

Commercial
Site
Assessment™
Tier II

Prepared for:

Crossroads

HOA

17823 Glasgow Way
Lakeville, MN 55044

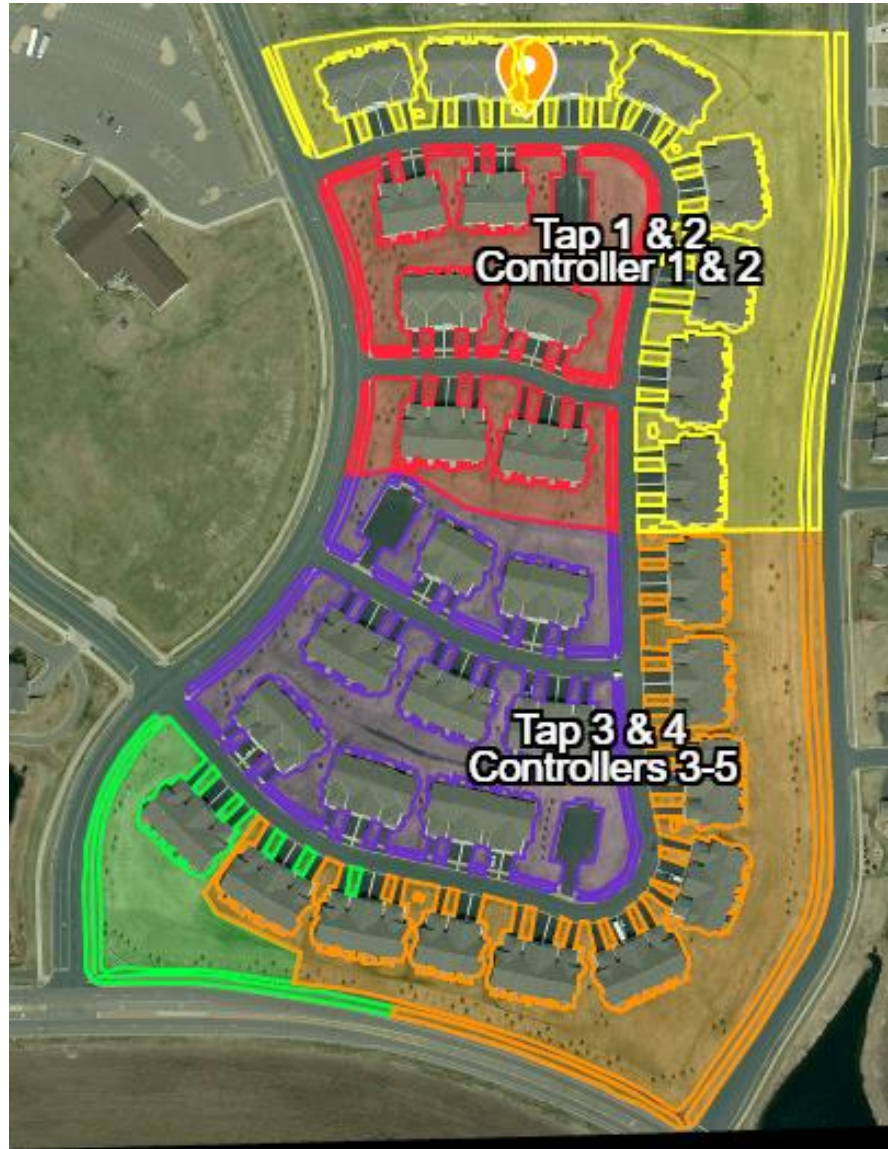
2021 Season



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Proud Partner of 

Controller Systems	
#1	
#2	
#3	
#4	
#5	



Commercial Site Assessment™

Date of Tier I CSA: August 12th, 2021
 Certified Technician: Garret Peterson, CLIA, CIT

Date of Tier II CSA: August 12th, 2021
 Certified Technician: Garret Peterson, CLIA, CIT

Irrigated Acres: 15.63
 Irrigated *ft*²: 680,900

Crossroads HOA Audit Observations

Crossroads has 2 water sources and 5 controllers with 86 zones total.

- **System #1:** Rainbird ESP-SMTe, 16 zones, Rainbird SMT Rain Sensor
- **System #2:** Rainbird ESP-SMTe, 20 zones, Rainbird SMT Rain Sensor
- **System #3:** Rainbird ESP-SMTe, 8 zones, Rainbird SMT Rain Sensor
- **System #4:** Rainbird ESP-SMTe, 22 zones, Rainbird SMT Rain Sensor
- **System #5:** Rainbird ESP-SMTe, 20 zones, Rainbird SMT Rain Sensor

Crossroads general system observations

Crossroads HOA has smart (weather-based) controllers on site that should be managing the irrigation systems effectively. We checked the controllers' settings and they seemed correct for the parameters of the site and individual zones. However, the controllers are only a piece of the puzzle for water savings and they cannot control system design.

This property is susceptible to high winds. Irrigation systems, specifically the heads that throw water, do not perform well in high wind conditions (15 mph+). This can lead to heavier watering programming to make up for the wind carrying away water and drastically affecting distribution uniformity (DU) of the water over its area of coverage. High winds also dry out plant material and soils faster.

Crossroads has many large open areas of grass that are currently being watered by irrigation to be maintained. This is likely one of the biggest contributions to high water use on this site. I would highly suggest converting many of these areas, especially hill sides, to alternative ground covers that do not require watering (e.g. native vegetation, low-mow fescues). This would eliminate the need for these zones to be watered while also enhancing the look of the property. It would also result in less mowing for maintenance crews, which could reduce costs too.

Crossroads HOA Audit Issues and Solutions

Issue #1: Of the 1,081 rotors, 132 of them are either, leaking, broken, or not turning, etc.

Solution #1: Replace 132 broken or defective rotors.

Issue #2: Of the 662 sprays, 4 of them are either, leaking, broken, or clogged completely.

Solution #2: Replace 4 sprays.

Issue #3: Some spray heads have the wrong nozzle size installed for the area of coverage.

Solution #3: Change these spray nozzles to the correct sized nozzle.

Issue #4: Some spray heads have damaged or clogged nozzles.

Solution 4: Replace 6 damaged or clogged spray nozzles.

Issue #5: There are many zones that all or most of the rotors turn 360 degrees and have small to mid-sized nozzles. Unlike zones where most rotors turn 180 degrees or less, these 360-degree rotors cover twice or more of the area with the same nozzle output as rotors that turn less than 360-degrees. If runtimes are not adjusted accordingly, these zones will dry out.

Solution #5: Make sure controller settings match what is needed for the full circle zones to not dry out. These zones are as follows:

Controller 1 zone: 2

Controller 2 zones: 13, 14, 15, 17, and 18

Controller 3 zones: 3, 5, and 6

Controller 4 zones: 6, 7, 8, 10, 19, 20, and 22

Controller 5 zones: 2, and 18

Issue #6: Some rotors are not nozzled correctly for the area of coverage. The larger the area a rotor covers the larger the nozzle needs to be and vice versa. Example: heads in corners (90° turn) should have a 1.5 gallons per minute (gpm) nozzle, 180° turn heads should have 3.0 gpm nozzle, and 360° turn heads should have a 6-gpm nozzle.

Solution #6: Replace nozzles (application rates) or heads (if it is an older model of head) to match area of coverage.

Issue #7: There are also areas that are lacking proper coverage, have a gap in that coverage, or even an overabundance of coverage. This may be due to landscaping aging/changing, poor design, etc.

Solution #7: Move heads that are not installed in the most optimal spot for coverage, add heads where there is a gap in coverage, or cap/eliminate heads that are not needed.

Issue #8: Some rotors were crooked, too low, etc. and need to have their position in the ground adjusted for proper coverage. If a rotor is not set in the ground correctly, the throw from the head can range from 30' to 10' when crooked. Even worse, if a head is too low it hits all the grass immediately around the head and throws off the distribution.

Solution #8: Reset head in the ground to the correct orientation.

Issue #9: There are many zones with mixed sprinkler types (rotors and sprays) on the same zone. Sprays apply approximately two to three times as much water in their areas as rotors, causing over watering/wasted water.

Solution #9: Convert spray nozzles to rotary nozzles. Rotary nozzles have a similar application rate to rotor heads and work well with each other.

Issue #10: Some areas had mini rotors installed in areas where a standard rotor should be utilized. Mini rotors throw distance range around 19-32' with 22'-26' being the more likely with average flow and psi. Where a standard rotor range is 25'-50' with 30'-32' being more likely with normal flow and pressure on an HOA system. Rotors are usually spaced around 30'+ on this site, and for the best coverage each head should be able to reach the next head in line. Otherwise, dry spots can occur.

Solution #10: Convert some mini rotors to standard rotors for better coverage.

Issue #11: The pressure from the city is very high here. 95+psi at the water sources and 70-80 pounds per square inch (psi) at the heads.

Solution #11: Install pressure regulated heads to reduce water waste due to "misting" from high pressure. I would recommend doing this on head replacements moving forward.

Issue #12: There are two line leaks. One on system #1, zone 14. Another one on system #5, zone 7.

Solution #12: Repair Line leaks.

The following are individual system issues

Irrigation System 2:

Issue #13: Zone 1 has one mini rotor that should be converted to a spray head due to short throw distance.

Solution #13: Convert mini rotor to a spray head.

Issue #14: Zone 14 may have a pinched line or a leak that is reducing the functionality of the zone.

Solution #14: Find restriction and replace and/or reroute piping.

Irrigation System 3:

Issue #15: The union for the water source was leaking slightly. This union is likely uninstalled in fall and reinstalled in spring, so this may not be a perpetual issue but is worthy of note and a dripping union can add up over a season.

Solution #15: Make sure union is not leaking when reinstalled in spring.

Irrigation System 4:

Issue #16: Zone 11 has 11 of the 19 rotor heads doing 360-degree coverage with incorrect nozzles. Zone 11 is already a larger zone that likely will not accommodate the increase nozzle gallon per minute requirements.

Solution #16: Decrease the nozzle size on the heads that are not doing 360-degree areas and increase the run time of the zone accordingly.

Issue #17: Zone 18 has 360-degree rotors incorrectly nozzled for their area of coverage.

Solution #17: Zone 19 is all 360-degree rotors, has few heads, and is located by zone 18. Combine 360-degree rotors on zone 18 with the heads on zone 19 so that all the heads will be 360-degree rotors on one zone. Resulting in easier management of the area.

Water Rates:

Meter Reading Interval: Monthly Quarterly Other _____

Units Measured As: 1000 gallons CCF

Converted Units: 1 unit = 1000 gallons

WATER RATES	Irrigation Metered System
Price per unit (per 1,000 gals)	\$5.64
Threshold per quarter	Irrigation Metered System
Sewer Rate per unit (if unmetered):	None

Historical Water Usage:

Water Source #1

Year	Annual Water Usage (gallons)	Annual Water Cost*
2020	1,409,000	\$7,947
2019	1,123,000	\$6,334
2018	1,037,000	\$5,849
2017	1,317,000	\$7,428
2016	1,455,000	\$8,206
5 Year Average	1,268,200	\$7,153

Water Source #2

Year	Annual Water Usage (gallons)	Annual Water Cost*
2020	1,324,000	\$7,467
2019	700,000	\$3,948
2018	933,000	\$5,262
2017	1,444,000	\$8,144
2016	1,282,000	\$7,230
5 Year Average	1,136,600	\$6,410

*Based on current Water Rates for best year to year comparison.

Water Source #3

Year	Annual Water Usage (gallons)	Annual Water Cost*
2020	1,886,000	\$10,637
2019	1,976,000	\$11,145
2018	1,476,000	\$8,325
2017	2,822,000	\$15,916
2016	1,310,000	\$7,388
5 Year Average	1,894,000	\$10,682

Water Source #4

Year	Annual Water Usage (gallons)	Annual Water Cost*
2020	1,258,000	\$7,095
2019	869,000	\$4,901
2018	729,000	\$4,112
2017	1,464,000	\$8,257
2016	577,000	\$3,254
5 Year Average	979,400	\$5,524

*Based on current Water Rates for best year to year comparison.

Overall Average Use: 5,278,200

Overall Average Cost: \$29,769

Plant Water Requirement (ET Data):

Plant Material Need: **3,884,575 gallons**

Cost: **\$21,909/year**

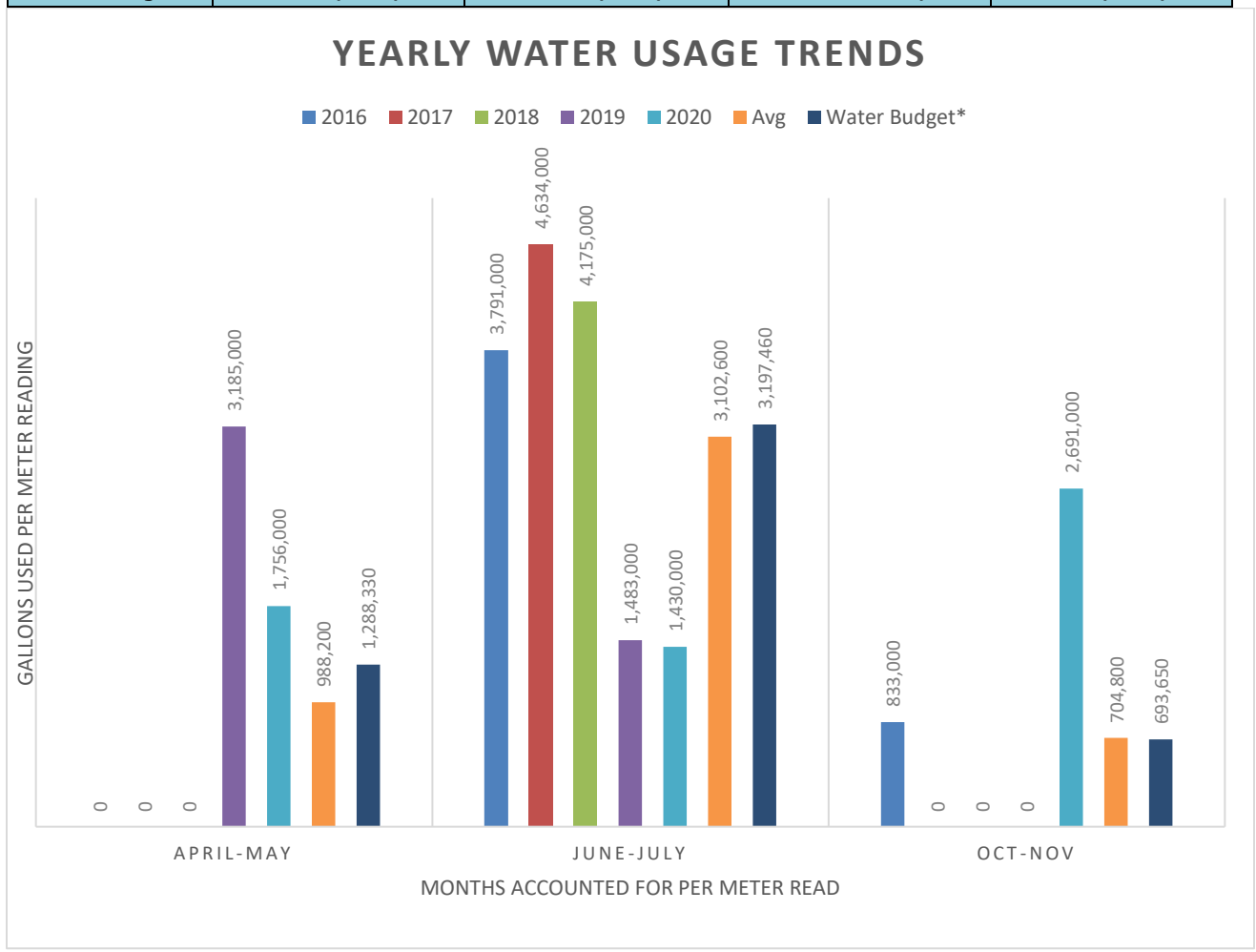
$$Eff \% = \frac{\text{water need}}{\text{water use}}$$

$$Eff \% = \frac{3,884,575}{5,278,200} = 73.6\%$$

EPA Standard = 75% Efficiency

Eff = 75% : 5,179,434 gallons used at an annual cost of **\$29,212**

Month	April-May Reading	June-July Reading	Oct-Nov Reading	Total(gal)
2020 Usage	1,756,000	1,430,000	2,691,000	5,877,000
2019 Usage	3,185,000	1,483,000	0	4,668,000
2018 Usage	0	4,175,000	0	4,175,000
2017 Usage	0	4,634,000	0	4,634,000
2016 Usage	0	3,791,000	833,000	4,624,000
Avg Usage	988,200	3,102,600	704,800	4,795,600
Water Budget*	1,288,330	3,197,460	693,650	5,179,430



***Water budget set higher than average in case of a dry season much like 2021**

System Components:

Water Source		Deficiency?		
#1	Location	17627 Glasgow Way, Lakeville MN 55044		
	Source	3" City Feed		
	Anti-syphon			
		Brand	Wilkins/Zurn (975XL) RPZ	
		Size	2"	
		Inspection Date	Tested in June 2021	
		Visual Inspection	Good	
	Deduct Meter			
		Brand	Neptune T-10 NSF61	
		Size	2"	
		Serial Number	61033168	
		Reading	2,481,930.7 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	N/A	
		Size		
		Volt/AMP		
		Visual Inspection		
		Notes:	<p>Water Source for Controller #1</p> <p>No Master Valve.</p> <p>PSI at RPZ:</p> <ul style="list-style-type: none"> • Static – over 100 psi • Dynamic – hovering around 98 psi 	

Water Source		Deficiency?		
#2	Location	17627 Glasgow Way, Lakeville MN 55044		
	Source	3" City Feed		
	Anti-syphon			
	Brand	Wilkins/Zurn (975XL) RPZ		
	Size	2"		
	Inspection Date	Tested in June 2021		
	Visual Inspection	Good		
	Deduct Meter			
	Brand	Neptune T-10 NSF61		
	Size	2"		
	Serial Number	60929283		
	Reading	6,338,642.6 Gallons		
	Visual Inspection	Good		
	Booster Pump			
	Brand	N/A		
	Size			
	Volt/AMP			
	Visual Inspection			
	Notes:	<p>Water Source for Controller #2</p> <p>No Master Valve.</p> <p>PSI at RPZ:</p> <ul style="list-style-type: none"> • Static – over 100 psi <p>Dynamic – hovering around 95 psi</p>		

Water Source		Deficiency?		
#3	Location	17823 Glasgow Way, Lakeville MN 55044		
	Source	3" City Feed		
	Anti-syphon			
		Brand	Wilkins/Zurn (975XL) RPZ	
		Size	2"	
		Inspection Date	Tested in June 2021	
		Visual Inspection	Good	
	Deduct Meter			
		Brand	Neptune T-10 NSF61	
		Size	2"	
		Serial Number	61142887	
		Reading	1,806,468 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	N/A	
		Size		
		Volt/AMP		
		Visual Inspection		
	Notes:	<p>Water Source for Controller #3 & #4 Union Leaking slightly No Master Valve.</p> <p>PSI at RPZ:</p> <ul style="list-style-type: none"> • Static – over 100 psi <p>Dynamic – hovering around 98 psi</p>		

Water Source		Deficiency?		
#4	Location	17823 Glasgow Way, Lakeville MN 55044		
	Source	3" City Feed		
	Anti-syphon			
		Brand	Wilkins/Zurn (975XL) RPZ	
		Size	2"	
		Inspection Date	Tested in June 2021	
		Visual Inspection	Good	
	Deduct Meter			
		Brand	Neptune T-10 NSF61	
		Size	2"	
		Serial Number	61111041	
		Reading	1,770,591 Gallons	
		Visual Inspection	Good	
	Booster Pump			
		Brand	N/A	
		Size		
		Volt/AMP		
		Visual Inspection		
	Notes:	<p>Water Source for Controller #5</p> <p>No Master Valve.</p> <p>PSI at RPZ:</p> <ul style="list-style-type: none"> • Static – over 100 psi <p>Dynamic – hovering around 98 psi</p>		

Recommend Critical Repairs and Adjustments: Controller #1

	Zones																
Head Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Total # Rotors	16	19	15	10		17	17	18		17	17		15	9	8	12	190
Total # Sprays				6	16	7		7	24	6	8	33	7				114
Rotating Nozzles										1			1				2
Drip																	
Mixed Head Types				X		X		X		X	X		X				6
Repairs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Damaged Rotors	1	2		1		2		4		1	4		3		1		19
Damaged 4" Sprays																	
Damaged 6" Sprays																	
Damaged High Pop Rotor																	
Damaged High Pop Spray																	
Line Leaks														1			1
Wrong Nozzle r=rotor s=spray	4R	3R	2R	6S	1S	3R 7S	2R	2R	1S	6S	1R 8S	4S	1R 7S	6R	1R		25R 43S
Damaged Spray Head Nozzles												1					1
Raise/Straighten Heads		1	2	1					3	3		3	2			1	16
Design Improvements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Move Head for better coverage					2	1	1				2		1				7
Add Head for better coverage			1										1	1			3
Cap Head																	

Recommend Critical Repairs and Adjustments: Controller #2

Zones																					
Head Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Total # Rotors	1	15	17	16	17	16	24	16	15	16			11	11	11	23	11	11	8	13	252
Total # Sprays	63		6	4	6	9	8	8		9	42	24									179
Rotating Nozzles			1	1					6												8
Drip																					
Mixed Head Types	X		X	X	X	X	X	X		X											
Repairs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Damaged Rotors		4			1	3	4	1	2	4			2	4		7	1	1		2	36
Damaged 4" Sprays												1									1
Damaged 6" Sprays																					
Damaged High Pop Rotor																					
Damaged High Pop Spray																					
Line Leaks																					
Wrong Nozzle r=rotor s=spray	3 S	5R	2R 6 S	4 S	3R 6 S	2R 9 S	1R 8 S	8 S		9 S	3 S	2 S		2R		2R			5R	3R	25R 58 S
Damaged Spray Head Nozzles	1					1															2
Raise/Straighten Heads	3		2		1	1	1	1	1			1			3		2		1	2	19
Design Improvements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Move Head for better coverage	1		2							1							1				5
Add Head for better coverage									2												2
Cap Head																					

Recommend Critical Repairs and Adjustments: Controller #3

	Zones								
Head Type	1	2	3	4	5	6	7	8	Total
Total # Rotors		18	14	14	13	12	24		95
Total # Sprays	40	6							46
Rotating Nozzles		1							1
Drip								X	1
Mixed Head Types		X							1
Repairs	1	2	3	4	5	6	7	8	Total
Damaged Rotors		3	4	3	2		1		13
Damaged 4" Sprays									
Damaged 6" Sprays									
Damaged High Pop Rotor									
Damaged High Pop Spray									
Line Leaks									
Wrong Nozzle r=rotor s=spray	3 S	2R 8 S	1R		2R		5R		10R 11 S
Damaged Spray Head Nozzles	1								1
Raise/Straighten Heads	8		1	1	2		1		13
Design Improvements	1	2	3	4	5	6	7	8	Total
Move Head for better coverage									
Add Head for better coverage									
Cap Head									

Recommend Critical Repairs and Adjustments: Controller #4

Zones																							
Head Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Total # Rotors	17	18		13		12	12	9	26	13	19	16	18		15	17	19	25	9	14	20	12	304
Total # Sprays	6	5	32	7	41						5	8	5	40	4	7	7						167
Rotating Nozzles		3		3							3		4		2	3							18
Drip																							
Mixed Head Types	X	X		X							X	X	X		X	X	X						9
Repairs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Damaged Rotors	2	1		4		4	1	2	6	2	2				2	3	2	3	2	5	3	2	46
Damaged 4" Sprays											2												2
Damaged 6" Sprays																							
Damaged High Pop Rotor																							
Damaged High Pop Spray																							
Line Leaks																							
Wrong Nozzle r=rotor s=spray	6R 4 S	6R 5 S	1 S	12R 7 S	3 S		2R	1R	1R	2R	5 S	1R 8 S	1R 5 S	3 S	4 S	7 S	7 S		1R	1R	5R	2R	41R 59 S
Damaged Spray Head Nozzles	2																						2
Raise/Straighten Heads	1	1	5		4	1			3			1		2		1				1	1		21
Design Improvements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
Move Head for better coverage																		1	1				2
Add Head for better coverage					1										1	2	2					2	8
Cap Head															1				1				2

Recommend Critical Repairs and Adjustments: Controller #5

	Zones																				
Head Type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Total # Rotors	10	8	14	6	18		16	17		16		16	18	19		22	20	8	18	14	240
Total # Sprays					3	24	7	7	24	8	24	8		6	32	5	8				156
Rotating Nozzles					1												1				2
Drip																					
Mixed Head Types					X		X	X		X		X		X		X	X				8
Repairs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Damaged Rotors			1		1		1	2					2	2		4	1	1	3		18
Damaged 4" Sprays															1						1
Damaged 6" Sprays																					
Damaged High Pop Rotor																					
Damaged High Pop Spray																					
Line Leaks							1														1
Wrong Nozzle	2R	4R	4R	1R	4 S		2R 7 S	2R 7 S		1R 8 S	1 S	3R 8 S	5R	1R 6 S	2R 9 S	1R	1R 8 S	5R	7R	1R	40 R 58 S
Damaged Spray Head Nozzles																					
Raise/Straighten Heads	1						1	1	1			1			1		1		1	1	9
Design Improvements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Move Head for better coverage			1			8				1							1				11
Add Head for better coverage			1					3				2								2	8
Cap Head			1																		1

Critical Repairs and Adjustments

Repairs	Price (each)	Count	Total
R1.) Installed 4" spray (Issue #2)	\$ 65.00	4	\$ 260.00
R2.) Installed 5" rotor (Issue #1)	\$ 65.00	132	\$ 8,580.00
R3.) Damaged spray nozzles (Issue #4)	\$ 20.00	6	\$ 120.00
R4.) Poly line leaks (Issue #12)	\$ 90.00	2	\$ 180.00
R5.) Raise / Straighten Heads (Issue #8)	\$ 15.00	78	\$ 1,170.00
R6.) Resolve pinched or restricted line(s) (Issue #14)	\$ 150.00	1	\$ 150.00
R7.) Make sure when union is installed it doesn't leak in spring (cost should be part of startup) (Issue #15)	\$ 0.00	1	\$ 0.00
			\$ 10,460.00

Design Improvements

Design Improvements	Price (each)	Count	Total
D1.) Cap unnecessary heads (Issue #7)	\$ 30.00	3	\$ 90.00
D2.) Replace spray nozzle with rotary nozzle (matching precipitation rate) (Issue #9)	\$ 20.00	203	\$ 4,060.00
D3.) Add a Head (Issue #7)	\$ 150.00	21	\$ 3,150.00
D4.) Move a head (Issue #7)	\$ 150.00	25	\$ 3,750.00
D5.) Replace spray nozzle that is incorrectly sized for its area of coverage (Issue #3)	\$ 25.00	26	\$ 650.00
D6.) Convert mini rotors to standard rotors. (Issue #10 & #13)	\$ 65.00	3	\$ 195.00
D7.) Rotor nozzle replacement for incorrectly nozzled rotors that are otherwise functional (Issue #6 & #16)	\$ 25.00	141	\$ 2,820.00
D8.) Combine 360 rotor heads from controller 4, zone 18, with zone 19 (Issue #17)	\$ 150.00	1	\$ 150.00
D9.) Update controller setting to account for full circle zones that need to run longer. (This should be part of maintenance costs) (Issue #5)	\$ 0.00	5	\$ 0.00
			\$ 14,865.00

In summary, completing the recommended critical repairs and upgrades will result in substantially more efficient water usage and healthier plant material.

Next Steps:

- Fix critical repair issues
- Move heads for optimal coverage
- Change various nozzles sizes for better coverage and distribution
- Raise/straighten heads as needed to have proper coverage
- Cap unneeded heads
- Add heads/change heads in areas that are lacking proper coverage
- Resolve line pinch/restriction on zone 14 (controller 2).
- Add 360-degree rotor heads on zone 18 (controller 4) into zone 19 instead of zone 18.
- Address high pressures by installing pressure regulated heads going forward
- Annually maintain (including adjustments) & monitor property
- Convert open areas, especially hills, to areas alternative ground cover