeast has been ignored in the sampling process and must be included due to the higher temperature ranges and longer periods experienced in this geographic area...<sup>115</sup>

<sup>114</sup> <https://www.healthychildren.org/English/safety-prevention/at-play/Pages/Safety-in-the-Sandbox.aspx>

<sup>115</sup> <https://www.regulations.gov/document?D=ATSDR-2016-0002-0018>

## Comparison of Fields

### Natural Grass

#### Carcinogens<sup>116, 117</sup>



- N/A

### Synthetic Turf



- **Silica sand** is a known carcinogen; required with both PBI such as corkonut (60-90% silica sand) and tire crumb (nearly 50% silica sand).<sup>93, 110</sup> According to an MSDS<sup>111</sup>:
  - "INHALATION: ... Some medical reports state **inhalation of silica dust for prolonged periods may cause lung cancer...**
  - **CHRONIC EFFECTS / CARCINOGENICITY: Silicosis, cancer, scleroderma, tuberculosis, nephrotoxicity and arthritis** are potential **chronic effects**
  - Some medical reports state **inhalation of silica dust may cause lung cancer**. Medical reports also link **breathing silica dust to crippling arthritis and skin and eye irritation...**
  - **Avoid direct skin contact** with the material...
  - You must **never use this material without having a government-approved respirator...**If dusty, use protective goggles..."
- **Tire crumb** – EHHI's study done at Yale University: "...of the 96 chemicals detected — **a little under a half** have had **never had toxicity assessments** for their health effects. Of the rest, 20% are probable carcinogens."<sup>118</sup>
  - **Contains at least "12 carcinogens:** 2-mercapto-benzothiazole; 9,10-dimethylantracene; Bis(2-ethylhexyl) phthalate; Fluoranthene; Hepta-decane; Phenol, 4-(1,1,3,3-tetramethylbutyl)-; Phenanthrene; Phthalimide; Pyrene; 1-methyl-Tetratriacontane; Pyrene; Carbon Black."

<sup>116</sup> [https://en.wikipedia.org/wiki/File:GHS\\_carcinogen\\_sign.svg](https://en.wikipedia.org/wiki/File:GHS_carcinogen_sign.svg)

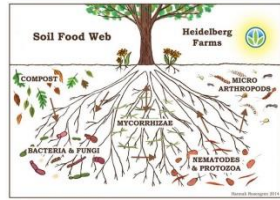
<sup>117</sup> <http://www.synturf.org/silica.html>

<sup>118</sup> <http://www.ehhi.org/chemicals>

## Comparison of Fields

### Natural Grass

**Field Care**<sup>119, 120, 121, 122, 123, 124</sup>



Football field using organic land care (third-party certified).

- **Real grass naturally cleans itself!** "Different types of bacteria serve different purposes in the world of athletic fields. Soils in natural grass fields contain helpful bacteria which **naturally sanitize the surface** by decomposing human body fluids, algae and animal excrements."<sup>125</sup>
- An **organic, systems-based approach** for real grass minimizes the need for inputs and all but eliminates nitrogen runoff.
  - **Organic land care** – "Organic land care is a sustainable ecological landscaping system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-site inputs and on management practices that restore, maintain, and enhance ecological harmony and beauty in urban and suburban landscapes and gardens. "Organic" means landscaping with no synthetic pesticides of any kind (insecticides, herbicides, fungicides, etc.) and with no synthetic fertilizers or soil amendments."<sup>126</sup>

### Synthetic Turf



- "[Synthetic] turf lacks significant populations of these natural cleansers, leaving **the job of sanitation to man-made cleansers**, which then must be flushed to leave the surface safe for athletic play. But other **bacteria, such as that found in sand and [tire crumb] infill** of [synthetic] turf, can **cause infection and even life-threatening health problems**. Because sand and [synthetic] turf has a **lower microbiological activity than soil**, harmful bacteria do not have to compete with beneficial microbes that grow in turfgrass root zones, allowing the **harmful bacteria to multiply to dangerous levels, creating an increased opportunity for dangerous infection...** synthetic fields are virtual **breeding grounds for harmful bacteria** due to the combinations of warmth, moisture, sweat, spit and blood."<sup>125</sup>
- A **variety of unregulated chemicals are sprayed** at factory and **continually** after installation during field life cycle due to: insects, weeds, fungus, **blood, vomit, animal feces**, gum, oil, grease:

<sup>119</sup> <http://heidelbergfarms.com/>

<sup>120</sup> <https://sites.google.com/site/sfparks/silvertermrsa>

<sup>121</sup> <http://www.simpleturf.com/artificial-lawn-turf-maintenance-warranty/>

<sup>122</sup> <http://www.beyondpesticides.org/programs/lawns-and-landscapes/tools-for-change/organic-land-care-training>

<sup>123</sup> <http://www.sportsturf.com/synthetic-turf-is-sustainable/>

<sup>124</sup> <http://www.cbssports.com/college-football/news/plight-of-the-geese-birds-mistake-boise-states-blue-turf-for-a-lake/>

<sup>125</sup> <http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

<sup>126</sup> <http://www.organiclandcare.net/sites/default/files/upload/standards2011.pdf>

## Comparison of Fields

### Natural Grass

#### Field Care

(continued)

- Organic land care is certified through third parties.<sup>127</sup>
  - **Northeast Organic Farming Association (NOFA)** – the accreditation Program for organic land care professionals based on the NOFA Standards for Organic Land Care.
  - **Oregon Tilth** has recently developed a similar organic land care program.
  - **Society for Organic Urban Land Care in Victoria, B.C., Canada**, has developed a Canadian standard for organic land care.

### Synthetic Turf

- Surfactants (at factory, after installed)<sup>128</sup>
- Antistatic liquids (at factory, after installed)<sup>128</sup>
- Field Scrub, industrial cleaner (after installed)<sup>128</sup>
- Gum remover solvent (after installed)<sup>128</sup>
- RoundUp/other herbicides (after installed)<sup>128</sup>
- Moss/Algae Killer (after installed)<sup>129</sup> – this chemical gets an “F” on Environmental Working Group’s site. Reasons include:
  - "EPA's review of industry submitted toxicity data and the potential for human exposure concludes that this substance poses a high risk for human health.
  - Asthmagen (allergic)
  - ...reproductive toxicity in animals."<sup>130</sup>

- **Specific to PBI – ALL of the above, plus:**

- Pesticides for PBI due to attractiveness to insects<sup>93</sup>
- Antimicrobial application (at factory)<sup>131</sup>
- Pre-emergent herbicides (at factory)<sup>131</sup>
- Flame retardants (at factory)<sup>132</sup>
- Antifungal/Antimold agents (at factory)<sup>132</sup>

<sup>127</sup> <http://www.organiclandcare.net/accreditation/standards>

<sup>128</sup> [http://www.fieldturf.com/sites/fieldturf/assets/FT\\_Maintenance%20Guidelines.pdf](http://www.fieldturf.com/sites/fieldturf/assets/FT_Maintenance%20Guidelines.pdf)

<sup>129</sup> <http://www.synturf.org/images/TencateProductAdvisoryMold.pdf>

<sup>130</sup> <http://www.ewg.org/guides/substances/22336-AlkylDimethylbenzylammoniumchloridesC1216>

<sup>131</sup> <http://www.shawsporsturf.com/geofill/>

<sup>132</sup> <http://www.synturf.org/images/US8563099.pdf>

## Comparison of Fields

### Natural Grass

#### Temperatures<sup>133</sup>

- **ALWAYS 35-55 degrees COOLER** than ST, anywhere in the world!<sup>134</sup>



Chesterfield, MO  
Nearby Grass field 111 °F



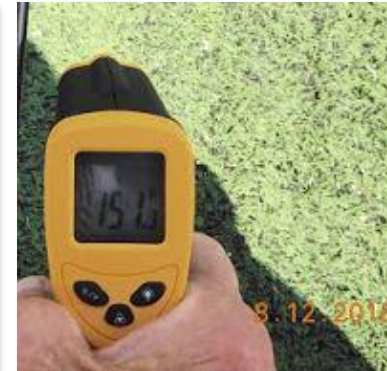
Silver Spring, MD  
Nearby Grass field 84 °F

### Synthetic Turf

- ALLST infills record frequent **140 °F and higher** on **SUNNY days**. Temperatures directly related to the SUN.<sup>134, 135</sup>



Chesterfield, MO  
Synthetic (corkonut) 140 °F



Silver Spring, MD  
Synthetic (tire crumb) 151 °F

#### 2<sup>nd</sup>-3<sup>rd</sup> Degree Burns<sup>136, 137</sup>

- N/A



- **Very HIGH numbers of children suffering 2<sup>nd</sup>-3<sup>rd</sup> degree burns** due to frequent temperatures on **SUNNY DAYS** of 140 °F and higher.<sup>138</sup>

<sup>133</sup> <http://www.synturf.org/images/AST-Temps-TPG-Temps-Rev1-20161007.pdf>

<sup>134</sup> <http://plantscience.psu.edu/research/centers/ssrc/documents/temperature.pdf>

<sup>135</sup> [http://www.synturf.org/images/Devitt\\_et\\_al\\_2008\\_art\\_turf.pdf](http://www.synturf.org/images/Devitt_et_al_2008_art_turf.pdf)

<sup>136</sup> <https://youtu.be/xqmDWtOtKnY>

<sup>137</sup> <https://youtu.be/Dm53frqMLJQ>

<sup>138</sup> <http://www.synturf.org/images/AST-Tire-PG-Skin-Injuries-Other-Rev1-20161007.pdf>



## Comparison of Fields

### Natural Grass

#### Abrasions<sup>138, 139</sup> (Turf Burns)



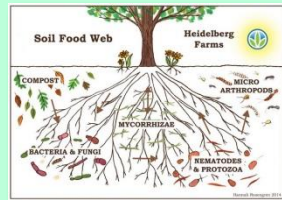
- N/A

#### Melted Shoes<sup>138</sup>



- N/A

#### Staph/MRSA<sup>119, 120, 145</sup>



- N/A
- **Clean surface** – grass roots, thatch and leaves provide a good, clean surface to run and play on.<sup>140</sup>
- Real grass **cleans itself!** Soils in natural grass fields contain helpful bacteria which naturally sanitize the surface by decomposing human body fluids, algae and animal excrements.<sup>141</sup>

### Synthetic Turf



- **Very HIGH numbers of children suffering abrasions.**<sup>138</sup>



It's so hot in Texas, turf is melting cleats



- Several accounts of **melted cleats, water bottle**, even on supposedly cooler synthetic turf system.

- **Blood, sweat, spit, vomit, and animal feces** remain on field unless properly cleaned.
- ST has **ALL risk factors** for Staph/MRSA infections – CDC 5 C's: crowding, frequent skin-to-skin contact, compromised skin (cut, scrape, or rash), contaminated items and surfaces, lack of cleanliness<sup>142</sup>
- **Killing Staph/MRSA**
  - **Takes 140 degrees to kill MRSA.**<sup>143</sup>



Photo Credit: Gregory Miravet, M.D.

<sup>139</sup> [http://www.standifordfamily.com/2010\\_06\\_01\\_archive.html](http://www.standifordfamily.com/2010_06_01_archive.html)

<sup>140</sup> [www.kinnelonconserves.net, Turf\\_Report\\_2015.doc](http://www.kinnelonconserves.net/Turf_Report_2015.doc)

<sup>141</sup> <http://plasticfieldsforever.org/ArtificialTurfBooklet.pdf>

<sup>142</sup> <http://www.cdc.gov/niosh/docs/2013-112/pdfs/2013-112.pdf>

<sup>143</sup> <http://www.sciencedaily.com/releases/2011/10/111003132351.htm>

## Comparison of Fields

### Natural Grass

#### Staph/MRSA

(continued)

- N/A

### Synthetic Turf



- **Only UVC light kills Staph/MRSA.** Ozone blocks this band from sunlight, must use UVC machine to access. Turf industry claim is that sunlight can kill, but this is false.<sup>144</sup>
- **Cleaning methods**
  - **UVC machine** cost, typical school football field is \$14,000.<sup>145</sup>
  - **Chemicals/bleach to kill** – “Irritants to humans. Bad for the environment. Expensive over the longer time period. Very corrosive to metal and synthetic turf fields are full of metal. Not 100% effective.” Disinfectants and cleaners, like bleach, can damage some surfaces, such as metal and plastic.<sup>146</sup>
- **7x risk of Staph/MRSA** for athletes who sustain abrasions (turf burns).<sup>147</sup>

<sup>144</sup> <http://www.sciencedaily.com/releases/2011/10/111003132351.htm>

<sup>145</sup> <http://www.sportsturf.com/trust-the-center-for-disease-control-when-it-comes-to-facts-about-mrsa-and-staph/>

<sup>146</sup> <http://www.staph-infection-resources.com/prevention/infection-control/>

<sup>147</sup> <http://cid.oxfordjournals.org/content/39/10/1446.full>

## Comparison of Fields

### Natural Grass

#### Staph/MRSA

(continued)

- N/A

### Synthetic Turf

- **PBI, such as corkonut, is even NASTIER than we thought when it comes to Staph/MRSA!**<sup>148, 149</sup>
  - "This study looked the survivability of methicillin-resistant staphylococcus aureus (MRSA) on turf infill (rubber, sand, organic, or polymer materials), and turf fibers (monofilament, slit-film or nylon turf blades), and the toxicity of infill materials to MRSA. MRSA was measured as the incubation time in which 50% of the inoculated MRSA are still viable (A50). **MRSA persisted longer in infill (A50 = 13hr)** vs turf fibers (A50 = 4hr, p<0.05). A50 for crumb rubber was 13hr. The role of infill toxicity to the MRSA A50 was assessed using a dialysis assay, which showed that **94% of MRSA cells remained viable following 6 h of exposure to organic infill, 91% for sands, 79% for polymer coated materials, 71% for crumb rubber, 68% for TPE rubber, and 17% for EPDM rubber. Conclusion: MRSA survived less in crumb rubber materials than other fill materials such as sand/organic.**"
- **Baltimore, MD.: Morgan State Football Coach makes connection between turf field and higher incidence of MRSA among his players.** In a news report by The Baltimore Sun, Donald Hill, the football coach of Morgan

<sup>148</sup> [https://www.epa.gov/sites/production/files/2016-12/documents/federal\\_research\\_action\\_plan\\_on\\_recycled\\_tire\\_crumb\\_used\\_on\\_playing\\_fields\\_and\\_playgrounds\\_status\\_report.pdf](https://www.epa.gov/sites/production/files/2016-12/documents/federal_research_action_plan_on_recycled_tire_crumb_used_on_playing_fields_and_playgrounds_status_report.pdf)

<sup>149</sup> <http://utdr.utoledo.edu/cgi/viewcontent.cgi?article=1137&context=theses-dissertations>

## Comparison of Fields

### Natural Grass

### Synthetic Turf

#### Staph/MRSA

(continued)

State University is quoted at length about **his efforts last year to stamp out staph infection among his players.**

Hill said, “I’d seen maybe **one or two staph infections in all my time** in football. But **three years ago, we put down a new synthetic turf on our football field**, and we began to have **three to four cases a week.**” In response, Hill disinfected the showers, disinfected the equipment, made sure the uniforms were washed daily and still he could not stop the infections from occurring. “We went from hugging to a nice wave,” Hill said, “Players didn’t want to touch each other. It wasn’t until our trainer, Todd Smith, said **he was going to try to disinfect the field that we got it under control.**” “Athletes are prime candidates for the infection because they come in contact with [synthetic] surfaces that retain germs, they share exercise equipment, showers and locker rooms, and when on the field or court, they come in contact with other players,” according to the Baltimore Sun.<sup>150</sup>

- **Weber State study debunks Penn State study**

<sup>150</sup> [http://articles.baltimoresun.com/2008-08-19/sports/0808180269\\_1\\_staph-infection-staphylococcus-prevent-the-infection](http://articles.baltimoresun.com/2008-08-19/sports/0808180269_1_staph-infection-staphylococcus-prevent-the-infection)

## Comparison of Fields

### Natural Grass

Staph/MRSA  
(continued)

- N/A

### Synthetic Turf

| Comparison of Studies            |  |  |
|----------------------------------|--|--|
|                                  | Weber State <sup>151</sup>   | Penn State <sup>152</sup>  |
| Conflicts of Interest            | <ul style="list-style-type: none"> <li>• No</li> </ul>   | <ul style="list-style-type: none"> <li>• Yes.                             <ul style="list-style-type: none"> <li>○ Funded by the Synthetic Turf Council</li> <li>○ Penn State has a partnership with FieldTurf.<sup>153</sup></li> </ul> </li> </ul>   |
| Conclusions                      | <ul style="list-style-type: none"> <li>• <b>“104 increase in microbial populations (such as Staph/MRSA) in older ST versus newer ST; accumulate over time if not properly cleaned.”</b></li> <li>• <b>ST “infill material source for spread of pathogens among student athletes.”</b></li> </ul> | <ul style="list-style-type: none"> <li>• "... generally lower numbers of total microbes present in the infill or fibers of the synthetic turf systems tested compared to natural turfgrass rootzones..."</li> <li>• “Staphylococcus aureus bacterium were found on towels and other devices used by athletes.”</li> </ul>  |
| Sample Size                      | <ul style="list-style-type: none"> <li>• 10 grams</li> </ul>   | <ul style="list-style-type: none"> <li>• 0.075 grams</li> </ul>  |
| Collection Time Frame of Samples | <ul style="list-style-type: none"> <li>• Once a week for 14 weeks. Very controlled samples.</li> </ul>   | <ul style="list-style-type: none"> <li>• 15 days, June only.</li> </ul>  |
| Location of Samples              | <ul style="list-style-type: none"> <li>• Three locations and same locations on both new and old field being sampled: Sideline, 50-yard Line, End of field</li> </ul>   | <ul style="list-style-type: none"> <li>• “High Use” and “Low Use” areas.</li> </ul>  |
| Time of Study                    | <ul style="list-style-type: none"> <li>• <b>Height of the Actual Football Season</b> when the fields were in use.</li> </ul>   | <ul style="list-style-type: none"> <li>• Height of Summer when field temperatures were at the peak.</li> </ul>   |
| Faulty Testing Methods           | <ul style="list-style-type: none"> <li>• N/A</li> </ul>  | <ul style="list-style-type: none"> <li>• Very small sample size</li> <li>• Testing when fields not in use and at peak temperatures</li> <li>• Small amount of days tested</li> <li>• Testing areas undefined</li> <li>• Shortened agitation times for the samples (means less chance for full discovery of Pathogens; see study.)</li> <li>• Penn State-Failed to Isolate S. Aureus (Staph) on samples.</li> </ul> |

<sup>151</sup> <http://skyline.bigskyconf.com/journal/vol1/iss1/1/>

<sup>152</sup> <http://plantscience.psu.edu/research/centers/ssrc/research/microbial>

<sup>153</sup> <http://www.syntheticurfCouncil.org/?page=Research>

## Comparison of Fields

### Natural Grass

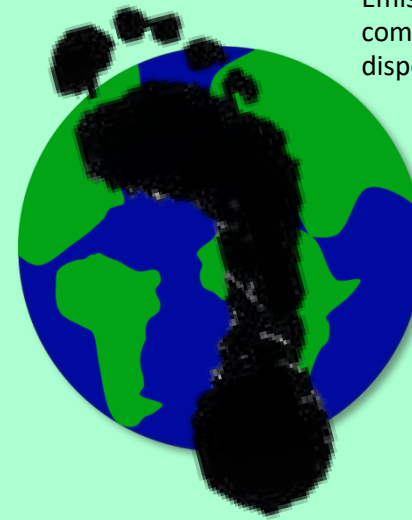
#### CO<sub>2</sub> Footprint

- **ABSORBS 16.9 tons of CO<sub>2</sub>**<sup>154, 155</sup>
- It slows water infiltration to **recharge water tables**; it **allows healthy ecosystem exchange** among roots, bacteria, soil, and water.<sup>156</sup>



### Synthetic Turf

- **EMITS 55.6 tons of CO<sub>2</sub>**<sup>154</sup>
- **1,861 trees must be planted** every 10 years to offset carbon emissions<sup>154</sup>



Emissions consider project life cycle: production of the main components of the [synthetic] turf system, use and maintenance, disposal phase (recycling), transportation<sup>154</sup>

<sup>154</sup> [http://www.athensmi.org/wp-content/uploads/2012/01/UCC\\_project\\_ATHENA\\_technical\\_paper.pdf](http://www.athensmi.org/wp-content/uploads/2012/01/UCC_project_ATHENA_technical_paper.pdf)

<sup>155</sup> <http://www.lawnandlandscape.com/article/ll-090115-opei-living-landscapes/>

<sup>156</sup> [http://www.water.ca.gov/wateruseefficiency/landscapeordinance/pubcomments/Jurgen%20Gramckow/0571\\_0001.pdf](http://www.water.ca.gov/wateruseefficiency/landscapeordinance/pubcomments/Jurgen%20Gramckow/0571_0001.pdf)

## PBI General Information

### Brands

- Geofill (coconut husks/ fibers) – made by Italgreen S.p.A. (Italy) offered exclusively by Shaw Sports Turf.<sup>157, 158</sup>
- GreenPlay (cork, coconut husks = corkonut) – FieldTurf, other fields<sup>159</sup>
  - **Prior Names of Company** – GeoTurf USA, Limonta Sport USA. "GeoTurf USA, the distributor of Limonta Sport products in the United States... GeoTurf USA is the market brand of Limonta Sport USA since 2007 for the distribution of Limonta Sport products in the USA."<sup>160</sup> GreenPlay (formerly GeoTurf USA, a market brand of Limonta Sport USA, prior to July 2015).<sup>161, 162</sup>
  - **Infills** - InfillPro NB/InfillPro Geo/InfillPro Geo Plus international patent PCT/IB2009/007271, now called GreenPlay (infill is named GreenPlay or G20 or G2O, listed as Generation 2).<sup>160</sup> Towards end of trilingual document, it states that the composition is 37.8% sand, 52.8% InfillPro Geo Plus. Below that it states, "90.6% natural products, 9.4% artificial."<sup>163</sup>
  - **Development** - Limonta worked with Ce.RTES which translates to the Sports Turfgrass Research Center of the Univ. of Pisa. "Limonta Sport Italy has availed itself of the collaboration of Ce.RTES, Sports Turfgrass Research Center of the University of Pisa and the indications provided by the experience of the Commission Sport center in Grass Artificial FIGC LND."<sup>164</sup>
- PureFill (cork) – FieldTurf<sup>165</sup>

### False Advertising

- **A variety of chemicals are sprayed** at factory and **regularly** after installation during field life cycle due to: insects, weeds, fungus, **blood, vomit, animal feces**, gum, oil, grease. See chemical treatments listed below in table.
- **Deceptive marketing material** confuses consumers. Communities are told they have an option to purchase "organic corkonut infill." However, this infill is not certified by the USDA or any third party as organic, and is **totally unregulated**.

<sup>157</sup> <http://www.shawsportsturf.com/geofill/>

<sup>158</sup> <http://www.shawsportsturf.com/shaw-sports-turf-announces-partnership-to-distribute-geofill-organic-infill-systems/>

<sup>159</sup> <http://www.greenplayusa.com/>

<sup>160</sup> [http://www.csrwire.com/press\\_releases/37744-Organic-Infill-Replaces-Car-Tires-in-Turf](http://www.csrwire.com/press_releases/37744-Organic-Infill-Replaces-Car-Tires-in-Turf)

<sup>161</sup> <https://www.linkedin.com/in/domenic-carapella-89466824>

<sup>162</sup> <http://www.greenplayusa.com/>

<sup>163</sup> <https://www.kunstgraes.dk/images/pdf/infillgeopro.pdf>

<sup>164</sup> <https://translate.google.com/translate?hl=en&sl=it&u=http://www.sportindustry.com/site/Home/SportFitness/Sceltipervoi/articolo1006387.html&prev=search>

<sup>165</sup> <http://www.fieldturf.com/it/purefill>

*Choosing PBI means using an **expensive and controversial** product that requires the **use of carcinogens and many chemicals**, in addition to being a **respiratory risk**. It means a headlong rush into other dangers with multiple and unknown angles.*

## Overview of Risk Areas for Plant-Based Infills (PBI)

PBI presents many significant risks:

- Risk to players' entire bodies, from feet to brains and every system in between.
- Risk to local budgets – from installation and purchase of equipment etc., to ongoing, cyclical costs of maintenance and replacement; such an obligation creates a substantial opportunity cost.
  - “Greater upfront investment than crumb rubber”<sup>180</sup>
  - “Requires use of pad; requires more maintenance than traditional [tire] crumb fields”<sup>180</sup>
  - “Requires an annual top-off of one to two supersacks, at an annual materials cost of approximately \$2,500-\$4,200 per year”<sup>110, 180</sup>
- Risk to insurance rates and policies of ST field owners and managers. Liability law is catching up with evolving technology and its risk profile, as happens for any product with changing and unregulated components.



## Other PBI Observations

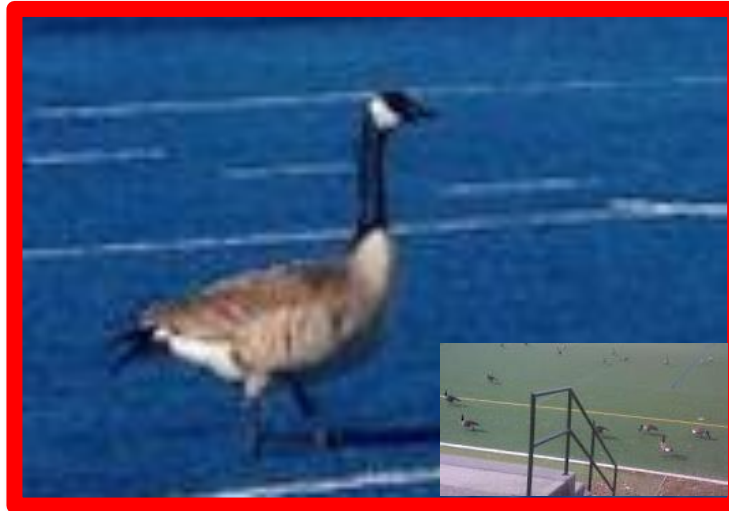
Synthetic turf:

- It is just that: synthetic. Fake.
- PBI comes with its own risks.
  - Known issues similar to tire-infill (high temperatures, inhalation risks, lack of regulation, undisclosed chemical additives, etc.).
  - Numerous unknown issues that have not been reliably measured, pro or con, by reliable, third party researchers or analysts.
  - No long-term study on the effects of children inhaling chemical-laced PBI has ever been conducted by anyone.
  - Poses this critical question: are we willing to take the risk posed by this non-uniform, variable toxic mix, over time, in high heat, on our children?
  - PBI floats readily during storm events (much easier than rubber infills, which also float), fouling waterways with suspended solids (TSS) and nutrients, plus any binders/adhesives and biocides/antifungals, etc., used on the field.



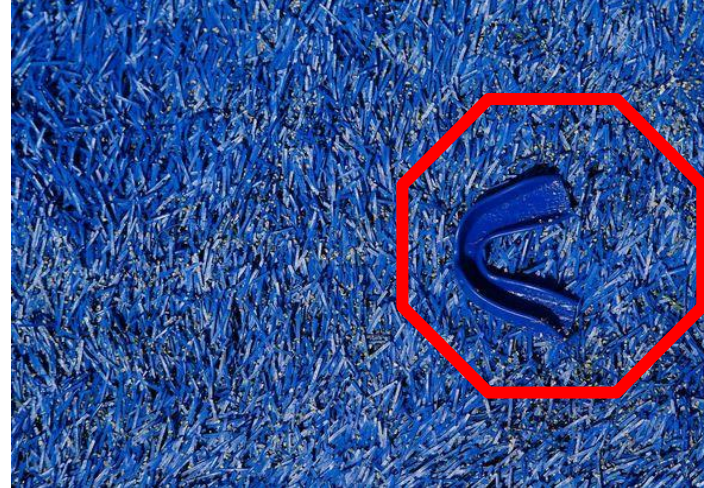


**Dangers to Health that Can Be Seen**



Some of the dangers of synthetic turf you can see; some you cannot. The following are photographic evidence of what is happening to our children on synthetic turf fields, including those with plant-based infill (PBI). **From chemical treatments deemed high risk for human health by EPA to deep abrasions to 2<sup>nd</sup> and 3<sup>rd</sup> degree burns, our children are suffering on synthetic turf! Let us end this madness!**

***The EW GROSS! Factor and Chemical Treatments Used***



**Questions: does synthetic turf remain dirty, full of germs even after these chemicals are sprayed? How can we know? Do we want our children to take these risks?**<sup>120, 123, 124, 166, 167</sup>



<sup>166</sup> <https://www.instagram.com/p/BJE0J2mgQFH>

<sup>167</sup> <https://shop.tjb-inc.com/professional-broad-spectrum-algaecidefungicide-for-moss-mildew-mold--algae-for-synthetic-turf-p1030.aspx>



**2<sup>nd</sup>-3<sup>rd</sup> Degree Burns**

**Synthetic turf = synthetic turf. Even with PBI, such as corkonut, children remain at risk for 2<sup>nd</sup>-3<sup>rd</sup> degree burns due to extreme temperatures.<sup>168</sup> Question: why would we allow this?**

**2<sup>nd</sup>-3<sup>rd</sup> Degree Burns Suffered on Synthetic Turf Fields and Tire Playgrounds**

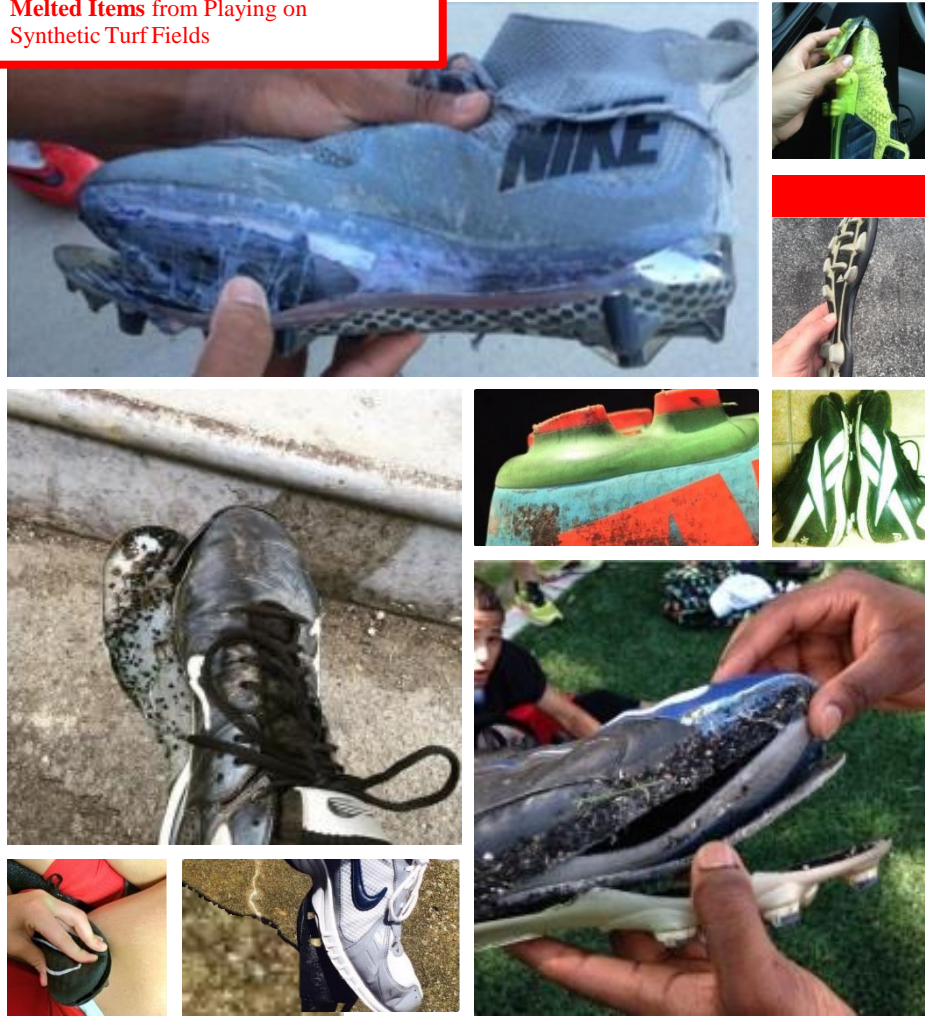


**Melted: Cleats, Synthetic Turf Fibers and a Thick Water Bottle**

ALL infills of synthetic turf, including PBI, such as corkonut, create extreme temperatures to cause cleats, synthetic turf fibers, and thick water bottles to melt. **Synthetic turf = synthetic turf.**

**Questions: when synthetic turf gets hot enough to melt cleats, its own fibers and thick water bottles, what is it doing to children's bodies? What is it doing to their spirits?**<sup>168, 169</sup>

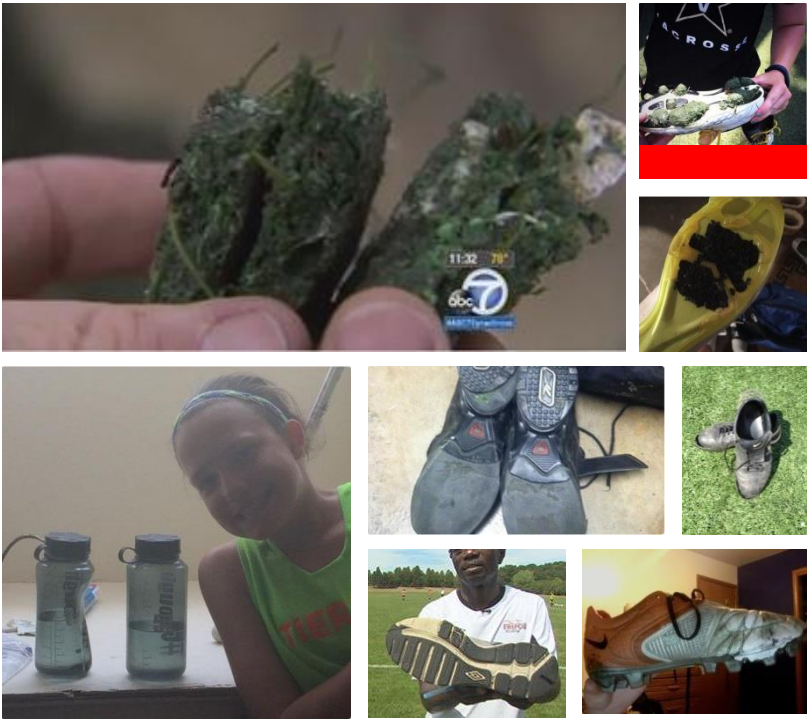
Melted Items from Playing on Synthetic Turf Fields



GS = Georgia Southern University  
 SHS = Statesboro High School

The picture at right describing the three **melted/exploded shoes** on a new system called HydroChill. **What a waste of money!**

Synthetic turf is **still extremely hot no matter the infill, or even contraptions.**



<sup>169</sup> [http://www.thegeorgeanne.com/sports/article\\_68428670-cebc-11e5-934a-9fda6d983a74.html](http://www.thegeorgeanne.com/sports/article_68428670-cebc-11e5-934a-9fda6d983a74.html)

## Temperatures

**SYNTHETIC TURF**  
**Skin Injury References**

**EXPOSED SKIN/BODY EFFECTS**

\*MSHSAA Guidelines  
\*\*Universities like BYU: athletic fields unusable above 120° F.

**105 °F\*** (heat index)  
cancel sport  
115 °F  
burns, heat stroke

**122 °F\*\***  
<10 MINUTES  
injure/burn  
131 °F  
2nd degree burn  
>120 °F scalds

**140 °F**  
3 SECONDS  
2nd degree burn  
5 SECONDS  
3rd degree burn

**162 °F**  
human tissue  
destroyed on  
contact,  
may cause  
nerve damage

### Sources:

[https://www.mshsaa.org/Media/Default\\_News\\_Media%20Information\\_content.aspx?viewmode=story&storyid=2](https://www.mshsaa.org/Media/Default_News_Media%20Information_content.aspx?viewmode=story&storyid=2)

<https://www.reference.com/health/temperature-human-skin-burn-82a1af6b1322b289>

<https://www.nist.gov/%3Cfront%3E/fire-dynamics>

[http://www.mountsinai.org/static\\_files/MSMC/Files/Patient%20Care/Children/Childrens%20Environmental%20Health%20Center/Fact%20Sheet%20-%20Back%20to%20School%20QA.pdf](http://www.mountsinai.org/static_files/MSMC/Files/Patient%20Care/Children/Childrens%20Environmental%20Health%20Center/Fact%20Sheet%20-%20Back%20to%20School%20QA.pdf)

[http://www.synturf.org/images/Devitt\\_et\\_al\\_2008\\_art\\_turf.pdf](http://www.synturf.org/images/Devitt_et_al_2008_art_turf.pdf)

<http://lasvegassun.com/news/2009/jan/15/fake-grass-has-drawback-it-gets-too-hot-study-says/>

[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwiGnr20q4bPAhXHGz4KHVATCd4QFggIMAE&url=http%3A%2F%2Fwellesley.ma.gov%2Fpages%2FWellesleyMA\\_SpragueResources%2FSynthetic%2520Surfaces%2520Heat%2520Study.doc&usq=AFQjCNHUko4eAocdC79J83YAs-0MFP\\_1Jw&cad=rja](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwiGnr20q4bPAhXHGz4KHVATCd4QFggIMAE&url=http%3A%2F%2Fwellesley.ma.gov%2Fpages%2FWellesleyMA_SpragueResources%2FSynthetic%2520Surfaces%2520Heat%2520Study.doc&usq=AFQjCNHUko4eAocdC79J83YAs-0MFP_1Jw&cad=rja)

<http://www.npr.org/templates/story/story.php?storyId=93364750>

<http://emergencynurse-community.blogspot.com/2009/05/burns-thermal.html>

Below are **actual recorded temperatures of FieldTurf synthetic turf with GreenPlay (corkonut infill)** taken July through September 2016 at Rockwood School District: Lafayette High School in Wildwood, Missouri and Marquette High School in Chesterfield, Missouri.

Corkonut marketing materials cite temperatures based on testing typically conducted on the infill with heat lamps. As Dr. Brown noted above, the sun can burn you, but heat lamps cannot. Studies have shown that field temperatures are directly related to sunlight being present. In addition, these studies ignore the plastic grass carpet (made of petrochemicals), a major contributor to the extreme temperatures, regardless of the infill.<sup>134, 135</sup>

What the following recorded temperatures mean to parents/children:

- Sports in Missouri are **CANCELED at a heat index of 105 °F.**
- ST Fields at temperatures of:
  - **115 °F and higher** are known to cause **burns and heat stroke.**
  - **120 °F and higher canceled sports** on ST at universities.
- ALL recorded temperatures of FieldTurf with GreenPlay (corkonut) infill reached:
  - **115 °F and higher** except one.
  - **122 °F and higher** except two.
  - **EVERY TIME** when children were noted as playing on these fields while recording temperatures (age 6, high school), they were **at risk for 2<sup>nd</sup>-3<sup>rd</sup> degree burns and heat stroke!** Temperatures included **125 °F, 140 °F and 136 °F!**

**Actual recorded temperatures of FieldTurf with PBI, GreenPlay (corkonut) infill, remain extremely HIGH!** Temperatures translate to increased risk of 2<sup>nd</sup>-3<sup>rd</sup> degree burns and heat-related illness!

**Lafayette High School** (No pictures available)

7/2016

Kids around 6 years old playing soccer

Air Temp = 84 °F

Grass = 98 °F

FT w/ GP = **125 °F**

Asphalt = 135 °F

**NOTE:** Grass fields are in poor shape, maintained by school staff only. Licensed agronomist notes that grass field temperatures would be even lower if grass was in good condition.

**Lafayette High School**

7/2016



**Lafayette High School**

7/2016



Marquette High School (kids playing at Lafayette)  
7/2016



Grass = 111 °F



FieldTurf with GreenPlay  
(corkonut) = 140 °F

Air Temp = 97 °F



Asphalt = 148 °F

Marquette High School (kids playing)  
9/2016

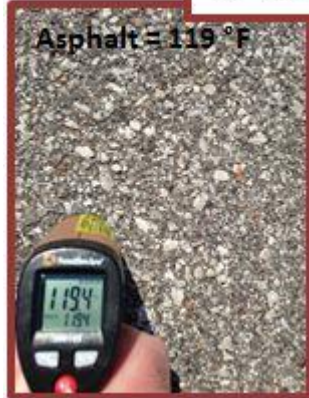


Grass = 97 °F



FieldTurf with GreenPlay  
(corkonut) = 136 °F

Air Temp = 79 °F



Asphalt = 119 °F



130 °F

Marquette High School  
8/2016



Grass = 100 °F



FieldTurf with GreenPlay  
(corkonut) = 120 °F

Air Temp = 82 °F



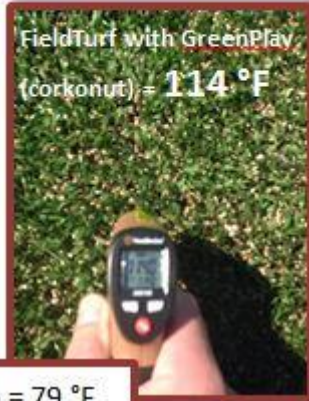
Asphalt = 131 °F



116 °F

**NOTE:** Grass fields are in poor shape, maintained by school staff only. Licensed agronomist notes that grass field temperatures would be even lower if grass was in good condition.

**Marquette High School**  
9/2016



Air Temp = 79 °F



**Marquette High School**  
9/2016



Air Temp = 87 °F



**NOTE:** Grass fields are in poor shape, maintained by school staff only. Licensed agronomist notes that grass field temperatures would be even lower if grass was in good condition.



**Pictures of Floating/Migrating PBI Illustrating Injury Risk: Concussions**

Infill is meant to cushion the fall for athletes. Enough infill must be maintained in order to keep athletes safe from concussions. The less infill, the more dangerous it becomes. The pictures below illustrate how after rain events, PBI is displaced and leaves athletes at higher risk for concussions. At least one field is no longer playable.<sup>170, 171</sup>



“This is what happens to cork infill after you get 2” of rain in 20 min! [#itfloats](#) [#syntheticturf](#) [#fieldexperts](#)”



“Six-month-old synthetic turf field with Geo infill made of coconut peet after rain storm, Italy, 2009”



“Six-month-old synthetic turf field with Geo infill made of coconut peet after rain storm, Italy, 2009



“Second field synthetic turf field, **no longer playable, requires complete refurbishing after same rain storm**”



“Second field synthetic turf field, **no longer playable, requires complete refurbishing after same rain storm**”

<sup>170</sup> <https://mobile.twitter.com/niceturf/status/748972283964731392>

<sup>171</sup> <https://youtu.be/Fzx-TGHnXSI>

## Dangers to Health: Plant-Based Infills (PBI): Cork, Coconut, Corkonut Infills

### Carcinogenic/Respiratory



- PBI infill, silica sand and the synthetic turf fibers/field components are ALL respiratory risks.<sup>101, 110, 111, 180</sup>
- PBI requires 60-90% silica sand.<sup>93, 110</sup>
- **Experimental product:**
  - NOT regulated as a children’s product.
  - NO respiratory testing has been conducted on corkonut infill.
  - NO studies of long-term effects of runoff conducted.
  - Biased current studies; paid for or conducted by industry.

### Silica Sand

#### Carcinogenic

- Silica sand is exposed due to thinness of the layers, cleats digging in and just general friction of play.
- “CSPC [sic] currently has no standards or labeling requirements regarding the source or content of sand.”<sup>114</sup>
- Silica sand is a **known carcinogen**. According to an MSDS for silica sand<sup>111</sup>:
  - "INHALATION: ... Some medical

#### Respiratory

- American Academy of Pediatrics says “Buy only natural river sand or beach sand. Avoid products made from crushed limestone, crushed marble, crushed crystalline silica (quartz), other products that are obviously dusty. When there is doubt, parents may send a sample to a laboratory to determine whether the sand contains tremolite or crystalline silica. Information about

### Corkonut Materials

#### Respiratory

- Cork infill is made from cork oak tree.<sup>172</sup> Infills such as corkonut also use coconut coir.
- Inhalation of cork dust can cause **hypersensitivity pneumonia** (alveolitis), which could lead to **permanent lung scarring** (fibrosis).<sup>173</sup>
- **Granulated Cork MSDS** - "Manual or mechanical handling can result in the generation of cork dust. Cork dust can cause nasal dryness, irritation and obstruction...Inhalation: Remove to fresh air. Get medical advice if persistent irritation or breathing difficulty occurs."<sup>174</sup>
- **Coconut Coir MSDS** - "Nuisance dust may require use of dust mask and safety glasses. Gloves are recommended...Routes of Entry: Inhalation / Skin / Ingestion...Emergency and First Aid Procedures: ...Ingestion can cause nausea or vomiting. If ingested, give large amounts of water and call a physician...Waste Disposal Method: ...Disposal in waterways or sensitive areas should be avoided...Other Precautions: Proper precautions are advised

<sup>172</sup> <http://www.fieldturf.com/media/W1siZiIsIjwMTUvMDEvMTQvMTcvMjEvMDgvMzc3L0ZpZWxkVHVyZi9QdXJlZmlsbF9Ccm9jaHVyZS5wZGYiXV0/FieldTurf%20Purefill%20-%20Brochure.pdf>

<sup>173</sup> [http://publichealth.uic.edu/sites/default/files//public/documents/great-lakes/other/HARTS\\_library/woodhazards.txt](http://publichealth.uic.edu/sites/default/files//public/documents/great-lakes/other/HARTS_library/woodhazards.txt)

<sup>174</sup> [http://www.capricork.com/wp-content/uploads/2011/10/UC210\\_MSDS\\_Composition\\_Cork.pdf](http://www.capricork.com/wp-content/uploads/2011/10/UC210_MSDS_Composition_Cork.pdf)

## Dangers to Health: Plant-Based Infills (PBI): Cork, Coconut, Corkonut Infills

reports state inhalation of silica dust for prolonged periods may cause lung cancer...

- o CHRONIC EFFECTS / CARCINOGENICITY: Silicosis, cancer, scleroderma, tuberculosis, nephrotoxicity and arthritis are potential chronic effects...
- o Some medical reports state inhalation of silica dust may cause lung cancer. Medical reports also link breathing silica dust to crippling arthritis and skin and eye irritation...
- o Avoid direct skin contact with the material..."

reliable laboratories can be obtained from the EPA Regional and State Asbestos Coordinators..."<sup>114</sup>

- Silica sand is a **respiratory risk**.
- According to an MSDS for silica sand<sup>111</sup>:
  - o "INHALATION: If inhaled as dust, this product can cause irritation of the respiratory system resulting in coughing and/or sneezing. Higher exposures may cause a build-up of fluid in the lungs with severe shortness of breath. Inhalation of silica can also cause a chronic irreversible lung disorder, silicosis..."
  - o Silica sand material contains fine dust. If you breathe this dust you can suffer severe, irreversible lung damage and death.
  - o You must never use this material without having a government-approved respirator...If dusty, use protective goggles..."

to prevent infection of open wounds, inhalation of excessive amounts of dust, eye irritation and ingestion...Respiratory Protection (Specify): Standard respirator for dust...Protective Gloves: Ordinary work gloves or rubber gloves. Eye Protection: Safety glasses as needed..."<sup>175</sup>

- Children will be inhaling fine particles from PBI and other from the breakdown of the field, which is toxic. Even "resilient particulate matter" including "SBR or thermoplastic elastomers" can be mixed into PBI.<sup>132</sup>
- "Studies have indicated that low-solubility ultra fine particles are more toxic than larger particles on a mass for mass basis. Because of their tiny size, they can get deep into the lungs and, once in the bloodstream, may be able to cross the blood-brain barrier. Particles deposited in the nasal region may be able to enter the brain by translocation along the olfactory nerve. Particles, especially composites, may be able to penetrate the skin, and even some protective equipment. The smaller the particle, the more likely it is to be suspended in air, and hence, be available for inhalation/ingestions."<sup>176</sup>
- PBI field particulate can be inhaled with every direct and possibly each indirect use. Poured, granulated field surfaces that are loose, unencapsulated and pulverized (high surface area that gets more pulverized/become higher surface area as it is pounded by feet and weathering) must be assumed to be inhaled, or available to be inhaled by all players.<sup>111, 174, 175</sup>
- Every use, direct or indirect, presents inhalation or ingestion risk. Direct contact like player use presents exposure risk with each contact, but so does indirect contact, say to spectators or even possibly in the hallway of a school where the material was dragged in by clothing or contact.
- Cork absorbs polychlorinated biphenyl (PCBs).<sup>177, 178</sup>
- PBI can break down plastic grass carpet exacerbating plastic particulate exposure risk: some of the PBI materials have characteristics that enhance the breakdown of the plastic carpet rug (tiny pieces get plastic/latex torn off, and they get sharp; corkonut is sharp to

<sup>175</sup> <https://www.groworganic.com/media/pdfs/pso110-m.pdf>

<sup>176</sup> <http://www.ehs.gatech.edu/chemical/nanotechnology.doc>

<sup>177</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3066656/>

<sup>178</sup> <http://www.toxipedia.org/display/toxipedia/PCBs>

## Dangers to Health: Plant-Based Infills (PBI): Cork, Coconut, Corkonut Infills

- **OSHA's new limit on crystalline silica is now 5x LOWER because it's such a problem!** Crystalline silica is 100x smaller than beach sand, so more easily inhaled, serious respiratory issue, causes cancer.<sup>112, 113</sup>

begin with unless consistently irrigated), thereby increasing the plastics getting worn down, and releasing more particulate to exposure zone.<sup>111</sup>

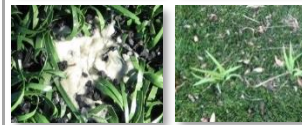
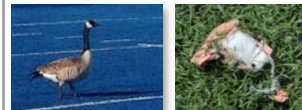
- Plastic rug presents inhalation and ingestion risk. Plastic particulate from the synthetic "grass" can be inhaled and ingested, presenting several types of plastics (styrenes, 1,3-butadiene, benzothiazoles, and others), and several types of metals (lead, chromium, cadmium have been found) that are used in the coloring of the "grass." There is at least 50 tons of plastic "grass" carpet in each field.<sup>110, 180</sup>
- Children should avoid plastic particulate exposure, the subject of several endocrine disruption fields of intense study. Children, particularly prepubescent females, appear likely to be at higher risk.<sup>179</sup>

### Abrasive Materials = Lead Exposure

"Most **existing lead standards fail to protect children.** They provide only an **illusion of safety.**" – an author of AAP policy statement "Prevention of Childhood Lead Toxicity", Dr. Jennifer Lowry

- ALL synthetic turf fields contain lead. CDC, AAP state all levels of lead, including low levels, are dangerous.<sup>98, 99</sup>
- Silica sand highly abrades synthetic turf fibers<sup>110, 180</sup>, thereby further exposing children to lead, in addition to the friction from play.
- "Silica sand is often used for synthetic turf ballast. It comes from multiple quarries throughout the country, contributing to its low cost. Silica sand is often used in combination with other performance infills."<sup>180</sup>
- "Does not absorb shock (must be used with a pad or shock absorbing infill)."<sup>180</sup>
- "Compacts. If used in too great a quantity without a pad, will negatively impact shock absorption as it hardens."<sup>180</sup>
- "No real benefits aside from ballast."<sup>180</sup>

### Chemical Treatments



- A variety of chemicals are sprayed at factory and continually after installation during field life cycle due to: insects, weeds, fungus, blood, vomit, animal feces, gum, oil, grease:
  - Surfactants (at factory, after installed)<sup>128</sup>
  - Antistatic liquids (at factory, after installed)<sup>128</sup>
  - Field Scrub, industrial cleaner (after installed)<sup>128</sup>
  - Gum remover solvent (after installed)<sup>128</sup>
  - RoundUp /other herbicides (after installed)<sup>128</sup>
  - Moss/Algae Killer (after installed)<sup>129</sup>
- Specific to PBI – ALL of the above, plus:
  - Pesticides due to attractiveness to insects (possible at factory, after installed)<sup>93</sup>
  - Antimicrobial application (at factory)<sup>131</sup>
  - Pre-emergent herbicides (at factory)<sup>131</sup>
  - Flame retardants (at factory)<sup>132</sup>
  - Antifungal/Antimold agents (at factory)<sup>132</sup>

<sup>179</sup> <https://www.niehs.nih.gov/health/topics/agents/endocrine/>

<sup>180</sup> <http://www.astroturf.com/products/infill/>

## Dangers to Health: Plant-Based Infills (PBI): Cork, Coconut, Corkonut Infills

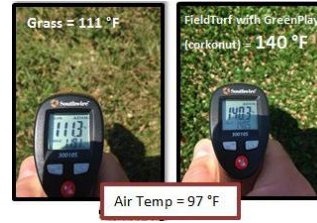
### Injury Risk

"...any guy in the league...that's played on [synthetic] turf, trained on [it] for a number of years said it's taken years off their career."

"Over the course of the season, a lot of injuries occur from playing and training on [synthetic] turf every week. That's pretty obvious."<sup>56</sup>  
 – USNT Forward, Landon Donovan

- Enough infill must be maintained in order to reduce risk of concussions.
- Concerns of PBI include:
  - No track record for durability<sup>93</sup>
  - "Potential break down of the organic material"<sup>93</sup>
  - "Compaction of material over time"<sup>93</sup>
  - "Low UV stability"<sup>93</sup>
  - "Degrades early"<sup>93</sup>
  - "Particles float"<sup>93</sup>
  - "Stays hard under frozen conditions"<sup>93</sup>
  - Migrating infill causes annual replacement of 3.5 Tons! Only G-max testing can determine if there's enough infill to maintain safety levels.
  - Is field safe for concussions near end of year, close to time of replenishment?
  - No third-party objective data on PBI fields' hardness. Professional leagues require G-max (hardness) testing: the NFL performs this on every field before every game, in dozens of spots. A high score means the game is cancelled or at least delayed until remediation (= \$\$ and time).

### 2<sup>nd</sup>-3<sup>rd</sup> Degree Burns/Heat Stroke/Temperatures



- **PBI is still extremely hot!** Temperatures reach at least 140 degrees. This translates to 2<sup>nd</sup> and 3<sup>rd</sup> degree burns and increased risk of heat-related illnesses. See detailed actual recorded temperatures of FieldTurf with GreenPlay (corkonut) infill above.
- **ST extreme temperatures are caused by the plastic fibers!** Once again we see that no matter the infill, **ST remains dangerous in the sun.**<sup>134</sup>
- **All other temperature testing of corkonut at this time is biased; paid for by industry.**

## Dangers to Health: Plant-Based Infills (PBI): Cork, Coconut, Corkonut Infills

### Environmental Risks

*Where you LIVE, EAT, and DRINK is negatively affected by PBI and ST. Impacts to drinking water, waterways and other environmental factors must be considered.*

- **Annually, 3.5 tons of PBI is lost** that must be replaced. So **every 8 years, 28 tons of small particulate** leaves the fields and goes into the adjacent streams and aquatic environment.<sup>93</sup>
- **Scope and scale of material and runoff on each field is huge:** each field presents 200 Tons of material that is pulverized, loose and unencapsulated. For an average soccer field (105m x 68m) with average precipitation/irrigation of 50 inches a year, and irrigation estimates according to manufacturer requirements<sup>181</sup>, the runoff is approximately **2,400,000 gallons each year.**
- Environmental impact of PBI needs study. Runoff from PBI material, its particulate, and its chemical additives are washed into the system in addition to leachate from plastics, plasticizers, metals (lead, chromium, cadmium), PCBs, phthalates, flame retardants, and antimicrobial agents must be examined. Small particulate is of great concern since it can be easily ingested by feeding invertebrates and fish.
- The **separation of the many plastics used**, and the separation of **plastic carpet particulate from infill particulate is tedious and so economically unrealistic** as to be considered implausible at best for recycling of any kind. **We see no solutions other than landfill at this time.** No documented successful recycling or second use of PBI field components, although some companies suggest that the field material can be separated and composted or reused.<sup>95</sup>

### The Unknowns



- No disclosure regarding the **contents of various chemicals used.**
  - How often is each chemical listed above sprayed?
- **No verification of:**
  - **PBI sourcing, prior use,** prior chemical treatment, acceptability for frequent and close human contact.
  - **Future PBI composition** if current inputs are later prohibited or become scarce or prohibitively costly.
  - **Consistent PBI composition,** absent which no amount of testing can tell you what's in the current or future PBI fields. Similarly, tire 'recipes' have near-zero consistency which makes thorough testing functionally unachievable — although all tires contain lead, mercury, VOCs, SVOCs, phthalates, carbon black and carbon nanotubes.
- **No objective short- or long-term studies on impacts to:**
  - **Children's health and environment** from maintenance chemicals.
  - **Local waterways** due to runoff
- No MSDS and full ingredients/materials used in the shock pad for use with PBI.
- Percent of cork/coconut husks/silica sand required for using PBI within synthetic turf fields? Does the percentage vary by synthetic turf brand?
- No third-party respiratory testing results, along with pediatricians' comments on the results. Documentation that third-party conducting the respiratory testing has no financial or other conflict of interest.

<sup>181</sup> [http://www.shawsporsturf.com/wp-content/uploads/2016/05/GeoFill\\_FAQ\\_5.16.pdf](http://www.shawsporsturf.com/wp-content/uploads/2016/05/GeoFill_FAQ_5.16.pdf)

*Maintenance, Replacement, Disposal*

| Maintenance, Replacement, Disposal: Plant-Based Infills (PBI): Cork, Coconut, Corkonut  |  |   |
|---|--|---|
| Maintenance   | Replacement  | Disposal/Landfill   |
| <ul style="list-style-type: none"> <li>• "The higher installation costs consist largely of the infill material cost, shock pads required to meet ASTM F355 G-max requirements for some infill systems, and watering systems required to avoid excessive drying of organic infill..."<sup>93</sup></li> <li>• "The organic infill maintenance cost is higher than the [tire crumb] and sand mixture currently specified, but the other infills have similar maintenance costs. The organic infill needs to be watered to avoid excessive drying, and also requires annual replenishment to replace material loss through decomposition and wind throw. Aside from these two maintenance requirements, there is no significant difference in grooming equipment or frequency for the various infills..."<sup>93</sup></li> <li>• Moisture requirements – molds if wet, blows away if dry. Moisture maintained at 30-40%.<sup>182</sup></li> </ul> | <ul style="list-style-type: none"> <li>• Assuming careful maintenance, "...requires annual top-off of one to two supersacks...", which is 3.5 Tons.<sup>93, 180</sup> <ul style="list-style-type: none"> <li>○ Annual – estimated at \$2,500-\$4,200 per field<sup>93, 180</sup></li> </ul> </li> <li>• 8 years - "Organic infill material can be warranted for 8 years, but it is not expected to last beyond the warranty..."<sup>93</sup></li> <li>• Unexpected replenishing requirements based on weather events, premature degradation, etc.</li> </ul> | <ul style="list-style-type: none"> <li>• The <b>separation of the many plastics used, and the separation of plastic carpet particulate from infill particulate is tedious and so economically unrealistic</b> as to be considered implausible at best for recycling of any kind. <b>We see no solutions other than landfill at this time.</b><sup>95</sup> No documented successful recycling or second use of PBI field components, although some companies suggest that the field material can be separated and composted or reused.</li> </ul> |

<sup>182</sup> <http://www.shawSPORTsturf.com/geofill/>

## Synthetic Turf Field Costs

### Studies and Actual Scenarios Confirm Natural Grass is Cheaper

#### True Cost

*Installation, maintenance and disposal/replacement are the true factors in cost. Because the **construction and disposal costs are extremely high for synthetic turf**, maintenance costs are irrelevant! Properly built, professionally managed real grass fields are cheaper in the short- and long-term.<sup>183, 184, 185, 186</sup>*

#### • Maintenance

- “It is a myth that synthetic fields require less maintenance than natural turfgrass fields or to say that [synthetic] turf fields are maintenance free. Synthetic fields require 1) additional infill, 2) irrigation because of unacceptably high temperatures on warm-sunny days, 3) chemical disinfectants, 4) sprays to reduce static cling and odors, 5) drainage repair and maintenance, 6) erasing and repainting temporary lines, and 7) removing organic matter accumulation. In a recent presentation by the Michigan State University Certified Sports Turf Manager, she cited that the typical **annual maintenance costs of her [synthetic] turf fields ranged from \$13,720-\$39,220, while the typical annual maintenance costs of her natural turf fields had a similar range of \$8,133-\$48,960.**<sup>186</sup>

#### • Life Cycle Costs

- “In analyzing the costs of [synthetic] vs. natural grass systems, it is important to consider full lifecycle costs, including **installation, maintenance, and disposal/replacement.**”<sup>183</sup> Industry would have us believe that maintenance savings are the only item to consider, but it is deceptive. **True cost is all of the above, plus the enormous negative cost to children’s health when installing synthetic turf.**
- “[Synthetic] turf fields have a higher life-cycle cost than natural grass fields. Once established, **organic management of natural grass can be even more cost effective than conventional management of natural grass.**”<sup>183</sup>
- “While the factors influencing costs vary from field to field, **construction costs for a [synthetic] turf field generally far outweigh construction costs for a natural field.**<sup>184</sup>
- “**Properly installed and maintained quality natural grass remains viable for at least twice as long**, exponentially increasing the costs for a synthetic field based on the need to tear up, totally re move and reinstall new [synthetic] turf every eight to ten years or even more often.”<sup>184</sup>
- “**[Synthetic] turfs cost more than grass fields.** [Synthetic] turf fields cost between \$500,000-\$1,000,000. My school district has a quote for \$750,000 for one field...A premium organic renovation with real grass would cost approximately \$300,000.”<sup>185</sup>

#### Maintenance

*“the typical annual maintenance costs of her **[synthetic] turf fields ranged from \$13,720-\$39,220**, while the typical annual maintenance costs of her **natural turf fields had a similar range of \$8,133-\$48,960.**” – Michigan State University, Certified Sports Turf Manager<sup>186</sup>*

<sup>183</sup> [http://www.turi.org/Our\\_Work/Home\\_Community/Artificial\\_Turf/Cost\\_Analysis](http://www.turi.org/Our_Work/Home_Community/Artificial_Turf/Cost_Analysis)

<sup>184</sup> [http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf\\_booklet.pdf](http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf)

<sup>185</sup> <http://www.ecowatch.com/the-skinny-on-children-and-toxic-turf-1881859491.html>

<sup>186</sup> <http://turf.uark.edu/turfhelp/archives/021109.html>



- **Long-term costs**

- “**Long-term costs are less with natural turf fields compared to synthetic turf fields.** [Synthetic] fields need replacing every 8-10 years, whereas a natural turf field does not need as frequent renovation and can be renovated at a much reduced price compared to a [synthetic] field. In a 16-year scenario, Fresenburg came up with an annual average cost for each field type as follows: the natural soil-based field, \$33,522; the sand-cap grass field, \$49,318; the basic synthetic field, \$65,846; and the premium synthetic field, \$109,013.”<sup>186</sup>

**Hidden Cost – Disposal**

- **Synthetic turf is replaced every 8-10 years.**
- **Field disposal costs estimated at \$130,000 per field plus transportation and landfill charges.**
- **Infill disposal costs estimated between \$15,475-\$28,200 and higher.**<sup>93, 184</sup>

- **Disposal costs**

- “When [synthetic] turf...needs renovating every 8-10 years, **there is a hidden cost of disposal.** Because the field is filled and top-dressed with a [tire] crumb material (typically made from ground automobile tires), the material may require special disposal. **Disposal costs are estimated at \$130,000 plus transportation and landfill charges.**”<sup>186</sup>
- It appears that **synthetic turf carpet disposal cost is separate from infill disposal cost**, just adding more to overall cost of synthetic turf fields.<sup>93</sup>
  - Disposal cost is \$15,475 for tire crumb to a solid waste facility.<sup>93</sup>
  - With PBI, it still must go to landfill because it is cost prohibitive to separate the plastic particulate from the infill.<sup>95</sup>
  - One estimate of PBI removal/transportation cost is \$28,200, but we do not know the cost to place in landfill. One reason it is more expensive is because PBI doesn't last as long as tire crumb.<sup>93</sup>

Sample 24-Year Life Cycle Costs: Comparing Synthetic Turf Fields with Real Grass Fields<sup>93</sup>

| YR | SUMMARY OF TURF SYSTEM COST AND TIMING OVER 24 YEARS | Crumb Rubber Infill | Greenplay Organic Infill | FieldTurf PureFill (Cork) | US Greentech Envirofill (acrylic coated sand) | Sprinturf TPE/ EPDM | FieldTurf EcoGreen (TPE) | Natural Turf Grass  |
|----|--|---------------------|--------------------------|---------------------------|---|---------------------|--------------------------|---------------------|
| 1  | Initial Construction                                 | \$ 1,100,000        | \$ 1,136,384             | \$ 1,276,384              | \$ 1,223,584                                  | \$ 1,427,024        | \$ 1,298,784             | \$ 90,000           |
| 6  | Infill Replacement                                   | \$ -                | \$ 144,200               | \$ 144,200                | \$ -  | \$ -                | \$ -                     | \$ -                |
| 8  | Maintenance YR 1-8                                   | \$ -                | \$ 112,522               | \$ 33,600                 | \$ -  | \$ -                | \$ -                     | \$ 530,240          |
| 12 | Maintenance YR 9-12                                  | \$ -                | \$ 46,340                | \$ 16,800                 | \$ -  | \$ -                | \$ -                     | \$ 198,840          |
| 12 | Carpet Replacement                                   | \$ 500,000          | \$ 500,000               | \$ 500,000                | \$ 500,000                                    | \$ 500,000          | \$ 500,000               | \$ -                |
| 12 | Infill Replacement                                   | \$ 121,691          | \$ 144,200               | \$ 144,200                | \$ 168,400                                    | \$ 448,616          | \$ 243,600               | \$ -                |
| 13 | Grass Resod YR 4,7,10,13                             | \$ -                | \$ -                     | \$ -                      | \$ -  | \$ -                | \$ -                     | \$ 360,000          |
| 18 | Maintenance 12-20                                    | \$ -                | \$ 112,522               | \$ 33,600                 | \$ -  | \$ -                | \$ -                     | \$ 530,240          |
| 18 | Infill Replacement                                   | \$ -                | \$ 144,200               | \$ 144,200                | \$ -  | \$ -                | \$ -                     | \$ -                |
| 24 | Maintenance 20-24                                    | \$ -                | \$ 46,340                | \$ 16,800                 | \$ -  | \$ -                | \$ -                     | \$ 198,840          |
| 24 | Carpet Replacement                                   | \$ 500,000          | \$ 500,000               | \$ 500,000                | \$ 500,000                                    | \$ 500,000          | \$ 500,000               | \$ -                |
| 13 | Grass Resod YR 16,19,22,25                           | \$ -                | \$ -                     | \$ -                      | \$ -  | \$ -                | \$ -                     | \$ 360,000          |
| 24 | Infill Replacement                                   | \$ 121,691          | \$ 144,200               | \$ 144,200                | \$ 168,400                                    | \$ 448,616          | \$ 243,600               | \$ -                |
|    | <b>Total 24 YR Budget</b>                            | <b>\$ 2,343,382</b> | <b>\$ 3,030,908</b>      | <b>\$ 2,953,984</b>       | <b>\$ 2,560,384</b>                           | <b>\$ 3,324,256</b> | <b>\$ 2,785,984</b>      | <b>\$ 2,268,160</b> |
|    | <b>SUMMARY</b>                                       |                     |                          |                           |   |                     |                          |                     |
|    | Initial Construction                                 | \$ 1,100,000        | \$ 1,136,384             | \$ 1,276,384              | \$ 1,223,584                                  | \$ 1,427,024        | \$ 1,298,784             | \$ 90,000           |
|    | Additional Maintenance                               | \$ -                | \$ 317,724               | \$ 100,800                | \$ -  | \$ -                | \$ -                     | \$ 1,458,160        |
|    | Infill & Carpet Replacement                          | \$ 1,243,382        | \$ 1,576,800             | \$ 1,576,800              | \$ 1,336,800                                  | \$ 1,897,232        | \$ 1,487,200             | \$ -                |
|    | Grass Resod  | \$ -                | \$ -                     | \$ -                      | \$ -  | \$ -                | \$ -                     | \$ 720,000          |
|    | <b>Total 24 YR Budget</b>                            | <b>\$ 2,343,382</b> | <b>\$ 3,030,908</b>      | <b>\$ 2,953,984</b>       | <b>\$ 2,560,384</b>                           | <b>\$ 3,324,256</b> | <b>\$ 2,785,984</b>      | <b>\$ 2,268,160</b> |

**Real grass athletic fields are cheapest as shown here!<sup>93</sup>**  
 Professionally built and managed **real grass can also last forever without resod, but certainly at least 8 years, not 3 as assumed here.** So grass resod line item is actually \$270,000 instead of \$720,000, giving a new **total of \$1,818,160!**

**Real grass saves over a million versus cheapest PBI! \$1,135,824 cheaper!**

**Hours of Play**  
 At least two examples prove that **real grass athletic fields perform.** Maryland and Missouri athletic complex fields play **over 1,000 hours/year!**<sup>13, 81</sup>

### **Sample Cost Estimate of Synthetic Turf Fields Using GreenPlay (Corkonut) Infill and Real Grass Fields: Rockwood School District**

Rockwood School District (RSD), located in Eureka, Missouri, installed four FieldTurf synthetic turf fields with GreenPlay (corkonut) infill in the summer of 2015. While many argue synthetic field are cheaper than grass, RSD's actual costs are explored here. Note that **installation and disposal costs** are missing from the original cost analysis provided by RSD. Parents and taxpayers must **ask for these items to be included as they are incredibly high costs.**

**Bottom line: RSD could have saved at least \$1.7 million in 2015 alone had they hired a local professional landscaping company to build and manage natural grass athletic fields.<sup>187</sup>**

Below is an analysis of actual costs for RSD's previous natural grass versus the actual costs for synthetic turf (as of 2015). RSD's synthetic turf fields were installed in 2015, so it is not yet known what a year's maintenance costs will be, but it is possible to estimate based on research. RSD provided only FieldTurf's projected maintenance costs in a spreadsheet given to the CSIP Finance Committee. The spreadsheet called "Costs Based on Actual Estimates from Local Professional Landscaping Company and Other Research" accounts for installation costs, additional maintenance costs based on research, and an estimate from a local professional landscaping company to provide services for natural grass. Based on this analysis, TruTurf Solutions (TruTurf) natural grass is clearly the cheapest, safest, most durable option. **RSD has not been able to refute these findings.**

- **RSD believed it would only spend \$3.3 million for installation and maintenance** of four synthetic turf fields. As of October 2015, since 4/9/2015, there have been **6 change orders, with a current total of \$3.8 million.** This does not include an equipment cost of \$66,716.52 for watering systems for corkonut infill.
- When considering annual maintenance, the existing grass fields' total annual maintenance was \$217,720, the total annual maintenance cost for TruTurf is \$128,600, and RSD's own estimate of synthetic turf annual maintenance of \$178,000. **With TruTurf natural grass, RSD could save \$89,120 in annual maintenance** compared to existing conditions!
- In addition, the cost of relocating games is \$42,671, so adding \$89,120 in annual maintenance, **with TruTurf natural grass, RSD could save a total of \$131,791/yr** compared to existing conditions. Only save \$82,391/yr with synthetic turf.
- **Combined installation and maintenance, natural grass always comes out cheaper.**
- RSD was told it will only cost \$8,000/year for synthetic turf maintenance. However **this doesn't account for include disinfection, carpet repair (rips, joints), water cooling, or weeding.** These items are listed in studies by Fresenburg and others.
  - A more likely annual maintenance cost could run upwards of \$42,000.
- **Bottom line: Brand new state-of-the-art sand-based field facility by TruTurf = \$2,000,000 total for 4 fields.**
  - Useful life is 8 years.
  - Annual maintenance is \$66,100.
  - Every 8 years RSD would pay \$500,000 total for 4 fields' replacements.
- **Synthetic turf installation = \$3.8 million total for 4 fields (actual cost as of October 2015)**
  - Useful life is 10 years.
  - Annual maintenance is \$8,000, but with additional costs unaccounted for, it could more likely be \$42,000.
  - Every 10 years RSD will pay \$1.7 million for 4 fields' replacements, but did not account for premature failure or the estimated \$130,000 in disposal costs for each field.

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<sup>187</sup> <http://www.synturf.org/images/RealThis.pdf>

- **10-Year Total Cost (Install/Maintain)**
  - TruTurf = \$3.2 million
  - Synthetic Turf = Range of \$3.9 million-\$4.2 million
- **Every Subsequent 10-Year Total Cost (Replace/Maintain)**
  - TruTurf = \$1.3 million
  - Synthetic Turf = Range of \$1.8 million-\$2.6 million

**List of Costs Associated with RSD’s Four Synthetic Turf Fields Installation, Infill according to RSD Budget**

As of 10/29/2015, **\$3,771,129** is the cost for installation and infill.

9/17 \$4,093,887.40 athletic fields, track resurfacing Byrne & Jones Construction<sup>188</sup>

5/7 +\$483,341.60 Limonta (corkonut infill)<sup>189</sup>

-806,100 track resurfacing

4/9/2015 \$4,265,500 athletic fields and track resurfacing<sup>190</sup>

7/16/2015 C.O. 1 \$39,765 Eureka unsuitable soils<sup>191</sup>

7/8/2015 C.O. 2 Policy 7211 Superintendent approved (under an amount of money less than 15,000) \$4,125 Marquette High unsuitable soils (call to

8/5/2015 C.O. 3 \$209,100 Lafayette unsuitable soils<sup>192</sup>

5/7 C.O. 4 -\$483,341.60 tri party contract with Byrne and Limonta. RSD will pay Limonta directly, contract with Byrne & Jones reduced by the above amount.<sup>193</sup>

9/17 C.O. 5 \$26,355 Rockwood Summit unsuitable soils<sup>194</sup>

9/17 C.O. 6 \$32,384 Lafayette, Rockwood Summit asphalt repairs<sup>195</sup>

Track resurfacing -\$806,100

**Does not include A/E, equipment cost**

4/9 +\$310,000 A/E services<sup>196</sup>

7/16 +\$66,716.52 watering systems<sup>197</sup>

11/12 +20,011.00 infill top dresser<sup>198</sup>

<sup>188</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/\\$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf)

<sup>189</sup> <http://www.boarddocs.com/mo/rsdpa/Board.nsf/Public>

<sup>190</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTS5B4B48/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Byrne%20%26%20Jones%20Construction%20040915\\_Revised.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTS5B4B48/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Byrne%20%26%20Jones%20Construction%20040915_Revised.pdf)

<sup>191</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YGR8D5C5FA5/\\$file/Consent-Change%20Order%201-Byrne%20%26%20Jones%20Construction%20071615.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YGR8D5C5FA5/$file/Consent-Change%20Order%201-Byrne%20%26%20Jones%20Construction%20071615.pdf)

<sup>192</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9ZDH3K4688E5/\\$file/Consent-Change%20Order%203-Byrne%20%26%20Jones%20Construction%20082015.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9ZDH3K4688E5/$file/Consent-Change%20Order%203-Byrne%20%26%20Jones%20Construction%20082015.pdf)

<sup>193</sup> <http://www.boarddocs.com/mo/rsdpa/Board.nsf/Public>

<sup>194</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29UR45D2591/\\$file/Consent-Change%20Order%205-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29UR45D2591/$file/Consent-Change%20Order%205-Byrne%20%26%20Jones%20Construction%20091715.pdf)

<sup>195</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/\\$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A29US55D3170/$file/Consent-Change%20Order%206-Byrne%20%26%20Jones%20Construction%20091715.pdf)

<sup>196</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTX5B4E29/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Dickinson%20Hussman%20Architects%20040915.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9VEMTX5B4E29/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20or%20Greater-Facilities-Dickinson%20Hussman%20Architects%20040915.pdf)

<sup>197</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/9YA3D56D3E6A/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000%20071615.pdf)

<sup>198</sup> [http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A4257H739B6D/\\$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000-Facilities%20111215.pdf](http://www.boarddocs.com/mo/rsdpa/Board.nsf/files/A4257H739B6D/$file/2015%20Bond%20Issue-Purchases%20and%20Related%20Contracts%20%247%2C500%20to%20%24150%2C000-Facilities%20111215.pdf)

**RSD Cost Estimate: Synthetic Turf Costs Based on Research/Real Grass Fields Based on Estimate from Local Professional Landscaping Company** <sup>187</sup>

**Turf Fields Annual Effect on Budget**

Source: Rockwood School District CSIP Finance Committee Meeting  
11/24/2014

|  | RSD Staff<br>Existing Fields | TruTurf<br>Grass Fields | Turf Fields      | Addl Costs<br>Turf Fields |
|--|------------------------------|-------------------------|------------------|---------------------------|
| Mowing   | \$6,720                      | \$10,240                |                  |                           |
| Seeding  | \$2,800                      | \$10,600                |                  |                           |
| Irrigation Repairs                             | \$6,000                      | \$6,000                 |                  |                           |
| Water Use                                      | \$4,240                      | \$4,240                 |                  |                           |
| Aerating                                       | \$2,400                      | \$4,000                 | \$480            |                           |
| Striping                                       | \$17,200                     | \$15,800                | \$2,800          |                           |
| Fertilizing                                    | \$8,960                      | \$6,320                 |                  |                           |
| Pesticides                                     | \$6,000                      | \$3,800                 | \$1,680          |                           |
| Re-sprigging                                   | \$16,800                     | \$0                     |                  |                           |
| Other  | \$2,200                      | \$3,000                 | \$400            |                           |
| Brushing/Grooming                              | \$0                          | \$0                     | \$1,920          |                           |
| Vacuuming/Sweeping                             | \$4,400                      | \$0                     | \$720            |                           |
| Disinfecting*                                  |                              |                         |                  | \$8,000                   |
| Carpet Repair (rips, joints)**                 |                              |                         |                  | \$4,000                   |
| Water Cooling**                                |                              |                         |                  | \$20,000                  |
| Weeding**                                      |                              |                         |                  | \$2,000                   |
| <b>Annual Costs</b>                            | <b>\$77,720</b>              | <b>\$66,100</b>         | <b>\$8,000</b>   | <b>\$42,000</b>           |
| Replacement Cost                               | \$700,000                    | \$300,000               | \$1,700,000      |                           |
| Disposal***                                    | \$0                          | \$0                     |                  | \$320,000                 |
| Estimated Useful Life (years)                  | 5                            | 8                       | 10               |                           |
| Annual Cost                                    | \$140,000                    | \$62,500                | \$170,000        | \$222,000                 |
| <b>Total Annual Cost</b>                       | <b>\$217,720</b>             | <b>\$128,600</b>        | <b>\$178,000</b> | <b>\$264,000</b>          |
| <b>Difference - Maintenance</b>                | <b>\$39,720</b>              |                         |                  |                           |
| <b>Annual Maintenance</b>                      | <b>Savings</b>               | <b>Loss</b>             |                  |                           |
| Synthetic Turf vs Existing                     | \$39,720                     |                         |                  |                           |
| Adjusted Synthetic Turf vs Existing            |                              | \$46,280                |                  |                           |
| TruTurf vs Existing                            | \$89,120                     |                         |                  |                           |
| TruTurf vs Synthetic Turf                      | \$49,400                     |                         |                  |                           |
| TruTurf vs Adjusted Synthetic Turf             | \$135,400                    |                         |                  |                           |
| <b>Cost of Relocating Games (FY14):</b>        |                              |                         |                  |                           |
| Field Rental                                   | \$8,785                      | \$8,785                 |                  |                           |
| Travel to Alternate Site                       | \$3,786                      | \$3,786                 |                  |                           |
| Estimated Reduction of Gate                    | \$8,500                      | \$8,500                 |                  |                           |
| Estimate Reduction of Concessions              | \$21,600                     | \$21,600                |                  |                           |
| <b>Total Cost of Relocating Games</b>          | <b>\$42,671</b>              | <b>\$42,671</b>         |                  |                           |
| <b>Total Impact</b>                            | <b>\$82,391</b>              | <b>\$131,791</b>        |                  |                           |
| <b>Installation + Maintenance Costs</b>        |                              |                         |                  |                           |
| <b>First 10 Years</b>                          |                              |                         |                  |                           |
| Cost to Install**                              | \$1,400,000                  | \$2,500,000             | \$3,771,129      | \$3,771,129               |
| Cost to Maintain per Year                      | \$77,720                     | \$66,100                | \$8,000          | \$42,000                  |
| 10-Year Maintenance Costs                      | \$777,200                    | \$661,000               | \$80,000         | \$420,000                 |
| 10-Year Total Costs                            | \$2,177,200                  | \$3,161,000             | \$3,851,129      | \$4,191,129               |
| Average Cost per Year                          | \$217,720                    | \$316,100               | \$385,113        | \$419,113                 |
| <b>Annual Installation + Maintenance Costs</b> | <b>Savings</b>               | <b>Loss</b>             |                  |                           |

|                                     |           |
|-------------------------------------|-----------|
| Synthetic Turf vs Existing          | \$39,720  |
| Adjusted Synthetic Turf vs Existing | \$201,393 |
| TruTurf vs Existing                 | \$98,380  |
| TruTurf vs Synthetic Turf           | \$69,013  |
| TruTurf vs Adjusted Synthetic Turf  | \$103,013 |

|                           | Cost to Replace** | Disposal  | Cost to Maintain per Year | 10-Year Maintenance Costs | 10-Year Total Costs | Average Cost per Year |
|---------------------------|-------------------|-----------|---------------------------|---------------------------|---------------------|-----------------------|
| Every Subsequent 10 Years | \$1,400,000       | \$0       | \$77,720                  | \$777,200                 | \$2,177,200         | \$217,720             |
| Cost to Replace**         | \$625,000         | \$0       | \$66,100                  | \$661,000                 | \$1,286,000         | \$128,600             |
| Disposal                  | \$1,700,000       | \$320,000 | \$8,000                   | \$80,000                  | \$1,780,000         | \$178,000             |
| Cost to Maintain per Year | \$42,000          |           | \$42,000                  | \$420,000                 | \$2,640,000         | \$264,000             |
| 10-Year Maintenance Costs |                   |           | \$80,000                  | \$800,000                 |                     |                       |
| 10-Year Total Costs       |                   |           | \$1,780,000               | \$1,780,000               | \$2,640,000         | \$264,000             |
| Average Cost per Year     |                   |           | \$178,000                 | \$178,000                 | \$264,000           | \$264,000             |

| Total                               | Savings   | Loss     |
|-------------------------------------|-----------|----------|
| Synthetic Turf vs Existing          | \$39,720  |          |
| Adjusted Synthetic Turf vs Existing |           | \$46,280 |
| TruTurf vs Existing                 | \$89,120  |          |
| TruTurf vs Synthetic Turf           | \$49,400  |          |
| TruTurf vs Adjusted Synthetic Turf  | \$135,400 |          |

Bottom Line: Hire TruTurf, spend \$2 million for installation, \$66,100/year for maintenance. Total of \$2,066,100 for 2015. In 2023, spend \$300,000 to replace fields, \$66,100/year for maintenance. Total of \$666,100 in 2023.

Alternative is hiring synthetic turf company, spend \$3.3 million for installation, \$8,000/year maintenance. Total of \$3,779,129 for 2015. In 2023, spend \$1.7 million to replace fields, \$8,000 for maintenance. Total of \$1,708,000 in 2023.

**Conclusion: when installation and maintenance costs are combined, natural grass costs less.**

"Artificial fields require a different type, but just as extensive maintenance protocol as natural grass, particularly if used regularly for a multitude of sports regularly."

Notes:  
Data represents costs for 4 fields total.  
Data in green and/or italics added by TruTurf Solutions and Jill Schilling  
To compare all costs equally:

\*Initial installation is \$2,000,000 total for 4 fields with a lifespan of 8 years. The 10-year cost is calculated by \$2,000,000/8=\$250,000 per year, x 10 years=\$2,500,000  
\*\*\$1,300,000 is the amount RSD believed it would cost for installation and infill of synthetic turf fields. As of 10/29/2015, \$3,771,129 has been spent on installation and infill of synthetic turf fields. This was calculated by using the contract amount to Byrne & Jones of \$4,093,807.40 (construction of athletic fields and track resurfacing)  
\*\*\*Replacement is \$300,000 total for 4 fields with a lifespan of 8 years. The 10-year cost is calculated by \$300,000/8=\$37,500 per year, x 10 years=\$375,000

\*Source: <http://www.environurfservices.com/>  
\*\*Source: <http://plasticfieldsformever.org/ArtificialTurfBooklet.pdf>  
\*\*\*Source: [http://www.ccenterdispatch.com/opinion/article\\_f36e8394-379f-11e4-8d0f-0017e43b2370.html](http://www.ccenterdispatch.com/opinion/article_f36e8394-379f-11e4-8d0f-0017e43b2370.html)

Additional Resources:  
<http://www.britubad.com/resources.html?artificial-turf-vs-natural-grass>  
[http://www.nrgso.com/images/Natural-Grass-and-Artificial-Turf\\_booklet.pdf](http://www.nrgso.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf)

# Turf Fields – Annual Effect on Budget

|   | Existing<br>Fields | Turf Fields    |
|---|--------------------|----------------|
| Mowing                                  | \$6,720            |                |
| Seeding                                 | \$2,800            |                |
| Irrigation Repairs                      | \$6,000            |                |
| Water Use                               | \$4,240            |                |
| Aerating                                | \$2,400            | \$480          |
| Striping                                | \$17,200           | \$2,800        |
| Fertilizing                             | \$8,960            |                |
| Pesticides                              | \$6,000            | \$1,680        |
| Re-sprigging                            | \$16,800           |                |
| Other                                   | \$2,200            | \$400          |
| Brushing/Grooming                       | \$0                | \$1,920        |
| Vacuuming/Sweeping                      | \$4,400            | \$720          |
| <b>Annual Costs</b>                     | <b>\$77,720</b>    | <b>\$8,000</b> |
| Replacement Cost                        | \$700,000          | \$1,700,000    |
| Estimated Useful Life (years)           | 5                  | 10             |
| Annual Cost                             | \$140,000          | \$170,000      |
| Total Annual Cost                       | \$217,720          | \$178,000      |
| <b>Difference - Maintenance</b>         | <b>\$39,720</b>    |                |
| <b>Cost of Relocating Games (FY14):</b> |                    |                |
| Field Rental                            | \$8,785            |                |
| Travel to Alternate Site                | \$3,786            |                |
| Estimated Reduction of Gate             | \$8,500            |                |
| Estimate Reduction of Concessions       | \$21,600           |                |
| <b>Total Cost of Relocating Games</b>   | <b>\$42,671</b>    |                |
| <b>Total Impact</b>                     | <b>\$82,391</b>    |                |

<sup>199</sup> Email correspondence from RSD 11/2014

**Synthetic Turf Plant-Based Infill (PBI), Corkonut, Costs Compared with Tire Crumb Infill**<sup>93</sup>

| <b>Crumb Rubber Infill</b> | Quantity | Unit | Unit Cost | Cost     | Frequency | Life | Annual Cost | Year 1-8 Cost   | Year 9-12 Cost | Total 12-Year Cost | Description/Notes                               |
|----------------------------|----------|------|-----------|----------|-----------|------|-------------|-----------------|----------------|--------------------|---|
| <b>Infill Install</b>      |          |      |           |          |           |      |             |                 |                |                    |   |
| Crumb Rubber               | 129.6    | Tons | \$460.00  | \$59,616 |           | 12   | N/A         | \$59,616        | \$0            | \$59,616           | 3.24# per SF (approx. 1.39" at 28#/CF)          |
| Sand                       | 120      | Tons | \$180.00  | \$21,600 |           | 12   | N/A         | \$21,600        | \$0            | \$21,600           | 3.00# per SF (approx. 0.36" at 100#/CF)         |
| <b>Maintenance</b>         | NA       |      |           |          |           |      |             |                 |                |                    | No additional maintenance relative to GreenPlay |
| <b>Disposal</b>            | 249.6    | Tons | \$62.00   | \$15,475 |           |      |             | 0               | \$15,475       | \$15,475           | Assumed to go to solid waste facility           |
| <b>Total Cost</b>          |          |      |           |          |           |      |             | <b>\$81,216</b> | <b>\$0</b>     | <b>\$96,691</b>    |   |

| <b>GreenPlay Organic Infill</b> | Quantity | Unit      | Unit Cost  | Cost     | Frequency | Life | Annual Cost | Year 1-8 Cost    | Year 9-12 Cost   | Total 12-Year Cost | Description/Notes                                |
|---------------------------------|----------|-----------|------------|----------|-----------|------|-------------|------------------|------------------|--------------------|--|
| <b>Infill Install</b>           |          |           |            |          |           |      |             |                  |                  |                    |  |
| GreenPlay Organic Infill        | 80       | Tons      | \$1,200.00 | \$96,000 |           | 8    |             | \$96,000         | \$96,000         | \$192,000          | 2.00# per SF (approx. 2" at 12#/CF)              |
| Sand                            | 120      | Tons      | \$180.00   | \$21,600 |           | 12   |             | \$21,600         | \$0              | \$21,600           | 3.00# per SF (approx. 0.36" at 100#/CF)          |
| <b>Maintenance</b>              |          |           |            |          |           |      |             |                  |                  |                    | Maintenance shown is relative to crumb rubber    |
| Moisture Control                |          |           |            |          |           |      |             |                  |                  |                    |  |
| Equipment                       | 1        | Ea.       | \$10,000   | \$10,000 | Once      | N/A  | N/A         | \$10,000         | \$0              | \$10,000           | Kifco Water-Reel E-2005                          |
| Water Cost                      | 6        | 1,000 Gal | \$10.21    | \$61.26  | WeeklyX12 | N/A  | \$735.12    | \$5,881          | \$2,940          | \$8,821            | Weekly watering for 3 month, Loudoun Water rates |
| Water Meter and Availability    | 1        | Ea.       | \$42,841   | \$42,841 | Once      | N/A  | N/A         | \$42,841         | \$0              | \$42,841           | 1-1/2" Meter. One time install cost.             |
| Water piping installation       | 1        | Ea.       | \$20,000   | \$20,000 | Once      | N/A  | N/A         | \$20,000         | \$0              | \$20,000           | Assumed 400 LF @ \$50/LF. One time install cost. |
| Monitoring System               | 1        | Ea.       | \$200      | \$200    | Once      | N/A  | N/A         | \$200            | \$0              | \$200              | Extech Moisture Meter - model M0210              |
| Replenishment                   | 3.5      | Tons      | \$1,200.00 | \$4,200  | Annually  |      | \$4,200     | \$33,600         | \$16,800         | \$50,400           | Assumes 3-5% annually                            |
| <b>Disposal</b>                 | 160      | Tons      | \$20.00    | \$3,200  |           |      |             | \$1,600.00       | \$ 1,600         | \$3,200            | Assumed reuse. Removal/transportation only.      |
| Infill Removal                  | 1        | LS        | \$25,000   | \$25,000 |           |      |             |                  | \$25,000         | \$25,000           | Take out and place in truck at end of year 8.    |
| <b>Total Cost</b>               |          |           |            |          |           |      |             | <b>\$231,722</b> | <b>\$117,340</b> | <b>\$349,062</b>   |  |

|   |           |           |           |
|---|-----------|-----------|-----------|
| Estimated Cost Relative to SBR Infill (Total)                                     | \$150,506 | \$117,340 | \$252,371 |
| Estimated Cost Relative to SBR Infill (Annual)                                    | \$18,813  | \$29,335  | \$21,031  |
| Estimated Cost Relative to SBR Infill (as % above typical \$1.3M turf conversion) | 12%       |           | 19%       |

| <b>FieldTurf PureFill (Cork)</b> | Quantity | Unit      | Unit Cost  | Cost      | Frequency | Life | Annual Cost | Year 1-8 Cost    | Year 9-12 Cost   | Total 12-Year Cost | Description/Notes                             |
|----------------------------------|----------|-----------|------------|-----------|-----------|------|-------------|------------------|------------------|--------------------|---|
| <b>Infill Install</b>            |          |           |            |           |           |      |             |                  |                  |                    |   |
| Purefill                         | 80       | Tons      | \$1,200.00 | \$96,000  |           | 8    |             | \$96,000         | \$96,000         | \$192,000          | 2.00# per SF (approx. 2" at 12#/CF)           |
| Sand                             | 120      | Tons      | \$180.00   | \$21,600  |           | 12   |             | \$21,600         | \$0              | \$21,600           | 3.00# per SF (approx. 0.36" at 100#/CF)       |
| Shock pad/drainage tile          | 80,000   | SF        | \$1.75     | \$140,000 |           | 12   |             | \$140,000        | \$0              | \$140,000          |   |
|                                  |          |           |            |           |           |      |             |                  |                  |                    |   |
| <b>Maintenance</b>               |          |           |            |           |           |      |             |                  |                  |                    | Maintenance shown is relative to crumb rubber |
| Moisture Control                 |          |           |            |           |           |      |             |                  |                  |                    | Water not required per FieldTurf rep          |
| Equipment                        |          | Ea.       | \$10,000   | \$0       | Once      | N/A  | N/A         |                  | \$0              | \$0                |   |
| Water Cost                       |          | 1,000 Gal | \$10.21    | \$0.00    | WeeklyX12 | N/A  | \$0.00      |                  | \$0              | \$0                |   |
| Water Meter and Availability     |          | Ea.       | \$42,841   | \$0       | Once      | N/A  | N/A         |                  | \$0              | \$0                |   |
| Water piping installation        |          | Ea.       | \$20,000   | \$0       | Once      | N/A  | N/A         |                  | \$0              | \$0                |   |
| Monitoring System                |          | Ea.       | \$200      | \$0       | Once      | N/A  | N/A         |                  | \$0              | \$0                |   |
| Replenishment                    | 3.5      | Tons      | \$1,200.00 | \$4,200   | Annually  |      | \$4,200     | \$33,600         | \$16,800         | \$50,400           | Assumes 3-5% annually                         |
|                                  |          |           |            |           |           |      |             |                  |                  |                    |   |
| <b>Disposal</b>                  | 160      | Tons      | \$20.00    | \$3,200   |           |      |             | \$1,600.00       | \$ 1,600         | \$3,200            | Assumed reuse. Removal/transportation only.   |
| Infill Removal                   | 1        | LS        | \$25,000   | \$25,000  |           |      |             |                  | \$25,000         | \$25,000           | Take out and place in truck at end of year 8. |
|                                  |          |           |            |           |           |      |             |                  |                  |                    |   |
| <b>Total Cost</b>                |          |           |            |           |           |      |             | <b>\$292,800</b> | <b>\$114,400</b> | <b>\$407,200</b>   |   |



## Plant-Based Infill (PBI) Additional Costs Compared to Tire Crumb Infill

### PBI Costs

### Cost Information from Manufacturer

- Installation of ST fields between \$1-3 million.<sup>200</sup>
- Replacement of ST fields \$500,000 every 8-10 years.<sup>93</sup>
- Additional annual maintenance beyond typical synthetic turf field maintenance is between +28,233 (FieldTurf PureFill) and +37,272 (GreenPlay).<sup>93</sup>
- Increased maintenance costs compared to tire infill
  - +\$132,384 more than SBR for materials<sup>93</sup>
  - +\$140,000 for resilient pad<sup>93</sup>
  - +\$71,862 for 12-year irrigation<sup>93</sup>
  - +16,679.13 for water cannons<sup>94</sup>
  - +50,400 12-year annual replenishment<sup>93</sup>
    - "...The organic infill needs to be watered to avoid excessive drying, and also requires annual replenishment to replace material loss through decomposition and wind throw..."
  - +28,200 12-year disposal/removal<sup>93</sup>
    - **\$439,525.13 net add-on**

**Missing Costs**  
*Notice line items for shock pad, irrigation, water cannons and disposal/removal were not provided in manufacturer's estimate.<sup>93</sup>*

**Underestimated Costs**  
*Estimate given by Bowman Consulting to Loudoun County Schools is \$4,200 for annual replenishment.<sup>93</sup>*

From: Cynthia Carucci <cynthia@greenplayusa.com>  
 Sent: Friday, April 22, 2016 11:37 AM  
 Subject: RE: Organic Infill for Edina Synthetic Turf Field

"Good morning \_\_\_\_\_,

...Below you will find the cost difference for a standard field.

Lifetime Cost Analysis of Greenplay in Turf

Cost of 100% organic Greenplay in bulk direct to school is approx. \$0.68/lb. wholesale before GC markup.

**Installation:**

Typical infill cost per standard 90,000 sf field- Greenplay @ 68 cents/lb. x 2 lbs. per foot = \$1.36/ft. x 90,000 = **\$122,400** SBR @ 20 cents/lb. x 4 lbs. per foot = \$0.80/ft. x 90,000 = \$72,000 (note: sometimes 6 or more lbs. of SBR is used)

So the delta for Greenplay over SBR is \$50,400

**Maintenance:**

Maintenance material for topping off @ +/-3% per annum over 8 years (conservative) - Greenplay 1650 lb. sacks x 3= 4950 lb. x 0.68 cents= **\$3,366** x 8 yr.= \$26,928 - SBR 2000 lb. sacks x 5= 10,000 lb. x 0.25 cents= \$2,500 x 8 yr.= \$20,000

**Removal:**

The life-cycle cost analysis contains multiple unknowns regarding future laws regarding the disposal of SBR, so we do not have one memorialized because it depends on these future laws as well as the region. However at the rate the laws are changing we can assume that in 8-10 years the restrictions on SBR hazardous waste will significantly increase.

<sup>200</sup> <http://www.forbes.com/sites/mikeozanian/2014/09/28/how-taxpayers-get-fooled-on-the-cost-of-an-artificial-turf-field/#4410869d1bca>

**Missing Disposal/Removal Cost**

*Disposal/removal is at least \$28,200 and it is cost prohibitive to separate plastics from PBI; only option is landfill. <sup>93, 95</sup>*

1- Greenplay can be used on site for top dressing natural grass fields or soil enrichment Bagging and trucking- \$0 Disposal fees- \$0 2- SBR must be bagged on site and trucked to hazard waste facility- \$50k+ Bagging and trucking 500,000 lbs.+ \$50k+ Disposal fees- \$X (can multiple tens of thousands of dollars)

Life cycle (8 year)- 1- Greenplay initial cost of \$122,400 plus maintenance of \$26,928 plus disposal cost of \$0 = total \$149,328 2- SBR initial cost of \$72,000 plus maintenance of \$20,000 plus disposal cost of \$50,000 + \$X = total \$142,000 + \$X

The life cycle cost of utilizing Greenplay instead of SBR is negligible, if not much less, as future landfill restrictions prohibit SBR waste.

Have a great day.

All the best,

Cynthia

Cynthia Carucci  
Marketing and Communications

[www.greenplayusa.com](http://www.greenplayusa.com) | Tel: 212- 904- 1223

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## Additional Photo Sources

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## Other Graphics Sources

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