

# **Team Turf**

## **A Survey and Cost-Benefit Analysis to Conserve Water through the Utilization of Artificial Turf on UCLA Intramural Fields**

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**Action Research Team**

**UCLA Institute of the Environment**

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## **Abstract**

Water conservation remains to be an environmental concern within the UCLA campus. In order to address an aspect of this issue, our group composed a detailed survey and cost-benefit analysis regarding the artificial turfing of the UCLA intramural fields. Student response was analyzed in a survey of 283 UCLA students. Also, our group took action by seeking out local universities and high schools that had recently converted to AstroTurf, creating a compilation of information (i.e. Field Use, Size, Cost of turfing, Warrantees, Problems, etc.) and pertinent contact information. Our recommendations are three fold: acquire accurate and up-to-date cost analysis for the IM field, confirm the compatibility of artificial turf with all perennially scheduled events held on the IM field, and structure the drainage system to connect with UCLA's cogeneration plant in attempt to recycle cooling water for air conditioners around campus.

**Action Research Team**

**UCLA Institute of the Environment**

## **Executive Summary**

Our Action Research Team has focused on water conservation on the UCLA campus aiming to implement sustainable change to limit water use on the IM Field.

As with all projects, research was the first step. Our group took action by seeking local universities and high schools that had recently converted to AstroTurf. We created a Google database with the information and pertinent contact information.

Student response was also analyzed in a detailed survey via a convenient sampling of 283 UCLA students. This survey revealed an overwhelming positive response regarding the turfing of the intramural fields. Other concerns were also taken into consideration and detailed in the report. With many recreational events happening on the intramural fields including the Jazz/Reggae Festival, poking holes into the AstroTurf to build sturdy stages and tents would be damaging, and should be avoided.

Our stakeholders made this project possible. Nurit Katz first presented this idea to us, and started us off with a few schools to contact, and Rich Mylin was vital in the final stages for his connections to other Managers of Recreation at UCLA, and for valuable information regarding the IM field.

The American Southwest is essentially a desert, which has been transformed into an oasis by the wonders of the Colorado River. The last century has been trademarked by exponential increases in population, added rates of consumption, and a higher demand for resources. The availability of an ample water supply in the next century has pushed its way to the top of the list in terms of environmental concern.

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## **Research Methodology:**

After looking at the initial conditions of the intramural fields, we decided that the best way to approach our research was through comparing data from other universities that have implemented turf on their fields and a wide reaching survey that would provide a clear response from the students who would experience the effects of turfing the I.M. field first hand. The turfing of the field is ultimately based on three things: environmental and financial benefits and the opinions of the students who would be using the field, so we wanted to cover all of our bases through these two methods of research. We chose to do individual online surveys to get a qualitative view of the personal opinions of having the I.M. field turfed so that we could have as many people's opinions as possible, all the while allowing for them to add their own personal input at the end of the survey. With these objectives in mind, we came up with a questionnaire that focused on personal opinions of the quality of turf in comparison to grass in each sport that the fields are currently used for, and also gauged the students' knowledge of the environmental benefits of turfing the field and how important they believed this impact is. A copy of the survey is included in the back.

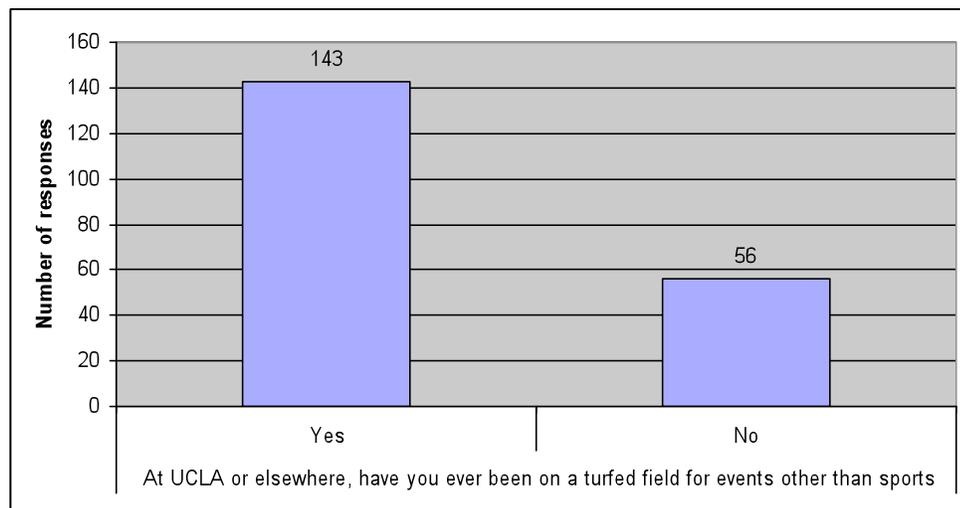
As part of our research we came up with a sampling method to ensure that our research was valid and unbiased. We aimed to get upwards of 200 respondents, and sent the survey to over 1,000 UCLA students in order to give as many people the opportunity to respond as possible (those who cared enough to have an opinion were generally the ones to respond). We made the survey public, thereby placing it in the Facebook newsfeed of anyone who had friends that had participated, which broadened our response pool even more.

Overall, we received responses from 283 people, all of whom are members of the UCLA student community. While not all of the people that received the survey responded, we feel that the number of respondents that we did end up receiving was definitely sufficient, particularly when considering the clarity of the data in our findings. Furthermore, as mentioned earlier, those who had a particular opinion and vested interest in the turfing of the fields were more likely to respond, so we believe that our research reflects the sentiments of the most important sector of our community in regards to our project.

### Data Analysis

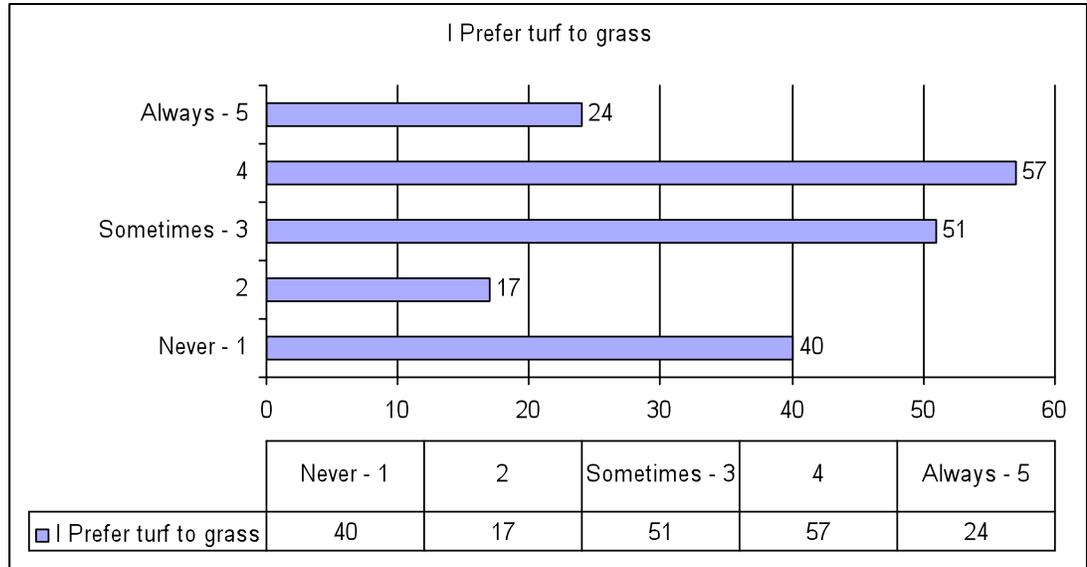
The following pages examine the data of our results from the 283 questionnaires. Each chart and graph will be explained in detail after each figure. The survey was based on convenience sampling of a denominator of 907 UCLA students.

**Figure 1**



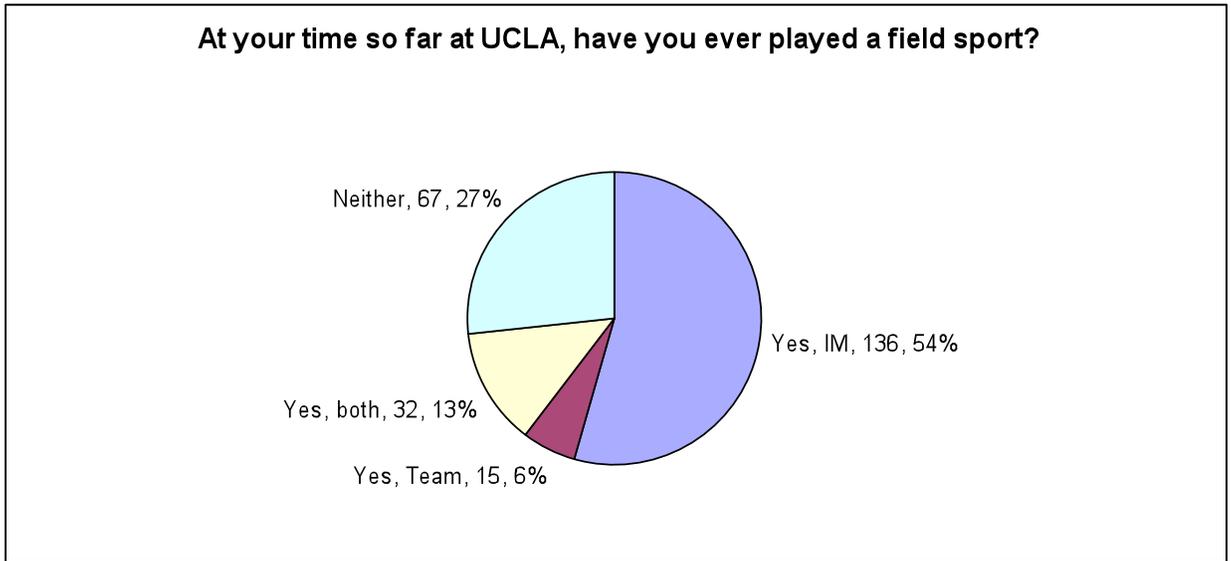
As **Figure 1** illustrates, about 72% of the answers received revealed that students had used artificial turf for events other than sports. This trend represents the growing commonality of artificial turf in our area.

**Figure 2**

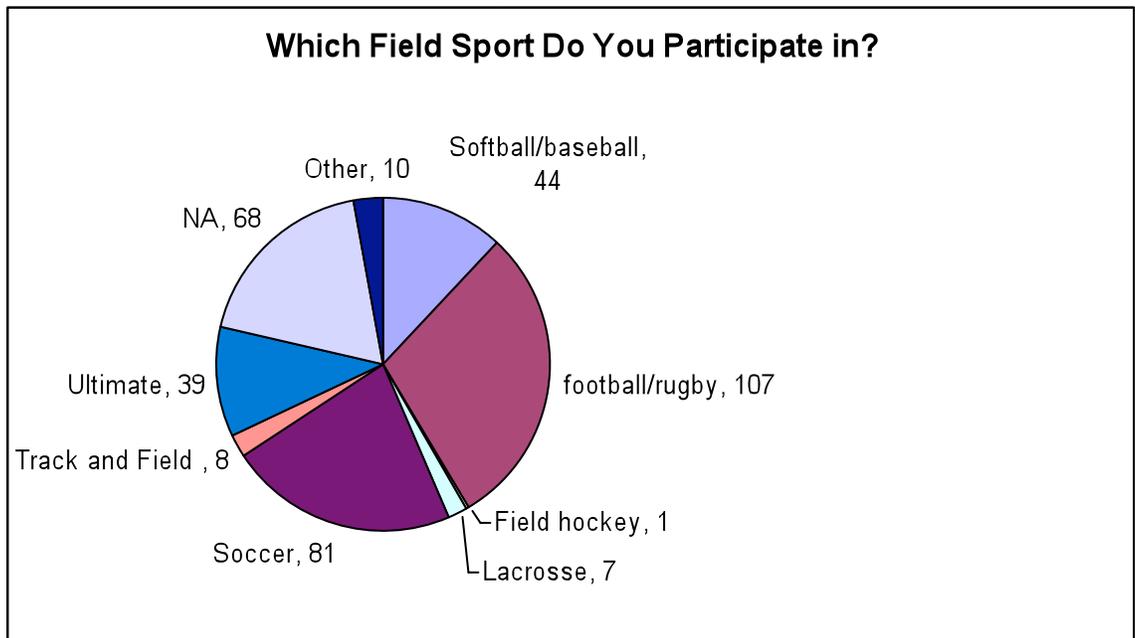


**Figure 2** represents the statement “I Prefer Turf to Grass” with answers on a scale of **1** – meaning never – to **5** – meaning always. The average response was **3.1**; however the number which received the highest response was **4**. This tells us that of the students surveyed who had been on artificial turf for any reason a majority of them, at least sometimes, preferred it to grass.

**Figure 3**

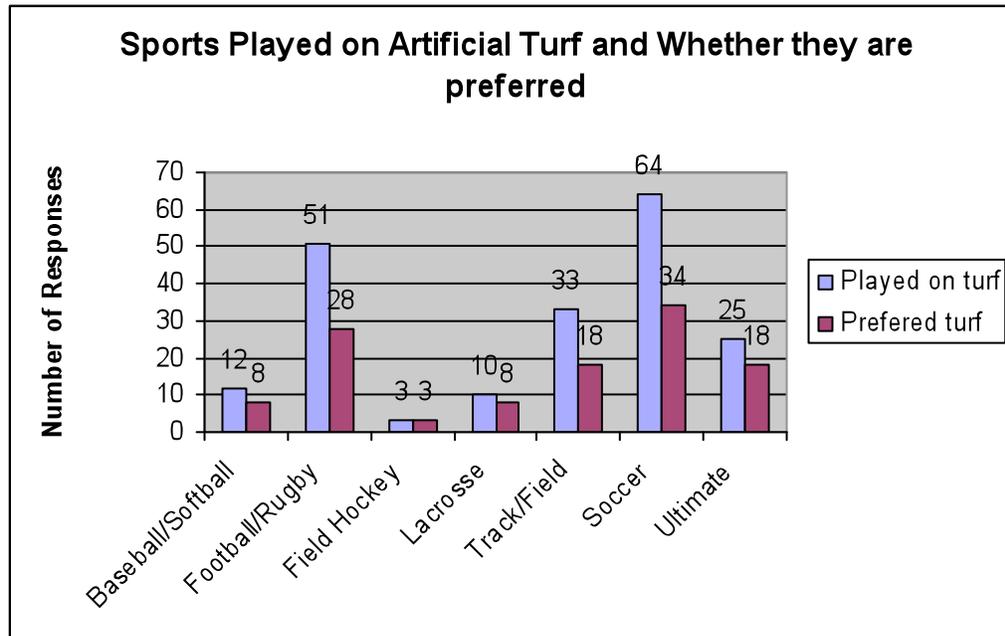


**Figure 4**

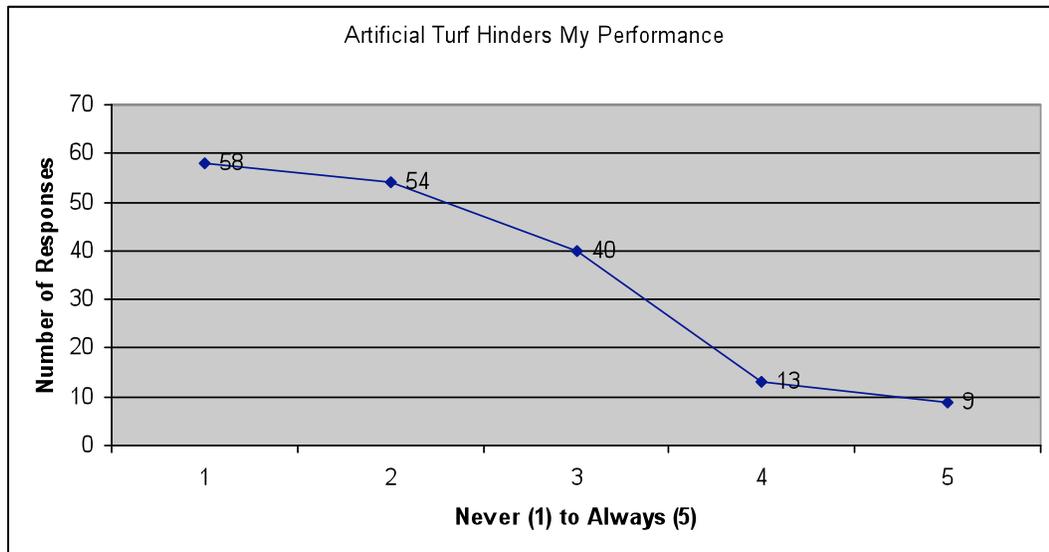


**Figures 3 and 4** reveal that a majority of the students surveyed have played an IM sport (54%), and of those IM sports, that Soccer and Football/Rugby were the most common with 22.2% and 29.3% students reporting having played those sports respectively.

**Figure 5**



**Figure 6**



We see from **Figure 5** that of the students surveyed who have played a sport on artificial turf, the majority – for *each* category – not only preferred playing that sport on turf, but also – as we see from **Figure 6** – that it very rarely impeded their athletic performance. Significantly, from **Figure 5**, our reported two most common sports (soccer

and football) both saw over 50% preferences as well. **Figure 6** shows an average of 2.2, showing a trend against turf hindrance.

### **Cost-Benefit Analysis**

Our procedure of data collection was three-fold: creating a database of local turfing projects from other schools, gathering and organizing a list of expenses directly related to the upkeep of UCLA's IM field, and quantifying the total cost of the SprinTurf installation project.

Our stakeholder Nurit Katz first supplied us with contact information for the head of facilities management at Pasadena City College, a local school who recently turfed their football field. We organized a database of specifications relating to the field in question including size, purpose, problems, cooling, warranty, and student response. This was a necessary step in keeping up to date with the latest pros and cons of artificial turfing, and the practicality of funding a turf project.

Then with the help of our stakeholder Rich Mylin, we accumulated a detailed breakdown of maintenance expenditures based on a typical year. The detailed list of materials, labor, and equipment for one year of natural grass can be seen below.

Every other year re-sod must be applied to all 360,714 ft<sup>2</sup> of the IM field which costs \$252,500. The next step is to estimate the costs of acquiring turf, installation, and maintenance and compare it with the current costs of natural grass.

We sent SprinTurf blueprints of the IM field which included dimensions, a cross-section of the parking structure underneath (which could be problematic for turfing), and a sprinkler layout. He returned to me a document describing the various costs of setting

up the base, the cooling system, and the turf, sufficient information to begin the comparison between artificial and natural grasses.

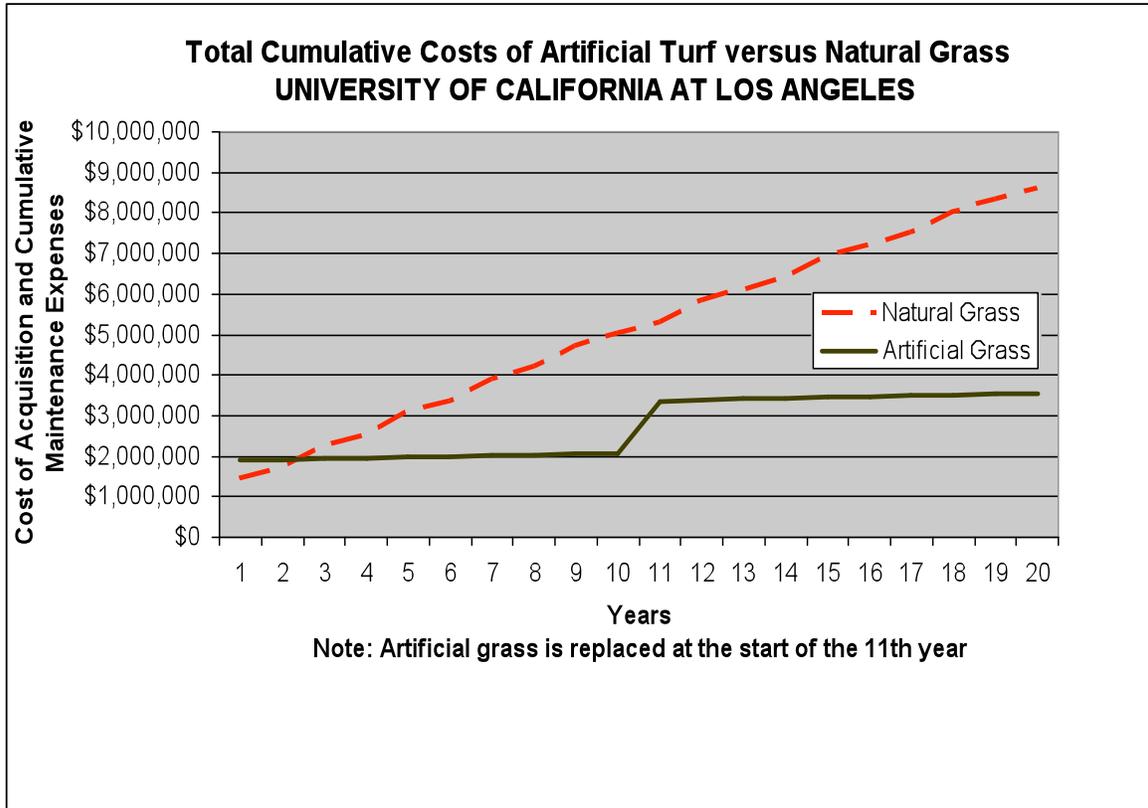
Year	1	2	3
1. Natural Grass			
Cost of Maintenance			
A. Materials			
Water	\$ 68,317	\$ 68,317	\$ 68,317
Fertilizers	\$ 9,937	\$ 9,937	\$ 9,937
Soil	\$ 39,748	\$ 39,748	\$ 39,748
Sand	\$ 9,937	\$ 9,937	\$ 9,937
Re-Sod	\$ -	\$ -	\$ 252,500
Seed	\$ 8,695	\$ 8,695	\$ 8,695
	<hr/>	<hr/>	<hr/>
	\$ 136,634	\$ 136,634	\$ 389,134
B. Labor/ Equipment			
Mowing	\$ 32,047	\$ 32,047	\$ 32,047
Slit Aeroation	\$ 12,421	\$ 12,421	\$ 12,421
Deep Core Aeration	\$ 5,590	\$ 5,590	\$ 5,590
Sand Placement	\$ 9,937	\$ 9,937	\$ 9,937
Fertilizer	\$ 16,562	\$ 16,562	\$ 16,562
Slit Seeding	\$ 6,625	\$ 6,625	\$ 6,625
Irrigation Maintenance	\$ 9,937	\$ 9,937	\$ 9,937
Green Waste	\$ 21,365	\$ 21,365	\$ 21,365
Maintenance/ fuel	\$ 12,421	\$ 12,421	\$ 12,421
one full time employee	\$ 20,495	\$ 20,495	\$ 20,495
	<hr/>	<hr/>	<hr/>
	\$ 147,399	\$ 147,399	\$ 147,399
Total Maintenance Costs	\$ 284,033	\$ 284,033	\$ 536,533

In addition to the cost of total water per year, we also found out how much water is used per year. The average watering day for all sprinklers on the IM field is about 1397 gallons per minute, for a running time of 22 minutes, totaling 30,700 gallons a day. In a 5 day week it comes to 153,600 gallons and for 41 weeks in a year the amount reaches 6.4 million gallons every year. The other 11 weeks of the year are not counted because of increment weather, and times when the field is not in use. Because of intense arid

summer months, the artificial turf can reach high temperatures making it uncomfortable to field users, and potentially dangerous in the event of falling. Artificial turf for a third of the year must still be watered therefore, however solely for cooling, rather than sustenance, thus requiring significantly less irrigation.

For artificial turf, only 10 minutes of watering would be required, but 7 days a week for 3 months which totals 1.17 million gallons of water per year which is 18% of the necessary hydration required for natural grass. Not only do we save on water quantity but our bill is \$55k less from water alone.

Typical maintenance with grooming, nurturing, and inspecting natural grass is simply replaced by a periodic sweep for cleaning after installation of artificial turf. The total cost of sweeps (40) per year amounts to \$20,331, only 13.5% of the \$147,399 required for natural grass' labor and equipment. The major cost associated with artificial turf is the initial installation and the replacement turf every 10 years. Below is a graph of on a 20 year time scale of the cumulative costs of natural grass versus artificial grass.



The ever expensive and frequent costs of re-sod, soil, and mowing shows quite a linear distribution for natural grass in comparison to the low-maintenance aspects of artificial turf. While these data so far have mostly measured the financial aspect, there are other environmental factors that are affected by artificial turfing.

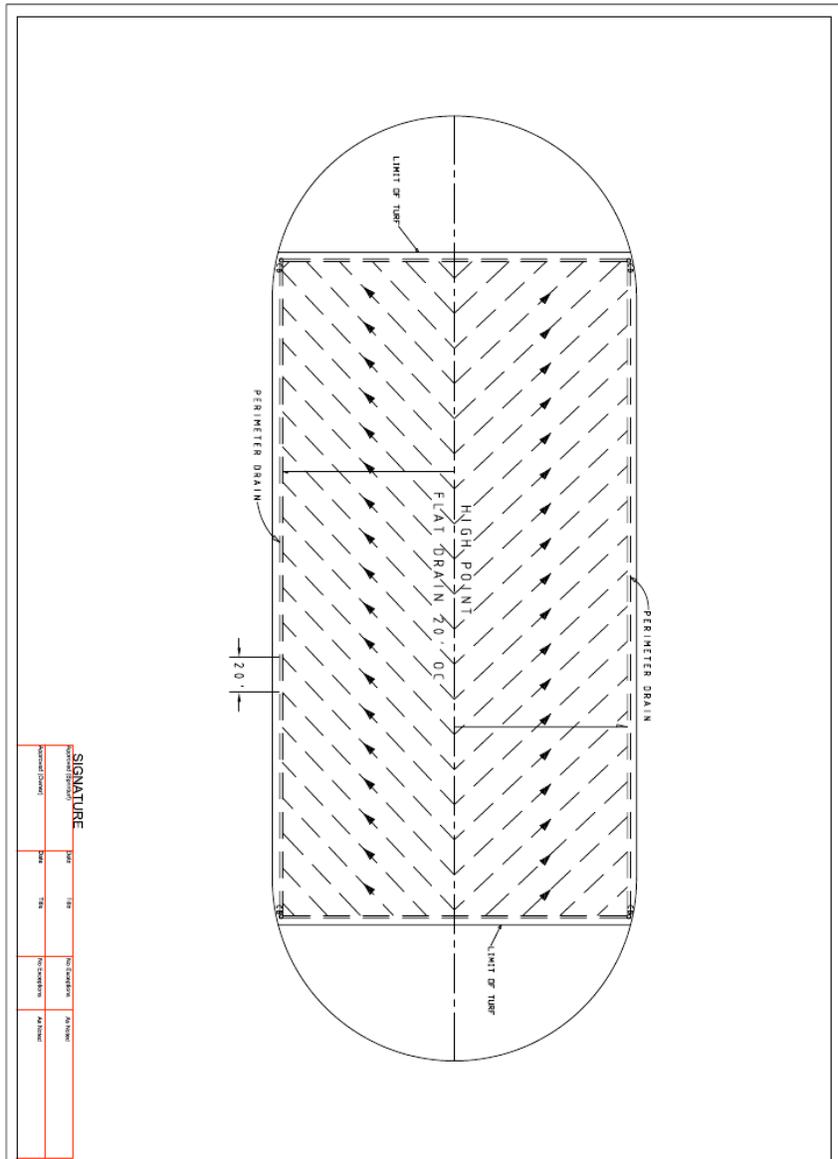
This project was designed primarily for the conservation of water, however being a part of the department of Sustainability brings about additional considerations when proposing a substantial change on campus.

We will examine the predominating environmental concerns with turfing, then investigate and analyze potential solutions, avoidances, and endurances of these to limit environmental endangerment. The single most resource-consuming and carbon-emitting effect of turfing is of course the acquisition and installation, which most honestly, cannot

be avoided. The process calls for heavy, carbon-exhaling machinery to remove a carbon-absorbing organism (grass), and replace it with rubber and fiber that was synthetically manufactured through fossil fuel burning. Once the cloud of dust created has settled and been swept clean, the large footprint left behind certainly has a presence. Though this problem cannot be avoided, we can endure it by utilizing the long term financial savings of the project by funding other sustainable projects on campus.

The overheating of synthetic turf is two-fold. First (and most far-fetched) is that the absorption of heat by the polyethylene rubber turf affects not only the playing surface, but also surrounding buildings which drives up cooling costs. The supplementary problem is the required water to cool the field, and both problems have one common solution (apart from the water usage breakdown from above): a drainage system.

An effective sub-surface drainage system which has been designed specifically for the IM field can be seen here in a herring-bone formation with a high point being a pipe running lengthwise down the center of the field.

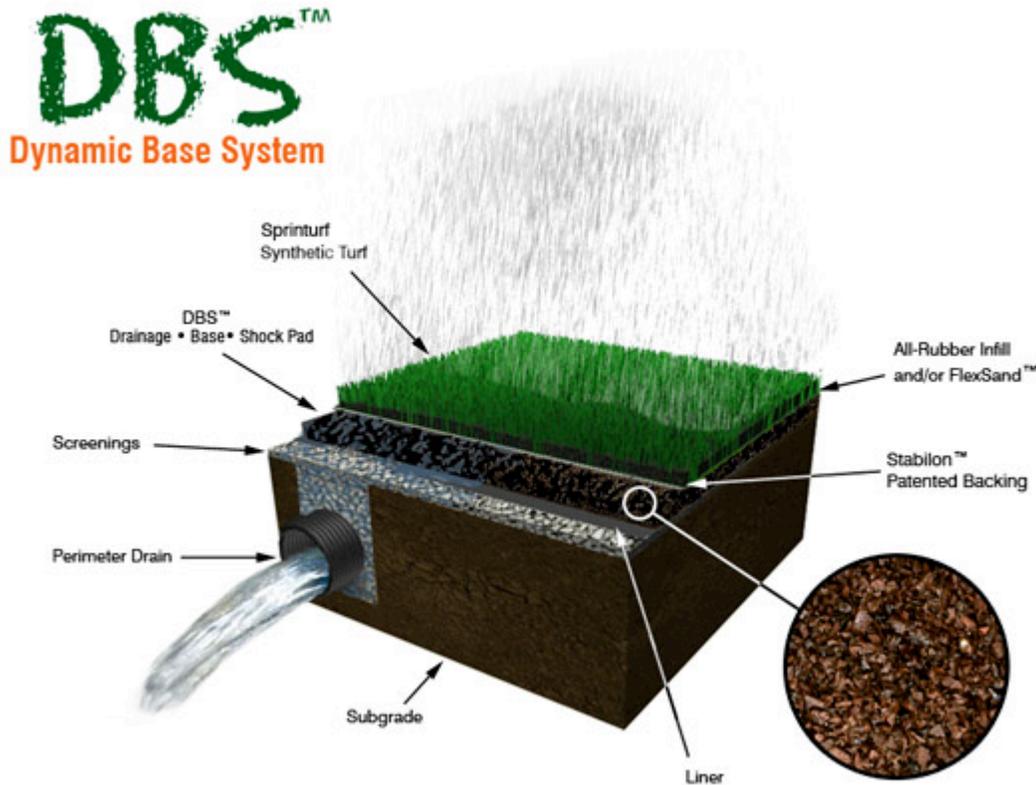


SIGNATURE		DATE	TITLE	SCALE	NO. SHEETS	TOTAL SHEETS
Project Engineer						
Drawn By						
Checked By						
Approved By						

 1200 Liberty Ridge Dr. Suite 100 Wayne, Pa. 19087 877-685-TURF www.sprinturf.com	PROJECT NAME: <b>Drainage Details                  Herring Bone                  20' On-Center</b>	DRAWING CONTENT: <b>Drainage Detail</b>	
		DRAWING SCALE: N.T.S.	DATE: 11/6/09
		DRAWN BY: K. WEST	DRAWN NO. 1

Run-off was a concern in the past, but no longer is a factor for synthetic turf. This is because uses Rubber Coated Sand, a revolutionary new technology which allows all water to permeate through the top layers and into the pipes below. The materials it is

comprised of has no hazardous material which can be carried away by run-off water. It meets the new FIFA standard, in that it is made of recycled materials, is homogenous, and rejects bacteria and fungus.



Most important is the permeability and sub-surface piping which allows redirection of all captured water. This new system provides drainage under every inch of the playing surface and the underground pipes is vital for sustainability. We have the ability to redirect this water to UCLA’s cogeneration plant which provides a majority of campus power. The most pragmatic use being to generate chilled water to use for air-conditioning units in various buildings. “The plant contains seven chillers to produce a total of almost 22,000 tons of air conditioning, which is still not enough to service the entire campus,” said David Johnson, director of energy services and utilities. Effective

drainage and transport eliminates run-off and soil erosion, preserves water, and affords repeated usage for cooling: on the turf itself, and in the surrounding buildings.

Another minor problem exists as biodiversity tampering, since polyethylene doesn't support microbial life, but the necessary data to test this is difficult to capture and is considered negligible for this project.

### **Recommendations and Conclusions**

Acquiring accurate and up-to-date cost analysis for the IM field is our first recommendation. Our focus is maximizing water conservation but also draws attention to sustainability as an entity, which can be achieved indirectly through successful progression of our project. Saving water has the byproduct of saving money, which can then be used towards funding alternative sustainable programs. It is essential that another in-depth financial analysis with the head of Facilities Management be conducted before initiation of any on campus turfing.

The numbers acquired from SprinTurf for complete installation and base construction of the artificial turf field is attached in a document, but should be revised by the company in case of any changes needed to take place. Generally speaking, our team has spent sufficient time organizing, and comparing costs of the two types of fields, and our graphs reflect a trend of increasing profitability over a 20-year period.

Our second recommendation is to confirm compatibility of artificial turf with all perennially scheduled events held on the IM field. Most activities (obviously) are Intramural Sports, and we have a majority of positive responses from students who use this field. Assistant Director of Recreation Rudy Figueroa has provided us with a

comprehensive list of activities hosted on the IM field every year. Nearly all of these are artificial turf friendly with possible exceptions of the Nickelodeon Awards Fair, and the Jazz Reggae Festival. These particular events require oversized tents that achieve sufficient stability only through stakes and poles breaking through the surface and into the foundation. Although SprinTurf has deemed this to be a non-issue as modern turf can support such structures, uncertainty of maintaining the contiguity of the turf remains. For this reason we recommend any future attempts at this project to suppose, and take into account a partial turfing option of the field, something similar to what has been done with Spaulding Field. The versatility of a half-natural, half-synthetic field is appealing to both supporters and critics, and can accommodate all events.

The third recommendation is to structure the drainage system to connect with UCLA's cogeneration plant in attempt to recycle cooling water for air conditioners around campus. This will add another facet to the sustainability of the IM field's turfing.

## Schools for Comparison:

### Whittier College

- Field Use?: Intercollegiate athletics, intramural, club sports, no events with tent.  
depressions cause marks and troughs in the field
- Size?: Football field, accommodates soccer (high school)
- Turf Company?: Sprint turf, field turf 2nd best
- Cost?: \$600,000 for turf, 1.2 million for the whole thing. Steve Davie contractor.

### Byron Davie (co.)

- When Installed?: last August, 2008
- How Long?: May 18th - 2 months
- Water saved?: In a given year, \$35,000 on water.
- Money saved?: Will pay itself off in the future, grass didn't grow so well. Rain flooded the area. Renting it out for totals of \$50,000 this year.
- Cooling?: 8 Water cannons
- Problems?: Carry on items to the field, no driving, or major weight distribution
- Positive Response?: Definitely, yes! Super enthused
- Cleaning?: Spray you have to purchase, easy to clean up. Hook ups for hoses
- Extra: 10 year guarantee. May and June is the busiest time of the year.

## Schools for Comparison:

### Pasadena City College

- Field Use?: 30,000 students, Band, Soccer practices, games M/W, football, highschool football, P.E. activities, events, track and field meets, commencement, tents, staging, plywood,
- Size?: regular football field, slightly narrower than normal soccer field,
- Turf Company?: Sprint turf
- Cost?: \$425,000, although doubled for drainage for rain
- When Installed? 3 years ago
- How Long? 6 weeks
- Water saved?: seed, pesticide, herbicide, plus water, 5 guys 4-5 hours to prep for football,
- Money saved?: Save on the fertilizer, the maintenance, the lines, the effort
- Cooling?: Water jets for cooling, 170 degrees on the field, water cannons, 1 button use for watering
- Problems?: seams lifting to sew back together.
- Positive Response? Comparing to real world, easier to land on, because of rubber pellets.
- Cleaning?: Not so much blood, but vomit, there's a cleaning kit, that custodians can use, given by the company
- Extra: 3rd party insurance, warranty 10yrs, if the company went bankrupt. Extra of the material to put on top of a building weighed down to have the same color as normal turf.

## **Appendix A: The Survey**

### **Sex?**

- Sex? Male
- Female

### **Year in school:**

- Year in school: Freshman
- Sophomore
- Junior
- Junior Transfer
- Senior
- Senior Transfer

### **At your time so far at UCLA, have you ever played a field sport?**

- At your time so far at UCLA, have you ever played a field sport? Yes, IM sports.
- Yes, team sports.
- Yes, IM & team sports.
- No, neither IM nor team sports

### **Which field sport did you participate in? (Select all that apply)**

- Which field sport did you participate in? (Select all that apply) Baseball
- Football
- Field Hockey
- Lacrosse
- Track and Field
- Soccer
- Ultimate Frisbee
- N/A
- Other (please specify)

**The sports I have played consistently on artificial turf was:  
(If you select yes and preferred playing the sport on the turf, state that.)**

	<b>Played on artificial turf</b>	<b>Have not played on artificial turf</b>	<b>Preferred playing on artificial turf</b>
<b>Baseball</b>	<input type="checkbox"/> The sports I have played consistently on artificial turf was: (If you select yes and preferred playing the sport on the turf, state that.) Baseball Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Football</b>	<input type="checkbox"/> Football Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Field Hockey</b>	<input type="checkbox"/> Field Hockey Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Lacrosse</b>	<input type="checkbox"/> Lacrosse Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Track and Field</b>	<input type="checkbox"/> Track and Field Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Soccer</b>	<input type="checkbox"/> Soccer Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
<b>Ultimate Frisbee</b>	<input type="checkbox"/> Ultimate Frisbee Played on artificial turf	<input type="checkbox"/> Have not played on artificial turf	<input type="checkbox"/> Preferred playing on artificial turf
Other (please specify)	<input type="text"/>		

**At UCLA or elsewhere, have you ever been on a turf field for events other than sports? (such as concerts, school events, fairs)**

- At UCLA or elsewhere, have you ever been on a turf field for events other than sports? (such as concerts, school events, fairs) Yes
- No

**Having been on or used an artificially turfed field, rate the following statements:**

	Never	Sometimes	Always
<b>I prefer artificial turf to grass</b>	<input type="radio"/> Having been on or used an artificially turfed field, rate the following statements: I prefer artificial turf to grass Never	<input type="radio"/> Sometimes	<input type="radio"/> Always
<b>Artificial turf hinders my ability to play my sport</b>	<input type="radio"/> Artificial turf hinders my ability to play my sport Never	<input type="radio"/> Sometimes	<input type="radio"/> Always

**Environmentally, what affect do you think Artificial Turf has?**

	Much worse for the env.	Neutral	Much better for the env.
<b>Answer:</b>	<input type="radio"/> Environmentally, what affect do you think Artificial Turf has? Answer: Much worse for the env.	<input type="radio"/> Neutral	<input type="radio"/> Much better for the env.

**If part of the IM field was turfed, my feelings would be: (Select all that apply)**

- If part of the IM field was turfed, my feelings would be: (Select all that apply)  
Angry
- Neutral, I don't care either way
- Happy, it would be a benefit to the sports/activities I do on the IM field.
- Happy, the environmental benefits would be great for UCLA.
- Indifferent, as long as it doesn't interfere with sports and activity events.
- Depends on how much of the field is turfed.
- I would need more information to make a truly informed decision.

**Do you have any other comments, questions, or concerns regarding artificial turf on the IM field?**

- Do you have any other comments, questions, or concerns regarding artificial turf on the IM field? If yes, enter into comment space provided below.
- Comments