# THE BIG CYPRESS BASIN URBAN MOBILE IRRIGATION LAB

2016 4th Quarter & Annual Report

# COLLIER SOIL AND WATER CONSERVATION DISTRICT NATURAL RESOURCES CONSERVATION SERVICE BIG CYPRESS BASIN



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#### **Abstract**

The Big Cypress Basin Urban Mobile Irrigation Lab (MIL) completed 28 evaluations for the fourth quarter of project year 2016. These evaluations produced Potential Water Savings (PWS) of 14.4 million gallons of water per year (44.2 acre-feet). Of the 28 evaluations 10 were follow-up evaluations performed for Follow-Up Actual Water Savings (FAWS) of 1.9 million gallons of water per year (5.9 acre feet). And with changes to the homeowners' controllers, the MIL had Immediate Actual Water Savings (IAWS) of 4.5 million gallons of water (13.7 acre feet) just by reducing long run times and multiple programs on irrigation controllers. These are documented in attachment #1. The Follow-up evaluations with their original evaluations are documented in Attachment #2.

The Big Cypress Basin Urban Mobile Irrigation Lab will be acknowledged during evaluations and the numerous Rookery Bay Best Management Practices (BMP) training courses and the Waterwise and Other Irrigation Concepts course available to contractors of Collier County at Rookery Bay. The Big Cypress Basin Urban MIL has contacted Florida Gulf Coast University in efforts to conserve our natural resource and promote awareness of the MIL. The MIL also reaches the community through PowerPoint presentations and conservation expositions. The MIL is preparing an irrigation demonstration for the Annual Master Gardener Southwest Florida Yard and Garden Show.

### **Annual Summary**

The Big Cypress Basin Urban Mobile Irrigation Lab completed 110 evaluations for the project year of 2016. The evaluations produced Potential Water Savings (PWS) of 47.8 million gallons of water per year (146.9 acre-feet). Of the 110 evaluations, 16 were follow-up evaluations. The follow-up evaluations produced a Follow-Up Actual Water Savings (FAWS) of 2.5 million gallons of water per year (7.7 acre-feet). And with changes to the homeowners' controllers, the MIL had Immediate Actual Water Savings (IAWS) of 8.2 million gallons of water per year (25.3 acre-feet) just by reducing long run times and multiple programs on irrigation controllers. The Big Cypress Basin Urban Mobile Irrigation Lab evaluated 151.7 acres of land in Fiscal Year 2106.

The Big Cypress Basin Urban Mobile Irrigation Lab Completed the following for Fiscal 2016:

- 110 evaluations
- 16 follow-up evaluations
- 4 Power Point Presentation
- 2 Exposition booths
- Live Forum Marco Island TV

#### Introduction

The Big Cypress Basin Urban Mobile Irrigation Lab's mission is to promote water conservation through on-site evaluations of irrigation systems and conservation education.

#### **Evaluation Methods**

There are three levels of evaluation: visual inspection; pressure and flow check; and the efficiency test. Visual inspections are conducted first to determine if the system is in disrepair or has poor coverage. If the system is found to be in poor condition, the other levels of evaluation are not carried out. Pressure and flow checks on individual sprinkler heads or emitters are conducted next. If pressure and flow are found to be uniform, a catch can test is performed to determine optimum run times for the zones in the system.

#### **Common Problems**

The average operator is unaware of watering restrictions and what the proper irrigation schedule should be for their lawn and landscape. Most systems evaluated this year were using municipal sources that are expensive to operate or dual systems that have limitations on usage. The main concerns were saving money and water. Most of the evaluations requested this year were from other customer referrals and MIL flyers. The Mobile Irrigation Lab and evaluation report gives system operators and managers a realistic view of what their systems can do and how to improve their systems to save water. The major problems were blocked sprinklers and wrong settings and times on the controllers. Homeowners often have multiple programs running and overlapping other programs. Many rain sensors are bypassed and set too high. Unmatched precipitation rates with rotors on the same zone as fixed sprinklers were found almost on every site. Residents have lawn and landscaping zones watering together and overwatering landscaping areas.

#### **Conservation Education/Outreach**

For the fourth quarter 2016, the Big Cypress Basin Urban Mobile Irrigation Lab presented an irrigation booth at the 2016 Florida Citrus Exposition held at the Lee County Civic Center. This educational program is documented in Attachment 3.

# **Training**

The training of the Master Gardeners in Collier County continues with conservation as the main objective around the Extension Office in Naples.

			county		System		Water			₄PWS	₅FAWS	6IAWS	
pcode		Acres	ID <sup>*</sup>	Soil	Type Sprinkler	Crop		<sub>2</sub> DU	Problems	Ac-Ft	Ac-Ft	Ac-Ft	F
34145 34145	2	0.3	Collier	.8	Sprinkler	Turf Turf	City City	50 65	7,10,20,21,22,32,34,40,51,52,53,54,55 4,5,10,20,21,24,25,30,40,52,54,55	0.4 0.2	0.0	0.0	
34145 34145	3	0.3 0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	65 70	3,10,32,34,40,50,54,55 10,20,26,32,34,40,54,55	0.3 0.1	0.0	0.2	
34145 34145	5 6	0.5 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City County	65 60	10,26,32,40,50,52,55 3.8,10,20,23,24,31,40,51,52,53,55	0.7 0.5	0.0	0.5 0.0	1
4145	7	0.3	Collier	.8	Sprinkler Sprinkler	Turf Turf	City	55 65	10,23,24,30,32,40,52,54,55 3,7,23,32,40,51,54,55	0.4	0.0	0.1	F
4104	9	0.3	Collier	.8	Sprinkler	Turf	County	65	3,10,20,21,24,30,52,54,55	1.5	0.0	0.0	F
4104	10 11	0.3 3.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County Well	50 65	3,8,9,10,21,25,26,30,32,35,51,52,54,55 1,4,10,20,21,24,32,40,50,52,54,55	0.1 1.9	0.0	0.0 1.5	t
34145 34145	12 13	0.3	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	65 65	7,10,23,32,40,52,54,55 3,10,20,21,26,30,40,50,52,54,55	0.4 1.1	0.0	0.0	$\vdash$
34119 34145	14 15	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake City	60 50	3,10,24,30,31,32,40,50,54,55 3,7,8,10,20,21,22,23,24,30,31,32,34,35,40,54,55	0.4 0.1	0.0	0.2 0.0	F
34145 34145	16 17	0.7	Collier	.8	Sprinkler Sprinkler	Turf	City	55 75	3,8,10,20,21,30,35,40,50,54,55 10,24,32,54	0.7	0.0	0.0	‡
34145	18	0.3	Collier	.8	Sprinkler	Turf	City	65	10,23,24,40,54	0.0	0.4	0.0	┢
4145	19 20	0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City County	65 60	3,10,20,32,34,40,50,54,55 3,7,10,20,21,23,40,50,53,54,55	0.1 0.6	0.0	0.0 0.4	╁
34101 34104	21 22	0.3	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County Well	50 55	3,10,20,21,22,23,25,30,32,40,53,54,55 4,10,20,21,25,32,50,53,54,55	0.0	0.0	0.0	F
4145	23 24	0.5	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City County	65 60	3,10,20,21,24,32,40,54,55 10,20,21,23,31,32,33,40,50,52,55	0.0	0.0	0.0	Į
4104	25	0.3	Collier	.8	Sprinkler	Turf	County	50	3,10,20,21,22,23,24,30,32,34,40,50,53,54,55	0.2	0.0	0.2	t
34145 34145	26 27	0.3 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 65	3,10,23,26,30,32,40,54,5 3.10,30,32,51,52,53,54,55	0.1 0.2	0.0	0.1	t
34145 34104	28 29	0.8	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City County	65 65	3,4,10,30,34,40,50,52,54,55 3,10,20,21,24,40,50,51,54,55	1.6 0.0	0.0	0.9	╁
34145 34145	30 31	0.8 0.5	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	60 65	4,5,10,20,21,23,32,40,50,52,54,55 3,10,24,32,40,50,52,53,54,55	0.6 0.6	0.0	0.5 0.5	F
34110 34110	32 33	0.3	Collier	.8	Sprinkler Sprinkler	Turf Turf	County	60	3,7,10,20,21,22,23,24,32,40,51,52,54,55 3,10,20,21,24,25,32,35,40,51,54,55	0.1 0.1	0.0	0.1	ļ
34145	34	0.3	Collier	.8	Sprinkler	Turf	City	60	10,20,21,23,27,32,34,40,50,53,54,55	0.1	0.0	0.0	F
4104 4104	35 36	0.3	Collier	.8	Sprinkler Sprinkler	Turf Turf	County County	60 65	4,5,10,20,21,30,32,34,40,54,55 3,10,20,21,32,40,50,52,54,55	0.2	0.0	0.0	$\pm$
4145 4104	37 38	0.3 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County County	65 65	3,10,20,32,40,50,54,55 3,8,10,20,25,52,53,54,55,	0.3 0.1	0.0	0.2 0.0	F
34145 34104	39 40	0.5	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	City County	70 65	3,10,24,32,34,52,54,55 4,10,20,21,24,32,40,50,52,54,55	0.3	0.0	0.3	ļ
4104	41	0.3	Collier	.8	Sprinkler	Turf	County	60	3,10,20,23,24,30,32,34,40,50,53,54,5	0.2	0.0	0.0	上
4117	42 43	1.5 2.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Well Well	50 65	4,9,10,20,21,23,25,32,34,40,52,54,55 3,10,20,21,32,40,50,52,53,54,55	0.5 2.0	0.0	0.0	t
34105 34110	44 45	0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County City	70 70	34,40,50,52,54,55 10,24,32,40,52,54,55	0.8	0.0	0.0 0.2	╁
34105 34110	46 47	0.3 1.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City County	65 55	10,,20,30,34,51,54,55 3,7,21,23,32,34,40,50,52,53,54,55	0.1 0.5	0.0	0.0	F
34112 34108	48	1.5	Collier	.8	Sprinkler Sprinkler	Turf Turf	Lake	65 65	10,24,31,32,33,34,40,53,54,55 10,20,21,23,24,32,40,54,55	0.4	0.0	0.0	Į
4108	50	0.3	Collier	.8	Sprinkler	Turf	City	60	10,20,21,32,50,52,54,55	0.5	0.0	0.5	t
4108 4104	51 52	0.1 80.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Lake	65 60	10,20,21,32,54,55 1,4,5,8,10,20,21,32,34,50,52,54,55	0.0 67.1	0.0	0.0	╁
4105 4145	53 54	0.3 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County City	60 65	7,10,22,23,24,31,32,40,50,54,55 3,10,23,32,50,52,54,55	0.3 0.8	0.0 0.0	0.3 0.6	F
34110 34105	55 56	0.3	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	County	75 60	3,10,20,21,40 3,7,10,23,25,32,40,53,54,55	0.0	0.1	0.0	ļ
34104	57	0.3	Collier	.8	Sprinkler	Turf	City	65	7,10,20,21,23,30,32,40,51,52,53,54,55	0.6	0.0	0.5	t
34145 34145	58 59	0.5 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	70 70	10,24'26,30,34,40,50,54,55 7,10,23,40,50,52,54,55	0.3 0.5	0.0	0.3 0.4	+
34119 34109	60 61	0.3 0.5	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake County	65 60	7,10,32,40,4250,52,54,55 3,10,20,21,23,24,30,32,40,50,54,55	0.5 1.3	0.0	0.0	F
34145 34104	62 63	0.5 0.2	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City	50 75	3,10,20,21,23,30,32,34,51,52,53,54,55 3,10,21,40,54	0.2 0.0	0.0	0.1 0.0	F
34120	64	0.3	Collier	.8	Sprinkler	Turf	Well	65	7,10,20,26,32,40,50,51,54,55,	0.9	0.0	0.0	t
34105 34119	65 66	0.3 2.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County Lake	65 65	10,23,30,32,40,51,52,54,55 10,24,40,50,52,53,54,55	0.0 1.6	0.0	0.0	t
34109 34145	67 68	1.5 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake City	65 60	3,10,21,31,32,40,54,55 3,10,22,23,32,40,50,53,54,55	0.3	0.0	0.0	$\vdash$
34115 34145	69 70	0.2 0.8	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County City	65 65	3,10,20,21,26,32,40,53,54,55 10,24,32,40,50,54,55	0.1 0.3	0.0	0.1 0.0	F
4102	71 72	0.3	Collier	.8	Sprinkler	Turf	City Lake	65 60	9,10,23,35,50,54,55	0.2	0.0	0.2	F
34120	73	0.3	Collier	.8	Sprinkler Sprinkler	Turf	Well	65	5,7,10,21,23,26,30,34,40,51,54,55 10,23,34,50,52,54,55	1.0	0.0	0.6	t
34145 34113	74 75	0.5 3.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Lake	50 70	3,10,21,23,32,34,40,51,52,52,54,55 3,10,24,32,40,50,52,54	0.1 3.8	0.0	0.0	╁
34145 34113	76 77	0.3	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City County	75 55	3,10,54 3,10,21,23,25,30,32,34,40,50,52,53,54,55	0.0	0.7 0.0	0.0	F
34119 34145	78 79	5.0	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	Reclaimed City	70 55	3,10,32,40,53,54,55 3,7,10,22,23,32,34,40,50,52,54,55	1.1	0.0	0.0	ļ
4145	80	0.3	Collier	.8	Sprinkler	Turf	City	60	7,10,20,21,23,25,27,32,35,40,51,54,55	0.1	0.0	0.0	‡
4145 4145	81 82	0.3 0.5	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City City	70	3,10,20,23,24,32,40,52,53,54,55 3,10,20,40,54	0.4	0.0	0.2	E
4119 4113	83 84	0.3 3.0	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake Lake	50 70	3,10,,20,21,22,23,26,27,30,32,33,34,53,54,55 4,10,52,54,55	0.6 8.0	0.0	0.6 6.4	F
34120 34145	85 86	1.0	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	Well City	65 60	10,30,34,52,54,55 4,5,10,20,21,23,24,32,34,40,50,52,54,55	1.5 0.4	0.0	0.8	F
4104	87 88	1.0	Collier	.8 .8	Sprinkler	Turf	City	75 60	10,32,40,54 3,10,20,21,23,31,32,34,40,50,53,54,55	0.0	2.8	0.0	ŧ
4101	89	1.5	Collier	.8	Sprinkler Sprinkler	Turf	Lake	60	3,10,21,23,24,25,26,30,32,40,50,52,53,54,55	1.9	0.0	0.0	t
4119 4101	90 91	0.3 2.5	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake Lake	65	4,10,24,31,32,34,40,50,54,55 10,20,21,26,30,32,40,50,52,53,54,55	0.2 5.2	0.0	0.0	╁
4105	92 93	0.3 2.0	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	City Lake	60 65	3,7,10,20,21,23,32,40,50,52,54,55 10,20,40,50,52,53,54,55	0.8 9.3	0.0	0.7 0.0	F
4113 4104	94 95	5.0 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Reclaimed City	65 60	10,20,24,31,32,33,40,50,52,54,55 3,8,9,10,20,21,32,40,50,52,53,54,55	1.1 0.6	0.0	0.0 0.5	Į
4119	96	0.3	Collier	.8	Sprinkler	Turf	Lake	55	3,10,20,21,23,30,32,34,40,50,52,54,55	3.7	0.0	3.6	‡
4142 4120	97 98	0.2	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake Well	65 70	3,10,20,30,31,42,52,54,55 7,10,40,54	0.0	0.0	0.0	$\pm$
4142 4145	99 100	5.0 0.3	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Well City	50 70	7,10,22,26,30,31,32,34,42,53,54,55 2,10,40,54	7.7 0.0	0.0 0.1	0.0	F
4101 4104	101 102	2.0	Collier Collier	.8	Sprinkler Sprinkler	Turf Turf	Well City	50 65	10,20,30,35,50,53,54,55 3,10,20,21,32,40,51,52,53,54,55	1.5 0.2	0.0	0.0	F
4110	103	0.3	Collier	.8	Sprinkler	Turf	City	75	10,24,40,53,54	0.0	0.2	0.0	mutage = 100000000000000000000000000000000000
34119 34110	104 105	0.3	Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	Lake City	75 75	3,10,32,53,54 10,20,32,40,54,55	0.0	0.7	0.0	$^{\dagger}$
34113 34119	106 107	0.3 0.1	Collier Collier	.8 .8	Sprinkler Sprinkler	Turf Turf	County Lake	65 70	3,10,23,32,34,54 3,10,24,40,54,	0.0	0.5 0.1	0.0	F
34119 34119	108 109	0.1	Collier	.8	Sprinkler Sprinkler	Turf Turf	Lake Lake	70	7,24,40,54 10,34,53,54	0.0	0.5	0.0	F
4119	110	0.1	Collier	.8	Sprinkler	Turf	Lake	70	7,10,53,54	0.0	0.1	0.0	#
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<sup>2.</sup> Distrubution uniformity

<sup>4.</sup> Potential Water Savings

<sup>5.</sup> Follow up actual water savings

<sup>6.</sup> Instant actual water savings

# Attachment #2 Original Evaluation and Follow up Tracking Table

MIL ID: BCB 2016 1-2-3-4

IVIIL ID.	DCD		1-2-3-4	IFOID	Ι.		I
Yr	Qtr ID#	ID No#	Crop	EQIP	Acres	PWS ac-ft	AWS ac-ft
2015	4	96	Turf	Sprinkler	0.25	0.2	0
2016	1	17	Turf	Sprinkler	0.25	0	0.15
2016	1	7	Turf	Sprinkler	0.25	0.48	0
2016	1	18	Turf	Sprinkler	0.25	0	0.37
2016	2	32	Turf	Sprinkler	0.3	0.1	0
2016	2	55	Turf	Sprinkler	0.33	0	0.1
2015	3	61	Turf	Sprinkler	0.2	0.23	0
2016	3	63	Turf	Sprinkler	0.2	0	0.24
2016	2	54	Turf	Sprinkler	0.3	0.8	0
2016	3	76	Turf	Sprinkler	0.3	0	0.7
2016	1	23	Turf	Sprinkler	0.5	0	0
2016	3	82	Turf	Sprinkler	0.5	0	0.26
2015	3	72	Turf	Sprinkler	1	2.6	0
2016	4	87	Turf	Sprinkler	1	0	2.8
2016	3	64	Turf	Sprinkler	0.3	0.9	0
2016	4	98	Turf	Sprinkler	0.3	0	0.84
2016	2	37	Turf	Sprinkler	0.25	0.3	0
2016	4	100	Turf	Sprinkler	0.25	0	0.29
2016	2	45	Turf	Sprinkler	0.3	0.2	0
2016	4	103	Turf	Sprinkler	0.3	0	0.23
2016	4	83	Turf	Sprinkler	0.3	0.63	0
2016	4	104	Turf	Sprinkler	0.3	0	0.66
2016	3	77	Turf	Sprinkler	0.25	0.4	0
2016	4	106	Turf	Sprinkler	0.25	0	0.5
2014	4	110	Turf	Sprinkler	0.1	0.1	0
2016	4	107	Turf	Sprinkler	0.1	0	0.1
2014	4	99	Turf	Sprinkler	0.1	0.5	0
2016	4	108	Turf	Sprinkler	0.1	0	0.5
2014	4	103	Turf	Sprinkler	0.1	0.13	0
2016	4	109	Turf	Sprinkler	0.1	0	0.13
2014	4	106	Turf	Sprinkler	0.1	0.1	0
2016	4	110	Turf	Sprinkler	0.1	0	0.095

# MOBILE IRRIGATION LAB CONSERVATION EDUCATION REPORT ATTACHMENT 3 BIG CYPRESS BASIN URBAN MOBILE IRRIGATION LAB

**1ST -4**<sup>TH</sup> **QUARTER 2016** 

		1ST -4 <sup>TH</sup> QUARTER 2016			
DATE	Type of Presentation	NAME OF GROUP	NUMBER ATTENDING	LOCATION	TIME
10/7/2015	Mobile Irrigation Lab Power Point Presentation	Copper Cove Community	28	Eagle Lakes Community Center Naples 34113	3
10/24- 25/2015	Southwest Florida yard and garden show	Collier county	500	Collier County Extension 14700 Immokalee Rd Naples	20
10/28/2015	Best Management Practices Irrigation Module	Green Industries Best Management Practices 2015	25	Rookery Bay National Estuarine Research Center	2
		2ND QUARTER 2016			
DATE	Type of Presentation	NAME OF GROUP	NUMBER ATTENDING	LOCATION	TIME
2/10/2016	Mobile Irrigation Lab Free Service	Marco Island Forum	30	Marco Island Community Center	4
		3rd Quarter 2016			
DATE	TYPE OF PRESENTATION	NAME OF GROUP	NUMBER ATTENDING	LOCATION	TIME
5/19/2016	Mobile Irrigation Power Point Presentation	Master Gardeners of Collier County	19	Naples IFAS Center	2
6/8/2016	Irrigation BMP Module	Collier County Irrigation & Landscape Contractors	100	Rookery Bay National Estuarine Research Reserve	2
		4TH QUARTER 2016			
DATE	Type of Presentation	NAME OF GROUP	NUMBER ATTENDING	LOCATION	TIME
8/8/2016	Irrigation Field Training	Longshore Lakes Employee	1	Longshore Lakes	2
8/17- 18/2016	Mobile Irrigation Lab Citrus Exposition Booth	Florida Citrus and Land owners	700	Lee County Civic Center	20

## **Appendix A Definitions**

#### **AWS and PWS Definitions**

The goal of an irrigation evaluation is to determine the capacity and efficiency of an irrigation system. This information is then used to develop a sound Irrigation Management Plan in which, irrigation water is applied only when needed and only in amounts which can be fully utilized by healthy plants.

Properly managed irrigation is used to supplement natural rainfall. The amount of irrigation required annually is the Net Irrigation Requirement (NIR) and is defined as;

#### **NIR** = Crop water requirement – Effective rainfall

The efficiency of an irrigation system is defined in terms of Distribution Uniformity (DU) for sprinklers and Emission Uniformity (EU) for microirrigation. These terms are defined in the USDA-NRCS Irrigation Guide. These numbers, in the form of percentages, are used to calculate the run times of irrigation events. The annual water use of a properly managed irrigation system is:

#### **Gross application = NIR/DU or EU**

Potential Water Savings (PWS) – The total amount of irrigation water that can be saved annually by following the recommendations derived from an irrigation system evaluation.

 $PWS_{(management)}$  - The amount of irrigation water that can be saved annually by schedule changes (run time and frequency) alone.

#### PWS(man) = measured water use - projected water use

PWS(design) – The additional amount of irrigation water that can be saved annually by improving the performance of the system and readjusting the schedule.

#### $NIR/DU_{(present)} - NIR/DU_{(projected)}$

Actual Water Savings (AWS) - The total amount of water which is saved for a period of x years as a direct result of following the recommendations derived from an irrigation system evaluation.

Instant AWS can be achieved if repairs are made, resulting in quantifiable water savings or if the controller settings are adjusted (schedule change) at the time of the evaluation or when the report is delivered.

AWS schedule changes can be documented in person or by phone and AWS design and repairs can be documented by follow-up evaluations.

The following definitions and formulas are taken from the "Mobile Irrigation Laboratory Urban Irrigation Evaluation & Troubleshooting Training Manual" (Mickler1998).

#### 1. Determine average application rate

#### Meter records water use in gallons

Where Average application rate = Inches per hour (iph)

Volume = Volume required for needle in water meter to make one

complete revolution (gal)

Area = Irrigated area  $(ft^2)$ 

Time = Time required for needle in water meter to make one

complete revolution (s)

#### No water meter present

Where Flow rate = Gallons per minute (GPM)
Volume = Volume collected (ml)

Time = Time that water was collected (s)

#### 2. Determine distribution uniformity

When DU = Distribution uniformity in percent

Low quarter average = Average volume in the 25% of cans that received the

least water (ml)

Total average = Average volume of all cans (ml)

#### 3. Determine the effective application rate

Effective application rate = Average application rate x DU

#### 4. Calculate operating time

Where *Watering time* = Suggested time that a zone should be operated (min)

Plant watering requirement = 0.5 or 0.25 depending on location (in)

Effective application rate = From step 3 (iph)

#### 5. Determine water used per operating cycle

When used per operating cycle is calculated by the following equation:

$$Current\ usage = Flow\ rate\ x\ time$$

Where Current usage = Total water used for a given zone per irrigation cycle (gal)

Flow rate = Determined from equations below (gpm)

Time = Time a zone is operated during a scheduled irrigation cycle (min)

If water meter records units of gallons, use the following equation:

Where *Flow rate* = Flow through a particular zone (gpm)

Time = Time required for the needle on the meter to make one complete revolution(s)

If no water meter is present, determine the flow rate from each sprinkler within one zone and add them all together.

Where *Flow rate* = Gallons per minute (gpm) Volume = Volume collected (ml)

Time = Time that water was collected

Appendix B Problem Descriptions

Problem Descriptions - Problems are irrigation system or management factors that limit irrigation system performance or efficiency. Problems are noted during the site visit, system evaluation, and/or through discussions with the operator.

Code	Description of Problems							
Pressure / Application Rate								
1	Under-sized pump for number and type of sprinkler heads or emitters							
2	Pressure loss between pump and sprinklers/emitters due to inadequate pipe size							
3	Higher pressure than manufacturer's specifications							
4	Lower pressure than manufacturer's specifications							
5	Low pressure due to water supply							
6	Different pressure between manifolds							
7	Small wetted area							
8	Application rate > soil infiltration rate (ponding)							
9	Air in pipelines							
10	Turf and landscape area irrigated in the same zone							
11	Pressure variation due to elevation differences							
Emitters / Sprinklers								
20	Mixed sprinkler/emitter sizes & unmatched precipitation in the same zone							
21	Mixed sprinkler/emitter brands or types in the same zone							
22	Poor emitter/sprinkler uniformity due to worn orifice							
23	Poor overlap due to improper sprinkler/emitter alignment or spacing							
24	Various riser heights in same zone							
25	Emitter/sprinkler spacing varies in same zone							
26	Missing/malfunctioning emitters or sprinklers							
27	Missing/malfunctioning pressure gauge/regulator/filter							
	Maintenance – Irrigation System							
30	Leaks and broken valves, pipe, laterals lines (Poly-tubing), emitters, sprinklers							
31	Clogged filter or filter screen							
32	Sprinkler heads not properly adjusted, causing overflow on paved areas							
33	Clogged emitters/nozzles (due to biological, chemical or physical factors)							
34	Leaning sprinklers/emitters causing non-uniform distribution							
35	Malfunctioning valves							
	Maintenance – Landscape							
40	Stream of water blocked by vegetation							
41	Variable crop spacing and stage of growth							
42	Poor drainage, requiring water control							
	Operation / Management							
50	Operating time too long							
51	Operating time too short							
52	Operating time too frequent							
53	No rain shut-off device							
54	No soil moisture measuring device or rain gage							
55	No irrigation water management plan							

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