



# LABORATORY TESTING TEMPERATURE AND WATER LOSS EVALUATION



## Project Information

<b>Project Name</b>	Temperature Evaluation - Water loss comparison SBR Rubber vs Greenplay vs Natural Grass		
<b>Client Info</b>	GreenPlay Organics, LLC 6 Hawthorne Avenue Merrick, NY 11566		
<b>Report Date</b>	11/12/2015	<b>Test Date</b>	8/26/2015
<b>Report Status</b>	Final	<b>Job no.</b>	90258/327
<b>Prepared by</b>	Kieran O'Donnell Field Operation Manager		
<b>Checked by</b>	Jeffrey Gentile Laboratory Director		

**Notes:**

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## Introduction

Sports Labs USA was commissioned to perform a temperature evaluation on two turf systems, each with a different infill composition paired with the same synthetic turf carpet. The results will be compared to show a relative temperature difference.

## Summary

The following testing was performed to determine the relative effect infill can have on the surface temperature of a synthetic turf system. A number of synthetic turf systems were tested, each used the same synthetic turf carpet with only the infill varied between systems. All were exposed to infra-red heat lamps for a prolonged period to simulate the heating of the sun in a controlled environment. The resulting temperatures were observed and recorded.

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## Procedure

Each system was constructed and prepared per EN 12229: Surfaces for sports areas - Procedure for the preparation of synthetic turf and textile pieces.

Each system was constructed using the infill combinations shown in the systems description table below.

The samples were conditioned to room temperature for at least 24 hours.

## Heat Test

The following sensors were used to capture and record measurements to a digital data logger every 60 seconds:

- (2) thermo-couples mounted in series to provide a 2 point average of the surface temperature.
- (2) Infra-red thermo-couples aimed at the sample to register fiber temperature.
- (1) thermo-couple placed inside of the infill for heat transfer across the performance layer.

The samples were heated for 3.5 hours. All of the data was compiled and the average temperatures for each hour were found. This report will present for each system, the hourly average temperature recorded at each sensor as well as the average for each type of temperature measurement sensor.

## Water Loss

Synthetic turf samples were dried between 0-5% moisture then 450 mL of water was added to achieve 50% moisture in both the Greenplay and SBR rubber systems. Samples were weighed after every 20 minutes of lamp exposure. The natural turf was not dried and there was no water added, but it had a moisture reading of 43%.

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## System Descriptions

System ID	System Description
SBR Rubber / Sand	<p>Synthetic Turf Carpet: 2.25" Slit Film</p> <p>Infill Combination: 50% SBR Rubber/50% Silica sand (by weight)</p> <p>¾" Pile Exposure</p>
Greenplay/Sand	<p>Synthetic Turf Carpet: 2.25" Slit Film</p> <p>Infill Combination: 2lbs Greenplay organic over 3lbs of sand.</p> <p>Moisture measured at 50%</p> <p>¾" Pile Exposure</p>
Natural Blue Grass Mix	<p>1' thick cross section 1.5" free pile</p>

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## System Results- Heat Test

### SBR Rubber / Sand

Avg Temperature per Time Period					
Temperature (F°) per Sensor					
Exposure Time Period	Surface Sensor #1	Surface Sensor #2	Sensor Embedded in Infill	Infra-red Sensor #1	Infra-red Sensor #2
0hr-1hr	160.3	163.5	89.0	169.4	166.6
1hr-2hr	182.3	183.4	115.0	189.7	190.7
2hr-3hr	198.6	190.7	125.5	193.7	197.9
3hr-3.5hr	208.2	204.3	130.6	202.8	206.6

### Greenplay/Sand

Avg Temperature per Time Period					
Temperature (F°) per Sensor					
Exposure Time Period	Surface Sensor #1	Surface Sensor #2	Sensor Embedded in Infill	Infra-red Sensor #1	Infra-red Sensor #2
0hr-1hr	121.4	120.3	84.5	122.8	127.2
1hr-2hr	145.9	143.7	104.6	153.5	156.7
2hr-3hr	155.8	154.1	110.0	167.0	173.3
3hr-3.5hr	159.5	159.1	111.6	171.0	178.3

### Natural Turf

Avg Temperature per Time Period					
Temperature (F°) per Sensor					
Exposure Time Period	Surface Sensor #1	Surface Sensor #2	Sensor Embedded in Infill	Infra-red Sensor Location #1	Infra-red Sensor Location #2
0hr-1hr	108.6	112.8	97.1	120.5	120.5
1hr-2hr	124.6	128.9	109.9	140.8	139.5
2hr-3hr	132.0	141.3	114.4	152.0	151.6
3hr-3.5hr	135.4	148.3	116.3	160.2	160.7

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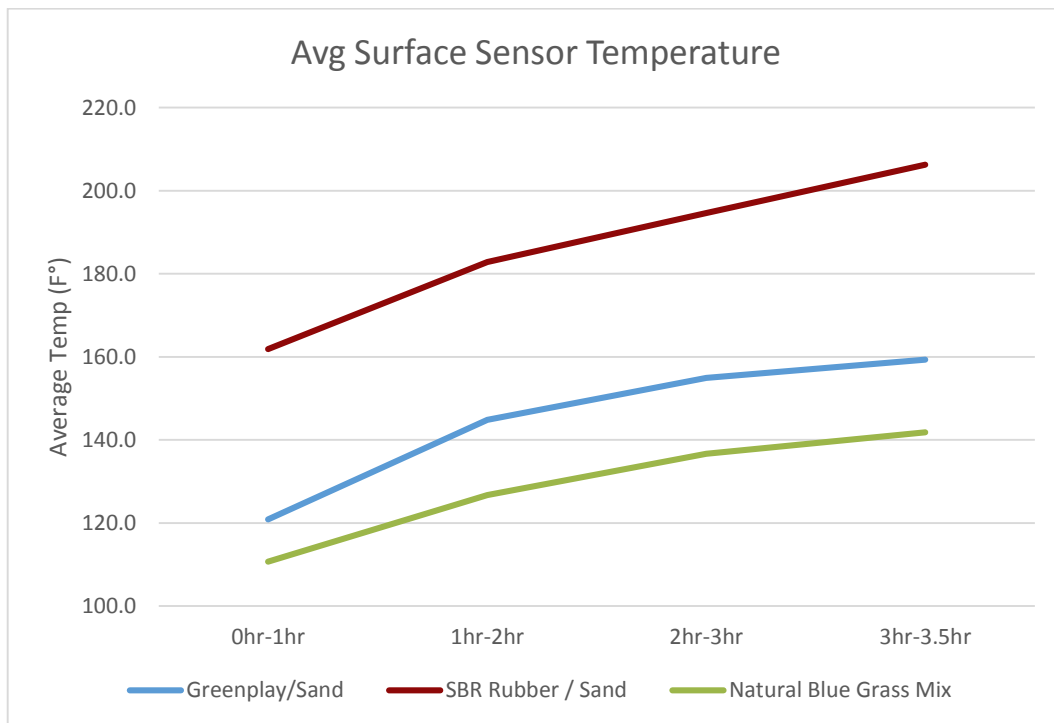


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## Comparison Results- Heat Test

Average Surface Sensor Temperature per Time Period					
Average Temperature (F°) per Sensor Type					
Exposure Time Period	Greenplay/Sand	Temp Difference	SBR Rubber / Sand	Temp Difference	Natural Blue Grass Mix
0hr-1hr	120.9	41.1	161.9	51.2	110.7
1hr-2hr	144.8	38.1	182.9	56.1	126.8
2hr-3hr	155.0	39.7	194.7	58.0	136.7
3hr-3.5hr	159.3	47.0	206.3	64.4	141.9



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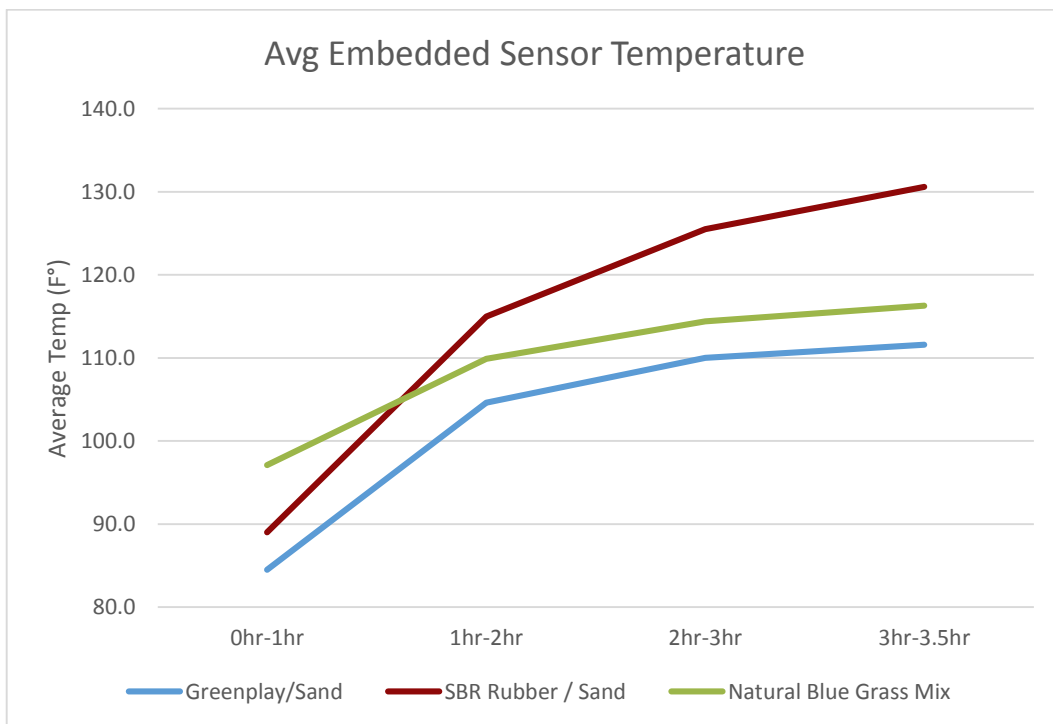
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Average Embedded Sensor Temperature per Time Period					
Average Temperature (F°) per Sensor Type					
Exposure Time Period	Greenplay/Sand	Temp Difference	SBR Rubber / Sand	Temp Difference	Natural Blue Grass Mix
0hr-1hr	84.5	4.5	89.0	-8.1	97.1
1hr-2hr	104.6	10.4	115.0	5.1	109.9
2hr-3hr	110.0	15.5	125.5	11.1	114.4
3hr-3.5hr	111.6	19.0	130.6	14.3	116.3



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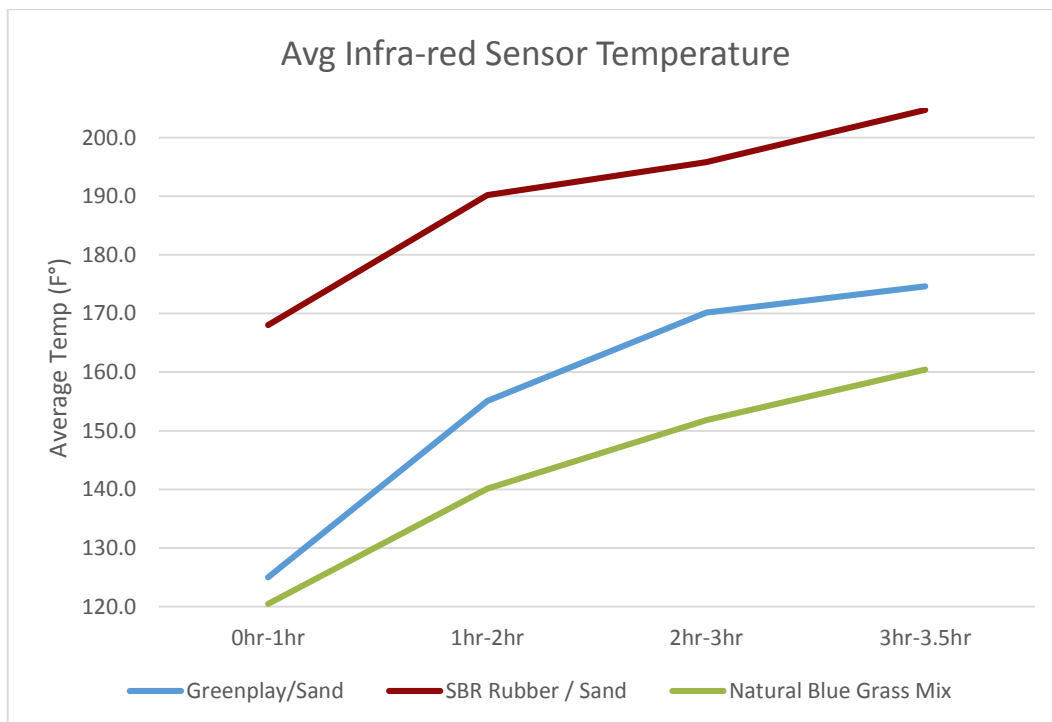
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Average Infra-red Sensor Temperature per Time Period					
Average Temperature (F°) per Sensor Type					
Exposure Time Period	Greenplay/Sand	Temp Difference	SBR Rubber / Sand	Temp Difference	Natural Blue Grass Mix
0hr-1hr	125.0	43.0	168.0	47.5	120.5
1hr-2hr	155.1	35.1	190.2	50.1	140.1
2hr-3hr	170.2	25.7	195.8	44.0	151.8
3hr-3.5hr	174.7	30.1	204.7	44.3	160.5



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## System Results- Water Loss

### Rubber/Sand

Water loss through evaporation		
Exposure Time Period	Water Loss (g)	% loss in water weight
0hr-1hr	87.30	19.80%
1hr-2hr	95.60	21.68%
2hr-3hr	91.60	20.77%
3hr-3.5hr	56.80	12.88%
total	331.30	75.12%

### Greenplay

Water loss through evaporation		
Exposure Time Period	Water Loss (g)	% loss in water weight
0hr-1hr	64.40	14.60%
1hr-2hr	66.40	15.06%
2hr-3hr	52.00	11.79%
3hr-3.5hr	34.20	7.76%
total	217.00	49.21%

### Natural Grass

Water loss through evaporation		
Exposure Time Period	Water Loss (g)	% loss in water weight <i>*unable to detect, see procedure</i>
0hr-1hr	54.70	n/a
1hr-2hr	53.40	n/a
2hr-3hr	57.00	n/a
3hr-3.5hr	48.40	n/a
total	213.50	n/a

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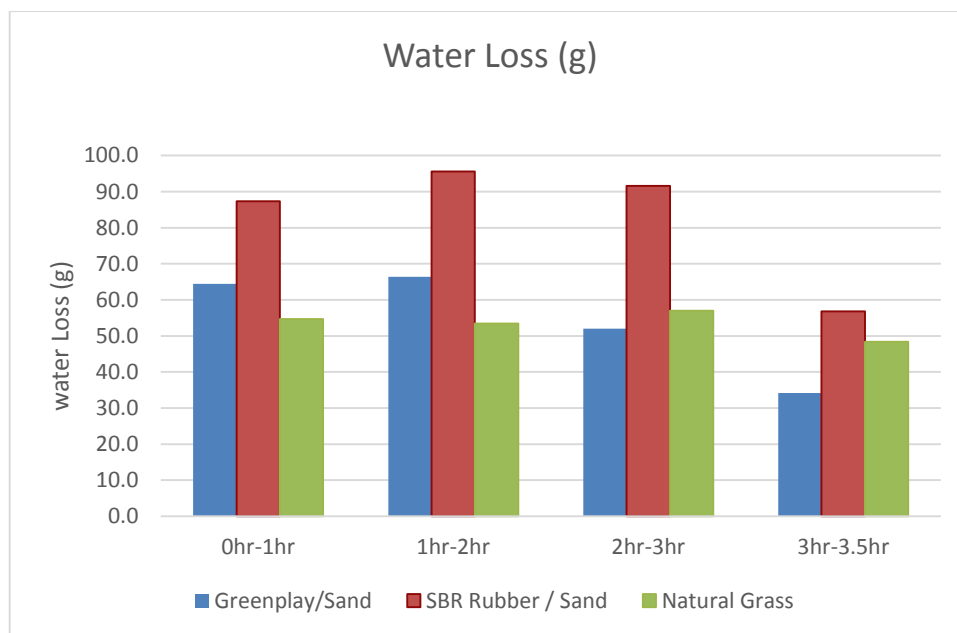


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## Comparison Results- Water Loss

Exposure Time Period	Water Loss (g)				
	Greenplay/Sand	Water Loss difference	SBR Rubber / Sand	Water loss difference	Natural Grass
0hr-1hr	64.4	22.9	87.3	32.6	54.7
1hr-2hr	66.4	29.2	95.6	42.2	53.4
2hr-3hr	52.0	39.6	91.6	34.6	57.0
3hr-3.5hr	34.2	22.6	56.8	8.4	48.4
total	217	-0.66	331.3	0.15	213.50



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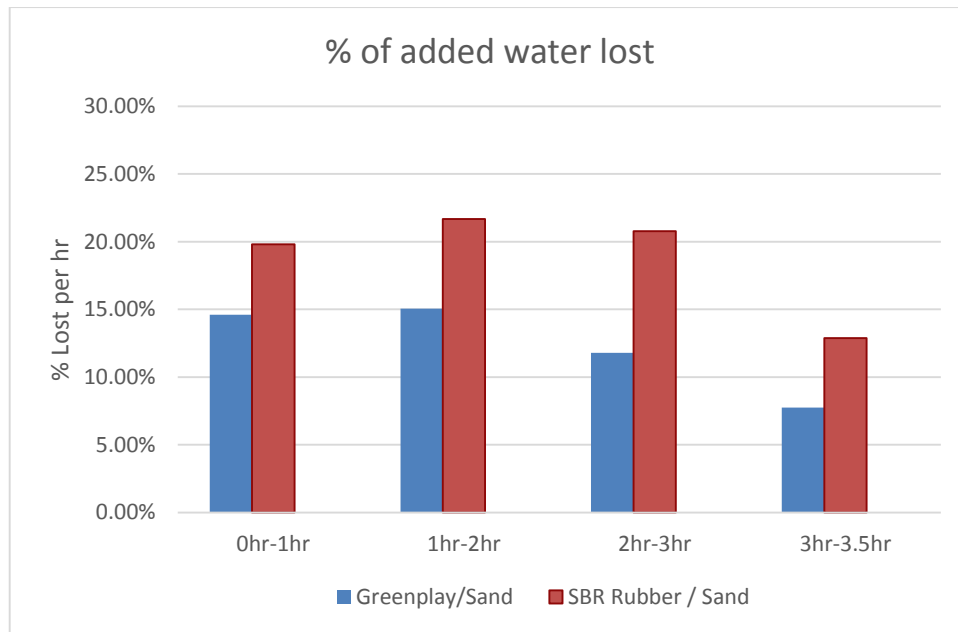
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% of water weight loss (g)					
Exposure Time Period	Greenplay/ Sand	Temp Difference	SBR Rubber / Sand	Temp Difference	Natural Grass <i>*see procedure</i>
0hr-1hr	14.60%	5.19%	19.80%	19.80%	n/a
1hr-2hr	15.06%	6.62%	21.68%	21.68%	n/a
2hr-3hr	11.79%	8.98%	20.77%	20.77%	n/a
3hr-3.5hr	7.76%	5.12%	12.88%	12.88%	n/a



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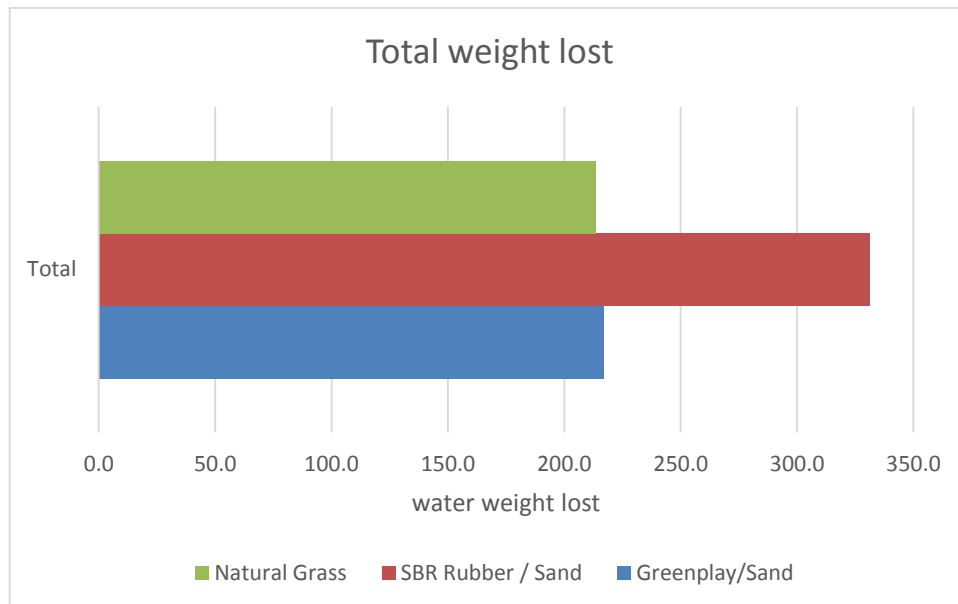
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Total weight loss					
Exposure Time Period	Greenplay/ Sand	Weight Difference	SBR Rubber / Sand	Weight Difference	Natural Grass
Total 3.5 Hours	217.0	114.3	331.3	117.8	213.5



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## Discussion

The systems that incorporated Greenplay displayed temperatures that were consistently lower than the traditional SBR Rubber / Sand infill system and more compatible to natural grass with all of the measuring devices for the entire duration of heating.

Since the turf used between all systems was kept consistent it appears that the infill composition does play a role in surface temperature. As a result of this laboratory evaluation it is concluded that the Greenplay system will have significantly lower surface temperatures than the traditional SBR Rubber / Sand infill system.

End of Report

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