



SHOULD TIRE-DERIVED PRODUCTS BE USED ON ATHLETIC FIELDS IN SAN MATEO COUNTY SCHOOLS?

[Issue](#) | [Summary](#) | [Glossary](#) | [Background](#) | [Discussion](#) | [Findings](#) | [Recommendations](#)
[Requests for Responses](#) | [Methodology](#) | [Bibliography](#) | [Appendixes](#) | [Responses](#)

ISSUE

In recent years, the use of recycled rubber tires, or “tire-derived products” (TDP), in playground and athletic field surfaces nationwide has increased. The trend began as a way to dispose of the enormous amount of tire-related waste that is generated each year. The Grand Jury investigated the use of these tire-derived products in San Mateo County school athletic fields in light of the considerable health and safety concerns raised by other communities and expressed in the print and online media regarding such products, particularly its “crumb rubber” form. How many crumb rubber fields exist at San Mateo County schools, and what is the process used by school districts to consider the safety and desirability of such material before utilizing it to replace existing fields?

SUMMARY

Citizens in communities around the U.S. have expressed concern to school districts, legislators and public facilities administrators that children may be exposed to potentially toxic materials by using artificial turf (AT) fields surfaced with TDP, particularly crumb rubber. Aware of these types of concerns, the Grand Jury became interested in what local school districts are doing to address them. The Grand Jury investigated the use of crumb rubber in athletic fields maintained by local school districts, including the process and costs of installation and maintenance of such fields, and the monetary grants and subsidies offered as incentives to use TDP. The Grand Jury also examined arguments in favor of artificial turf fields made with crumb rubber, including how those fields compare with natural grass in terms of overall costs, maintenance costs, safety for the people who use them, and the potential impact on the environment. In addition, while the Grand Jury cannot draw definitive conclusions as to the potential toxicity of crumb rubber surfaces, the investigation underlying this report nevertheless acknowledges, and was performed in light of, crumb rubber’s well-publicized health concerns. (See Bibliography.) The Grand Jury believes that it would be a mistake for San Mateo County school districts to fail to consider such potential health risks as a part of their overall analysis of whether to use crumb rubber on its athletic field surfaces. The Grand Jury surveyed all 23 school districts, and selected the San Mateo Union High School District (SMUHSD) and the San Mateo-Foster City Elementary School District (SMFCSD) as test cases in its investigation.

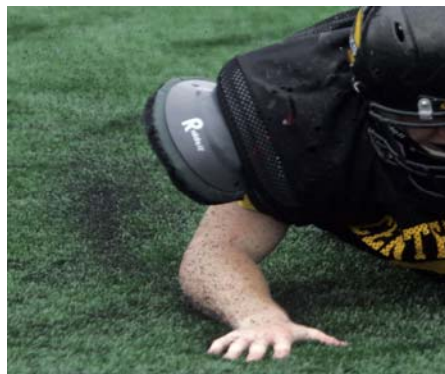
The Grand Jury reviewed the significant body of research, including the 2016 U.S. Environmental Protection Agency’s (EPA) “Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields”¹ and other reports. (See Bibliography.) After interviewing local

¹ United States Environmental Protection Agency, “Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields”, February 2016. <https://www.epa.gov/chemical-research/december-2016-status-report-federal-research-action-plan-recycled-tire-crumb-0>. Click on the PDF link. Accessed January-May 2017.

school district personnel and collecting data from district offices, the Grand Jury learned that the schools surveyed by the Grand Jury have both grass fields and AT fields made with crumb rubber, some of which are scheduled for replacement. The Grand Jury investigated and compared the costs of grass and crumb rubber fields, and found that the total costs involved in installing and maintaining a crumb rubber field are comparable to or greater than for grass. However, the uncertainty about the toxicity of crumb rubber is of greater concern and should be examined during the decision-making process. The Grand Jury therefore recommends that, when constructing a new field, or replacing an existing one, each school district formalize a process to evaluate the options available, compare the relative pros and cons of each, include public input in such decisions, consider safety as well as cost when making their decisions, and impose a moratorium on the use of crumb rubber until these policies are in place.

GLOSSARY: TYPES OF ATHLETIC FIELD SURFACES

Athletic field surfaces fall into two general categories: natural and artificial. Grass is the classic natural standard for playing fields. Tire-derived field products, as identified by the Consumer Product Safety Commission (CPSC), are one type of artificial turf. These products come in a variety of forms and labels, all of which are manufactured from ground-up scrap tires.² The material specifically at issue in this report is “**crumb rubber**,” which refers to the loose-fill “pellets” that are used as “infill” in AT sports fields.³



Al Behrman, AP. Crumb rubber infill pellets on playing field at Centerville High School, Centerville, OH.

Installing synthetic or **artificial turf (AT)** used to refer to replacing grass with what was essentially a green-painted, rough plastic carpet with “blades” designed to look like real blades of grass. AT now contains “**infill**” material between the blades to soften the surface of the turf and to provide cushioning. These infills may be composed of organic products (see below) or crumb rubber. Crumb rubber is widely used in the synthetic sports field and landscape market. The most popular type of AT infilled with crumb rubber — Fieldturf® — is used extensively in athletic fields and stadiums and generally lasts for eight to ten years.⁴

² CalRecycle, Tire-Derived Material Feedstock, accessed March 2017. <http://www.calrecycle.ca.gov/Tires/Products/Feedstock/default.htm>. Also see U. S. EPA, “Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields”, p. 5, and CalRecycle, Playground Surfaces, accessed April 2017, <http://www.calrecycle.ca.gov/Tires/Products/Types/Playground.htm>.

³ United States EPA, op.cit., p. 151.

⁴ *DoItYourself*, accessed March 2017. <http://www.doityourself.com/stry/different-types-of-artificial-turf-explained>. Also see Louis Berger, “Recycling and Reuse of Crumb Rubber Infill Used in Synthetic Turf Athletic Fields”, CalRecycle, March 31, 2016, p. 6. <http://www.calrecycle.ca.gov/tires/BizAssist/AthleticFld.pdf>.

Crumb Rubber Infill is a form of TDP and refers to the small “pellets” that fill the spaces between the “grass blades” in artificial turf fields. These pellets can be “enhanced by the addition of metals, chemicals and other materials,”⁵ and coated with colorants, sealers, or anti-microbial substances if desired. This form of TDP is the focus of this report and of the ongoing EPA research.



Crumb rubber turf flying at Gunn High School, Palo Alto, California, May 25, 2017. Gunn High School’s field is regularly used by student athletes from San Mateo County. Used with permission.

Organic Fill products that utilize organic components include sand, wood chips, natural cork, ground walnut shells, and/or ground fibers from the outside shell of the coconut. These products can be used in playgrounds and landscaping, and can also be used as infill in AT sports fields. GreenPlay® is an example of this product, and Fieldturf® also has a brand that uses organic infill instead of crumb rubber. At replacement time, the organic portions of these products can be separated from the TDP and recycled directly into the environment.⁶

BACKGROUND

In spite of concerns, including those addressed in this report, recycling tires into athletic fields continues as a way to dispose of the four million tons of waste tires generated in the U.S. each year.⁷ In 2005, the State of California Department of Resources Recycling and Recovery (CalRecycle) initiated the Tire Grant Program to encourage activities that reduce the disposal of waste tires in landfills.⁸ Since then CalRecycle has given more than \$40 million in grants to local governmental entities across the state to pay for AT with crumb rubber playing fields in schools and parks.⁹

As communities began to replace their existing playing surfaces with TDP, concern arose about TDP’s potential toxicity, resulting in a number of investigations identifying the presence of lead and other toxins in the rubber products.¹⁰ Communities started to notice reports of cancers in children who used AT fields infilled with crumb rubber.¹¹ In 2016, the EPA acknowledged that existing studies did not sufficiently evaluate the concerns about health risks from exposure to TDP, and that limited information was available about the chemical safety of recycled tire materials in playing field surfaces. That same year, the EPA launched a comprehensive study

⁵ Grand Jury interview with a state legislator, January 17, 2017, plus follow-up written reports and emails.

⁶ Synthetic Turf Council, Glossary of Terms, accessed March 2017. <http://www.syntheticurfCouncil.org/page/Glossary>.

⁷ Waste Tires, accessed March 2017, https://en.wikipedia.org/wiki/Waste_tires

⁸ CalRecycle Tire Management, <http://www.calrecycle.ca.gov/Tires/Grants/>, accessed January-April 2017

⁹ Sherry Posnick Goodwin, “Turf Wars”, *California Educator*, September 2016, Volume 2, Issue 2, p. 18. <http://educator.cta.org/i/726969-september-2016>.

¹⁰ Stephanie Gosk, Kevin Monahan and Tracy Connor, “Feds Finally Take Action on Crumb Rubber Turf”, NBCNews Online, February 12, 2016. <http://www.nbcnews.com/storyline/artificial-turf-debate/feds-finally-take-action-crumb-rubber-turf-n517726>.

¹¹ David Wharton, LA Times online, February 28, 2016, “Are synthetic playing surfaces hazardous to athletes’ health? The debate over ‘crumb rubber’ and cancer”, <http://www.latimes.com/sports/la-sp-artificial-turf-debate-20160229-story.html>

along with the Centers for Disease Control (CDC), the CPSC and other agencies to investigate these issues and concerns.¹²

Historically, fields were covered with natural grass. Following the 1966 debut of AstroTurf in the Houston Astrodome, however, artificial surfaces generally became more available and many school districts, as well as cities and counties, opted to use this material based on a variety of assumptions: that it would be cheaper to install than grass, less expensive to maintain, and might mitigate head injury by offering a softer surface for play. In addition, state and local governments have tried to recycle more waste tires by providing funding for playgrounds and athletic fields that utilize recycled tire products. Since the 1960s, approximately 12,000-13,000 AT athletic fields have been installed in the United States, and the rate of installation of AT for landscaping and recreation has generally increased by 10-15% per year,¹³ with new AT installations each year totaling between 1,200-1,500. Despite this marked increase in the utilization of AT, there has been little or no conclusive scientific research on its effects.¹⁴

Both grass and AT fields have their advantages and disadvantages. Grass has to be watered, mowed and fertilized, and gophers present problems. Costs for AT include removal of existing field material, installation of the AT components, prophylactic sprays, and regular maintenance that includes safety testing, replenishment of infill pellets, raking and fluffing.

In the absence of conclusive scientific research, a number of investigations identifying the presence of lead and other toxins in TDP have led to child safety concerns about such products.¹⁵ After playing on crumb rubber and other TDP surfaces, some children have left with blackened hands and faces.¹⁶ TDP has also been suspected of causing other health issues, including cancer.¹⁷ As a result of these and other concerns, school districts and other agencies around the country have begun limiting or banning the use of crumb rubber and other TDP in fields and playgrounds.¹⁸



PlayItSafeAromas.org (CA). The black residue on a child's hands after playing on a TDP playground.
<https://benitolink.com/rubber-tire-mulch-removal-playgrounds-school-board-agenda>.

¹² United States EPA, op.cit, pp. 5, 150. Information and updates about this research are posted to EPA's website: <http://www.epa.gov/TireCrumb>. Also see "Tire Crumb Questions and Answers", <https://www.epa.gov/chemical-research/tire-crumb-questions-and-answers>. Accessed January-May 2017.

¹³ *Houselogic*, Realtors® website, accessed March 2017. <https://www.houselogic.com/by-room/yard-patio/fake-grass/>

¹⁴ United States EPA, op.cit., p.1. Accessed January-May 2017.

¹⁵ Gosk, Monahan and Connor, op.cit.

¹⁶ Diephof, Laureen, "Rubber tire mulch removal from playgrounds on school board agenda", *BenitoLink*, October 24, 2016, <https://benitolink.com/rubber-tire-mulch-removal-playgrounds-school-board-agenda>.

¹⁷ Sherry Posnick Goodwin, op.cit.

¹⁸ Gosk, Monahan and Connor, op.cit.

In recognition of these concerns, the Grand Jury investigated the presence of crumb rubber in school fields around the county. The Grand Jury also examined arguments in favor of this form of AT, including how it compared with natural grass in terms of overall costs, maintenance costs, and the potential impact on the environment. How many San Mateo County school fields contain AT with crumb rubber infill? How are school districts addressing concerns about the impact of crumb rubber products on the health and safety of children?¹⁹ Are any school districts considering banning (or at least placing a moratorium on) the use of crumb rubber in light of such concerns, until a definitive study by the EPA or other testing agency is complete?

DISCUSSION

Billions of Waste Tires

Because they are hefty, thick, and made of multiple materials, scrap tires present distinct challenges in recycling and disposal. Unrecycled tire waste is a global problem because of its non-biodegradability, its flammability and its chemical composition that leads to leaching of toxic substances into the ground and hazardous fumes from incineration.²⁰

In 2008, it was estimated that approximately 1 billion ELTs (end-of-life tires) were becoming available for recycling globally each year, with an estimated additional 4 billion ELTs already in stockpiles and landfills. World demand for tires is projected to rise 4.7 percent per year to 3 billion units in 2019.²¹ The United States, as the largest producer of ELTs, generated approximately 4,038,000 tons of them in 2015, as estimated by the U.S. Rubber Manufacturers Association (RMA). According to the RMA, approximately 25% of scrap tires are used in ground rubber products, with the remainder used in fuels, construction, and other applications.²² According to the 2013 California Waste Tire Report released in July 2014, ground rubber used in AT fields represented 4.8% of the total “end use universe” for California-generated waste tires.²³

State and local governments have tried to improve the waste tire situation by funding projects that use recycled tire products. CalRecycle offers the Tire Grant Program to promote markets for recycled-content products.²⁴

The California Tire Recycling Act, passed in 1989, requires CalRecycle to manage and regulate waste tires within the state and requires the collection of \$1.75 for each new tire purchased in the state. Of the \$1.75 per tire collected, \$1 is deposited into the Tire Recycling Management Fund for oversight, enforcement, and market development grants related to waste tire management and recycling. One of the grant programs provides funding to certain entities that use TDP made

¹⁹ Waste Tires, op.cit.; see also Renata Birkenbuel, “Ex-Carroll Goalkeeper Beats Cancer But Worries About Kids Playing on Crumb Rubber”, *Montana Standard*, June 26, 2016. http://mtstandard.com/news/local/ex-carroll-goalkeeper-beats-cancer-but-worries-about-kids-playing/article_3671f14b-7484-55af-803c-7421454c0a9b.html.

²⁰ Waste Tires, op. cit.

²¹ Freedonia Research, Industry Study 2860, February 2012, “World Tires”, accessed March 2017. <http://www.freedoniagroup.com/industry-study/world-tires-2860.htm>.

²² Rubber Manufacturers’ Association, “Scrap Tire Markets”, 2015. <https://rma.org/scrap-tire/scrap-tire-markets>.

²³ California Waste Tire Market Report: 2013 <http://www.calrecycle.ca.gov/Publications/Documents/1503/20141503.pdf>, p. 9.

²⁴ CalRecycle, Tire Management, accessed March 2017.

from 100 percent California-generated waste tires. These uses generally fall into one of three categories: agricultural/landscape, recreational, or transportation. The recreational category includes the use of TDP in the construction of fields, playgrounds, and running tracks.²⁵

Since the TDP Grant Program began in fiscal year 2005-06, CalRecycle has awarded grants totaling over \$40 million to California communities that use materials made from scrap tires.²⁶ Cities and entities in San Mateo County participated in those grants almost from the beginning, including a grant to create a crumb rubber or other AT field at Sandpiper Field, and a Redwood City-maintained field on school property in the Belmont-Redwood Shores School District.^{27, 28}

Statewide, demand for these grants diminished between 2008 and 2010, as schools were especially impacted by the economic downturn and were not constructing or replacing fields. During 2011-2015, however, the requests for grants increased and the program was fully subscribed.²⁹ Thereafter, beginning in 2015-16 through the present, the program has been undersubscribed and requests for TDP grants have decreased, and at least one of the individuals interviewed by the Grand Jury opined that this decrease may be the result of the 2016 State Senate bill (see below) or increasing community awareness. CalRecycle stated that they “will continue to offer these grants for these uses in an effort to divert this material from landfills ... unless credible scientific evidence is obtained that would warrant a change in policy.”³⁰

Concerns about Safety

Safety concerns regarding AT are not new, especially to the manufacturers of AT. Concerns for child safety have resulted in a number of investigations identifying the presence of lead and other toxins in recycled rubber products.³¹ In 2008, the California Attorney General sued AT maker AstroTurf LLC “after testing by the Center for Environmental Health (CEH) found high levels [of lead] in artificial turf products”.³² In response to that lawsuit, the manufacturer began to reformulate its products.³³ In 2009, the parties settled the lawsuit pursuant to a consent judgment

²⁵ Grand Jury interview with state legislator, January 17, 2017, plus follow-up written reports and emails.

²⁶ Laurel Rosenhall, CALmatters, “Lawmakers reject bills aimed at artificial turf”, *Bakersfield.com*, January 31, 2016. http://www.bakersfield.com/news/lawmakers-reject-bills-aimed-at-artificial-turf/article_73cea17c-f8c1-56eb-89d0-1790ecf7aacc.html

²⁷ Legislative & External Affairs Office, CA Department of Resources Recycling and Recovery (CalRecycle), email correspondence, March 2017. Also reported in Grand Jury Survey of San Mateo County school districts (see Appendix B).

²⁸ Other San Francisco Bay Area cities that received grants to use crumb rubber on their athletic fields include: the City of Dublin, \$99,445 for a crumb rubber soccer field at Fallon Sports Park; the City of Fremont, \$150,000 for rubber surface on 9 playgrounds, and to convert 2 grass soccer fields to AT; and the City of San Pablo, \$125,064 for crumb rubber infill on AT fields at Rumrill Sports Park. Laurel Rosenhall, op.cit.

²⁹ CalRecycle, “Awards for the Tire-Derived Product Grant Program, FY 2014-15”, p. 4.

<http://www.calrecycle.ca.gov/Actions/Documents%5C45%5C20152015%5C1305%5CSingedTDP Awards.pdf>. Also, statements from interviewee at CalRecycle, March 2017.

³⁰ CalRecycle, “Awards for the Tire-Derived Product Grant Program, FY 2014-15”, p. 5. Also, communication from playitsafearomas.org, December 15, 2016.

³¹ Gosk, Monahan and Connor, op.cit. See additional articles in “Artificial Turf Debate”, nbcnews.com/storyline/artificial-turf-debate.

³² State of California Department of Justice, “Brown Creates Nation’s First Enforceable Lead Standards for Artificial Turf”, August 14, 2009. <https://oag.ca.gov/news/press-releases/brown-creates-nations-first-enforceable-lead-standards-artificial-turf>.

³³ Ibid.

which, among other things, required AstroTurf, LLC to drastically reduce the amount of lead in their products.³⁴ As stated at the time of the settlement by the executive director of the CEH, “Lead is a stunningly toxic chemical that has no place in playing fields for children.”³⁵ The EPA acknowledged that then-existing studies did not sufficiently evaluate the concerns about health risks from exposure to TDP, and in 2016 the EPA, along with the CDC and the Agency for Toxic Substances and Disease Registry (ATSDR), launched a comprehensive study of TDP.³⁶ This study is ongoing and has been extended into 2018 in order to complete the new research on crumb rubber. According to the EPA, past studies which indicated few or no safety issues with TDP contained significant “data gaps”.³⁷ The 2016 study notes “data gaps ... for locations such as playgrounds and indoor fields, and for studies that examine environmental background levels of tire crumb rubber constituents. Studies on occupational exposures from turf and playground installations were also limited. Metal constituents of tire crumb rubber, such as lead and zinc, have been frequently identified in the literature as constituents of concern, but research on exposures to these metals by field and playground users is limited.”³⁸

At present, other agencies around the country are starting to limit or ban the use of crumb rubber in fields. In 2009, the Los Angeles Unified School District and the City of New York both banned the use of TDP in fields. LAUSD board member Marlene Canter said, “The health of our students is more important than any other issue. You should never equate economics with health. In no way should we be skimping on something like this that could affect our kids.” Kathleen McCowin, a demonstrator who was arrested in 2014 for blocking trucks installing “fake turf” in San Francisco, said, “After our children play on these fields, they blow their nose and it comes out black.”³⁹ In January 2015, the Kentucky Energy and Environment Cabinet began redirecting crumb rubber grant allocations to other uses rather than continuing to fund applicants that use crumb rubber infill on playgrounds and athletic fields. In February 2015, Montgomery County, Maryland, the most populous county in the state, approved a ban on TDP in athletic fields and instead required plant-derived materials for infill instead of crumb rubber in future field projects.⁴⁰

“The common sense concern is that this is just chopped up hazardous waste,” said Jeff Ruch, Executive Director of the Public Employees for Environmental Responsibility (PEER), a national nonprofit that has fought the EPA since 2009 over the federal agency’s endorsement of TDP in playgrounds and sports fields. “The studies that have been done are narrow and mostly funded by the industry or waste bureaus trying to get rid of tires.”⁴¹

³⁴ Ibid.

³⁵ Ibid.

³⁶ United States EPA, op.cit., p.6.

³⁷ Ibid., p. 15 ff; Laurel Rosenhall, op.cit.

³⁸ United States EPA, op.cit., pp.15-16.

³⁹ Laurel Rosenhall, op.cit.

⁴⁰ Fact Sheet SB 47, Turf Fields Containing Crumb Rubber from Used Tires, https://d3n8a8pro7vhm.cloudfront.net/harveymilkclub/pages/128/attachments/original/1426294848/Fact_Sheet_1_-_SB_47__with_supporters.pdf?1426294848

⁴¹ Melody Gutierrez, “Critics say EPA played dual role in recycled tire controversy”, *San Francisco Chronicle*, February 21, 2015. <http://www.sfchronicle.com/bayarea/article/Critics-say-EPA-played-dual-role-in-recycled-tire-6094382.php>. Accessed February 2017.

The concerns regarding the potentially harmful effects of crumb rubber have led at least one California state legislator to introduce legislation that would require the State of California to further study the effects of crumb rubber and also impose a statewide moratorium on the use of those products on fields until such studies have been completed. The 2016 bill (which reintroduced an amended version of an earlier 2014 bill) noted that the Office of Environmental Health Hazard Assessment's 2010 study on tire crumb rubber⁴² in AT fields had reviewed chemical concentrations in the air above the fields and found that eight of the chemicals detected were included in the California Proposition 65 list of chemicals known to the state to cause cancer. Exposure via inhalation to five of these chemicals (benzene, formaldehyde, naphthalene, nitromethane, and styrene) were associated with increased lifetime cancer risks over that which would be expected in the general population. The study found that the highest risk was from nitromethane, and also found that two additional identified chemicals (toluene and benzene) appear on the California Proposition 65 list as developmental/reproductive poisons.⁴³

Environmental groups, lawmakers and health advocates, including the above-mentioned PEER and two former EPA toxicologists⁴⁴ claim that the EPA failed to thoroughly study the health effects of crumb rubber, and that the agency was vested in promoting recycling of the material as a solution to the nation's growing stockpile of scrap tires. They asked questions about the health risks posed by the contact with, and inhalation of, crumb rubber and the fumes created when it was under extreme heat, and why jurisdictions continued to use crumb rubber despite the continuing concerns about its potential health effects.⁴⁵ In 2010, University of Washington Associate Soccer Coach Amy Griffin joined the discussion when she began compiling a list based on news reports that appeared about soccer, field hockey and football players across the U.S. who had been diagnosed with cancer after playing for years on AT fields with crumb rubber infill.⁴⁶ Griffin's list now numbers 237 athletes from several sports who have been diagnosed with cancer; and while the list neither qualifies as a "study" nor has direct evidence of links between crumb rubber fields and cancer, it has been widely discussed and has cultivated more concern about the popular use of crumb rubber on playing fields.⁴⁷

One claimed advantage of crumb rubber infill was that it purportedly provided a softer surface to mitigate head injuries from falls. Studies indicated that the head-injury protection for both grass and AT surfaces depended on the hardness of the surfaces, and that a properly maintained playing surface can help reduce head injury risk.⁴⁸ For both grass and AT, field management

⁴² California Office of Environmental Health Hazard Assessment, "Synthetic Turf Studies", <https://oehha.ca.gov/risk-assessment/synthetic-turf-studies>. Accessed May 2017.

⁴³ Text of CA SB 47, *California Legislative Information*, Section 1, Article 3. https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB47; Grand Jury interview with state legislator, January 17, 2017, plus follow-up written reports and emails.

⁴⁴ Melody Gutierrez, *op.cit.*

⁴⁵ *Ibid.*

⁴⁶ Renata Birkenbuel, *op.cit.*

⁴⁷ *Ibid.* Also see NBC News report: <http://www.nbcnews.com/storyline/artificial-turf-debate/congress-asks-epa-if-crumb-rubber-turf-safe-young-athletes-n450551>.

⁴⁸ Tom Serensits, USA Football online, "From the Field: Field Hardness Impacts Head Injury Risk", January 20, 2014, accessed May 2017. <https://web.usafootball.com/news/field/field-field-hardness-impacts-head-injury-risk>.

practices directly affect field hardness and, in turn, the risk of head injury. Reports show that a small amount of crumb rubber remaining in shoes or on clothing after a game adds up and comprises what is referred to as “walk-off” crumb rubber.⁴⁹ While grass fields need to be aerated and watered, AT fields infilled with crumb rubber require specified maintenance services including regular replacement of the infill pellets that help to soften the field surface. And the more a crumb rubber field is used, the more it requires replenishing.⁵⁰

The drought also called attention to AT as a way to reduce the need for irrigation. Along with the potential for reduced water needs, however, came a host of unanticipated, but equally significant, issues. For example, research showed that when it does rain, storm water does not get drained and filtered through synthetics as well as through grass, and in some cases an AT field can effectively “kill” the soil beneath it.⁵¹ In addition, AT fields experience a “heat-island” problem: natural grass fields get a few degrees hotter than the outside air, but AT fields can get 60 to 70 degrees hotter than the outside air, making these fields potentially dangerous. A maximum surface temperature of 200°F on the Brigham Young University (Utah) AT field was reported, and the University of Missouri reported measuring an air temperature of 138°F at “head-level” height on the university’s AT field on a sunny 98°F day.⁵² As a result of this “heat-island” effect, athletes can get dehydrated and even suffer heat stroke; small children are at an even higher risk.⁵³ Some AT fields may require irrigation or other cooling methods installed around them, possibly negating any water savings.⁵⁴

AT also presents its own carbon footprint. In 2006, the Athena Institute conducted a study researching what a school would need to do in order to offset the carbon footprint of an AT field infilled with crumb rubber. The purpose of the study was to estimate the greenhouse gases emitted during the life cycle of such a field compared to a natural grass surface. The study determined that 1,861 coniferous trees would need to be planted to achieve a 10-year carbon-

⁴⁹ Ibid. See also Charles Vidair, Robert Haas & Robert Schlag, “Testing impact attenuation on California playground surfaces made of recycled tires”, Taylor and Francis Publishers Online, June 25, 2008.

<http://www.tandfonline.com/doi/abs/10.1080/17457300701584290>, accessed January 2017; also State of California-Office of Environmental Health Hazard Assessment (OEHHA), Contractor’s Report to the Board, “Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products”, January 2007.

<http://www.calrecycle.ca.gov/Publications/Documents/1206/62206013.pdf>, pp. 104 ff, accessed January 2017; also New York State Department of Health, “Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields”,

www.health.ny.gov/environmental/outdoors/synthetic_turf/crumb-rubber_infilled/fact_sheet.htm, accessed May 2017.

⁵⁰ Ibid.

⁵¹ Recorded video of San Carlos School Board Meeting re: Playing Fields, Dec. 12, 2016, viewed by Grand Jury members. Also see Akiva Fishman, “Artificial Turf Fields: A Literature Review and Recommendations

Prepared for the Charles River Watershed Association”, http://www.synturf.org/images/CRWR-Artificial_Turf_Report.pdf. Accessed May 2017.

⁵² Fact Sheet: Crumb-Rubber Infilled Synthetic Turf Athletic Fields, New York State Dept. of Health, August 2008.

https://www.health.ny.gov/environmental/outdoors/synthetic_turf/crumb-rubber_infilled/fact_sheet.htm

⁵³ Environment and Human Health, Inc.” Artificial Turf Report”, December 2016. www.ehhi.org/turf.php/artificial-turf.php.

Also see Pacific Northwest Pollution Prevention Resource Center 2015 report at <http://pprc.org/index.php/2015/p2-rapid/how-can-we-make-synthetic-turf-fields-safer>.

⁵⁴ Penn State’s Center for Sports Surface Research, “The Effect of Irrigation on Synthetic Turf Characteristics”, June 2015, p. 1. <http://plantscience.psu.edu/research/centers/ssrc/documents/irrigationsynthetic.pdf>

neutral AT installation.⁵⁵ Also of environmental concern is the disposal of crumb-rubber products, including fields, at the end of their 8 to 10 year life expectancy. (See Appendix A.)

Local school district officials who make decisions about field installations and replacements have had to learn about the natural and artificial products available, but the Grand Jury learned that since scientific data is incomplete,⁵⁶ much of their information comes from AT manufacturers and landscapers. The crumb rubber industry understandably maintains that the product is safe, but is aware of the controversy and the continuing scientific studies.

It should be noted that much of the protest about the use of AT with crumb rubber infill, as well as data reports in the media, have focused on the potential cancer risks. It may be wise to cast the net of concern a bit wider and consider health risks and effects other than cancer. School officials should include the public early on in their decision-making process to allow for input and ideas from the wider community and to consider the possibility of unknown future health risks, including what health risks are acceptable to the public and their children who will be playing on these surfaces.

One of the witnesses interviewed by the Grand Jury who has been involved in the removal of his own local school's TDP put it this way: "Lack of evidence is not evidence for safety. How do you declare something safe when the effects of the exposure may not show up for decades?"

Cheaper, Or Not? The Ins and Outs of Artificial Turf vs. Grass

Athletic fields are an integral part of school and community recreation. Planning for them begins long before they are developed, and money must be budgeted for their installation, maintenance and replacement.

According to turf field specialists, typical grass maintenance includes watering, mowing, aeration, fertilizer, seeding, herbicides and insecticides, gopher-hole repairs, drainage repair and eventual replacement.⁵⁷ Initially, freedom from all these tasks and costs was assumed to be one of the benefits of AT, but as AT fields have aged, it is less clear whether they are indeed the easy and economical solution to grass replacement they were perceived to be.⁵⁸ As crumb rubber infill pellets degrade or scatter, they must be replaced, and entire fields may need replacement every 8-10 years. According to SMUHSD staff, crumb rubber AT on a high school field will probably last 7 years and an elementary school field probably 10 years. The concept is similar to carpet or tires: more traffic, more wear. The replaced AT material, as with waste tires, becomes non-

⁵⁵ David Millar of Red Hen Turf Farm, New Carlisle, Indiana and Aaron Loan of Blue Grass Enterprises, Cedar Rapids, Iowa, "The Dirt on Turf: What You Need to Know About Synthetic Turf and Natural Grass for Athletic Fields", p. 8. <https://www.noexperiencenecessarybook.com/LdAYr/the-dirt-on-turf-red-hen-turf-farm.html>. Accessed April 2017. Also see Jamie Meil and Lindita Bushi, "Estimating the Required Global Warming Offsets to Achieve a Carbon Neutral Synthetic Field Turf System Installation", Athena Institute, p. 7. Accessed May 2017.

⁵⁶ U. S. EPA, *op.cit.*, p. 1.

⁵⁷ David Millar and Aaron Loan, *op.cit.*

⁵⁸ Mike Kaszuba, "Schools' sports turf is artificial, but cost concerns are real", *Minneapolis Star Tribune*, October 20, 2012. <http://www.startribune.com/schools-sports-turf-is-artificial-but-cost-concerns-are-real/175030471/>

compostable waste that may require special disposal costs, possibly as hazardous matter.⁵⁹ As a result, scrap tires continue to be a vast and expensive disposal problem, from the time they are removed from vehicles to the end of their lives as artificial turf.

The San Mateo County Office of Education reported to the Grand Jury that some school fields and playgrounds are currently planned for upgrade. The Grand Jury learned that these projects are usually financed through existing maintenance funds or through the issuance of bonds, although some school districts have depended on wealthy donors for field costs. The Grand Jury further learned that some school districts prefer grass because they believe that its maintenance is cheaper and easier in the long run. One school official stated that grass has usually been selected for its fields because of concerns about the safety, and the cost, of crumb rubber. According to school superintendents interviewed by the Grand Jury, there is no obvious funding source for San Mateo County school districts to replace field surfaces, and tapping their General Funds would be unlikely.

The Grand Jury also learned that municipalities in other states such as New Jersey and Missouri have experienced disappointing results with their crumb rubber AT field replacements, and taxpayers there have complained that they have been “hoodwinked” by analyses stating that AT fields are cheaper than natural grass.⁶⁰ Indeed, some non-partisan studies have shown the exact opposite — that natural grass fields are a bargain compared to AT due to the huge costs to maintain and replace artificial fields after their warranties expire. One of the AT industry’s selling points is that an AT field with crumb rubber infill will last 8 to 10 years, even though the usual warranty runs for only eight.⁶¹ At least 20 AT fields at schools across San Diego County have deteriorated while still under warranty. Yet instead of getting a free replacement, some schools had to pay even more money for another new field.⁶²

Planning for Increasing Field Use

One of the major issues currently facing school districts in San Mateo County is the increasing desire for field time from schools and other community groups. Fields are much more in demand than they used to be, and the number of fields is insufficient to meet the demand. As one school official informed the Grand Jury, the county is “built out,” and insufficient real estate remains for new field construction. Currently, SMUHSD fields are used 7 days a week, 16 hours a day during the school year, and some groups are requesting that additional field hours be made available even though the use of such facilities at night would require the additional cost of lighting. One district administrator stated that first and foremost, the fields are for the district’s students, although school officials work with community groups to implement consistent user

⁵⁹ California Department of Toxic Substances Control, Fee Summary, January 1, 2013. <https://dtsc.ca.gov/IDManifest/upload/Fee-Summary1.pdf>

⁶⁰ Mike Ozanian, “How Taxpayers Get Fooled On The Cost Of An Artificial Turf Field”, *Forbes*, September 28, 2014. <https://www.forbes.com/sites/mikeozanian/2014/09/28/how-taxpayers-get-fooled-on-the-cost-of-an-artificial-turf-field/#5c6821935db2>.

⁶¹ *Ibid.*

⁶² Ashly McGlone, “Across the County, Taxpayer-Funded Turf Fields Are Falling Apart After Just a Few Years”, *Voice of San Diego*, November 14, 2016. <http://www.voiceofsandiego.org/topics/news/across-county-taxpayer-funded-turf-fields-falling-apart-just-years/>

policies. Because of high demand for school athletic programs, minimal time is available for other groups that also want to use the fields, and some of them are being turned away.

With this growing demand, replacing grass fields with AT seemed like an appealing and simple choice, since grass fields need “down time” between periods of heavy use, and also need to dry out after rain. A 2017 San Mateo City Parks and Recreation document cited “extremely heavy field use” as a justification to propose installation of AT on a local field.⁶³ The Grand Jury learned that at least one school district and at least four cities in San Mateo County have comprehensive written policies in place for allocating field time to city teams and groups.⁶⁴ These policies use a “priority of use” system which prescribes how groups must request the use of field facilities, and written applications are required during specified seasonal booking periods. SMUHSD, which gives school groups priority when booking field time, reported that it is revising its booking guidelines for the tenth time in five years, to ensure that local groups have priority for the remaining limited rental time. The Grand Jury did not receive all the records it requested from the San Mateo Union High School District in regard to this demand issue, but statements from witnesses, the details of District and City field booking policies, and online news and local reporting indicates that field demand is a significant challenge in San Mateo County and other areas.

One witness from a local Parks and Recreation department acknowledged to the Grand Jury that because of high demand, many groups are turned away and often don’t even apply for field time. The witness stated that the desire and need for year-round use is one of main reasons some cities opted for AT fields, but on some of these fields, they deliberately chose not to use crumb rubber infill, and to “err on the side of safety” in case the newer scientific studies indicate a greater degree of exposure to participants.

The school district personnel interviewed by the Grand Jury also indicated that they are looking for a balance between safety concerns and demand issues when making their decisions about building new fields and replacing old ones. Some districts are committed to using grass because of the safety concerns until more scientific studies provide solid evidence one way or the other.

Based on Grand Jury interviews, the school districts used as test cases in this investigation have no comprehensive plan specifically governing the construction or replacement of athletic fields or playgrounds. For small facilities upgrades, district management considers the costs, funding sources, maintenance, and safety concerns. As one school official stated, districts must determine where the biggest demand is, and as money becomes available, the fields that need it most get improved. Another school official stated that a written policy for field construction is unnecessary because their district doesn’t have the fiscal capacity or desire to replace grass with artificial turf. A request to install AT fields would require a number of considerations, including a Board study session and a subsequent bond measure, which taxpayers would have to approve.

⁶³ City of San Mateo Parks and Recreation Department, King Park Synthetic Turf Project Request for Proposals, May 2017. <http://www.cityofsanmateo.org/DocumentCenter/View/55862>.

⁶⁴ The Grand Jury reviewed field use policies for the cities of Belmont, Burlingame, Redwood City and San Mateo.

In 2013, citing high demand, heavy use and maintenance issues,⁶⁵ the City of San Mateo studied the possibility of using AT on its fields. An extensive public outreach and comment effort was conducted, with more than 100 community members participating. Based upon the site review, assessment of the community's criteria and public comment, Los Prados Park was selected as the first installation, with other parks in line depending on outcome. A review of the report⁶⁶ shows that residents were concerned about:

- The ability of their fields to be used by multiple sports and age groups
- The ability to expand the amount of use of their fields
- Reduction in maintenance costs
- Reductions in water use
- Improved safety
- The amount of impact of a new field on other park uses and users
- The amount of impact on the surrounding neighborhood
- The safety and potential toxicity of crumb rubber.

The City of San Mateo decided against using crumb rubber, and the Los Prados project was completed in 2015, using a rubber infill called ethylene propylene diene monomer (EPDM) in combination with a GreenFields® fiber product that claims to be resistant to wear. EPDM infill is a virgin rubber material that is not made from recycled tires. It claims to be durable in all climates and resistant to abrasion and wear.

Since then, the 2016 EPA Report on crumb rubber, referenced in this document, reported on the limits of current research, data gaps and the need for further research before the safety of crumb rubber could be established.

Cost comparisons for installation and maintenance of AT and grass fields

A significant portion of the comparative data that is used in athletic field purchasing decisions is published by AT manufacturers and grass turf installers. Decision-makers in many organizations, including public school districts, have a number of factors to consider when deciding between natural grass and AT. They often look to manufacturers and landscapers for guidance, which may have vested interests in either choice.

In addition to the concerns about safety and toxicity, AT versus grass is a debate about money, high traffic and demand for field time. AT fields with crumb rubber infill require regular specialized maintenance to keep them in good condition, and so do grass fields.⁶⁷ In the long term, grass may be a comparable or even cheaper solution.⁶⁸ Some field experts recommend that

⁶⁵ Samantha Weigel, "Synthetic turf considered for park", *The Daily Journal*, January 19, 2015.
<http://www.smdailyjournal.com/articles/news/2015-01-19/synthetic-turf-considered-for-park/1776425136859.html>.

⁶⁶ City of San Mateo, "2013 Synthetic Turf Study Community Feedback Results", p. 2-22.
<http://www.cityofsanmateo.org/documentcenter/view/38060>

⁶⁷ Texas Multi-Chem, "Natural Grass vs Synthetic Turf Athletic Field Costs", 2017.
<http://www.texasmultichem.com/blog/natural-grass-vs-synthetic-turf-athletic-field-costs-part-1.html>.

⁶⁸ Sports Turf Managers Association, "Natural Grass Athletic Fields".

grass fields be maintained by a specialized sports field manager who can produce the best grass field possible for the lowest cost.⁶⁹ Grass field managers work closely with school athletic departments to maintain their fields year-round. All these factors must be analyzed with regard to the specific location being considered.

According to a survey conducted by the Grand Jury, all of the AT fields in San Mateo County school districts are made with crumb rubber infill (see Appendix B). Of the 192 fields, 163 are grass and 29 are AT with crumb rubber infill. For reference purposes in this report, the size of one regulation-size soccer field is approximately 70,000 square feet: 110-120 yards long by 70-80 yards wide, a few yards larger than a football field. Crumb rubber surfacing is also often used on sidelines, tracks and other surrounding areas.

The Grand Jury investigated the comparative costs, as of May 2017, of crumb rubber AT and grass fields to provide information for the school districts. That information is detailed below. However, cost is only one factor in the decision. The Grand Jury strongly recommends that school districts consider the unknown and potentially toxic effects to humans from using fields infilled with crumb rubber.

Artificial Turf Cost Details

According to school district officials at SMUHSD, the following preventive maintenance services must be performed regularly on each AT field with crumb rubber infill:

- Machine brushing, raking and “fluffing” every 4-6 weeks
- Sweeping, done quickly, before any debris on the field works its way into the infill
- Aerating: 3 times per year after the second year
- Adding crumb rubber infill to high-use areas as needed (must be checked periodically)
- Application of anti-fungal/anti-bacterial sprays because of athlete’s foot or other contamination
- G-max testing, essential to ensure that the AT fields are safe to play on, must be done on each field annually.⁷⁰

In addition to the above services, the manufacturer also recommends two Advanced Care maintenance services per year to be performed by an approved and certified maintenance partner, which include:

http://www.stma.org/sites/stma/files/STMA_Bulletins/NaturalGrassFields.pdf.

⁶⁹ Growing Green Grass: Innovative Discussions and Solutions For Managing High Quality Turfgrass, June 8, 2013. <https://growinggreengrass.net/2013/06/08/synthetic-v-grass-the-numbers/>. Also see: BluegrassPreps.com, “How Much Does It Cost to Maintain a Grass Field?”, 2011. <http://bluegrasspreps.com/ky-football-high/how-much-does-222834-page2.html>.

⁷⁰ Synthetic Turf Council, Glossary of Terms: A field’s level of shock absorbency is tested by using a unit of measurement called the g-max, where one “g” represents a single unit of gravity. The peak acceleration reached upon impact of two objects, such a football player and the synthetic turf surface, is the maximum number of g’s a field is able to absorb. A field with a higher g-max level loses its ability to absorb the force, and places more impact on the athlete during a collision, while a surface with a lower g-max absorbs more force, lessening the impact to the athlete. Using ASTM F1936 test method, g-max readings shall not exceed 200 at each test point. With proper maintenance, a synthetic turf field should have a g-max of well below 200. The g-max guideline in the STC’s Guidelines for Synthetic Turf Performance is “below 165” for the life of the synthetic turf field. <http://www.syntheticurfCouncil.org/page/Glossary>

- Deep field de-compaction
- Magnet sweep for metal debris
- Rotary brushing to raise turf fibers and to collect any contaminated infill
- Cleaned infill is then re-distributed back into the field using a power brush and vacuum
- Vacuuming to remove fine dust and debris from the field surface
- Multiple infill depth measurements to verify surface planarity
- Minor warranted seam and inlay repairs
- Addition of light infill to high traffic areas
- Power-cleaning the field perimeter.

SMUHSD’s annual cost for these services is \$63,600 for their 6 crumb rubber fields, or \$10,600 per field. This does not include the cost of district staff spreading the crumb rubber pellets twice a month as part of maintaining the facilities. The district owns the machines that spread the pellets. If the underlayment, or “carpet,” unravels or tears, repair is an additional cost; replacement costs \$700,000 per field.

This maintenance is not optional. The Grand Jury learned that one city in the county has been discussing the need for replacement of some of their AT fields. Officials there stated that turf fields can last ten or more years if they are properly maintained. However, two of their fields were opened in April 2010, but “due to high use and insufficient maintenance they were nearing the end of their useful life.”⁷¹

Natural Grass Cost Details

Natural grass field costs include initial installation, maintenance labor and materials, equipment, irrigation, and renovation/resurfacing as needed.

Typical grass maintenance may include watering, mowing, aeration, fertilizing, seeding, application of herbicides and insecticides, gopher-hole repairs, drainage repair and eventual replacement. SMFCSD, with 20 grass fields, uses a landscaping company to provide mowing and maintenance services, at an annual cost to that district of \$57,000, or \$2,850 for each grass field.

⁷¹ Burlingame City Council Meeting Minutes, April 17, 2017, pp. 5-16, offer a city’s perspective on the subject of artificial turf installation, maintenance and replacement, as well as the issue of high demand for field time. Costs are comparable to other evidence obtained by the Grand Jury. http://burlingameca.granicus.com/MediaPlayer.php?view_id=3&clip_id=500#

Comparison of the total costs, as of May 2017, for an AT crumb rubber field and a grass field:

Cost Summary per AT crumb rubber field: (SMUHSD figures)

Artificial turf field total costs: \$2.5 million - \$3.7 million⁷²
- Maintenance: approximately \$10,600 per year, per field

Cost Summary per grass field: (SMFCSD figures)

Natural grass field total costs: \$2.0 million - \$2.5 million
- Maintenance: approximately \$2,850 per year, per field

For reference purposes, the Grand Jury collected cost comparisons for natural grass and crumb rubber field installations from the Sports Turf Manager's Association (STMA), whose figures generally conform to installation costs for San Mateo County schools as reported to the Grand Jury. STMA estimates that the costs for an AT field infilled with crumb rubber range from 93% to 110% of the costs for a natural grass installation that includes sand and drainage.⁷³

TDP Use in San Mateo County

In light of the concerns raised in this report, the Grand Jury investigated TDP use in San Mateo County. Using interviews and a survey, the Grand Jury investigation focused on the athletic fields in the county's 23 school districts. (Although outside the purview of this report, San Mateo County also has dozens of public parks, some of which are AT with crumb rubber infill. Site visits were made at eight City of San Mateo and Foster City public facilities, during which nine AT fields and five grass fields were identified.)

The 23 San Mateo County school districts have 192 fields, serving 172 schools and 95,000 students. The San Mateo Union High School District (SMUHSD) and the San Mateo-Foster City Elementary School District (SMFCSD) were used as test examples in the Grand Jury's investigation. The Grand Jury interviewed school district personnel and obtained specific data on the construction, use and maintenance of the fields in these two districts. The Grand Jury also surveyed all 23 districts to obtain information about the rest of the county's school athletic facilities, specifically the types of fields and how many of them would need replacement within the next five years. (See Appendix B for the survey results.)

All 23 school districts responded to the survey. The report indicated that of the 192 fields, 163 are grass and 29 are crumb rubber. Of the 23 districts, 16 have fields that are scheduled for replacement within the next five years. Of these, 14 stated that they planned to seek public input during the decision-making phase.

⁷² Costs for an AT field infilled with crumb rubber vary depending on how much material is used. At some fields, a surrounding crumb rubber track is included, and the crumb rubber area may be extended into the sidelines or other surrounding areas.

⁷³ Sports Turf Manager's Association, op.cit., p. 5.

In 2013, the City of San Mateo initiated its “Synthetic Turf Study,” mentioned above, to solicit public comment concerning a proposal to replace five grass fields with AT. In planning the approach to this study, a high priority was to ensure that there was a robust opportunity for community members to participate in the process. Key to this public engagement was the establishment of a Community Advisory Committee. The make-up of this committee was intentionally diverse, to represent field users, neighborhood interests, and general community members.⁷⁴ The Grand Jury recommends that before San Mateo County school districts begin planning the construction or replacement of a field, they use the City of San Mateo’s process as an example and initiate similar studies to assess public opinion, using post cards, email, website comment, community workshops and capture surveys to notify, solicit and collect this input.

Into the Future

San Mateo County school districts currently have a mix of grass fields and AT fields infilled with crumb rubber. County school districts are under pressure to make their fields available more often than in the past to school and community groups who all want time for sports and other activities. District personnel are aware of the pros and cons of natural and artificial field materials, and must make decisions based on conflicting reports and incomplete scientific and industry-sponsored studies.

Despite the conflicting evidence and opinions regarding the health and environmental dangers of crumb rubber, some communities have opted to enact a temporary ban on crumb rubber fields out of caution on the grounds that future studies might uncover dangerous effects. For example, in December 2015, the city of Edmonds, Washington approved an 18-month moratorium on installing any new AT fields made with crumb rubber infill from recycled tires. The city council enacted the moratorium after residents protested the local school district’s plans to remove the aging grass field at a school campus and replace it with AT. A city official said construction of the school field was already under way when residents learned it would have crumb rubber infill, and so workers completed the project before protests could halt construction. Because of the community outcry, he said, other fields that were scheduled to get similar upgrades will not, at least during the 18-month moratorium.⁷⁵

San Mateo County School Districts should be concerned about the impact of crumb rubber on the health and safety of their students and student-athletes as well as for county residents generally. Should the districts consider putting a similar moratorium on its use? This question and the other issues raised in this report should be discussed thoroughly by residents as part of each school district’s open process in considering field installation and replacement projects.

Considering the cost and maintenance of both crumb rubber AT and grass fields, grass may still be a wise choice. The sod industry has developed grass varieties that hold up better and longer than those normally used for fields. Grass sports fields take considerable abuse and need dense,

⁷⁴ Sheila Canzian, City of San Mateo Director of Parks and Recreation, “Synthetic Turf Conversion Study and Plan”, July 17, 2013, p. 3. <http://www.cityofsanmateo.org/DocumentCenter/View/38057>

⁷⁵ Megan Quinn, “Fear vs. Facts”, *Scrap*, March/April 2016, under “Crumbs of Concern”. <http://www.isri.org/news-publications/scrap-magazine/top-stories/scrap-magazine-crumb-rubber-march-april-2016#.WMrZohLyvdQ>.

thick sod to withstand impact and recover quickly. Many of the new athletics grasses are seeded mixtures that get the most coverage for the longest period of time.⁷⁶ They are selected based on their ability to withstand traffic wear and tear and stress from drought and heat; their recovery from field use (“recuperative ability”); good color; desirable growth characteristics; resistance to insects, weeds and diseases; and their maintenance requirements.⁷⁷

The same sensible and practical criteria would have to apply to any of the field surface options: Is it safe for humans and animals to play on, will it hold up to heavy use, and will it thrive with reasonable maintenance?

Like many communities in the U.S. and around the world, San Mateo County residents and officials will have to make choices and find a balance to provide residents with recreational facilities while helping to keep them safe.

FINDINGS

F1. Of the 23 San Mateo County school districts, the following 16 reported to have fields that will require replacement in the next 5 years:

- Bayshore Elementary School District
- Belmont-Redwood Shores School District
- Brisbane School District
- Burlingame School District
- Cabrillo Unified School District
- Hillsborough City School District
- Jefferson Elementary School District
- Jefferson Union High School District
- Las Lomas Elementary School District
- Millbrae School District
- Portola Valley School District
- Redwood City School District
- San Carlos School District
- San Mateo Union High School District
- Sequoia Union High School District
- South San Francisco Unified School District

⁷⁶ SportsGrass.com. <http://sportsgrass.com/>

⁷⁷ Cornell University, Sports Field Management. <http://safesportsfields.cals.cornell.edu/grasses-for-sports-fields>.

- F2. The total installation costs for each artificial turf field infilled with crumb rubber equal approximately \$2.5 million - \$3.7 million; the total installation costs for each natural grass field are approximately \$2.0 million - \$2.5 million. The annual maintenance costs for each artificial turf field infilled with crumb rubber equal approximately \$10,600 per field, per year; the annual maintenance costs for each grass field equal approximately \$2850 per field, per year.
- F3. High demand for field use by schools and community groups is one reason why some school districts favor the installation of artificial turf fields instead of grass.
- F4. According to the U.S. Environmental Protection Agency, “studies to date have not shown an elevated health risk from playing on fields with tire crumb rubber, but these studies have limitations and do not comprehensively evaluate the concerns about health risks from exposure to tire crumb rubber.”
- F5. The San Mateo County Office of Education reported that it is the responsibility of each school district’s Board of Trustees and Superintendent to develop policies regarding the issue of athletic field installation or replacement.
- F6. The San Mateo-Foster City School District and the San Mateo Union High School District have written policies regarding school construction and renovations, but neither has written guidelines or policies governing the decision-making process for constructing or replacing athletic fields.

RECOMMENDATIONS

The San Mateo County Grand Jury recommends that each San Mateo County School District shall:

- R1. Produce written guidelines for the decision-making process involved in field installation and replacement, which shall include the following:
 - R1a: Consider the uncertainty regarding the safety of tire-derived products used on school fields, particularly crumb rubber.
 - R1b: Evaluate and make their decisions on policy development and field replacements based on current scientific evidence regarding the use of crumb rubber on athletic fields as it becomes available, whether or not the EPA report is complete.
 - R1c: Undertake measures to increase community involvement during the field replacement evaluation process, including discussion regarding potential concerns about the safety of crumb rubber or other tire-derived products. This could be similar to the 2013 City of San Mateo study regarding the possibility of using artificial turf on its fields, which included extensive public outreach for comment, using post cards, email, website comment, community workshops and capture surveys to solicit and collect public input.

R2. Consider (among other factors) the following when selecting materials for their athletic fields and playgrounds:

1. Safety to humans and animals
2. Suitability based upon the location's intended use and frequency of use
3. Cost (of installation and lifecycle requirements) and manufacturer warranty.

R3. Impose a moratorium on the utilization of artificial turf with crumb rubber infill until the Environmental Protection Agency concludes its study or until all the policies listed above have been implemented.

REQUEST FOR RESPONSES

Pursuant to Penal code section 933.05, the grand jury requests responses as follows:

From the following governing bodies:

- Bayshore Elementary School District
- Belmont-Redwood Shores School District
- Brisbane School District
- Burlingame School District
- Cabrillo Unified School District
- Hillsborough City School District
- Jefferson Elementary School District
- Jefferson Union High School District
- La Honda-Pescadero Unified School District
- Las Lomas Elementary School District
- Menlo Park City School District
- Millbrae School District
- Pacifica School District
- Portola Valley School District
- Ravenswood City School District
- Redwood City School District

- San Bruno Park School District
- San Carlos School District
- San Mateo Union High School District
- San Mateo-Foster City School District
- Sequoia Union High School District
- South San Francisco Unified School District
- Woodside Elementary School District

The governing bodies indicated above should be aware that the comment or response of the governing body must be conducted subject to the notice, agenda and open meeting requirements of the Brown Act.

METHODOLOGY

Interviews

The Grand Jury interviewed a number of individuals in the San Mateo County Office of Education, the San Mateo Union High School District, the San Mateo-Foster City School District and the San Mateo County School Insurance Group (SMCSIG). We also interviewed and gathered data from a California state legislator's office. Communications with other cities in San Mateo County and other counties and communities in California who are also concerned with the TDP issue provided us with additional data and perspective. We also viewed a video-recorded San Carlos School Board meeting with speakers from the artificial turf industry, and concerned parents, some of whom had done extensive research on their own.

Documents

- CA State Senate Bill 47, 2016
- The 2016 Federal Research Action Plan on Recycled Tire Crumb Used on Playing Fields and Playgrounds
- Survey sent by the Grand Jury to all San Mateo County School Districts, March 22, 2017, and its results
- 2013 City of San Mateo Synthetic Turf Study Community Feedback Results
- City of Belmont Athletic Field Use Policy
- City of Burlingame Athletic Field Use Policy
- City of Redwood City Athletic Field Use Policy
- City of San Mateo Athletic Field Use Policy
- San Mateo Union High School District Guidelines for Booking SMUHSD Fields

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APPENDIX A

Recycling crumb rubber infill is much more costly than disposal due to the comparatively high cost of separating and cleaning infill and turf materials, and transporting them to processors and end-users. In 2015, CalRecycle hired a consulting team to investigate the recycling of playground surfaces made with crumb rubber at the end of their useful life. However, no information sources on this topic were identified and the reporting consultant could not find any specific examples of rubberized playground surfaces being recycled.⁷⁸ According to an AT installation and removal expert, a typical soccer or football field consists of approximately 600,000 pounds of TDP material. In 2011, 180 AT fields were removed in the U.S., and 90 percent of those went into a landfill. By 2018, it is estimated that more than 1,000 fields will need to be replaced every year, for decades to come. This means that each year nearly 100 million square feet of turf and half a billion pounds of sand and crumb rubber infill will need to be disposed of, either by separating and repurposing the components or by dumping them in a landfill.⁷⁹

⁷⁸ Louis Berger, "Recycling and Reuse of Crumb Rubber Infill Used in Synthetic Turf Athletic Fields", March 31, 2016, p. 6. <http://www.calrecycle.ca.gov/Tires/BizAssist/AthleticFld.pdf>

⁷⁹ SynTurf.org, "Current theory and practice of dealing with used artificial turf fields", April, 2016, accessed April 2017.

APPENDIX B

San Mateo County School Districts: Athletic Fields Survey Results, March 2017

<u>District</u>	<u>City</u>	<u>No. of Fields</u>	<u>Material(s) Used</u>	<u>Replacement planned?</u>	<u>If yes, what?</u>	<u>Public/parent input?</u>
Bayshore	Daly City	1	Grass	Yes	Artificial turf	No
Belmont-Redwood Shores	Belmont	7	6 grass, 1 crumb rubber (Sandpiper)	Sandpiper, 2017	Artificial turf, cork or TPE*	Will be RC's decision
Brisbane	Brisbane	2	Grass	Yes	Artificial turf	Yes, has been ongoing
Burlingame	Burlingame	4	2 grass, 2 crumb rubber	Yes	Artificial turf w/organic infill	All construction noted & discussed at public board meetings
Cabrillo	Half Moon Bay	8	5 grass, 3 crumb rubber	Yes, 2017	Replace 1 crumb rubber field with cork	Yes
Hillsborough	Hillsborough	5	Grass	Yes: one, for renovation	Grass	Yes, multiple during planning phase
Jefferson Elem.	Daly City	13	12 grass, 1 crumb rubber	Yes, the AT field in near future	Suitable alternative to crumb rubber	Yes, at open Board meeting
Jefferson UHS	Daly City	4	Crumb rubber	Yes, 2	Cork or material other than crumb rubber	Yes
La Honda-Pescadero	Pescadero	3	Grass	No		Will seek input if replacement needed
Las Lomas	Menlo Park	2	Grass	Possibly	No discussion yet	No discussion yet
Menlo Park	Atherton	5	4 grass, 1 crumb rubber	No		
Millbrae	Millbrae	10	Grass	Yes (playground)		Yes, during facilities committee meetings
Pacifica	Pacifica	6	Grass	Nothing scheduled at this time		
Portola Valley	Portola Valley	2	Grass	Yes, both	Grass or artificial turf	Yes
Ravenswood	E. Palo Alto	3	Grass	No		

<u>District</u>	<u>City</u>	<u>No. of Fields</u>	<u>Material(s) Used</u>	<u>Replacement planned?</u>	<u>If yes, what?</u>	<u>Public/parent input?</u>
Redwood City	Redwood City	12	10 grass, 2 crumb rubber	Yes, Hoover field in 2 years	CoolPlay® or TPE*	Yes, at Board or City Council meetings
San Bruno	San Bruno	2	Crumb rubber	No		Yes
San Carlos	San Carlos	5	Grass	Yes, 2 new fields	Anything but crumb rubber, per commitment	Yes, have been for 2 years
San Mateo Union	San Mateo	20	14 grass, 6 crumb rubber	Yes	Crumb rubber or grass	
San Mateo-Foster City	Foster City	20	Grass	No. Grass only on new FC school.	Grass	Yes
Sequoia	Redwood City	13	8 grass, 5 crumb rubber	Yes	Crumb rubber	Fields already designed and in final approval
South SF	South SF	42	40 grass, 2 crumb rubber	Yes	Grass or crumb rubber	Yes, public Board meeting
Woodside	Woodside	3	Grass	No		
		192				
			*CoolPlay®: FieldTurf® cork infill			
			*TPE: thermoplastic elastomers			

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