2017 AWWA Water Audit Level 1 Validation

Water System Name: Nevada Irrigation District **Water System ID Number:** 2910004/ E. George **Water Audit Period:** Calendar 2017

Water Audit & Water Loss Improvement Steps:

Steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:

In 2017 the District continued to expanded and improve record keeping of water used in flushing, outages and tank maintenance, so that this could be reported in unbilled unmetered usage. The District performed electronic calibration of treatment plant meters. Per the recommendation from the 2017 audit, the District connected the intertie to SCADA and monitors data daily. The District evaluated the merit of improving our meter testing program, but because we are in the process of replacing all meters it does not seem warranted at this time.

Utility Provided

Certification Statement by Utility Executive:

This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, *Water Audits and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Remleh Scherzinger, P.E.	General Manager		9/20/18
Executive Name (Print)	Executive Position	Signature	Date

CAVANAUGH
Stewardship Through Innovation

2017 AWWA Water Audit Level 1 Validation - Review Document

Validator Provided

Audit Information:

Utility: Nevada Irrigation District – E. George PWS ID: 2910004

System Type: Potable Audit Period: Calendar 2016

Utility Representation: Sue Sindt, Aurora Tipton, Chad, Debbie Martin

Validation Date: 8/15/2018 Call Time: 8:30am Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 61 Data Validity Band (Level): Band III (51-70)

ILI: 2.31 Real Loss: 57.59 (gal/conn/day) Apparent Loss: 9.05 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 16.2%

Certification Statement by Validator:

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. ☒

Validator Information:

Water Audit Validator: Larry Lewison / Jeff Cappadona (support) Validator Qualifications: Contractor for California Water Loss TAP

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
1	Volume from Own Sources	VOS	5	Supply meter profile: WTP with 1 effluent mag meter. VOS input derived from: SCADA reads from production meter as archived. Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of own supply metered: 100% Signal calibration frequency: No signal span calibration is known to take place. Perform regular maintenance. Planning for annual calibration activities starting in 2018. Volumetric testing frequency: None. Volumetric testing method: n/a. Percent of own supply volumetrically tested: n/a. Comments: Grade limited to a 5 due to no signal calibration.
2	VOS Master Meter & Supply Error Adjustment	VOS MMSEA	5	Input derivation: Left blank in absence of available test data. Net storage change included in MMSEA input: No. Comments: No additional comments.	Supply meter read frequency: Continuous. Supply meter read method: Automatic logging via SCADA telemetry. Frequency of data review for trends & anomalies: Each business day. Storage levels monitored in real-time: Yes. Comments: Grade limited to 5 due to lack of data adjustment when meter/instrumentation equipment malfunction is detected.
3	Water Imported	WI	3	Import meter profile: Transfer in from NID Loma Rica district (same utility), via a single pump station with mag meter, installed approximately 2015. Tied to SCADA. Comments: Input derivation from supporting documents confirmed. Loma Rica to E. George intertie Exclusion of non-potable volumes confirmed.	Percent of import supply metered: 100% Signal calibration frequency: None. Volumetric testing frequency: None. Volumetric testing method: n/a. Percent of import supply volumetrically tested: n/a. Comments: Grade limited to 3 due to no regular accuracy testing.
4	WI Master Meter & Supply Error Adjustment	WI MMSEA	5	Input derivation: Left blank in absence of available test data. Comments: No additional comments.	Import meter read frequency: Daily. Import meter read method: Automatic logging via SCADA telemetry. Frequency of data review for trends & anomalies: Monthly. Comments: No additional comments.
5	Water Exported	WE	3	Export meter profile: Small amount of export to Grass Valley, remainder is transfer out to NID Loma Rica district (same utility), via a single pump station with mag meter, installed approximately 2015. Tied to SCADA. Comments: Input derivation from supporting documents confirmed. Exclusion of non-potable volumes confirmed.	Percent of export supply metered: 100% Signal calibration frequency: None. Volumetric testing frequency: None. Volumetric testing method: n/a. Percent of export supply volumetrically tested: n/a.

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
				City of Grass Valley @ Treatment Plant; Broadview Heights; City of Nevada City Intertie (rarely used) E. George to Loma Rica Allison Ranch Canal export (unique to 2017)	Comments: No additional comments.
6	WE Master Meter & Supply Error Adjustment	WE MMSEA	4	Input derivation: Left blank in absence of available test data. Comments: No additional comments.	Export meter read frequency: Daily. Export meter read method: Automatic logging via SCADA telemetry. Frequency of data review for trends & anomalies: Monthly. Comments: No additional comments.
7	Billed metered	BMAC	5	Customer meter profile: Age profile: Most meters approximately 15 years old from AMR conversion in 2002. Reading system: AMR ~95%, AMI ~5%. Read frequency: Bi-monthly. Comments: Lag-time correction is employed in input derivation – this is automatically conducted within the billing software, believed to be at the account level. Input derivation from supporting documents confirmed. E George BMAC is the total of the 10312 and 10313 district consumption tables, which is a remnant of historical coding of a separate district that is now combined with E George. UMAC volumes associated with leakage adjustments were relocated back into BMAC, as these volumes are indeed billed just at a lower rate. BMAC also includes temporary hydrant meters. Exclusion of non-potable volumes confirmed.	Percent of customers metered: 100% Small meter testing policy: Reactive - complaint based or flagged-consumption testing only. Number of small meters tested/year: Very few. Large meter testing policy: Reactive - complaint based or flagged-consumption testing only. Number of large meters tested/year: Very few. Meter replacement policy: Based on an age threshold per manufacturer guidelines, as well as upon failure. All new installs are cell-based AMI meters. Number of replacements/year: Roughly 20% of the three systems collectively. Billing data auditing: Standard billing QC, plus review of volumes each billing cycle. Comments: No additional comments.
8	Billed unmetered	BUAC	10	Profile: Tanker fills that are not metered. Input derivation: Quantified by count of tanker fills. Small volume and reliable estimation method. Comments: No additional comments.	Policy for metering exemptions: All connections require metering, however occasionally they run short of temporary hydrant meters. Comments: Site-specific estimation methods, highest confidence.
9	Unbilled metered	UMAC	10	Profile: District facilities only. Leakage adjustments originally in this input were relocated to BMAC. Input derivation: Direct from meter readings. Comments: Input derivation from supporting documents confirmed.	Policy for billing exemptions: Limited to own facilities. Comments: Meter management practices typical of customer meter practices.

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
10	Unbilled unmetered	UUAC	4	Profile: Operational flushing and fire department usage. Comments: Flushing activities greatly scaled back due to drought. Custom California default of 0.25%xWS utilized.	Comments: Default grade applied.
11	Unauthorized consumption	UC	5	Comments: Default input applied.	Comments: Default grade applied.
12	Customer metering inaccuracies	CMI	3	See BMAC comments regarding meter testing & replacement activities. Input derivation: Rudimentary estimate. Comments: No additional comments.	Characterization of meter testing: Limited (upon request or consumption flag only). Characterization of meter replacement: Limited (upon failure only). Comments: No additional comments.
13	Systematic data handling errors	SDHE	5	Comments: Default input applied.	Comments: Default grade applied.
14	Length of mains	Lm	8	Input derivation: Totaled from GIS based map. Hydrant leads included: Yes. Comments: No additional comments.	Mapping format: Digital. Asset management database: In place but separate from GIS system. Currently on Lucity, planning to migrate to another system in near future. Map updates & field validation: Accomplished through normal work order processes. Comments: Grade limited by extent of field validation.
15	Number of service connections	Ns	8	Input derivation: GIS spatial query, then compared against standard report run from billing system with close agreement. Basis for database query: Location or other premise-based ID. Comments: No additional comments.	CIS updates & field validation: Accomplished through normal meter reading processes. Estimated error of total count within: 2%. Comments: No additional comments.
16	Ave length of cust. service line	Lp	10	Comments: Default input and grade applied, as customer meters are typically located at the property boundary given California climate.	
17	Average operating pressure	AOP	4	Number of zones, general profile: Not quantified, but there are many zones due to widely varying topography. Large number of PRVs and booster stations. Typical pressure range: 20-200. Input derivation: Calculated as simple average from analysis of field data. Comments: No additional comments.	Extent of static pressure data collection: Hydrant pressures taken during routine system flushing and/or hydrant testing. Characterization of real-time pressure data collection: Basic - telemetry or pressure logging at boundary points (supply locations, tanks). Hydraulic model: One was developed recently but has not been calibrated. Comments: No additional comments.

#	AWWA Water Audit Input	Code	Final DVG	Basis on Input Derivation	Basis on Data Validity Grade
18	Total annual operating cost	TAOC	10	Input derivation: From official financial reports. Comments: Confirmed costs limited to water only, and water debt service included.	Frequency of internal auditing: Annually. Frequency of third-party CPA auditing: Annually. Comments: No additional comments.
19	Customer retail unit cost	CRUC	10	Input derivation: Weighted average developed from consumption by rate. Sewer charges are not applicable. Comments: Recommend using district specific unit costs since consumption will be different.	Characterization of calculation: Weighted average composite of all rates. Input calculations have been reviewed by an M36 water loss expert. Comments: No additional comments.
20	Variable production cost	VPC	4	Supply profile: Own sources only. Import reflected in audit is from a different district but same utility. Primary costs included: Treatment chemicals and supply & distribution power. Secondary costs included: None currently included. Comments: No additional comments.	Characterization of calculation: Primary costs only. Input calculations have not been reviewed by an M36 water loss expert. Comments: No additional comments.

Key Audit Metrics

(~)	VALIDITY	Data Validity Score: 61	Data Validity Band (Level): **Band III (51-70)**	
(#)	VOLUME	ILI: 2.31	Real Loss: 57.59 **(gal/conn/day)**	Apparent Loss: 9.05 **(gal/conn/day)**
($)	VALUE	Annual Cost of Apparent Losses: $67,891		Annual Cost of Real Losses: $30,510

Infrastructure & Water Loss Management Practices:

Infrastructure age profile: Average network age of 30-40 years. Infrastructure replacement policy (current, historic):At least $250,000 each year allocated to mains renewal – aggregate for all 7 NID districts. Service renewals handled responsively within operating budget.

Estimated main failures/year: Aggregate for NID about 20, much of this occurs in the E George district. Estimated service failures/year: Aggregate for NID about 200, but less of this occurs in the E George district.

Extent of proactive leakage management: None currently in place.

Other water loss management comments: No additional comments.

Comments on Audit Metrics & Validity Improvements

The Infrastructure Leakage Index (ILI) of 2.31 describes a system that experiences leakage at 2.31 times the modeled technical minimum for its system characteristics. Given the relationship between E George and Loma Rica districts, it is likely that some error in the 'transfer' volumes between these 2 districts is causing the ILI to be overstated for E George district.

The Data Validity Score falling within Band III (51-70) suggests that next steps may be focused simultaneously on improving data reliability and evaluating cost-effective interventions for water & revenue loss recovery. Opportunities to improve the reliability of audit inputs and outputs include:

- Improved understanding of transfer volumes between E George ad Loma Rica.
- Improved understanding of Supply Meter (Own or Import) Master Meter Error: consider adopting or increasing the rigor of a source meter volumetric testing and calibration program, informed by the guidance provided in AWWA Manual M36 – Appendix A.
- Customized estimate of Unbilled Unmetered Authorized Consumption: consider producing itemized, agency-specific estimates of unbilled unmetered (operational) uses, rather than using the default. Ensure leakage estimates are excluded.
- Improved estimation of CMI: consider a customer meter testing program which tests a sample of random meters whose stratification (by size, age, or other characteristics) represents the entire customer meter stock.

Further Recommendations

Since Data Validity Score is >50, consider follow-on implementations as described in the AWWA M36 Manual, once the annual water audit is established:

- Conduct a Real Loss Component Analysis to develop your leakage profile.
- Conduct an Apparent Loss Component Analysis to develop your apparent loss profile.
- Cost-benefit analysis & target setting for water loss components.
- Design & implement water loss control program for cost-effective interventions.