Parks Recreation & Waterfront Department

Memorandum

May 15, 2017

To: City Managers and Councilmember Representatives of the Five Member JPA Cities (Albany, Berkeley, El Cerrito, Emeryville, and Richmond) *(via email)*

From: Dee Williams-Ridley, City Manager

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Subject: -Gilman Fields Turf Replacement Project FY2018
-Discussion and Recommendation

OVERVIEW

Installed in August of 2008, the two synthetic turf fields at Gilman Fields (aka Tom Bates Sports Complex) are considered to be the most highly used fields in Northern California. They provide up to 300,000 player hours per year, rain or shine, and serve approximately 19,000 youth and adult users. As provided for in the JPA[1] Agreement -- and anticipated by annual contributions from all of the JPA cities -- after 8 years of constant use, the turf is worn out and needs to be replaced. This memo describes the four best options to replace the fields, along with costs and the pro's and con's of each option.

EXISTING FUNDING

When they were installed in 2008, per a requirement in the ground lease with the East Bay Regional Park District, the City of Berkeley created a Gilman Fields Capital Reserve Account whereby field user fees and the annual contributions from the five JPA cities would be accumulated in order to fund the replacement of the turf after eight years. As of summer 2017, the Capital Reserve Account will have accumulated $1.2 million for this purpose. This amount is currently sufficient to replace the current fields using the current design, which involves the use of a monofilament carpet, and a layer of sand and crumb rubber infill to act as the shock absorber. Since 2008, however, new concerns about health and safety have emerged, and newer products are available that can lessen those health and safety concerns. These new products and their costs are described below.

CURRENT FIELD DESIGN (from 2008)

In August 2008, the new Gilman Fields Complex involved the construction of two synthetic turf fields with night lighting, three natural turf fields, fencing, parking, and amenities (drinking fountains, etc). At that time, the industry best practice design for synthetic turf fields was to place the synthetic turf carpet directly on top of a base made of drain rock so that the fields

[1]In 2003, the five East Bay cities of Albany, Berkeley, El Cerrito, Emeryville, and Richmond, entered into a joint powers agreement ("JPA") to jointly seek funding to develop and operate sports fields in the five city area. At that time, the Gilman Fields site in Berkeley was identified as the first project of the JPA, and the City of Berkeley was designated as the project lead.

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could drain quickly during rain events. Unlike the first generation of synthetic turf fields from the 1960's, this new generation included a layer of "infill" mixed into the carpet to act as a shock absorber to reduce injuries and to feel like natural grass. Using this concept, the infill material at the Gilman Fields included an initial layer of sand for weight and stability ("ballast"), and additional layers of infill to provide the shock absorbing function as well as "playability" characteristics to feel like a grass field, such as proper ball roll, ball bounce, and foot traction for players. At the Gilman Fields, this top layer of infill material is currently comprised of a mix of sand, and crumb rubber that comes from recycled tires.

In 2016, in order to plan for the replacement of the synthetic turf fields, as provided for in the JPA, the City retained Carducci Associates, a design consultant with expertise in this area. Using input from the public, the sports leagues, City maintenance staff, as well as the JPA member cities, the project team developed criteria to evaluate replacement options that include Public Safety, Durability and Maintenance, and Playability.

After the original turf fields were installed in 2008, two key concerns have emerged in the public realm regarding the safety of synthetic turf fields: Field Hardness as measured by the "g-max" rating and implications for injuries, especially concussions; and Chemicals in the crumb rubber infill mix with potentially adverse effects on human and environmental health.

Field hardness. The current ASTM[2] standard for synthetic fields says that a field should be closed and corrected if a field has a "g-max" rating of 200 or more (ASTM F1936). Natural grass fields have a g-max rating of between 70-110 g's. Newly installed synthetic turf fields typically have a g-max rating of 100-120. Over time, some of the crumb rubber infill migrates away from certain high use areas on the field because of wear and tear, foot traffic, and wind, etc. (e.g., in front of the goals), and there is less crumb rubber on the field in those spots to provide shock absorption. As a result, some synthetic turf fields can develop higher g-max ratings, and some fields can yield ratings of 200 or more. With proper maintenance, field operators can replace the missing crumb rubber and make the field softer to acceptable levels. However, as fields age, the synthetic blades wear down and can no longer keep the crumb rubber from migrating away. At that point, the fields need to be replaced.

In a 2009 study of a nationally representative high school population[3], 15.5% of concussions in a range of sports occurred as a result of contact with the playing surface. The Center for Disease Control (CDC) estimates that between 1.6 and 3.8 million concussions occur in sports and recreation every year in the U.S. Therefore, contact with the playing surface may account for up to 720,000 concussions per year in the United States, or about one concussion per minute.

There are two ways to provide shock absorption at g-max levels below 200 g's. One method uses a layer of crumb rubber infill fix placed on top of the synthetic carpet. The other method places a shock pad underneath the synthetic carpet, and then uses a small layer of infill on top of the carpet to feel like a grass field. In recent years, the use of a shock pad has grown because of its advantages over the crumb rubber infill mix. First, a shock pad underneath a carpet does not migrate, and so it can provide a consistent g-max rating throughout the life of

[2]ASTM International is a globally recognized leader in the development and delivery of voluntary consensus standards to improve performance in manufacturing and materials, products and processes, systems and services. Originally known as the American Society for Testing Materials, it was renamed to ASTM International in 2001.
[3]https://concussionfoundation.org/sites/default/files/Learning%20Center/The%20Role%20of%20Synthetic%20Turf%20in%20Concussion_0.pdf

the carpet without any maintenance (e.g., replenishing the crumb rubber infill). Current shock pads are made from a variety of materials, and provide a g-max warranty that varies by product. For example, a half-inch thick shock pad (Expanded Polypropylene Composite) offers a g-max warranty of 16 years. Second, it improves the drainage of stormwater beneath the carpet, which can extend the life of the carpet as well as provide a very reliable drained playing surface during wet weather. Third, although shock pads are made from synthetic materials, there is no avenue for exposure to humans because it is covered by the carpet. With a shock pad underneath the carpet, users have the option of several different alternative infill mixes on top of the carpet for that grass field feel, such as cork, coconut, sands, synthetic pellets, or other alternative.

TRENDS

According to the City's consultant, Northern California is a regional market that differs from the national market. Approximately 75% of the shock pads sold in the US go to California fields, and approximately 80% of new alternate infill fields in the USA are installed in Northern California. Nationally, the use of shock pads and alternate infill mixes are both creeping upwards but California, and particularly Northern California, lead those trends by a significant margin. According to Field Turf, the major vendor of synthetic turf fields in the U.S., 70% to 80% of the new fields in Northern California in the last two years chose a shock pad and non-crumb rubber infill. By contrast, the majority of existing crumb rubber fields that were replaced recently in Northern California decided to stay with crumb rubber, with two exceptions – the City of San Francisco and the Livermore School District. FieldTurf staff believes most of the existing crumb rubber fields get replaced with crumb rubber is because school districts, athletic directors, and facility managers have a comfort level with it and understand its maintenance needs. Additionally, cities and schools have tight budgets, and so replacing a worn out field with crumb rubber infill can be the most economical option.

Chemicals of Potential Concern. Across the U.S., there is public concern among some field users about small amounts of chemicals of potential concern found in crumb rubber infill with the potential for cancer[4]. While numerous scientific studies have found no evidence linking crumb rubber infill to cancer in humans, public concern nevertheless persists. A second concern is the potential negative impact of these trace leachable chemicals on aquatic life. Studies have found that crumb rubber infills do indeed contain certain chemicals at levels that exceed the safety thresholds for certain aquatic habitats (e.g., zinc). However, the Gilman Fields currently has a large bioswale that solves this problem in that it filters the stormwater from the fields before it enters the nearby waters of the Bay[5]. A third concern is that the crumb rubber infill mix might become regulated as hazardous material when it comes time to dispose of the fields at the end of its useful life, and therefore could have costly landfill disposal costs. However, several options have emerged regarding this issue – the industry has found new markets to recycle the crumb rubber fields into new products such as backpacks, irrigation piping, composite lumber, and other uses. In addition, many landfills need materials such as carpets to provide required dust suppression layers.

[4] Zinc is found in crumb rubber, along with much smaller levels of lead, cadmium, and other metals.
[5] The bioswale at the Gilman Fields is a Best Management Practice (BMP) design element for stormwater treatment that removes metals and other constituents of concern and was authorized by the Regional Water Board in 2008.

PUBLIC LIABILITIES

At the time the JPA Cities made the decision to install crumb rubber fields in 2008, the design of the Gilman Fields met the "industry standard" at that time for a layer of crumb rubber infill mix on top of drain rock underneath the carpet. Even though there is no evidence that the current fields pose any public health risk, there is no doubt that public perception has increased regarding possible health concerns posed by crumb rubber and fields without shock pads.

Field Hardness

When a crumb rubber field is installed, it provides an appropriate g-max rating for shock absorption; however, by year five, many crumb rubber fields have lost a certain amount of infill in certain high use areas due to wear and tear and lack of a formal maintenance program, and g-max ratings can sometimes exceed the ASTM recommended acceptable limit of 200. A proper maintenance program would cost a total of $40k - $66k over eight years and would ensure that the fields provided a proper g-max rating over that time period. This formal maintenance program was only a product guideline back in 2008, and so it was not formally implemented at the Gilman Fields. However, on three occasions, the synthetic turf was tested, and maintenance was performed; as a result, safe levels of shock absorption were always maintained. Nevertheless, the exceedingly high use over a nine-year period has recently rendered the field incapable of future effective maintenance; therefore it must be replaced. Public perception is that hard fields with g-max ratings above 200 have a higher potential for player injuries, including concussions, which is consistent with the ASTM standard of 200 g's. A shock pad underneath a synthetic carpet guarantees a g-max rating of below 135 for the duration of the warrantee (16 years), with no maintenance of the shock pad required. A small amount of maintenance should be done to replenish the infill mix on top of the carpet to maintain proper playability characteristics and to prevent the fiber blades from wearing out prematurely for aesthetic reasons.

Chemicals of Potential Concern.

Based on the current concerns expressed by some members of the public regarding small amounts of chemicals of potential concern found in crumb rubber infill with the potential for cancer, if the project entails replacing the fields with a crumb rubber infill mix, it will likely require a CEQA environmental review. To that point, residents in at least three northern California communities over the last decade initiated litigation based on perceived problems with the environmental process for proposed synthetic field installations, but dropped the litigation after dismissal by the presiding judge. While a Mitigated Negative Declaration maybe sufficient in order to identify and mitigate any impacts to human and environmental health due to chemicals contained in crumb rubber, CEQA documents can be legally challenged and cause project delays. Producing and adopting such a document could add six to eleven months to the project schedule, not accounting for potential additional legal challenge delays. As a result, if crumb rubber fields are installed, the fields will likely be closed for a portion of 2018, at a minimum, until the CEQA document is completed and the project can proceed to completion. By contrast, a cork infill mix (an alternative to crumb rubber) would not require CEQA review because cork does not contain chemicals of concern above screening levels for the protection of human health and aquatic habitat.

It should be noted that six years ago, in 2011, the San Francisco Recreation and Park Department (SFRPF) performed an Environmental Impact Report (EIR) for the Beach Chalet Soccer Fields (synthetic turf fields with crumb rubber infill plus a shock pad). The study reviewed the available research on crumb rubber and determined that there was no significant

impact on human health and no significant impact on environmental health with mitigation (groundwater treatment), and the project was subsequently approved and completed in 2015. However, following the installation of crumb rubber infill at the Beach Chalet Soccer Fields, subsequent SFRPD field renovations have used cork infill.

In 2015, the U.S. EPA scheduled a comprehensive study of the human and environmental health effects of crumb rubber. The study is ongoing and will provide results to the public as various components of the study are completed[6]. Also in June 2015, the California Office of Environmental Health Hazard Assessment (OEHHA) committed under a contract with CalRecycle to conduct a new study on synthetic turf and potential human health impacts. This study will be completed by mid-2019[7]. There is a chance that these studies could identify adverse human and environmental health impacts in the future, which could provide motivation for lawsuits against the JPA member cities. Such a finding would also affect how the fields are disposed of during a future replacement project and could potentially require that the carpets be handled as hazardous waste, which would increase costs and liabilities to the JPA member cities.

CURRENT SYNTHETIC TURF PRODUCTS

Synthetic turf fields are comprised of carpets and infill mixes that are designed to feel like natural grass fields. The current carpet at the Gilman Fields uses a crumb rubber and sand infill mix placed on top of a monofilament polyethylene fiber carpet, which is a soft, long-lasting fiber that feels like natural grass. This synthetic turf system is designed to provide a g-max rating of 120-185 over an eight year period with proper maintenance. In recent years, newer carpets have been developed that are more durable and will work with a number of infill materials that include crumb rubber as well as alternatives. The bottom layer of the infill on the carpet is sand, which is needed to hold the carpet in place and keep it from wrinkling and bunching over time. The top layers of infill material provide playability characteristics similar to natural turf, such as additional shock absorption, better ball roll and ball bounce, and better foot traction. There are several alternative infill materials currently available in addition to conventional crumb rubber from recycled tires as follows: virgin or recycled synthetic materials (e.g., virgin rubber pellets, plastic pellets); washed or coated sand products; and organic products such as cork, or a blended coconut/cork mixture. Each of the infill materials has advantages and disadvantages:

- Conventional crumb rubber from recycled tires provides adequate shock absorption without a shock pad, and it has standard playability characteristics. However, these fields get harder over time because the crumb rubber migrates away from certain high use areas at the field and needs to be replenished with more crumb rubber infill in order to maintain a suitable g-max rating. In addition, there is public perception of potentially adverse human health and environmental effects due to trace amounts of chemicals of concern found in conventional crumb rubber. Scientific studies to-date have not shown an increased risk to human health due to contact with crumb rubber at synthetic fields. However, there is the possibility that a future study could result in crumb rubber being re-classified as harmful to human health or the environment. Recently, cities have indicated the potential need for a CEQA environmental review of crumb rubber infill,

[6] See the following website for updates about the U.S. EPA study: https://www.epa.gov/chemical-research/tire-crumb-questions-and-answers

[7] See the following website for updates about the OEHHA study: https://oehha.ca.gov/risk-assessment/fact-sheet-environmental-health-study-synthetic-turf

primarily due to potential environmental impacts to water quality (see City of San Francisco, Beach Chalet Fields, 2013).

- Washed or coated sand products are slightly more abrasive than crumb rubber; they are more expensive than crumb rubber or cork; and a shock pad must be used to maintain proper g-max ratings.

- The organic cork/coconut blend product provides excellent playability characteristics. However, without regular watering, it dries up and gets easily dispersed by winds and must be replenished at fairly high cost. The installation of a new watering system at the Gilman Fields would be extremely expensive ($200,000) and the organic cork/coconut infill mix would require relatively high amounts of water each year. In addition, the sourcing of coconut material is highly variable, and the consultants have found elevated levels of chemicals of concern in previous tests of cork/coconut blended infill (e.g., lead, nickel, and mercury). As a result, each batch must be tested for potential chemicals of concern prior to installation.

- The virgin cork infill product provides very good playability characteristics; it does not require a dedicated watering system; and it is extremely reliable in terms of quality control. To-date, the consultant has not found any installations of cork infill that contained chemicals of potential concern above screening levels for the protection of human health and aquatic habitat. Finally, cork is not classified as a hazardous material and is quite easy to dispose of when a field needs to be replaced.

COMMUNITY PROCESS

In 2017, the City of Berkeley conducted several public meetings to communicate technical information about the project and to seek community input on this replacement project. The City held two community meetings, January 28 and March 25, 2017. In addition, community members attended a JPA City meeting on March 16, and may attend on May 24. At the community meetings, 25-30 people were in attendance, and most participants indicated that the top priority is health and safety, and that "cost" is a lower priority. Most participants also expressed concerns about the health effects of crumb rubber infill material and lack of a shock pad at the current fields. Thus far, one community member has expressed interest in replacing the fields with crumb rubber using the current design in the name of saving costs and time (one letter and verbal presentation from Doug Fielding of the Association of Sports Field Users). To-date, the project team has received several emails and a petition with over 300 signatures in favor of the shock pad and non-crumb rubber solution.

JPA AGREEMENT AND DECISION-MAKING

In 2003, the five East Bay cities of Albany, Berkeley, El Cerrito, Emeryville, and Richmond, entered into a joint powers agreement ("JPA") to jointly seek funding to develop and operate sports fields in the five city area. At that time, the Gilman Fields site in Berkeley was identified as the first project of the JPA, and the City of Berkeley was designated as the project lead. Regarding liabilities, JPA Agreement Number Three states that the Operator of the facility would carry commercial general liability insurance in an amount of at least $1,000,000, with all of the Cities as additional named insureds; and that the five JPA member Cities shall share any excess liability equally. As the project lead for the Gilman Fields, the City of Berkeley contracted out the operations of the field to a third party contractor from 2008 to the present.

PROJECT COSTS

The matrix below provides the total project cost to replace the two synthetic turf fields at the Gilman Fields with four possible options:

Option	Carpet	Infill	Shock Pad	Cost	Shortfall
1a.	Monofilament	CR	No	$1.20M	$0
1b.	Dual Fiber	CR	No	$1.35M	$150k
2a.	Monofilament	Cork	Yes	$1.55M	$350k
2b.	Dual Fiber	Cork	Yes	$1.65M	$450k

Notes:

Carpet

- Monofilament polyethylene fiber (older design). Monofilament fiber carpets are suitable for soccer, provide reasonable playability, but allows infill material to migrate faster leading to the need for more frequent maintenance.
- Dual fiber (Monofilament + slit film blend (latest design). Dual fiber carpets are recommended for soccer fields. The combination of monofilament fibers and slit film fibers in the dual fiber carpet offer better playability and reduce infill migration.

Infill

- CR= Crumb Rubber
- Cork= Virgin Cork

Cost

- Includes construction (purchase and installation of the carpet+infill+pad); and non-construction (design, permits, environmental review, construction management, inspection, and testing).

The optimal solution is to use a shock pad. Since this design requires a much smaller amount of infill mix on top of the carpet, there is only a small price difference between crumb rubber and cork infill, and so cork infill is ideal because it contains no chemicals of concern. For a lower cost, the project could select the standard carpet (monofilament) which is similar to the existing carpet at the Gilman Fields. For a higher price, the dual fiber carpet can be selected that would provide a higher level of durability and playability. The project currently has $1.2 million currently available in the Gilman Capital Reserve Account. A replacement with shock pad, cork infill, and a monofilament carpet would cost $1.55 million (Option 2a.), and with the upgraded dual fiber carpet the project cost would be $1.65 million (Option 2b.) which would be the ideal option if funding allows. It should be noted that the shock pad can be used for at least sixteen years (two carpet replacements total), and so there will be a significant savings for the second carpet replacement in eight years.

The least expensive viable solution is to replace the fields using the existing field design from 2007, which is comprised of a monofilament carpet with an infill mix of sand and crumb rubber, and no shock pad (Option 1a). This installation can be accomplished with the currently existing funding of $1.20 million and still provide reasonable performance and playability, as the past eight years has shown. At a slightly higher cost of $1.35 million, a crumb rubber infill (no pad) can be used with the dual fiber carpet (Option 1b). It should be noted that due to the problem of migrating crumb rubber at certain high use areas, the g-max rating at the Gilman Fields began to climb after four to five years, and required maintenance to replenish both the crumb rubber and worn carpet so that the fields continued to have acceptable shock absorption. By contrast, a field with a shock pad does not require grooming in order to maintain the g-max rating, and only needs grooming to maintain the aesthetic playability characteristics.

RECOMMENDATION

The City of Berkeley recommends Option 2b. as the optimal solution for the Gilman Field turf replacement project; which involves the installation of a turf system that consists of a shock pad with cork as the infill mix on a dual fiber carpet. This solution offers the safest approach for players, and provides the best playability with enhanced durability. This system has been installed recently at Emeryville Center of Community Life Field, and two public fields in San Francisco (Franklin Square Park Field, and the Garfield Park Field). By contrast, the less durable monofilament carpet could also be used instead of the dual fiber carpet, which would result in a cost reduction of approximately $105,000 while still providing reasonable playability.

Using an allocation method based on population, the table below indicates the additional funding needed from each JPA city for Option 2b. as the preferred option.

JPA City	Population U.S. Census 2010	Percent Total	Option 2b. Pad/Cork/ Dual Fiber
Albany	18,539	6.9%	$31,021
Berkeley	112,580	41.9%	$188,378
El Cerrito	23,549	8.8%	$39,404
Emeryville	10,080	3.8%	$16,867
Richmond	103,701	38.6%	$173,521
Total	**268,449**	**100.0%**	**$449,190**

In order to procure the new field material, Berkeley will need a commitment from each JPA city by June 11, 2017. At the next meeting of the JPA member cities on May 24, 2017, a discussion will be held to determine next steps in order to keep the project on schedule for completion by March 1, 2018.

Note that if the fields are not replaced by spring of 2018, the fields will likely be closed to public use if the average g-max rating exceed the recommended limit of 200.