

ARTIFICIAL TURF IN NEWTON: A SUMMARY OF ISSUES

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I. PURPOSE

The purpose of this report is to consolidate and summarize the facts and issues regarding artificial turf in order for the Newton Sustainable Materials Management Commission (SMMC) to make an informed decision on:

- whether or not to formalize an opinion about the Artificial Turf (AT) fields in Newton and if so,
- what that opinion should address and,
- what that opinion should be.

II. HISTORY OF ARTIFICIAL TURF (AT)

A. ORIGIN

Artificial Turf (AT), also known as Synthetic Turf, was popularized when it was used in 1966 in the Houston Astrodome. It was manufactured by Monsanto and originally called Chemgrass before the name was changed to AstroTurf.¹

B. THE INDUSTRY

MANUFACTURERS/INSTALLERS

Manufacturers of the polyethylene, the main component of AT, include: Dow, Exxon Mobil, Sabic and Ineos.

Manufacturers of AT: Controlled Products, Shaw Industries, SportGroup, Tarkett, TenCate Grass Group, and Victoria PLC.²

The installer for the Newton South High School (NSHS) turf replacement project, the only bidder for the contract, is R.A.D. Corp. d/b/a R.A.D. Sports from Rockland, MA.

Newton has chosen a product by Shaw Industries(a Berkshire Hathaway Company), Legion Pro-2.25". The infill selected for the project is Guardian Bio-based TPE. Guardian, a family owned Georgia company, also makes lacrosse balls and practice football helmets. They have been making infill since 2016.

GROWTH OF INDUSTRY

It is estimated that in 2019 there were approximately 12,000-13,000 AT fields in the US with approximately 1,500 installations/year.³ Insight Partners shows the worldwide market at approximately \$2.8B in 2021 expected to grow to \$4B by 2028, a compounded annual growth rate (CAGR) of 5.2%. Most reports agree that sports fields are, and will continue to be, the largest share of the market with The Insight Partners estimating it to be 63% of the global market.

¹ [Artificial Turf-Wikipedia](#)

² [Artificial Turf Market Demand, Size - Arziton, Jan 2022](#)

³ [Synthetic Turf Recycled Tire Crumb Research Vol 1-EPA July 2019, pg 2](#)

The key here is that this is considered a growth market across the world with sports fields being the big driver.

C. REASONS FOR POPULARITY

1. WATER CONCERNS

2. INCLEMENT WEATHER

3. TURF MAINTENANCE AND ABILITY TO EXPAND FIELD USAGE

Nicole Banks, Commissioner of Parks, Recreation and Culture Department (PRCD) stated in the 1/4/2023 Program and Services Committee meeting that to replace one AT field the City would need to add two additional fields (for a total of 3 fields) with 2 acres cleared for each field. In addition, if the existing AT fields were to be turned back into grass it would take a year plus to do the work and have the grass established.⁴ **No comparison study between the cost of AT versus grass fields was done for Newton.**

There is considerable disagreement with the above position. The Partnership for Healthy Playing Surfaces⁵ produced a very readable report with good references that includes three communities in MA that have organic, natural athletic fields and are able to provide adequate fields for their citizens.⁶ One major issue is that most communities do not budget enough for grass field maintenance which lets them become a mess. That is a topic for another report.

	Springfield, MA	Marblehead, MA	Martha's Vineyard, MA
Area of natural grass maintained naturally	67 acres of athletic fields, recreational space, and general use city property	20 acres of athletic fields	8.6 acres of athletic fields
Products	Organic fertilizer, lime, soil conditioner	Organic fertilizer, lime, soil conditioner	Organic fertilizer, humic acid, calcium silicate, loam/sand, seed
Labor	City environmental and maintenance staff	City staff	The Field Fund staff and contractors
Rentals and other maintenance	Periodic irrigation maintenance, equipment maintenance	Periodic irrigation maintenance, equipment maintenance	Periodic irrigation maintenance, equipment maintenance, aerator rental
Total cost per acre	\$1,500/acre	\$4,140/acre	\$7,600/acre (includes 30% "island markup")

⁴ [Newton City Council Program and Services Committee Meeting 1/4/2023](#), see 1:36:46 hours in

⁵ A consortium of the Icahn School of Medicine at Mt Sinai, GrassRoots Environmental Education, TURI: Toxics Use Reduction Institute at UMASS-Lowell, Women for a Healthy Environment, NonToxic Portsmouth, NonToxic Dover, Clean Water Action.

⁶ [Healthy Playing Surfaces.org](https://HealthyPlayingSurfaces.org)

D. PRODUCT CHANGES OVER TIME⁷

1. FIRST GENERATION:

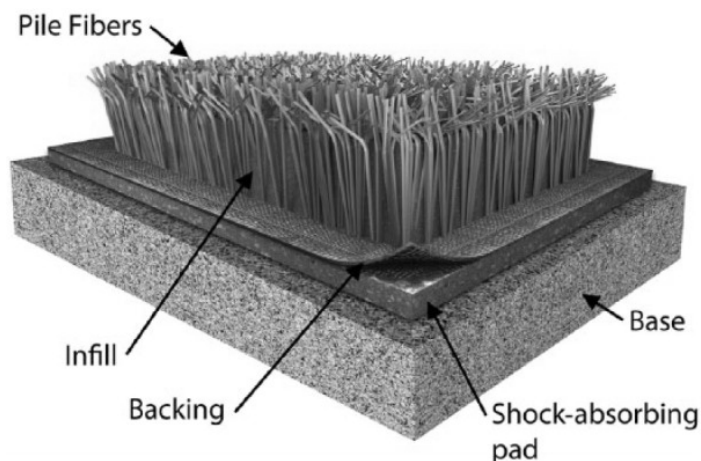
Astroturf style AT was popular in the 1970s and 80s. It was a short-fiber, dense nylon carpet installed over a compacted soil base usually with an elastomeric foam pad between the carpet backing and the soil. This was criticized for causing athlete injuries.

2. SECOND GENERATION:

Second-generation surfaces included a shock-absorbing pad beneath a carpet that contained much longer fibers compared with the first-generation systems. The carpet pile was filled with silica sand to within several millimeters of the top of the fibers, allowing them to stand upright. While second-generation playing surfaces were not widely adopted within the United States, they did pave the way for the modern, third-generation systems now commonly used.

3. THIRD GENERATION:

Beginning in the late 1990s, AT started to be made with the material that takes up the space between the grasslike fibers, the infill, using rubber or a combination of rubber and silica sand. Ground up used tires, crumb rubber, have been the main infill in this latest generation. This was considered a big improvement because it added cushioning to the field. **NSHS and NNHS AT fields currently have crumb rubber infill.** Crumb rubber from recycled tires was the only infill until around 2015 when people started to get concerned about toxicity. According to the PRCD consultant, CDM Smith, 75% of projects still use crumb rubber.⁸



⁷ [Synthetic Turf: History, Design, Maintenance and Athletic Safety-NIH August 2018](#)

⁸ [Nearby Communities with Synthetic Infill, pg 23 of the 11/11/2/2022 Synthetic Turf Improvement Project presentation by NPRCD and CDM Smith](#)

III. TOXICITY AND ENVIRONMENTAL CONCERNS

A. CRUMB RUBBER TOXICITY CONCERNS

There has been much concern over the toxicity of the crumb rubber which has been the subject of many health reports including a large **study from the EPA** which was published in 2019⁹. The report found many metals and volatile and semi-volatile compounds including cadmium, benzene, nickel, chromium and arsenic-known carcinogens(note, PFAS was not investigated as part of this study). Reportedly, a second part of the study is underway now to look at the health impacts.

However, **there has been criticism of the EPA report** as summarized by this article in The Intercept¹⁰:

“The EPA cautioned that “risks cannot be inferred from the information and conclusions found in this study” and promised that a second study to be released at a later, unspecified date will look at the exposures and risks of people who play on these fields. Yet on a webpage about the study, the agency assures visitors that “while chemicals are present as expected in the tire crumb rubber, human exposure appears to be limited.”

The turf industry welcomed the EPA study as evidence that their product doesn't cause harm, but others criticized the agency's reassurances as premature. The environmental group Public Employees for Environmental Responsibility went so far as to call for the EPA to retract the July report. Kyla Bennett, PEER's science policy director, criticized the federal agency for not offering evidence for its characterization of the risk from turf as low and for failing to test the crumb rubber for more than half of the chemicals that have been associated with it.” **Note, the EPA report does not address disposal issues and it is not known if they will address disposal issues.**

B. ALTERNATIVE INFILLS

To address the concerns with the crumb rubber, around 2015, other manufactured granular infill materials were developed. They included thermo plastic elastomer (TPE, which is being sourced for the new NSHS project), polymer, or organic substances such as coconut fiber, cork, and ground walnut shells.

TPE is a plastic that is apparently used in many consumer goods and it is a petro-chemical product. **Newton chose TPE because it is more durable than organics but avoids some of the concerns about recycled tires in crumb rubber.** However, the decision to use TPE has been met with criticism because it significantly increases the carbon footprint of the project given that the pellets are new and are a petrochemical product.

Organic products would have a much lower environmental impact but are more expensive and have more maintenance issues.

⁹ [Synthetic Turf Recycled TireCrumb Rubber Research Vol 2-EPA-July 2019](#) and [Synthetic Turf Recycled Tire Crumb Rubber Research Vol 1-EPA July 2019](#)

¹⁰ [Toxic PFAS Particles Found in Artificial Turf, The Intercept, Oct., 2019](#)

C. PFAS CONCERNS

Although there has been a lot of focus on the infill materials it has not been until more recently that there has been a recognition and concern about the toxicity of the turf itself, especially given that PFAS may be in the plastic grass and backing. **The industry has stated that PFAS was used in the manufacturing of the blades; however, according to CDM Smith the major manufacturers have more recently removed PFAS substances from their manufacturing process.**

The toxicology expert from CDM Smith stated that it is difficult to measure PFAS and the many related chemicals. Also, the drinking water standards that have been put in place at very low levels are not appropriate for soils and other materials and that there are no standards for those in place. However, given the large number of PFAS chemicals and the lack of standards they cannot guarantee that there are no PFAS in the samples of the new products. Nevertheless, they will be testing them to the best of the lab's ability(both the turf and the infill) as part of the Conservation Commission's Order of Conditions.¹¹

There are numerous studies that show that there are PFAS in existing AT. For example The Ecology Center, a non-profit in Michigan, found the following:

- *“Elemental fluorine and specific PFAS chemicals in artificial turf, suggesting that PFAS is an ingredient of the carpet grass fibers or the backing, or a byproduct of the manufacturing process. In addition the following was tested:*
- *a brand-new piece of turf being laid at Oliver Ames High School in Easton, Massachusetts for PFAS, and the lab found 300 ppt of 6:2-Fluorotelomersulfonic acid (6:2 FTSA), a short-chain Gen X PFAS, in the backing of the turf.;*
- *the backing from a discarded piece of artificial turf manufactured around 2004 in Franklin, Massachusetts that had 190 ppt of PFOS;*
- *8 different synthetic turf fiber samples (including Shaw and Turf Factory Direct brands) and found 100% of grass fiber contained total fluorine levels, suggesting the presence of PFAS (results indicated 44-255 ppm total fluorine), and;*
- *They also found turf patents and industry literature discussing the widespread use of PFAS as a plastic processing aid (PPA) to enhance smoothness and reduce friction.”*

¹¹ Newton City Council Program and Services Committee Meeting 1/4/2023, see hour 1:26:49

An April 2023 presentation¹² by the **Director of Research, Jeff Gearhart, at The Ecology Center in Detroit, MI gives a compelling argument about why we should not “dumb down” our risk assessments.** (*The link is below and is worth watching.*) He concludes that there are many studies showing that the toxins in AT and infill are proven endocrine disruptors or carcinogens but none or few that show the actual health effects, therefore the science is not there to conclude that these products are safe. He believes that it is likely that no one source is responsible for getting someone sick but that it is additive and therefore we should be cautious. **He also believes that many environmental consultants are “peddling overconfidence in their conclusions around safety”.**

According to Kyla Bennett, a scientist and lawyer formerly with the U.S. Environmental Protection Agency, and now the Science Director of PEER(Public Employees for Environmental Responsibility) said “The shredded tires used as infill on fields are filled with carcinogens and other toxic chemicals, but PFAS in synthetic turf should sound alarm bells for all municipalities with these fields.”¹³

D. RECYCLING/ DISPOSAL CONCERNS AT NSHS

The RFP for the contract calls for “removals including removal and recycling of synthetic turf, removal of infill material for reuse”; however, there seems to be limitations. In numerous testimonies the NPRCD representative has said that there will be a “Bill of Lading” and “Chain of Custody” to show where the old turf and infill have gone. It has also been stated “shock pads” will be made out of the old AT. Given that infill and turf for a single field can weigh approximately 495,000 pounds that is a lot of shock pads.¹⁴

RECYCLING/DISPOSAL OF TURF

Although there is a lot of discussion about recycling materials there is no guarantee and very little evidence that any of it can be recycled. There is mention of some recycling centers around the country but they do not appear to be sizable and are still in the developmental stage.

In 2021, Re-Make, a Danish turf recycling company, announced it was going to build a plant in PA to recycle AT; however, to date it has not and as of March 2023 the company had not even applied for all of its permits. The used AT has been accumulating out of doors with complaints about the piles being mosquito havens and possibly leaching toxic materials.¹⁵

In Sept 2022 Tencate Grass announced a pilot project with Exxon Mobil to break down 50 turf fields from CA and TX into the original raw materials¹⁶. There may be one other in the country.

¹² [Chemical Hazards in Synthetic Turf: An Overview by Jeff Gearhart, Director of The Ecology Center April 2023](#)

¹³ [Toxic Forever Chemicals Infest Artificial Turf-PEER.org October 2019.](#)

¹⁴ [Toxic PFAS Chemicals Found in Artificial Turf, The Intercept, Oct. 2019](#)

¹⁵ [PA officials say turf recycler is violating environmental laws, Phillyburbs.com,3/20/2023](#)

¹⁶ [Tencate Grass announces first of its kind Recycling Program in the US Sept 2022](#)

Furthermore, although AT has not been designated as a hazardous waste, there may be a problem of disposing of old turf, if not now perhaps in the future without testing for PFAS. MassDEP currently has guidance on sampling and analysis for PFAS at Disposal Sites including the reportable quantities and concentrations.¹⁷ However, as with PFAS concentrations in water, the acceptable concentrations could be reduced further as more research is done.

As considerable focus has been given to PFAS chemicals and their toxicity concentrations this issue could present a considerable problem should the old turf ever be considered hazardous waste.

DISPOSING OF CRUMB RUBBER

It is unlikely that the crumb rubber can be recycled through traditional means. Furthermore, according to Waneta Trabert of the Newton SMMD, in MA whole tires cannot be put into landfills and are discouraged from going to a waste-to-energy facility; however, shredded tires are allowed in both. So, the most likely end of life for crumb rubber is a landfill or incinerator.

E. CLIMATE CONCERNS

AT is plastic and plastic is a petrochemical. Petrochemicals release greenhouse gasses (GHG) and Greenhouse gasses are the cause of the climate crisis.

A 2017 study done for FIFA, the international organization that controls the sport of football (soccer)¹⁸, on the environmental impacts of FIFA certified football turf provides a detailed analysis of the GHG emissions from AT. The study was prepared by Eunomia Research & Consulting LTD, a British based consultancy providing environmental services with offices worldwide.

The chart below is directly from the report and shows the kg of CO₂/square meter of artificial turf. SBR (styrene butadiene rubber), is the recycled rubber or crumb rubber that is currently in the NSHS and NNHS fields. TPE (thermoplastic elastomers) is the new infill that is being put into the NSHS fields (and is proposed for the NNHS and Albemarle fields). The Newton fields have no shock pads. The study assumes the AT has a 10 year lifespan. The study breaks down the GHG emissions based on a number of variables: the choice of infill material; the decision regarding whether to use a shock pad or not; and the type of treatment used at the end of life (landfill, incinerate or recycle). This life cycle analysis includes the raw materials, manufacture, transport, installation, maintenance and disposal options at the end of life. Note, it does not include any GHG emissions from any potential offgassing which would occur while the turf is on the field and is exposed to the elements.¹⁹

¹⁷ [MassDEP Fact Sheet: Interim Guidance on Sampling and Analysis of PFAS for PFAS at Disposal Sites Regulated under the MA Contingency Plan-June 16, 2022](#)

¹⁸ [Eunomia Research & Consulting LTD for FIFA March 2017, Environmental Impact Study on Artificial Football Turf](#)

¹⁹ [Production of Methane and Ethylene from Plastic in the Environment , August 2018](#)

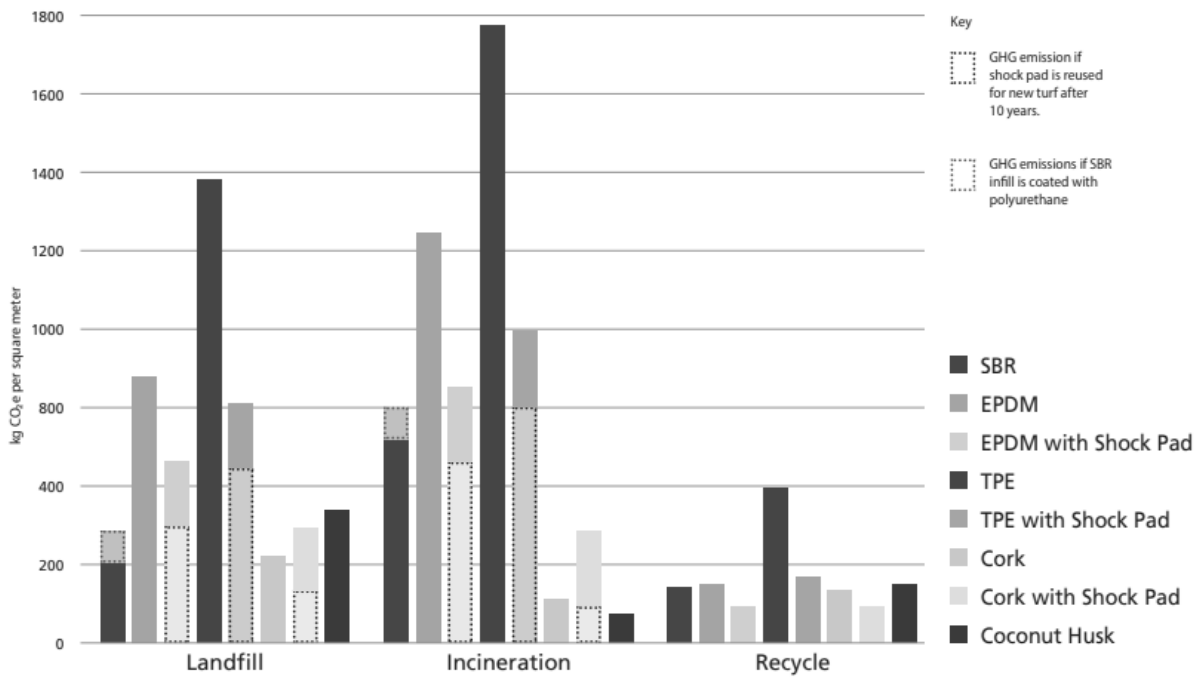


Figure 8: Climate Change Comparison between Turf Containing Different Infill Materials

From: [Eunomia Research & Consulting LTD for FIFA March 2017, Environmental Impact Study on Artificial Football Turf,pg10](#)

Assuming the high school fields are approximately the same size as a standard FIFA pitch, 7,526 square meters, the following would be the GHG emissions for one field assuming the infill was SBR(crumb rubber) which is currently in place or TPE which is going to be used for the NSHS field:

Life Cycle CO ₂ Emissions for One Athletic Field				
	SBR (Crumb Rubber)		TPE	
	Metric Tons of CO ₂	Equivalent to the Energy Use of X Houses for 10 years ²⁰	Metric Tons of CO ₂	Equivalent to the Energy Use of X Houses for 10 years ²¹
Landfill	1,505	19	10,386	130
Incineration	4,516	57	13,171	166
Recycle	865	11	3,010	38
Assumptions:				
Field Size (sq m)	7,526			
Field Life Span (yrs)	10			

²⁰ EPA Greenhouse Gas Equivalency Calculator

²¹ EPA Greenhouse Gas Equivalency Calculator

Given the City has a Climate Action Plan to reduce greenhouse gasses putting in multiple AT fields appears to contradict that plan.

F. PROPOSED LEGISLATION

The following proposed legislation regarding AT is being considered at the State level.

1. **Senate Bill S.524:** This bill would install a 3 year moratorium in which time studies could be done on the toxicity of artificial turf, including PFAS. The bill was introduced by Senator Jason Lewis.
2. **House Bill 3948:** This bill would prohibit any state agency or authority to provide funding for the purchase, use or installation of artificial turf that contains zinc, plastic, or PFAS after 10/1/2023. Any existing turf field could be used to the end of its life and then removed and not replaced. This bill was introduced by Reps. Carmine Lawrence Gentile, Lindsay N Sabadosa and Michelle M. DuBois.

Reportedly in a memo in support of this bill, the MassDEP stated that “unregulated artificial turf poses a significant and ongoing threat to public health, the environment, and the climate”.

G. OTHER CONCERNED ENTITIES

1. **The Sierra Club of MA wrote a letter on 7/5/2023 to Mayor Fuller²²** stating that they are against the budgeted and proposed AT field at Albemarle. They also stated that if the high school fields were to be replaced with AT the infill should be organic (too late for NSHS).
2. **Other communities:**
To date the following communities have either rejected or put a moratorium on new AT fields: Andover, Brookline, Springfield, Swampscott, Newburyport, Methuen and Wayland. Boston has a moratorium on new AT fields (apparently they are allowing the replacement of existing fields).

IV. CURRENT STATUS OF ARTIFICIAL TURF FIELDS IN NEWTON

A. NSHS

1. Funds have been appropriated to install two AT fields and redo the track.
2. The field is currently in the process of being torn up with rolls of turf on the property and crumb fill spilling out²³. There has not been any indication of where it is all going. This discussion should include the old track material.
3. The Conservation Commission Order of Conditions²⁴ requires that samples of both carpet and infill that are being installed should be collected at the factory AND when the product is delivered to the site. Samples should be submitted to a private lab for verification testing of chemical constituents. Nothing is mentioned about the disposal of the existing materials.

²² [The Sierra Club of MA letter to Mayor Fuller 7/5/2023](#)

²³ [YouTube video by Julia Malakie of NSHS AT removal 7/23/2023](#)

²⁴ [Conservation Commission Minutes 12/1, 2022, item 2](#)

A “preliminary report” from an environmental lab for the TPE²⁵ was seen by the writer. The report emphasized that it is only preliminary. The status of the other report (for the turf) should be requested.

B. NNHS

1. The field is proposed to be the same material as NSHS. It has not been started.

C. ALBEMARLE

1. **ARPA** funds were set aside by the Mayor . Construction has not started. The project is planned to be started in Fall 2024.

**APPENDIX A:
NEWTON SYNTHETIC TURF ORDINANCE**

City Of Newton Synthetic Turf Field Ordinance (Ord. No. Z-96, 11-07-11) Sec. 2-205. Installation of synthetic in-filled turf athletic fields on city-owned property. The installation of synthetic in-filled turf athletic fields on city-owned property shall use sustainable, recyclable, lead-free, non-toxic products to the maximum extent feasible. The department responsible for the project, in conjunction with the city's chief procurement officer, shall make the determination of the maximum extent feasible for installation in any particular site. The determination shall take into account the best available technology, cost effectiveness, public health and safety, and environmental risks and benefits, and shall consider each proposed installation in light of site conditions, engineering feasibility, commercial availability, public safety, environmental impact and cost. Cost, however, shall not be the overriding factor in determining maximum extent feasible, and a determination of cost shall include consideration of projected life cycle costs including maintenance, repair, replacement, recycling and/or disposal costs over the estimated useful life of the installation.

