This presentation premiered at WaterSmart Innovations

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INNOVATIONS

State to State Domino Effect

The Water Loss Control Movement

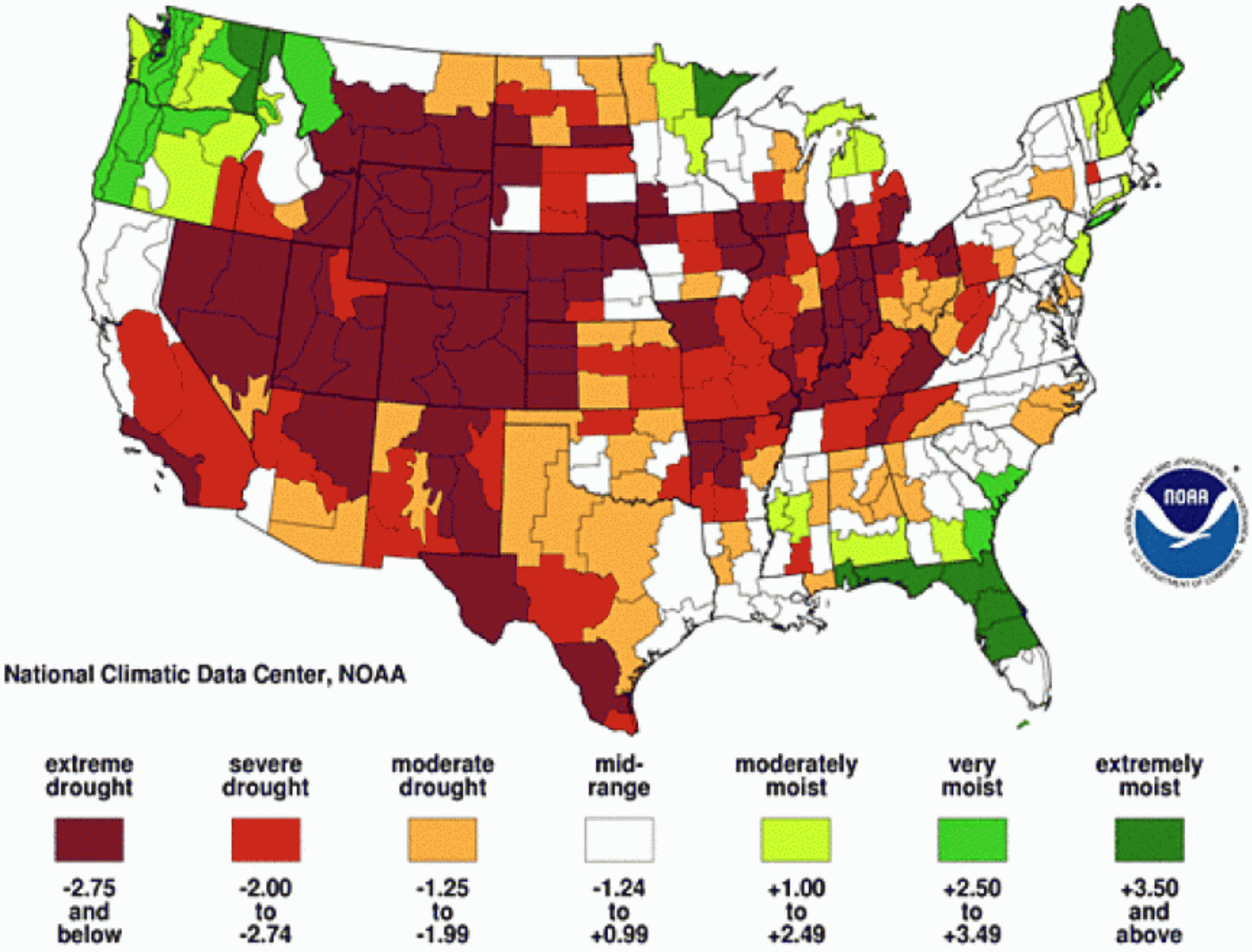
October 3, 2018

WaterSmart Innovations CONFERENCE and EXPOSITION
LAS VEGAS NEVADA

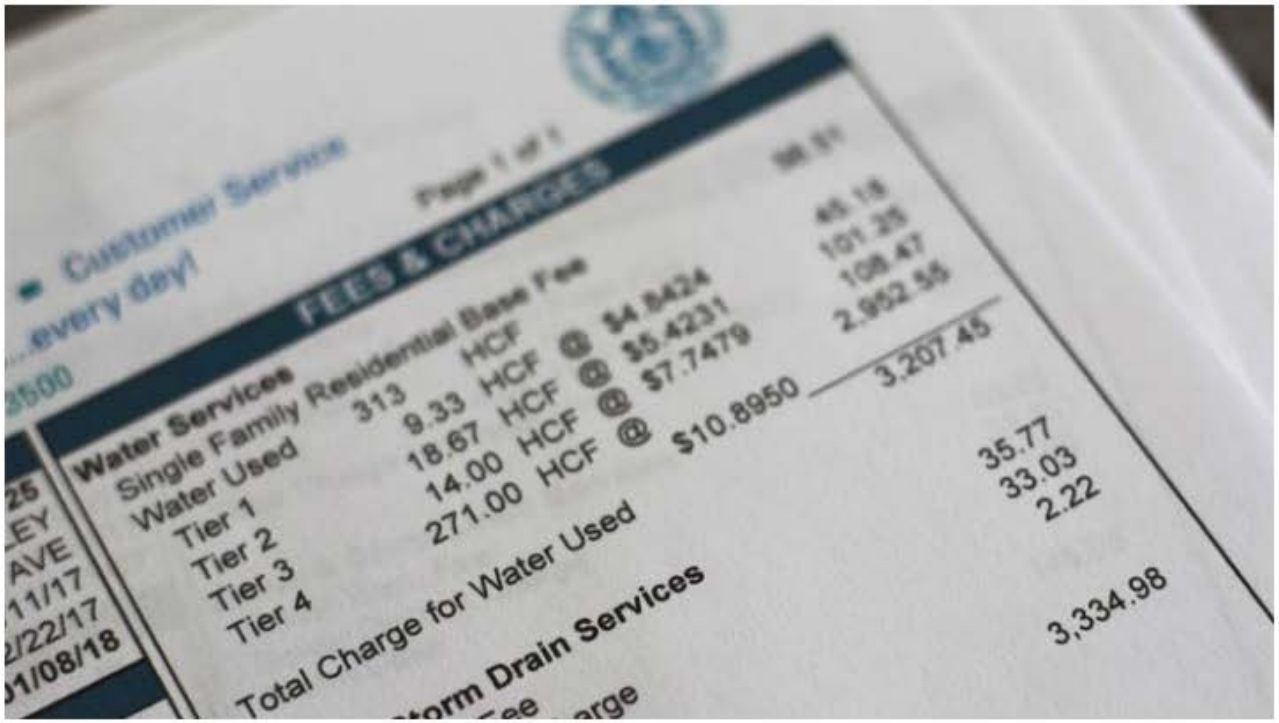
Presenter:
Steve Cavanaugh, P.E.
Chief Innovation Officer
steve.cavanaugh@cavanaughsolutions.com

WSI Bootcamp Success!

Relevance: Environmental Drivers



Relevance: Public Relations



San Carlos resident Kelli Sandman-Hurly got a water bill of $3,334.98 -- an overcharge of more than $3,000. (K.C. Alfred / U-T)

Editorial | ***Don't just blame the meter readers for San Diego's water billing scandal***

By The San Diego Union-Tribune Editorial Board

JULY 27, 2018, 5:15 PM

A new report from City Auditor Eduardo Luna about erroneous water bills serves as a clear indictment of the city's Public Utilities Department. It detailed how 2,750 water bills sent to residents in 2017 were incorrect, often by hundreds of dollars, and that

"Some Residents' Water Bills Jumped 500 Percent or More in the Last 14 Months
Numerous water customers saw radical jumps in water bills from one bill to the next from January 2017 through February 2018, a VOSD and NBC 7 analysis shows."

https://www.voiceofsandiego.org/author/ry-rivard/

Relevance: Public Relations

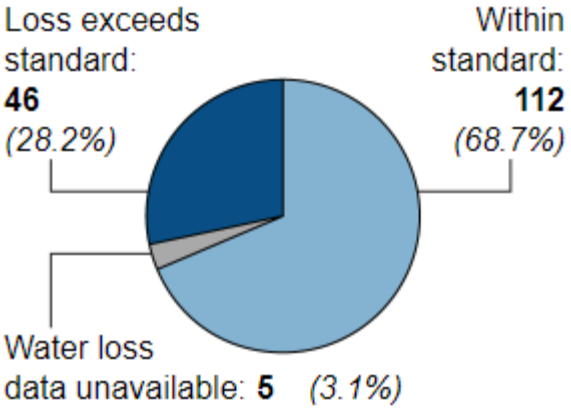
SAWS reveals 9 billion gallons of water wasted last year

by APRIL MOLINA | Wednesday, November 1st 2017

Communities compliant with Illinois water loss standard

For 163 Illinois municipalities that received Lake Michigan water in 2016

Illinois standard: 12% water lost



SOURCE: Tribune reporting, Illinois Department of Natural Resources

CHICAGO TRIBUNE

Relevance: Impact on Bond Ratings

STANDARD & POOR'S RATINGS SERVICES
McGRAW HILL FINANCIAL

MOODY'S

Strong – Utility has performed a water audit consistent with the AWWA M-36 methodology on an annual basis for the prior five years. The utility has a well-structured and documented Non-Revenue Water Management Program that includes ongoing leak detection work and annual accuracy testing of finished water meters and a representative sample of customer meters.

Good – Utility has performed a water audit consistent with the AWWA M-36 methodology on an annual basis for the prior three years. The utility has engaged in specific components of a Non-Revenue Water Management Program such as periodic finished water meter testing, accuracy testing of samples of customer meters and active leak detection.

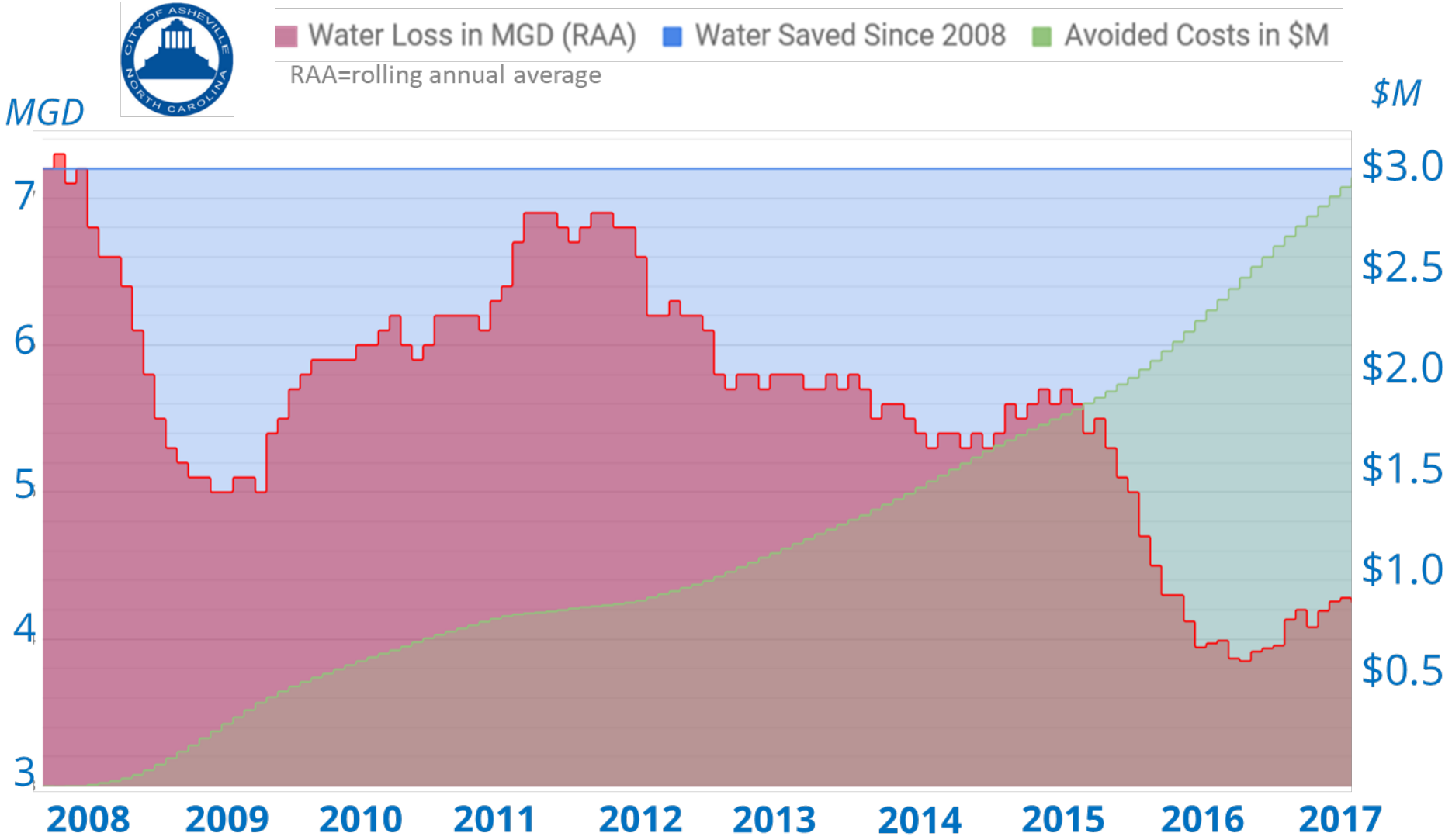
Standard – Utility has performed a water audit consistent with the AWWA M-36 methodology but does not do so on an annual basis. The utility tracks some basic water loss information on a monthly basis but does not have an active Non-Revenue Water Management Program.

Vulnerable – Utility has not performed a water audit consistent with the AWWA M-36 methodology and does limited tracking of some basic water loss information on a monthly basis. This information is generally reported on a percentage of volume-supplied basis.

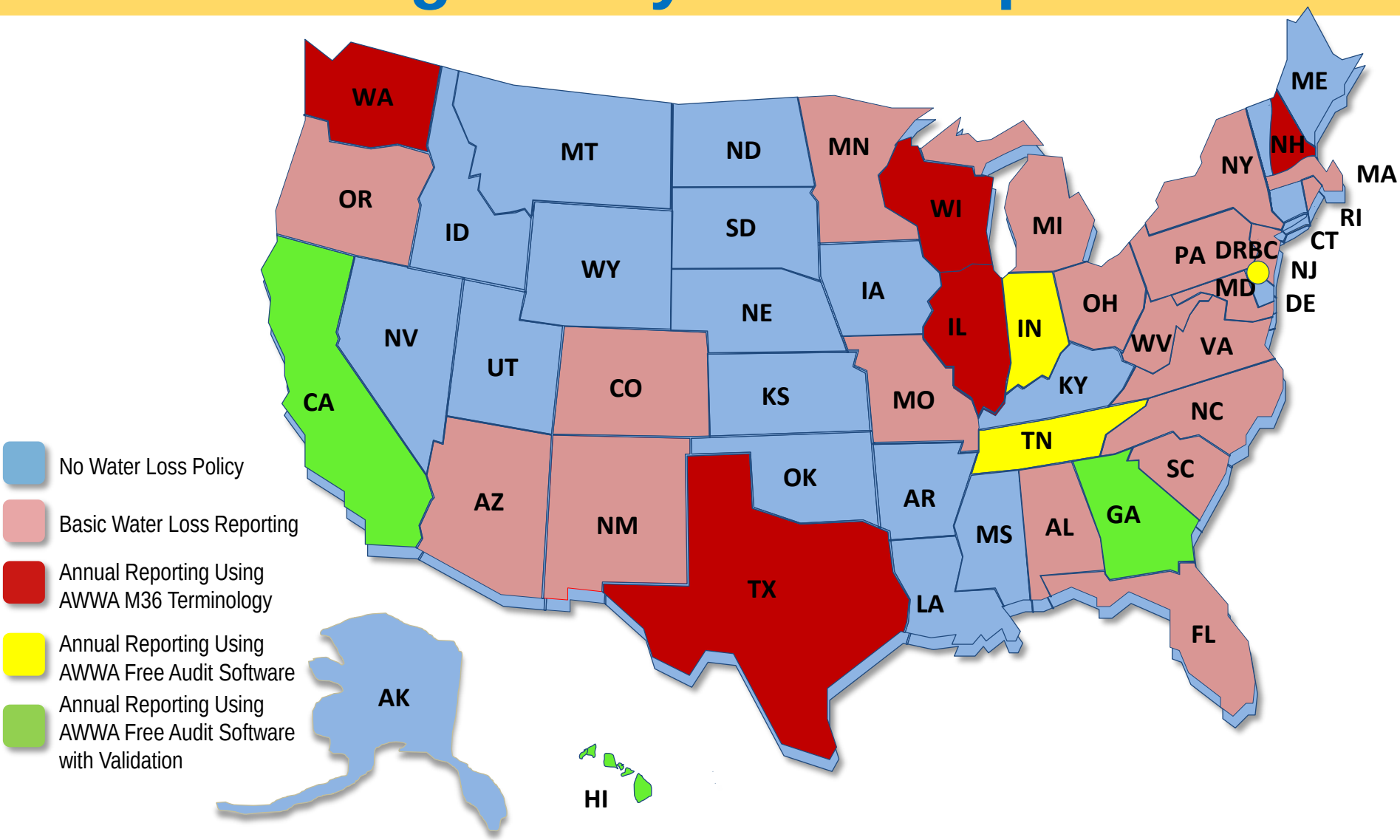
#48 Enterprise Risk Profile Assessment Factors (Table 10)

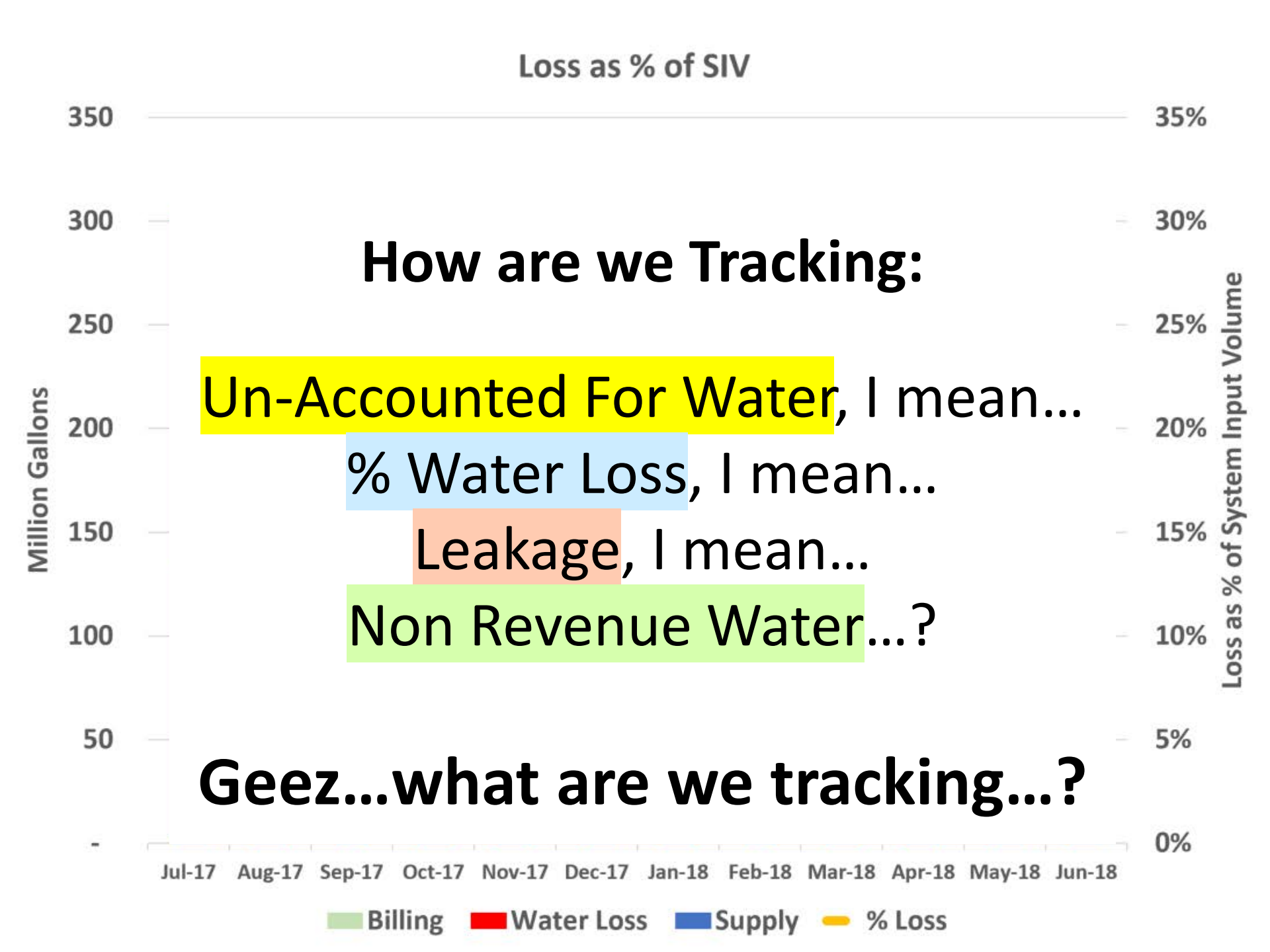
Relevance: Increased Supply

Relevance:
Avoided Cost & Revenue Recovery



AWWA M36
Regulatory Landscape




Loss as % of SIV
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35%
30%
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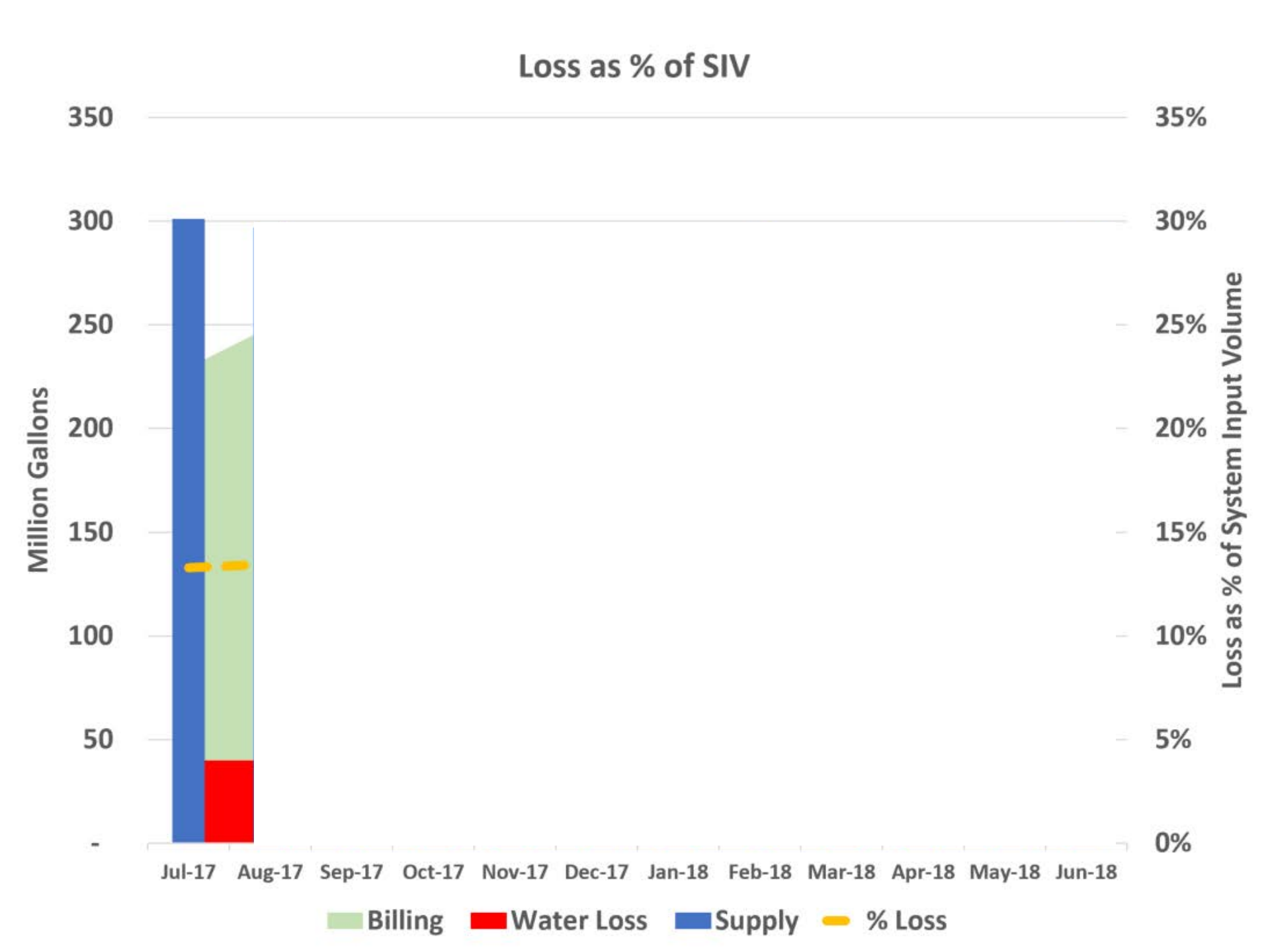
15%
10%
5%
0%
Million Gallons
Loss as % of System Input Volume
How are we Tracking:
Un-Accounted For Water, I mean…
% Water Loss, I mean…
Leakage, I mean…
Non Revenue Water…?
Geez…what are we tracking…?
Jul-17
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Billing
Water Loss
Supply
% Loss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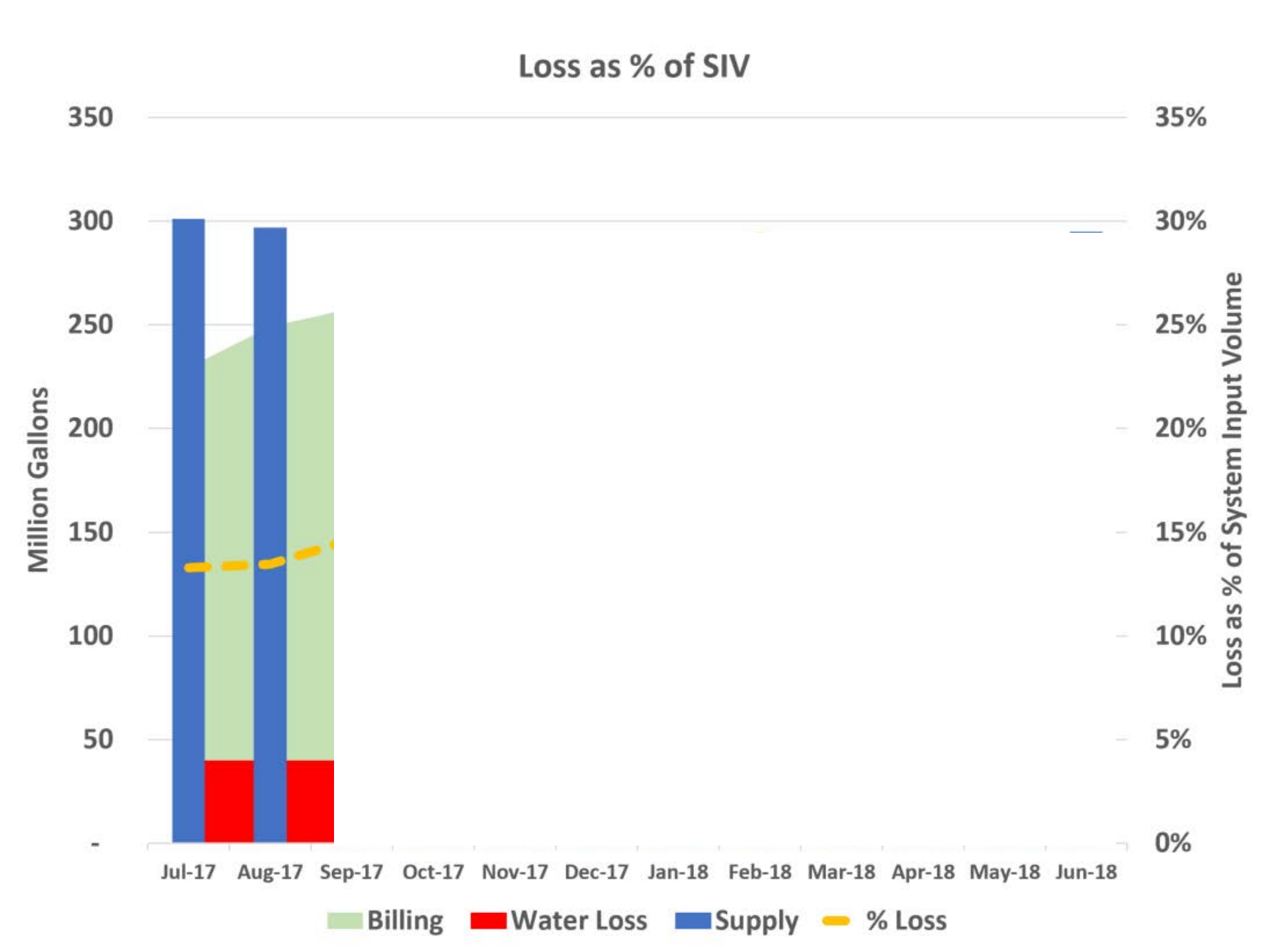
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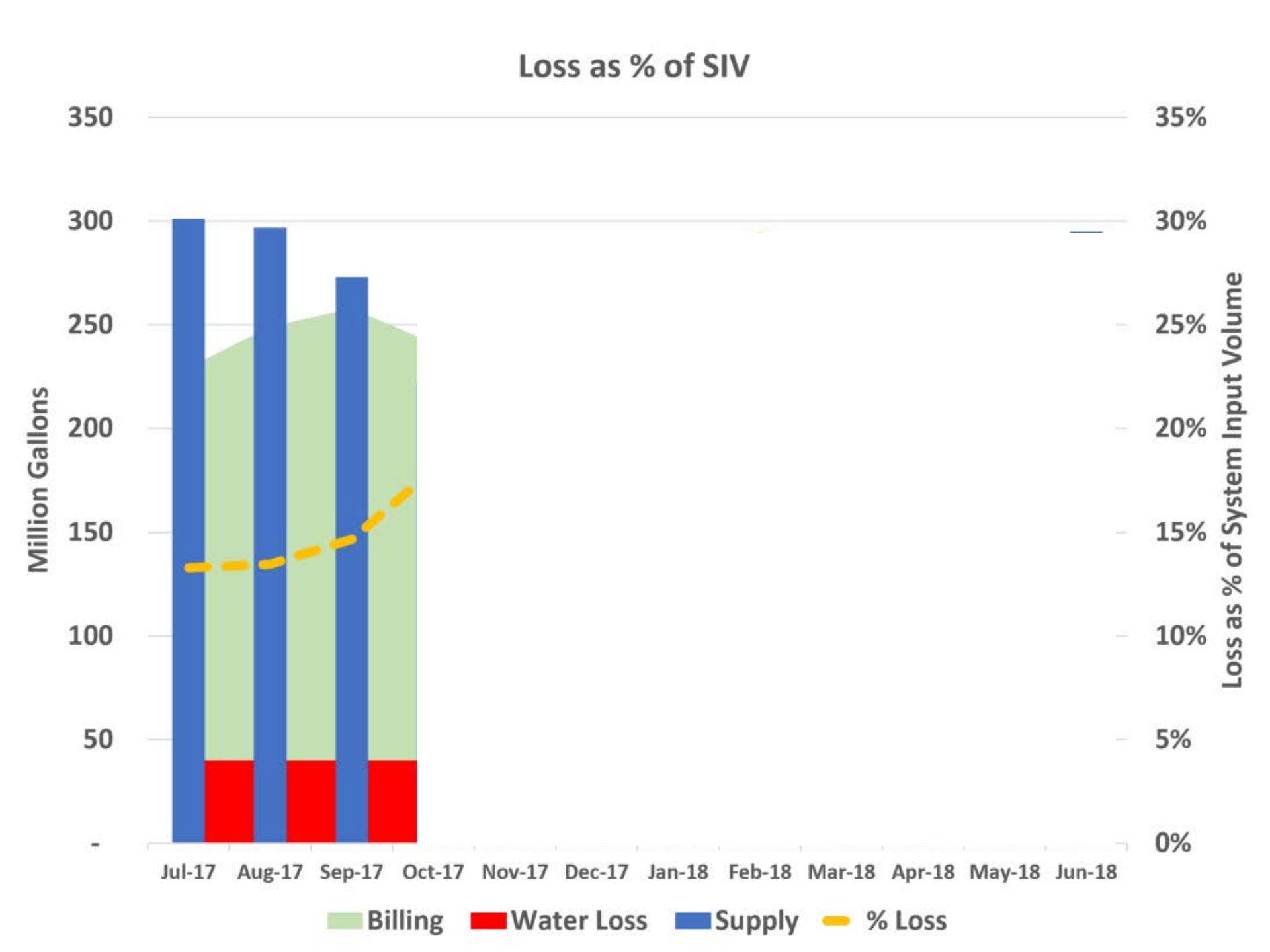
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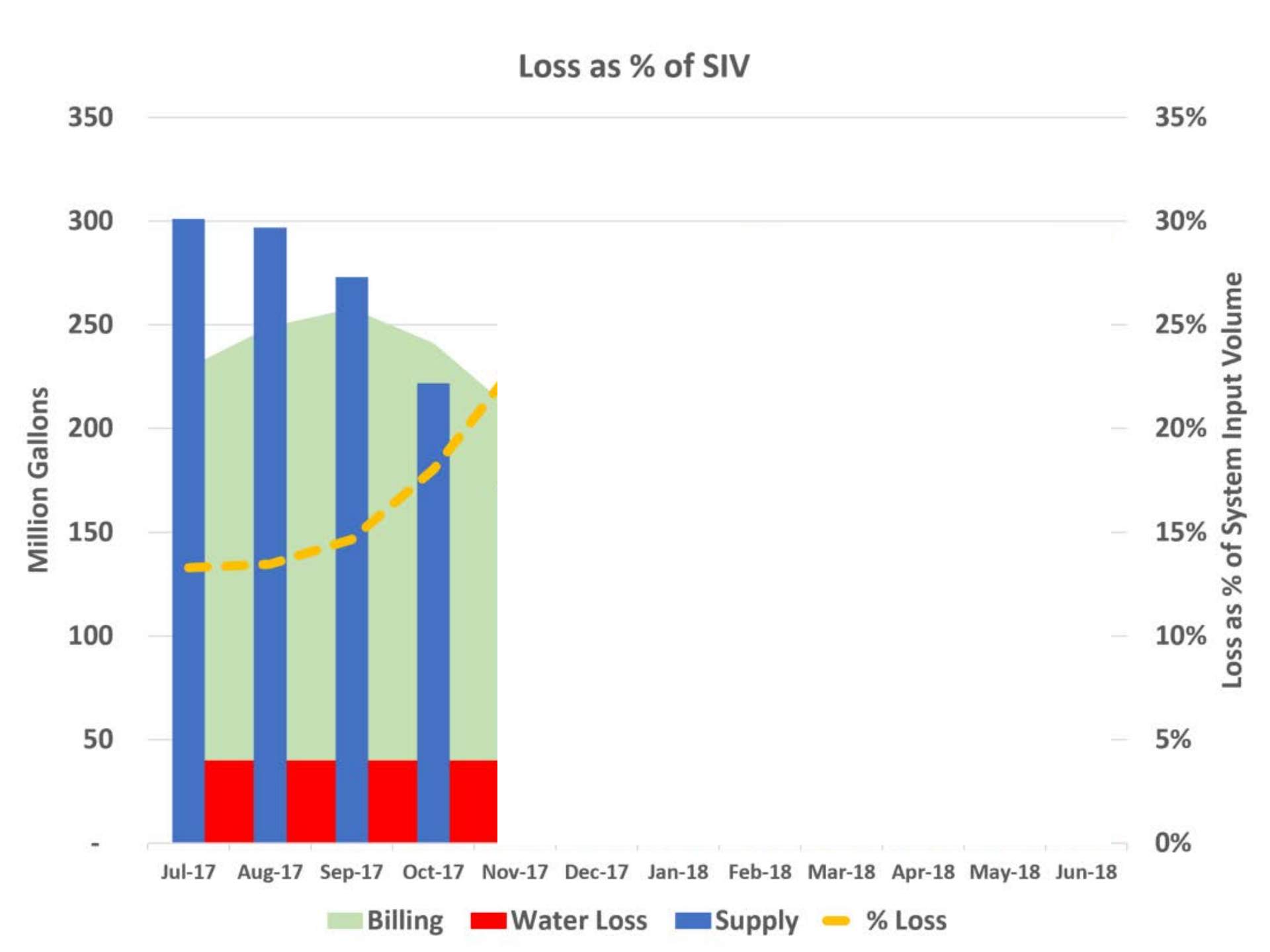
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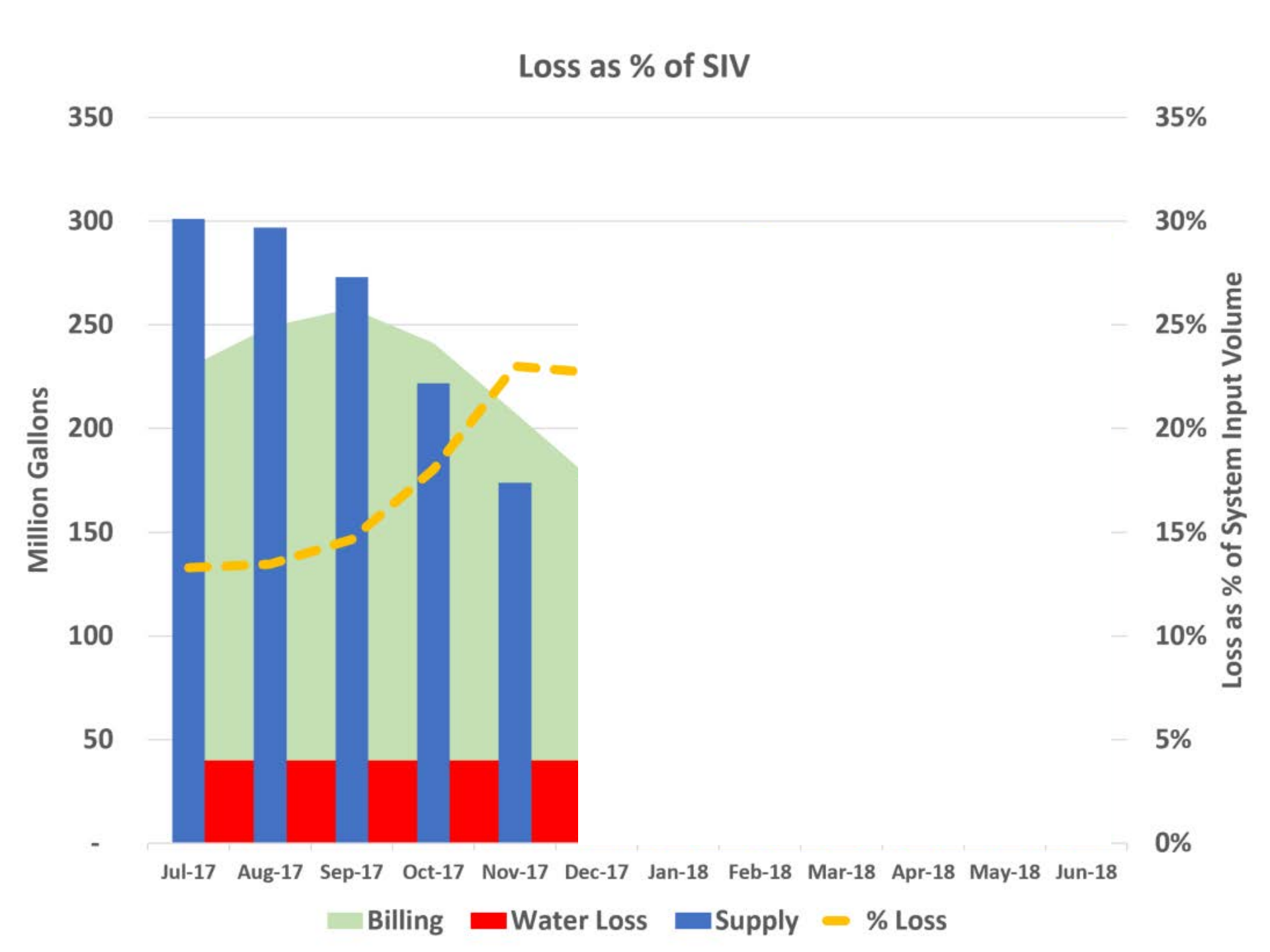
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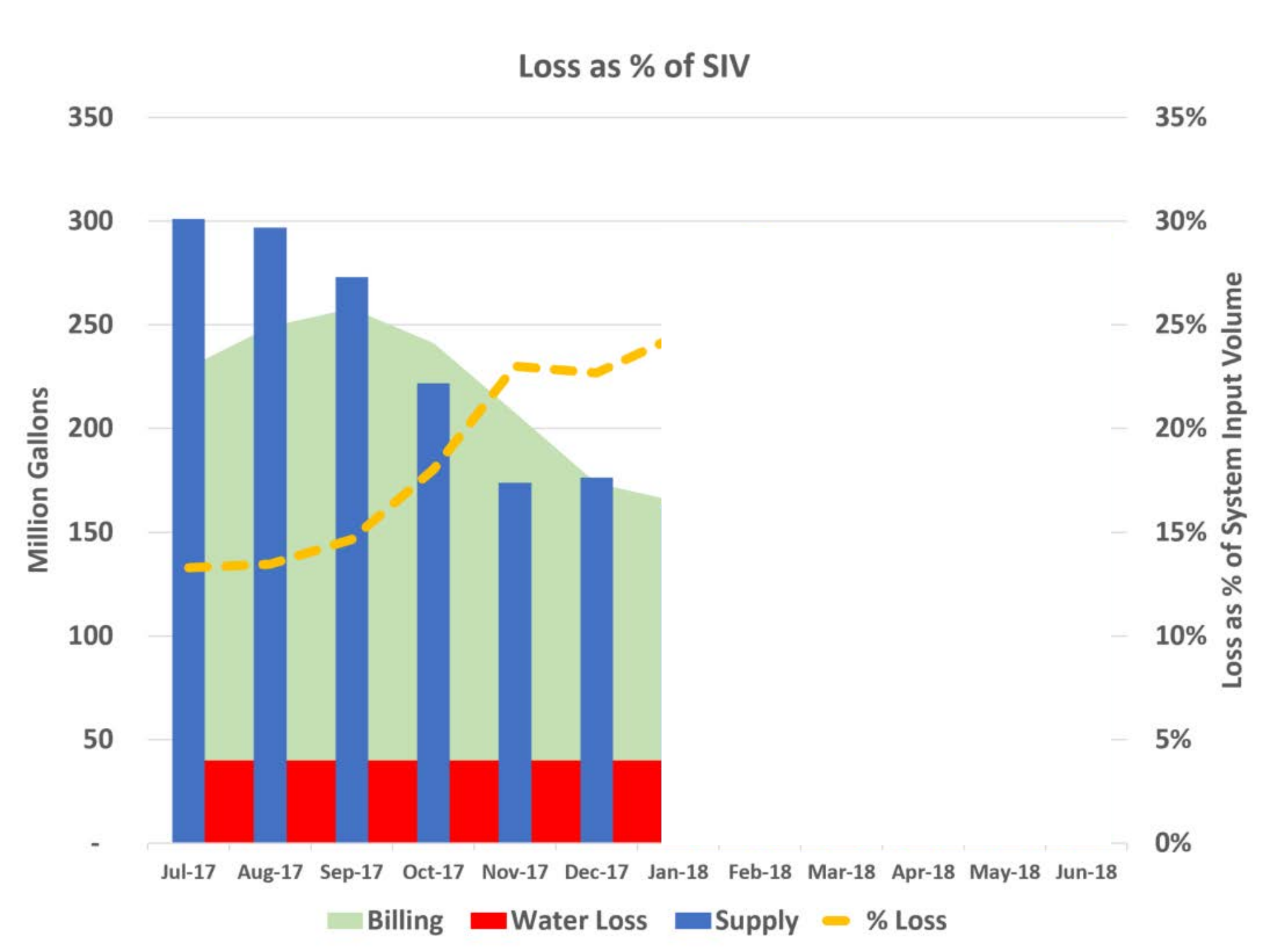
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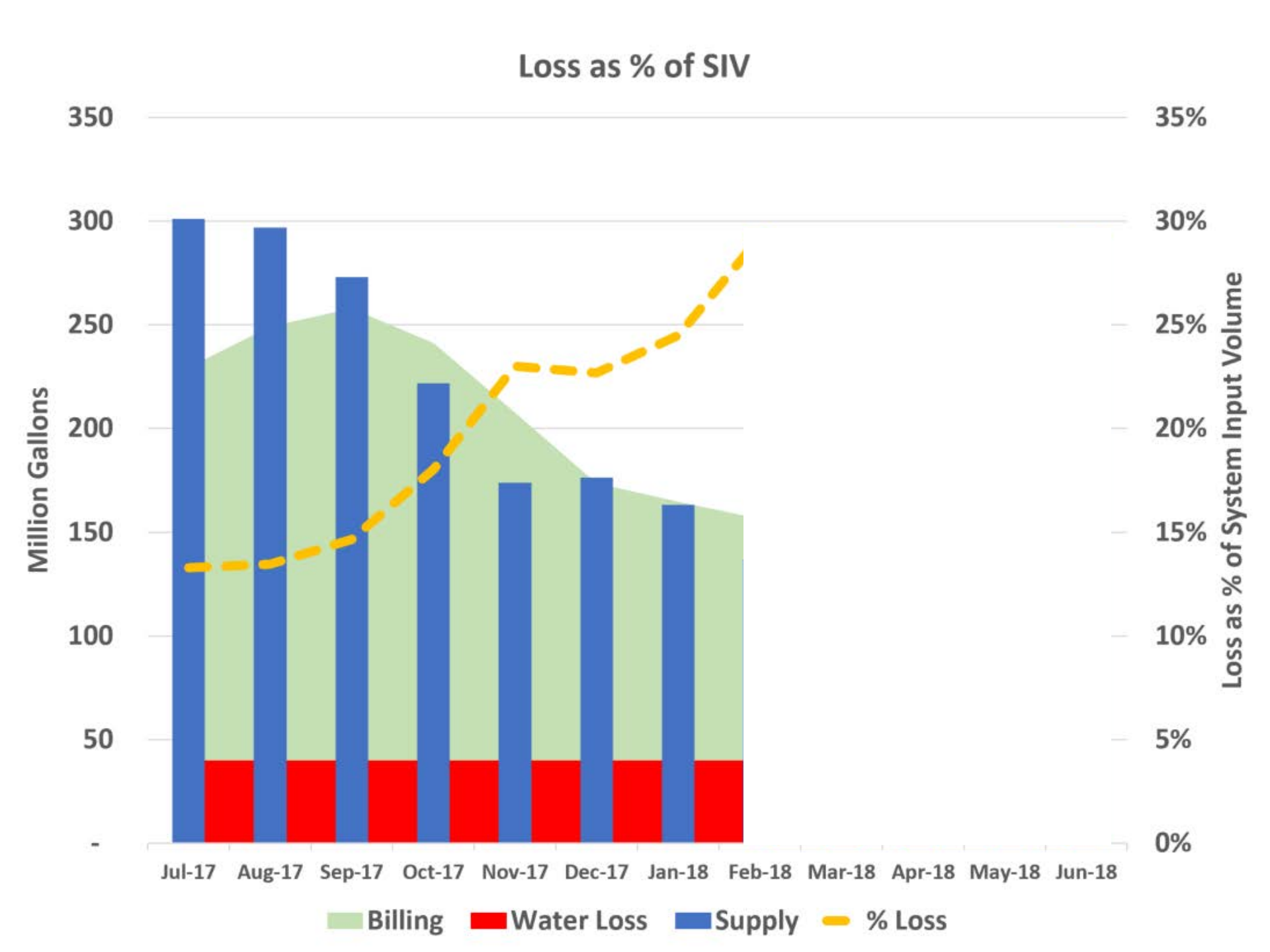
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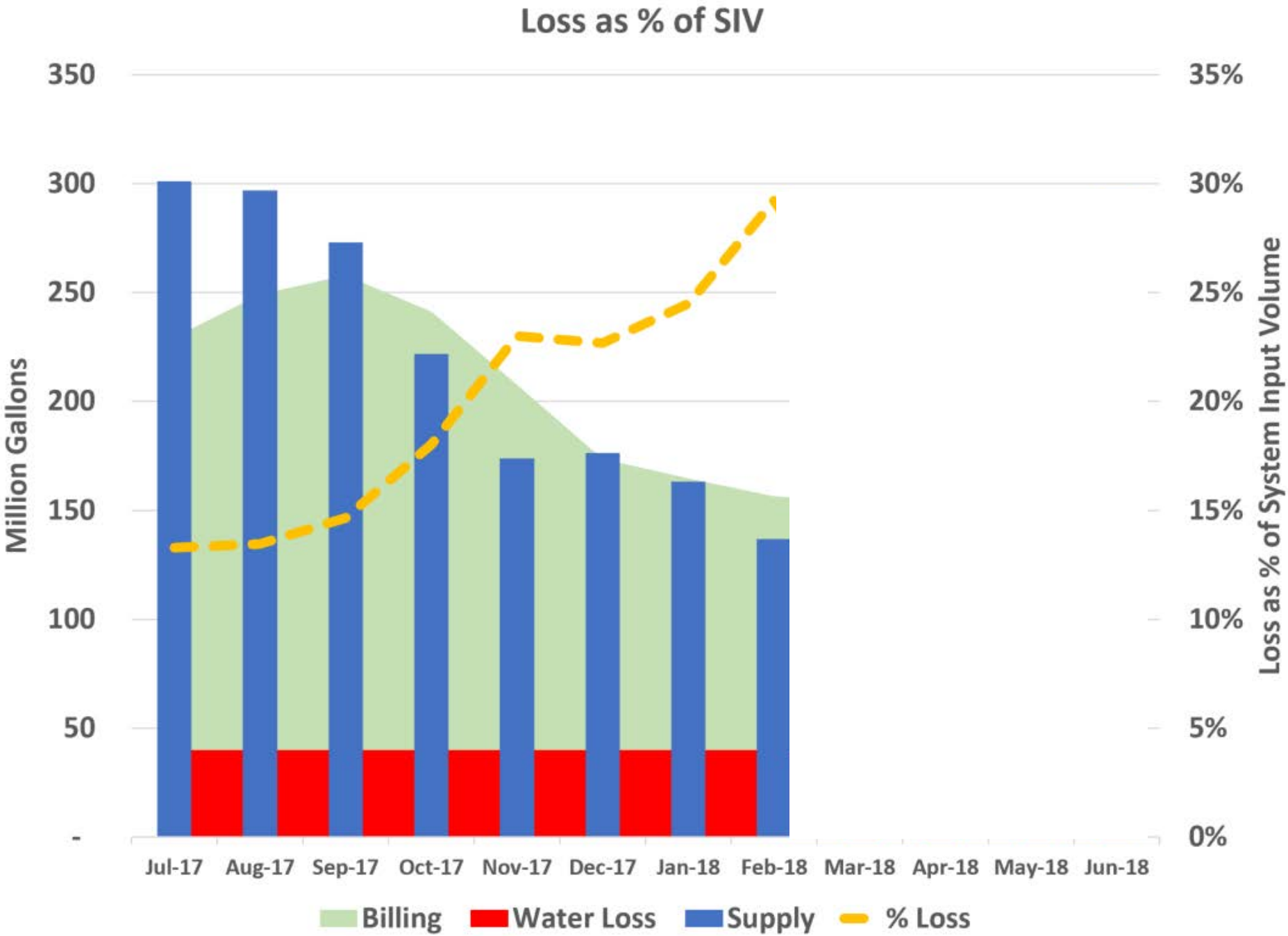
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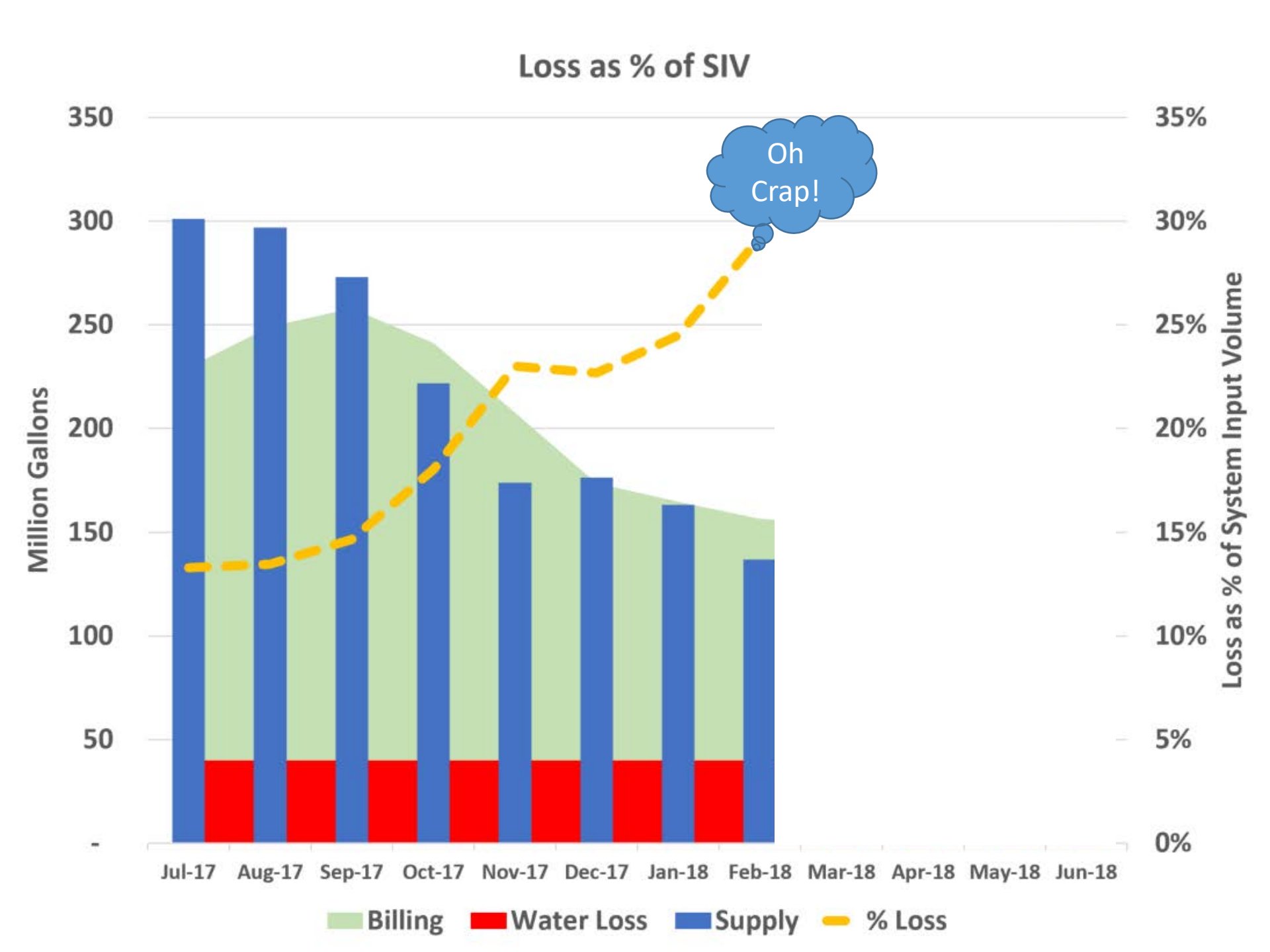
Water Loss
Supply
% Loss


Loss as % of SIV
Oh Crap!
Million Gallons
Loss as % of System Input Volume
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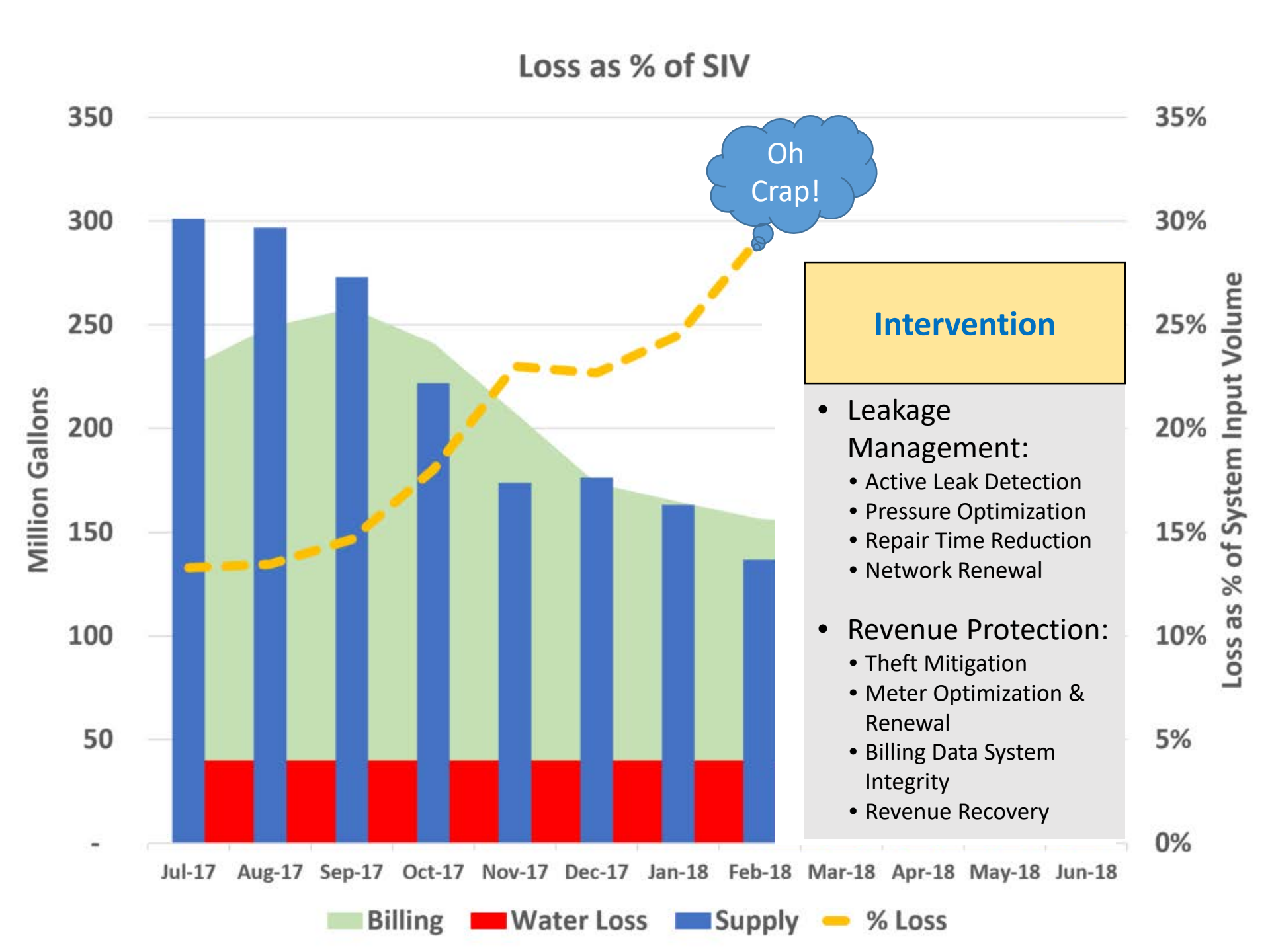
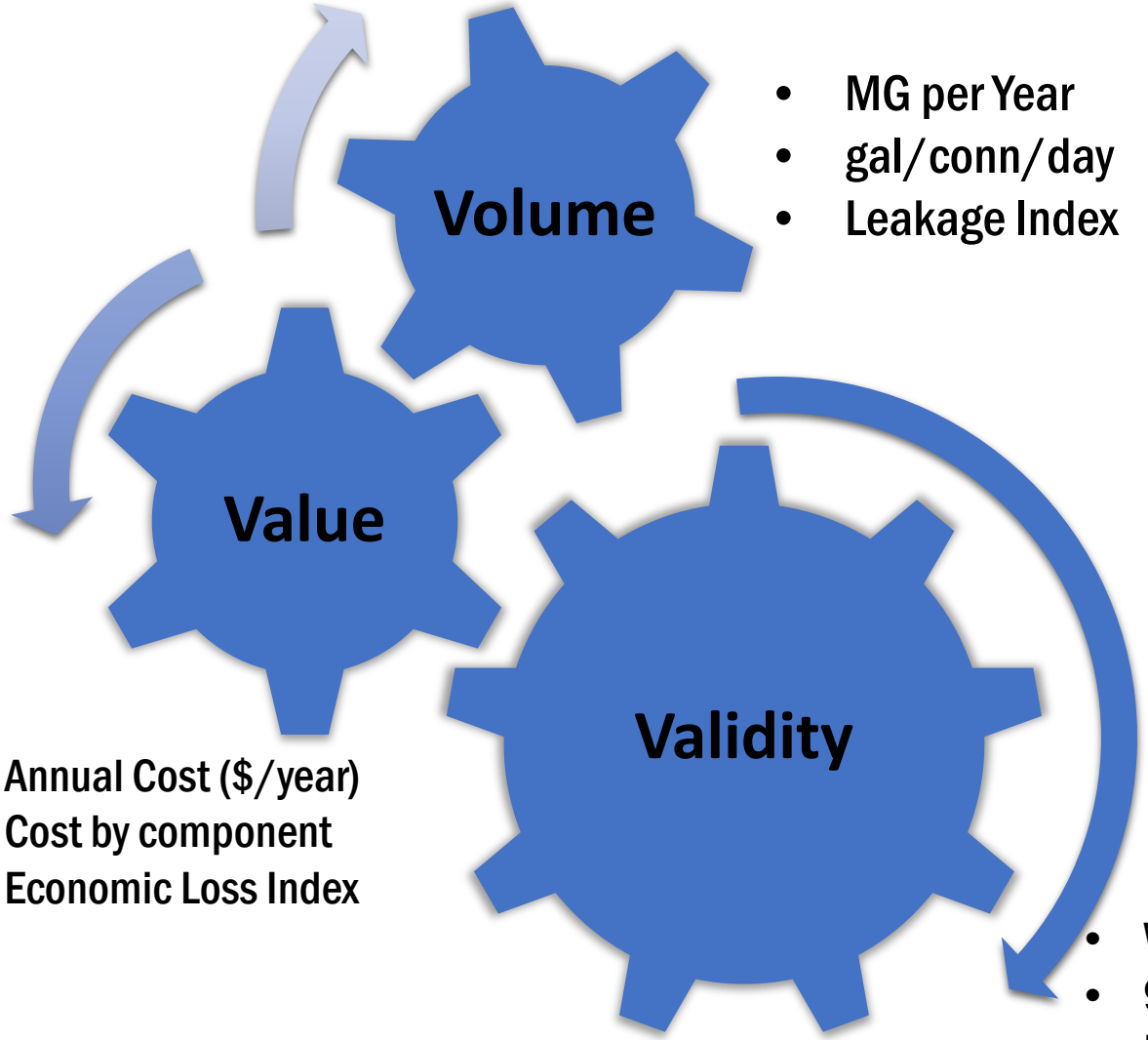


Intervention

- Leakage Management:
  - Active Leak Detection
  - Pressure Optimization
  - Repair Time Reduction
  - Network Renewal
- Revenue Protection:
  - Theft Mitigation
  - Meter Optimization & Renewal
  - Billing Data System Integrity
  - Revenue Recovery

Right Tool, Wrong Problem?

Measuring Performance: The Three Vs



- MG per Year
- gal/conn/day
- Leakage Index

- Annual Cost ($/year)
- Cost by component
- Economic Loss Index

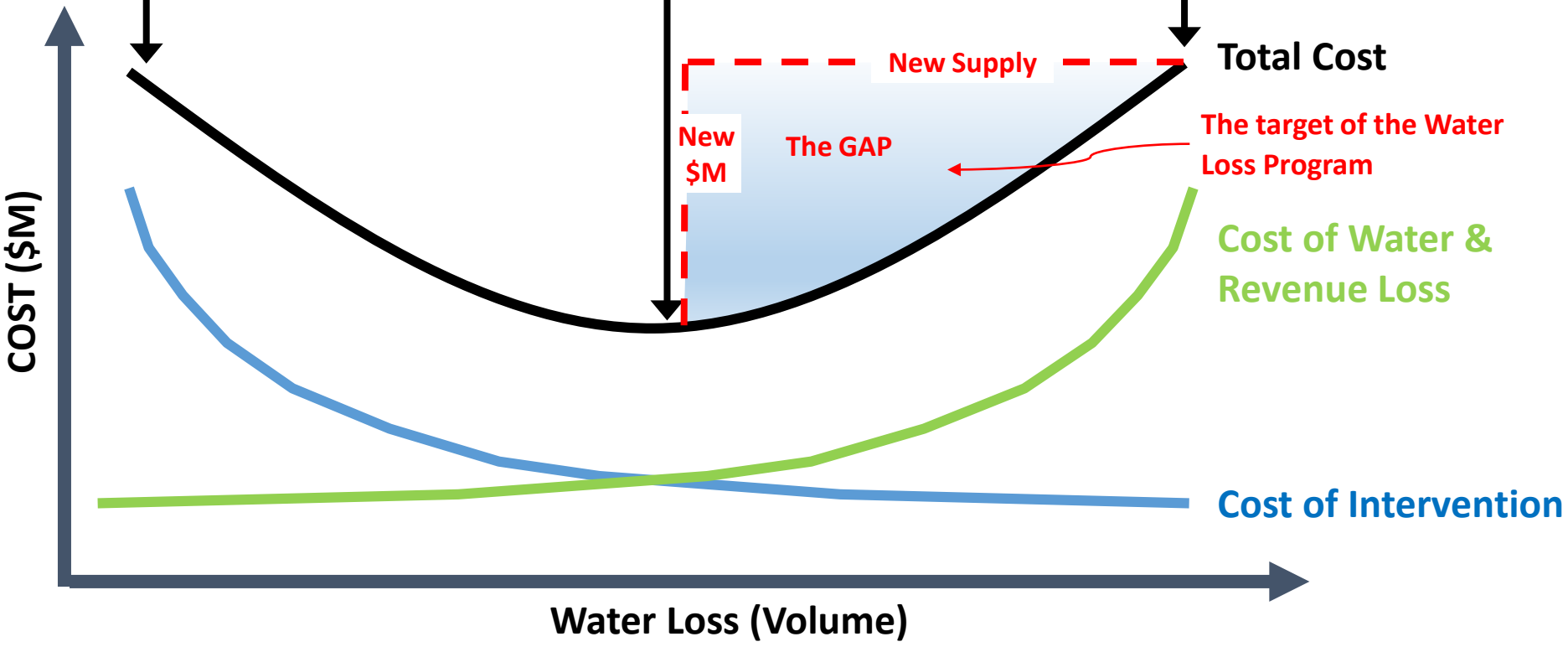
- Water Audit Data Validity Score
- 95% Confidence Limits
- Key Data Input Grades

AWWA M36 Economic Optimum

Aggressive Intervention is **Over-Spending**
Example: replacement of pipes and meters before their optimal useful life

Economic Optimum Loss & Intervention
Economic target from benefit-cost design (M36)

Reactive Intervention is **Over-Spending**
Example: fixing only leaks that surface, replacing meters only when they stop



AWWA M36 Methodology: Economic Intervention

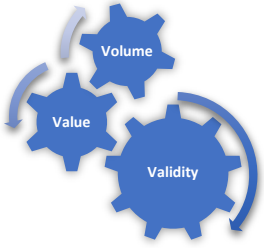
Annual Water Balance

Annual M36 water audit

Apparent & Real Loss volumes

Level 1 validation

baseline



Stage 1

Loss Profiling & Uncertainty

Advanced Validation
- Level 2 Analytics
- Level 3 Field Study
- Margins of Error

Apparent Loss Profile
- Theft
- Meter Inaccuracy
- Data Handling

Real Loss Profile
- Reported Leakage
- Unreported Leakage
- Background Leakage

technical analysis

Stage 2

Cost-Benefit & Targets

Costs of losses
- by subcomponent
- in aggregate
- wholesale & retail

Costs of intervention strategies

Program design

System-specific

economic analysis

Stage 3

Intervention

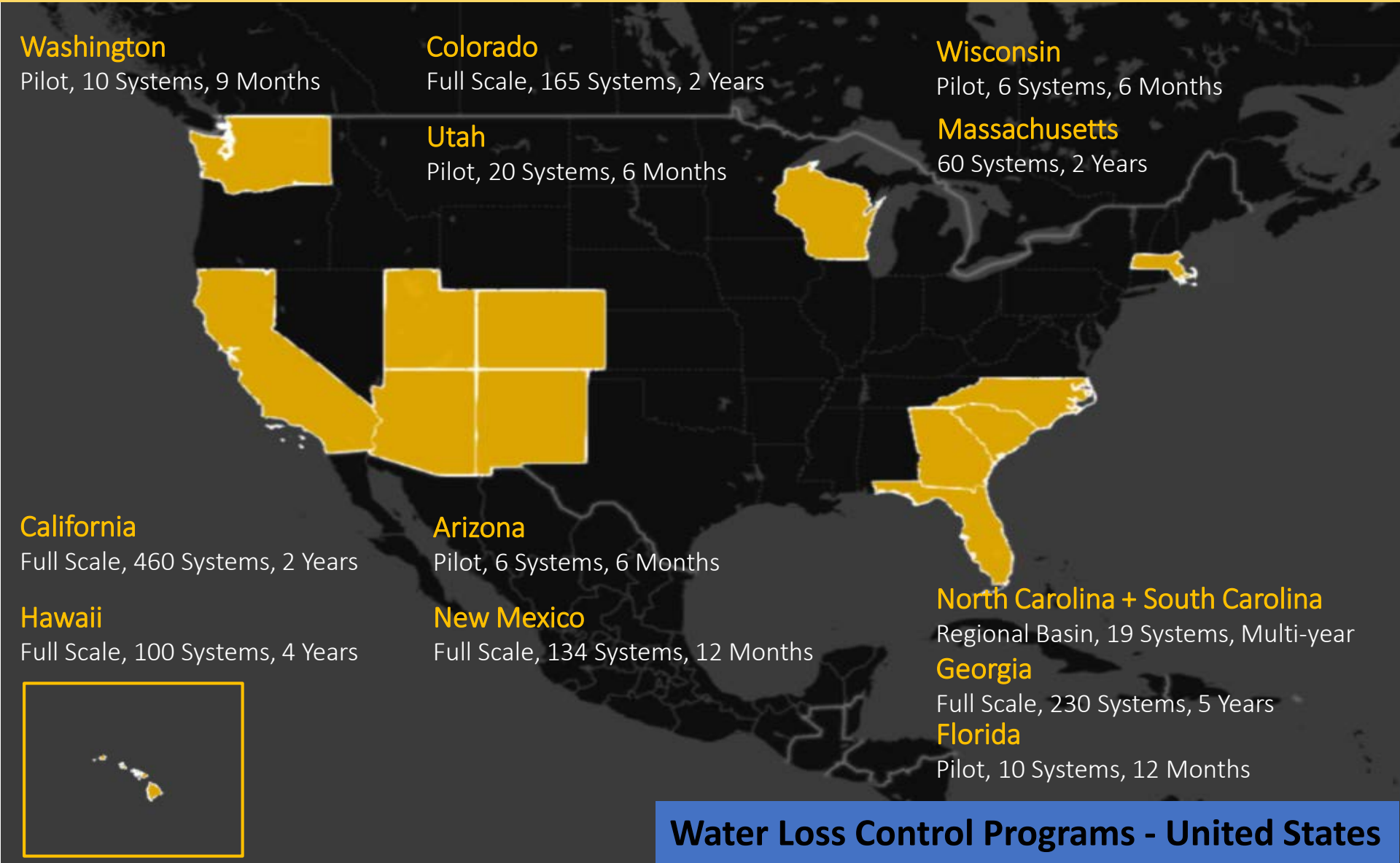
Leakage Management:
- Active Leak Detection
- Pressure Optimization
- Repair Time Reduction
- Network Renewal

Revenue Protection:
- Theft Mitigation
- Meter Optimization & Renewal
- Billing Data System Integrity
- Revenue Recovery

cost-effectiveness

Stage 4

AWWA M36
U.S. State Programs

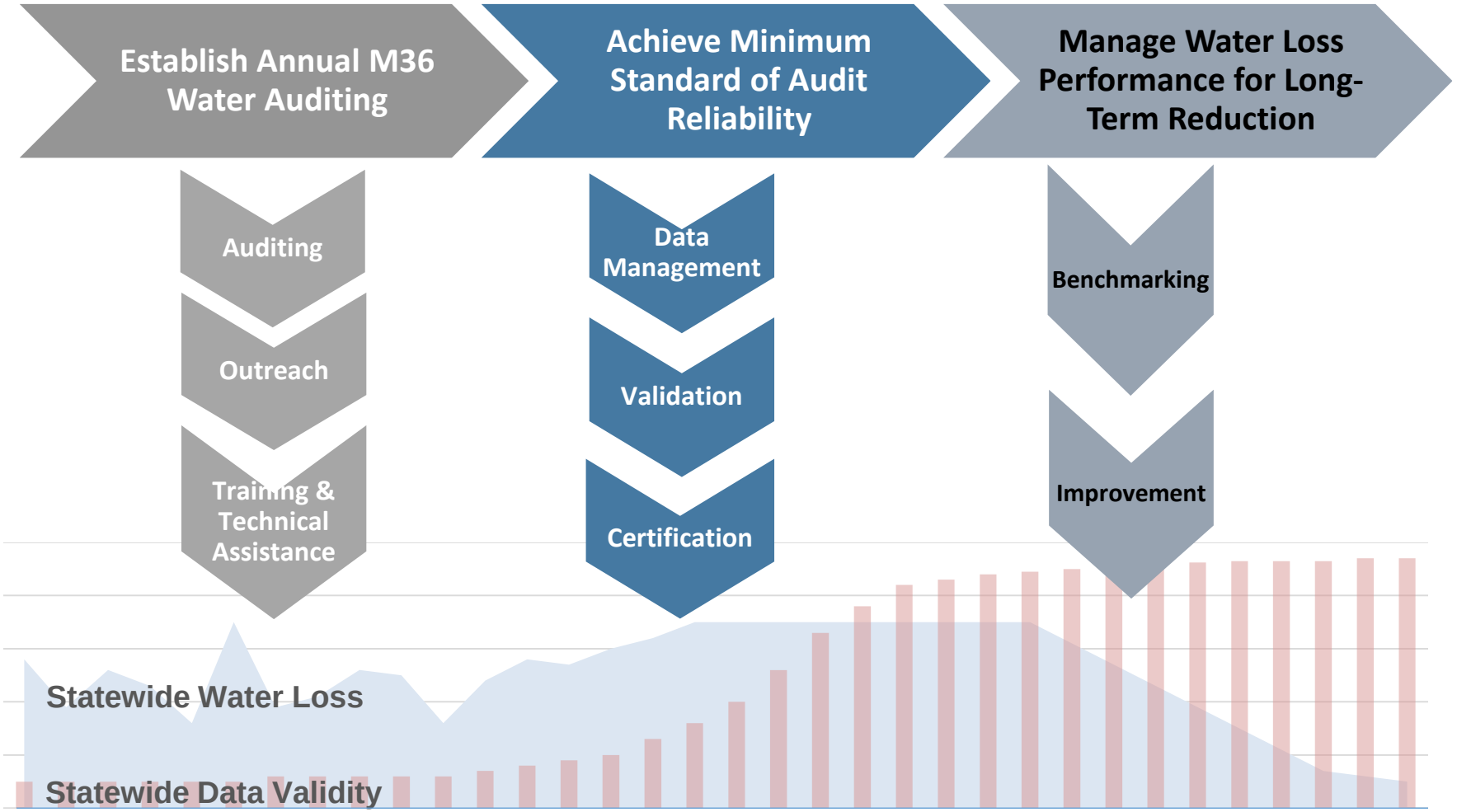


Water Loss Control Programs - United States

Why all of the Interest?

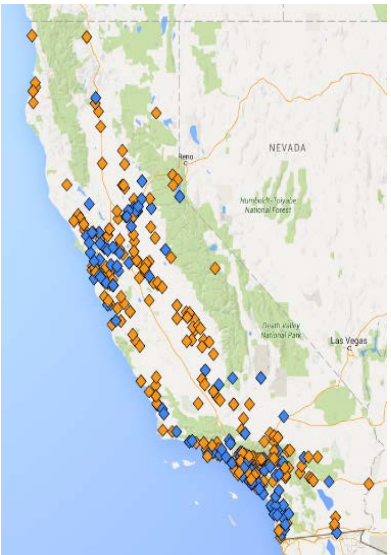
- Assures that water use reporting data is meaningful, **not just filling out a form**
- Resulting in reliable water use planning data
- Assure that state funding tagged for asset management (Pipe Rehabilitation, Leakage, Metering, etc.) is matched to the real problem and appropriate solution
- Assures that **rates** are set to cover appropriate cost of operating the utility

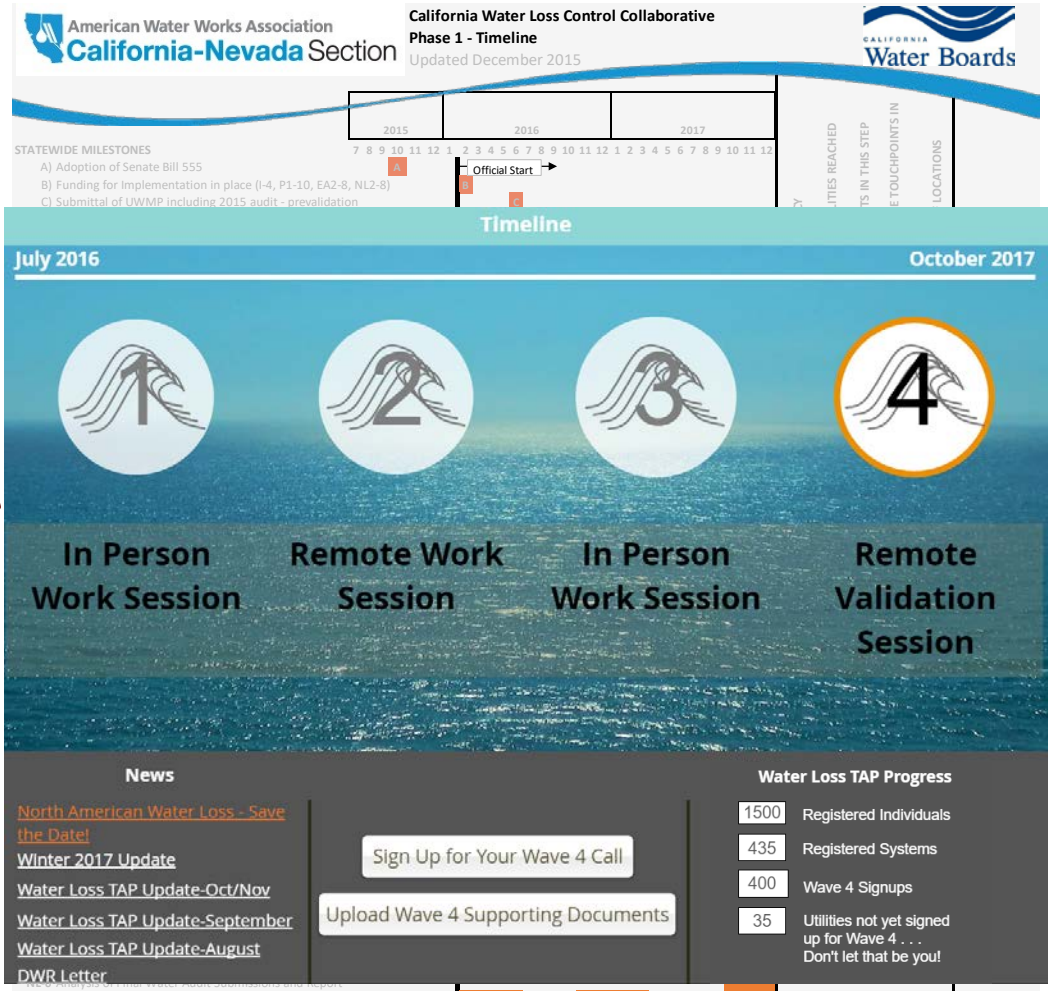
Statewide Implementation Model



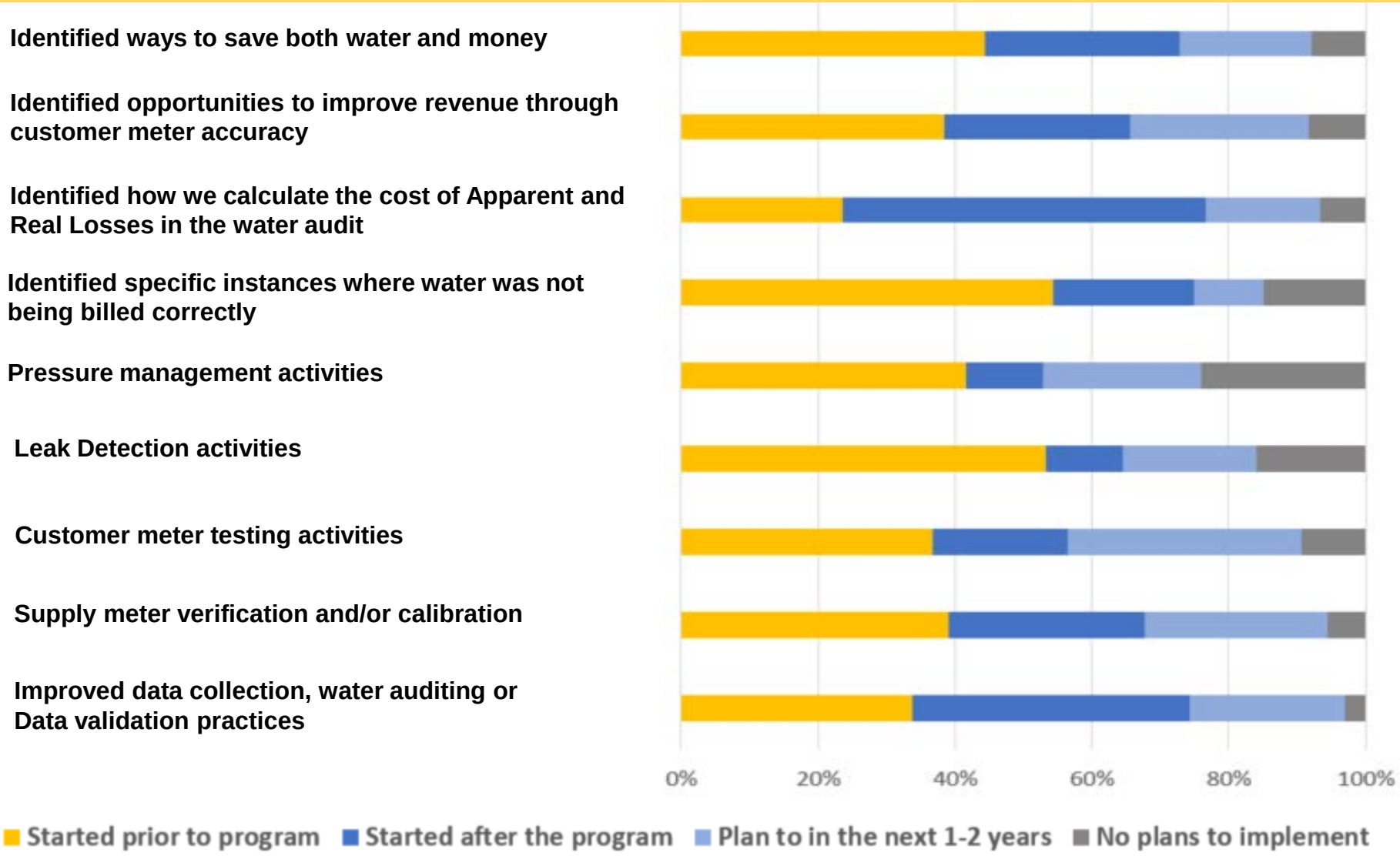
California Water Loss Technical Assistance Program

- Under regulatory framework
- Multiple Tracks based on experience
- Technical assistance:
  - AWWA Water Audit
  - Level 1 Validation
  - Introduction to component analysis





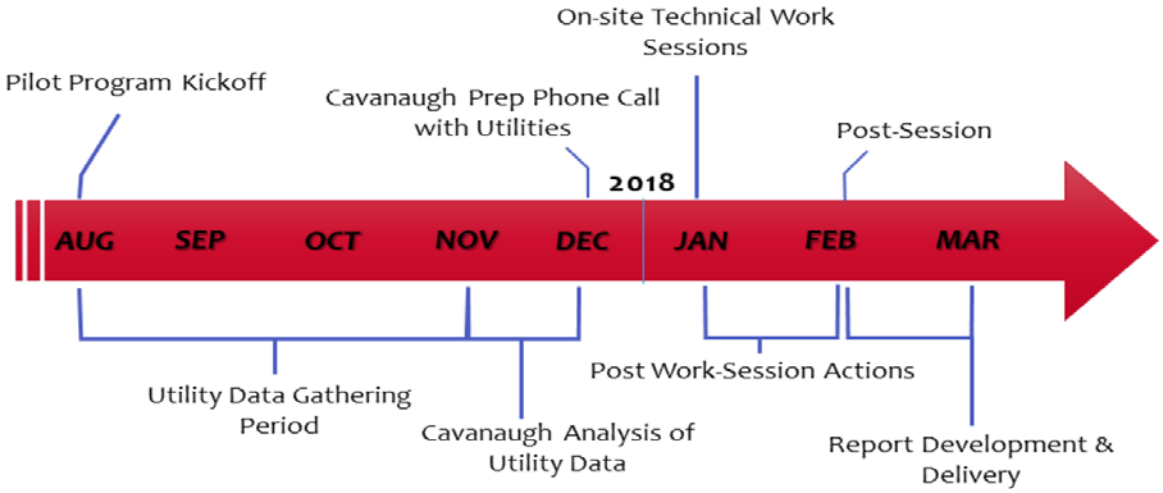
Impact for California Utilities

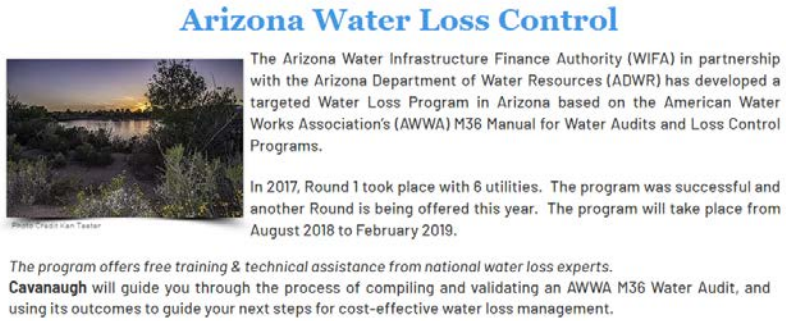


Ref CA-NV AWWA Tap Survey - 338 respondents

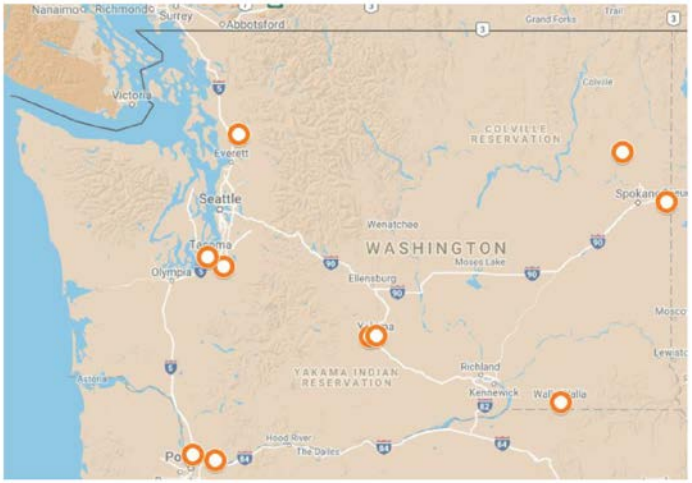
Arizona Water Loss Program – Pilot #1

1. Pilot Program utility selection with ADWR & WIFA
2. State agency training
3. Kickoff webinar with Pilot Program utilities to launch program
4. Data request delivery to pilot utilities
5. Utility data gathering period
6. Consultant compilation & analysis of utility data for technical work session preparation
7. On-site technical work session
8. Post work-session actions by utilities & consultant review
9. Post-session survey about utilities' experience with the Pilot Program
10. Recommendations & report development & delivery





Washington Pilot Water Loss Program



Washington Water Loss Control

Water loss control is an important part of water resource management for water utilities. The Washington State Department of Health (department) has implemented the Water Use Efficiency (WUE) rule for nearly a decade. Recent Supreme Court decisions will likely make it more difficult for water systems to secure additional water supplies to meet growing population demands.

foundations

utility recruitment

preparatory webinar

10 utilities – range of system types, water loss profiles, and experience with water audit methodology

Program overview and initial instruction in water auditing methodology

exposure, experience, and investigation

guided data collection

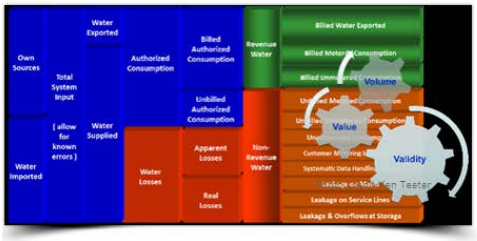
water audit compilation and transfer

water audit and data review

Water audit data request and guidance

Hands-on water audit compilation and documentation

Data review and validation tailored to each participating utility



refinement and reinforcement

workshop

Water audit compilation and validation methodology
Utility-specific methodological and analytical support
Water loss control practices and strategy design

reflection and planning

reporting and recommendations

Utility-specific water audit findings and next steps for data management and water loss control
Pilot to Program report and statewide recommendations

WSO

CAVANAUGH
Stewardship Through Innovation

Washington Advanced Analysis

Location ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
42-87950	2	22	63	21	3	3	26	88	8	3	1	3	243
44-14300	20	10	10	4000	1010	1800			14	13	1	4	6882
30-89100	110	197	157	317	216	412	744	3451	2081	61	1	2	7749
13-70000	412	14		17	23	2	2	59		64	2		595
45-81700	458	536	558	456	440	394	447	509	558	1083	2	5	5446
10-33200		2	4		4	1143	5	2	2		3	316	1481
30-95900	233	291	203	258	221	260	258	304	269	216	4	51	2568
45-78000	400	479	426	378	411	315	356	480	519	52	5	4	3825
40-15000	283	357	365	278	465	338	282	667	348	307	6	232	3928
10-11850	1102	585		742	699	1017	664	771	700		9	1	6290
42-15640	324	363	310	306	482	381	397	576	421	135	10	18	3723
30-13400	2070	1431	204	243	64		191	26	6	4	13	2	4254
40-00840	372	4263	9786	950	1	1		8	93	88	16	16	15594
40-13900	549	643	697	461	653	535	570	772	316		17		5213
45-25100	107	39	32	57	23	51	35	41	76	27	26	28	542
43-80900	421	786	674	564	677	685	597	881	704	708	26	159	6882

Location ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
30-46900	327	465	255	487	1265	298	332	1440	-523	263	321	522
30-63500	555	900	526	793	831	1287	-222068	1714	2026	846	624	733
30-90200	430	343	320	508	618	832	-115743	789	750	361	341	365
33-00100	518	695	547	595	484	585	600	402		-35	435	723
33-46000	687	863	449	738	1594	952	-147178	1515	886	543	452	931
35-34700	227	281	207	220	212	-50023	235	379	602	247	214	263
40-13400	304	482	718	551	342	234	609	665	551	-57029	447	620
40-28500	275	875	495	432	563	535	571	1166	-57705	560	418	535
40-33200	492	532	544	435	645	520	510	1048	-66674	541	380	525
42-04300	435	523	401	495	425	644	470	606	578	536	-5363	531
42-05100	1395	2191	1472	1257	931	932	1475	1096	1730	792	-16681	1291

negative consumption

Account #	Jan	Mar	May	Jul	Sep	Nov
07-0017-00-00	60	55	49	31	20	20
10-2021-00-03	30	30	29	27	9	9
10-6103-00-00	106	97	87	62	29	19
10-6885-71-01	41	24	8	7	7	8
11-1008-00-07	91	69	43	46	42	35
12-8610-00-19	34	23	15	16	11	11
13-1335-15-03	65	61	52	52	37	34
13-1339-12-02	61	59	54	33	12	9
06-0545-00-00	1050	811	353	170	386	280

meter degradation

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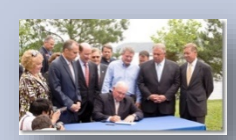
Stewardship Through Innovation

Georgia Water Loss Control Phasing

2010

Following 2008 Drought, the Water Stewardship Act was Passed into Law



2011

Annual AWWA Auditing Begins,

WLC Committee Formed

V1.0 Manual Published

Initial Workshops

(all systems)

2012

Phase 1:

Statewide Training on Water Auditing

(Small systems)

2013

Phase 1A: Validation of 2011 Audits

V1.1 Manual Updated

Phase 2:

Statewide Technical Assistance Projects

(Small Systems)

2014

Phase 1B: Validation of 2012,2013 Audits

V1.2 Manual Updated

Phase 2A:

Statewide Technical Assistance Projects

(Small Systems)

2015-16

Phase 1C:

Audit Certification Program kicks in with 2015 Audits

V2.0 Manual Updated. Ch391 Rules updated.

Phase 2B:

Statewide Technical Assistance Projects

(Large Systems)

DEPT. OF NATURAL RESOURCES ENVIRONMENTAL PROTECTION DIVISION GEORGIA

GEFA ENERGY • LAND • WATER

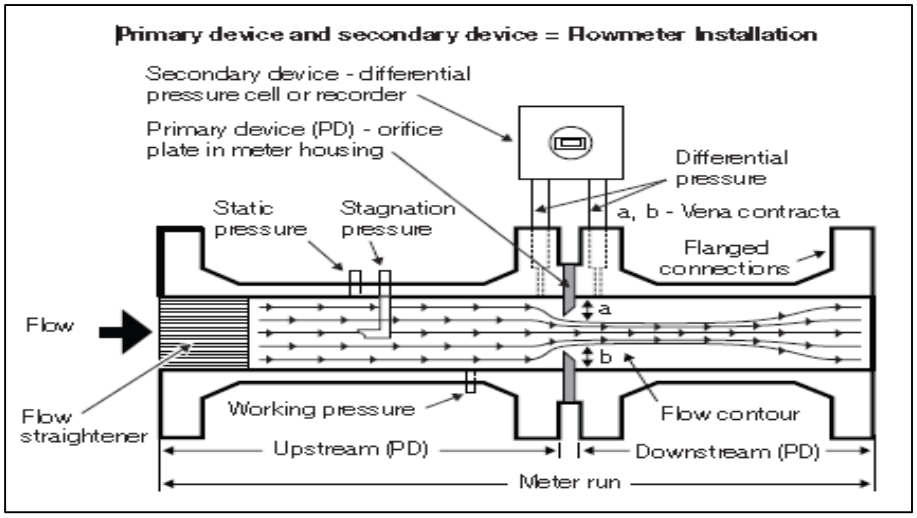
CAVANAUGH

Stewardship Through Innovation

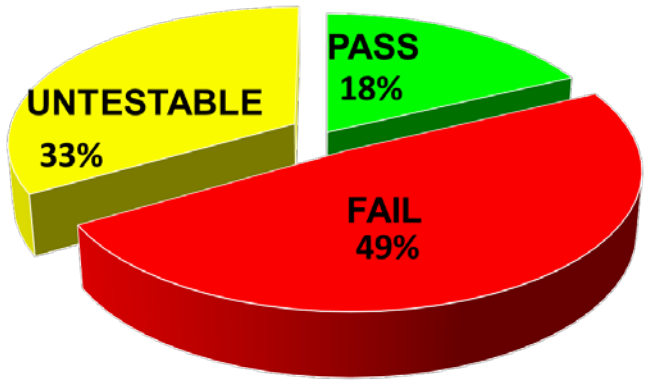
ch2m

Georgia Challenges in Source Data

Example of Water Pumping Data Gaps an		
8/15/2012, hrs	High Service Pumping Rate, mgd actual flow	High Service Pumping Rate, mgd raw recorded data
0:00	8.69	8.69
1:00	8.65	8.65
2:00	8.32	8.32
3:00	8.11	8.11
4:00	7.94	0
5:00	8.02	0
6:00	8.44	0
7:00	8.98	0
8:00	9.34	0
9:00	9.25	0
10:00	9.17	0
11:00	9.12	9.12
12:00	9.27	9.27
13:00	9.22	9.22
14:00	9.08	9.08
15:00	8.99	8.99
16:00	9.14	9.14
17:00	9.18	9.18
18:00	9.25	9.25
19:00	9.22	9.22
20:00	8.82	8.82
21:00	8.78	8.78
22:00	8.75	8.75
23:00	8.71	8.71
0:00	8.68	8.68
Total	**212.43**	**151.29**
Average	**8.85**	**6.30**
Difference		**2.55**



Finished Water Meter Flow Verification



Basin Water Loss Training & Tracking

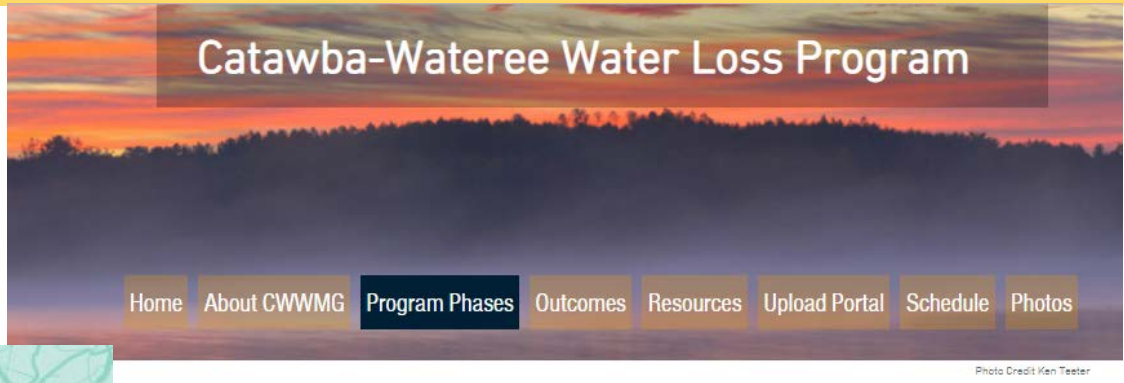
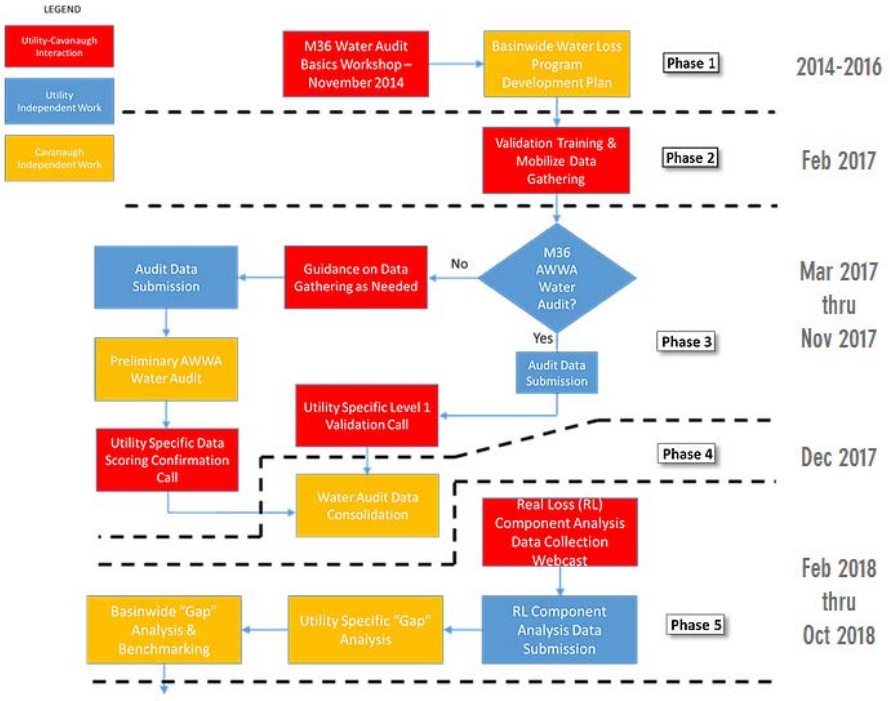


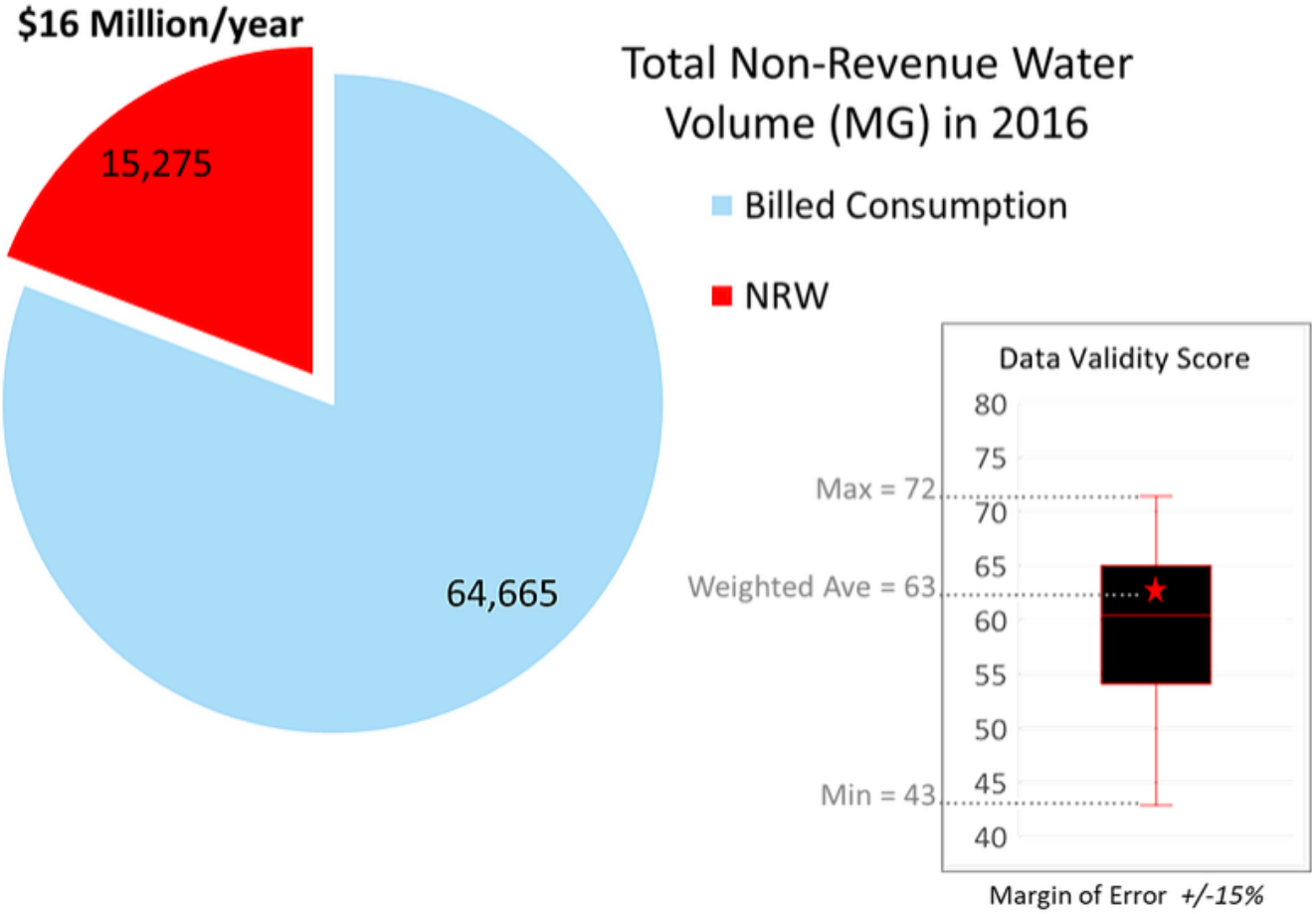
Photo Credit Ken Teeter

Program Phases

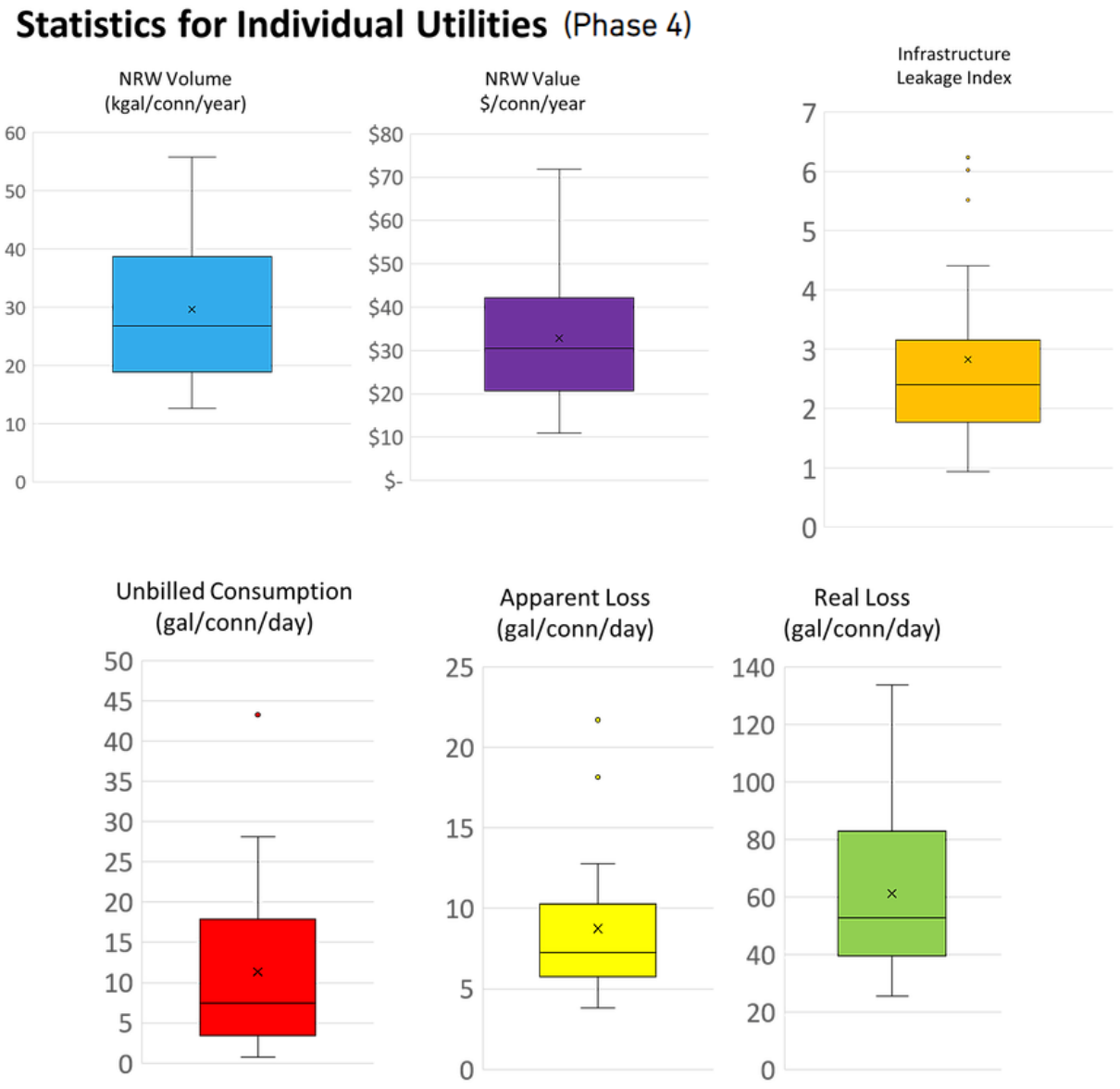


Phase 4 Results – Basin Aggregation

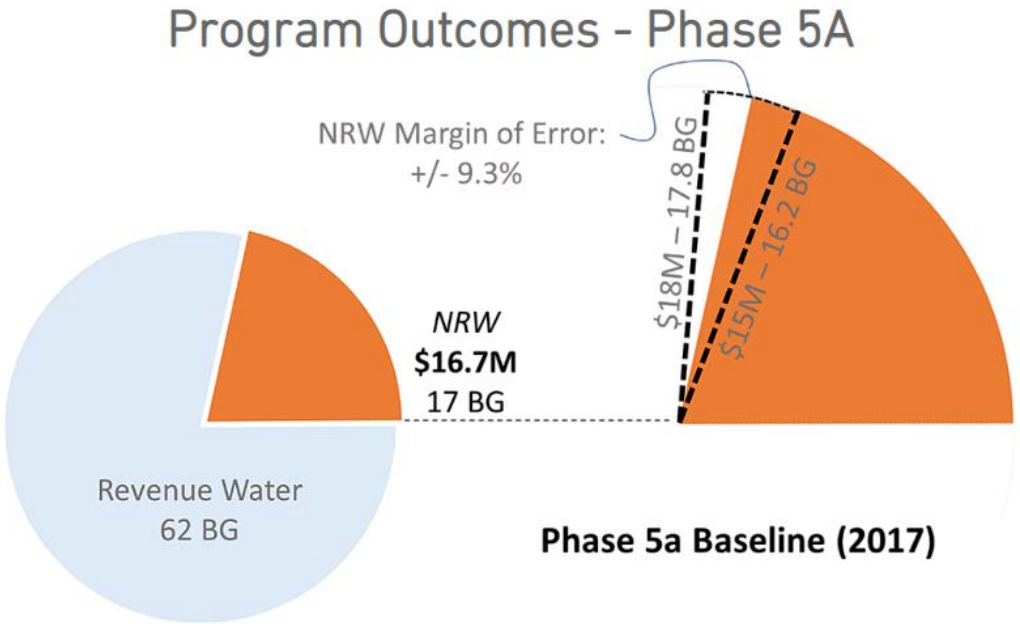
Statistics for Basinwide Aggregate (Phase 4)

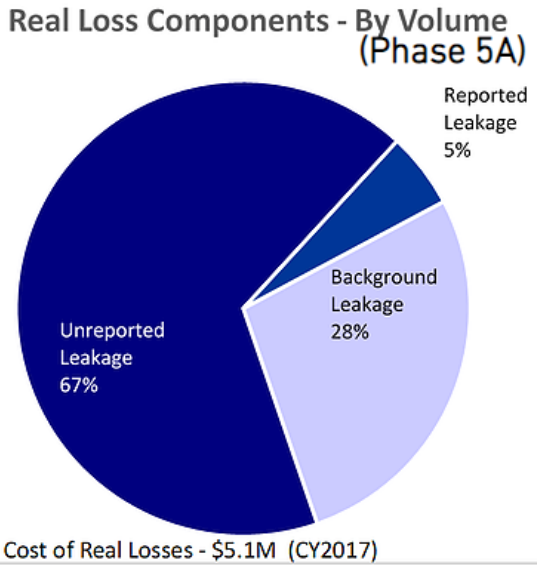


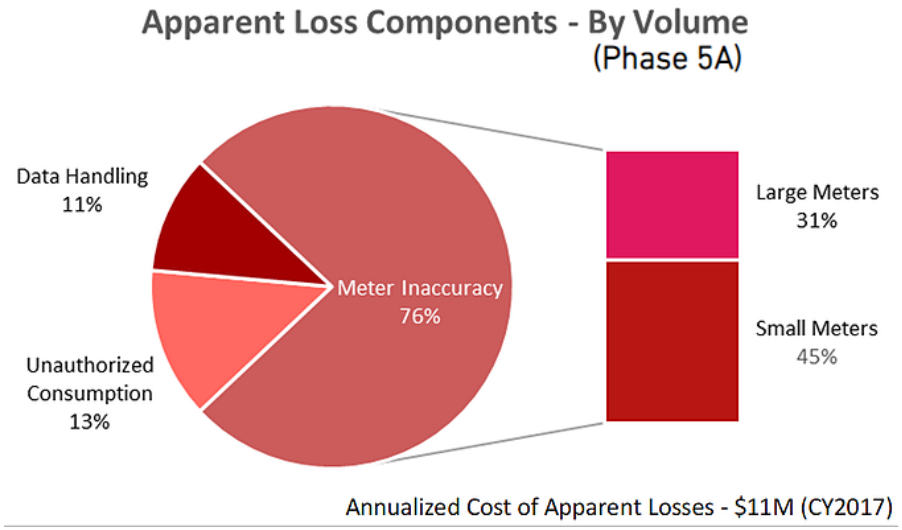
Individual Utility Metrics (PI's)

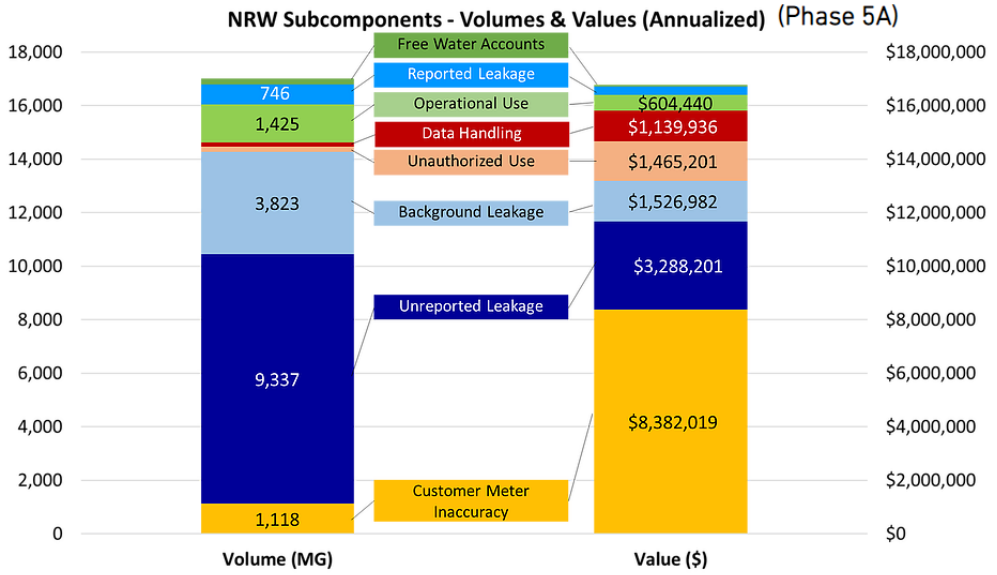


Component Analysis (Technical)









State to State Domino Effect

The Water Loss Control Movement

October 3, 2018

WaterSmart Innovations CONFERENCE and EXPOSITION
LAS VEGAS NEVADA

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