

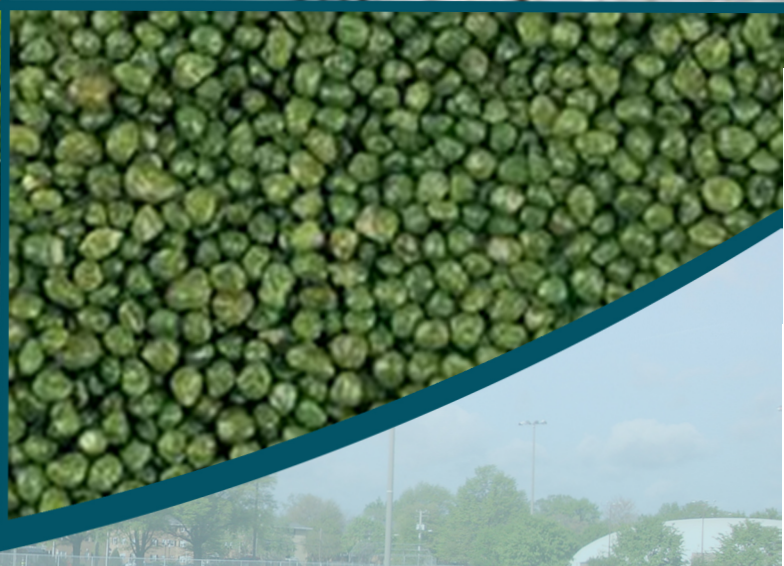
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*Final Report*

# SYNTHETIC TURF INFILL ALTERNATIVES to Traditional Crumb Rubber from Recycled Tires

February 2015



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**INTRODUCTION:**

Synthetic turf fields have increased in popularity in many communities across the country. The benefits of these fields include year-round play; consistent playability; minimal maintenance (compared to natural turf fields); and programming flexibility. However, there are worries about the safety of the materials used in synthetic turf infill. Specifically, there is concern about the chemicals within crumb rubber made from recycled rubber tires that make up the infill in most of the synthetic turf fields currently installed. This type of infill is usually mixed with silica sand or is stand-alone within the synthetic turf blades which together make up a typical field profile. Other concerns are the intense heat associated with synthetic turf fields. Studies have shown a majority of the heat is produced from the grass blades of the turf and is maintained/conducted through the rubber infill. This report provides a review of the available alternatives to the “traditional” crumb rubber infill. These alternatives range from natural infill to synthetic infill material, and some alternatives may be mixed with silica sand to mimic the “traditional” feel as much as possible. The infill alternatives provided below include current and more recognized (tested) options available. A brief description of each infill material is provided along with a list of the advantages and disadvantages associated with each infill alternative and a comparison summary has been provided on page 14.

**INFILL ALTERNATIVES:**

There are numerous synthetic infill alternatives to the more frequently used crumb rubber from recycled tires. Below is a comparison of some of the more notable alternatives. There are numerous factors to consider when choosing an infill alternative. These include: the type of facility; type of sports to be played; level and amount of daily play; and availability of maintenance. Since Arlington Parks and Recreation has various synthetic turf installs at different types of facilities, it should be noted that not one alternative should serve the same purpose or be best suitable at a school vs an open recreation field at a public park. This report analyzed the following alternative infills:

- Recycled Rubber Infill
- TPE Synthetic Rubber Infill
- EPDM Synthetic Rubber Infill
- Coated Sand Infill
- Organic Infill
- Other Infill Products

**1. Recycled Rubber Infill**

Infill will consist of ground up recycled rubber shoe soles/post manufactured materials or post manufactured materials. Infill should be mixed with silica sand like traditional crumb rubber.

Advantages:

- Most similar to traditional crumb rubber, no additional maintenance
- Most cost effective of alternative infill options – does not require shock pad if maintain 2.25-2.5” carpet height
- Product will last life of carpet (8 years) or longer
- Slight reduction in heat retention, options for color mix to reduce thermal buildup
- Will work in virtually any turf system – i.e., current turf spec with sand
- Post manufactured materials not in limited supply

**Disadvantages:**

- Free of heavy metals and harmful chemicals in rubber tire crumb – however, inconclusive as to what metals or chemicals are within due to varying products and materials that make up composition
- Nike Grind option available in limited supply. Unknown supply amounts per turf manufacturer or industry in general; product is used to make indoor flooring as well
- Nike Grind Rubber particles composed of 50% black and 50% multicolored. Consequently, Infill aesthetics can appear a bit messy. PremARC product all black
- Reduction in heat on the field is minimal
- Unknown/ Various supply sourcing; quality is guaranteed; however, composition not completely known

**Color:** 50% Black/ Multicolor Mix – Nike Grind  
100% Black – PremARC

**Products Currently Available:**

- *Sole Revolution with Nike Grind* – mix of Recycled shoe soles and post manufactured material
- *PremARC by American Recycling Center* – *Premium post manufactured material blend, limited availability – ideal for smaller field projects*

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**2. Ethylene Propylene Diene Monomer (EPDM) Infill**

Infill will consist of manufactured elastomer (a type of synthetic rubber). Infill should be mixed with silica sand like traditional crumb rubber.

**Advantages:**

- Virgin and/or recycled materials – non-toxic, less odor than traditional crumb rubber; can be recycled at end of its lifespan, recycled content based on manufacturer
- Softer than TPE alternative infill and traditional crumb rubber; will not need a pad
- Migration of infill material similar to traditional crumb rubber
- Traditionally used in tracks, play surfaces, etc.
- Less abrasive on turf fibers than traditional crumb rubber tires
- Slight reduction in heat retention compared to crumb rubber depending on color selected
- Same maintenance as traditional crumb rubber fields
- Various color options
- Readily Available on demand

**Disadvantages:**

- There are some good companies producing good products; however, a good spec would need to be written to ensure quality. We would recommend an approved EPDM vendor list, as it has been noted that some material has deteriorated quickly, melted, and/ or contained toxic materials, such as lead
- Reduction of heat not significant compared to Organic options
- Recycled materials and fillers (more binders and stabilizers for UV protection) used to create colored EPDM - can create inconsistencies. MSDS available
- Warranty – 2 years for color stay, manufacturer states material will last the life of 8 year warranty of carpet and beyond although, technically, still just 2 years

Colors: Black, Various Colors; Green/ Brown most popular and readily offered

**Products Currently Available:**

- *Sof-touch/ 25 Green by Ultimate RB Inc.* – All virgin, no heavy metals, no supply issues; PAL Park S. Plainfield NJ; Briarcliff Manor HS, NY; John Jay HS, PA; Briarcliff HS, NY; Northview HS, MI; Canisius College, NY

**3. Thermoplastic Elastomer (TPE) Infill**

Infill will consist of manufactured polyethylene based polymer (a type of synthetic rubber). Infill should be mixed with silica sand like traditional crumb rubber.

**Advantages:**

- Virgin materials – non-toxic, less odor than traditional crumb rubber, no recycled materials; however, can be recycled at end of its lifespan; 8 Year Warranty – company states 2-3 lifecycles
- Minimal loss of infill from wear – similar to traditional crumb rubber
- Limited migration of infill material – less than traditional crumb rubber, seems to lock together
- Several companies make good products with different benefits, such as weight to water to reduce flotation, “plus” shaped to reduce fly out, cylinder shape to reduce compaction
- Less abrasive on turf fibers than traditional crumb rubber tires
- Slight reduction in heat retention compared to crumb rubber
- Same maintenance as traditional crumb rubber fields
- Lead time required to produce
- Not prone to sticking on clothes and tracking into car/ home, etc.

**Disadvantages:**

- There are some good companies producing good products; however, a good spec would need to be written to ensure quality. We would recommend an approved TPE vendor list, as it has been noted that some material has deteriorated quickly, melted, and/ or contained toxic materials, such as lead
- Reduction of heat not significant compared to Organic options
- Prone to compaction – may need pad based on company/product specified; dial up sand sieve size to resist compaction of ballast layer

Colors: Brown, Green



Products Currently Available:

- *Infill Pro TP by Limonta Sport* – tested to EN 71 Safe Toys
- *FutrFill TPE by Target Technologies (TTII)* – Nike 4 in Great Falls VA
- *Holo, Terra, Forgrin by So.f.ter* – Options based on facility and sport, designed to resist compaction
- *TPV by American Recycling Center* – slightly different chem. make-up, conforms to FIFA 2 star standards

**4. Coated Sand Infill**

Infill will consist of acrylic coated silica sand. There are approximately 60 installations in the United States but no local installations. Product has been on the market for over 10 years and is currently being used in everything, including lawns, play areas, and athletic fields (high school and college level).

**Advantages:**

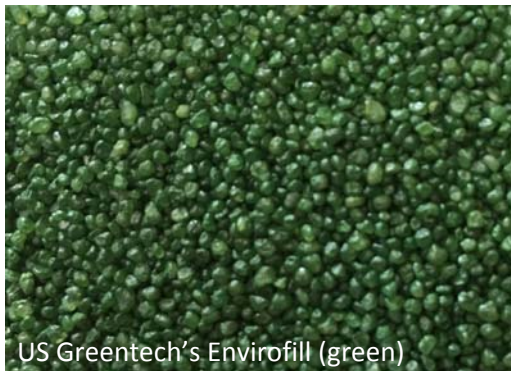
- 16 year warranty – two turf life cycles
- Non-toxic; micro-biotic option
- Can lower surface temps 10%-25% depending on moisture content
- Manufacturer recommends reduced pile height to 1 1/2"-1 3/4," sand will act as a ballast and the pad will provide the proper Gmax
- Same maintenance as traditional crumb rubber fields
- Great references, product seems to perform as advertised

- Readily available
- Not prone to sticking on clothes and tracking into car/ home, etc.

Disadvantages:

- More firm – susceptible to compaction than traditional sand rubber infill and, because of this, manufacturer recommends reduced pile height to keep infill depth at 1," therefore, product requires a shock pad
- Warranty of 16 years, 70% of coating will remain – some dust noted with product but limited, warranty exclusions include cleats in excess of 5/8"

Colors: Green, Tan



US Greentech's Envirofill (green)



US Greentech's Envirofill (tan)

Products Currently Available:

- *Envirofill by US Greentech* – No Local Installations, Good References from other Regions of the Country

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## 5. Organic Infill

Infill may consist of all or a mix of silica sand, coconut fiber, rice husk, cork (corkonut).

Advantages

- Reduced surface temps, if maintained per recommendations (watering), evaporative action maintains turf near air temp
- Organic and non-toxic
- Can produce similar Gmax and performance of natural turf if appropriately maintained
- Turf companies (such as Shaw) now have their own organic mix, others are willing to do an alternative third party mix in their turf, if approved and tested
- Field turf uses only cork and sand – no watering necessary (maintenance for frequent displacement/ migration required)
- Can specify 2.5" carpet height with sand in infill mix to remove the need for a pad
- Unknown supply availability based on sourcing in foreign countries

Disadvantages:

- Highest maintenance of all traditional and alternative infill options, requires irrigation during dry times, requires de-compaction – dependent on how much use, requires weekly or biweekly brushing, requires regular top dressing, dependent on how much field is used and the weather (Typically 1-3 times per year). Material is lightweight and can blow away and/ or float

- If not maintained properly, there could be Gmax issues that could lead to injuries and performance problems
- Requires shock pad if a 2.5" carpet with sand is not used
- Some infill manufacturers of this product limit play time up to 50-80 hours a week so as to not void warranty, usage also limited by weather freeze/ thaw
- Since material has to stay moist, subject to frost/ freezing vs traditional infill materials – will freeze and thaw quicker than natural turf since laid on stone base
- Flammable when extremely dry – potential vandalism issue
- No warranty, product breaks down naturally

Color: Brown/ Tan



Products Currently Available:

- *Infill Pro Geo by Limonta Sport* – Coconut fibers, cork and rice husk - available via 3<sup>rd</sup> party – will sell to any turf company, no exclusivity – examples of local facilities that use one of these infill products includes: Lakelands Park Gaithersburg MD, St Timothy's School Stevenson MD.
- *Geofill by Shaw* – Coconut fibers and sand - exclusive to Shaw products
- *Purefill by Field Turf* – Cork and sand - exclusive to Field Turf products, treated cork to reduce floating, no irrigation required, will need exclusive shock pad

**6. Other Infill Products of Notable Value:**

Color Coated recycled rubber – *Color Coated PremARC by American Recycling*

- Made from SBR EPDM and natural material from post-industrial scrap – NOT recycled rubber tires
- Free of heavy metals and harmful chemicals; however, inconclusive as to what metals or chemicals are within due to varying products and materials
- Seal coat to encapsulate rubber particles – new and not conclusive as to how long this coating will last.
- Colors: Green, Tan, Red

Mineral Aggregates – *ZeoFill Inc. (delivered .50 cents sf)*

- Organic option – mineral aggregates, sourced from US southwest region, softer on turf fibers than sand
- Absorbs/ slowly releases water to maintain lower field temp
- Manufacturer recommends two options: mix with EPDM rubber infill (no pad needed) or reduce pile height of turf, use product as ballast layer, but will need a pad





- May be a better option for smaller turf fields / lawn areas due to dust or provide irrigation.
- 8 year Warranty (one turf life cycle)
- Color: Gray

#### Hybrid Recycled/ TPE - *Eco Max by Field Turf*

- Field turf's new infill product made of recycled carpet and TPE
- May or may not need a pad depending on turf height specified
- Less expensive than TPE
- Shape of crumb rubber from tires
- Con: unknown longevity and performance
- Color: Greenish/ Black

*It should be noted that in developing this report many more companies and products were found that fit into the above mentioned infill categories or are variations of the above mentioned infill types. These products were not included due to lack of testing/ information, lack of US presence, or other concerns.*

#### **WARRANTY AND APPROVALS:**

With the various infill alternatives available to choose, an important component of this decision is whether or not synthetic turf carpet manufacturers will permit the use of an alternative third party infill product. Discussions with the turf manufacturers have led to the conclusion that a separate specification should be written for the infill and turf manufacturers that will outline and clearly define the role of the turf and base installers vs the infill manufacturer. For the turf manufacturers to be comfortable and approve the use of an alternative third party infill, they would need to have the assurance that they would not be liable for any type of failure of either the infill itself or the system as a whole (such as drainage) as a result of the infill. Interestingly enough, all infill for all field manufacturers turf systems is via third party sources; however, tested and customized for each turf manufacturer's system. Below is a list of the currently approved turf manufacturers and responses to warranty with alternative third party infill material:

- Shaw: Yes, if acceptable to their standards
- Field turf: Maybe, if tested and approved corporately
- Hellas: Yes
- Astroturf: Yes, with testing and approval
- A-Turf: Yes, with testing and approval
- Prograss: No response

#### **PAD OPTIONS:**

Once you have selected the type of alternative infill you want to use for your next project, it is then important to determine whether or not the infill/carpet requires a shock pad. We have provided pad options below. All pad options are available via third party and are not associated with any particular turf brand or turf type. When selecting a pad for your next field, keep in mind several factors, e.g., Will this field be used for concerts, fundraisers, carnivals, or other similar events such as at Thomas Jefferson Middle School? These types of occasions would benefit from a "harder" shock pad/ base. Contrast with a smaller field like at Rocky Run Park,

where high impact sports will not be played, performance and structure is not important. Below is a list of various pad options:

**Elastic Rubber Shock Pad** – the most traditional of pad options

- Product comes in 4' wide rolls, 8-12mm thickness options, recommend thickness on type of impact sports or events to be held on the field
- Made from post-consumer tire rubber, placement under carpet and not prone to weathering and pulverization – no exposure to chemical composition
- Great shock attenuation
- Free draining
- Will not reduce base depth more than its own thickness but least expensive base option
- Flexible
- Can drive machinery without damage to the product
- 10 year warranty, manufacturers claim 2-3 full turf lifecycles depending on level of play and weather

Uses: Best for General Parks and recreation applications, lawn areas, play areas



Products Currently Available:

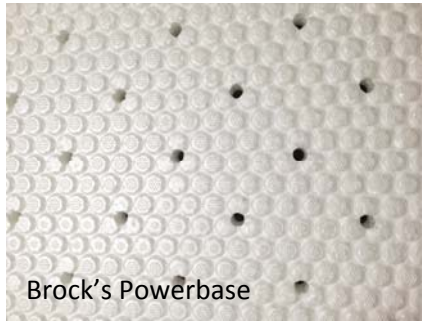
- *Ecore 6010 SP* \$0.90-1.10 SF
- *Regupol Abzorb* \$0.75-1.10 SF

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**Foam Shock Pad**

- Panel and rolled foam systems available. Due to product composition will not span areas of depression, or have a high range of flexibility – thus, panels can crack
- Excellent shock attenuation, however firm, to maintain performance standards
- Good Drainage characteristics
- Will not allow use of heavy machinery for installation and removal of turf; tends to add money to a bid, as it will be more labor to install or remove turf at end of its lifecycle
- Will not reduce base depth as it has similar storage capacity/ void as stone base

Uses: Best for General Parks and recreation fields, schools, universities where better performance is preferred (which costs upwards of 0.50 a SF over an elastic rubber pad); product can also be used on structure to allow horizontal drainage



Brock's Powerbase



AlveoSport's Pad



Armacell's ArmaSport Pad

**Products Currently Available:**

- *Brock Powerbase and YSR* – \$1.50 SF installed, rigid panel foam
- *AlveoSport* – \$1.00 Installed, 'flexible' rolled foam
- *ArmaSport* – \$2.20 Installed, closed cell foam in a variety of densities for project specific sports and applications

**Structural Shock Pad/ Base**

- "Hard" Panel system, made of recycled thermo polymeric material (plastic), such as recycled synthetic grass.
- Provides consistent Gmax and performance
- High volume drainage, both vertically and horizontally, allows for reduced stone base depth by 2"
- Can drive heavy machinery over product even with no turf/ infill

Uses: Best for General Parks and recreation fields, schools, universities where heavy usage and other events will be held on field and where consistent performance is preferred (which costs upwards of 0.50 a SF over an elastic rubber pad); product can be used on structure or allow for reduced stone base depth



Ultrabase Champion



Bottom View

**Products Currently Available:**

- *Ultrabase Champion* - \$1.50 SF installed
- *No other product of similar design*

**Other Shock Pad Products of Notable Value:**

- *Field turf Versatile* \$1.25 SF - Ideal for organic infill options to allow fast infiltration to reduce migration, exclusive to Field Turf - cannot be specified in conjunction with other turf manufacturers
- *Brock SP14* \$1.00 SF installed – somewhat brittle compared to other options, more ideal for an economical application/ small fields
- *Ultrabase Pro* - \$2.40 SF Installed – Ideal for heavy use areas or locations where a reduced depth stone base is necessary due to subsurface conditions. Able to drive fire trucks, placement of concert staging, etc. Can reduce base depth by 4”

*Additionally it should be noted that ASTM safety standards for synthetic turf fields are expected to be lowered from 200 maximum to 165 maximum Gmax ratings. How this will translate to turf manufacturers’ systems and infill mixtures (sand vs rubber amount) has yet to be seen; and whether or not a pad may be necessary regardless of the alternative infill type chosen.*

**IRRIGATION OPTIONS:**

If you decide to choose the organic infill alternative, that infill type requires regular watering during dry times of the year. We have provided some watering options, including estimated cost that includes the entire system to operate:

**Traveling Water Reel** - This is a portable unit on a trailer. It needs to be transported to the field by tractor or truck. The sprinkler is placed at one end of the field and it travels the length of the field. *Kifco Model E200SST*.

Cost: Low - approx. \$25,000 for system

Labor: Intensive

**Water Cannon** - Water cannons can be considered fixed or portable. If they are portable, a series of quick coupler valves are installed around the perimeter of the field. The user would move the unit from valve to valve until the desired amount of water is applied to the field. McDaniel College in Westminster had this style of system installed on their stadium field about 15 years ago. This method works well, but the cannons can be cumbersome to move, and as you can imagine, this can be very labor intensive. *Nelson 100 Series Big Gun*

Cost: Mid-Range - approx. \$65,000 for system

Labor: Intensive

**Valve-in-Head** - The sprinkler and valve come from the manufacturer as one unit. They are installed around the perimeter of the field. The sprinklers retract back into the ground and the system is automated like a traditional irrigation system on an athletic field. *Hunter ST Cooling system*

Cost: High - approx. \$100,000+ for system

Labor: Low - similar to regular natural turf irrigation system with controller

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**CONCLUSIONS:**

This report has provided an analysis of the more notable infill alternatives to traditional crumb rubber for synthetic turf athletic fields. The infill alternatives presented have been tested and/or are newer variants of tested products. Some infill alternatives may require a pad and some may not; however, this variable should be re-considered for each turf project you plan. The appropriate solution for one site may not be the right choice for another based on maintenance, longevity and cost factors.

The standard design profile of synthetic turf fields for Arlington County Parks and Recreation is a free draining gravel base with choker layer (depth based on SWM requirements), no pad, and a 2.5" infilled carpet system (1.75" 50/50 sand crumb rubber infill depth). Below we have provided some conclusions for consideration. For comparison, Arlington's standard specification is a 2.5" depth synthetic turf carpet with a 1.75" depth 50/50 cryogenic crumb rubber/sand infill and will run approx. \$4.25 – \$4.75 SF (depending on manufacturer). Costs below are additional to the standard design profile (excluding stone base – as it is based on SWM design and will vary by location in Arlington County).

**COSTS:** *Alternative Infill Options are listed in order of cost magnitude starting with least expensive. The pricing provided should be considered conservative and is not indicative of the bidding process or using County buying contracts where cost savings can be provided with individual Turf Manufacturers.*

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**Option 1a Recycled Rubber Infill** - Reduce carpet height of current specification to 2.25", replace cryogenic crumb rubber/sand mix with Nike Grind/sand mix (1.75" infill depth). The reduction of .25" will save on material costs. No shock pad will be necessary.

Maintenance: Low – same as traditional crumb rubber/ sand infill

Cost: Nike Grind +/- \$1.50-1.75 SF = \$120,000 – \$140,000 additional cost than standard mix (80,000 SF field)

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**Option 1b Recycled Rubber Infill** - Reduce carpet height of current specification to 2.0," replace cryogenic crumb rubber/sand mix with Nike Grind/sand mix (1.5" infill depth). Shock pad will be necessary for most field applications – depending on field size and anticipated sports to be played on the field.

Maintenance: Low – same as traditional crumb rubber/ sand infill

Cost: Nike Grind Rubber: +/- \$1.25-1.50 SF = \$100,000 – \$120,000 additional cost than standard mix  
Pad: +/- \$0.90-1.50 SF = \$72,000 – \$120,000

Total \$172,000 – \$240,000 per 80,000 SF Field

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**Option 2a EDPM Rubber Infill** - Reduce carpet height of current specification to 2.25", replace cryogenic crumb rubber/sand mix with EDPM/sand mix (1.75" infill depth). The reduction of .25" will save on material costs. No shock pad will be necessary.

Maintenance: Low – same as traditional crumb rubber/ sand infill

Cost: EPDM +/- \$1.85-2.10 SF = \$148,000 – \$168,000 additional cost than standard mix (80,000 SF field)

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**Option 2b EDPM Rubber Infill** - Reduce carpet height of current specification to 2.0," replace cryogenic crumb rubber/sand mix with EPDM/sand mix (1.5" infill depth). Shock pad will be necessary for most field applications – depending on field size and anticipated sports to be played on the field.

Maintenance: Low – same as traditional crumb rubber/ sand infill

Cost: EPDM: +/- \$1.60-1.85 SF = \$128,000 – \$148,000 additional cost than standard mix  
Pad: +/- \$0.90-1.50 SF = \$72,000 – \$120,000

Total \$200,000 – \$268,000 per 80,000 SF Field

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**Option 3a TPE Rubber Infill** – Reduce carpet height of current specification to 2.25," replace cryogenic crumb rubber/sand mix with TPE/sand mix (1.75" infill depth). The reduction of .25" will save on material costs. No shock pad will be necessary.

Maintenance: Low – same as traditional crumb rubber/sand infill

Cost: +/- \$2.00-2.75 SF = \$160,000 –\$220,000 additional cost than standard mix (80,000 SF field)

**Option 3b TPE Rubber Infill** - Reduce carpet height of current specification to 2.0," replace cryogenic crumb rubber/ sand mix with TPE/ sand mix (1.5" infill depth). Shock pad will be necessary for most field applications – depending on field size and anticipated sports to be played on the field.

Maintenance: Low – same as traditional crumb rubber/sand infill

Cost: Rubber: +/- \$1.70-2.50 SF = \$136,000 –\$200,000 additional cost than standard mix  
Pad: +/- \$0.90-1.50 SF = \$72,000 – \$120,000

Total \$208,000 – \$320,000 per 80,000 SF Field

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**Option 4 Coated Sand Infill** - Reduce carpet height of current specification to 1.75," replace cryogenic crumb rubber/sand mix with Envirofill (1-1.25" infill depth). Shock pad will be necessary.

Maintenance: Low – same as traditional crumb rubber/sand infill

Cost: Envirofill: +/- \$1.75-2.00 SF = \$140,000 – \$160,000 additional cost than standard mix  
Pad: +/- \$0.90-1.50 SF = \$72,000 – \$120,000

Total \$212,000 – \$280,000 per 80,000 SF Field

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**Option 5 Organic Infill** – Reduce carpet height of current specification to 2," (Side note: Shaw and AstroTurf offer a 1.75" option, with an infill depth of 1 1/8." We would not recommend this, as it would be necessary to keep an eye on the turf at all times to maintain proper elevation for safety and turf fiber longevity), replace cryogenic crumb rubber/sand infill with organic infill (various products to choose from). Shock pad will be necessary.

Maintenance: High, weekly brushing, routine "fill-up" since product naturally breaks down, and irrigation during dry times (year around)

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**Cost:** Organics: +/- \$1.30-1.50 SF = \$104,000 –\$120,000 additional cost\* than standard mix  
 Pad: +/- \$0.90-1.50 SF = \$72,000 – \$120,000

Total \$176,000 – \$240,000 per 80,000 SF Field

Alternate design: Maintain 2.5” carpet with organic/sand infill mix

Total +/- \$1.75-2.50 SF = \$140,000 - \$200,000 additional cost\* than standard mix, NO pad needed

- Maintenance: optional maintenance contract \$10,000-\$20,000 x 8 years
- Irrigation: if needed based on selected organic option, \$25,000-\$100,000 (depending on level of maintenance desired) + operational costs

*\*Wide range in numbers due to varying product lines available from multiple manufacturers.*

**Note:** If the Ultrabase pad is used for any of the above options, a reduction of 2” of gravel base can be applied to any of the totals. Approx. +/- \$20,000 savings

**Summary of advantages/ disadvantages:**

	RECYCLED RUBBER	EDPM RUBBER	TPE RUBBER	COATED SAND	ORGANIC FIBER
<b>1.75”-2.0” CARPET</b>					
<b>ADDITIONAL COST PER SF (INCLUDES PAD PRICING IF APPLICABLE)</b>	\$1.25-\$1.50	\$1.60-\$1.85	\$1.75-\$2.25	\$2.65-\$3.50	\$2.10-\$3.00
<b>ADDITIONAL MAINTENANCE (NOT INCLUDED IN PRICE PER SF ABOVE)</b>	no	no	no	no	Yes- High
<b>AVAILABILITY</b>	Limited at times	Short Lead Time	Short Lead Time	Available	Available
<b>HEAT REDUCTION</b>	Minimal-10%	Minimal-10%	Minimal-10%	10%-25%	50%-100%
<b>WARRANTY PERIOD</b>	Carpet Life (8yrs) or longer	2 yr Color Carpet life (8yrs) or longer	8 Yr Warranty (life of Carpet or longer)	16 Yr Warranty (2 turf 8yr life cycles)	None, naturally breaks down
<b>LIMITS ON USE</b>	No	No	No	No	Some
<b>PAD REQUIRED</b>	Depends on Location and usage	Depends on Location and usage	Depends on Location and usage	Yes	Yes
<b>IRRIGATION REQUIRED (NOT INCLUDED IN PRICE PER SF ABOVE)</b>	No	No	No	No	Yes
<b>3<sup>RD</sup> PARTY TESTING AVAILABLE*</b>	MSDS only	MSDS only	Yes, MSDS	Yes, MSDS	Yes, MSDS
<b>COMPANY TESTING AVAILABLE</b>	Yes	Yes	Yes	Yes	Yes
<b>HEALTH CONCERNS</b>	None Known	None Known	None Known	None Known	Possible Allergies
<b>IDEAL USES</b>	Competitive; All Sports and field sizes; All Age Levels	Competitive; All Sports and field sizes; All Age Levels	Sports that prefer a firm surface-Futrfill, Competitive; All Sports and field sizes; All Age Levels	Sports that prefer a firm surface; Small to medium size fields; Lower level play and recreational sports; Practice Fields; Lawns/ Play surface	Competitive; All Sports and field sizes; All Age Levels; Lawn areas and play surface

<b>2.25"-2.50" CARPET</b>	<b>RECYCLED RUBBER</b>	<b>EDPM RUBBER</b>	<b>TPE RUBBER</b>	<b>COATED SAND</b>	<b>ORGANIC FIBER</b>
<b>ADDITIONAL COST PER SF (INCLUDES PAD PRICING IF APPLICABLE)</b>	\$1.50-\$1.75	\$1.85-\$2.10	\$2.00-\$2.75	-	\$2.25-\$3.00
<b>ADDITIONAL MAINTENANCE (NOT INCLUDED IN PRICE PER SF ABOVE)</b>	<i>no</i>	<i>no</i>	<i>no</i>	-	<i>Yes- High</i>
<b>AVAILABILITY</b>	<i>Limited at times</i>	<i>Short Lead Time</i>	<i>Short Lead Time</i>	-	<i>Available</i>
<b>HEAT REDUCTION</b>	<i>Minimal-10%</i>	<i>Minimal-10%</i>	<i>Minimal-10%</i>	-	<i>50%-100%</i>
<b>WARRANTY PERIOD</b>	<i>Carpet Life (8yrs) or longer</i>	<i>2 yr Color Carpet life (8yrs) or longer</i>	<i>8 Yr Warranty (life of Carpet or longer)</i>	-	<i>None, naturally breaks down</i>
<b>LIMITS ON USE</b>	<i>No</i>	<i>No</i>	<i>No</i>	-	<i>Some</i>
<b>PAD REQUIRED</b>	<i>Depends on Location and usage</i>	<i>Depends on Location and usage</i>	<i>Depends on Location and usage</i>	-	<i>Depends on Location and usage</i>
<b>IRRIGATION REQUIRED (NOT INCLUDED IN PRICE PER SF ABOVE)</b>	<i>No</i>	<i>No</i>	<i>No</i>	-	<i>Yes</i>
<b>3<sup>RD</sup> PARTY TESTING AVAILABLE*</b>	<i>MSDS only</i>	<i>MSDS only</i>	<i>Yes, MSDS</i>	-	<i>Yes, MSDS</i>
<b>COMPANY TESTING AVAILABLE</b>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	-	<i>Yes</i>
<b>HEALTH CONCERNS</b>	<i>None Known</i>	<i>None Known</i>	<i>None Known</i>	-	<i>Possible Allergies</i>
<b>IDEAL USES</b>	<i>Competitive; All Sports and field sizes; All Age Levels</i>	<i>Competitive; All Sports and field sizes; All Age Levels</i>	<i>Sports that prefer a firm surface-Futrfill, Competitive; All Sports and field sizes; All Age Levels</i>	<i>Not Recommended for tall carpet systems – cost prohibitive, no benefit</i>	<i>Competitive; All Sports and field sizes; All Age Levels; Lawn areas and play</i>

**\*MSDS (Material Data Safety Sheet) If concerned about unwanted content within infill, it would be advantageous when creating the bid specification to ensure a 3<sup>rd</sup> party test of the infill material when it arrives on site and prior to installation to ensure quality and safety.**

**Adoption:**

The health concerns with traditional crumb rubber tire infill have been around for years. New York City, Los Angeles and a growing number of cities have eliminated the use of crumb rubber tires in synthetic turf field infill systems mainly due to unknown health concerns from the public, but also the known issue of excessive heat. In speaking with several manufacturers who currently perform work for these cities, we can note they have been using the following infill alternatives:

**NYC and the Northeast region:** EPDM, TPE, Various Envirofill, Nike Grind, and Organic

**Los Angeles and Western Region:** TPE, Zeofill, Various Nike Grind and Organic



**Local Alternative Infill Examples:**Great Falls Nike Park, Field #4 – Fairfax County Park Authority

1100 Utterback Store Road

Great Falls, VA 22066

*Installed Winter 2013*

*Field Turf Revolution with Futrfill/ Silica Sand Infill mix* – Field does not appear to be filled to the proper height and has a very firm feel – no pad. Infill material seems to be holding up very well with no signs of degradation. Field aesthetics are great, and there does not seem to be any signs of pre-mature carpet wear except lacrosse goal areas. Field is primarily used for lacrosse and is favored for its fast playing surface. County states Gmax averaging 165-169 over last 2 seasons.

Lakelands Park – Montgomery County Parks and Recreation

1368 Main Street

Gaithersburg, MD 20878

*Installed Summer 2014*

*2.5" Limonta Max S Turf with Limonta Sport Infill Pro* – Field has a nice feel, a bit softer than walking on a natural turf, no pad. Some of the infill material (cork) has migrated to the outside edges of the field, otherwise the field seems to be in great condition. Field is relatively new, aesthetics are great and there does not seem to be any issues of note. County states cost was 10% more than traditional system; however, no irrigation or additional maintenance costs were included.



[www.gordon.us.com](http://www.gordon.us.com)

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## RECYCLED RUBBER INFORMATION KIT

### INTRODUCTION

The recycled rubber industry has been charged with defending itself against baseless accusations in the wake of the recent report by NBC News. The report featured an assistant coach for the University of Washington women's soccer team who claimed there is a relationship between crumb rubber infill and incidents of cancer among athletes.

The following document is intended to serve as a tool to refute speculative dangers, and help spread the truth about crumb rubber and rubber mulch. It is a comprehensive summary of the recent media coverage as well as science-based studies that prove recycled rubber is safe.

#### **In this document, you will find:**

- Page 2 -**        **The top five reasons** recycled rubber is safe
- Pages 2, 3 -**    **Industry statements** by companies and organizations that stand behind their product
- Pages 4, 5 -**    **Frequently asked questions** that may come from customers
- Page 6 -**        **Summary of UL GREENGUARD Certification** and how it guarantees the safety of recycled crumb rubber
- Pages 7, 8 -**    **Summaries of scientific reports** that support the safety of recycled rubber
- Pages 9, 10 -**   **State of Connecticut Department of Public Health**
- Page 10, 11 -**   **Vinton Today**
- Page 12 -**        **Power Engineering - Lower Canada College (LCC)**
- Page 13 -**        **MetroWest Daily News – Medway**
- Page 14 -**        **KSDK St. Louis**
- Page 15 -**        **Trib Total Media - Mt Lebanon**
- Page 16 -**        **Glendale News Press – Glendale Sports Complex**
- Page 17 -**        **Richmond Review**
- Page 18 -**        **Karmanos Cancer Institute**
- Page 19 -**        **Yakima Herald, Wa**
- Page 20 -**        **Resources**
  
- Pages 21-24**    **An extensive Index of Reports that prove recycled rubber is safe**  
                         **Provided by Synthetic Turf Council (STC)**

## TOP FIVE REASONS RECYCLED RUBBER IS SAFE

1. Extensive studies over the past 20 years have all concluded that recycled rubber is safe, and there is absolutely no credible evidence that crumb rubber infill or rubber mulch causes any illness.
2. All of the studies that prove the safety of recycled rubber were conducted without industry influence by government agencies and top universities.
3. The recent news stories claiming a link to cancer are based purely on speculation. They haven't presented any data. As NBC correctly noted, "there is no research directly linking recycled rubber exposure to cancer."
4. Airborne levels of particulate matter, metals and volatile organic compounds associated with crumb rubber and rubber mulch are within acceptable environmental tolerances, according to the U.S. Environmental Protection Agency. Additionally, lead, zinc and particulate matter are at acceptable EPA levels.
5. Crumb rubber produced by Liberty Tire Recycling is certified by the GREENGUARD Environmental Institute, which uses UL Verification Services, a certified lab for Consumer Product Safety Commission standards testing. The products are certified based on the Consumer Product Safety Improvement Act, European toy safety standard criteria for heavy metals (EN 71.3), and the California Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels for volatile organic compounds.

## Industry Response

### Liberty Tire Recycling

Liberty Tire Recycling confidently stands behind the safety of recycled rubber. There are extensive independent studies conducted over the past 20 years that come to the same conclusion. These studies were conducted by government agencies and top universities, with no industry interference.

To our knowledge, any claims that indicate recycled rubber causes cancer or any other health problems are based purely on speculation. Of the dozens of high-level studies that investigated the effects of recycled rubber on human health, none of them has revealed any connection to illness of any kind.

Liberty Tire Recycling has also proactively sought third-party validation through our UL GREENGUARD Synthetic Turf Certification from Underwriters Laboratories. UL GREENGUARD is an independent organization that strives to improve public health and quality of life through programs that reduce chemical exposure.

UL GREENGUARD ensures that synthetic turf components meet stringent requirements for chemical emissions, lead content and heavy metal migration that are certified by independent laboratories.

## **Liberty Tire Recycling Response (cont'd)**

UL GREENGUARD tests crumb rubber infill produced by Liberty Tire Recycling using UL Verification Services, a certified lab for Consumer Product Safety Commission standards testing. The certification is based on the Consumer Product Safety Improvement Act, European toy safety standard criteria for heavy metals (EN 71.3), and the California Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels for volatile organic compounds.

The preponderance of scientific evidence is why we stand behind the safety of our product, and it's why artificial turf fields and playgrounds across the country utilize recycled rubber materials to provide safer, more environmentally friendly playing surfaces.

## **Synthetic Turf Council (STC)**

The Synthetic Turf Council (STC) and the synthetic turf industry take the health, safety, and welfare of synthetic turf users very seriously. We sympathize with those individuals who are battling a serious illness. As the industry's trade association, it is our responsibility to address the issues raised in the NBC story in an objective manner.

The STC believes that reliable scientific data should be the foundation of any discussion regarding the safety of synthetic turf with crumb rubber infill. During the past two decades, there have been more than 60 technical studies and reports that review the health effects of crumb rubber as it pertains to toxicities from inhalation, ingestion and dermal contact, as well as cancer. These studies and reports were performed during the past 22 years by independent organizations such as: Connecticut Department of Health, Hofstra University, New York State Department of Environmental Conservation, The New York City Department of Health and Mental Hygiene and University of California Berkeley. The preponderance of evidence shows no negative health effects associated with crumb rubber in synthetic turf. As NBC factually reported, "there is no research directly linking crumb rubber exposure to cancer."

According to an EPA report, Child-Specific Exposure Factors Handbook, "supplemental chronic risk estimates indicate regular exposure (e.g. regular play on ground rubber filled athletic fields) to ground rubber for the length of one's childhood does not increase risk of cancer above levels considered by the state of California to be de minimus."

The STC supports the extensive scientific research already performed and any future opportunities for science-based research.

Crumb rubber used in synthetic turf systems should always meet or exceed the Synthetic Turf Council's quality guidelines.

The STC website includes many of the studies on the human health and environmental safety of synthetic turf and crumb rubber.

## Consumer Questions

### *What is **crumb rubber**?*

Crumb rubber is a **recycled rubber used on turf fields and other flooring** throughout the world. Crumb rubber gives turf fields greater cushioning and flexibility and creates a playing surface that can be used and maintained for decades.

### *What is **the source of crumb rubber**?*

Crumb rubber is produced from recycled tires after a thorough process by which tire cords are removed and the rubber is transformed into a safe flooring product.

### *Have there been **any scientific studies** to examine the safety of crumb rubber?*

Yes. In fact, over the past 20 years, every study conducted has shown that the use of crumb rubber is not associated with any elevated health risks. Over five dozen studies have been conducted by health and environmental agencies in California and Connecticut and at universities such as Penn State. You can review these studies [here](#).

### *Is there any **research showing that crumb rubber may be dangerous to children**?*

To our knowledge, there is **not a single scientifically valid study** linking the use of crumb rubber to increased health risks for children or adults.

### *What about **questions raised by NBC's televised report**?*

We sympathize with every individual and family mentioned in NBC's story. However, the story highlighted health concerns that could be related to a multitude of factors both on and off the field, and are extremely unlikely to be related to the use of crumb rubber. As NBC properly noted in their report, "**there is no research directly linking crumb rubber exposure to cancer.**"

### *What if my child **ingests crumb rubber or it comes into contact with his or her skin**?*

While people should avoid ingesting crumb rubber, swallowing crumb rubber has not been found to pose any serious health risks. According to a 2010 study by the University of California, ingestion of a significant quantity of tire shred did not elevate a child's risk of developing cancer. A Hofstra University study in 2007 found similar results and reported that exposure to rubber crumb by swallowing, inhalation and skin contact posed no significant health risk.

### *Are children and adults **vulnerable to unusually high rates of toxic chemicals in synthetic turf fields**?*

Extensive research, such as a study conducted by the University of California in 2012, has concluded that synthetic turf fields result in **little, if any, exposure to toxic substances**. In 2008, the U.S. Consumer Product Safety Commission (CPSC) staff evaluated various synthetic athletic fields. The evaluation concluded that young children are **not at risk from exposure to lead in these fields**.

## Consumer Questions (cont'd)

*Even if the chemicals in crumb rubber do not affect your health significantly, aren't they **still bad to inhale?***

Any **compounds that enter the air** from crumb rubber **do not exceed** the amount that are naturally present in the air.

*Can I be **100% certain** that crumb rubber does not cause cancer?*

There is **absolutely no evidence that crumb rubber causes cancer**, while more than 60 studies conducted over the past two decades point to the product's safe use.

## Buyers and Contractors Questions

*How do I **explain to stakeholders** that turf with crumb rubber is safe?*

During the past two decades, there have been more than **60 technical studies and reports that review the health effects of crumb rubber as it pertains to toxicities from inhalation, ingestion and dermal contact, as well as cancer**. None of the evidence has shown **any negative health effects associated with crumb rubber in synthetic turf**.

*What about that story about crumb rubber on **NBC**?*

The NBC story featured the concerns of people who are drawing parallels based purely on speculation. NBC noted in their report, "**there is no research directly linking crumb rubber exposure to cancer.**"

*Aren't there **safer alternatives** to crumb rubber, such as **Nike Grind, coconut fiber and cork infill**?*

A City of Richmond (British Columbia) review found **no evidence that the Nike Grind material is safer** than the industry standard crumb rubber. And there have been no studies to prove the safety or viability of coconut fiber or cork as infill for synthetic turf, while over 60 studies have been performed regarding the safety of crumb rubber.

*Haven't a lot of communities **cancelled their orders** for synthetic turf with crumb rubber?*

A few communities have delayed their decision until more information regarding health risks could be determined. And many, like the City of Richmond in British Columbia, proceeded with synthetic turf as planned: "Following a staff review of the concerns raised, we are proceeding with the project as planned," said City of Richmond spokesperson Ted Townsend. "The crumb rubber-recycled truck tire product is the present industry standard and **we have not been advised of any verified health hazards from using the product.**"

## UL GREENGUARD Synthetic Turf Certification

As part of UL Environment, a business unit of UL (Underwriters Laboratories), UL GREENGUARD Certification helps manufacturers create – and helps buyers identify – interior products and materials that have low chemical emissions, improving the quality of the air in which the products are used.

UL GREENGUARD Certification is broadly recognized and accepted by sustainable building programs and building codes around the world. Additionally, the UL GREENGUARD Product Guide serves as a free online tool for finding certified low-emitting products for offices, hospitals, schools, homes and more.



## Liberty Tire Recycling is the first and only company to achieve UL GREENGUARD Synthetic Turf Certification.

**All products certified by UL GREENGUARD are rigorously tested to ensure they meet a series of strict chemical emissions standards based on established criteria from key public health agencies.**

UL GREENGUARD Synthetic Turf Certification ensures that synthetic turf components meet stringent requirements for chemical emissions, lead content and heavy metal migration that are certified by independent laboratories.

The certification is based, in part, on the Consumer Product Safety Improvement Act, European Toy safety standard criteria for heavy metals, and the California Office of Environmental Health Hazard Assessment's Chronic Reference Exposure Levels for volatile organic compounds.

UL Sustainable Product Guide

**Certification Period**      **May 2011 – May 2015**

**Facility**                      Des Moines, IA

**Claim**                      Heavy metals content meets requirement of EN 71. Limits are based on the ASTM F963-08 and the European Standard "Safety of toys," EN71: Part 3: 1994, Amendments – AC: 2000/AC:2002. Lead meets the requirement of CPSIA for children's products. Total lead content meets the requirement of 90ppm in surface coatings (per Consumer Product Safety Improvement Act (CPSIA) of 2008) VOC emissions meet the requirements of CDPH Standard Method v1.1. Predicted exposure concentration of specific VOCs less than ½ Chronic Reference Exposure Levels (CRELs) with results modeled in an indoor soccer arena environment (1,505m<sup>2</sup> field area in a 94,423m<sup>3</sup> stadium with air change rate of 0.73 ACH

**Method**                      EN 71 - CDPH Standard  
Method v1.1.- CPSIA



## REPORT SUMMARIES

The following highlights show snapshots of the most concrete scientific studies that prove recycled rubber does not elevate health risks for athletes. The complete studies can be found at the Synthetic Turf Council [website](#).

Lower Canada College, a leading K-12 private school in Montreal, announced that the **crumb rubber infill used in its new synthetic turf athletic field is safe for continued use by children of all ages**. This comes as a result of testing that the school conducted using an independent, highly-sophisticated laboratory in Paris, France to test its crumb rubber.

*Toxicological Analysis of performance infill for synthetic turf fields according to EN 71-3 standard, November 2014 Lower Canada College*

Several scientific research studies carried out in the United States and Europe have assessed potential exposures and health risks for people using turf fields containing crumb rubber. According to the Health Department's review of these research findings, **health effects are unlikely from exposure to the levels of chemicals found in synthetic turf**.

*Artificial Turf: Are any health effects associated with these chemicals found in synthetic turf crumb rubber?* 2014 The New York City Department of Health and Mental Hygiene website

Based on the available literature on exposure to rubber crumb **by swallowing, inhalation and skin contact** ... we conclude, that there is **not a significant health risk due to the presence of rubber infill** for football players [for] an artificial turf pitch with rubber infill from used car tires.

- *Environmental and Health Risks of Rubber Infill: Rubber crumb from car tires as infill on artificial turf*, 2007 Hofstra University

Based upon the current evidence, a public health risk appears unlikely. **DPH does not believe there is a unique or significant exposure from chemicals** that can be inhaled or ingested at these fields.

*Health Questions about Artificial Turf Fields*, October 2007 **Connecticut Department of Public Health**

Authorities are worried that because of the chemical content of the material, exposure by various means could endanger the health of field users, especially children. However, **extensive research** has pointed to the conclusion that **these fields result in little, if any, exposure to toxic substances**.

*Review of the Impacts of Crumb Rubber in Artificial Turf Applications*, February 2010  
University Of California, Berkeley Laboratory for Manufacturing and Sustainability

The U.S. Consumer Product Safety Commission (CPSC) staff today released its evaluation of various synthetic athletic fields. The evaluation concludes **that young children are not at risk from exposure to lead in these fields**.

*CPSC Staff Finds Synthetic Turf Fields OK to Install, OK to Play On*,  
July 2008 United States Consumer Product Safety Commission

Based on the available information, chemical exposures from crumb rubber in synthetic turf **do not pose a public health hazard**.

- *Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields*,  
August 2008 State of New York Department of Health

## Report Summaries (cont'd)

I have reviewed the available literature regarding the use of rubber crumb in artificial turf infields — both pro and con — and in my professional opinion the **artificial turf field would present no significant risk to human health.**

- *Rubber Crumb Health Risk Evaluation*, April 2007  
Pamela Lamie Environmental Scientist Review for Concord Public Works

The use of outdoor and indoor artificial turf fields **is not associated with elevated health risks.**

- *Human Health Risk Assessment of Artificial Turf Fields Based upon Results from Five Fields in Connecticut*, July 2010  
**Connecticut Department of Public Health**

Ingestion of a significant quantity of tire shred **did not elevate a child's risk of developing cancer**, relative to the overall cancer rate of the population.

- *Review of the Impacts of Crumb Rubber in Artificial Turf Applications*, February 2010 Rachel Simon, **University of California, Berkeley**

Supplemental chronic risk estimates ... indicate that regular exposure (e.g., regular play on ground rubber filled athletic fields) to ground rubber for the length of one's childhood **does not increase risk of cancer** above levels considered by the State of California to be de minimus.

*Child-Specific Exposure Factors Handbook, Interim Report*, 2002  
United States Environmental Protection Agency

These **risks are well within typical risk levels in the community** from ambient pollution sources and are below target risks associated with many air toxics regulatory programs.

- *Risk Assessment of Artificial Turf Fields*, July 2010  
Connecticut Department of Energy & Environmental Protection

The NIPH [Norwegian Institute of Public Health] (2006) study **did not show significant levels of risk to children** playing football (rugby) on indoor synthetic turf fields, at exposure levels ranging from acute to chronic scenario.

- *Review of the Potential Health and Safety Risks from Synthetic Turf Fields Containing Crumb Rubber Infill*, May 2008  
Prepared for New York City Department of Health and Mental Hygiene by TRC

Concentrations of VOCs and PM above field **did not exceed background**, even with high field temperatures; not likely to pose risk from inhalation.

- *An Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb-Rubber Infilled Synthetic Turf Fields*, 2009  
Department of Environmental Conservation and Department of Health

The results of their analysis indicated that playing on synthetic turf fields **do not cause any increased health risk.** *Initial Evaluation of Potential Human Health Risks Associated with Playing on Synthetic Turf Fields on Bainbridge Island*, February 2008 Windward Environmental LLC

## Related News Coverage and projects moving forward

State of Connecticut Department of Public Health  
Recent News Concerning Artificial Turf Fields

January 20, 2015

This letter and [video clip](#) are being sent to update you regarding the news story that has circulated since last spring regarding potential cancer risks at artificial turf fields. Various media outlets have continued to run this story and a number of local health departments have inquired as to its validity. Since many Connecticut towns have installed or are considering artificial turf fields an elevated cancer risk would be an important consideration. However, this news story is still based upon very preliminary information and does not change CTDPH's position that outdoor artificial turf fields do not represent an elevated health risk.

The Connecticut Department of Public Health has evaluated the potential exposures and risks from athletic use of artificial turf fields. Our study of 5 fields in Connecticut in 2010-2011 was a comprehensive investigation of releases from the fields during active play. This study was conducted as a joint project with the CT DEEP and the University of CT Health Center and was peer-reviewed by the Connecticut Academy of Science and Engineering. Our study did not find a large amount of vapor or particle release from the fields confirming prior reports from Europe and the US. We put these exposures into a public health context by performing a risk assessment. Our risk assessment did not find elevated cancer risk. These results have been published as a set of 3 articles in a peer review journal and are available on the DPH artificial turf webpage (<http://www.ct.gov/dph/cwp/view.asp?a=3140&q=464068>).

The news story suggests soccer players and especially goalies may have an elevated cancer risk from playing on artificial turf fields. This is based upon anecdotal observations of a university soccer coach (<http://www.komonews.com/news/local/Soccer-coach-Could-field-turf-be-causing-cancer-259895701.html>). Reportedly the coach is developing a list of soccer players who have contracted cancer. However, the types of cancer are undocumented and so it is impossible to say whether they represent a common effect and there has been no reporting on how long the goalies played on artificial turf fields to see if there was plausible exposure and latency. There are many reasons why someone collecting a list of cancer cases may appear to find a cluster including the fact that when you have a single-minded focus on finding cases you do not capture all the non-cases that would tend to disprove the cluster. Documentation of an increased rate in soccer players would require an epidemiological study in which the total number who play on turf fields in a given region was also known so that a cancer rate could be established and compared to those that do not play on artificial turf fields. The current news report does not constitute epidemiological evidence and thus is very preliminary.

Our risk assessment did cover carcinogens that are known to be in recycled tires and the crumb rubber used to cushion fields. Once again, we found there to be very little exposure of any substances, carcinogenic or not, in the vapors and dust that these fields generate under active use, summer conditions. Background levels of chemicals in urban and suburban air from heating sources and automobile traffic are much more significant sources of airborne carcinogens.

The fact that we sampled 5 fields (4 outdoor and 1 indoor) of different ages and composition suggests that the results can be generalized to other fields, a conclusion supported by the fact that results were similar to what was found in California, USEPA and European studies. Our study did not evaluate ingestion of the crumb rubber itself as players are unlikely to ingest an entire rubber pellet.

## Related News – State of Connecticut Department of Public Health (Cont'd)

However, two studies, one in California and one at Rutgers University did evaluate the cancer risk if children ingested a mouthable chunk of playground rubber (10 gram), using laboratory extraction methods to estimate the amount of chemicals that might become available in the stomach and absorbed into the body. Both studies found very low cancer risk from this scenario (Cal OEHHA 2007; Pavilonis et al. 2014). Thus, CT DPH finds no scientific support for a finding of elevated cancer risk from inhalation or ingestion of chemicals derived from recycled tires used on artificial turf fields. US EPA has a similar position: “At this point, EPA does not believe that the field monitoring data collected provides evidence of an elevated health risk resulting from the use of recycled tire crumb in playgrounds or in synthetic turf athletic fields.” (<http://www.epa.gov/epawaste/consERVE/materials/tires/health.htm>)

In summary, federal and state authorities have taken seriously the concerns that artificial turf fields may present a health risk due to contaminants in recycled rubber. The best way to investigate these concerns is via an exposure investigation. Studies conducted in Connecticut and elsewhere have shown a very low exposure potential, less than from typical outdoor sources of air pollution. The current news reports of **a list of soccer players with cancer does not constitute a correlation or causality** and thus raises a concern that currently lacks scientific support.

**Thus, the CT DPH position expressed in 2011 at the conclusion of the Connecticut study, that outdoor artificial turf fields do not represent an elevated health risk, remains unchanged.**

For further information please contact Brian Toal or Gary Ginsberg at 860-509-7740.

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## Related News (cont'd) – Vinton Today

*Vinton Today*

January 15, 2015

### **After reviewing studies, VS board chooses crumb rubber for new turf project**

For as long as athletes – from the smallest youth soccer players to the highest-paid celebrities – have been practicing and performing on synthetic turf fields cushioned with rubber crumbs from recycled tires, the leaders of sports organizations, schools and medical experts have pondered and studied the safety of those fields, and those crumbs.

The question became a national issue in November of 2014, after NBC News aired television segments about a soccer coach and a soccer player who believe the cause of the cancer was the chemicals in those crumbs.

The issue quickly became a national topic of debate last autumn, with leaders from small-town school board to members of Congress seeking more information. The most-curious, and most-concerned leaders were those contemplating using a synthetic rubber turf for the first time.

Among those concerned people were members of the Vinton- Shellsburg School Board.

When someone mentioned at a 2014 school board meeting that the NBC story came at a bad time for the proposed V-S project, school board member Megan Rickels disagreed.

“It’s perfect timing,” she said, adding that school officials need to be sure that the field they choose will not harm student-athletes.

The turf project continued throughout the late months of 2014, but Rickels – a youth soccer mom and a youth soccer coach – along with several other district leaders, spent more time researching the safety of crumb rubber athletic fields.

## Related News– Vinton Today(Cont'd)

School board members took their concerns to this month's meeting, where they listened to an hour-long discussion about synthetic turf options after spending hours over the previous few weeks reviewing a variety of studies.

**Despite the anecdotal evidence and the fears of those soccer players and coach in the Pacific Northwest, no study has ever linked synthetic rubber crumbs to cancer** – a fact mentioned in the NBC story. V-S officials (and Vinton Today) reviewed several studies: A study in Connecticut concluded that often government health agencies have overstated the risks. A New Jersey Department of Environmental Protection study declared that risks are "de minimus" – Latin for "too trivial or minor to merit consideration." A study by a hematologist at the Karmanos Cancer Center of Detroit's Wayne State University saying that there is no link between synthetic rubber turf and cancer.

"The health benefits of playing sports far outweigh keeping your kids indoors," said Dr Abhinav Deol, M.D.. "The data is not there to support keeping kids from playing on artificial turf."

But the study that did the most to convince Vinton-Shellsburg leaders that crumb rubber turf products are safe took place in Paris, at the request of a private Montreal K-12 school.

**Leaders at Lower Canada College sent samples of their crumb rubber to a lab in France, where they asked for it to be tested at the stringent European standard known as EN 71-3, which includes stricter guideline for children's toys than any American rule. The crumb rubber tested there passed tests in every category, and in many categories, no hazards were present at all.**

"I am familiar with EN 71-3," said board member Kathy Van Steenhuyse, who said she had worked with those standards at her job at Kirkwood. "The thing that assures me is that the crumb rubber matches the toy standards of the European model. On that basis I am more comfortable to go away from some of the other choices."

During the meeting, **the board had heard about some other options, including a cork-based infill and another blend made from left-over rubber used in the production of Nike shoes. However, since cork has a very low weight, it presents more maintenance issues (as well as a higher initial cost).**

The board unanimously voted to install the crumb rubber, although Van Steenhuyse said that further studies over the expected 8-12-year life span of the turf may impact the board's decisions in the future. Board member Rob Levis noted that Americans use many products – including the plastic bottle from which he sipped water during the meeting – made from materials that in some form could pose health risks.

"The evidence is overwhelming that it is safe," said board member and VS assistant football coach Mike Timmermans. And Rickels, while saying "there's no way I can put a price on my children's health," also acknowledged that other items such as microwave ovens have been the subject of studies and speculation in the past. During the meeting, board members learned that while the cork has been used in some parts of the U.S. and in some other countries, virtually all of the turf projects done in the Midwest, including the recently-installed high school fields in eastern Iowa, have consisted of the crumb rubber.

## Related News (Cont'd) – Power Engineering

*Power Engineering*

November 25, 2014

### **New Independent Lab Testing of Synthetic Turf Crumb Rubber Infill Re-Confirms Health and Safety**

Lower Canada College, a leading K-12 private school in Montreal today announced that the crumb rubber infill used in its new synthetic turf athletic field is safe for continued use by children of all ages. **This comes as a result of testing that the school conducted using an independent, highly-sophisticated laboratory in Paris, France to test its crumb rubber. The analysis measured potential toxicity levels of the crumb rubber against the European Union's EN 71-3 standards, which set strict limits for various elements in children's toys. These standards, set in 2013 as part of Europe's Toy Safety Directive, are widely recognized as the most advanced in the world.**

**"We are happy with the results because, together with the chemical science and research that is readily available, they confirm for us, our Board, and the parents of our students that our turf field is safe for children of all ages for play and competition,"** said Christopher Shannon, Headmaster, Lower Canada College. "We offer **this information** to the entire Montreal community and to the Synthetic Turf Council to not only offer context and clarity to this issue, but **to take on an advocacy role that relies on science, technology, research, testing and factual data.**"

"When we first considered installing a synthetic turf field, we conducted extensive due diligence investigating the safety of synthetic turf with crumb rubber infill. We knew we weren't going to find one study that definitively proved their safety, so we reviewed the numerous studies that had been conducted in North America and Europe, all of which validated the human health and environmental safety of synthetic turf and crumb rubber infill. Nevertheless, in the wake of recent unfounded media speculation regarding the safety of this material and the concerns raised by parents as a result of that speculation, we decided to fund our own laboratory analysis using a toxicology test that simulates the ingestion of the crumb rubber, and benchmarks the results against tough European standards for heavy metals in toys. **The lab report clearly shows that the results were negligible compared to the standards. As a school with a strong focus on developing a global perspective, we felt we should seek the world's highest standard. The results are very comforting.**"

Synthetic turf fields allow millions of children and people of all ages the opportunity to be active year-round in virtually all weather conditions. There is tremendous growth in all sectors of the industry -- sports fields, landscape and recreation, municipalities and many other uses. In addition, a synthetic turf field conserves billions of gallons of water each year, avoids the use of pesticides and fertilizers, and recycles 25 million used car and truck tires that would otherwise end up in landfills.

**MetroWest Daily News**

November 24, 2014

**Medway: Turf fields near completion**

Despite concerns of some residents over potential health risks from crumb rubber, town officials still intend to lay down the tiny pieces of recycled tires on a newly-constructed artificial turf field. According to Department of Public Services Director Tom Holder, crumb rubber has already been installed on one of the two new fields that were part of a \$4.2 million project, which residents approved at Annual Town Meeting in May.

The other field, Holder said, is “just about completed.”

The turf is expected to be fully installed Tuesday and crumb rubber is to be laid down starting Dec. 1, he said. Crumb rubber is used to fill the turf and provides the cushioning.

Last month, NBC News aired a report detailing the research of Amy Griffin, an associate head coach for the University of Washington’s women’s soccer team, who compiled a list of more than 40 American soccer players who have developed cancer after playing on turf surfaces with crumb rubber infill. Since that report, high schools in New Jersey and Washington have changed plans to build turf fields - some have replaced the infill material or halted plans altogether.

Last week, several residents organized a forum of panelists with expert knowledge in turf fields, crumb rubber and alternative infill materials, but town officials say their plans to use crumb rubber have not changed. **Presented at the forum was a cork and coconut infill mixture, but Holder said the function and longevity of the material hasn’t been evaluated, while crumb rubber has been used for more than a decade.**

“To back selectmen – with the information and evidence we have in front of us - we believe that it’s appropriate to install crumb rubber,” Holder said. “Nothing that came out of (the forum) caused us to go in a different direction.”

**Officials and selectmen said unless a credible analysis that deems crumb rubber to be harmful to children comes forward, they will not halt plans or replace the material.**

Selectmen Chairman Dennis Crowley said while the forum was informative, “the fact remains: the fields are done and crumb rubber has been installed.”

**There still has not been any correlation that crumb rubber causes cancer,”** he said, adding that town officials will continue to be “cautious” of the issue.

“If in fact anything does develop, we will take precautions necessary to correct the issue,” Crowley said. Steven Lee, one of the residents opposed to the crumb rubber fields, said he won’t let his kids - ages 7 and 5 - play on the fields.

The forum, he said, wasn’t intended to halt or change the project, but to better educate people. “I hope people can make their own decision about whether or not they want to let their children play on it,” Lee said.

## Related News (Cont'd)– KSDK St. Louis

KSDK

CST November 17, 2014

### **Toxic turf: Safety concerns over crumb rubber fields**

ST. LOUIS - It's a recent trend in turf athletic fields; using ground-up rubber to give a soft playing surface. They're causing quite a stir. A University of Washington Soccer coach is calling for research because she believes there's a link to cancer.

Most shots end with a fall to the ground. Drew Orf, a goalie for Fort Zumwalt South, is constantly in contact with the turf field. The field is made of little, black crumbs. They're actually used tires that have been ground-up. They're pretty annoying for athletes. "You walk in the house take your shoes and socks off and a ton of them fall all over the ground," Orf said.

All those crumbs are causing a stir. In October, NBC News spoke with University of Washington Soccer Coach Amy Griffin, who discovered 38 former soccer players from across the country, all suffering from cancer. All played on crumb rubber turf fields.

Orf saw the story. "It's a little scary to think about that as in 34 of 38 were goalies," she said. "Little scary to think about."

While the link to the fields and cancer is a theory, Dr. Robert Hayashi, the Director of Pediatric Hematology and Oncology at St. Louis Children's Hospital, said there's no scientific evidence to believe it's true. "Unfortunately, we don't have good answers as to why cancers develops and as a consequence it's difficult to point to something and say this is the cause or that is the cause," said Dr. Hayashi.

The Environmental Protection Agency studied the fields in 2009. Their report deemed the fields safe. However, an identified list of ingredients could be alarming; chemicals like acetone, benzene, and halogenated flame retardants. Dr. Hayashi said it's part of the world we live in.

"It would be great to have an environment in which there were not dangerous materials."

**"I think we're naive in thinking everything we put in our bodies is free of everything hazardous,"** said Dr. Hayashi.

NewsChannel 5 contacted medical professionals at Washington University, Siteman Cancer, the Mayo Clinic, and Hutchinson Cancer Research Center in Seattle, Washington where this story developed. All of them said without a scientific link to cancer there is no research to say the fields are unsafe.

"Obviously we can't live in a bubble. Despite all the things we do all of us are at risk for developing cancer every day and I think we still have to be able to live our lives and let our children thrive in a healthy environment," said Dr. Hayashi.

As for Orf, the only thing he's stopping is the ball. "Love soccer, it's what I love to play," said Orf.

**Dr. Hayashi said if you consider the other dangers of playing sports, like traumatic brain or bone and joint injuries those risks fare outweigh the risk of participating on a crumb rubber field.**



## Related News (Cont'd)– Trib Total Media - Mt Lebanon

*Trib Total Media*

October 29, 2014

### **Mt. Lebanon commissioners stand ground on artificial turf**

Four of five Mt. Lebanon commissioners say they won't reverse course on installing artificial turf on municipal playing fields, but the fifth wants them to reconsider alternatives to the crumb-rubber infill that's drawn opposition from residents with health concerns. A standing-room-only commission meeting Monday included more than a dozen people speaking against replacing the grass at Wildcat and Middle fields with artificial turf.

Many cited an NBC News report that drew attention to soccer players in Washington state who contracted cancer after playing extensively on such turf. The story noted how research on the health effects of turf had not drawn any conclusions linking it to cancer, but studies hadn't ruled it safe under every circumstance, either.

Residents urged the commission to delay the project, which started construction last week, until more studies could prove it wasn't harmful, particularly to younger children. "Even if it's not detrimental to human health ... are we not better safe than sorry?" asked Frankie Kavalir, a junior at Mt. Lebanon High School.

But four of the five commissioners maintained that more of the **studies they'd seen had shown no health risks from artificial turf, and said they would not vote to stop the project.**

**"(The NBC report) was not news to any of us," said Commissioner Dave Brumfield.**

**"We've seen dozens of studies, and not a single one says turf creates any risk."**

Commissioner Kelly Fraasch, the lone "no" vote, asked Mt. Lebanon staff to look into the costs of altering the project to use alternatives to crumb rubber, like the organic mix of cork and coconut shells initially deemed too expensive. Bids for organic infill ranged from \$1.3 million to \$2.03 million.

Solicitor Phil Weis said Fraasch could move to amend the project and its budget at the commissioners' meeting Nov. 11, when they consider a "budget cleanup" bill reflecting all the projects paid for out of Mt. Lebanon's fund balance, including the turf. She would need two other commissioners' votes to pass an amendment.

## **Related News (Cont'd)– Glendale News Press**

*Glendale News Press*

October 29, 2014

### **Complex to get turf upgrade despite worries**

Artificial turf at the Glendale Sports Complex that is nearly a decade old will be replaced following approval by the Glendale City Council on Tuesday, though potential, yet unconfirmed, cancer concerns linger over a rubber component from which the material is made.

Artificial turf was first installed at the sports facility in 2005 and has since suffered wear and tear throughout its expected 10- to 12-year life span, said Public Works Director Roubik Golanian during the meeting.

The new turf is slated to be installed in January.

Councilwoman Laura Friedman voted against the project not because she was necessarily opposed to artificial turf at places such as the sports complex, but she said she needed to see some studies showing the grass-field alternative doesn't bear any negative health effects.

"We need to take the time to vet these kinds of things," she said in a phone interview after the meeting.

NBC News did a story earlier this month on Amy Griffin, a University of Washington soccer coach who put together a list of nearly 40 American soccer players that played on artificial-turf fields and have been diagnosed with cancer.

The concern is over a material used in artificial turf known as "crumb rubber," which is made up of recycled tires, but there aren't any studies that link it to cancer. Though he didn't have any research on hand, a sales representative, said many studies have been done to disprove any connection between artificial turf and the disease.

"We would not put anything out there that would harm our children or our athletes," he said.

But Friedman said she would have liked to have seen some of those studies prior to casting a vote. The crumb rubber is a cushion beneath the grass blades that's aimed at improving safety. Pieces of it do tear off in the form of pellets and can stick to clothes and cleats.

Friedman then asked how much of the material that breaks away could end up in storm drains. City Manager Scott Ochoa said it's a relatively small amount.

Councilman Dave Weaver said he wasn't too worried about artificial-turf pellets ending up in runoff water.

"Every car on the street generally has four tires and they're leaving rubber on the streets, which are going into the flood-control channels and into the ocean, more so than the pellets on an athletic field," he said.

In 2011, a study by an environmental testing firm found that levels of lead in the sports complex's turf was far below federal and state limits.

## Related News (Cont'd)– Richmond Review

*Richmond Review*

October 27, 2014

### **City to stick with recycled tires for new artificial turf playing pitch**

City staff have reviewed concerns about the crumb rubber granules used in artificial turf fields, but is going ahead with plans to use them in the new Minoru artificial turf sports fields.

**"Following a staff review of the concerns raised, we are proceeding with the project as planned," said City of Richmond spokesperson Ted Townsend. "The crumb rubber- recycled truck tire product is the present industry standard and we have not be advised of any verified health hazards from using the product."**

Townsend said the city look at alternative types of infill, including Nike Grind, but "found...no evidence that the Nike Grind material is safer than the industry standard crumb rubber."

**The city also looked at combing the use of crumb rubber with Nike Grind but "determined that it was not a viable option."**

Townsend added: "The current project is already 100 per cent tendered and nearing completion."

The field is scheduled to be phased open during the month of November, with the local soccer association, Richmond FC, already scheduling practices and games there in the coming weeks.

Concerns about crumb rubber, which contain known carcinogens, were raised in an NBC News investigation that focused on a Washington State soccer coach who had two goalkeepers come down with cancer.

The coach compiled a list of three dozen soccer players who were diagnosed with cancer, all but two of whom were goalkeepers.

The concern focused on the use of the crumb rubber, which comprises recycled car tires, which contain carcinogens at low levels, including arsenic, benzene, cadmium, nickel and mercury.

## Related News (Cont'd)– Karmanos Cancer Institute

*Karmanos Cancer Institute*

October 23, 2014

### **Karmanos Hematology expert says, “Research doesn’t back up claims linking artificial turf with cancer”**

Health risks associated with young people coming in contact with artificial turf, such as what can be found on many sports fields across the country, has made national headlines. NBC’s Web site recently ran a lengthy story about the subject, speculating on how safe children are playing on the artificial turf, which is partly composed of “crumb rubber.”

The NBC story can be found here: <http://www.nbcnews.com/news/investigations/how-safe-artificial-turf-your-child-plays-n220166>

Crumb rubber comes in the form of tiny black rubber crumbs that are used to fill in between the blades of artificial grass. It is made from pulverized rubber from old tires and can contain benzene, carbon black and lead, among other ingredients, according to the story. Some members of the public, including sports team coaches, believe these particles can cause cancer in those who are exposed to it.

**The NBC report notes that no research has linked artificial turf with cancer,** though young people in their early 20s who have played on the fields are being diagnosed with blood-type cancers, such as lymphoma.

While federal agencies like the Environmental Protection Agency (EPA) state that more testing needs to be done to determine a link, the EPA also deemed the issue a state and local decision about whether artificial turf sports fields should be installed in their respective communities.

**Abhinav Deol, M.D., member of the Hematology Oncology Multidisciplinary Team at the Barbara Ann Karmanos Cancer Institute and assistant professor in the Department of Oncology at Wayne State University School of Medicine, stated that research thus far does not back up the link between the artificial turf and individuals being diagnosed with cancer.**

“It’s hard to say if there is a link between crumb rubber and cancer like Hodgkin Lymphoma because the common age group of patients diagnosed with this cancer is either in their 20s or over 55 years old,” Dr. Deol stated. Deol said. **“We still don’t know why some people get lymphoma and as of yet, there is no strong causative relation identified between environmental exposure and lymphomas.**

“There are so many chemicals in the environment,” he added. “It’s a hard thing to distinguish, whether the chemicals in artificial turf can cause cancer.”

“A majority of the young adults who have played on the turf don’t have the cancer.”

A few precautions parents can take to ensure their children aren’t overexposed to the materials is to have their kids shower after playing on the artificial turf, cleaning wounds of black pellets and telling them to try to not ingest the pellets.

**Lastly, Dr. Deol doesn’t believe parents should yank their kids off the sports fields over news of artificial turf.**

“The health benefits of playing sports far outweigh keeping your kids indoors,” he said.

**“The data is not there to support keeping kids from playing on artificial turf.”**

**Related News (Cont'd)– Yakima Herald, Wa**

*Yakima Herald*

October 18, 2014

**Yakima school board OKs \$3.3M for additional athletic upgrades**

Long-anticipated new soccer and football practice fields and other work on athletic facilities at Eisenhower High School will begin soon, with completion estimated in February.

The Yakima school board on Friday approved a \$3.3 million contract for one-half of the new athletic fields project, labeled as Phase 3A. In addition to the practice fields, the money will pay for event space for track and field, a storage facility and retaining walls.

New facilities for baseball, softball and tennis on the south side of Eisenhower's campus and other renovations, such as new restrooms, are projected to be completed by the spring of 2016.

The 50-year-old Zaepfel Stadium, shared with Davis High School athletic teams, has been a contentious issue for the district. Talks about renovating the stadium stalled in 2011, when bids for the all-new, \$108 million Ike campus came in higher than expected.

Last June the district said it could afford to spend another \$4 million to \$4.7 million on the athletic upgrades. Updates to Zaepfel's field still are not complete.

Meanwhile, the school district will move ahead with the installation of artificial turf at the athletic fields despite recent concerns about the potential health risks of crumb-rubber turf, made from recycled tires.

An Oct. 8 story from NBC News featured a University of Washington women's soccer coach and former players pleading for continued studies on any health problems associated with the turf.

In the story, the coach said some former players developed cancer and believed it may have resulted from exposure to the crumb rubber.

**District spokeswoman Amy Neal said officials looked into the issue because athlete safety is a priority, but no studies have linked exposure to crumb rubber to any health risks.**

**"We are moving forward with the installation of the synthetic turf product," she said. "We made this decision because studies do not link crumb rubber to negative health effects."**

## RESOURCES

- **CalRecycle**

Through landmark initiatives like the Integrated Waste Management Act and Beverage Container Recycling and Litter Reduction Act, California works toward a society that uses less, recycles more, and takes resource conservation to higher and higher levels. Our state now leads the nation with a 65 percent recycling rate for all materials, and today recycling supports more than 140,000 green jobs in California.

<http://www.calrecycle.ca.gov/>

- **The Connecticut Agricultural Experiment Station**

To put science to work for society, The Connecticut Agricultural General Assembly chartered The Station to investigate plants and their pests, insects, soil, and water. The Connecticut Agricultural Experiment Station is the first in America and remains a separate state agency. <http://www.ct.gov/caes/site/default.asp>

- **GREENGUARD Environmental Institute**

<http://www.greenguard.org/en/index.aspx>

The GREENGUARD Environmental Institute is an industry-independent organization that aims to protect human health and improve quality of life by enhancing indoor air quality and reducing people's exposure to chemicals and other pollutants.

- **The Rubber Manufacturers Association (RMA)** The (RMA) is the national trade association for tire manufacturers that make tires in the U.S. Read more to learn about RMA. <http://www.rma.org/>

- **Synthetic Turf Council**

Founded in 2003, the Synthetic Turf Council is a non-profit association dedicated to serving as a resource for trustworthy information about synthetic turf. Our objective is to encourage, promote and facilitate better understanding among all parties involved in the manufacture, selection, delivery and use of today's synthetic turf systems. <http://www.syntheticurfCouncil.org/>

- **U.S. Environmental Protection Agency**

The mission of EPA is to protect human health and the environment. EPA's purpose is to ensure that all Americans are protected from significant risks to human health and the environment where they live, learn and work. <http://www.epa.gov/>

- ***Martin (marty) Wright***

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