Sports Turf Alternatives Assessment
COST ANALYSIS

September 2016

Introduction

The Massachusetts Toxics Use Reduction Institute (TURI) and the Lowell Center for Sustainable Production have received numerous requests for information about the comparison between natural grass and artificial turf fields. This document provides information on costs (installation, maintenance, replacement and disposal) associated with natural grass and artificial turf options. Information has been drawn from industry publications, articles in the press, and personal communications from municipal grounds managers.

This document is one section of a larger series. The documents in the series cover the following topics related to athletic fields: cost analysis; physical and biological hazards; overview of infills; tire crumb infill; EPDM infill; and TPE infill. Together, they form a preliminary alternatives assessment. This document was written in 2016 and was re-posted on the Lowell Center for Sustainable Production website with minor revisions in 2024. The full series is available at https://www.uml.edu/research/lowell-center/athletic-playing-fields/.

Cost Analysis

In analyzing the costs of artificial vs. natural grass systems, it is important to consider full life-cycle costs, including installation, maintenance, and disposal/replacement. This section provides information on each of these categories of cost, comparing costs for artificial turf fields with those for natural grass. Information is also presented on the relative costs of conventional versus the organic management of natural grass.

Costs vary substantially depending on the type of field, the level of maintenance, and other factors. In general, however, artificial turf fields have a higher life-cycle cost than natural grass fields. Once established, organic management of natural grass can be even more cost effective than conventional management of natural grass.

Installation

Installation costs depend on a variety of factors, including the type of field chosen and the dimensions of the field. Cost estimates are shown below for two possible field sizes: 85,000 square feet or 65,625 square feet (based on a calculation of a football field with a play area of 360x160 feet plus a 15-foot extension on each dimension).

Some sources provide total estimated costs, while others provide estimated costs per square foot. The Turfgrass Resource Center (TRC) is a project of Turfgrass Producers International, an industry association that promotes the use of natural grass. The SportsTurf Managers Association (STMA) is an association of sports field managers. The TRC has developed total

estimated costs, while the STMA has estimated costs per square foot. In Table 1, below, we have converted all estimates to total costs per field for two possible field sizes.

As shown in the table, installation costs for an 85,000 square foot natural grass field can range from $50,000 to $600,000, depending on the complexity of the site work, drainage and caps. Costs for a synthetic turf field of the same size can range from under $400,000 to approximately $1 million.

The total budget of a project to install a synthetic field may include a variety of additional activities that are not directly associated with the synthetic turf, such as other landscaping, paving or equipment. Variation in estimates may depend in part on the range of elements that are included in the cost calculation. Some estimates may focus on field installation only, while other estimates may include items beyond basic field installation, such as additional water systems and site work.

Table 1: Installation Costs*

Field size (square feet)	**85,000** (TRC)	**85,000** (STMA)	**65,625** (STMA)	**undefined** (Fresenburg)
Natural grass				
Native soils	$50,000-$150,000	$106,000-$213,000	$82,000-$164,000	
On-site native soils (no added top soil or sod)		$51,000-$77,000	$39,000-$59,000	$0
Sand and drainage	$250,000-$350,000	$361,000-$425,000	$279,000-$328,000	
Sand cap		$221,000-$327,000	$171,000-$253,000	$300,000
Sand-based mesh element	$450,000-$600,000			
"Pure sand based water-contained sub-surface systems"**	$500,000-$600,000			
Synthetic turf				
	$850,000-$1,000,000	$383,000-$871,000	$295,000-$673,000	$600,000-$1,000,000

Sources:
Turfgrass Resource Center (TRC). (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts." Available at https://www.saratogasod.com/wp-content/uploads/2018/02/NaturalGrassArtificialTurf.pdf.
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Brad Fresenburg. "More Answers to Questions about Synthetic Fields – Safety and Cost Comparison", Turfgrass Specialist & Extension Associate, University of Missouri. PowerPoint slides obtained via email December 2015.
* Rounded to three significant digits.
** "This is a new type of natural grass field that requires less than 50 percent of the water of a normal sand based field." (Turfgrass Resource Center)

Table 2 shows the budget for a 117,810 square foot synthetic field installation project for the town of Natick, Massachusetts which took place in 2015. The field includes a 2.25 acre soccer field, about 0.5 acres of surrounds, and another one acre field. The field is composed of crumb rubber infill with no sand mixed in. As shown in the table, the project budget includes core items

such as land clearing, drainage, earthwork, and field surfacing; it also includes other, related items such as paving and site furnishings. The total project cost was over $1.2 million (Goodhind 2016).

Table 2: Natick Town Field: Synthetic Turf Installation, 2015	
Item	*Cost*
General Conditions	$24,000
Mobilization	$59,000
Land Clearing	$41,200
Drainage	$100,500
Earthwork	$131,000
Fencing	$43,500
Landscaping	$38,500
Masonry	$75,000
Field Surfacing	$556,000
Paving (sidewalks)	$46,000
Site Furnishings/Athletic Equipment	$6,300
TOTAL:	**$1,223,829**
Source: Art Goodhind, Land Facilities & Natural Resources Supervisor, Town of Natick (personal email communication, April 11, 2016. Field size: 117,810 square feet.	

Cost of Synthetic Infills by Type

There are many possible synthetic infill options, some more readily available than others. The information in Table 3 is drawn from a general cost and availability comparison on various synthetic infills (Gale Associates 2015). As shown in the table, according to the Gale Associates analysis, crumb rubber, silica sand, and coated crumb rubber are readily available, while the other options have limited availability.

Table 3: Gale Associates Infill Cost Comparisons			
Infill Type	**Typical Mixture, by weight**	**Approximate cost***	**Availability****
Crumb rubber	50% sand 50% rubber	$50,000	Readily available
Silica sand	100% silica sand	+$0 net for additional sand +$130,000 (resilient pad)	Readily available
Organic (cork or coconut or rice)	10-15% organic 90-85% sand	+$180,000 (materials) +$130,000 (resilient pad) +$15,000 (irrigation)	Limited
Coated crumb rubber	50% sand 50% coated rubber	+$220,000 (materials)	Readily available
ethylene propylene diene monomer (EPDM)	50% sand 50% EPDM	+$360,000 (materials)	Limited
thermoplastic elastomer (TPE)	50% sand 50% TPE	+$360,000 (materials) +$130,000 (resilient pad)	Limited

Coated sand	100% coated silica sand particles	+$150,000 to $250,000 (materials) +$130,000 (resilient pad)	Limited
Nike Grind	50% sand 50% Nike Grind	+$130,000 (resilient pad)	Very limited

Source: Gale Associates. 2015. "Alternative Infills for Synthetic Turf." Table prepared by Gale Associates, March 17, 2015. Available at http://www.galeassociates.org/wp-content/uploads/2015/03/Alternative-Infills-for-Synthetic-Turf.pdf, viewed December 11, 2015.
* "Costs are generalized approximations. Costs are net addition to cost of a typical sand/SBR turf infill system. Actual costs will vary based on depth of infill/turf depth, and type of resilient pad used. Market costs can vary greatly due to materials demand and availability." Costs shown with a "+" are added to a base cost of $50,000 per field.
** "May become more or less available as demand and popularity fluctuates. Cost fluctuates with availability."

Information about the cost of various alternatives is included in several press stories in 2015.

- The town of Marlborough, Massachusetts chose to look at alternatives to standard crumb rubber for their 102,000 SF field. A consultant presented three alternative materials: a rubber that receives an ultraviolet coating to reduce the release of chemicals, a plastic compound and an "organic infill" made of recycled coconut fiber and sand, possibly also including cork and rice husks. It was determined that the encapsulated rubber that receives an ultraviolet coating would cost an additional $114,000 more than uncoated crumb rubber; the thermoplastic elastomer, a plastic compound, would cost an additional $229,000; and the "organic infill" would cost an additional $451,000. (Activitas 2014; Malachowski 2014).
- A California town considered an organic coconut fiber infill for a project and it was estimated to cost $1.25 per pound, nearly three times as much as the originally proposed acrylic-coated rubber crumbs (Ruiz 2015).
- A Pennsylvania town chose to move to the Nike Grind product despite spending about $350,000 more than expected on two synthetic fields (Lester 2015).

Maintenance

Maintenance of artificial turf systems can include fluffing, redistributing, and shock testing infill; periodic static control and disinfection of the materials; seam repairs and infill replacement; field line erasing and repainting; organic matter removal; and watering to lower temperatures on hot days. Maintenance of natural grass can include irrigation, mowing, fertilizing, replacing sod, and other activities. A soil and grass health assessment of the field is needed to establish an appropriate maintenance program. Maintenance of a natural field may be minimized by substituting full field replacements and seam repairs with spot sod replacements. In both systems, specialized equipment is needed. Communities shifting from natural grass to artificial turf may need to purchase new equipment for this purpose.

As noted in Table 4, the costs of field maintenance can vary widely. This can depend on its exact makeup, the initial condition of the field, and the standards to which it is kept.

Table 4: Maintenance Costs			
Material Type	Annual Maintenance – 65,625 sf field*	Annual Maintenance – undefined field size – 16-yr cost analysis with and without surface replacements**	Annual Maintenance – undefined field size***
Natural turf fields			
Natural with native soils	$4,000-$14,000 (materials) + 250-750 hours (labor)		$8,133-$48,960
Natural with on-site native soils (no added top soil or sod)		$25,000 (initial maintenance cost) $37,287 (with 4, 8, 12, and 16 year replacement costs factored in)	
Natural with sand and drainage			
Natural with sand cap		$25,000 (initial maintenance cost) $53,787 (with 4, 8, 12, and 16 year replacement costs factored in)	
Synthetic turf fields			
	$4,000 (materials) + appr. 300 hours (labor)	$5,000-$20,000 (initial maintenance cost) $93,000-$136,169 (with 8 and 16 year surface replacement costs factored in)	$13,720-$39,220

Sources:
* STMA. (no date.) "A guide to Synthetic and Natural Turfgrass for Sports Fields, 3rd edition. Available at http://www.stma.org/sites/stma/files/STMA_Bulletins/STMA%20Syn%20and%20Nat%20Guide%203rd%20edition%20FINAL.pdf
**Brad Fresenburg, "More Answers to Questions about Synthetic Fields – Safety and Cost Comparison", Turfgrass Specialist & Extension Associate, University of Missouri. PowerPoint slides obtained via email December 2015.
***Turfgrass Resource Center. (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts." Available at http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf.

The Turfgrass Resource Center provided further breakdown of their numbers noted above as shown in Table 5 (TRC n.d. a).

Table 5: Annual Maintenance Requirements (TRC)			
Synthetic Turf		**Natural Grass**	
Painting/paint removal (various sports)	$1,000-10,000	Painting (various sports)	$800-12,300
Top dressing/infill	$5,000	Top dressing (sand)	$0-5,400
Brushing/sweeping	$1,000-5,000	Dragging	$0-200
Disinfecting/fabric softener	$220	Fertilizers	$1,200-11,000
Carpet repairs (rips, joints)	$1,000-8,000	Pesticides	$650-6,300
Water cooling	$5,000-10,000	Aeration	$700-960
Weeding	$500-1,000	Sod replacement	$833-12,500

		Irrigation	$300-3,000
Total	**$13,720-39,220**	**Total**	**$8,133-$48,960**
Source: Turfgrass Resource Center. (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts."			

Maintenance: Equipment. Some data show that equipment for maintaining a natural grass field may be more expensive than that for a synthetic field. However, towns or schools may be more likely to already own this equipment, thereby making natural grass field maintenance equipment costs lower. Information in Table 6 was published by The Turfgrass Resource Center detailing a comparison of equipment and maintenance used for artificial turf and natural grass fields. The data is a compilation from a variety of sources that are meant to provide a starting point for entities considering which type of field to install (TRC n.d. a).

Table 6: Cost of Equipment, Supplies, and Labor (TRC)

Synthetic Turf		**Natural Grass**	
Water (for cooling)	$6,000-35,000	Irrigation	$6,000-35,000
Sprayer for water application	$1,000-35,000	Equipment for irrigation	$3,000-31,000
Sweeper	$1,500-20,000	Mower	$13,000-69,000
Mechanical broom	$500-3,000	Fertilizer applicator	$1,000-3,000
Line painter	$500-$3,000	Line painter	$700-3,000
Groomer	$1,500-2,000	Rollers	$2,000-4,000
Cart (for towing equipment)	$7,000-16,000	Cart (for towing equipment)	$7,000-18,500
Field magnet	$500-1,000	Aerator	$3,500-17,000
Rollers	$250-2,000	Vacuum	$2,100-5,000
Top dresser	$4,500-10,000	Top dresser	$4,500-20,000
Total	**$23,250-127,000**	**Total**	**$42,800-205,500**
Source: Turfgrass Resource Center. (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts."			

Maintenance: Synthetic and Natural Turf in Marblehead. The town of Marblehead, MA maintains both synthetic turf and natural grass for playing fields. The Chairman of the Recreation and Park Commission has provided information about their costs for maintenance of the two types of fields. (Osborne 2016).

Marblehead's synthetic turf field is 65,340 square feet. As shown in Table 7 below, the town made a capital investment of between $10,000 and $14,000 for a Gator utility vehicle and $7,500 for a brusher to attach to it. The synthetic turf field is groomed by an in-house Marblehead Recreation and Parks Department staff member who spends about a half day every three weeks in the spring and fall and every four weeks in the summer. That equates to $1,000 to $1,400 in labor costs (including fringe).

The town received a bid for disinfection application two times per year, for a total annual disinfection cost of $6,000. The chemical disinfection product was determined to contain several potential human carcinogens. A less toxic, enzyme-based treatment could be provided for a higher cost, but specific figures are not yet available for this option. Assuming use of the lower-

cost disinfection option, total annual maintenance costs come to $7,000 to $7,400, not including up-front capital costs for maintenance equipment.

Table 7: Marblehead Town Fields: Synthetic Turf Maintenance Costs (65,340 sf)	
Maintenance equipment	
Gator utility vehicle	$10,000 - $14,000
Brusher	$7,500
Annual costs	
Grooming	$1,000 - $1,400
Disinfection (chemical)	$6,000
Total annual costs (not including equipment)	**$7,000 - $7,400**
Source: Osborne, Charles, Chairman of the Recreation and Park Commission, Marblehead, personal communication, May 26, 2016.	

The costs shown in the table above are for an approach that uses both town staff and an outside vendor. To gain more information on costing options, the town of Marblehead obtained a cost quote for synthetic turf maintenance performed entirely by an outside contractor.

For two maintenance visits per year (including grooming, cleaning, de-compacting, field inspection, G-max testing, and infill depth measurements) the total came to $5,300 per year. A higher cost option provides six visits per year, with disinfectant applied at each visit, as well as minor repairs. This option is offered for $6,800 per year (Osborne 2016).

Variations in the approach to maintenance could lead to changes in cost. For example, use of a safer, enzymatic product in place of chemical disinfection would be available at a higher cost. It is also important to note that the maintenance programs offered by many providers may not meet the specifications provided by the manufacturer in the product manual (Osborne 2016).

Fifteen acres of playing fields in Marblehead are managed organically. Annual maintenance costs are $2,400-$3,000 per 2-acre playing field, not including mowing costs. Mowing costs for a 2-acre field have been estimated to be $10,000 annually for a total of 26 cutting weeks (using 2010 dollars) (Osborne 2016). Thus, total maintenance costs per 2-acre field are $12,400 to $13,000 annually.

Maintenance: Conventional vs. Organic. Organic turf management can be cost-competitive with conventional management of natural grass. In Marblehead, a conventional athletic field maintained by a conventional land care company for the same two-acre area noted above is estimated at $3,400, not including mowing. Thus, the maintenance cost for established organic playing fields is lower than ongoing maintenance costs for conventional grass fields of the same size.

One study found that once established, an organic turf management program for school athletic fields can cost 25% less than a conventional turf management program, as shown in Table 8, below (Osborne & Wood 2010).

Table 8 below further illustrates the differences in cost in a 5-year comparison.

Table 8: Cost comparison of conventional vs. organic turf management*						
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Conventional	$8,222	$8,544	$9,055	$9,755	$10,279	$45,855
Organic	$9,782	$9,553	$8,497	$7,268	$7,642	$42,742
Source: Osborne, Charles and Wood, Doug, "A Cost Comparison of Conventional (Chemical) Turf Management and Natural (Organic) Turf Management for School Athletic Fields", Grassroots Environmental Organization, March 2010. *Costs include products, labor, irrigation, and indirect costs.						

Disposal/replacement

Artificial turf also requires removal and replacement at the end of its useful life. These costs can include removal, resurfacing, transportation, and landfill surcharges.

The Turfgrass Resource Center estimates the cost for removal and disposal of an artificial surface at $1.75 to $2.25 per square foot, not including transportation costs and any landfill surcharges that disposal might incur (TRC n.d. b). This would yield approximately $115,000 - $148,000 for a 65,625 square foot field and $149,000 - $191,000 for an 85,000 square foot field.

The SportsTurf Managers Association estimates costs of $6.50 to $7.80 per square foot for disposal and resurfacing (STMA n.d.). Those estimates yield approximately $427,000 - $512,000 for a 65,625 square foot field and $553,000 - $663,000 for an 85,000 square foot field.

The STMA also estimates the transportation and landfill charges for disposal of a crumb rubber field at $130,000. (STMA n.d.) Landfill tipping fees alone have been estimated at $45,000 to $65,000 for synthetic turf fields (Fresenburg 2015).

The disposal costs are summarized below in Table 9.

Table 9: Disposal Cost Summary*		
	62,625 sf field	**85,000 sf field**
Removal & disposal (TRC)	$115,000 - $148,000	$149,000 - $191,000
Disposal & resurfacing (STMA)	$427,000 - $512,000	$553,000 - $663,000
Transportation & landfill (STMA)	$130,000	
Total (STMA) [disposal & resurfacing + transportation & landfill]	$557,000 - $642,000	$683,000 - $793,000
Landfill (Fresenburg) [no field size given]	$45,000 - $65,000	
* Rounded to three significant digits. Sources: Turfgrass Resource Center. (no date.) "Natural Grass and Artificial Turf: Separating Myths and Facts." Available at http://www.nsgao.com/images/Natural-Grass-and-Artificial-Turf_booklet.pdf. STMA. (no date.) "A guide to Synthetic and Natural Turfgrass for Sports Fields, 3rd edition. Available at http://www.stma.org/sites/stma/files/STMA_Bulletins/STMA%20Syn%20and%20Nat%20Guide%203rd%20edition%20FINAL.pdf. Brad Fresenburg, "More Answers to Questions about Synthetic Fields – Safety and Cost Comparison", Turfgrass Specialist & Extension Associate, University of Missouri. PowerPoint slides obtained via email December 2015.		

Annualized life cycle costs

Capital investment, annual maintenance costs, and disposal costs are all noted above. These can be brought together in a single figure by calculating annualized life cycle costs. Below we summarize the findings of two studies that developed annualized costs, and provide an additional sample calculation based on figures from STMA.

Missouri University Extension study. In 2008, a Missouri University Extension study calculated annualized costs for a 16-year scenario – based on their own raw data, not necessarily the numbers specifically cited above. The calculation included the capital cost of installation; annual maintenance; sod replacement costing $25,000 every four years for the natural fields; and surface replacement of the synthetic fields after eight years. Based on this calculation, a natural grass soil-based field is the most cost effective, followed by a natural grass sand-cap field, as shown in Table 10 below (Fresenburg 2015).

Table 10: Comparison of annualized costs

Field type	16-year annualized costs
Natural soil-based field	$33,522
Sand-cap grass field	$49,318
Basic synthetic field	$65,849
Premium synthetic field	$109,013

Source: Brad Fresenburg, "More Answers to Questions about Synthetic Fields – Safety and Cost Comparison", Turfgrass Specialist & Extension Associate, University of Missouri. PowerPoint slides obtained via email December 2015.

Western Australia Department of Sport and Recreation. Another life cycle cost calculation has been developed by the Western Australia Department of Sport and Recreation, which published a decision maker's guide to natural grass versus synthetic turf likely in 2012 (the exact date is not known and we were not able to confirm with the authors). The report takes into account the life cycle implications of planning, acquiring, operating, maintaining and disposing of a field. The report considers several types of sport fields; of these, the data for soccer fields are shown below, as these are likely to be most applicable to a US context. The report distinguishes between community level playing fields and elite level playing fields, with a higher level of maintenance assumed for an elite level field. Table 11, below, summarizes the data for soccer fields. We assumed the report provided cost figures in Australian dollars, and converted them to US dollars. As shown in the table, the 25-year and 50-year life cycle costs for synthetic turf are about 2.5 times as large as those for natural grass.

Table 11: Australian Life Cycle Costs – Soccer Field				
	Community Level		Elite Level	
	Natural Grass	Synthetic Turf	Natural Grass	Synthetic Turf
Construction Costs	153,000	508,000		
Annual Operating Costs	20,000	18,000	25,000	18,000
25 Year Life Cycle Cost	724,000	1,813,000		
50 Year Life Cycle Cost	1,295,000	3,118,000		

* Note: These costs are not identified as community or elite in report.
Source: Government of Western Australia, Department of Sport and Recreation, "Natural Grass vs Synthetic Turf Surfaces Study Final Report", accessed at http://www.dsr.wa.gov.au/support-and-advice/facility-management/developing-facilities/natural-grass-vs-synthetic-turf-study-report. Costs were originally provided in Australian dollars and were converted to US dollars using the May 2016 conversion rate of 0.72 US dollars to 1.0 Australian dollar.

Life cycle costs based on STMA information. To add additional perspective, for purposes of this report we have calculated a life-cycle cost over 16 years based on the costs estimated by STMA for installation, maintenance, labor and replacement/disposal for a 65,625 square foot field. This is a simplified calculation and is not intended to cover all scenarios. As shown in Table 12 below, we have estimated an hourly labor rate of $20 and an interest rate of 3%.

We also had to make certain assumptions regarding the state of the field in the final year of the scenario (in this case, year 16). We chose to work with a scenario in which the field is in excellent condition in year 16. Thus, we have assumed that that the synthetic field is fully replaced in year 16, making it possible to continue playing on the field in the future.

For a natural grass field, certain high-impact sports such as football make it necessary to periodically replace portions of sod. We have assumed that portions of the field are replaced periodically, so that there is no effect of wear and tear at the end of the calculation period, and the field is equally playable in year 16 as it was in year 1.

The cost of sod replacement can be estimated either as an annual average, or as a periodic cost. We have used an estimate of sod replacement at years 6, 11, and 16, for a cost each time of $25,000 to $45,000. These estimates are based loosely on the experience of the Marblehead grounds manager with one sample field in the first decade of the field's use. (An alternative approach is to estimate an annual average cost for sod replacement. One estimate of annual expenditures on sod replacement provides a range from $800 to $12,000 [TRC n.d.]; an annual average would thus be around $6,700 per year. This approach yields similar final values.)

Based on these assumptions, for a 16-year period, the net present value for a natural field ranges from about $219,000 to $799,000. The net present value for a synthetic field runs from about to $1.2 to $1.7 million.

Each of the estimates used in this calculation could be modified for greater precision. The replacement cycle for some synthetic fields may be considerably longer than 8 years; these fields may also have higher maintenance costs in the intermediate years, include periodic additions of infill. Installation costs for synthetic fields also vary depending on the type of infill used. For natural grass, similarly, there are many sources of variability; for example, average annual sod

replacement costs could be lower or higher for some fields, depending on other maintenance parameters as well as the type of sports played on the fields.

Table 12: Sample Life Cycle Cost Estimate (65,625 square foot field)

	Natural		*Synthetic (replacements in years 8 & 16)*	
	Low	High	Low	High
Installation*	$39,000	$328,000	$295,000	$673,000
Annual Maintenance*	$4,000	$14,000	$4,000	$4,000
Annual Labor (hrs)*	250	750	300	300
Annual labor cost	$5,000	$15,000	$6,000	$6,000
Resodding (yrs 6, 11, 16)	$25,000	$45,000	$0	$0
Disposal & resurfacing & transport & landfill*	$0	$0	$557,000	$642,000
Net Present Value	**$197,000**	**$753,000**	**$1,189,000**	**$1,676,000**

*Source: SportsTurf Managers Association. [no date.] A Guide to Synthetic and Natural Turfgrass for Sports Fields. 3rd edition. Lawrence, KS: STMA. Assumptions: Hourly rate $20; interest rate 3%, disposal/resurfacing occurs in years 8 & 16; natural grass resodding in years 6, 11 and 16; conversion factor used to calculate annualized cost from NPV 0.0796. In the scenarios used here, at year 16 the field is in equally good condition as in year 1.

Other factors

When considering life cycle costs it is important to recognize the variability in field use, quality of playing surface, regional climate, and other factors that may influence the useful life of the product. Manufacturers provide estimates of product life, and some fields may be used over their recommended life and others may be replaced earlier

When using the information provided here, please note it is also important to consider the size of the specific field in question. Towns may also wish to consider cost as related to the total number of events on the field, which are not calculated here. Field use time is discussed in a separate section of this report.

Summary

In this section, we have presented costs for installation, maintenance, and disposal/replacement for natural grass and artificial turf fields. The information is drawn from industry association sources, university projects, and the experience of individual Massachusetts municipalities. Even with varying assumptions and parameters, the information reveals a consistent trend.

In summary, when considering the costs of artificial vs. natural turf, institutions should consider the full life-cycle cost. A wide variety of site-specific considerations may affect field costs. In nearly all scenarios, the full life-cycle cost of natural turf is lower than the life-cycle cost of a synthetic turf field for an equivalent area.

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The Toxics Use Reduction Institute is a multi-disciplinary research, education, and policy center established by the Massachusetts Toxics Use Reduction Act of 1989. The Institute sponsors and conducts research, organizes education and training programs and provides technical support to help Massachusetts companies and communities to reduce the use of toxic chemicals.

The Lowell Center for Sustainable Production uses rigorous science, collaborative research, and innovative strategies for communities and workplaces to adopt safer and sustainable practices and products to protect human health and the environment. The Lowell Center is composed of faculty, staff, and graduate students at the University of Massachusetts Lowell who work with citizen groups, workers, businesses, institutions, and government agencies to build healthy work environments, thriving communities, and viable businesses that support a more sustainable world.