



Date: August 15, 2014
To: Patrick H. West, City Manager *PWest*
From: George Chapjian, Director of Parks, Recreation and Marine *SPS for*
For: Members of the Budget Oversight Committee
Subject: Parks, Recreation and Marine Department – Water Management

This memorandum is intended to respond to the Mayor and City Council's water-related questions from the Parks, Recreation and Marine Department's (PRM) August 5, 2014 Budget Hearing presentation.

Background

The Department is working hard to balance the need for safe, enjoyable parks for all visitors, while fully embracing the necessity to use water responsibly in the current state-wide drought conditions. The total park system represents well over 3,000 acres of parkland and other open spaces. The Department irrigates roughly 1,275 acres of parks and street islands.

It is important to note that approximately 690 acres, or about 54 percent, of these areas are maintained with reclaimed, or recycled, water (Attachment A – List of Reclaimed Sites). Reclaimed water is a form of waste water that has been treated and disinfected for such non-drinking uses as irrigation. PRM's utilization of reclaimed water is dependent upon where the Long Beach Water Department (LBWD) has existing infrastructure to distribute this water resource. All available reclaimed water lines to the parks are being utilized by the Department. PRM would support any LBWD efforts to expand their reclaimed water distribution infrastructure. The remaining water used to irrigate the City's park system is potable, or drinkable, water (Attachment B – List of Potable Sites).

Water Needs: The Department must irrigate recreational open spaces to keep them safe and functional for residents, including the many who have no backyards and who rely on parks as places to relax and recreate. Additionally, hundreds of thousands of mature trees and many athletic fields also depend on irrigation to remain viable and safe.

To that end, the Department does adhere to LBWD's water restrictions, where possible. Even with the reclaimed water sites, which are not included in the Water Department's restrictions, the Department is watering on a Saturday, Monday, and Thursday schedule. Because there are so many acres to water, the Department does start the watering process late in the evening the night before the allowable watering day. This practice helps to ensure that the irrigation cycle is complete by the next morning when patrons begin using the park.

Residents will also see watering occurring outside of the LBWD allowable watering days. This is the result of a number of different scenarios, including:

- Manual irrigation systems - where it can take the entire week just to complete one manual watering session (i.e., Heartwell Park);
- Athletic field maintenance – more frequent watering is required to ensure newly re-seeded or re-sodded fields take root;
- Park irrigation infrastructure repairs or tests; and,
- Any new landscape installation.

Landscape Irrigation Audit

Last year, PRM secured a \$95,000 grant to conduct an audit of the irrigation systems for 20 of the Department's parks (covering close to 75 percent of irrigated park acreage), which was completed by AquaSave, a third-party certified landscape irrigation auditing firm. A sample of one of the park audit reports is attached for reference (Attachment C). This audit was funded entirely by the Metropolitan Water District, through LBWD, and provided a detailed analysis of our current irrigation infrastructure, assessment of soil and existing vegetation, current watering practices versus landscape needs and evapotranspiration (ET) standards, and future improvements, using the latest technology, needed at each of the 20 surveyed parks.

Findings/Recommendations: The 2013 audit identified specific infrastructure limitations and needed improvements to achieve a more efficient and effective irrigation program for each of the 20 sites. At the macro-level, the audit revealed that, not only is the parks and medians irrigation infrastructure antiquated and failing in many places, but it lacks equipment standardization and a central management system, making it very difficult and expensive to maintain. The audit also found that the Department has watered to a budget level, not to the level that trees and turf need, thus providing additional stress on the City's plant life, particularly its tree canopy.

The audit provided specific recommendations for each of the 20 parks. These recommendations can be summarized into a few, high-level, tasks, including: replacing outdated manual and hydraulic irrigation systems with new automatic, electric-control systems; standardize irrigation systems for greater efficiencies; and, install a centrally managed and controlled irrigation system. A summary of the parks and findings are attached (Attachment D).

Irrigation Investment

The findings and corresponding recommendations from the 2013 audit already provided a roadmap for the Department to prioritize future investments in updating the parks irrigation infrastructure. Based on the findings from the audit, the Department is first investing in the communications infrastructure needed to implement a central management system, and then prioritizing the upgrade of our remaining manual and hydraulic irrigation systems.

Fiscal Year 2014: The Department is currently utilizing the FY 14 non-recurring irrigation funds of \$1.1 million to address a number of these recommendations.

PRM is currently working with Technology Services to install the communications infrastructure needed to connect the Calsense irrigation controllers at 16 park sites. Once the communications systems are upgraded, the Department will have the capability to monitor and operate these irrigation systems from any computer or smartphone. Staff will be able to monitor and adjust irrigation based on real time reporting from the controllers, rain and weather forecasts, and even event scheduling. This technology will automatically turn off the irrigation at a park when there is a break in the system that causes flows in excess of programmed levels. It is expected that the communications infrastructure will be completed within the next few weeks, which will allow the Department to immediately begin bringing each park site online.

Additionally, the irrigation infrastructure at Stearns Park will be upgraded. Stearns Park has an old, hydraulic system that continues to require costly repairs. The Department has prioritized this location not only because it is an antiquated, hydraulic system, but also because it is a heavily programmed park asset by our partner local sports leagues.

Fiscal Year 2015: In the FY 15 Proposed Budget, there is \$2.0 million in non-recurring funds identified for replacing the irrigation system at Heartwell Park. This park is home to our largest remaining manually operated irrigation system. This is an inefficient system whereby staff has to first go out and physically install an irrigation head where they want to water, then manually turn on the water, and return 10 minutes later to move the irrigation head to the next area that needs to be watered. Using this antiquated system, it takes a full week, Monday through Friday, from 6:30 am to 2:30 pm, to manually water the entire length of Heartwell Park, which measures well over 1 mile long.

This investment will allow PRM to modernize the infrastructure by moving to an electronically controlled irrigation system, which will allow for remote management of the system, and therefore will significantly reduce staff time expended; will enable more efficient application of our limited water resource, which could result in over 9 million gallons of water saved annually, per the audit; and allow the Department to better meet the watering restriction timeframes and irrigate during times that the park is not in use, which will also reduce water loss through evaporation. Once again, this is a critical need.

The proposed budget also includes a non-recurring \$450,000 investment in our park system's water budget. The entire park system's water budget has not kept up with the over 40 percent increase in water rates over the past 7 years. This non-recurring investment will provide the Department the necessary resources to bridge the current budgetary gap until water savings are realized in the near future. It will also allow the Department to appropriately fund its current water needs, without having to use funds from other operations as has been the past practice. This addresses the "watering-to-budget" finding in the audit.

New Parks: As new parks are added, or existing parks are upgraded, PRM takes that opportunity to upgrade the irrigation infrastructure, but also explore the

Patrick H. West, City Manager
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installation of drought tolerant landscaping in lieu of traditional turf. As done with recent projects, such as Chittick Field, Craftsman Park, Baker Mini-Park, Bixby Park Annex (south of Ocean), and Pacific Avenue Medians, the Department will work closely with Public Works and the City's consulting landscape architects and irrigation designers to ensure that state of the art irrigation systems are installed to ensure water conservation.

It is important to note that all PRM project Plans and Specifications are prepared in accordance with AB1881, the State's Water Efficient Landscape Ordinance. This State legislation sets forth the direction for water conservation and efficiency, including the use of central controllers, water efficient design elements, installation of drought tolerant palettes, and use of mulch to conserve water, just to name a few.

Recycled or Potable Water

Recent conversation with LBWD has revealed that the current demand for recycled/reclaimed water almost equals the demand for potable water as a precious resource. This is especially true in the summer months. The demand is so high that LBWD is currently not taking on any new recycled water accounts. Some parks and street medians are watered with potable water (46 percent), while the remainder is irrigated with recycled water (54 percent).

Our decision to fund Heartwell Park irrigation improvements, which utilizes recycled water, is because it was identified in the audit as one the parks with the most critical need. Heartwell Park has an old, manual irrigation system that is expensive to staff and operate, and is inefficient with water utilization.

Partnership with Long Beach Water Department

The Department has a long-standing relationship with the Long Beach Water Department. In addition to receiving funding from MWD, through LBWD, for the irrigation audit mentioned above, the Department has also participated in a number of LBWD rebate opportunities. For example, PRM received 16 ET Smart Controllers from LBWD, funded through a Water Grant, and participated in the rotary nozzle rebate program. The Department is also exploring funding opportunities with LBWD for turf-to-mulch and median-to-landscape programs.

As demonstrated above, the Department of Parks, Recreation and Marine takes its responsibility as a "water wise" steward very seriously. The Department will continue to take all necessary steps to ensure the efficient and effective use of this limited resource. Should you have any questions or concerns, please contact me at 570-3170.

Attachments

cc: Mayor and Members of the City Council
Jyl Marden, Interim Assistant City Manager
Reginald Harrison, Deputy City Manager
Tom Modica, Deputy City Manager
John Gross, Director of Financial Management
Lea Erikson, Budget Management Bureau Manager
Ramon Arevalo, Maintenance Operations Bureau Manager

**PRM Sites Irrigated with Reclaimed Water
August 2014**

Parks

Bixby Park, Annex to 1st St

Bluff Park

Cherry Park

Colorado Lagoon, except along Colorado from Appian to Eliot

El Dorado East Regional Park

El Dorado Nature Center

El Dorado West Park, except Good Neighbor & area around community center from playground to South of Field 5 and courts

Heartwell Park

Marina Vista Park

Recreation Park

Rosie The Riveter Park

Scherer Park

Somerset Park

Stearns Park, except NE section near water wells

Whaley Park

Will Rogers

Street Islands

Douglas Park Development

Lakewood Blvd, Spring St to Carson

Los Coyotes Diag, Palo Verde to Studebaker

Willow St, most islands between Clark and Studebaker

Street Islands Sprayed by Water Truck Filled with Reclaimed Water

Studebaker Rd, Stearns to Parkcrest, except W service road islands from Willow to Spring

**PRM Sites Irrigated with Potable Water
August 2014**

<u>Park</u>	<u>Note</u>
1 21st to Hill Park	
2 34th St Greenbelt	
3 51st St Greenbelt	
4 Alamos Bay Marina	
5 Alamos Park	
6 Aquarium/Pierpoint - Lease	
7 Baker St Mini Park	
8 Bayshore Park	
9 Bayshore Parkway	
10 Belmont Plaza Pool	
11 Birdcage Park	
12 Bixby Knolls Park	
13 Bixby Park	Approximately 34% of irrig. area is potable
14 Black, Officer Daryle W., Park	
15 Bouton Creek Park	
16 Carroll Park	
17 Chace, Burton W., Mini Park	
18 Channel View Park	
19 Chavez, Cesar E., Park	
20 Chittick Field	
21 College Estates Park	
22 Colonnade, The	
23 Colorado Lagoon	
24 Coolidge Park	
25 Craftsman Village Park	
26 Daisy Avenue Greenbelt	
27 Davenport, Ed "Pops", Park	
28 Davies Launch Ramp	
29 DeForest Park	
30 Drake Park	
31 Dunster, Jack, Marine Biological Reserve	
32 East Village Arts Park	
33 El Dorado Nature Ctr	Less than 1% of irrig. area is potable
34 El Dorado Park West	Approximately 5% of irrig. area is potable
35 Fellowship Park	
36 Fourteenth St Park	
37 Golden Shore Marine Bio Reserve	
38 Good Neighbor Park	
39 Grace Park	
40 Houghton Park	
41 Hudson Park	
42 Jackson Street Park	
43 Kent, Maurice "Mossy", Park	
44 Kidd, Admiral Issac C., Park	
45 King, Martin Luther, Jr., Park	
46 La Bella Fontana di Napoli	
47 Lilly Park	
48 Lincoln Park	

PRM Sites Irrigated with Potable Water August 2014

<u>Park</u>	<u>Note</u>
49 Livingston Drive Park	
50 Loma Vista Park	
51 Long Beach Municipal Cemetery	
52 Lookout Park	
53 Los Altos Park	
54 Los Altos Plaza	
55 Los Cerritos Park	
56 MacArthur, General Douglas, Park	
57 Marina Green	
58 Marina Pacifica Park	
59 Marine Park	
60 Marine Stadium	
61 McBride, Ernest S., Sr., Park	
62 Milk, Harvey, Promenade Park	
63 Miracle on 4th St Mini Park	
64 Nichol, Jack, Park	
65 Orizaba Park	
66 Overlook Park	
67 P.E. Right of Way Bikepath	
68 Pan American Park	
69 Parks, Rosa, Park	
70 Peace Park	
71 Poly Gateway - Atlantic	
72 Poly Gateway - MLK	
73 Promenade Square	
74 Rainbow Lagoon	
75 Ramona Park	
76 Rancho Los Cerritos	
77 Rose Park	
78 Rotary Centennial Park	
79 Santa Cruz Park	
80 Seaside Park	
81 Shoreline Marina	
82 Shoreline Park	
83 Silverado Park	
84 Sleepy Hollow Greenbelt	
85 South Shore Launch Ramp	
86 South Street Parkway	
87 Stearns Champions Park	Approx 26% of irrig. area is potable
88 Tanaka Park	
89 Treasure Island Park	
90 Trolley Park	
91 Veterans Memorial Park	
92 Victory Park	
93 Wardlow Park	
94 Williams, Dennis, Greenway (prop nm)	
95 Willow & Golden N	
96 Willow & Golden S	
97 Wrigley Greenbelt	
98 All Medians Not Listed on Reclaimed List	



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Theresa Maceyka (Superintendent of Grounds Maintenance, City of Long Beach)
 7600 E. Spring Street, Long Beach, CA. 90815
 562-570-4879, Theresa.Maceyka@longbeach.gov

June 3, 2013

Dear Theresa:

AquaSave is pleased to provide you with this outdoor water use survey report to help you identify your water use and give you recommendations on where you can save water. On **May 2, 2013**, an Outdoor Water Use Survey was conducted by John Oudyk/ CLIA, AquaSave Auditor/Member. This report is based solely on professional observations and findings from the outdoor water survey and information received from the parks staff. This report will address current usage, problems, and the opportunities to use water more efficiently at the **Marina Vista Park** property.

GENERAL OBSERVATIONS

LEAKS IDENTIFIED

Meter Movement	No
Outdoor	No— See detailed report

SITE PROFILE

Account No.	A65
Meter #	A65
Dedicated meter(s)	Yes
Site Size (sq. ft.)	960,015
Irrigated area (sq. ft.)	710,914
Pool (sq. ft.)	No
Spa (sq. ft)	No
Pump	No
Master valve (s)	Yes
Flow sensor	No
Reclaimed Water	Yes

Your outdoor recommendations have the potential to save you **255,816 Gals/yr.**

By implementing the recommended measures and correcting certain items you may reduce your water usage, helping you and the community to save water and save energy.



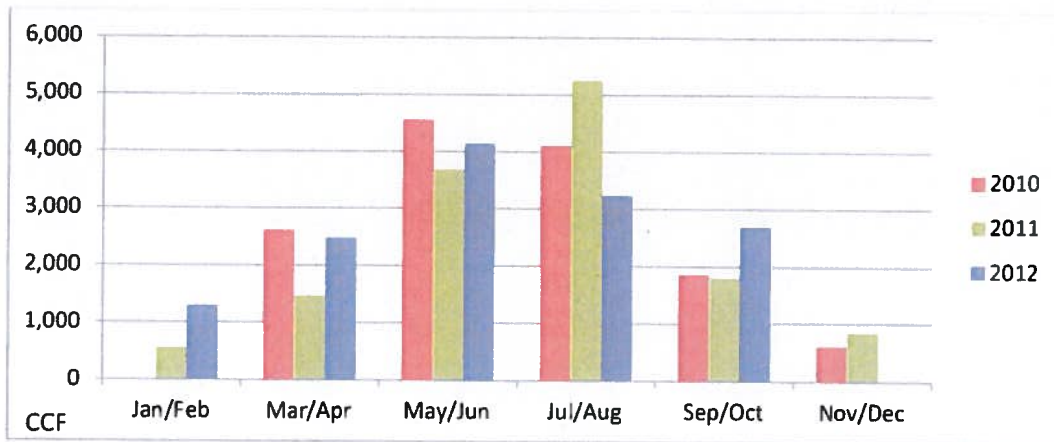
LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Water Use Analysis - Historical

Using your available water use history and applying the profile information we have collected, we are able to generally determine your outdoor water use. Of course each month and year will be different but in general similar patterns are revealed.

Year	Jan/Feb	Mar/Apr	May/June	Jul/Aug	Sep/Oct	Nov/Dec	TOTAL CCF
2010	0	2,613	4,556	4,100	1,856	610	13,735
2011	553	1,469	3,689	5,253	1,804	847	13,615
2012	1293	2,484	4,140	3233	2,696	0	13,846

Table #1 - Historical Water Use



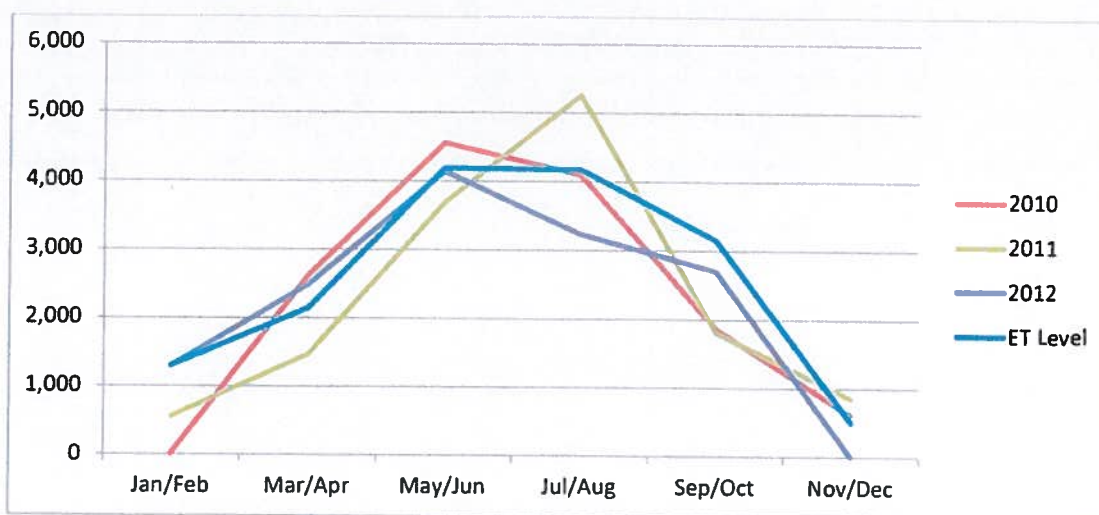
Graph #1 - Historical Water Use (CCF)

Water Use Discussion: According to available water use history, water use was generally varied, but there were two spikes in use, one in May and June of 2010 and one in July and August of 2011 respectively (See ET graph below).

LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

OUTDOOR WATER USE

There are several factors that affect outdoor water use. As conservationists, we try to educate customers about watering for the plant needs by season. By observing and adjusting the irrigation system, identifying and repairing breaks and leaks, and managing the areas that typically use the most water, significant savings can be achieved.



Graph #2 - Historical Water Use vs. Plant Needs (ET)

ET (Evapotranspiration) is the line that indicates the amount of water your landscape actually requires based on historical weather patterns.

The above graph reflects that water usage was varied ET (the amount of water that plants actually needed) for the years 2010, 2011 and 2012. However, there was a slight spike in use above ET in May and June of 2010 and also a noticeable spike in July and August of 2011. It was estimated that watering more in line with ET could reduce outdoor water cost by 3% annually. Our calculations show that the outdoor usage in 2012 is 14% or 342ccfs above the amount of water needed by the plants.



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Landscape and Irrigation Profile and Deficiencies Observed: (See Outdoor Data Sheets for Details)

Landscape Plant Condition	<u>GENERALLY VARIED</u> - Site consists primarily of turf and trees. The turf and tree condition was generally varied, with some areas showing good healthy and others showing stress.
Backflow Prevention	<u>No – BACKFLOW DEVICE</u> - The reclaimed water system at Marina Vista Park does not require anti-siphon valves or backflow prevention devices.
Irrigation Controllers	<u>SATISFACTORY</u> - There are 2 controllers. Two (2) Rain Bird ESP 24-MC controllers were found to be in satisfactory working condition. These controllers are operated by the maintenance team and are Smart Controllers (Weather-based option inactive).
Soil Structure	<u>AVERAGE</u> – A soil probe sample was taken in several locations and soil with root depth was observed. 1-5" soil depth and 1-2" root zone was observed.
Irrigation Efficiency	<u>UNSATISFACTORY</u> – 51% efficiency / 70% is optimal (System efficiency is expressed in % DU)
Irrigation Spray Coverage	<u>UNSATISFACTORY</u> - Blockage was found to be a limiting problem in eight (8) areas.
Irrigation Water Over-spray	<u>UNSATISFACTORY</u> – Sprinkler over spray was observed in seven (7) places while run off was observed in 12 places.
Irrigation heads unmatched	<u>UNSATISFACTORY</u> - Unmatched heads – One (1) nozzle was found to be a problem in this irrigation system.
Irrigation heads too low or need straightening	<u>UNSATISFACTORY</u> – Twenty-one (21) heads were found to be either too low or in such a position as to limit distribution uniformity (DU). 32 heads are not perpendicular to grade.
Head spacing	<u>UNSATISFACTORY</u> – Head spacing was not found to be a limiting factor needing adjustment in 2 areas.
Broken/leaking heads	<u>UNSATISFACTORY</u> – Three (3) broken heads were found to be a problem in this irrigation system and 33 heads were observed to be leaking.
Broken/leaking laterals	<u>UNSATISFACTORY</u> – One (1) lateral was found to be a problem in this irrigation system on Controller 1, Valve 13.
Irrigation valves without flow control	<u>SATISFACTORY</u> – Flow control was not found to be a limiting problem.
Valve sequencing	<u>SATISFACTORY</u> – Not found to be a limiting factor needing correcting.
Master Valve	<u>SATISFACTORY</u> – Not found to be a limiting factor needing correcting
Flow Sensor	<u>UNSATISFACTORY</u> – Flow sensors were not observed on site, but are recommended.
System Pressure	<u>SATISFACTORY</u> – System line pressure was not observed to be a problem limiting system functionality.



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Outdoor Recommendations

- ✓ Activate Weather-based function of existing “Smart Weather Based” Controllers and implement central control capability *
- ✓ Repair irrigation system breaks, leaks and deficiencies as needed
- ✓ Correct unmatched nozzles on rotor heads to achieve matched precipitation. This will require matching head manufacturers in most cases, due to the differential in precipitation rates from manufacturer to manufacturer. I.E. all RB 5000 heads on one valve or all Hunter I-40's.
- ✓ Upgrade to pressure regulating valves to minimize overspray
- ✓ Remove portions of grass in favor of low water used shrubs and ground covers or mulch

*We provide a sample schedule for your use until you initiate this upgrade

Other Landscape Recommendations

Improving horticultural practices will help improve soil permeability and plant water use. This can help in using water more efficiently.

- ✓ Reduce the amount of turf thatch and increase aeration to improve soil permeability.
- ✓ Take frequent soil samples and fertilize the plants with only the nutrients that they require.
- ✓ Reduce selected turf areas in favor of drought tolerant plants and ground covers to help save water.

Based on the historical water use versus the plant water needs (ET) the following table summarizes the estimated volume and dollar savings potential at this site at current water rates:

Estimated Savings Summary:

Savings Estimates	CCFs	Gallons	\$ Savings
1 year	342	255,816	\$636
3 years	1,026	767,448	\$1,908
5 years	1,710	1,279,080	\$3,180



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Basic Retrofit Cost and Payback Period Estimate:

A. Outdoor retrofit cost and ROI estimate	Annual H2O cost		Qty	Unit	Exten	% Savings	*\$ Savings	** ROI Yrs
		\$21,703						
1. Upgrade existing controller(s) to "Smart" ET controller(s) with central control			0	\$1,500	\$0	0%	\$0	0.00
2. Convert all spray heads to Hunter MP rotator or Toro Precision Nozzles			1	\$12	\$12	3%	\$651	0.02
Total basic water conserving upgrade for exterior					\$12	3%	\$651	0.02
* Annual Savings ** ROI = Return On Investment = Time in which cost savings pay for themselves. NOTE: Correction of system deficiencies and breaks and improvement of DU needs to be done to fully realize saving of Items 1 and 2 above. (see cost estimate below) ***Labor costs, communications fees and or subscriptions are not included in the above unit prices except for nozzles								

B. Outdoor Deficiency Corrections & DU Improvement estimate		Qty	Unit	Exten
1. Correct deficiencies (see data sheets)		168	\$ 45	\$ 7,560
2. System modifications to improve DU to 60-70%***		2	\$ 150	\$ 300
Total system improvements				\$7,860

Table "A" above reflects items to which rebates may apply reducing the cost of the retrofit.

Table "B" above reflects non-rebate irrigation system items that can be implemented to improve system efficiency (DU)



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

AUDITOR'S COMMENTS:

Booster Pumps:

There are no booster pumps implemented or present at Marina Vista Park.

Vehicular Traffic:

No vehicular traffic was observed, nor was any indicated from field findings.

Microclimate & Site Management Considerations:

Marina Vista Park, like Bixby Park, is located on the water front of Long Beach. This type of microclimate generally helps soil and air retain more moisture. Thus, base scheduling should be adjusted for such a scenario (reducing system and valve run times).

Recommendation:

- Upgrade to "Weather Based" and central control irrigation system with internet access capability.
- Upgrade to "Professional Water Management" to improve conservation & plant health.

League Activities:

There is one baseball diamond that received infield (all dirt) watering by the leagues, while the outfield and rest of park are watered by city maintenance crews. The league watering is minimal and is only for safety and dust abatement purposes during games. Although there is not league soccer played at Marina Vista Park, heavy use is still indicated in many areas of the park (particularly the outfield of the baseball field). This wear is much more apparent than other areas of the park, which would indicate that pick up soccer games might occur so frequently as to limit the turf's ability to recover adequately.

Recommendation: Focus on turf rehabilitation by aerating and fertilizing regularly.

System Observations:

The two controllers at Marina Vista Park are relatively modern models (Rain Bird ESP), but the irrigation system is an outdated and worn hydraulic system. During the site survey Controller 1, valve 1 was stuck in the on position and would not shut off for over 3 hours. Based on the field findings, this issue is ongoing and appears to have been a problem for some time (very saturated soil and a tree suffering from oxygen deprivation).

Many of the rotors are Rain Bird Falcon (5604), but there are Hunter I-40 and PGP models interspersed throughout the site. These differences in nozzle and model types can severely limit the valve by valve distribution uniformity.

Recommendation: Upgrade to a modern electronic irrigation system. Standardize manufacturers of heads by zone to improve system DU.

Recommendation: Straighten heads that are not perpendicular to the grade to improve system DU.



LARGE LANDSCAPE OUTDOOR WATER USE SURVEY REPORT

Quick Coupler Valve (QVC) and Impact head performance:

No quick coupler valves were observed or implemented at Marin Vista Park.

Site Priorities:

1. Adjust base scheduling for specific park microclimate needs.
2. Frequently fertilize turf and aerate soil to improve plant health and aid in recovery.
3. Upgrade outdated hydraulic irrigation system and standardize rotor heads for increase distribution uniformity.

REPORT SUMMARY:

This water audit has identified some of the shortcomings of mixing hydraulic valve systems with more modern electrical systems. While it is wise to implement modern equipment and technology, mixing newer tools with older, worn out and obsolete equipment can have negative effects on the system and landscape. Many of the problems observed at Marina Vista Park (stuck valves and broken laterals) may have stemmed from the mixing of an older hydraulic system with a more modern electrical one.

Relative to water savings, there is little savings potential at this site, short of improving system efficiency (DU), and implementing the use of "Smart Weather Based" controllers and professional water management. As a cautionary note however, "Smart Weather Based" system operation does not take into account the extremely heavy athletic field level of demands on this park and may result in turf quality and safety being sacrificed for "water conservation".

It is important to understand that this data and report are a "snapshot" of the conditions observed in the few days that the auditors were on each site. Landscape and irrigation is a living, breathing, dynamic thing that changes on virtually a daily basis. So, although deficiencies noted may be corrected and repaired it is not reasonable to assume that they will stay that way. New deficiencies can occur due to new vehicular traffic, as well as park and athletic field use. The sites require constant monitoring.

This water audit has identified many of the challenges you face with making your water systems more conservative. However, this information is only the first step in your journey toward achieving effective landscape water conservation. The next step is to initiate the recommended improvements so that your new systems can realize actual water and cost savings. Above is a list of the steps you may choose to take in improving your water conservation.

Sincerely,

AquaSave Inc.

LEAKS IDENTIFIED:


















Meter Movement	No
Outdoor	No

-See Detailed Report

SITE PROFILE:

Account No.	A65	Pool (sq. ft.)	No
Meter #	A65	Spa (sq. ft.)	No
Dedicated Meter(s)	Yes	Pump	No
Site Size (sq. ft./ acre)	960,015	Master Valve(s)	Yes
Irrigated Area (sq. ft.)	710,914	Flow Sensor	No
Smart Controllers	Yes	Weather Station Active	No
		Reclaimed Water	Yes

SITE	Marina Vista Park
Address	5355 E. Eliot St. 90814
CITY	LONG BEACH
CONTROLLER:	1 and 2
TOTAL VALVES SURVEYED	44
TOTAL ROTORS	175
TOTAL SPRAY	710,914
Irrigated Area:	N/A
League Irrigated	N/A
League % of Total	N/A

Totals		%		Totals		%		Totals		%		Totals		%	
	Leaking Rotor e.g. "wiper seal"	33	18.9%		Head too low	21	12%		Overpressurized	21	12%		EXPOSURE PROBLEM: e.g. North/South;	1	
	Broken Rotor	33	19%		Broken lateral	1			MIXED HYDROZONE: e.g. planter	1					
	Adjust Arc	17	10%		Water hits building	7			MIXED ROTORS VALVE.	7					
	Not Perpendicular	32	18%		Run off on hardscape	12			Spacing Problem	12					
	Blocked Head	8	5%		SLOPE: Need check valve	2				2					
	Head too high				Rotor does not Retract										
Totals		33	18.9%	33		21	12%	1		7		65	37%	12	

Water Use Calculations / Large Landscape Outdoor Irrigation - Dedicated Irrigation Meters

Customer Name: **Mariano Villa Park** Water Co: **City of Long Beach** Auditor: **John Oshika** Audit Date: **5/27/2013**
 Contract Address: **Theresa Moseyka** County: **Long Beach** Report Writer: **Aaron Compton** Report Date: **6/20/2013**
 5325 E. Elm St. CRMIS Area: **1.4** Long Branch: **1.4** CCF Rate: **\$1.00 (including service charge)** ZIP Code: **90814**

1. How much water are we using? (Inhouse)

Year	Jan/Jan	Mar/Mar	May/May	Jul/Jul	Sep/Sep	Nov/Nov	TOTAL CCF
2010	1,053	1,013	1,058	1,105	1,110	1,110	13,725
2011	1,053	1,013	1,058	1,105	1,110	1,110	13,725
2012	1,053	1,013	1,058	1,105	1,110	1,110	13,725

2. How much water should we use for our landscape? (Plan & Implement for improvement)

ET Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2010	2.19	2.08	3.25	4.97	5.31	5.43	5.52	5.88	4.95	3.46	2.01	1.41	47.28
2011	1.14	1.31	1.16	1.46	0.91	0.93	0.33	0.15	0.03	0.16	0.09	2.36	7.82
2012	1.14	1.31	1.16	1.46	0.91	0.93	0.33	0.15	0.03	0.16	0.09	2.36	7.82

3. How much water the plants need

Site No. In.	Jan/Jan	Mar/Mar	May/May	Jul/Jul	Sep/Sep	Nov/Nov	TOTAL
CINMS Data	3.38	5.58	10.92	10.83	8.2	1.32	40.23
Adjust for Crop Coefficient (C _p)	0.65	3.28	2.64	4.83	4.81	1.68	30.7
Adjust for applicable crop coefficient	0.65	3.28	2.64	4.83	4.81	1.68	30.7

Outdoor Water Use Compared to ET (Regional Plant Needs)

Month	2010	2011	2012	ET
Jan/Jan	0	553	1,293	3.38
Mar/Mar	2,613	1,488	2,464	2,142
May/May	4,556	3,659	4,140	4,192
Jul/Jul	4,100	3,253	3,233	4,181
Sep/Sep	1,856	1,804	2,096	3,149
Nov/Nov	610	617	0	507
Total	13,725	13,615	13,846	15,668

Convert from ET Ref to CCF, needed by billing period

ET (Inch)	588 SF x .82 gal/100 sq ft	total gallons x .134	total CCFs
40.23	718,914	0.62	0.134 / 100

1. How do we compare our water consumption? (Manage for savings)

Outdoor retrofit cost and ROI estimate	Annual H2O cost	Annual H2O cost	ROI
11,000	11,000	11,000	0.00

Outdoor retrofit cost and ROI estimate

Year	Unit	Cost	% Savings	ROI
2010	30	10	0%	0.00
2011	317	317	3%	0.02
2012	317	317	3%	0.02

2. How do we compare our water consumption? (Manage for savings)

Year	Unit	Cost	% Savings	ROI
2010	30	10	0%	0.00
2011	317	317	3%	0.02
2012	317	317	3%	0.02

3. How do we compare our water consumption? (Manage for savings)

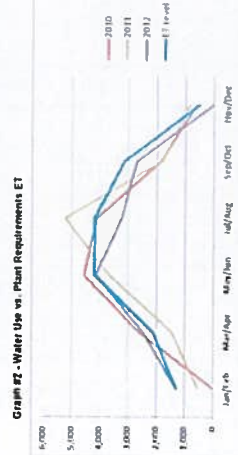
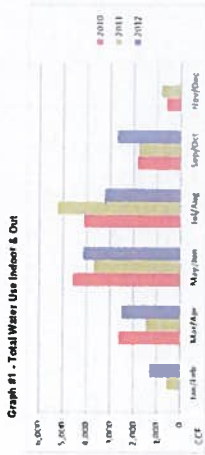
Year	Unit	Cost	% Savings	ROI
2010	30	10	0%	0.00
2011	317	317	3%	0.02
2012	317	317	3%	0.02

4. How do we compare our water consumption? (Manage for savings)

Year	Unit	Cost	% Savings	ROI
2010	30	10	0%	0.00
2011	317	317	3%	0.02
2012	317	317	3%	0.02

5. How do we compare our water consumption? (Manage for savings)

Year	Unit	Cost	% Savings	ROI
2010	30	10	0%	0.00
2011	317	317	3%	0.02
2012	317	317	3%	0.02



Customer #: See Profile
 Name: City of Long Beach
 Meter #: See Profile

Month	Usage	Charges	Usage	Charges
Jan-Feb	1,293	\$1,943.77	553	\$889.09
Mar-Apr	2,464	\$3,844.42	1,449	\$2,151.76
May-June	4,140	\$5,410.41	3,689	\$4,852.18
July-Aug	3,233	\$5,881.27	5,253	\$6,745.43
Sept-Oct	2,096	\$4,958.97	1,864	\$2,540.07
Nov-Dec	0	\$119.82	817	\$1,310.31
Total	13,846	\$21,702.64	13,615	\$18,679.78

Annual Calculation for Cost per CCF (Costs to City)

Item	Value	Cost/CCF
Water Cost	\$21,702.64	\$1.58
Other Costs	\$11.84	\$0.09
Total	\$21,714.48	\$1.67

Cost Savings of Current Rates

Year	Cost
2010	\$24,993
2011	\$18,680
2012	\$21,703

Savings Estimates

Year	CCFs	Gallons	\$ Savings
1 year	342	257,816	\$635
3 years	1,026	773,448	\$1,905
5 years	1,710	1,272,647	\$3,163

Notes

** ROI = Return On Investment = Times in which cost savings pay for themselves.
 NOTE: Correction of system deficiencies and leaks and improvement of DMF results to be done to fully realize savings of Items 1 and 2 above.
 (Per City Water Audit Report - Forward Recommendations & Proposed Costs & ROI)

Client Name	City of LongBeach	Auditor	JO	Start Time	730am	EndTime	330PM	Date	5/2/2013
Job Name	Marina Vista	Address:	Colorado & Santiago	Phone#	562-570-4879	email:	Theresa.Maceyka@longbeach.gov		
Mtr #	119431184	Meter Loc	Colorado/orlena	Meter Rdg					
Controller I.D.	1	Type & Mod	Rainbird ESP-24MC	Location	BY Tennis court	# Activ Strns	16		
Soil Type	Clay Loam Sandy	Soil Depth	1.5"	Soil Fertility	passable	Root Depth	1-2"	Plant Condition	spotty
SITE SQUARE FOOTAGE:		710.914							
LEAGUE AREAS		N/A							

IRRIGATION SYSTEM DATA COLLECTION WORKSHEET

Controller Programming		CONTROLLER #1							Spcl Sched / Notes	
Program - 1,2,3,4	PROGRAM	Sun	Mon	Tu	Wed	Th	Fr	Sat	On / OFF	
IOPM	A	ON		ON	ON	ON			On / OFF	
Start Time									On / OFF	
VALVE #		1	2	3	4	5	6	7	8	↓ Total From Sheets
Program										
RUN TIME		25	25	25	25	25	25	25	20	
PLANT TYP			C,D	C	C	C	C	C	C	
# of Hds		5	5	7	9	8	8	9	8	175
SPACING		27'-55'	48'-63'47'	37'-63'	49'R:60'	56'50'R:	57'1.60'	57R:58'35'	55'Rw:57'h	
Est. D.U			65%	60%	60%	45%	40%	40%	40%	51%
Mixed Rotor Use		60				1				4
Rotor Mfg	Series	A,B,E	A,E	A,E	A	A,E	E	A,E	E	Repair breaks and deficiencies in system
	Nozzle-(color)		dblu,-E	dblu,-E	blu-E	bw-E	dblu-E	dblu-E	dblu-E	
	Nozzle-(color)		bk_E	bk-A	bk-E	blu-E	blu-E	bk-A		
	Nozzle-(color)					bl-A				
	Dyn PSI range valve	57	55	40	51-40	40-	40	40-28	35	
	Leaking Rotor				4	1	2	2	1	23
	Broken Rotor						1	1	1	0
	Adjust arc	2	1							3
	Head not Perp.			2			2	1	2	14
	BLOCKED head			1		2		2		25
	Head too high									3
	Head too low									0
	Nozzle Problems			3	2	2		4		12
	Missing									0
	Inapprop	1								0
	clogged									0
	Broken lateral									0
	Wtr Hits Bldgs /Fence	2								1
	Run Off on Hrdsc	2								5
	Slope:Need ckvalve									10
	Head does not retract									16
	Misting/Over.press.						1	1	2	13
	Exposure Problem									17
	Mixed Hydrozone									0
	SPACING PROBLEM									0
VALVE ISSUES										2
										169

PLANT TYPES (key)

A	Shrubs & Grnd Cver
B	Small plants & grnd
C	Turf
D	Trees
E	Annual Color

ADDITIONAL ROTORS ON SITE

Mfg	I.D. Code	Series	Nozzle
Hunter	A	i40	blu
	B	PGP	rd,blu
	C	PGJ	RED
	C-1	i 20	
TORO	D	640	white
Rainbird	E	6504	blu
	F	5000	BLU
	G	1800	

- 3 Upgrade existing nozzles to water
- 4 Upgrade head spacing to improve
- DU Adjust valvePressure Fix Exposure problem: Fix mixed hydrozones

IRRIGATION SYSTEM DATA COLLECTION WORKSHEET

Controller Programming		CONTROLLER #1							Spcl Sched / Notes	
Program - 1,2,3,4	PROGRAM	Sun	Mon	Tu	Wed	Th	Fr	Sat		
10PM	A	ON		ON	ON	ON			On / OFF	
Start Time									Un / U/H	
VALVE #		9	10	11	12	13	14	15	16	17
Program										
RUN TIME		20	30	15	15	20	30	23	25	30
PLANT TYP		C	C(D)	C,D	C,D	C,D	C	C	C	C,D
# of Hds		8	8	6	7	8	8	8	8	8
SPACING		56'Rw;	58'	57'Rw;56'H	57'	80';58'	57'76'	71'56'	56'Rw;57'	80'-57'
Est. D.U.		50%	55%	60%	60%	50%	55%	40%	40%	50%
Mixed Rotor Use			1						1	
Rotor Mfg	Series	DE	A,B,E	A,E	A,E	E	A,E	A,E	A,E	A,E
	Nozzle (color)	dblu-E	bk-A	bk-A	blu-E	blu-E	blu-E	blu-E	blu-E	bk-A
	Nozzle (color)	DR70	blu-E	blu,bw-E	bk-A		bk-A	bk-A	bk-A	blu-E
	Nozzle (color)		rd-B							
	Dyn PSI range-valve	40	46-40	50	45	40	50	45	32	25-40
	Leaking Rotor	1	1			1	3	5	2	2
	Broken Rotor			4	4			1		1
	Adjust arc									9
	Head not Perp.	1	2	1		1	2	1	4	1
	BLOCKED head		3					1	1	1
	Head too high									6
	Head too low	1	3						1	1
	Nozzle Problems									
	Missing									
	Inapprop									
	clogged									
	Broken lateral					1				
	Wtr Hits Bldgs / Fence									
	Run Off on Hrdsc							1	1	1
	Slope:Need ckvalve									3
	Head does not retract	3								0
	Misting/Overpress.									3
	Exposure Problem									0
	Mixed Hydrozone									0
	SPACING PROBLEM					1	1		1	1
VALVE ISSUES										4

PLANT TYPES (Key)

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E	Annual Color

ADDITIONAL ROTORS ON SITE

Mfg	i.D.	Code	Series	Nozzle
Hunter	A	i40	blu	
	B	PGP	rd,blu	
	C	PGJ	RED	
	C-1	i 20		
TORO	D	640	white	
Rainbird	E	6504	blu	
	F	5000	BLU	
	G	1800		

- 3. Upgrade existing nozzles to water
- 4. Upgrade head spacing to improve DU. Adjust valve pressure. Fix Exposure problem. Fix mixed hydrozones

IRRIGATION SYSTEM DATA COLLECTION WORKSHEET

Controller Programming				CONTROLLER #1							Spcl Sched / Notes	
Program - 1,2,3,4	PROGRAM	Sun	Mon	Tu	Wed	Th	Fr	Sat	On / OFF			
10PM	A	ON		ON	ON	ON			<div style="text-align: center;"> </div>			
Start Time									<div style="text-align: center;"> </div>			
VALVE #		18	19	20	21	22	23		<div style="text-align: center;"> </div>			
Program												
RUN TIME		25	25	30	20	30						
PLANT TYP		C,D	C,D	C	C,D	C,D						
# of Hds		8	6	7	7	11						
SPACING		56'73'	62'	56'	56'	47'20'						
Est. D.U.		60%	60%	60%	65%	60%						
Mixed Rotor Use			1	1	1							
Rotor Mfg	Series	A,E	A,E	A,E	A,B,E							
	Nozzle (color)	bk-A	bw-E	bk-A	rd-B	i20 B						
	Nozzle (color)	blu-E	bk-A	bk-A	bk-A							
	Nozzle (color)		dblu-E	dblu-E	dblu-E							
	Dyn PSI range-valve	45	48-60	45-55	50	38						
	Leaking Rotor	2	1		1							
	Broken Rotor											
	Adjust arc				1	4						
	Head not Perp.	1	1	1								
	BLOCKED head	2										
	Head too high											
	Head too low											
	Nozzle Problems											
	Missing											
	Inapprop											
	clogged											
	Broken lateral				1							
	Wtr Hits Bldgs /Fence				1							
	Run Off on Hrdsc	2				4						
	Slope:Need ckvalve											
	Head does not retract											
	Misting/Overpress.											
VALVE	Exposure Problem											
ISSUES	Mixed Hydrozone											
	SPACING PROBLEM	1		1								

PLANT TYPES (Key)

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ADDITIONAL ROTORS ON SITE

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TORO	D	640	white
Rainbird	E	6504	blu
	F	5000	BLU
	G	1800	

- 3 Upgrade existing nozzles to water
- 4 Upgrade head spacing to improve DU Adjust valvePressure. Fix Exposure problem. Fix mixed hydrozone!

Client Name	City of LongBeach	Auditor	JO	Start Time	730AM	EndTime	330pm	Date	5/2/2013
Job Name	Marina Vista	Address:	Colorado & Santiago	Phone#		562-570-4879		email:	Theresa.Maceyka@longbeach.gov
Mtr #		Meter Loc	Meter Rdg			5 Min. leak test			
Controller I.D.	2	Type & Mod	Rainbird ESP-24MC	Location		BY Tennis court		# Activ Stns	
Soil Type	Clay Loam Sandy Loam	Soil Depth	1-5"	Soil Fertility	ok	Root Depth	1-2"	Plant Condition	spotty

SYSTEM IS HYDRAULIC
WATER BUDGET 80%

**PARK LANDSCAPE IRRIGATION AUDIT
SUMMARY OF RECOMMENDATIONS**

Priority	Park (Irrigated Sq. Ft.)	Water Source	Irrigation Infrastructure Recommendations	Cost Estimate (Retrofit to Replacement)
High	Heartwell – Areas I- III (4,168,164 sq. ft.) Manual System	Reclaimed	<ul style="list-style-type: none"> ✓ Retrofit system to electrical/automatic irrigation system from manual/hydraulic system ✓ Install “Smart Weather-based” controller with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Reduce heavy traffic on fields and park to allow turf recovery ✓ Limit access of irrigation controls by athletic leagues ✓ Standardize manufacturers of heads to improve efficiencies 	\$2,000,000
High	Stearns Champions (795,260 sq. ft.) Hydraulic System	Both (26% Potable)	<ul style="list-style-type: none"> ✓ Upgrade system to convert 10 battery operated valves to automatic weather-based, central control system ✓ Install “Smart Weather-based” controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Increase aeration of turf and limit vehicular traffic on turf 	\$994,000 - \$2,386,000
High	Recreation (1,395,524 sq. ft.) Hydraulic System	Reclaimed	<ul style="list-style-type: none"> ✓ Retrofit existing battery, hydraulic, and electric irrigation system to electric, automated system ✓ Install or activate “Smart Weather-based” controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Increase aeration/reseeding of damaged turf area and thin tree canopy to allow more sunlight ✓ Upgrade to pressure regulating valves to minimize overspray 	\$1,744,000 - \$3,489,000

Priority	Park (Irrigated Sq. Ft.)	Water Source	Irrigation Infrastructure Recommendations	Cost Estimate (Retrofit to Replacement)
High	Marina Vista (710,914 sq. ft.) Hydraulic System	Reclaimed	<ul style="list-style-type: none"> ✓ Upgrade outdated hydraulic irrigation to modern electronic system ✓ Activate existing "Smart Weather-based" system with central control ✓ Straighten heads that are not perpendicular to improve coverage ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to pressure regulating valves to minimize overspray 	\$889,000 - \$2,133,000
High	Bixby (313,751 sq. ft.) Hydraulic System	Both (34% Potable)	<ul style="list-style-type: none"> ✓ Upgrade antiquated hydraulic system to electric, automated system ✓ Install or activate "Smart Weather-based" controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to pressure regulating valves to minimize overspray ✓ Upgrade to water saving rotator or precision spray water saving nozzles 	\$392,000 - \$941,000
Med	Houghton (930,445 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Install "Smart Weather-based" controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Limit access of irrigation by athletic leagues ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Upgrade to pressure regulating valves to minimize overspray ✓ Increase aeration of turf and limit vehicular traffic on turf 	\$1,163,000 - \$2,326,000
Med	Scherer (617,478 sq. ft.)	Reclaimed	<ul style="list-style-type: none"> ✓ Activate existing "Smart Weather-based" system with central control ✓ Repair irrigation controller near tennis courts ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Remove portions of grass for low water use shrubs or mulch 	\$772,000 - \$1,852,434
Med	Veterans (542,064 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Install "Smart Weather-based" controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Increase aeration/reseeding of turf and limit vehicular traffic on turf 	\$678,000 - \$1,626,000

Priority	Park (Irrigated Sq. Ft.)	Water Source	Irrigation Infrastructure Recommendations	Cost Estimate (Retrofit to Replacement)
Med	Wardlow (417,419 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Install "Smart Weather-based" controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Limit access of irrigation controls by athletic leagues ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Upgrade to pressure regulating valves to minimize overspray ✓ Increase aeration of turf and limit vehicular traffic on turf 	\$522,000 - \$1,252,000
Med	Pan American (412,173 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Install "Smart Weather-based" controllers with central control capability ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Limit access of irrigation controls by athletic leagues ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Upgrade to pressure regulating valves to minimize overspray 	\$515,000 - \$1,237,000
Med	Los Cerritos (319,231 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Convert 4 valves on LEIT controller to automatic, weather-based central controller ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to pressure regulating valves to minimize overspray ✓ Upgrade to water saving rotator or precision spray water saving nozzles and standardize head manufacturers 	\$399,000 - \$958,000
Med	Martin Luther King, Jr. (239,780 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Install "Smart Weather-based" controllers with central controller ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Correct system deficiencies and head spacing to achieve high Distribution Uniformity ✓ Implement booster pumps to ensure consistent pressure ✓ Increase aeration/reseeding of turf and limit vehicular traffic on turf 	\$300,000 - \$719,340
Med	Coolidge (277,924 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Repair irrigation system breaks, leaks, deficiencies, as needed ✓ Repair and upgrade to water saving rotator or precision spray water saving nozzles ✓ Remove portions of grass for low water use shrubs or mulch 	\$347,000 - \$834,000

Priority	Park (Irrigated Sq. Ft.)	Water Source	Irrigation Infrastructure Recommendations	Cost Estimate (Retrofit to Replacement)
Med	Ramona (222,062 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Repair irrigation system breaks, leaks, deficiencies, as needed ✓ Repair and upgrade to water saving rotator or precision spray water saving nozzles ✓ Remove portions of grass for low water use shrubs or mulch ✓ Install “Smart Weather-based” controllers with central control capability ✓ Correct unmatched nozzle heads or rotor heads 	\$278,000 - \$666,000
Med	Jackson (97,303 sq. ft.)	Potable	<ul style="list-style-type: none"> ✓ Activate existing “Smart Weather-based” system with central control ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to pressure regulating valves to minimize overspray ✓ Adjust rotor arcs to improve spray zone 	\$114,000 - \$292,000
Med	El Dorado West (3,988,462 sq. ft.)	Both (<5% Potable)	<ul style="list-style-type: none"> ✓ Upgrade system to convert battery operated valves to automatic weather-based, central control system ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch ✓ Upgrade to water saving rotator or precision spray water saving nozzles ✓ Increase aeration of turf and limit vehicular traffic on turf ✓ Correct system deficiencies and valve spacing to increase efficiency 	\$4,986,000 - \$9,971,000
Med	El Dorado East – Area II (6,564,602 sq. ft.)	Reclaimed	<ul style="list-style-type: none"> ✓ Convert existing Quick Coupler Valves from manual operation to automatic weather-based irrigation controllers ✓ Repair system breaks, leaks, deficiencies, as needed ✓ Remove portions of grass for low water use shrubs or mulch 	\$8,206,000 – 16,412,000
Med	El Dorado East – Areas III (5,072,969 sq. ft.)	Reclaimed	<ul style="list-style-type: none"> ✓ Upgrade system to convert 5 battery operated valves to automatic weather-based, central control system ✓ Activate existing “Smart Weather-based” system with central control 	\$6,341,000 - \$12,682,000