INNOVATIVE CONSERVATION PROGRAM
Metropolitan Water District of Southern California

DISCLAIMER

This project was conducted with financial assistance from a grant from the Metropolitan Water District of Southern California (Metropolitan), the U.S. Bureau of Reclamation, the Central Arizona Project, the Southern Nevada Water Authority, the Southern California Gas Company, and the Western Resource Advocates through Metropolitan's Innovative Conservation Program (ICP). The ICP provides funding for research to help document water savings and reliability of innovative water savings devices, technologies, and strategies. The findings of this project, summarized in this report, are solely from the project proponent.

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FINAL REPORT
"PRECISION INJECTION MACHINE WATER CONSERVATION PILOT"
ICP Agreement No. 180903

October 16, 2017 - December 31, 2018

Elaine Sibert, Cofounder, CEO, Rain Systems - Pilot Project Manager
Jim Sibert, Cofounder, CTO, Rain Systems - PIM Inventor/Pilot Technical Manager
Paul Cushing, Agronomic Consultant, PCTurfPro

This project was conducted with financial assistance from the Metropolitan Water District of Southern California, the U.S. Bureau of Reclamation, the Central Arizona Project, the Southern Nevada Water Authority, Southern California Gas Company and Western Resource Advocates through the Innovative Conservation Program (ICP).

Pilot conducted with the cooperation and assistance of the City of Los Angeles Department of Recreation and Parks

Data analysis and verification of results; Paul Cushing, Agronomist - Class A GCSAA, Golf Course and Sports Field Specialist

RAIN SYSTEMS
PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

Precision Injection Machine (PIM)

Patent No: US 7,845,293 B1

Patent No: US 8,707,878 B2

PRECISION INJECTION MACHINE TECHNOLOGY

Rain Systems' Precision Injection Machine (PIM) is the innovation and working prototype of Jim Sibert's patented technology. Jim discovered that hydrogel products such as Broadleaf P4 (1) and Soil Moist (2) were used to reduce irrigation for crops and for landscaping. He became intrigued by the fact that while many others had attempted to build a machine that could put these water saving soil amendments into lawns and turfgrass, no one had yet succeeded. Once he finalized his design and filed for patents, he received his first patent within 12 months and the second within another 2 years. Jim worked with NASA fabricators, Navy submarine valve engineers and an AI software engineer to help him build the working prototype of the Precision Injection Machine. Jim and Elaine Sibert started Rain Systems and became a Portfolio Company at the Los Angeles Cleantech Incubator in 2016. Since that time, they have implemented pilots with California State University Northridge (3), City of Los Angeles Department of Recreation and Parks (4), as well as the Los Angeles Unified School District (5).

The PIM has the unique ability to implant hydrogel into existing turfgrass into the root zone level, while keeping the turf pristine, even on short cut turfgrass. Using computer-controlled pinpoint water injections, the PIM implants hydrogel between 2" - 8" into the ground, while simultaneously metering the exact amount of hydrogel necessary to each injection point. It is designed with the capability to adjust to different types of soil and turf.

The technological advances of the PIM allows Rain Systems to price our services at a fraction of our competitors. Our installation time is more than twice as fast, pays for itself within 6 months and each treatment is fully effective for 3 years.

METHODOLOGY

The goal of this case study was to validate the amount of water savings for turf irrigation utilizing Rain Systems Precision Injection Machine (PIM) method of implanting hydrogel at the root zone level. The water that is stored within the hydrogels has been proven to be readily available to the turfgrass roots in the upper root zone. Hydrogels continually provide water to the roots while improving the turf quality on the surface through increased uptake of water and nutrients.

The City of Los Angeles Department of Recreation and Parks provided test sites for the Rain Systems PIM Conservation pilot. The first two test sites are located at Ken Malloy Harbor Regional Park and a third site is at Loren Miller Recreation Center. The following methodology was implemented during the pilot:

Soil testing conducted in this case study to determine the role that the hydrogels play in enhancing turfgrass plant nutrient availability in the upper root zone during the testing process.

Soil testing was conducted by Logan Labs LLC out of Lakeview, OH (6)

Soil results, analysis and recommendations were performed by Paul Cushing, Agronomic Turfgrass Services (7)

Rain Systems PIM implanted Soil Moist hydrogel product into Tall fescue (Festuca arundinacea) turf plot areas into the rootzone at a depth of 3" below the soil surface

Photo documentation was taken both from the ground as well as with a drone aerial camera

Soil moisture conditions and readings were monitored and collected with a Turf Tec International Digital Moisture Sensor soil water meter

Weather data for Test Areas #1 and #2 was compiled for Ken Malloy Harbor Regional Park through CIMIS Long Beach (8), Time and Date and Wunderground for Harbor City(9)

Weather data for Test Area #3 was compiled for Loren Miller Recreation Center from Wunderground Downtown Los Angeles(9) and CIMIS Monrovia(10)

PILOT TEST AREAS

For the purpose of this case study, Rain Systems conducted pilots with the assistance and cooperation of the City of Los Angeles Department of Recreation and Parks in three test areas during the following times:

TEST AREA #1: Ken Malloy Harbor Regional Park, STATION 40
3,978 Square Feet of Turfgrass
25,820 S Vermont Ave, Los Angeles, CA 90710
October 17, 2017 - December 31, 2018

TEST AREA #2: Ken Malloy Harbor Regional Park, STATION 26
11,145 Square Feet of Turfgrass
25,820 S Vermont Ave, Los Angeles, CA 90710
August 9, 2018 - December 31, 2018

TEST AREA #3: Loren Miller Recreation Center
3,232 Square Feet of Turfgrass
2717 Halldale Ave, Los Angeles, CA 90018
August 16, 2018 - December 31, 2018

THE RESULTS

Rain Systems case study showed a successful reduction in water usage and a sustainable method of maintaining turf in each of the test areas:

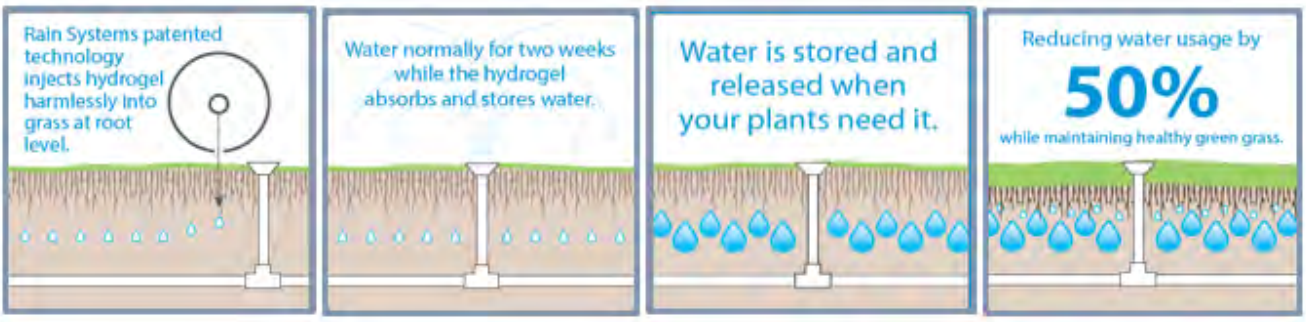
TEST AREA #1: 47% average water usage savings over the 14 months of the pilot

TEST AREA #2: 34% average water usage savings over the 3.5 months of the pilot

TEST AREA #3: Revived damaged grass into healthy, green turfgrass without increasing irrigation to pilot area over the 4.5 months of the pilot

HYDROGELS

Hydrogels were developed decades ago as an environmentally friendly soil amendment to increase the water retention capacity of soil. Once Rain Systems Precision Injection Machine (PIM) implants the hydrogels into the ground, they absorb and store water typically lost in drainage and evaporation, slowly releasing it back to the soil as needed. This keeps the soil hydrated between irrigation cycles, leading to fewer days of irrigation and a reduction in water consumption for turf irrigation of up to 50%. Soil Moist, the hydrogel product that Rain Systems used for this pilot, is EPA tested, non-toxic, fully effective for 3 years and 100% biodegradable. These soil amendments have been effectively used in agriculture and landscaping for decades, where they were able to mix it into the soil before planting. Rain Systems developed the PIM in order to introduce these water saving soil amendments into the managed turf industry.



During the course of this pilot, an additional strategy of using soil amendments to reduce sodium levels in the soil was added to the treatment process. Removing the sodium through multiple applications of calcium and leaching was an added value in studying the effectiveness of hydrogels implanted into turfgrass. As a part of Rain Systems' on-going services, we will conduct semi-annual soil testing and applications of gypsum, calcium and potassium will be made if high levels of sodium are found in the lab results. This will ensure the longevity of the hydrogel once implanted over the 3-year life cycle of each treatment.

SOIL CHEMISTRY

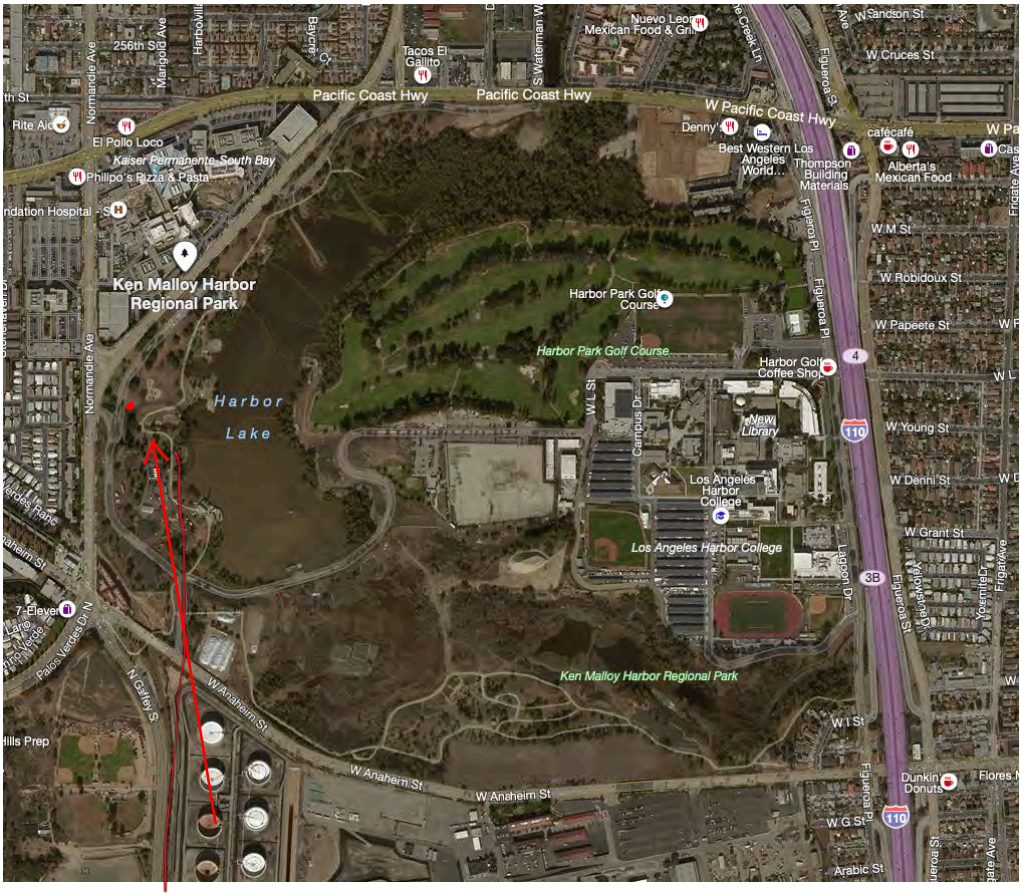
Prior to and after the application of hydrogels with the Precision Injection Machine (PIM), the test areas were soil tested to determine the soil chemistry in the upper 3" of the root zone. Test Area #1, Station 40 and Test Area #2, Station 26 soil results came back with elevated levels of sodium (salts) which had accumulated from the irrigation source (water) as well as below average rainfall dating back to the 2010-2011 season. Test Area #1, Station 40 lab results showed 879 pounds/acre in sodium. Test Area #2, Station 26 lab results showed 403 pounds/acre in sodium. Both Test Areas #1 and #2 would be considered dangerously excessive in sodium, as these numbers should be less than 50 pounds/acre. These sodium numbers would also be considered detrimental for the long term viability of hydrogels and turfgrass roots. Removing the sodium through applications of calcium and leaching is an added benefit for improving the efficacy of the hydrogels.

The recommendations for correcting the soil chemistry were applications of gypsum, a leaching irrigation to push the salts out of the rootzone, then replacing the sodium with multiple applications of potassium. This process was extremely successful, as the results were able to decrease the amount of sodium in the upper 3" of the root zone by 80% on both Test Areas #1 and #2 in a 5 month period. The follow up results showed Test Area #1, Station 40 had reduced from 879 pounds/acre down to 174 pounds/acre of sodium. Test Area #2, Station 26 had reduced from 403 pounds/acre down to 82 pounds/acre in sodium. This reduction in salts contributed to the hydrogels more effectively being able to store water without breaking apart under the influence of sodium, which in turn allows for increasing the long-term efficacy of the hydrogels. In addition, an added benefit of the gypsum applications has been a 13% increase in calcium percentage in soil root zone during the 5 month period. This increase in calcium will improve the soil structure and nutrient holding capabilities/availability.

MAP: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 17, 2017 - DECEMBER 31, 2018

KEN MALLOY HARBOR REGIONAL PARK
25,820 S Vermont Ave, Los Angeles, CA 90710



Station 40, Test Area #1

MAP: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 9, 2018 - DECEMBER 31, 2018

KEN MALLOY HARBOR REGIONAL PARK
25,820 S Vermont Ave, Los Angeles, CA 90710

MAP: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 17, 2018 - DECEMBER 31, 2018

LOREN MILLER RECREATION CENTER
2717 Halldale Ave, Los Angeles, CA 90018

PILOT: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 17, 2017 - DECEMBER 31, 2018
AVERAGE REDUCTION: 47%

Rain Systems implanted Soil Moist hydrogels into existing turf at root level with their patented technology, the Precision Injection Machine (PIM) on October 17, 2017 at Ken Malloy Harbor Regional Park Test Area#1, Station 40. Per the manufacturer's recommendation of 5 pounds/1000 sq ft, Rain Systems' PIM implanted a total of 20 pounds into Test Area #1, Station 40, which is 3,978 sqft of Tall fescue (Festuca arundinacea) turfgrass.

From October 17 - November 8, 2017, personnel at City of Los Angeles Department of Recreation and Parks kept the irrigation at the same amount as the surrounding park, 4 days/week x 8 minutes/day.

November 8, 2017: City of Los Angeles Department of Recreation and Parks personnel reduced the irrigation schedule for Test Area #1, Station 40 was reduced from 4 cycles/week x 8 minutes/day down to 2 cycles/week x 8 minutes/ cycle. From November 8, 2017 - June 1, 2018, the irrigation schedule remained at 2 cycles/week x 8 minutes/cycle in comparison to the surrounding park that was receiving between 4 to 5 cycles/week x 8+ minutes/cycle. This translated to an average monthly reduction in water usage of 53% in comparison to the surrounding park. Water usage was reduced by 31,136 gallons over this 7-month time period for the 3,978 sqft area of Tall fescue (Festuca arundinacea) turfgrass.

In June of 2018, a small part of Test Area #1, Station 40, was showing signs of stress. The irrigation schedule was increased to 3 cycles/week in comparison to 5 cycles/week in the surrounding park in order to ensure that the pilot area remained in good condition. Paul Cushing, Agonomist, conducted soil testing that revealed high levels of sodium in the soil of this area, 879 pounds/acre. He recommended gypsum and applied it throughout the pilot area, followed by a leaching irrigation to push the salts out of the root zone. These applications were followed with applications of potassium which subsequently brought down the sodium levels to 174 pounds/acre over the next 4 months.

From June through November 2018, Test Area #1, Station 40, remained at 3 cycles/week schedule in comparison to the surrounding park's irrigation schedule of 5 cycles/week, a monthly average of 40% reduction in water usage and a savings of 25,376 gallons of water for the 3,978 sqft area over these 6 months of the pilot.

In December 2018, the park's overall irrigation schedule was reduced to 4 cycles/week x 8+ minutes/cycle) while Test Area#1, Station 40 remained at 3 cycles/week x 8 minutes/cycle. A 29% reduction in water usage and a savings of 2,440 gallons of water in one month.

PHOTOS: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2017.

October 6, 2017 .
Prior to Rain Systems Installation of hydrogel

October 17, 2017.
Rain Systems Precision Injection Machine iinstalling hydrogel into turf

PHOTOS: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

DECEMBER 2017 - MAY 2018

NOVEMBER 8, 2017.
Reduced Irrigation from 4 Days/ Week to 2 Days/ Week

December 15, 2017.
1 month, 7 days at 50% irrigation reduction
IRRIGATION SCHEDULE: Station 40 = 2 Cycles/Week | Control = 4 Cycles/Week
WATER USAGE: Station 40 = 975.2 Gallons/Week | Control = 1950.4 Gallons/Week

May 25, 2018.
7 months at 50% reduction in irrigation
IRRIGATION SCHEDULE: Station 40 = 2 Cycles/Week | Control = 4 Cycles/Week
WATER USAGE: Station 40 = 975.2 Gallons/Week | Control = 1950.4 Gallons/Week

PHOTOS: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

SEPTEMBER - OCTOBER 2018

September 24, 2018 .
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 2438 Gallons/Week

October 18, 2018 - One Year After InsTallation
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 2438 Gallons/Week

PHOTOS: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

JUNE 1, 2018 - AUGUST 17, 2018

June 1, 2018 - increased irrigation by 1 day
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 2438 Gallons/Week

August 17, 2018 - improvement at new irrigation schedule and with added benefit of gypsum application
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 2438 Gallons/Week

PHOTOS: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

NOVEMBER - DECEMBER 2018

November 12, 2018 -
Full year of irrigation reduction
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 2438 Gallons/Week

December 31, 2018.
Equally green grass in comparison to park around it at an average of 47% reduction in irrigation
IRRIGATION SCHEDULE: Station 40 = 3 Cycles/Week | Control = 4 Cycles/Week
WATER USAGE: Station 40 = 1462.8 Gallons/Week | Control = 1950.4 Gallons/Week

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2017 - DECEMBER 2018

AVERAGE REDUCTION: 47%

MONTH	WEATHER DATA						STATION 40	3,978 SqFt		20 lbs hydrogel	
Daytime Temperatures	MAX	MIN	MEAN	Precip	Avg Humidity	CIMIS ETo	GPM Control	GPM Test Area #1	Water Savings	Water Savings	Water Savings
	(℉)	(℉)	(℉)	(in)	(%)	(in.)	Water Usage (gallons)	Water Usage (gallons)	(gallons)	%	($) .01366/gallon
2017											
October	82	75	79	0	46	3.87	Installation on October 17, irrigation reduction on November 8				
November (1)	75	66	70	0.04	59	2.24	6,339	2,926	3,413	54%	$46.62
December	73	65	69	0.06	36	2.03	8,777	4,388	4,388	50%	$59.95
2018											
January	73	64	68	0.00	46	2.18	7,802	3,901	3,901	50%	$53.28
February	70	62	66	0.00	40	3.09	7,802	3,901	3,901	50%	$53.28
March	67	61	64	0.00	60	3.61	11,215	4,388	6,826	61%	$93.25
April	72	66	69	0.04	53	5.25	10,240	3,901	6,339	62%	$86.59
May	72	67	70	0.04	63	5.13	10,727	4,388	6,339	59%	$86.59
June	77	72	75	0.00	61	5.93	10,727	6,339	4,388	41%	$59.95
July	87	81	84	0.00	58	6.88	10,727	6,339	4,388	41%	$59.95
August	87	80	83	0.00	59	6.24	10,727	6,826	3,901	36%	$53.28
September	81	75	78	0.00	63	4.75	10,727	5,851	4,876	45%	$66.61
October	79	72	75	0.46	58	3.70	10,240	6,826	3,413	33%	$46.62
November	83	74	78	1.21	53	2.65	9,752	5,851	3,901	40%	$53.28
December	67	60	63	1.56	53	1.91	8,289	5,851	2,438	29%	$33.30
Averages (2)	76	69	73		54	4.28	9,752	5,213	4,539	47%	
Total				3.41		59.46	134,090	71,677	62,413	47%	$853
$ Savings/SqFt/Year (3)											$0.19
$ Projected Savings / Acre / Year (4)											$8,148
Water Savings/1000 SqFt/Year									13,693	Gallons/1000 SqFt/Yr	
Water Savings/Acre/Year									596,452	Gallons/Acre/Yr	

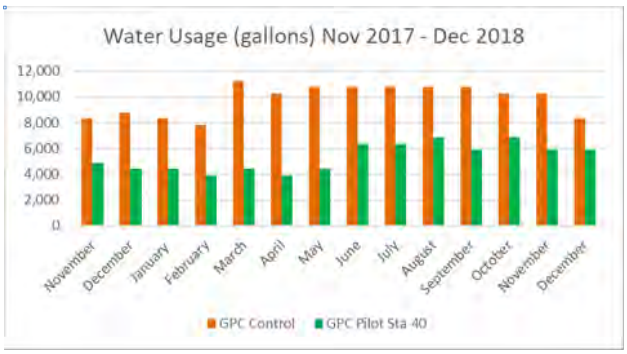
(1) November water savings based on 11/8-11/30
(2) Average Water Usage (gallons) were computed as 13.75 months
(3) Savings/SqFt/Year was computed as (Savings/SqFt/13.75 months) x 12 months a year
(4) Savings/Acre/Year is based on Savings/SqFt/Year x 43,560 (SqFt/Acre) x .01366

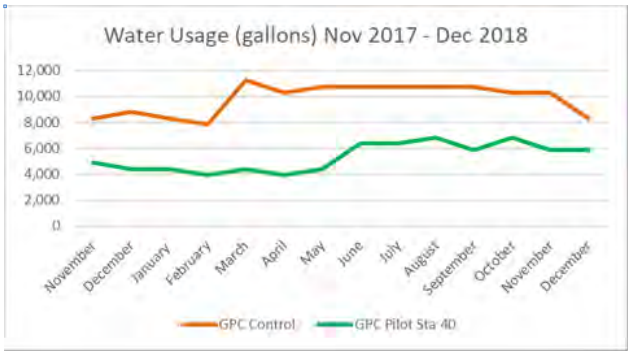
Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

Data Back up — APPENDIX C
CIMIS ETo — Evapotranspiration Rate
GPM Control — Gallons per Month - Other Park Stations
GPM Test Area #1 — Gallons per Month, Test Area #1, Station 40

Sources

Daily Data https://www.timeanddate.com/weather/@5362754/historic?month=12&year=2018
Daily Data https://www.wunderground.com/personal-weather-station/dashboard?ID=KCALOMIT4&cm_ven=localwx_pwsdash
ET Rates http://www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg





CONCLUSIONS : TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 17, 2017 - DECEMBER 31, 2018

AVERAGE REDUCTION: 47%

The turfgrass leaves and overall canopy on the Tall fescue remained strong in Test Area #1, Station 40 thrived with available moisture and nutrients available from the hydrogel. The soil structure, nutrient availability and chemistry were greatly enhanced throughout the 15 month pilot test period.

The effectiveness of the process of installing hydrogel into turf at root level by Rain Systems' patented PIM technology can be seen in the percentage of moisture found in the soil. Utilizing the digital moisture meter during a period from September 2018 to December 2018, soil moisture readings from Test Area #1, Station 40 ranged an average of 186 down to 177. Thus, representing a differential of just 4.8%, even though the water savings percentage averaged 38% during this same time. This strongly exhibits the effectiveness of the hydrogels to retain moisture and allow the turfgrass to thrive while saving substantial water. Studies conducted by the manufacturer of Soil Moist, JRM Chemical, have proven that this hydrogel is fully effective for 3 years.

The PIM process was successful, with significant water savings data to substantiate the results. The water usage for irrigation was reduced by as much as 62% and maintained at a 41% reduction during the warmest month of the year, despite an ET rate of 6.88. The total rainfall for the 15 months of this study was only 5.10". Even with high temperatures, little rainfall, and an average ET rate of 4.28, Rain Systems application of hydrogel proved itself able to reduce turf irrigation throughout the pilot.

In conclusion, the overall condition of Test Area #1, Station 40 at the Ken Malloy Harbor Regional Park remains healthy, green and lush, as evidenced in the photographs within this study. The water usage was reduced by up to 62% in one month, with a total an average reduction of 47% and 62,413 gallons of water were saved in the 3,978 SqFt area of Tall fescue (Festuca arundinacea) turfgrass over the 14 months of this pilot. The projected annual water savings are an average of 596,542 Gallons/Acre/Year.

PILOT: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 9, 2018 - DECEMBER 31, 2018

AVERAGE REDUCTION: 34%

Rain Systems implanted Soil Moist hydrogels into existing turf at root level with their patented technology, the Precision Injection Machine (PIM) on August 9, 2018 at Ken Malloy Harbor Regional Park Test Area #2, Station 26. Per the manufacturer's recommendation of 5 pounds/1000 sqft, Rain Systems implanted a total of 55 pounds into Test Area #2, Station 26, which is 11,145 sqft of Tall fescue (Festuca arundinacea) turfgrass.

From August 9 - September 24, 2018, personnel at City of Los Angeles Department of Recreation and Parks kept the irrigation at the same amount as the surrounding park, 5 days/week x 23 minutes/day for a total of 2249.4 gallons per cycle during this time period.

Paul Cushing, Agronomist, conducted soil testing for Test Area #2, Station 26, which revealed high levels of sodium in the soil of this area, 403 pounds/acre. He applied multiple applications of gypsum followed with a leaching irrigation to push the salts out of the rootzone. After the gypsum applications and flushing irrigations, a potassium application followed, which reduced the sodium levels to 82 pounds/acre over the next 4 months.

September 24, 2018: City of Los Angeles Department of Recreation and Parks personnel reduced the irrigation schedule for Test Area #2, Station 26 from 5 cycles/week x 23 minutes/cycle down to 3 cycles/week x 23 minutes/ cycle. Throughout September 24 - November 30, 2018 the irrigation schedule remained at 3 cycles/week x 23 minutes/cycle in comparison to the surrounding park that was receiving 5 cycles/week x 23 minutes/cycle. This translated to an average monthly reduction in water usage of 37% in comparison to the surrounding park. 35,893 gallons of water were saved over this 9-week time period for the 11,145 sqft area of Tall fescue (Festuca arundinacea) turfgrass.

December 1, 2018: City of Los Angeles Department of Recreation and Parks reduced the irrigation schedule for the overall park to 4 cycles/week x 20 minutes/cycle, and changed Test Area #2, Station 26 to 3 cycles/week x 20 minutes/cycle, which lowered the output for Test Area #2, Station 26 to 1956 gallons/cycle. In December, there was a 29% reduction in water usage in comparison to the surrounding park and a savings of 9,780 gallons of water for the 11,145 SqFt.

PHOTOS: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST - SEPTEMBER 2018

August 6, 2018.
Prior to Rain Systems Precision Injection Machine installation of hydrogel

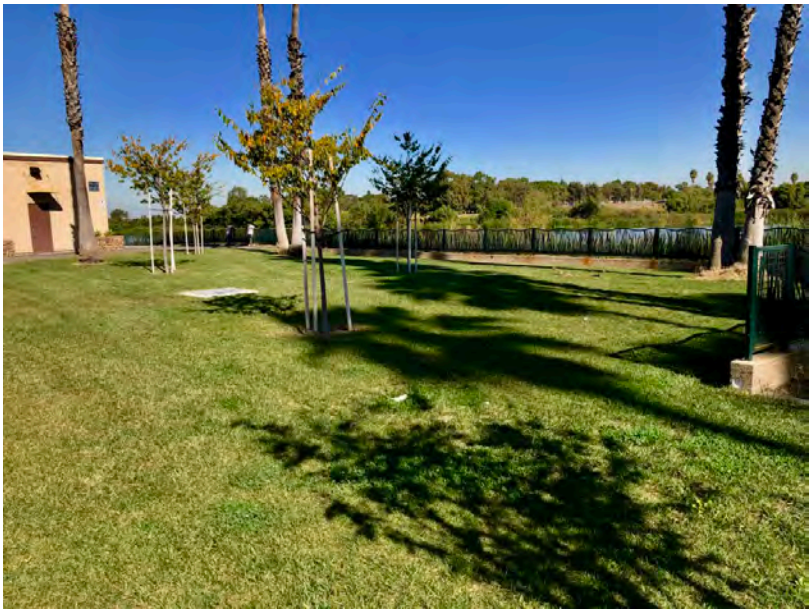
September 24, 2018 - condition of turf has greatly improved, irrigation schedule changed on this date
IRRIGATION SCHEDULE: 9/24/18 REDUCED Station 26 DOWN TO 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 26 = 6748.2 gallons/week | Control 11,247 / week

PHOTOS: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER - NOVEMBER 2018

October 10, 2018 - soil retaining high levels of moisture, keeping grass hydrated and healthy
IRRIGATION SCHEDULE: Station 26 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 26 = 6748.2 Gallons/Week | Control = 11,247 Gallons/Week

November 12, 2018 - 6 weeks of reduced irrigation
IRRIGATION SCHEDULE: Station26 = 3 Cycles/Week | Control = 5 Cycles/Week
WATER USAGE: Station 26 = 6748.2 Gallons/Week | Control = 11,247 Gallons/Week



PHOTOS: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

DECEMBER 2018

December12, 2018.
IRRIGATION SCHEDULE: Station26 = 3 Cycles/Week X 20 MIN | Control = 4 Cycles/Week X 20 MIN
WATER USAGE: Station 26 = 5868 Gallons/Week | Control = 7824 Gallons/Week

PHOTOS: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 16, 2018 - DECEMBER 13, 2018
AVERAGE REDUCTION: 34%

AUGUST 16, 2018 - BEFORE
PRIOR TO RAIN SYSTEMS TREATMENT

DECEMBER 31. 2018 - AFTER
Maintaining equally green grass with an average irrigation reduction of 34% during pilot study.

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 16, 2018 - DECEMBER 13, 2018

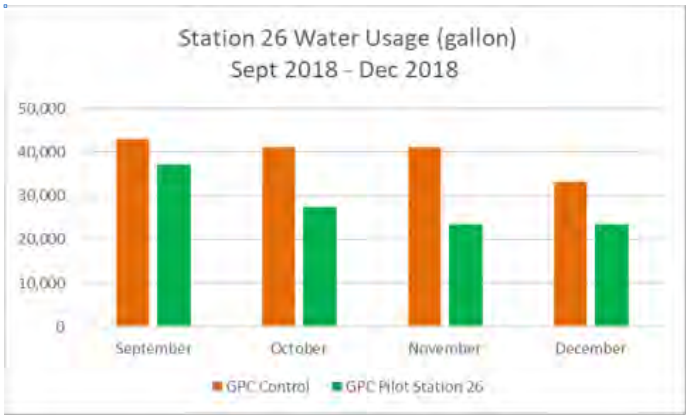
AVERAGE REDUCTION: 34%

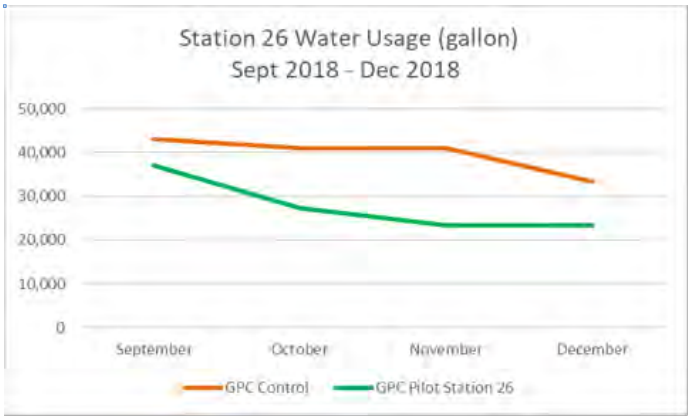
GPM/CYCLE	MINUTES/CYCLE	GPC
97.8	23	2249.4
97.8	20	1956

MONTH	WEATHER DATA						STATION 26	11,145 SqFt	55 lbs. hydrogel		
	MAX	MIN	MEAN	Precip	Humidity	CIMIS ETo	GPC Control	GPC Pilot Station 26	Water Savings	Water Savings	Water Savings
	(℉)	(℉)	(℉)	(in)	(%)	(in.)	Water Usage (gallons)	Water Usage (gallons)	(gallons)	%	($) .01366/gallon
2018											
August	87	80	84	0.00	59	6.24	Installation on August 9, irrigation reduction on September 24				
September (1)	81	75	78	0.00	63	4.75	11,247	6,748	4,499	40%	$61.46
October	79	72	76	0.46	58	3.70	44,988	31,492	13,496	30%	$184.36
November	79	72	76	1.21	53	2.65	39,120	23,472	15,648	40%	$213.75
December	67	60	64	1.56	53	1.91	33,252	23,472	9,780	29%	$133.59
Average (2)	79	72	75		57	3.85	9,186	6,085	3,102	34%	
Totals				3.23		19.25	128,607	85,184	43,423	34%	$593.16
Savings/SqFt/Year (3)											$0.20
$ Savings/Acre/Year (4)											$8,611.00
Water Savings/1000 SqFt/Year									14,472	Gallons/1000 SqFt/Yr	
Water Savings/Acre/Year									630,381	Gallons/Acre/Yr	

(1) September water savings were for one week only and computed based on that basis
(2) Average Water Usage (gallons) were computed as a WEEKLY savings while all other averages are monthly
(3) Savings/SqFt/Year was computed as (Savings/SqFt/14 weeks) x 52 weeks in a year
(4) Savings/Acre/Year is based on Savings/SqFt/Year x 43,560 (SqFt/Acre) x .01366

Data Back up	APPENDIX B		
CIMIS Eto	Evapotranspiration Rate	***Sources***	
GPC Control	Gallons per Cycle, All other park stations	Daily Data	https://www.timeanddate.com/weather/@5362754/historic
GPC Pilot	Gallons per Cycle, Pilot Station	ET Rates	http://www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg





CONCLUSIONS : TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 9, 2018 - DECEMBER 31, 2018

AVERAGE REDUCTION: 34%

The turfgrass canopy on the Tall fescue in Test Area #2 remained strong and thrived with moisture and nutrients made available through the hydrogel. The soil structure, nutrient availability and chemistry were greatly enhanced throughout the 4-month pilot test period.

Much like the Test Area #1 results, the effectiveness in the Rain Systems patented PIM process of installing hydrogel into turf at root level can be seen in the percentage of moisture to be found in the soil. Utilizing the digital moisture meter during a period from September 2018 to December 2018, soil moisture readings from Test Area #2, Station 26 ranged an average of 159 down to 144. This represents a differential of just 9.4%, over a 3.5-month period, with as high as a 40% decrease in irrigation during this same time. This displays the success of the hydrogels to retain moisture and allow the turfgrass to thrive while saving significant amounts of water.

The total rainfall for the 3.5 months of this study was only 3.23". Even with high temperatures, little rainfall, and an average ET rate of 3.85, Rain Systems application of hydrogel proved itself able to reduce turf irrigation throughout the pilot. As was shown in Test Area #1, the water savings will continue to be significant over time. Studies conducted by the manufacturer of Soil Moist, JRM Chemical, have proven that this hydrogel is fully effective for 3 years.

In conclusion, the overall condition of Test Area #2, Station 26 at the Ken Malloy Harbor Regional Park remains healthy, green and lush, as evidenced in the photographs within this study. The total water usage was reduced by an average of 34% and 43,423 gallons of water were saved for this 11,145 SqFt area of Tall fescue (Festuca arundinacea) turfgrass over the 3.5 Months of this pilot. The projected annual water savings is 630,384 Gallons/Acre/Year.

PILOT: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 16, 2018 - DECEMBER 31, 2018

The goal for Test Area #3 at Loren Miller Recreation Center was to revive and sustain an area of the park that was in poor condition with minimal turf coverage along with many areas of bare/exposed soil at the time of the initial application of hydrogels. As this lawn was already receiving a minimal amount of irrigation at 3 cycles/week x 8 minutes/cycle, we set out to prove the ability of our PIM hydrogel installation to improve and sustain this turf with a zero increase in water usage for irrigation.

August 16, 2018: Rain Systems implanted Soil Moist hydrogels into existing turf at root zone level with their patented technology PIM at the Loren Miller Recreation Center, Test Area #3. Per the manufacturer's recommendation of 5 pounds/1000 sqft, the PIM implanted a total of 16 pounds into 3,232 sqft of Tall fescue (Festuca arundinacea) and Kikuyugrass (Pennisetum clandestinum) turfgrasses.

In August of 2018, Paul Cushing - Agronomist, conducted soil testing that revealed elevated levels of sodium in the upper 3" of the root zone of this lawn, 177 pounds/acre. It is important to note that any readings over 50 pounds/acre are considered detrimental for turfgrass and shoot development. Per the recommendations from the soil test results; multiple applications of gypsum were followed with a leaching irrigation each time in order to mitigate the effects of sodium build up. These treatments were intended to push the salts out of the turfgrass root zone and enhance the effectiveness of the hydrogels. This series of gypsum applications and leaching irrigations were followed with a subsequent application of potassium to replace the leached sodium.

The results were tremendously successful in that the sodium levels dropped to 58 pounds/acre over the development of the study. This was a **67%** reduction in sodium in a relatively short period of time. During this same period, the calcium percentage increased over 15% as well. The reduction of sodium and the increase in calcium both play a significant role in refining the efficacy of the hydrogel as well as improving its effectiveness for up to 3 years. All the while increasing the nutrient availability in the soil which improves plant uptake.

PHOTOS: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 16, 2018 - DECEMBER 31, 2018

SEPTEMBER - DECEMBER, 2018 IRRIGATION SCHEDULE: 3 CYCLES/ WEEK X 8 MINUTES/ CYCLE

September 9, 2018. WITHIN 24 DAYS, TURF HAS IMPROVED DRAMATICALLY

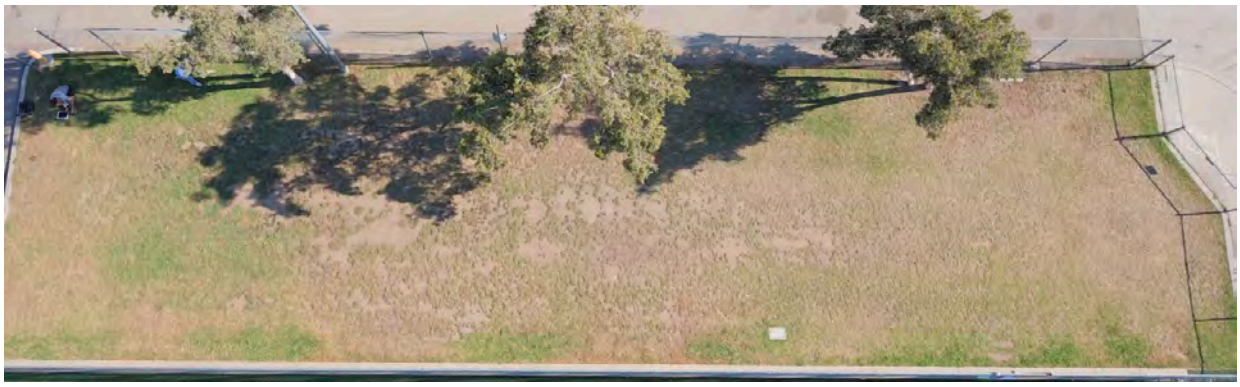
October 18, 2018. PILOT AREA CONTINUES TO IMPROVE, WITH MUCH MORE TURF COVERAGE ACROSS TEST AREA #3

DECEMBER 31, 2018. GREEN GRASS GROWING ACROSS THE PILOT AREA WHILE MAINTAINING 8 MINUTES X 3 CYCLES / WEEK

PHOTOS: TEST AREA #3, LOREN MILLER RECREATION CENTER

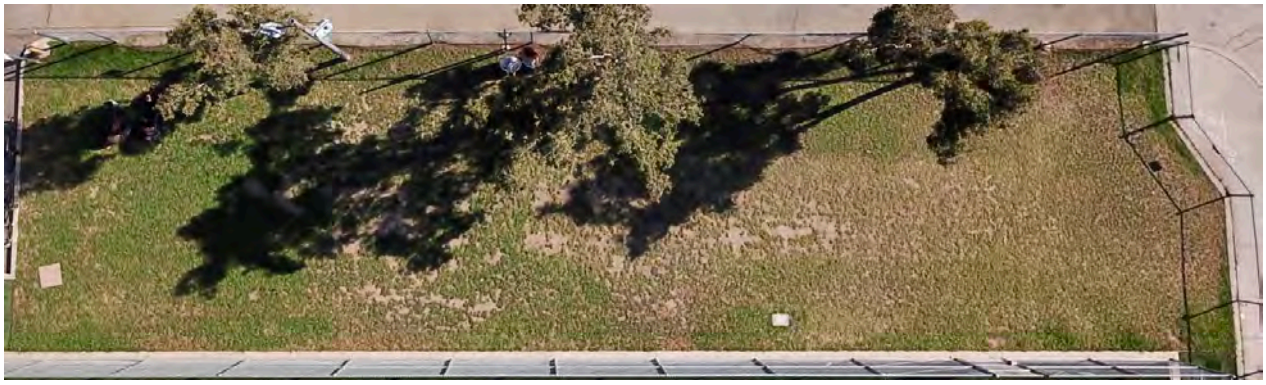
AUGUST 16, 2018 - DECEMBER 31, 2018 IRRIGATION SCHEDULE: 3 CYCLES/ WEEK X 8 MINUTES/ CYCLE

AUGUST 17, 2018 - BEFORE PRIOR TO RAIN SYSTEMS HYDROGEL INSTALLATION



SEPTEMBER 9, 2018.

24 DAYS AFTER HYDROGEL INSTALLATION. GRASS IS FILLING IN AND BECOMING MORE GREEN ACROSS TEST AREA #3



DECEMBER 31, 2019 - AFTER

IN JUST 4 MONTHS, OVERALL IMPROVEMENT IN TURFGRASS CONDITION, WITHOUT AN INCREASE IN WATER USAGE

THE BARE SPOTS IN THE MIDDLE HAVE SIGNIFICANTLY DECREASED IN SIZE, GRASS IS SLOWLY FILLING and WILL CONTINUE TO IN THE MONTHS TO COME

WEATHER DATA: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 16, 2018 - DECEMBER 31, 2018

IRRIGATION SCHEDULE: 3 CYCLES/ WEEK X 8 MINUTES/ CYCLE

MONTH	WEATHER DATA					
	MAX	MIN	MEAN	Precip	Avg Humidity	CIMIS ETo
	(℉)	(℉)	(℉)	(in)	(%)	(in.)
2018						
August	93	69	81	0.00	54	6.54
September	92	61	77	0.00	58	5.22
October	90	55	73	0.57	55	4.07
November	88	47	68	1.58	46	3.01
December	77	39	58	2.11	57	2.13
Average	88	54	71		54	4.19
Totals				4.26		20.97

CIMIS ETo Evapotranspiration Rate

Sources

Temps, Precipitation - Wunderground Dowtown LA https://www.wunderground.com/history/daily/us/ca/los-angeles-downtown/KCQT/date/2018-12-31

Eto Rates & Humidity - CIMIS Station 159 Monrovia https://cimis.water.ca.gov/UserControls/Reports/MonthlyReportViewer.aspx

The total rainfall for the 4.5 months of this study was only 4.26", of which over 2" fell in the final month of the study. There were unseasonably high temperatures from October - December and an average ET rate of 4.19. Rain Systems application of hydrogel helped revive turf that was in very poor condition at the Loren Miller Recreation Center Test Area #3.

CONCLUSIONS: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 16, 2018 - DECEMBER 31, 2018

Test Area #3 at Loren Miller Recreation Center was revived and sustained during the 4.5 month pilot test period. Overall, the grass became greener and expanded across areas that previously had little to no grass growing. No additional water usage for irrigation was required, keeping the same irrigation schedule throughout, while improving the quality and the health of the Tall fescue and Kikuyugrass at Test Area #3.

The success of the Rain Systems patented PIM process of installing hydrogel into turf at root level can be seen in moisture and nutrient availability found in the soil. This exhibited effectiveness of the hydrogels to retain moisture and allow the turfgrass to be revived and grow healthier. The turf was greatly improved despite rainfall totals of just 4.26" for the 4.5 months of this study, of which over 2" fell in the final month of the study. There were also unseasonably high temperatures from October - December and an average ET rate of 4.19.

What makes these results of this case study even more noteworthy is the significant improvement in the density/development of the Tall fescue and Kikuyugrass turf canopies during the period of the study with accessible moisture and nutrients available from the hydrogel. The soil structure, nutrient availability and chemistry were noticeably enhanced throughout the pilot test period.

In conclusion, the Rain Systems method of implanting hydrogel into existing turf at rootzone level when properly applied via the PIM into the upper 3" of the turfgrass rootzone, can revive difficult turf areas while producing a healthy & sustainable turfgrass lawn. The overall condition of the turfgrass test area at the Loren Miller Recreation Center Park has improved dramatically over the 4.5 months of this study and is healthy, green and lush, as evidenced in the photographs within this study.

OVERALL RESULTS

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

OCTOBER 17, 2017 - DECEMBER 31, 2018

Rain Systems method of implanting hydrogel into existing turf at root level when properly applied via the Precision Injection Machine into the upper 3" of the turfgrass rootzone, will save substantial money and reduce water usage for a prolonged period of time while producing a healthy & sustainable turfgrass lawn.

TEST AREA #1: Ken Malloy Harbor Regional Park, STATION 40
25,820 S Vermont Ave, Los Angeles, CA 90710

SQUARE FOOTAGE	3,978 SqFt
OCTOBER 17, 2017 - DECEMBER 31, 2018	14 months
REDUCTION IN IRRIGATION (%)	47%
REDUCTION IN IRRIGATION (Gallons)	62,413
WATER SAVINGS/1000 SQFT /YEAR (Gallons)	13,800
PROJECTED WATER SAVINGS /ACRE / YEAR (Gallons)	596,452
PROJECTED WATER SAVINGS /ACRE / YEAR ($)	$8,148

TEST AREA #2: Ken Malloy Harbor Regional Park, STATION 26
25,820 S Vermont Ave, Los Angeles, CA 90710

SQUARE FOOTAGE	11,145 SqFt
AUGUST 9, 2018 - DECEMBER 31, 2018	3.5 months
REDUCTION IN IRRIGATION (%)	34%
REDUCTION IN IRRIGATION (Gallons)	43,423
WATER SAVINGS/1000 SQFT /YEAR (Gallons)	14,472
PROJECTED WATER SAVINGS /ACRE / YEAR (Gallons)	630,834
PROJECTED WATER SAVINGS /ACRE / YEAR ($)	$8,611

TEST AREA #3: Loren Miller Recreation Center
2717 Halldale Ave, Los Angeles, CA 90018

SQUARE FOOTAGE	3,232 SqFt
AUGUST 16, 2018 - DECEMBER 31, 2018	4.5 months
RESULTS	Revived & Sustained Turf
INCREASE IN IRRIGATION (Gallons)	0%

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4 https://rainsystems.com/#case-studies

5 https://rainsystems.com/#case-studies

6 https://www.loganlabs.com

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10 https://cimis.water.ca.gov

THANK YOU

We would like to especially thank the Metropolitan Water District of Southern California, the U.S. Bureau of Reclamation, the Central Arizona Project, the Southern Nevada Water Authority, Southern California Gas Company and Western Resource Advocates for awarding Rain Systems an Innovative Conservation Program Grant, which allowed us to conduct this pilot.

We would also like to thank the City of Los Angeles Department of Recreation and Parks for allowing us to conduct this pilot at multiple parks in the Los Angeles area. We appreciate the time and energy that the personnel from the Department of Recreation and Parks so generously gave to us while conducting the pilot.

We would like to thank Paul Cushing of PCTurf Pro, Agronomic Consulting, for overseeing this study. We appreciate the time, effort and immense knowledge of soil chemistry and turfgrass he brought to this pilot.

Sincerely,
Elaine R. Sibert & James E. Sibert
Rain Systems, Inc.

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

APPENDIX

APPENDIX A

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

SOIL TESTING RESULTS

Soil samples were taken at each of the test areas for this pilot. This appendix includes the soil test results from Logran Labs, LLC. It also contains the analyis and recommendations by Paul Cusing, Agronomist.

1 Soil Report from Logan Labs
Test Areat #1, Station 40, Ken Malloy Harbor Regional Park
October, 2017

2 Soil Report from Logan Labs
Test Area #1, #2 and Control (Area 3), Ken Malloy Harbor Regional Park
July, 2018

3 Paul Cushing, Agronomist, Soil Testing Recommendations
Test Area #1, and Test Area #2, Ken Malloy Harbor Regional Park
August, 2018.

4 Soil Report from Logan Labs
Test Area #1, Station 40, Ken Malloy Harbor Regional Park
December 2018.

5 Soil Report from Logan Labs
Test Area #2, Station 26, Ken Malloy Harbor Regional Park
December, 2018

6 Soil Report from Logan Labs
Control Area, Ken Malloy Harbor Regional Park
December, 2018

7 Soil Report from Logan Labs
Test Area #3, Loren Miller Recreation Center
August, 2018

8 Paul Cushing, Agronomist, Soil Testing Recommendations
Test Area #3, Loren Miller Recreation Center
August, 2018.

9 Soil Report from Logan Labs
Test Area #3, Loren Miller Recreation Center
January, 2019

10 Soil Moisture Readings September - December 2018

Soil Report

Job Name: **Rain Systems** Date: 8/2/2018

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			Ken Malloy				
Sample ID			Park 2017				
Lab Number			88				
Sample Depth in inches			6				
Total Exchange Capacity (M. E.)			26.52				
pH of Soil Sample			8.1				
Organic Matter, Percent			3.43				
ANIONS	**SULFUR:**	p.p.m.	112				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	482				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value	7213				
		Value Found	6782				
		Deficit	-431				
	MAGNESIUM: lbs / acre	Desired Value	763				
		Value Found	1453				
		Deficit					
	POTASSIUM: lbs / acre	Desired Value	827				
		Value Found	755				
		Deficit	-72				
	SODIUM:	lbs / acre	769				
BASE SATURATION %	Calcium (60 to 70%)		63.93				
	Magnesium (10 to 20%)		22.83				
	Potassium (2 to 5%)		3.65				
	Sodium (.5 to 3%)		6.30				
	Other Bases (Variable)		3.30				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		1.79				
	Iron (p.p.m.)		209				
	Manganese (p.p.m.)		48				
	Copper (p.p.m.)		5.94				
	Zinc (p.p.m.)		8.61				
	Aluminum (p.p.m.)		312				
OTHER							

Logan Labs, LLC

Soil Report

Job Name: **Rain Systems Ken Malloy Park** Date: 7/18/2018

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			Pilot	Pilot	Pilot		
Sample ID			Area 1	Area 2	Area 3		
Lab Number			37	38	39		
Sample Depth in inches			6	6	6		
Total Exchange Capacity (M. E.)			28.66	23.25	19.60		
pH of Soil Sample			8.2	7.9	7.7		
Organic Matter, Percent			4.36	5.29	5.32		
ANIONS	**SULFUR:**	p.p.m.	97	80	110		
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	520	829	882		
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value	7795	6324	5331		
		Value Found	7062	6269	4782		
		Deficit	-733	-55	-549		
	MAGNESIUM: lbs / acre	Desired Value	825	669	564		
		Value Found	1698	1124	1165		
		Deficit					
	POTASSIUM: lbs / acre	Desired Value	894	725	611		
		Value Found	858	940	807		
		Deficit	-36				
	SODIUM:	lbs / acre	879	403	476		
BASE SATURATION %	Calcium (60 to 70%)		61.60	67.41	60.99		
	Magnesium (10 to 20%)		24.69	20.14	24.76		
	Potassium (2 to 5%)		3.84	5.18	5.28		
	Sodium (.5 to 3%)		6.66	3.77	5.28		
	Other Bases (Variable)		3.20	3.50	3.70		
	Exchangable Hydrogen (10 to 15%)		0.00	0.00	0.00		
TRACE ELEMENTS	Boron (p.p.m.)		1.76	1.46	1.75		
	Iron (p.p.m.)		167	304	386		
	Manganese (p.p.m.)		46	41	27		
	Copper (p.p.m.)		7.34	8.89	7.57		
	Zinc (p.p.m.)		12.16	24.67	24.46		
	Aluminum (p.p.m.)		315	323	296		
OTHER							

Logan Labs, LLC

Rain Systems - Ken Malloy Park – Los Angeles, CA

Soil Testing Recommendations from August 2018:

Pilot Area 1 Field Recommendations-

- Three (3) individual applications of Gypsum - Calcium Products SO4 @ 20#/1000 ft. Leach that night with at least 1 hour of water (or time prior to flushing rainfall) to displace sodium and bi-carbonates. Apply Gypsum applications 3-4 weeks a part in schedule.

- The following day after gypsum application & flush. Three (3) individual applications of 0-0-50 @ 1# K/1000 ft. (2# of actual material). Apply Potassium applications 3-4 weeks a part in schedule.

Pilot Area 2 Field Recommendations-

- Three (3) individual applications of Gypsum - Calcium Products SO4 @ 20#/1000 ft. Leach that night with at least 1 hour of water (or time prior to flushing rainfall) to displace sodium and bi-carbonates. Apply Gypsum applications 3-4 weeks a part in schedule.

- The following day after gypsum application & flush. Three (3) individual applications of 0-0-50 @ 1# K/1000 ft. (2# of actual material). Apply Potassium applications 3-4 weeks a part in schedule.

Pilot Area 3 Field Recommendations-

- Three (3) individual applications of Hi-Cal Lime - Calcium Products 98G @ 20#/1000 ft. Leach that night with at least 1 hour of water (or time prior to flushing rainfall) to displace sodium and bi-carbonates. Apply Hi-Cal Lime applications 3-4 weeks a part in schedule.

- The following day after lime application & flush. Three (3) individual applications of 0-0-50 @ 1# K/1000 ft. (2# of actual material). Apply Potassium applications 3-4 weeks a part in schedule.

Soil Report

Job Name: **Rain Systems** Date: 1/8/2019

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			Ken Malloy				
Sample ID			Station 40				
Lab Number			130				
Sample Depth in inches			3				
Total Exchange Capacity (M. E.)			22.21				
pH of Soil Sample			8.1				
Organic Matter, Percent			3.45				
ANIONS	**SULFUR:**	p.p.m.	87				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	267				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value Value Found Deficit	3020 3068				
	MAGNESIUM: lbs / acre	Desired Value Value Found Deficit	319 526				
	POTASSIUM: lbs / acre	Desired Value Value Found Deficit	346 388				
	SODIUM:	lbs / acre	174				
BASE SATURATION %	Calcium (60 to 70%)		69.08				
	Magnesium (10 to 20%)		19.74				
	Potassium (2 to 5%)		4.48				
	Sodium (.5 to 3%)		3.40				
	Other Bases (Variable)		3.30				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		1.07				
	Iron (p.p.m.)		183				
	Manganese (p.p.m.)		51				
	Copper (p.p.m.)		6.25				
	Zinc (p.p.m.)		13.39				
	Aluminum (p.p.m.)		227				
OTHER							

Logan Labs, LLC

Soil Report

Job Name: **Rain Systems** Date: 1/8/2019

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			Ken Malloy				
Sample ID			Station 26				
Lab Number			131				
Sample Depth in inches			3				
Total Exchange Capacity (M. E.)			15.27				
pH of Soil Sample			8.0				
Organic Matter, Percent			3.80				
ANIONS	**SULFUR:**	p.p.m.	24				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	420				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value Value Found Deficit	2076 2168				
	MAGNESIUM: lbs / acre	Desired Value Value Found Deficit	219 353				
	POTASSIUM: lbs / acre	Desired Value Value Found Deficit	238 237 -1				
	SODIUM:	lbs / acre	82				
BASE SATURATION %	Calcium (60 to 70%)		71.00				
	Magnesium (10 to 20%)		19.27				
	Potassium (2 to 5%)		3.98				
	Sodium (.5 to 3%)		2.33				
	Other Bases (Variable)		3.40				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		0.78				
	Iron (p.p.m.)		250				
	Manganese (p.p.m.)		32				
	Copper (p.p.m.)		6.09				
	Zinc (p.p.m.)		14.18				
	Aluminum (p.p.m.)		243				
OTHER							

Logan Labs, LLC

Soil Report

Job Name: **Rain Systems** Date: 1/8/2019

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			Ken Malloy				
Sample ID			Cntl				
Lab Number			132				
Sample Depth in inches			3				
Total Exchange Capacity (M. E.)			22.18				
pH of Soil Sample			8.2				
Organic Matter, Percent			3.91				
ANIONS	**SULFUR:**	p.p.m.	26				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	312				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value Value Found Deficit	3016 3092				
	MAGNESIUM: lbs / acre	Desired Value Value Found Deficit	319 566				
	POTASSIUM: lbs / acre	Desired Value Value Found Deficit	346 301 -45				
	SODIUM:	lbs / acre	121				
BASE SATURATION %	Calcium (60 to 70%)		69.70				
	Magnesium (10 to 20%)		21.26				
	Potassium (2 to 5%)		3.48				
	Sodium (.5 to 3%)		2.38				
	Other Bases (Variable)		3.20				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		0.87				
	Iron (p.p.m.)		196				
	Manganese (p.p.m.)		51				
	Copper (p.p.m.)		5.48				
	Zinc (p.p.m.)		12.76				
	Aluminum (p.p.m.)		255				
OTHER							

Logan Labs, LLC

Soil Report

Job Name: **Rain Systems Loren Miller Park** Date: 8/23/2018

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			LorenMiller				
Sample ID			RC				
Lab Number			103				
Sample Depth in inches			6				
Total Exchange Capacity (M. E.)			13.10				
pH of Soil Sample			7.6				
Organic Matter, Percent			4.78				
ANIONS	**SULFUR:**	p.p.m.	24				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	987				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value	3563				
		Value Found	3398				
		Deficit	-165				
	MAGNESIUM: lbs / acre	Desired Value	377				
		Value Found	653				
		Deficit					
	POTASSIUM: lbs / acre	Desired Value	408				
		Value Found	784				
		Deficit					
	SODIUM:	lbs / acre	177				
BASE SATURATION %	Calcium (60 to 70%)		64.84				
	Magnesium (10 to 20%)		20.77				
	Potassium (2 to 5%)		7.67				
	Sodium (.5 to 3%)		2.94				
	Other Bases (Variable)		3.80				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		0.8				
	Iron (p.p.m.)		437				
	Manganese (p.p.m.)		26				
	Copper (p.p.m.)		4.47				
	Zinc (p.p.m.)		24.55				
	Aluminum (p.p.m.)		272				
OTHER							

Logan Labs, LLC

Rain Systems – Loren Miller Park – Los Angeles, CA

Soil Testing Recommendations from August 2018:

Recreation Center Field Recommendations-

- Three (3) individual applications of Gypsum - Calcium Products SO4 @ 15#/1000 ft. Leach that night with at least 1 hour of water (or time application prior to flushing rainfall) to displace sodium. Apply Gypsum applications 3-4 weeks a part in schedule.

- Three (3) individual applications of Manganese sulfate (31%) @ 3#/1000 ft. Water in product thoroughly after application. Apply Manganese applications 3-4 weeks a part in schedule.

Soil Report

Job Name: **Rain Systems Loren Miller Park** Date: 1/30/2019

Company: Paul Cushing GC and Sports Turf Agronomics Submitted By: Paul Cushing

Sample Location			LorenMiller				
Sample ID			RC				
Lab Number			137				
Sample Depth in inches			4				
Total Exchange Capacity (M. E.)			12.84				
pH of Soil Sample			7.7				
Organic Matter, Percent			4.30				
ANIONS	**SULFUR:**	p.p.m.	25				
	Mehlich III Phosphorous:	as (P_2O_5) lbs / acre	685				
EXCHANGEABLE CATIONS	**CALCIUM:** lbs / acre	Desired Value Value Found Deficit	2328 2540				
	MAGNESIUM: lbs / acre	Desired Value Value Found Deficit	246 345				
	POTASSIUM: lbs / acre	Desired Value Value Found Deficit	267 256 -11				
	SODIUM:	lbs / acre	58				
BASE SATURATION %	Calcium (60 to 70%)		74.18				
	Magnesium (10 to 20%)		16.79				
	Potassium (2 to 5%)		3.83				
	Sodium (.5 to 3%)		1.47				
	Other Bases (Variable)		3.70				
	Exchangable Hydrogen (10 to 15%)		0.00				
TRACE ELEMENTS	Boron (p.p.m.)		1.14				
	Iron (p.p.m.)		375				
	Manganese (p.p.m.)		17				
	Copper (p.p.m.)		4.91				
	Zinc (p.p.m.)		20.43				
	Aluminum (p.p.m.)		248				
OTHER							

Logan Labs, LLC

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

SOIL MOISTURE READINGS

Soil Moisture readings taken with the Turf Tec International Digital Moisture Sensor soil water meter

TEST AREA #, STATION 40, KEN MALLOY HARBOR REGIONAL PARK								OVERALL	%
		09/24/18	10/10/18	11/12/18	11/14/18	12/13/18		AVERAGES	CHANGE
HIGH		198	196	199	195	194		196	-2.00%
LOW		150	110	144	150	160		143	6.60%
AVERAGE		186	178	185	179	177		181	-4.80%

TEST AREA 2, STATION 26, KEN MALLOY HARBOR REGIONAL PARK								OVERALL	%
	09/12/18	09/24/18	10/10/18	10/18/18	11/12/18	11/14/18		AVERAGES	CHANGE
HIGH	178	174	162	142	152	150		159	-15.70%
LOW	119	99	98	98	96	97		101	-19.80%
AVERAGE	159	155	141	127	135	144		144	-9.40%

Rain Systems Precision Injection Machine Water Conservation Pilot

APPENDIX B

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

SDS AND PROP 65 STATEMENTS

Hydrogel and calcium soil amendments were used during this study. This appendix includes the SDS and Prop 65 Statements for Soil Moist Hydrogels and Calcium Products used for reducing sodium in the soil.

1 Prop 65
Soil Moist Hydrogel (aka Cross-link polymer)
JRM Chemical

2 SDS
Soil Moist Hydrogel (aka Cross-link polymer)
JRM Chemical

3 SDS
SuperCal S04 Pelletized Gypsum
Calcium Products

4 Prop 65
SuperCal S04 Pelletized Gypsum
Calcium Products

5 SDS
SuperCal 98G Pelletized Limestone
Calcium Products

6 Prop 65
SuperCal 98G Pelletized Limestone
Calcium Products

Prop 65 Requirements for Soil Moist granules

Soil Moist is a copolymer of acrylic acid (Propenic acid) and acrylamide (2-Propenamide).

Initial product composition:

Component Name	**Component %**	**Prop 65 requirements[4]**
Polyacrylamide	18-20%	NOT LISTED CAS #9003-06-9 http://www.cas-no.org/9003-06-9
Propenic acid	8-10%	NOT LISTED CAS# 103455-29-4 http://www.cas-no.org/103455-29-4
Ammonium Persulfate (catalyst)	<0.01%	NOT LISTED CAS # 7727-54-0 http://www.cas-no.org/7727-54-0

Final product has less than 200ppm (< 200ppm) of acrylamide monomer.

ANSI Standard 60 for drinking water require the monomer to be less than 500 ppm (<500ppm). [1,2,3]

Degraded product composition:

Component Name	**Prop 65 requirements[4]**
Carbon Dioxide	NOT LISTED
Ammonium	NOT LISTED
Water	NOT LISTED

References:

1. NSF ANSI 60 (Page 28, Reference 4)
   https://www.nsf.org/newsroom_pdf/NSF-ANSI_60_watemarked.pdf

2. TREATMENT TECHNIQUES FOR ACRYLAMIDE AND EPICHLOROHYDRIN (40 CFR 141.111)
   https://www.gpo.gov/fdsys/pkg/CFR-2012-title40-vol24/pdf/CFR-2012-title40-vol24-sec141-111.pdf

3. OEHHA Acrylamide Daily Maximum Dosage: 140 micrograms/day
   https://oehha.ca.gov/media/downloads/proposition-65/chemicals/madl022610.pdf

4. The Proposition 65 List
   https://oehha.ca.gov/proposition-65/proposition-65-list

SAFETY DATA SHEET

Rev. 03/18/16
SDS 03

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY

Product name: Company:

Telephone: 216-475-8488
Fax: 216-475-6517
E-mail: jrm@en.com

Emergency 800-962-4010

SOIL MOIST™

JRM CHEMICAL INC
4881 NEO PARKWAY
CLEVELAND, OH 44128

Product Use: product aid in commercial applications.

2. HAZARDS IDENTIFICATION

Appearance and Odor:

Form: Granular solid
Color: White

Odor: None

Potential Health Effects:
None. See Section 11 for more information.

Potential Physical/Chemical Effects:
The product swells in water. The product when wet renders surfaces extremely slippery.

OSHA Regulatory Status:
This material is not considered hazardous in accordance with OSHA 29 CFR 1910.1200.

Potential Environmental Effects:
None. See Section 12 for more information.

Other information No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Identification:
Crosslinked polymer

Regulated Components:
None.

4. FIRST AID MEASURES

Inhalation: Move to fresh air.

Skin contact: Wash with water and soap as a precaution. Get medical attention if irritation develops and persists.

Eye contact: Rinse thoroughly with plenty of water, also under the eyelids. Get medical attention.

Ingestion: Rinse mouth with water. Do not induce vomiting.

5. FIRE FIGHTING MEASURES

Suitable extinguishing media: Water. Water spray. Foam. Dry powder. Carbon dioxide (CO2).

Unsuitable extinguishing media: None.

Precautions: The product swells in water The product when wet renders surfaces extremely slippery

Special protective equipment for firefighters: No special protective equipment required.

Specific methods: Keep personnel removed and upwind of fire.

Specific hazards: In the event of fire the following can be released: Nitrogen Oxides. Carbon Oxides.

Flash point (°C): Not applicable.

Auto ignition temperature (°C): Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: No special precautions required. The product swells in water. The product when wet renders surfaces extremely slippery

Environmental precautions: As with all chemical products, do not flush into surface water.

Methods for cleaning up: Do not flush with water. Clean up promptly by sweeping or vacuum Keep in suitable and closed containers for disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling: Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Wash hands before breaks and at the end of workday.

Storage: Keep in a dry, cool and well-ventilated place. The recommended storage temperature is 5-30 °C.

Technical measures/Precautions: No special precautions required.

Incompatible products: Strong oxidizing agents. Acids.

Technical measures/Storage conditions: No special storage conditions required.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits:
None.

Engineering measures: Use local exhaust if dusting occurs. Natural ventilation is adequate in absence of dusts.

Personal protective equipment:

Respiratory protection: Dust safety masks are recommended where concentration of total dust is more than 10 mg/m^3.

Hand protection: PVC or other plastic material gloves.

Eye protection: Safety glasses with side-shields. Do not wear contact lenses where this product is used.

Skin and body protection: Chemical resistant apron or protective suit if splashing or repeated contact with solution is likely.

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Granular solid
Color:	White
Odor:	None
pH:	5 - 8 @ 5 g/L
Melting point/range (°C):	> 150°C
Flash point (°C):	Not applicable.
Boiling point (°C):	Not applicable
Auto ignition temperature (°C):	Not applicable.
Vapor pressure (mm Hg):	Not applicable
Approx. bulk density:	0.6 - 0.9
Viscosity (mPa.s):	See Technical Bulletin
Water solubility:	Insoluble
LogPow:	-2

10. STABILITY AND REACTIVITY

Stability: Stable. Hazardous polymerization does not occur.

Materials to avoid: Strong oxidizing agents. Strong acids. Oxidizing agents may cause exothermic reactions.

Hazardous decomposition products: Thermal decomposition may produce: nitrogen oxides (NOx), carbon oxides (COx). Hydrogen cyanide (hydrocyanic acid).

11. TOXICOLOGICAL INFORMATION

Product Information

Acute toxicity:

Oral: LD50/oral/rat > 5000 mg/kg

Dermal: LD50/dermal/rat > 5000 mg/kg

Inhalation: The product is not expected to be toxic by inhalation.

Irritation:

Skin: Not irritating.

Eyes: Not irritating.

Sensitization: Not sensitizing.

Mutagenicity: Not mutagenic.

Carcinogenicity: Not carcinogenic.

Reproductive effects: Not toxic for reproduction.

Chronic toxicity: No chronic effects.

12. ECOLOGICAL INFORMATION

Product Information

Aquatic toxicity:

Toxicity to fish: LC50/Danio rerio/96 hours > 100 mg/L (OECD 203)

Toxicity to daphnia: EC50/Daphnia magna/48 hours > 100 mg/L (OECD 202)

Toxicity to algae: IC50/Scenedesmus subspicatus/72 hours > 100 mg/L (OECD 201)

Environmental fate:
Persistence and degradability: Not readily biodegradable.

Hydrolysis: Does not hydrolyze.

Bioaccumulation: Does not bioaccumulate.

LogPow: -2
LogKow: Not determined.

13. DISPOSAL CONSIDERATIONS

Disposal: Dispose of in accordance with local, state and federal regulations.

Container: Rinse empty containers with water and use the rinse water to prepare the working solution. Can be landfilled or incinerated, when in compliance with local, state and federal regulations.

14. TRANSPORT INFORMATION

DOT:
Not classified as dangerous in the meaning of DOT regulations.

IMDG/IMO:
Not classified as dangerous in the meaning of IMO/IMDG regulations.

ICAO/IATA:
Not classified as dangerous in the meaning of ICAO/IATA regulations.

15. REGULATORY INFORMATION

Product Information

US SARA Reporting Requirements: None.

RCRA status : Not RCRA hazardous.

SARA (Section 311/312) hazard class: Not concerned.

International Inventories:

USA (TSCA): All components of this product are either listed on the inventory or are exempt from listing.

China (IECSC): All components of this product are either listed on the inventory or are exempt from listing.

European Union (REACH): All components of this product have been registered or pre-registered with the European Chemicals Agency or are exempt from registration.

Australia (AICS): All components of this product are either listed on the inventory or are exempt from listing.

Japan (ENCS): All components of this product are either listed on the inventory or are exempt from listing.

Korea (ECL): Status not yet confirmed. For Research & Development purposes only.
Philippines (PICCS): Status not yet confirmed. For Research & Development purposes only

Taiwan (CSNN): All components of this product are either listed on the inventory or are exempt from listing.

New Zealand (NZIoC): All components of this product are either listed on the inventory or are exempt from listing.

16. OTHER INFORMATION

16. OTHER INFORMATION
NFPA and HMIS Ratings:

NFPA:

Health:	1
Flammability:	1
Instability:	0

HMIS:

Health:	1
Flammability:	1
Physical Hazard:	0
PPE Code:	B

This MSDS was prepared in accordance with the following:
ISO 11014-1: Material Safety Data Sheet for Chemical Products
ANSI Z400.1-2004; Material Safety Data Sheets - Preparation

Revision Number: 03

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Product Name: SuperCal 98G **Updated: June 2015**

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

Manufacturer:	Calcium Products, 2520 N. Loop Dr. #7100, Ames, IA 50010
Product Name:	SuperCal 98G
Common Name:	Calcium carbonate, limestone
Chemical Name:	Calcium carbonate
Chemical formula:	$CaCO_3$
Chemical Type:	Mineral ore
Emergency Contact:	(800) 255-8196 (M – F, 7:30am – 4:30pm CST)
Poison Control:	(800) 222-1222 (24 hrs)

Section 2 – HAZARDS IDENTIFICATION

DESCRIPTION: Brown granular mix with slight mineral odor.

HEALTH HAZARDS: May be irritating to the respiratory tract, eyes, and skin. Ingestion may cause gastrointestinal upset.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory, skin, or eye conditions.

EYE CONTACT: Direct contact with dust may cause irritation by mechanical abrasion.

SKIN CONTACT: Direct contact may cause irritation by mechanical abrasion.

INGESTION: If ingested, intestinal obstruction may occur if the material hardens, especially in the pyloric region.

INHALATION: Dusts may irritate the nose, throat, and respiratory tract by mechanical abrasion. Coughing, sneezing, and shortness of breath may occur following exposures in excess of appropriate exposure limits.

Section 3 – COMPOSITION & INFORMATION ON INGREDIENTS

INGREDIENTS	CAS REGISTRY#	% BY WEIGHT	MSHA/OSHA PEL	ACGIH TLV
Calcium carbonate	1317-65-3	85-95%	(T) 15 mg/m^3	(I) 10 mg/m^3
Calcium lignosulfonate	8061-52-7	1-2%		

(T) = total dust (I) = inhalable fraction

Section 4 – FIRST AID MEASURES

EYES: In case of contact, immediately flush eyes with water for a minimum of 15 minutes. Warm water is recommended but cold water may be used.

SKIN: In case of skin contact, immediately rinse area with water. Cover irritated are with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Seek medical attention if irritation persists.

INGESTION: Small amounts of (a tablespoon) swallowed during normal handling operations are not likely to cause injury or irritation. Ingestion of large amounts may cause gastrointestinal irritation and blockage. Seek medical attention if conditions worsen.

INHALATION: If a person inhales a large amount of nuisance dust, move exposed person to fresh air at once. Other measures are usually unnecessary.

Section 5 – FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: Not flammable or combustible. NFPA Hazard Class No: 1/0/0

EXTINGUISHING AGENT: Dry chemical, foam, water, fog or spray.

FLAMMABLE LIMITS IN AIR: Not flammable.

UNUSUAL FIRE AND EXPLOSION HAZARD: None.

Section 6 – ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Use dry methods to collect spilled materials, and reuse clean materials. Avoid generating dust. Do not clean up with compressed air. Minimize dust by evacuating area downwind in the case of large spills. Store contaminated materials in dry, sealed plastic or non-aluminum metal containers. Residues on surfaces may be washed with water.

None of the components in this product are subject to the reporting requirements of Title III or SARA, 1986 and 40 CFR 372.

Section 7 – HANDLING AND STORAGE

Store in a cool, dry, well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture.

Respirable quartz containing dust may be generated during processing, handling, and storage. Do not breathe dust and avoid contact with skin or eyes.

Section 8 – EXPOSURE CONTROL & PERSONAL PROTECTION

RESPIRATORY PROTECTION: NIOSH approved particulate respirator if required.

EYE PROTECTION: Safety glasses with side shield, goggles, or face mask recommended.

SKIN PROTECTION: No personal protection is recommended.

VENTILATION: Local exhaust ventilation recommended.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Light brown granular mix with slight detectable odor.

SPECIFIC GRAVITY: 2.7 – 2.9 g/cc pH: 7.66

BOILING POINT: N/A VAPOR PRESURE: N/A

VAPOR DENSITY IN AIR: N/A FLASH POINT: Not flammable.

EVAPORATION RATE: Zero SOLUBILITY IN WATER: Negligible

Section 10 – STABILITY AND REACTIVITY

STABILITY: Stable CONDITIONS TO AVOID: Temperatures above 825°C

INCOMPATABILITY (Materials to avoid):
Material is soluble in acid with concomitant release of carbon dioxide. Avoid exposure to acids.

HAZARDOUS DECOMPOSITION PRODUCTS:
When heated to high temperatures above 825°C, product may decompose to calcium oxide with release of carbon dioxide.

Section 11 – TOXICOLOGICAL INFORMATION

Calcium carbonate

NOTE: Calcium Products has not conducted specific toxicity tests on this product.

Exposure route: Inhalation, skin, and/or eye contact.

Target organs: Eyes, skin, respiratory system.

Acute Effect: Calcium carbonate dust has an irritant effect on eyes, skin, and respiratory system. It has been reported that there may be a silicosis risk when using impure limestone containing an excess of 3% quarts. However, it is claimed that pure calcium carbonate does not cause pneumoconiosis. Adverse health effects have generally not been reported in literature among workers exposed to $CaCO_3$.

Section 12 – ECOLOGICAL INFORMATION

Calcium carbonate

Note: Calcium Products has not conducted specific ecological tests on this product. The product is also used as an animal feed ingredient and agricultural liming material.

Section 13 – DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD

Calcium carbonate (limestone) is not classified as a hazardous waste under RCTA Section 3001. Use normal waste disposal procedures that are in compliance with federal, state, and local regulations.

Section 14 – TRANSPORT INFORMATION

DOT HAZARD CLASSIFICATION: None

PLACARD REQUIRED: None

LABEL REQUIRED: Label as required by OSHA Hazards Communication Standard [29 CFR 1910.1200 (f)] and applicable state and local regulations.

Section 15 – REGULATORY INFORMATION

FDA: Product is manufactured for agricultural applications. As such, FDA regulations do not apply.

Section 16 – OTHER INFORMATION

Revised June 2015
CFR: US Code of Federal Regulations
DOT: Department of Transportation
IARC: International Agency for Research on Cancer
IDLH: Immediately Dangerous to Life and Health
NIOSH: National Institute for Occupational Safety and Health, US Department of Health and Human Services
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limits
SARA Title III: Title III of the Superfund Amendments and Reauthorization Act, 1986
TLV: Threshold Limit Value
TWA: Time-weighted Average
FDA: Food and Drug Administration

CALCIUM PRODUCTS™

Proposition 65 Requirements for SuperCal 98G Pelletized Limestone (all grades)

Component Name	Component %	Prop 65 Requirements[1]
Calcium carbonate (limestone)	98%	NOT LISTED CAS# 1317-65-3 http://www.cas-no.org/1317-65-3
Calcium lignosulfonate	1-2%	NOT LISTED CAS# 8061-52-7 http://www.cas-no.org/8061-52-7

Degraded product composition does not differ from initial product composition.

References:

1. The Proposition 65 List:
https://oehha.ca.gov/proposition-65/proposition-65-list

Signed,

Andrew Hoiberg, Ph.D.
V.P., Research & Development

Product Name: SuperCal SO4 **Updated: June 2015**

Section 1 – PRODUCT AND COMPANY IDENTIFICATION

Manufacturer:	Calcium Products, 2520 N. Loop Dr. #7100, Ames, IA 50010
Product Name:	SuperCal SO4
Common Name:	Calcium sulfate dihydrate, gypsum
Chemical Name:	Calcium sulfate dihydrate
Chemical formula:	$CaSO_4 \bullet 2H_2O$
Chemical Type:	Mineral ore
Emergency Contact:	(800) 255-8196 (M – F, 7:30am – 4:30pm CST)
Poison Control:	(800) 222-1222 (24 hrs)

Section 2 – HAZARDS IDENTIFICATION

DESCRIPTION: Brown granular mix with slight mineral odor.

HEALTH HAZARDS: May be irritating to the respiratory tract, eyes, and skin. Ingestion may cause gastrointestinal upset.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory, skin, or eye conditions.

EYE CONTACT: Direct contact with dust may cause irritation by mechanical abrasion.

SKIN CONTACT: Direct contact may cause irritation by mechanical abrasion.

INGESTION: If ingested, intestinal obstruction may occur if the material hardens, especially in the pyloric region.

INHALATION: Dusts may irritate the nose, throat, and respiratory tract by mechanical abrasion. Coughing, sneezing, and shortness of breath may occur following exposures in excess of appropriate exposure limits.

Section 3 – COMPOSITION & INFORMATION ON INGREDIENTS

INGREDIENTS	CAS REGISTRY#	% BY WEIGHT	MSHA/OSHA PEL	ACGIH TLV
Calcium sulfate dihydrate	10101-41-4	85-95%	(T) 15 mg/m^3	(I) 10 mg/m^3
Calcium lignosulfonate	8061-52-7	1-2%		

(T) = total dust (I) = inhalable fraction

Section 4 – FIRST AID MEASURES

EYES: In case of contact, immediately flush eyes with water for a minimum of 15 minutes. Warm water is recommended but cold water may be used.

SKIN: In case of skin contact, immediately rinse area with water. Cover irritated are with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Seek medical attention if irritation persists.

INGESTION: Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention of contact poison control center immediately.

INHALATION: If a person inhales a large amount of nuisance dust, move exposed person to fresh air at once. Other measures are usually unnecessary.

Section 5 – FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES: Not flammable or combustible. NFPA Hazard Class No: 1/0/0

EXTINGUISHING MEDIA: Dry chemical, foam, water, fog or spray.

FLAMMABLE LIMITS IN AIR: Not flammable.

UNUSUAL FIRE AND EXPLOSION HAZARD: None.

HAZARDOUS COMBUSTION PRODUCTS: None. Above 1450°C, material can decompose and release sulfur dioxide (SO_2) and oxides of carbon.

Section 6 – ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Use dry methods to collect spilled materials, and reuse clean materials. Avoid generating dust. Do not clean up with compressed air. Minimize dust by evacuating area downwind in the case of large spills. Store contaminated materials in dry, sealed plastic or non-aluminum metal containers. Residues on surfaces may be washed with water.

None of the components in this product are subject to the reporting requirements of Title III or SARA, 1986 and 40 CFR 372.

Section 7 – HANDLING AND STORAGE

Ensure proper ventilation, and respiratory and eye protection are used under dusty conditions. Dew point conditions or other conditions causing presence of moisture will harden gypsum during storage. Excessive particulate concentrations in workplace must be avoided even though it is inert and non-toxic.

Section 8 – EXPOSURE CONTROL & PERSONAL PROTECTION

RESPIRATORY PROTECTION: NIOSH approved particulate respirator if required.

EYE PROTECTION: Safety glasses with side shield, goggles, or face mask recommended.

SKIN PROTECTION: Long sleeves, cotton gloves recommended.

VENTILATION: Local exhaust ventilation recommended.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Light brown granular mix with slight detectable odor.

SPECIFIC GRAVITY: 2.6 – 2.75 g/cc pH: 6.72

BOILING POINT: N/A VAPOR PRESURE: N/A

VAPOR DENSITY IN AIR: N/A FLASH POINT: Not flammable.

EVAPORATION RATE: Zero SOLUBILITY IN WATER: 2.1 g/L @ 20°C

Section 10 – STABILITY AND REACTIVITY

STABILITY: Stable CONDITIONS TO AVOID: Items listed under Incompatibility.

INCOMPATABILITY (Materials to avoid):
Aluminum (at high temperatures), diazomethane

HAZARDOUS DECOMPOSITION PRODUCTS:
When heated to high temperatures above 825°C, gypsum may emit toxic fumes of oxides of sulfur and calcium.

Section 11 – TOXICOLOGICAL INFORMATION

Calcium sulfate dihydrate

Exposure route: Inhalation, skin, and/or eye contact.

Target organs: Eyes, skin, respiratory system.

Acute Effect: Calcium sulfate dihydrate dust has an irritant action on mucous membranes of the respiratory tract and eyes. There have been reports of conjunctivitis, chronic rhinitis, laryngitis, pharyngitis, impaired sense of smell and taste, bleeding from the nose and reactions of tracheal and bronchial membranes in exposed workers.

Section 12 – ECOLOGICAL INFORMATION

No data available.

Section 13 – DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD

May be disposed of as an inert solid in sanitary landfill or by other procedures in accordance with all federal, state, and local regulations. May be used as a supplement on land and on some agricultural products.

Section 14 – TRANSPORT INFORMATION

DOT HAZARD CLASSIFICATION: None

PLACARD REQUIRED: None

LABEL REQUIRED: Label as required by OSHA Hazards Communication Standard [29 CFR 1910.1200 (f)] and applicable state and local regulations.

Section 15 – REGULATORY INFORMATION

FDA: Product is manufactured for agricultural applications. As such, FDA regulations do not apply.

Section 16 – OTHER INFORMATION

Revised June 2015
CFR: US Code of Federal Regulations
DOT: Department of Transportation
IARC: International Agency for Research on Cancer
IDLH: Immediately Dangerous to Life and Health
NIOSH: National Institute for Occupational Safety and Health, US Department of Health and Human Services
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PEL: Permissible Exposure Limits
SARA Title III: Title III of the Superfund Amendments and Reauthorization Act, 1986
TLV: Threshold Limit Value
TWA: Time-weighted Average
FDA: Food and Drug Administration

CALCIUM PRODUCTS™

Proposition 65 Requirements for SuperCal 98G Pelletized Limestone (all grades)

Component Name	Component %	Prop 65 Requirements[1]
Calcium carbonate (limestone)	98%	NOT LISTED CAS# 1317-65-3 http://www.cas-no.org/1317-65-3
Calcium lignosulfonate	1-2%	NOT LISTED CAS# 8061-52-7 http://www.cas-no.org/8061-52-7

Degraded product composition does not differ from initial product composition.

References:

1. The Proposition 65 List:
https://oehha.ca.gov/proposition-65/proposition-65-list

Signed,

Andrew Hoiberg, Ph.D.
V.P., Research & Development

APPENDIX C

RAIN SYSTEMS PRECISION INJECTION MACHINE WATER CONSERVATION PILOT

WEATHER AND WATER DATA FOR ALL TEST AREAS

Item #	Description
1	Compilation of all weather and water data for Test Area #1 Test Area #1, Station 40, Ken Malloy Harbor Regional Park October, 2017 - December, 2018
2	Monthly Compilations of weather and water data for Test Area #1 Test Area #1, Station 40, Ken Malloy Harbor Regional Park October, 2017 - December, 2018
3	Compilation of all weather and water data for Test Area #2 Test Area #2, Station 26, Ken Malloy Harbor Regional Park August, 2018 - December, 2018
4	Monthly Compilations of weather and water data for Test Area #2 Test Area #2, Station 26, Ken Malloy Harbor Regional Park August, 2018 - December, 2018
5	CIMIS Long Beach ET Rates and Precipitation for Test Area #1 and Test Area #2 October, 2017 - December, 2018
6	Compilation of all weather data forTest Area #3 Test Area #3, Loren Miller Recreation Center August, 2018 - December, 2018
7	CIMIS #159 Monrovia ET & Humidity Rates for Test Area #3, Loren Miller Recreation Center August, 2018 - December, 2018

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2017 - DECEMBER 2018

AVERAGE REDUCTION: 47%

MONTH	WEATHER DATA						STATION 40	3,978 SqFt	20 lbs hydrogel		
	MAX	MIN	MEAN	Precip	Avg Humidity	CIMIS ETo	GPM Control	GPM Test Area #1	Water Savings	Water Savings	Water Savings
	(℉)	(℉)	(℉)	(in)	(%)	(in.)	Water Usage (gallons)	Water Usage (gallons)	(gallons)	%	($) .01366/gallon
2017											
October	82	75	79	0	46	3.87	Installation on October 17, irrigation reduction on November 8				
November (1)	75	66	70	0.04	59	2.24	6,339	2,926	3,413	54%	$46.62
December	73	65	69	0.06	36	2.03	8,777	4,388	4,388	50%	$59.95
2018											
January	71	64	67	0.00	46	2.18	7,802	3,901	3,901	50%	$53.28
February	70	62	66	0.00	40	3.09	7,802	3,901	3,901	50%	$53.28
March	67	61	64	0.00	60	3.61	11,215	4,388	6,826	61%	$93.25
April	72	66	69	0.04	53	5.25	10,240	3,901	6,339	62%	$86.59
May	72	67	70	0.04	63	5.13	10,727	4,388	6,339	59%	$86.59
June	77	72	75	0.00	61	5.93	10,727	6,339	4,388	41%	$59.95
July	87	81	84	0.00	58	6.88	10,727	6,339	4,388	41%	$59.95
August	87	80	83	0.00	59	6.24	10,727	6,826	3,901	36%	$53.28
September	81	75	78	0.00	63	4.75	10,727	5,851	4,876	45%	$66.61
October	79	72	75	0.46	58	3.70	10,240	6,826	3,413	33%	$46.62
November	83	74	78	1.21	53	2.65	9,752	5,851	3,901	40%	$53.28
December	67	60	63	1.56	53	1.91	8,289	5,851	2,438	29%	$33.30
Averages (2)	76	69	73		54	4.28	9,752	5,213	4,539	47%	
Total				3.41		59.46	134,090	71,677	62,413	47%	$853
$ Savings/SqFt/Year (3)											$0.19
$ Projected Savings / Acre / Year (4)											$8,148
Water Savings/1000 SqFt/Year									13,693	Gallons/1000 SqFt/Yr	
Water Savings/Acre/Year									596,452	Gallons/Acre/Yr	

(1) November water savings based on 11/8-11/30

(2) Average Water Usage (gallons) were computed as 13.75 months

(3) Savings/SqFt/Year was computed as (Savings/SqFt/13.75 months) x 12 months a year

(4) Savings/Acre/Year is based on Savings/SqFt/Year x 43,560 (SqFt/Acre) x .01366

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

Data Back up	APPENDIX C	***Sources***	
CIMIS ETo	Evapotranspiration Rate	Daily Data	https://www.timeanddate.com/weather/@5362754/historic?month=12&year=2017
GPM Control	Gallons per Month - Other Park Stations	Daily Data	https://www.wunderground.com/weather/us/ca/lomita/90717
GPM Test Area #1	Gallons per Month, Test Area #1, Station 40	ET Rates	http://www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2017									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
Date	10/1	10/2	10/3	10/4	10/5	10/6	10/7		
GPC Control	488		488		488		488		1950
GPC Pilot Area	488		488		488		488		1950
Max Temp	97	95	84	75	77	75	77		83
Min Temp	84	86	77	70	70	64	72		75
Mean Temp	91	91	81	73	74	70	75		79
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	14	14	23	45.5	66	68	45		39
Date	10/8	10/9	10/10	10/11	10/12	10/13	10/14		
GPC Control	488		488		488		488		1950
GPC Pilot Area	488		488		488		488		1950
Max Temp	97	95	84	75	77	75	77		83
Min Temp	84	86	77	70	70	64	72		75
Mean Temp	91	91	81	73	74	70	75		79
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	14	14	23	45.5	66	68	45		39
	*Installed hydrogel into Station 40 on October 16 - 17								
Date	10/15	10/16	10/17	10/18	10/19	10/20	10/21		
GPC Control	488		488		488		488		1950
GPC Pilot Area	488		488		488		488		1950
Max Temp	97	95	84	75	77	75	77		83
Min Temp	84	86	77	70	70	64	72		75
Mean Temp	91	91	81	73	74	70	75		79
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	14	14	23	45.5	66	68	45		39
Date	10/22	10/23	10/24	10/25	10/26	10/27	10/28		
GPC Control	488		488		488		488		1950
GPC Pilot Area	488		488		488		488		1950
Max Temp	91	102	103	100	91	84	79		93
Min Temp	84	93	97	90	82	77	70		85
Mean Temp	88	98	100	95	87	81	75		89
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	18	14	19	13	21	33	72.5		27
Date	10/29	10/30	10/31						
GPC Control	488		488						975
GPC Pilot Area	488		488						975
Max Temp	72	70	68						70
Min Temp	66	66	66						66
Mean Temp	69	68	67						68
Precipitation	0	0	0						0
Avg Humidity	76	71	71						73
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
October 2017.	3.87	82	75	79	0	46	8777	8777	0

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

NOVEMBER 2017									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
				11/1	11/2	11/3	11/4		
GPC Control					488		488		975
GPC Pilot Area				488		488	488		1463
Max Temp				72	66	72	72		71
Min Temp				66	64	66	66		66
Mean Temp				69	65	69	69		68
Precipitation				0	0	0	0		0
Avg Humidity				63	63.5	54	62		61
	*reduced irrigation from 4 days to 2 days per week on 11/8/17								
	11/5	11/6	11/7	11/8	11/9	11/10	11/11		
GPC Control	488		488		488		488		975
GPC Pilot Area	488		488				488		488
Max Temp	70	72	73	77	72	70	72		72
Min Temp	63	64	66	64	64	63	63		64
Mean Temp	67	68	70	71	68	67	68		68
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	70	62	53.5	57.5	65.5	64	64		62
	11/12	11/13	11/14	11/15	11/16	11/17	11/18		
GPC Control	488		488		488		488		1950
GPC Pilot Area			488				488		975
Max Temp	70	72	75	79	79	72	77		75
Min Temp	63	63	66	68	70	64	64		65
Mean Temp	67	68	71	74	75	68	71		70
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	81	68	61	62	54	77	66		67
	11/19	11/20	11/21	11/22	11/23	11/24	11/25		
GPC Control	488		488		488		488		1950
GPC Pilot Area			488				488		975
Max Temp	75	73	88	93	91	84	82		84
Min Temp	63	66	73	77	73	72	66		70
Mean Temp	69	70	81	85	82	78	74		77
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	35	61	43	26	24	37	45		39
	11/26	11/27	11/28	11/29	11/30				
GPC Control	488		488		488				1463
GPC Pilot Area			488						488
Max Temp	70	68	73	73	75				72
Min Temp	61	63	64	63	63				63
Mean Temp	66	66	69	68	69				67
Precipitation	0	0	0	0	0				0
Avg Humidity	85	66	52	68	67				68
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
November 2017.	2.24	75	66	70	0.04	59	6339	2926	3413
							*11/8/-11/30		

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

DECEMBER 2017									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
						12/1	12/2		
GPC Control							488		488
GPC Pilot Area							488		488
Max Temp						73	75		74
Min Temp						63	63		63
Mean Temp						68	69		69
Precipitation						0	0		0
Avg Humidity						54.5	51.5		53
	12/3	12/4	12/5	12/6	12/7	12/8	12/9		
GPC Control	488		488		488		488		1950
GPC Pilot			488				488		975
Max Temp	68	72	72	75	77	77	82		75
Min Temp	61	64	64	63	66	64	66		64
Mean Temp	65	68	68	69	72	71	74		69
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	68	36	14	20	19	20	18.5		28
	12/10	12/11	12/12	12/13	12/14	12/15	12/16		
GPC Control	488		488		488		488		1950
GPC Pilot Area			488				488		975
Max Temp	82	81	82	81	75	81	66		78
Min Temp	70	64	64	66	64	64	59		64
Mean Temp	76	73	73	74	70	73	63		71
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	16	11	17	16	26	15	59		23
	12/17	12/18	12/19	12/20	12/21	12/22	12/23		
GPC Control	488		488		488		488		1950
GPC Pilot Area			488				488		975
Max Temp	72	72	70	59	63	64	66		67
Min Temp	70	70	66	59	61	63	63		65
Mean Temp	71	71	68	59	62	64	65		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	19.5	22.5	46.5	71	26	25	27		34
	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	
GPC Control	488		488		488		488	488	2438
GPC Pilot Area			488				488		975
Max Temp	73	68	66	75	79	82	72	66	73
Min Temp	72	66	63	73	79	81	72	64	71
Mean Temp	73	67	65	74	79	82	72	65	72
Precipitation	0	0	0	0	0	0	0	0	0
Avg Humidity	33.5	46	57.5	43	42.5	22	46	58	44

		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
December 2017.	2.03	73	65	69	0.06	36	8777	4388	4388

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

JANUARY 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
Date		1/1	1/2	1/3	1/4	1/5	1/6		
GPC Control			488		488		488		1463
GPC Pilot			488				487.6		975
Max Temp		70	75	73	73	72	68		72
Min Temp		59	61	64	64	61	63		62
Mean Temp		65	68	69	69	67	66		67
Precipitation		0	0	0	0	0	0		0
Avg Humidity		64	61	36	45	70	82		60
Date	1/7	1/8	1/9	1/10	1/11	1/12	1/13		
GPC Control	488				488		488		1463
GPC Pilot							487.6		488
Max Temp	73	68	61	64	70	72	84		70
Min Temp	63	61	54	59	61	63	72		62
Mean Temp	68	65	58	62	66	68	78		66
Precipitation	0.00	0.24	1.24	0.00	0.00	0.00	0.00		1.48
Avg Humidity	71.5	77	91	73	68	64	27.5		67
Date	1/14	1/15	1/16	1/17	1/18	1/19	1/20		
GPC Control	488		488		488		488		1950
GPC Pilot			488				487.6		975
Max Temp	81	70	1	77	75	63	61		61
Min Temp	68	66	63	66	66	59	57		64
Mean Temp	75	68	32	72	71	61	59		62
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	25	54	62	48	43	74	26		47
Date	1/21	1/22	1/23	1/24	1/25	1/26	1/27		
GPC Control	488		488		488		488		1950
GPC Pilot			488				487.6		975
Max Temp	63	68	73	73	63	66	73		68
Min Temp	55	61	64	64	59	63	66		62
Mean Temp	59	65	69	69	61	63	70		65
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	31	28	23	23	65	42.5	21		33
Date	1/28	1/29	1/30	1/31					
GPC Control	488		488						975
GPC Pilot			488						488
Max Temp	82	86	82	79					82
Min Temp	73	75	70	68					72
Mean Temp	59	65	69	69					66
Precipitation	0	0	0	0					0
Avg Humidity	24	19	18	23					21
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
JANUARY 2018	2.18	71	64	67	1.48	46	7802	3901	3901

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

FEBRUARY 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
Date					2/1	2/2	2/3		
GPC Control					488		488		975
GPC Pilot							487.6		488
Max Temp					77	82	79		79
Min Temp					66	70	66		67
Mean Temp					72	63	73		69
Precipitation					0	0	0		0
Avg Humidity					32	29	37		33
Date	2/4	2/5	2/6	2/7	2/8	2/9	2/10		
GPC Control	488		488		488		488		1950
GPC Pilot			488				487.6		975
Max Temp	81	75	72	81	82	66	73		76
Min Temp	66	72	63	64	70	63	66		66
Mean Temp	74	74	68	73	76	63	70		71
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	40.5	57	67	37	19	65	66.5		50
Date	2/11	2/12	2/13	2/14	2/15	2/16	2/17		
GPC Control	488		488		488		488		1950
GPC Pilot			488				487.6		975
Max Temp	72	61	66	68	72	73	73		69
Min Temp	61	57	61	63	64	64	64		62
Mean Temp	67	59	64	66	68	63	69		65
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	54.5	59	45	48	45	18.5	25		42
Date	2/18	2/19	2/20	2/21	2/22	2/23	2/24		
GPC Control	488		488		488		488		1950
GPC Pilot			488				487.6		975
Max Temp	70	57	59	61	61	57	61		61
Min Temp	66	52	54	55	55	54	54		56
Mean Temp	68	55	57	58	58	56	58		58
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	53.5	30	22	31	47	25	27.5		34
Date	2/25	2/26	2/27	2/28					
GPC Control	488		488						975
GPC Pilot			488						488
Max Temp	68	66	55	61					63
Min Temp	61	64	54	55					59
Mean Temp	65	65	55	58					61
Precipitation	0.00	0.00	0.00	0.00					0.00
Avg Humidity	32	45	52	31					40
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
FEBURARY 2018	3.09	70	62	66	0.00	40	7802	3901	3901

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

MARCH 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
Date					3/1	3/2	3/3		
GPC Control					488	488	488		1463
GPC Pilot							487.6		488
Max Temp					63	59	61		61
Min Temp					55	55	55		55
Mean Temp					59	57	58		58
Precipitation					0.00	0.00	0.30		0.30
Avg Humidity					55	91	69.5		72
Date	3/4	3/5	3/6	3/7	3/8	3/9	3/10		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				487.6		975
Max Temp	61	72	77	72	73	72	63		70
Min Temp	55	64	68	64	63	63	57		62
Mean Temp	58	68	73	68	68	63	60		65
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	44.5	21	18	30	38	69	87.5		44
Date	3/11	3/12	3/13	3/14	3/15	3/16	3/17		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				487.6		975
Max Temp	68	72	70	64	64	61	61		66
Min Temp	63	61	63	63	63	59	57		61
Mean Temp	66	67	67	64	64	63	59		64
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	78	76	81	67	48	60.5	58		67
Date	3/18	3/19	3/20	3/21	3/22	3/23	3/24		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				487.6		975
Max Temp	64	73	72	64	63	68	64		67
Min Temp	57	66	64	64	59	64	61		62
Mean Temp	61	70	68	64	61	66	63		65
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	56	38	42	77	90	75	62		63
Date	3/25	3/26	3/27	3/28	3/29	3/30	3/31		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	64	64	75	73	72	75	70		70
Min Temp	61	61	72	70	68	68	63		66
Mean Temp	63	63	74	72	70	72	67		68
Precipitation	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Avg Humidity	62	62	20	39	68	68	68		55
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
MARCH . 2018	3.61	67	61	64	0.30	60	11215	4388	6826

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

APRIL 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
	4/1	4/2	4/3	4/4	4/5	4/6	4/7		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	66	70	70	66	66	68	72		68
Min Temp	61	63	64	59	63	64	64		63
Mean Temp	64	67	67	63	65	66	68		65
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	62	62	20	39	68	68	68		55
	4/8	4/9	4/10	4/11	4/12	4/13	4/14		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	73	93	88	79	70	79	86		81
Min Temp	70	84	79	66	68	73	77		74
Mean Temp	72	89	84	73	69	76	82		78
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	58.5	27.5	38	57	31	23	18		36
	4/15	4/16	4/17	4/18	4/19	4/20	4/21		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	77	67	70	72	63	73	81		72
Min Temp	72	61	66	64	61	64	70		65
Mean Temp	75	64	68	68	62	69	76		69
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	32	55.5	33	40	58	59	49		47
	4/22	4/23	4/24	4/25	4/26	4/27	4/28		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	79	75	70	70	72	68	68		72
Min Temp	72	61	66	64	61	64	70		65
Mean Temp	76	68	68	67	67	66	69		69
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	50.5	65.5	77	63	64	62	64		64
	4/29	4/30							
GPC Control	488								488
GPC Pilot									0
Max Temp	68	66							67
Min Temp	64	63							63.5
Mean Temp	66	65							65.25
Precipitation	0	0							0
Avg Humidity	68	64							66
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
APRIL . 2018	5.25	72	66	69	0.04	53	10240	3901	6339

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

MAY 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
			5/1	5/2	5/3	5/4	5/5		
GPC Control			488		488	488	488		1950
GPC Pilot			488				488		975
Max Temp			61	64	70	90	84		74
Min Temp			57	61	66	79	75		68
Mean Temp			59	63	68	85	80		71
Precipitation			0	0	0	0	0		0
Avg Humidity			67	68	58	40	41		55
	5/6	5/7	5/8	5/9	5/10	5/11	5/12		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	81	75	75	72	75	64	66		73
Min Temp	70	72	72	68	70	63	64		68
Mean Temp	76	74	74	70	73	64	65		71
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	55.5	61	68	67	67	72	68		65
	5/13	5/14	5/15	5/16	5/17	5/18	5/19		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	70	68	72	73	72	70	68		70
Min Temp	59	66	66	70	68	66	64		66
Mean Temp	65	67	69	72	70	68	66		68
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	70.5	64	61	55	60	66	72		64
	5/20	5/21	5/22	5/23	5/24	5/25	5/26		
GPC Control	488		488		488	488	488		2438
GPC Pilot			488				488		975
Max Temp	70	66	68	70	66	68	70		68
Min Temp	64	64	64	64	63	66	66		64
Mean Temp	67	65	66	67	65	67	68		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	68.5	74	65	71	76	61	59		68
	5/27	5/28	5/29	5/30	5/31				
GPC Control	488		488		488				1463
GPC Pilot			488						488
Max Temp	81	75	75	72	75				76
Min Temp	70	72	72	68	70				70
Mean Temp	76	74	74	70	73				73
Precipitation	0	0	0	0	0				0
Avg Humidity	63.5	60.5	72	63	64				65
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
MAY. 2018	5.13	72	67	70	0.04	63	10727	4388	6339

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

JUNE 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
						6/1	6/2		
GPC Control						488	488		975
GPC Pilot							488		488
Max Temp						73	79		76
Min Temp						70	73		72
Mean Temp						72	76		74
Precipitation						0	0		0
Avg Humidity						59	50		54
	6/3	6/4	6/5	6/6	6/7	6/8	6/9		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	79	77	72	73	75	81	81		77
Min Temp	72	72	68	70	72	77	75		72
Mean Temp	76	75	70	72	74	79	78		75
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	63.5	64.5	70	68	60	50	60		62
	6/10	6/11	6/12	6/13	6/14	6/15	6/16		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	79	81	82	79	88	81	73		80
Min Temp	75	79	75	75	75	72	68		74
Mean Temp	77	80	79	77	82	77	71		77
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	59	52	62	67	60	61	60		60
	6/17	6/18	6/19	6/20	6/21	6/22	6/23		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	70	72	73	79	77	77	73		74
Min Temp	64	70	72	73	72	72	72		71
Mean Temp	67	71	73	76	75	75	73		73
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	64	59.5	64	67	67	71	73		66
	6/24	6/25	6/26	6/27	6/28	6/29	6/30		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	75	79	77	81	79	79	79		78
Min Temp	73	73	72	75	73	73	73		73
Mean Temp	74	76	75	78	76	76	76		76
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	65	60.5	60	63	63	63	63		63
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
JUNE. 2018	5.93	77	72	75	0	61	10727	6339	4388

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

JULY 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
	7/1	7/2	7/3	7/4	7/5	7/6	7/7		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	79	75	77	81	88	108	102		87
Min Temp	73	73	73	75	82	102	91		81
Mean Temp	76	74	75	78	85	105	97		84
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	61	62	60	56	50	28	40		51
	7/8	7/9	7/10	7/11	7/12	7/13	7/14		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	97	95	91	88	86	82	82		89
Min Temp	90	86	82	82	79	79	79		82
Mean Temp	94	91	87	85	83	81	81		86
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	37	43	56	58	60	64	61		54
	7/15	7/16	7/17	7/18	7/19	7/20	7/21		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	86	82	81	82	84	81	81		82
Min Temp	81	79	75	75	79	79	79		78
Mean Temp	84	81	78	79	82	80	80		80
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	61	66	68	68	63	60	61		64
	7/22	7/23	7/24	7/25	7/26	7/27	7/28		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	88	93	93	90	84	84	84		88
Min Temp	81	84	84	82	79	82	79		82
Mean Temp	85	89	89	86	82	83	82		85
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	56	51	52	64	68	64	65		60
	7/29	7/30	7/31						
GPC Control	488		488						975
GPC Pilot		488							488
Max Temp	91	84	88						88
Min Temp	82	82	82						82
Mean Temp	87	83	85						85
Precipitation	0	0	0						0
Avg Humidity	56	64	64						61
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
JULY. 2018	6.88	87	81	84	0	58	10727	6339	4388

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
				8/1	8/2	8/3	8/4		
GPC Control					488	488	488		1463
GPC Pilot				488		488			975
Max Temp				90	90	91	90		90
Min Temp				82	81	82	81		82
Mean Temp				86	86	87	86		86
Precipitation				0	0	0	0		0
Avg Humidity				48	55	56	61		55
	8/5	8/6	8/7	8/8	8/9	8/10	8/11		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	88	93	95	95	95	93	90		93
Min Temp	81	88	88	90	82	84	82		85
Mean Temp	85	91	92	93	89	89	86		89
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	61	54	51	39	50	42	54		50
	8/12	8/13	8/14	8/15	8/16	8/17	8/18		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	88	84	82	84	86	86	84		85
Min Temp	81	79	79	79	81	81	79		80
Mean Temp	85	82	81	82	84	84	82		82
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	64	59	58	65	64	67	67		63
	8/19	8/20	8/21	8/22	8/23	8/24	8/25		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	84	84	84	82	82	82	81		83
Min Temp	81	79	79	79	77	77	75		78
Mean Temp	83	82	82	81	80	80	78		80
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	67	65	65	62	62	63	67		64
	8/26	8/27	8/28	8/29	8/30	8/31			
GPC Control	488		488		488	488			1950
GPC Pilot		488		488		488			1463
Max Temp	81	79	81	84	88	84			83
Min Temp	75	75	75	79	79	79			77
Mean Temp	78	77	78	82	84	82			80
Precipitation	0	0	0	0	0	0			0
Avg Humidity	62	62	64	57	65	65			62
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
AUGUST 2018.	6.24	87	80	83	0	59	10727	6826	3901

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

SEPTEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
							9/1		
GPC Control							488		488
GPC Pilot							0		0
Max Temp							81		81
Min Temp							75		75
Mean Temp							78		78
Precipitation							0		0
Avg Humidity							65		65
	9/2	9/3	9/4	9/5	9/6	9/7	9/8		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	79	79	75	75	75	82	84		78
Min Temp	75	73	72	70	72	75	75		73
Mean Temp	77	76	74	73	74	79	80		76
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	66	69	73	73	72	67	71		70
	9/9	9/10	9/11	9/12	9/13	9/14	9/15		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	88	81	81	81	84	91	84		84
Min Temp	79	75	77	75	79	82	75		77
Mean Temp	84	78	79	78	82	87	80		81
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	54	64	61	62	61	40	51		56
	9/16	9/17	9/18	9/19	9/20	9/21	9/22		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	86	86	84	81	81	81	81		83
Min Temp	79	75	75	75	75	75	73		75
Mean Temp	83	81	80	78	78	78	77		79
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	48	44	52	60	66	66	65		57
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	
GPC Control	488		488		488	488	488	488	2926
GPC Pilot		488		488		488			1463
Max Temp	79	75	73	81	81	81	81	84	79
Min Temp	73	73	70	72	72	72	73	72	72
Mean Temp	76	74	72	77	77	77	77	78	76
Precipitation	0	0	0	0	0	0	0	0	0
Avg Humidity	66	62	72	69	71	72	71	65	68
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
September. 2018	4.75	81	75	78	0	63	10727	5851	4876

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
		10/1	10/2	10/3	10/4	10/5	10/6		
GPC Control			488		488	488	488		1950
GPC Pilot		488		488		488			1463
Max Temp		90	81	79	79	77	75		80
Min Temp		84	72	72	72	72	72		74
Mean Temp		87	77	76	76	75	74		77
Precipitation		0	0	0	0	0	0		0
Avg Humidity		43	59	63	66	66	68		61
	10/7	10/8	10/9	10/10	10/11	10/12	10/13		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	75	75	75	72	73	81	70		74
Min Temp	72	72	70	68	70	70	70		70
Mean Temp	74	74	73	70	72	76	70		72
Precipitation	0.00	0.00	0.00	0.00	0.00	0.10	0.36		0.46
Avg Humidity	67	63	59	59	50	54	76		61
	10/14	10/15	10/16	10/17	10/18	10/19	10/20		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	72	82	82	82	84	88	90		83
Min Temp	70	81	73	73	77	82	79		76
Mean Temp	71	82	78	78	81	85	85		80
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	71	19	24	30	26	25	24		31
	10/21	10/22	10/23	10/24	10/25	10/26	10/27		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	81	75	72	79	79	82	82		79
Min Temp	72	68	68	72	72	72	66		70
Mean Temp	77	72	70	76	76	77	74		74
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	58	66	74	69	67	55	64		64
	10/28	10/29	10/30	10/31					
GPC Control	488		488						975
GPC Pilot		488		488					975
Max Temp	81	73	73	79					77
Min Temp	68	68	66	72					69
Mean Temp	75	71	70	76					73
Precipitation	0	0	0	0					0
Avg Humidity	72	77	70	68					72
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
October. 2018	3.70	79	72	75	0.46	58	10240	6826	3413

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

NOVEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
					11/1	11/2	11/3		
GPC Control					488	488	488		1463
GPC Pilot						488			488
Max Temp					81	88	86		85
Min Temp					73	77	77		76
Mean Temp					77	83	82		80
Precipitation					0	0	0		0
Avg Humidity					33	33	39		35
	11/4	11/5	11/6	11/7	11/8	11/9	11/10		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	81	75	73	70	73	81	77		76
Min Temp	68	66	66	64	66	70	64		66
Mean Temp	75	71	70	67	70	76	71		71
Precipitation	0	0	0	0	0	0			0
Avg Humidity	49	68	62	70	66	20	21		51
	11/11	11/12	11/13	11/14	11/15	11/16	11/17		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	77	77	75	79	81	75	72		77
Min Temp	66	66	66	70	66	64	63		66
Mean Temp	72	72	71	75	74	70	68		71
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	28	20	18	19	25	47	67		32
	11/18	11/19	11/20	11/21	11/22	11/23	11/24		
GPC Control	488		488		488	488	488		2438
GPC Pilot		488		488		488			1463
Max Temp	73	72	73	72	66	68	70		71
Min Temp	64	64	64	64	63	64	64		64
Mean Temp	69	68	69	68	65	66	67		67
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	56	43	55	62	74	67	68		61
	11/25	11/26	11/27	11/28	11/29	11/30			
GPC Control	488		488						975
GPC Pilot		488		488					975
Max Temp	75	77	75	70	64	66			107
Min Temp	64	66	64	64	64	63			96
Mean Temp	70	72	70	67	64	65			102
Precipitation	0	0	0	0	1.21	0			1.21
Avg Humidity	63	32	34	65	90	63			86
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
November. 2018	2.65	83	74	78	1.21	53	9752	5851	3901

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #1, STATION 40 KEN MALLOY HARBOR REGIONAL PARK

DECEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
							12/1		
GPC Control							488		488
GPC Pilot									0
Max Temp							64		64
Min Temp							59		59
Mean Temp							62		62
Precipitation							0		0
Avg Humidity							54		54
	12/2	12/3	12/4	12/5	12/6	12/7	12/8		
GPC Control	488		488				488		1463
GPC Pilot		488		488					975
Max Temp	64	68	72	61	57	70	70		66
Min Temp	59	61	61	54	54	63	61		59
Mean Temp	62	65	67	58	56	67	66		63
Precipitation	0.00	0.00	0.00	0.00	1.56	0.00	0.00		1.56
Avg Humidity	39	38	27	57	88	56	52		51
	12/9	12/10	12/11	12/12	12/13	12/14	12/15		
GPC Control	488		488		488		488		1950
GPC Pilot		488		488		488			1463
Max Temp	72	68	70	66	77	70	72		71
Min Temp	61	63	61	61	64	63	61		62
Mean Temp	67	66	66	64	71	67	67		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	52	52	59	69	36	31	36		48
	12/16	12/17	12/18	12/19	12/20	12/21	12/22		
GPC Control	488		488		488		488		1950
GPC Pilot		488		488		488			1463
Max Temp	72	66	66	73	75	70	70		70
Min Temp	59	61	61	63	63	61	59		61
Mean Temp	66	64	64	68	69	66	65		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	55	74	72	55	51	67	63		62
	12/23	12/24	12/25	12/26	12/27	12/28	12/29		
GPC Control	488		488		488		488		1950
GPC Pilot		488		488		488			1463
Max Temp	66	66	66	64	66	63	61		65
Min Temp	61	61	59	57	57	57	55		58
Mean Temp	64	64	63	61	62	60	58		61
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	80	76	50	54	49.5	15	31		51
	12/30	12/31							
GPC Control	488								488
GPC Pilot		488							488
Max Temp	64	63							64
Min Temp	55	61							58
Mean Temp	60	62							61
Precipitation	0	0							0
Avg Humidity	54	52							53
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
December. 2018	1.91	67	60	63	1.56	53	8289	5851	2438

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
60.95	8	487.6

WEATHER & WATER DATA: TEST AREA #2, STATION 26, KEN MALLOY HARBOR REGIONAL PARK

AUGUST - DECEMBER 2018

AVERAGE REDUCTION: 34%

MONTH	WEATHER DATA						STATION 26	11,145 SqFt	55 lbs. hydrogel		
	MAX	MIN	MEAN	Precip	Avg Humidity	CIMIS ETo	GPM Control	GPM Test Area #2	Water Savings	Water Savings	Water Savings
	(℉)	(℉)	(℉)	(in)	(%)	(in.)	Water Usage (gallons)	Water Usage (gallons)	(gallons)	%	($) .01366/gallon
2018											
August	87	80	83	0.00	59	6.24	Installation on August 9, irrigation reduction on September 24				
September (1)	81	75	78	0.00	63	4.75	11,247	6,748	4,499	40%	$61.45
October	79	72	75	0.46	58	3.70	44,988	31,492	13,496	30%	$184.36
November	83	74	78	1.21	53	2.65	39,120	23,472	15,648	40%	$213.75
December	67	60	63	1.56	53	1.91	33,252	23,472	9,780	29%	$133.59
Average (2)	79	72	76		57	3.85	9,186	6,085	3,102	34%	
Totals				3.23		19.25	128,607	85,184	43,423	34%	$593.16
Savings/SqFt/Year (3)											$0.20
$ Savings/Acre/Year (4)											$8,611.04
Water Savings/1000 SqFt/Year									14,472	Gallons/1000 SqFt/Yr	
Water Savings/Acre/Year									630,384	Gallons/Acre/Yr	

(1) September water savings were for one week only and computed based on that basis

(2) Average Water Usage (gallons) were computed as a WEEKLY savings while all other averages are monthly

(3) Savings/SqFt/Year was computed as (Savings/SqFt/14 weeks) x 52 weeks in a year

(4) Savings/Acre/Year is based on Savings/SqFt/Year x 43,560 (SqFt/Acre) x .01366

Time Period	Gallons/Minute	Minutes/Cycle	Gallons/Cycle
Aug-Oct	97.8	23	2249.4
Nov-Dec	97.8	20	1956

Data Back up	APPENDIX D
CIMIS ETo	Evapotranspiration Rate
GPM Control	Gallons per Month - Other Park Stations
GPM Test Area #2	Gallons per Month, Test Area #2, Station 26

Sources

Daily Data	https://www.timeanddate.com, https://www.wunderground.com/weather/us/ca/lomita/90717
ET Rates	http://www.cimis.water.ca.gov/App_Themes/images/etozonemap.jpg

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

AUGUST 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
				8/1	8/2	8/3	8/4		
GPC Control					2249	2249	2249		6748
GPC Pilot					2249	2249	2249		6748
Max Temp				90	90	91	90		90
Min Temp				82	81	82	81		82
Mean Temp				86	86	87	86		86
Precipitation				0	0	0	0		0
Avg Humidity				48	55	56	61		55
	8/5	8/6	8/7	8/8	8/9	8/10	8/11		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		2249		2249	2249	2249		11247
Max Temp	88	93	95	95	95	93	90		93
Min Temp	81	88	88	90	82	84	82		85
Mean Temp	85	91	92	93	89	89	86		89
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	61	54	51	39	50	42	54		50
	8/12	8/13	8/14	8/15	8/16	8/17	8/18		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		2249		2249	2249	2249		11247
Max Temp	88	84	82	84	86	86	84		85
Min Temp	81	79	79	79	81	81	79		80
Mean Temp	85	82	81	82	84	84	82		82
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	64	59	58	65	64	67	67		63
	8/19	8/20	8/21	8/22	8/23	8/24	8/25		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		1956		1956	1956	1956		10073
Max Temp	84	84	84	82	82	82	81		83
Min Temp	81	79	79	79	77	77	75		78
Mean Temp	83	82	82	81	80	80	78		80
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	67	65	65	62	62	63	67		64
	8/26	8/27	8/28	8/29	8/30	8/31			
GPC Control	2249		2249		2249	2249			8998
GPC Pilot	2249		2249		2249	2249			8998
Max Temp	81	79	81	84	88	84			83
Min Temp	75	75	75	79	79	79			77
Mean Temp	78	77	78	82	84	82			80
Precipitation	0	0	0	0	0	0			0
Avg Humidity	62	62	64	57	65	65			62
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
AUGUST 2018.	6.24	87	80	83	0	59	49487	48313	1174

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
97.8	23	2249.4

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

SEPTEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
							9/1		
GPC Control							2249		2249
GPC Pilot							2249.4		2249
Max Temp							81		81
Min Temp							75		75
Mean Temp							78		78
Precipitation							0		0
Avg Humidity							65		65
	9/2	9/3	9/4	9/5	9/6	9/7	9/8		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		2249		2249	2249	2249		11247
Max Temp	79	79	75	75	75	82	84		78
Min Temp	75	73	72	70	72	75	75		73
Mean Temp	77	76	74	73	74	79	80		76
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	66	69	73	73	72	67	71		70
	9/9	9/10	9/11	9/12	9/13	9/14	9/15		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		2249		2249	2249	2249		11247
Max Temp	88	81	81	81	84	91	84		84
Min Temp	79	75	77	75	79	82	75		77
Mean Temp	84	78	79	78	82	87	80		81
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	54	64	61	62	61	40	51		56
	9/16	9/17	9/18	9/19	9/20	9/21	9/22		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot	2249		2249		2249	2249	2249		11247
Max Temp	86	86	84	81	81	81	81		83
Min Temp	79	75	75	75	75	75	73		75
Mean Temp	83	81	80	78	78	78	77		79
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	48	44	52	60	66	66	65		57
	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30	
GPC Control	2249		2249		2249	2249	2249	2249	11247
GPC Pilot		2249		2249		2249			6748
Max Temp	79	75	73	81	81	81	81	84	79
Min Temp	73	73	70	72	72	72	73	72	72
Mean Temp	76	74	72	77	77	77	77	78	76
Precipitation	0	0	0	0	0	0	0	0	0
Avg Humidity	66	62	72	69	71	72	71	65	68
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
September. 2018	4.75	81	75	78	0	63	11247	6748	4499
							9/24- 9/30 ONLY		

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
97.8	23	2249.4

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

OCTOBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
		10/1	10/2	10/3	10/4	10/5	10/6		
GPC Control			2249		2249	2249	2249		8998
GPC Pilot		2249		2249		2249			6748
Max Temp		90	81	79	79	77	75		80
Min Temp		84	72	72	72	72	72		74
Mean Temp		87	77	76	76	75	74		77
Precipitation		0	0	0	0	0	0		0
Avg Humidity		43	59	63	66	66	68		61
	10/7	10/8	10/9	10/10	10/11	10/12	10/13		
GPC Control	2249		2249		2249	2249			8998
GPC Pilot		2249		2249		2249			6748
Max Temp	75	75	75	72	73	81	70		74
Min Temp	72	72	70	68	70	70	70		70
Mean Temp	74	74	73	70	72	76	70		72
Precipitation	0.00	0.00	0.00	0.00	0.00	0.10	0.36		0.46
Avg Humidity	67	63	59	59	50	54	76		61
	10/14	10/15	10/16	10/17	10/18	10/19	10/20		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot		2249		2249		2249			6748
Max Temp	72	82	82	82	84	88	90		83
Min Temp	70	81	73	73	77	82	79		76
Mean Temp	71	82	78	78	81	85	85		80
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	71	19	24	30	26	25	24		31
	10/21	10/22	10/23	10/24	10/25	10/26	10/27		
GPC Control	2249		2249		2249	2249	2249		11247
GPC Pilot		2249		2249		2249			6748
Max Temp	81	75	72	79	79	82	82		79
Min Temp	72	68	68	72	72	72	66		70
Mean Temp	77	72	70	76	76	77	74		74
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	58	66	74	69	67	55	64		64
	10/28	10/29	10/30	10/31					
GPC Control	2249		2249						4499
GPC Pilot		2249		2249					4499
Max Temp	81	73	73	79					77
Min Temp	68	68	66	72					69
Mean Temp	75	71	70	76					73
Precipitation	0	0	0	0					0
Avg Humidity	72	77	70	68					72
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
October. 2018	3.70	79	72	75	0.46	58	44988	31492	13496

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
97.8	23	2249.4

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

NOVEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
					11/1	11/2	11/3		
GPC Control					1956	1956	1956		5868
GPC Pilot						1956			1956
Max Temp					81	88	86		85
Min Temp					73	77	77		76
Mean Temp					77	83	82		80
Precipitation					0	0	0		0
Avg Humidity					33	33	39		35
	11/4	11/5	11/6	11/7	11/8	11/9	11/10		
GPC Control	1956		1956		1956	1956	1956		9780
GPC Pilot		1956		1956		1956			5868
Max Temp	81	75	73	70	73	81	77		76
Min Temp	68	66	66	64	66	70	64		66
Mean Temp	75	71	70	67	70	76	71		71
Precipitation	0	0	0	0	0	0			0
Avg Humidity	49	68	62	70	66	20	21		51
	11/11	11/12	11/13	11/14	11/15	11/16	11/17		
GPC Control	1956		1956		1956	1956	1956		9780
GPC Pilot		1956		1956		1956			5868
Max Temp	77	77	75	79	81	75	72		77
Min Temp	66	66	66	70	66	64	63		66
Mean Temp	72	72	71	75	74	70	68		71
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	28	20	18	19	25	47	67		32
	11/18	11/19	11/20	11/21	11/22	11/23	11/24		
GPC Control	1956		1956		1956	1956	1956		9780
GPC Pilot		1956		1956		1956			5868
Max Temp	73	72	73	72	66	68	70		71
Min Temp	64	64	64	64	63	64	64		64
Mean Temp	69	68	69	68	65	66	67		67
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	56	43	55	62	74	67	68		61
	11/25	11/26	11/27	11/28	11/29	11/30			
GPC Control	1956		1956			0			3912
GPC Pilot		1956		1956		0			3912
Max Temp	75	77	75	70	64	66			107
Min Temp	64	66	64	64	64	63			96
Mean Temp	70	72	70	67	64	65			102
Precipitation	0	0	0	0	1.21	0			1.21
Avg Humidity	63	32	34	65	90	63			86
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
November. 2018	2.65	83	74	78	1.21	53	39120	23472	15648

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
97.8	20	1956

WEATHER & WATER DATA: TEST AREA #2, STATION 26 KEN MALLOY HARBOR REGIONAL PARK

DECEMBER 2018									
	SUN	MON	TUE	WED	THUR	FRI	SAT		WEEK
							12/1		
GPC Control							1956		1956
GPC Pilot									0
Max Temp							64		64
Min Temp							59		59
Mean Temp							62		62
Precipitation							0		0
Avg Humidity							54		54
	12/2	12/3	12/4	12/5	12/6	12/7	12/8		
GPC Control	1956		1956		0		1956		5868
GPC Pilot		1956		1956		0			3912
Max Temp	64	68	72	61	57	70	70		66
Min Temp	59	61	61	54	54	63	61		59
Mean Temp	62	65	67	58	56	67	66		63
Precipitation	0	0	0	0	1.56	0			1.56
Avg Humidity	39	38	27	57	88	56	52		51
	12/9	12/10	12/11	12/12	12/13	12/14	12/15		
GPC Control	1956		1956		1956		1956		7824
GPC Pilot		1956		1956		1956			5868
Max Temp	72	68	70	66	77	70	72		71
Min Temp	61	63	61	61	64	63	61		62
Mean Temp	67	66	66	64	71	67	67		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	52	52	59	69	36	31	36		48
	12/16	12/17	12/18	12/19	12/20	12/21	12/22		
GPC Control	1956		1956		1956		1956		7824
GPC Pilot		1956		1956		1956			5868
Max Temp	72	66	66	73	75	70	70		70
Min Temp	59	61	61	63	63	61	59		61
Mean Temp	66	64	64	68	69	66	65		66
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	55	74	72	55	51	67	63		62
	12/23	12/24	12/25	12/26	12/27	12/28	12/29		
GPC Control	1956		1956		1956		1956		7824
GPC Pilot		1956		1956		1956			5868
Max Temp	66	66	66	64	66	63	61		65
Min Temp	61	61	59	57	57	57	55		58
Mean Temp	64	64	63	61	62	60	58		61
Precipitation	0	0	0	0	0	0	0		0
Avg Humidity	80	76	50	54	49.5	15	31		51
	12/30	12/31							
GPC Control	1956								1956
GPC Pilot		1956							1956
Max Temp	64	63							64
Min Temp	55	61							58
Mean Temp	60	62							61
Precipitation	0	0							0
Avg Humidity	54	52							53
		Temperature					GPC	GPC	Water
MONTHLY	ET	Max	Min	Mean	Precipitation	Humidity	Control	Pilot	Savings
December. 2018	1.91	67	60	63	1.56	53	33252	23472	9780

Gallons/Minute	Minutes/Cycle	Gallons/Cycle
97.8	20	2249.4

WEATHER & WATER DATA: TEST AREA #3, LOREN MILLER RECREATION CENTER

AUGUST 16, 2018 - DECEMBER 31, 2018

MONTH	WEATHER DATA					
	MAX	MIN	MEAN	Precip	Avg Humidity	CIMIS ETo
	(℉)	(℉)	(℉)	(in)	(%)	(in.)
2018						
August	93	69	81	0.00	54	6.54
September	92	61	77	0.00	58	5.22
October	90	55	73	0.57	55	4.07
November	88	47	68	1.58	46	3.04
December	77	39	58	2.11	57	2.13
Average	88	54	71		54	4.20
Totals				4.26		21.00

CIMIS ETo Evapotranspiration Rate

Sources

Temps, Precipitation - Wunderground Dowtown LA https://www.wunderground.com/history/daily/us/ca/los-angeles-downtown/KCQT/date/2018-12-31

Eto Rates & Humidity - CIMIS Station 159 Monrovia https://cimis.water.ca.gov/UserControls/Reports/MonthlyReportViewer.aspx

California Irrigation Management Information System (CIMIS)

CIMIS Monthly Report

Rendered in ENGLISH Units.
August 2018 - December 2018
Printed on Wednesday, February 6, 2019

Monrovia - Los Angeles Basin - Station 159

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Aug 2018	6.54 K	0.02	608	17.4 K	92.9 K	66.2 K	77.6 K	79	33	54 K	59.4 K	1.0 K	84.2 L
Sep 2018	5.22 K	0.00	532 K	15.6 K	88.6	60.4	72.2	83	34	58 K	55.9 K	1.7 K	79.1
Oct 2018	4.07	0.88	378 K	12.7 K	81.4	57.1	67.7	80	34	55 K	49.4 K	3.3 K	71.2 K
Nov 2018	3.01	2.74	300 K	8.6 K	76.3	50.4	61.7	69	25	46 K	37.8 K	3.0	64.0 K
Dec 2018	2.13 K	3.24	236	8.6	67.5	45.5	55.2	82	33	57	39.4	2.7 K	56.6
Tots/Avgs	20.97	6.9	411	12.6	81.3	55.9	66.9	79	32	54	48.4	2.3	71.0

Flag Legend		
M - All Daily Values Missing	K - One or More Daily Values Flagged	
J - One or More Daily Values Missing	L - Missing and Flagged Daily Values	
Conversion Factors		
W/sq.m = Ly/day/2.065	inches * 25.4 = mm	(F-32) * 5/9 = c
	mBars * 0.1 = kPa	--