This presentation premiered at WaterSmart Innovations

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INNOVATIONS

Taking the "if" out of Verification for Custom Water Efficiency Projects

WaterSmart Innovations 2019

Gary Tilkian
Metropolitan Water District
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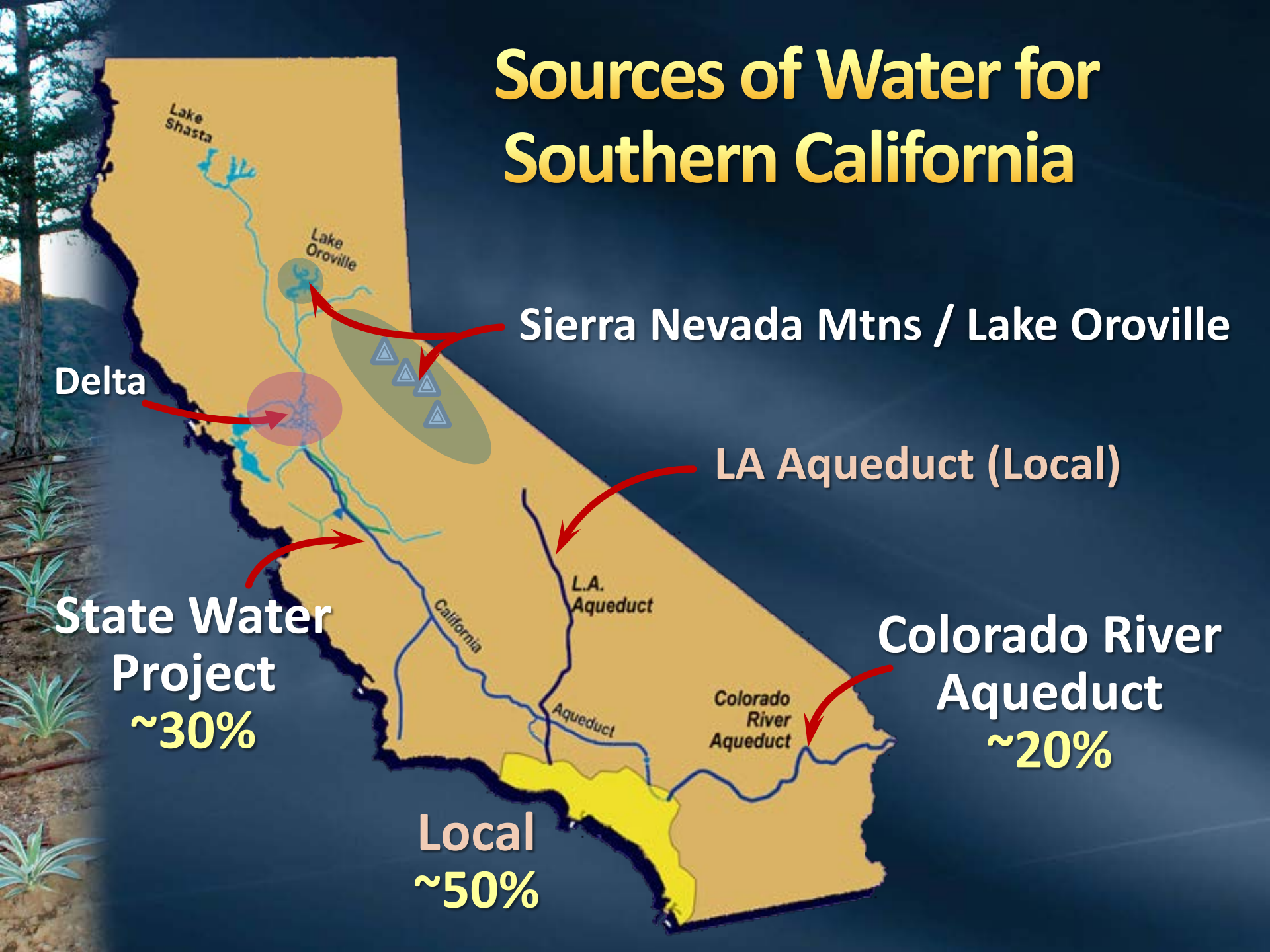
Metropolitan Water District Service Area

- 26 Member Agencies
- Regional water wholesaler to 6 counties, 19 million people
- Over 5,200 sq mi
- Growth: >100,000 people/yr
- $1 trillion regional economy
- ~50% of region's retail water supply

Sources of Water for Southern California



Water Savings Incentive Program (WSIP)

- Program start: Sep 2012
- “Pay for performance”
- Goals:
  - Reach out to non-residential water users
  - Incentives for custom projects
  - Encourage long-term water management as a standard business practice

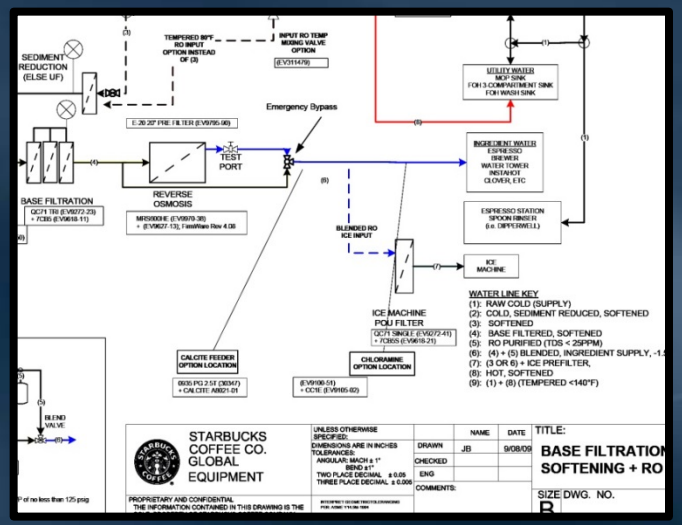
Eligible Projects

- Retrofit existing equipment
- Improve processes
- Improve agriculture & landscape irrigation systems
- Contract for water management services




Incentives

- Up to $0.60 / 1,000 gal saved per year (up to 10 yrs)
- Limited to 50% of eligible project costs
- Payments are phased
  - Final payment may be adjusted per monitored results
  - Some projects may qualify for single payment based on detailed engineering plans

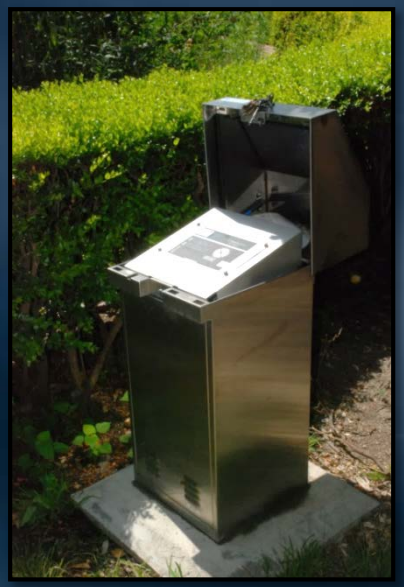


WSIP Eligible Costs

- Directly pertain to project installation or water management services
  - Audit, engineering, software, hardware
  - construction, equipment, materials (incl plants),
  - freight shipping, 3rd party labor, contract water management services
- Ineligible costs:
  - Customer's direct labor
  - Sales tax
  - Permitting
  - Environmental compliance
  - Land acquisition

Large Landscape Project

Project	Replacement & upgrade of entire irrigation system, including “smart” irrigation controllers, drip and high-efficiency sprays, flow sensors, rain sensors, master valves, & lateral lines ~16.6 Acres irrigated area
Estimated water savings	213M gallons over 10 years
Potential incentive	$141,069



Large Landscape Project

Weather Normalization

CIMIS Monthly Average ETo Report

Rendered in ENGLISH Units. Printed on Thursday, June 02, 2016

Average ETo Values by Station

Stn Id	Stn Name	CIMIS Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
			(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
159	Monrovia	LAB	2.19	2.42	3.76	4.37	5.18	5.75	6.33	6.26	4.88	3.4	2.42	1.92	48.9

Large Landscape Project

Weather Normalization

CIMIS Monthly Report
Rendered in ENGLISH Units.
January 2011 - May 2016
Printed on Thursday, June 02, 2016

(You'll need to create an account for this data [it's free])

Monrovia - Los Angeles Basin - Station 159

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan-11	**2.02**	**0.88**	197	8	69.7	45.4	56.2	75	30	53	38	2.8	54.8
Feb-11	**2.14**	**4.45**	260	7.8	64.8	41	52.1	82	35	59	37.3	3.2	55.4
Mar-11	**2.72**	**3.31**	284	10.3	69.5	46.5	57.1	88	41	65	45	3.2	59.8
Apr-11	**4.07**	**0.07**	421	11.1	72.5	50.3	61.2	83	42	61	46.7	3.5	64.8
May-11	**4.97**	**0.45**	464	11	75.1	51.5	62.5	80	39	59	47	3.7	68
Jun-11	**5.15**	**0.02**	496	14.5	79.1	56.1	66.1	86	45	66	54.2	3.7	72.1
Jul-11	**6.31**	**0**	535	16.7	87.4	61.8	73.1	83	40	60	58.3	3.8	78.2
Aug-11	**6.23**	**0**	521	16.6	89.9	61	73.4	84	37	60	58.2	3.6	77.2
Sep-11	**4.4**	**0.01**	404	16.4	86.5	60	70.7	85	42	65	57.9	3.4	73.1
Oct-11	**3.65**	**1.39**	338	12.5	80.8	54.5	65.9	81	37	58	49.6	3	66.7
Nov-11	**2.12**	**1.58**	231	9.4	70	46.7	57.1	82	37	60	42.2	2.9	58.3
Dec-11	**2.23**	**1.11**	225	6.4	66.6	41.8	52.9	71	27	47	31.7	3.1	53.7

Large Landscape Project

Weather Normalization

	Month - Year	Consumption	Actual ETo	Precip
3-Yr Prior Period	Jan-Feb 12	13,065	**5.13**	**1.89**
	Mar-Apr 12	13,996	8.29	4.32
	May-Jun 12	30,954	11.88	0.33
	Jul-Aug 12	36,531	12.90	0.06
	Sep-Oct 12	30,797	8.89	0.33
	Nov-Dec 12	15,420	3.60	9.74
2-Yr Prior Period	Jan-Feb 13	11,647	4.93	1.91
	Mar-Apr 13	18,031	8.11	0.77
	May-Jun 13	26,003	10.06	0.44
	Jul-Aug 13	37,444	10.93	0.00
	Sep-Oct 13	29,054	8.01	0.15
	Nov-Dec 13	12,622	4.20	1.19
1-Yr Prior Period	Jan-Feb 14	17,858	4.86	3.02
	Mar-Apr 14	21,081	8.55	2.19
	May-Jun 14	38,217	11.18	0.00
	Jul-Aug 14	39,393	11.61	0.00
	Sep-Oct 14	27,489	8.53	0.23
	Nov-Dec 14	9,133	3.99	6.75
Monitoring Period	Jan-Feb 15	13,700	4.70	2.75
	Mar-Apr 15	18,654	9.02	0.94
	May-Jun 15	22,985	8.81	0.93
	Jul-Aug 15	22,126	13.13	0.35
	Sep-Oct 15	15,276	8.51	1.24
	Nov-Dec 15	8,253	5.13	0.21

((act ETo-(0.25*precip))/avg ETo)-1

Adjustment Factors					
Month	Long-Term Avg ETo	3-Yr Prior ETo Adjust	2-Yr Prior ETo Adjust	1-Yr Prior ETo Adjust	Monitored ETo Adjust
Jan-Feb	**4.61**	**0.0103**	-0.03	-0.11	-0.13
Mar-Apr	8.13	-0.11	-0.03	-0.02	0.08
May-Jun	10.93	0.08	-0.09	0.02	-0.22
Jul-Aug	12.59	0.02	-0.13	-0.08	0.04
Sep-Oct	8.28	0.06	-0.04	0.02	-0.01
Nov-Dec	4.34	-0.73	-0.10	-0.47	0.17
Total ETo (in)	48.88	-0.05	-0.08	-0.07	-0.02

Steps:

1. Add *effective precipitation* to Avg ETo
2. Compare to monthly actual ET (ratio or adjustment factor)
3. Apply adjustment to actual use
4. Compare adjusted monitored to adjusted baseline

Large Landscape

Adjusted Use						
Month	3-Yr Prior Adjusted Use	2-Yr Prior Adjusted Use	1-Yr Prior Adjusted Use	Monitored Adjusted Use	Monitored Unadjusted Use	3-Yr Avg Adjusted Use
Jan-Feb	12,930	12,045	19,814	15,476	13,700	14,930
Mar-Apr	15,580	18,502	21,412	17,151	18,654	18,498
May-Jun	28,497	28,334	37,343	27,932	22,985	31,392
Jul-Aug	35,675	42,381	42,459	21,331	22,126	40,172
Sep-Oct	28,835	30,133	26,850	15,424	15,276	28,606
Nov-Dec	26,701	13,894	13,421	6,851	8,253	18,005
Total	**148,218**	**145,290**	**161,299**	**104,164**	**100,994**	**151,602**
			Relative Change	-31.29%		

47,400 HCF / ~35M gallons of water annual savings

Un-Adjusted savings: -29.3% = undercount (~$25K swing)

Large Commercial Laundry

Project	Install wastewater treatment and recycling system to re-use up to 75% of process water
Final Project Cost:	$1,080,000
Calculated water savings	196M gallons over 10 years (~40% reduction)
Paid incentive	$119,400
Project unit $/AF	$198 /AF

Also replaced older washers with larger “tunnel” washer, increasing wash capacity

Large Commercial Laundry

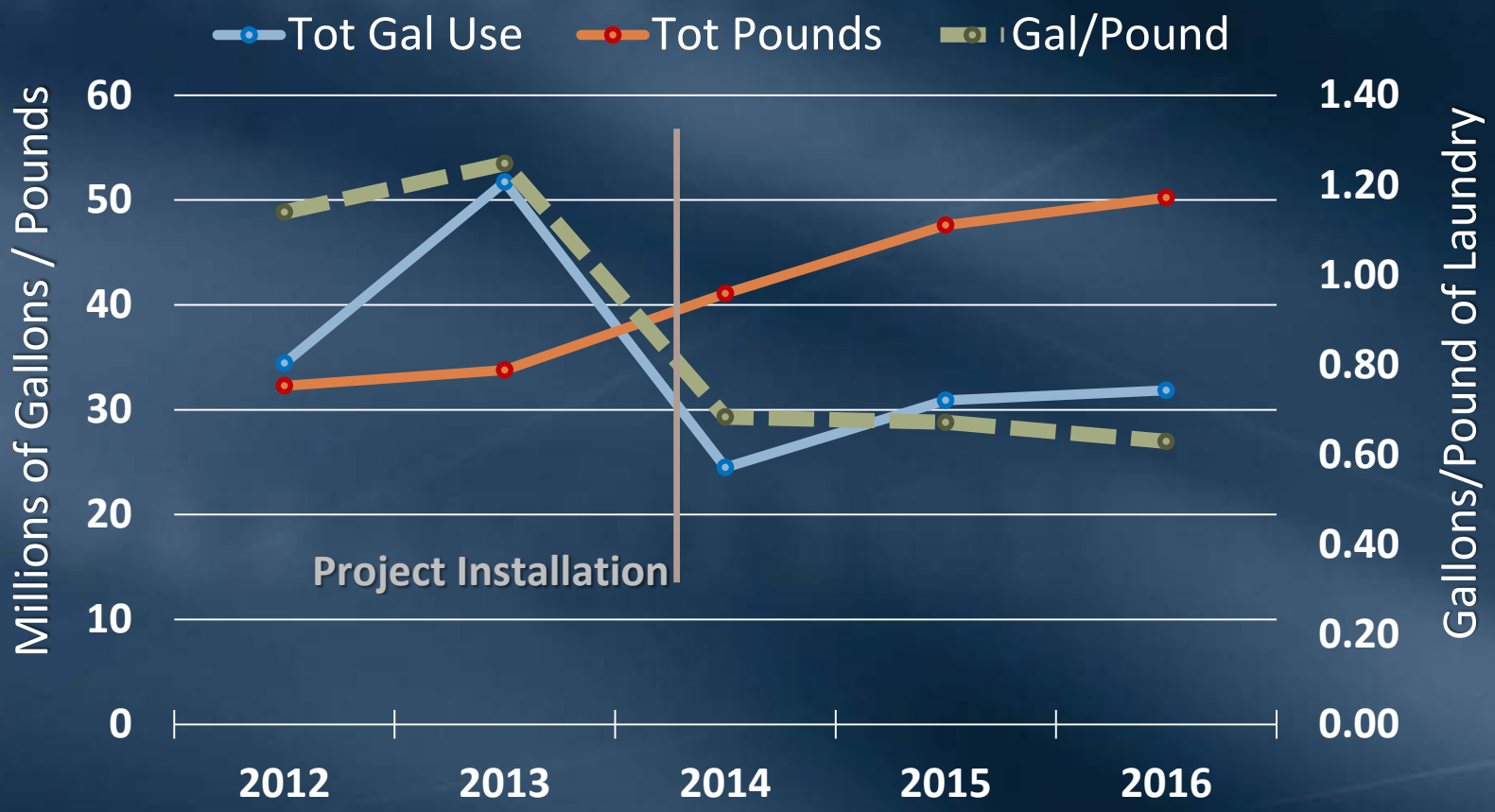
Excellent example of monitoring and data gathering:

WATER 1 GAL	**WATER 2 GAL**	**TOTAL GALS**	**WATER COST**
WW GAL	**WW COST**	**ELECT 10KWH**	**KWH'S USED**
ELECT COST	**GAS #1 Boiler Therms**	**BLR THRMS**	**BLR GAS COST**
GAS #2 Dryer Therms	**DRYER THERMS**	**DRYER GAS COST**	**BILLED LBS**

DATE	WATER 1 GAL	WATER 2 GAL	TOTAL GALS	BILLED LBS	Gal Per LB
1/1/2015	24123	5677	83,776	99,742	**0.84**
1/2/2015	24224	5686	82,280	116,050	**0.71**
1/3/2015	24336	5695	90,508	81,898	**1.11**
1/4/2015	24453	5704	94,248	90,919	**1.04**
1/5/2015	24554	5713	82,280	134,698	**0.61**
1/6/2015	24665	5722	89,760	123,284	**0.73**
1/7/2015	24780	5731	92,752	131,145	**0.71**

Large Commercial Laundry

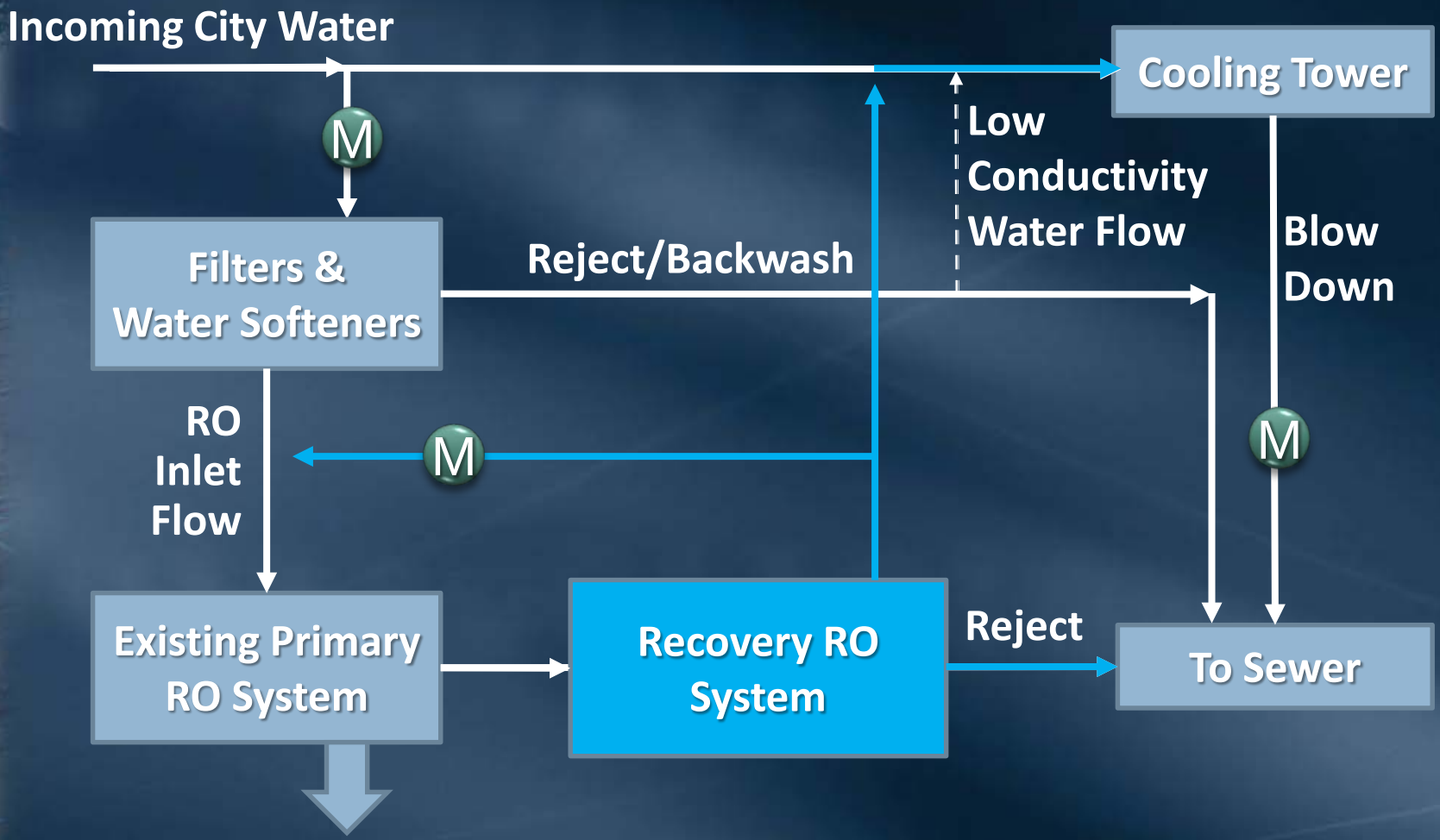
Commercial Laundry Water Use & Pounds Processed



Industrial Chemical Manufacturing

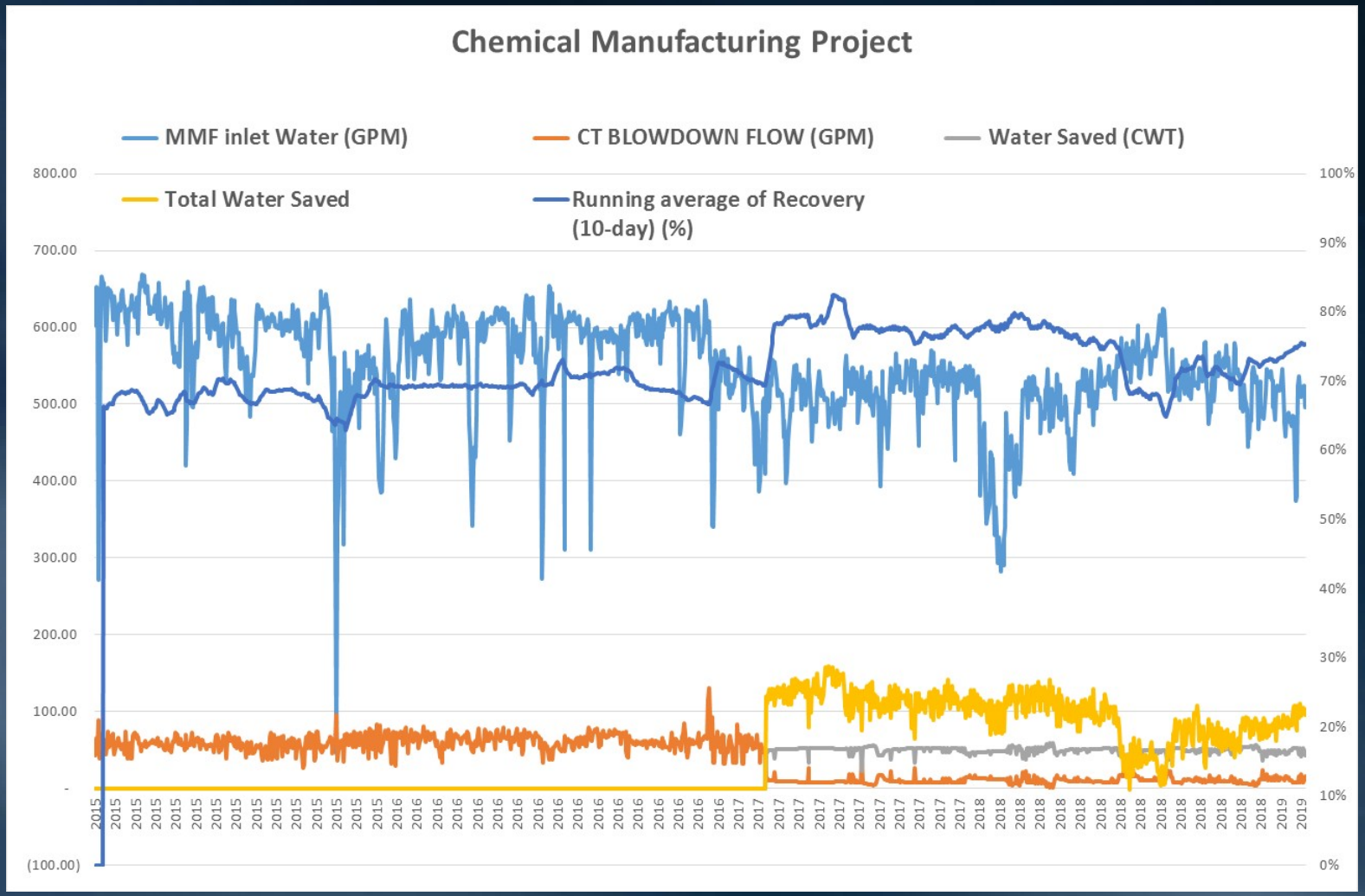
Project	Install equipment to capture and treat RO reject from the existing primary RO units; return recovered permeate to the primary RO feed
Final Project Cost:	~$450,000 (Management)
Calculated water savings	450M gallons over 10 years (~14% reduction)
Paid incentive	$242,800
Project unit $/AF	$177 /AF

Industrial Chemical Manufacturing



H2 Process Water Requirement drives the system

Industrial Chemical Manufacturing



Ag: Avocado Farm Renovation

Project	Replace old trees with new on “high density” planting (10’x10’); install new irrig. Equip. and soil moisture sensors
Final Project Cost:	$425,000
Calculated water savings	345M gallons over 10 years
Paid incentive	$238,814 (contract max)
Project unit $/AF	??

Ag: Avocado Farm Renovation

"High density planting"

- Plant on 10ft X 10ft spacing
- Reduced water use
  - Smaller watering footprints
  - Reduced loss to deep percolation
  - Inhibited weed growth
  - Reduced ET loss through overgrown canopies

Ag: Avocado Farm Renovation

Challenges

- New techniques/management
- Difficult to establish baseline
  - Changes in grove management
  - Older 20’x20’ spacing is well documented, HD not so much
- Phased implementation
  - Stopped watering some portions
  - Planting new trees in phases over 10 years
  - Different water requirements for different aged trees
- Weather normalization also

Ag: Avocado Farm Renovation

Procedure:

- Baseline established from actual use records
- Assume 50% of savings from HD planting, and 50% from irrigation equipment
  - Avocadosource.com for irrig data
  - HD Irrigation need assumed to be about 40% of normal spacing requirement
- Multiple inspections
  - Following planting plan?
  - Equipment installation?
- Time will tell…

Gary Tilkian

(213) 217-6088

gtilkian@mwdh2o.com