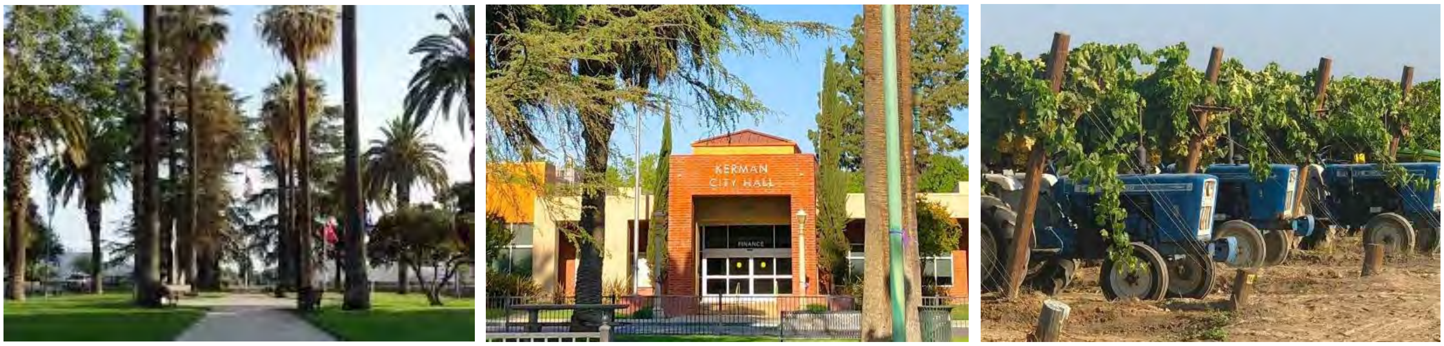
CITY OF KERMAN



FINAL 2020 URBAN WATER MANAGEMENT PLAN

July 2022

Prepared by:

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ABBREVIATIONS

AF	Acre-Feet
AFY	Acre-Feet per Year
AWWA	American Water Works Association
ACS	American Community Survey
AB	Assembly Bill
AMR	Automatic Radio Read Meter
BMP	Best Management Practice
CIMIS	California Irrigation Management Information System
CWC	California Water Code
City	City of Kerman
Census	United States Census Bureau
DMM	Demand Management Measure
DOF	Department of Finance
DWR	Department of Water Resources
DDW	Division of Drinking Water
DRA	Drought Risk Assessment
EAR	Electronic Annual Reports
eARDWP	Electronic Annual Reports to the Drinking Water Program
ERP	Emergency Response Plan
ET_o	Evapotranspiration
FID	Fresno Irrigation District
GPCD	Gallons per Capita Day
gpm	Gallons per Minute
GAC	Granular Activated Carbon
GHG	Greenhouse Gas
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCD	California Department of Housing and Community Development
CCF	Hundred Cubic Feet

in	Inch
ITP	Independent Technical Panel
IRWMP	Integrated Regional Water Management Plan
kWh	Kilowatt-Hour
kWh/MG	Kilowatt-Hours per Million Gallons
LAFCO	Local Agency Formation Commission
MCL	Maximum Contaminant Level
MHI	Median Household Income
MAF	Million Acre-Feet
MG	Million Gallons
MGD	Million Gallons per Day
µg/L	Microgram per Liter
MFR	Multi-Family Residential
NKGSA	North Kings Groundwater Sustainability Agency
PWS	Public Water System
RHNA	Regional Housing Needs Allocation
SB	Senate Bill
SFR	Single Family Residential
EC	Specific Conductivity
SOI	Sphere of Influence
SWRCB	State Water Resources Control Board
SGMA	Sustainable Groundwater Management Act
UWMP	Urban Water Management Plan
UWMPA	Urban Water Management Plan Act
WSCP	Water Shortage Contingency Plan
WWTP	Wastewater Treatment Plant
WDR	Waste Discharge Requirements
WRCC	Western Regional Climate Center

LAY DESCRIPTION

The City of Kerman (City) has prepared this 2020 Urban Water Management Plan (UWMP) as required by the California Department of Water Resources (DWR) for all urban water suppliers that provide water for municipal purposes to more than 3,000 customers within the State of California. This 2020 UWMP follows the State's requirements as defined in the California Water Code (CWC) and in the Urban Water Management Guidebook 2020 (DWR, 2021). The City's 2020 UWMP was adopted by the City of Kerman's City Council on July 13, 2022 and submitted to DWR within 30 days after adoption. The 2020 UWMP is summarized in the flowing sections in a lay description, or executive summary, which provides the key components of each chapter of the UWMP. Table LD-1 provides a summary of each chapter within the City's 2020 UWMP.

Table LD-1 Overview of the 2020 UWMP

Chapter	Information Within Chapter
Chapter 1 – Introduction and Overview	• General legal requirements for the 2020 UWMP. • Plan organization.
Chapter 2 – Plan Preparation	• Plan preparation. • Coordination and outreach.
Chapter 3 – System Description	• Description of the City of Kerman's service area and water system. • Climate and hydrologic characteristics. • Current and projected population, socioeconomics, and demographics.
Chapter 4 – Water Use Characterization	• Description of the City's water use. • Current and projected water use and demand. • System water losses. • Climate change impacts on water use.
Chapter 5 – SB X7-7 Baselines, Targets, and 2020 Compliance	• Baseline daily gross per capita water use. • 2020 target compliance.
Chapter 6 – Water Supply Characterization	• Description of the City's water supplies, including groundwater, surface water, recycled water, and wastewater. • Expected future water projects. • Current and projected water supplies. • Climate change and regulatory condition impacts to supplies.
Chapter 7 – Water Service Reliability and Drought Risk Assessment	• Description of constraints on the City's groundwater supplies. • Projections for water supplies and demands under normal, single dry year, and five-consecutive dry years conditions. • Regional supply reliability. • Climate change impacts on supply reliability.
Chapter 8 – Water Shortage Contingency Plan	• Annual Water Supply and Demand Assessment procedures. • Description of the City's water shortage levels and actions. • Compliance and enforcement for water shortage actions. • Catastrophic and seismic risk assessment for the City's water system. • Overview of communication protocols.
Chapter 9 – Demand Management Measures	• Description of the City's Demand Measurement Measures implemented over the past five years. • Current and future Demand Measurement Measures.

Table LD-1 Overview of the 2020 UWMP

Chapter	Information Within Chapter
Chapter 10 – Plan Adoption, Submittal, and Implementation	• Procedures followed for 2020 UWMP noticing and adoption process. • Plan and amendment submittal process.

This 2020 UWMP reports on a calendar year basis, with 2020 spanning from January 1, 2020, through December 31, 2020. UWMP regulations require the City to report actual supply and demand for 2020 in addition to projected supply and demand volumes in five-year increments through 2045. Projecting supply and demand through 2045 allows the City to assess the reliability and potential shortages that may come from population growth, climate change, and projected regional supply changes.

CHAPTER 1 – INTRODUCTION AND OVERVIEW

Water planning is an essential function of water suppliers and is critical as California continues to deal with ongoing drought conditions and expected long-term climate changes. Prior to the adoption of the Urban Water Management Planning Act (UWMPA) in 1983, there were no specific requirements for water agencies to conduct long-term resource planning. The UWMPA provided the foundation for the development of the UWMP, which provides the framework for long-term water planning. Additionally, the UWMP informs the public about water agencies long-term resource planning efforts that will ensure adequate water supplies for existing and future demands. This 2020 UWMP documents the availability of an appropriate level of reliability of water service sufficient to meet the needs of the City during normal, single dry and 5-consecutive dry years. A long-term reliable supply of water is essential to protect the productivity of the City and California's business and economic climate.

This 2020 UWMP is intended to serve as a general, flexible, and open-ended document that can be periodically updated to reflect changes in regional water supply trends and water use efficiency policies. This UWMP, along with other City of Kerman planning documents, will be used by City staff to guide water use and management efforts through the year 2025, when the UWMP is required to be updated.

CHAPTER 2 – PLAN PREPARATION

The City has prepared this 2020 UWMP in accordance with the UWMPA, sections 10610 through 10656 of the CWC. This UWMP summaries the City's projected retail water demands and characterizes the source water available to meet those demands for the years of 2025 through 2045. This UWMP also describes the reliability of the City's groundwater supplies and discusses the City's water shortage contingency plan during drought conditions and catastrophic events.

The City encouraged participation in this Plan by surrounding water management agencies, water retailers, public agencies, and members of the community. The draft UWMP was available for review at the Kerman City Hall located at 850 S. Madera Avenue, Kerman, CA 93630, and as a PDF on the City's website (www. cityofkerman.net) prior to the public hearing. The final 2020 UWMP will also be available at the Kerman City Hall or as a PDF on the City's website.

CHAPTER 3 – SYSTEM DESCRIPTION

The City of Kerman provides potable water service to a population of approximatley 16,016 residents, as well as commercial, industrial, and public facilities within its service area boundary. Located on the west side of Fresno County, in the southern portion of the San Joaquin Valley, the City is situated approximately

15 miles west of the City of Fresno and 20 miles south of the City of Madera. The City is bisected by State Route 145 (Madera Ave), which runs north/south, and State Route 180 (Whitesbridge Road), which runs east/west.

The City of Kerman is the governing agency and the sole purveyor of water within the City limits. The City owns and operates a public water system that provides water services to 3,767 metered connections. Historically, the City has provided water to residential, commercial, institutional/governmental, and industrial customers and for fire protection and flushing activities by use of groundwater wells. The City currently uses six active wells, Well Nos. 09A, 10, 12, 14, 15, and 17, to extract groundwater from the Kings Subbasin. The City's groundwater wells have individual capacities ranging from 900 gallons per minute (gpm) to 1,500 gpm.

The climate within the City's service area is characterized as Central Valley desert climate; summers are typically warm and dry, while winters are mild, humid and slightly wetter with average monthly lows near 35° F. According to the Western Regional Climate Center (WRCC), average January temperatures are a maximum of 54.6°F and a minimum of 37.6°F, and average July temperatures are a maximum of 98.3°F and a minimum of 65.7°F. According to WRCC records from the years of 1948 to 2016, annual precipitation within the City's service area averages approximatley 10.90 inches. Snow is a rare occurrence for the City.

The City of Kerman has historically experienced steady population growth and future projections anticipate further growth. According to the United States Census Bureau (Census), population within the City during 2020 was 16,016, which was up from 13,544 at the 2010 Census and up from 8,291 at the 2000 Census. According to these population figures, the City has experienced an average annual growth rate of approximatley 1.69 percent over the last 10 years. Current and projected populations through 2045 are shown in Table LD-2

Table LD-2 Population - Current and Projected (Submittal Table 3-1)

Population Served	2020	2025	2030	2035	2040	2045
	16,016	17,416	18,939	20,595	22,396	24,354

NOTES:
(1) An annual growth rate of 1.69% is used to project population growth within the City of Kerman service area through 2045.

CHAPTER 4 – WATER USE CHARACTERIZATION

This chapter describes and quantifies the City's current water use and future water use projections through the year 2045. Water use records, combined with projections of population, provide the basis for estimating future water requirements. Water use projections provided in this chapter will allow the City to accurately analyze the use of the water resources and conduct good resource planning. Additionally, the future demand estimates presented in this chapter will allow the City to adequately manage the water supply and appropriately plan their infrastructure investments.

This chapter also details total water demand and potable demand. Water demands refer not only to the water used by customers but also water used as part of the system maintenance and operation, as well as unavoidable losses inherent in the operation of a water distribution system. Total water demand within the City was approximatley 944 million gallons (MG) per year on average between 2015 and 2019, and 1,010 MG in 2020. Table LD-3 summarizes the 2020 actual water uses and the projected demand through

2045 in five-year increments. Chapter 4 of this UWMP describes the methodologies and assumptions used to project future demands.

Table LD-3 Retail Demands for Potable and Raw Water - Projected

Use Type	2020	2025	2030	2035	2040	2045
Single Family Residential	550	599	651	708	770	837
Multi-Family Residential	102	111	120	131	142	155
Commercial	34	36	40	43	47	51
Institutional/Governmental	43	47	51	56	61	66
Industrial	9	10	10	11	12	13
Landscape	112	122	133	144	157	170
Other Potable	18	20	21	23	25	27
Losses	142	142	142	142	142	142
TOTAL	**1,010**	**1,086**	**1,168**	**1,258**	**1,356**	**1,462**

Accounting for historical water use, expected population increase and other growth, climatic variability, water conservation, and other assumptions, the potable water demand within City's service area is projected to increase to 1,462 MG by 2045.

CHAPTER 5 – SB X7-7 BASELINES, TARGETS, AND 2020 COMPLIANCE

The Water Conservation Act of 2009, also known as the SB X7-7, required urban retail water suppliers to set water conservation targets for 2020 to support the overall State goal of reducing urban per capita water use by 20 percent by 2020. As required by the Act, individual supplier conservation targets had to be determined using one of four methods that are based upon a baseline of use that was calculated using the specific guidelines described in DWR's *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* (DWR, 2011).

In 2015, the City of Kerman calculated their baselines and targets based on the requirements and methodologies presented in the 2015 UWMP Guidebook. In the 2015 UWMP, the City demonstrated compliance with their interim water use target for the year 2015 and that the City was on track to achieve its 2020 target. In Chapter 5 of this 2020 UWMP, the City demonstrates that it has achieved its 2020 target.

CHAPTER 6 – WATER SUPPLY CHARACTERIZATION

The City acquires all of its water supply from the underlying groundwater basin via a series of wells. The City's existing system facilities include six active groundwater wells in various locations throughout the community. The six wells have a combined capacity of 6,700 gpm. Water is distributed by a network of pipelines ranging in size from 4 to 12-inches in diameter. The water system also includes two 750,000-gallon water storage tanks that are used for water storage.

The City is located within the geomorphic province known as the Central Valley, which is divided into the Sacramento Valley and the San Joaquin Valley. The groundwater underlying the City is part of the larger San Joaquin Valley Groundwater Basin within the San Joaquin River Hydrologic Region. The San Joaquin Valley Groundwater Basin is further divided into nine subbasins. The City's groundwater supply is extracted from the Kings subbasin, which is classified the DWR as a critical overdraft subbasin.

Following the passage of the Sustainable Groundwater Management Act (SGMA) by California Governor Edmund G. Brown Jr. in September 2014, the City became a member of the North Kings GSA (NKGSA). The NKGSA's plan area covers approximately 311,000 acres within Fresno County and is outlined by the Fresno Irrigation District (FID) border to the south and the Kings Subbasin boundary to the north. Other members of the NKGSA include the City of Fresno, City of Clovis, Bakman Water Company, Biola Community Services District, County of Fresno, FID, Fresno Metropolitan Flood Control District, Garfield Water District, and International Water District. The City and the NKGSA is working collaboratively with other partnering GAS's in the Kings Subbasin to achieve sustainable groundwater conditions by 2040 in accordance with SGMA.

In addition to the water system, the City also owns and operates a wastewater collection treatment, and disposal system that provides sewer service to residents, businesses, and small industries within the Kerman service area. The existing sewer collection system consists of network of 6 and 8-inch diameter "collection" lines that connect to larger "mains" that range from 10 to 27-inches in diameter. Wastewater from most of the southern half of Kerman flows into an 18-inch trunk line that runs along Madera Avenue from California Avenue to Church Avenue, and then to a 27-inch trunk line that runs along Church Avenue from Madera Avenue to the WWTP. The remainder of the City's collection lines flow into an 18-inch trunk line that runs along Del Norte Avenue from Whitesbridge Avenue to Church Avenue and then along Church Avenue from the Del Norte Avenue alignment to the WWTP. The City's sewer collection system operates with one permanent lift station that is located at the intersection of Siskiyou and Kearney. This facility currently receives flows from the areas generally to the north and west of the lift station and discharges into the Del Norte Avenue line.

In 2011, the City's WWTP was upgraded to provide secondary level of treatment and the plant's designed hydraulic capacity was increased to 2.0 MGD. The upgraded WWTP meets State requirements for the removal of Nitrates, Biochemical Oxygen Demand (BOD) and sludge handling, and consists of an consist of an influent pump station, headworks, two new clarifiers, a sludge press and one acre of new drying beds. To make use of the original plant, the old aeration tanks were converted to digesters. A Biolac aeration treatment system was also installed as part of the upgrade. By using the aerobic and anaerobic cycle, the treatment system aerates the water, releasing nitrogen to eliminate additional nitrates to the groundwater table. The exiting storage ponds and disposal ponds were significantly expanded, and a new 5,000-gallon storage tank for receiving domestic septic was installed. As part of the upgrade, the City also installed a 0.5 megawatt solar park to buffer rising power cost to operate the WWTP.

Treated wastewater from the WWTP is currently discharged to 30 acres of disposal ponds where it is allowed to evaporate and percolate into the soil and recharge the groundwater table. The City's secondary effluent is not disinfected and is therefore classified as an "oxidized" (undisinfected secondary) wastewater according to California Code of Regulations (CCR) Title 22. The City does not currently treat any wastewater to disinfected tertiary water standards to allow it to be used as a component of its water supply.

CHAPTER 7 – WATER SERVICE RELIABILITY AND DROUGHT RISK ASSESSMENT

Water supply reliability describes the long-term reliability of the City to meet the water needs of its customers under varying conditions. Chapter 7 describes the City's reliability to meet customer's demands through the year 2045 by analyzing plausible hydrological variability, regulatory variability, climate conditions, and other factors that affect the water supply and the customer's water use. Per the new requirements of the CWC, this chapter presents an assessment of the City's water supply by comparing projected future demands with expected water suppliers under three different hydrologic condition: normal year; a single dry year; and multiple dry years.

Reliability is expressed in terms of the City's water system ability to deliver water during normal water years and in years of water supply shortages. Reliability may be quantified by the amount and frequency of water delivery reductions required to balance customer demands with available water supplies. Based on the resiliency of the groundwater basin and if potable groundwater can be extracted by the City wells, which are individual sources in certain respects, it is not anticipated that a single or multiple dry year period will reduce the availability of water supply to the City. Groundwater has and will continue to provide drought protection for the City. However, the City has engaged in extensive emergency planning in preparation for potential service interruptions and has prepared a Water Shortage Contingency Plan (WSCP) that will be implemented during drought conditions. Chapter 7 concludes that no water supply shortages are anticipated in the City's service are during the planning period.

CHAPTER 8 – WATER SHORTAGE CONTINGENCY PLAN

Water shortage contingency planning is a strategic planning process to prepare for and respond to water shortages. The purpose of a WSCP is to include stages of response to a water shortage, such as a drought, that occur over a period of time, as well as catastrophic supply interruptions which occur suddenly. The primary objective of a WSCP is to ensure that a supplier has in place the necessary resources and management responses needed to protect health and human safety, minimize economic disruption, and preserve environmental and community assets during water supply shortages and interruptions.

Since the City sole source of water supply is obtained from the critical overdraft Kings subbasin, the City is committed to promoting water conservation measures to maintain the reliability of the groundwater basin. The City's WSCP was approved by City Council on adopted on February 3, 2010, through the adoption of Resolution No. 10-05. The WSCP was adopted on the City's need to conserve water supplies and to avoid or minimize the effects of any future water shortage. On June 6, 2018, the Kerman City Council adopted Ordinance No. 18-08, which repealed Section 13.04.160 of the Kerman Municipal Code (Municipal Code) and added Chapter 13.28 relating to water conservation. The purpose of Chapter 13.28 is to establish a water conservation plan that will reduce water consumption within the City through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, maximize the efficient use of water within the City to avoid and minimize the effect and hardship of water shortage to the greatest extent possible, and meet any state laws or state regulations requiring water conservation. The Chapter also establishes water conservation standards intended to alter behavior related to water use efficiency at all times. The Chapter ultimately authorizes the City Council to adopt further measures to be implemented during times of a declared water shortage or declared water shortage emergencies, with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies.

The 2020 WSCP presented in this Chapter updates the City's 2010 WSCP and Ordinance No. 18-08, which included only three stages of mandatory water conservation measures. For the 2020 WSCP, each of the six water shortage stages represent an increasing gap between the City's estimated water supplies and the unconstrained water demand or the gap between supply and demand at any time due to an unforeseen event that interrupts water supplies. The six shortage stages correspond to 10, 20, 30, 40, 50 percent, and greater than 50 percent shortage compared to the normal reliability conditions, as required by new legislation.

CHAPTER 9 – DEMAND MANAGEMENT MEASURES

The City recognizes water use efficiency as an integral component of current and future water strategy in its service area. Demand management measures (DMMs) refer to policies, programs, rules, regulation and ordinances, and the use of devices, equipment, and facilities that, over the long term, have been generally justified and accepted by the industry as providing the means to achieve a "reliable" reduction in water demand. This means providing education, tools, and incentives to help residents and businesses reduce the amount of water used on their property. The City has aggressively pursued conservation to reduce demand and stretch existing water supplies.

The UWMPA originally required implementation of fourteen DMMs; also known as best management practices (BMP). In 2014, the section of the CWC addressing DMMs was significantly modified based on recommendations from the Independent Technical Panel (ITP) to the legislature. The ITP recommended that the UWMP Act should be amended to simplify, clarify, and update the DMM reporting requirements, reorganizing the 14 specific measures to six more general requirements plus a "other" category. Urban water suppliers can choose to follow the six general requirements or report by type of DMM.

The City realizes the importance of DMMs to ensure a reliable future water supply. In this 2020 UWMP, the City has reported on the seven DMM described in the 2020 UWMP Guidebook. The DMMs that have been or are planning to be implemented within the City's water service area are detailed in Chapter 9.

CHAPTER 10 – PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

During preparation of the 2020 UWMP, the City notified the City of Fresno, County of Fresno, Fresno Irrigation District, North Kings Groundwater Sustainability Agency, and the Kings Basin Water Authority that it was updating their UWMP in compliance with the 2020 UWMP Guidebook and invited each agency to participate in the process. On March 24, 2022, a notice of public hearing was mailed, notifying each agency the date and time of the public hearing, contact information, and where the draft UWMP would be available for review. This occurred within the required 60-day notification period prior to the public hearing.

In accordance with Government Code 6066, the notice of the public hearing was also published in the City's local press to notify the general public. The notice included the date and time of the public hearing, as well as the location where the Plan is available for public inspection.

The 2020 UWMP and 2020 WSCP was adopted by Resolution Nos.22-51 and 22-52 on July 13, 2022, following the public hearing. The public hearing gave the general public the opportunity to comment on the Plan and further allowed the Kerman City Council to consider any further modifications of the UWMP in response to public input before adoption.

The UWMP was submitted to the DWR electronically in July of 2022. A copy of the UWMP was submitted to the California State Library, Kings River Conservation District, Fresno Irrigation District, Consolidated Irrigation District, City of Fresno, City of Clovis, City of Reedley, and County of Fresno within 30 days of approval of the Plan. Finally, copies of the adopted UWMP were also made available to the public within 30 days following adoption. The public can access an electronic copy of the Plan on the City's website and also obtain a copy at City Hall office during normal business hours.

CHAPTER 1 - INTRODUCTION AND OVERVIEW

1.1. Background and Purpose

The California Water Code requires all urban water suppliers within the state to prepare and adopt Urban Water Management Plans (UWMP) for submission to the California Department of Water Resources (DWR). The UWMPs must be updated every five years and satisfy the requirements of the Urban Water Management Planning Act (UWMPA) of 1983 including amendments that have been made to the Act. The UWMPA requires urban water suppliers servicing 3,000 or more connections or supplying more than 3,000-acre feet (AF) of water annually, to prepare an UWMP.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code (CWC), and as set forth in the guidelines and format established by the DWR, is the City of Kerman's (City) 2020 UWMP.

1.2. Urban Water Management Planning and the California Water Code

Water planning is an essential function of water suppliers, but it is critical as California grapples with ongoing drought and expected long-term climate changes. Prior to the adoption of the UWMPA, there were no specific requirements that water agencies conduct long-term resource planning. While many water agencies had conducted long-term water supply and resource planning prior to the Act, those who had not were left vulnerable to supply disruptions during dry periods or catastrophic events.

1.2.1. Urban Water Management Planning Act of 1983

In 1983, State Assembly Bill (AB) 797 modified the California Water Code Division 6, by creating the UWMPA. Several amendments to the original UWMPA, which were introduced since 1983, have increased the data requirements and planning elements to be included in 2020 UWMP.

Initial amendments to the UWMPA required that total projected water use be compared to water supply sources over the next 20 years, in 5-year increments. Recent DWR guidelines also suggest projecting through a 25-year planning horizon to maintain a 20-year timeframe until the next UWMP update has been completed and for use in developing Water Supply Assessments.

Other amendments require that UWMPs include provisions for recycled water use, demand management measures, and a Water Shortage Contingency Plan (WSCP), set forth therein. Recycled water was added in the reporting requirements for water usage and figures prominently in the requirements for evaluation of alternative water supplies when future projections predict the need for additional water supplies. Each urban water purveyor must coordinate the preparation of the WSCP with other urban water purveyors in the area, to the extent practicable. Each water supplier must also describe their water demand management measures that are being implemented or scheduled for implementation.

In addition to the UWMPA and its amendments, there are several other regulations that are related to the content of the UWMP. In summary, the key relevant regulations are:

- Chapter 1 - AB 1420: Requires implementation of demand management measures (DMMs)/best management practices (BMPs) and meeting the 20 percent reduction by 2020 targets (mandated by SBx7-7) to qualify for water management grants or loans.
- Chapter 2 - AB 1465: Requires water suppliers to describe opportunities related to recycled water use and stormwater recapture to offset potable water use.
- Chapter 3 - Amendments Senate Bill (SB) 610 (Costa, 2001), and SB 221 (Daucher, 2001), which became effective beginning January 1, 2002, require counties and cities to consider information relating to the availability of water to supply large new developments by mandating the preparation of further water supply planning (Daucher) and Water Supply Assessments (Costa).
- Chapter 4 - SB 1087: Requires water suppliers to report single family residential (SFR) and multifamily residential (MFR) projected water use for planned lower income units separately.
- Chapter 5 - Amendment SB 318 (Alpert, 2004) requires the UWMP to describe the opportunities for development of desalinated water, including but not limited to, ocean water, brackish water, and groundwater, as long-term supply.
- Chapter 6 - AB 105 (Wiggins, 2004) requires urban water suppliers to submit their UWMPs to the California State Library.
- Chapter 7 - SBx7-7: Requires development and use of new methodologies for reporting population growth estimates, base per capita use, and water conservation. This water bill also extended the 2010 UWMP adoption deadline for retail agencies to July 1, 2011.

A copy of the current version of the UWMPA, as incorporated in Sections 10610 through 10657 of the California Water Code (CWC), is provided in Appendix A.

1.2.2. Applicable changes to the Water Code since 2015

Table 1-1 provides a summary of the changes to the CWC since 2015:

Table 1-1 Changes to the CWC since 2015

Topic	CWC Section	Legislative Bill	Summary
Five Consecutive Dry-Year Water Reliability Assessment	Section 10635(a)	SB 606 Hertzberg 2018	The Legislature modified the dry-year water reliability planning from a “multiyear” time period to a “drought lasting five consecutive water years” designation. This statutory change requires a Supplier to analyze the reliability of its water supplies to meet its water use over an extended drought period.
Drought Risk Assessment	Section 10635(b)	SB 606 Hertzberg 2019	The Legislature created a new UWMP requirement for drought planning in part because of the significant duration of recent California droughts and the predictions about hydrological variability attributable to climate change. The Drought Risk Assessment requires a Supplier to assess water supply reliability over a five-year period from 2021 to 2025 that examines water supplies, water uses, and the resulting water supply reliability under a reasonable prediction for five consecutive dry years.

Table 1-1 Changes to the CWC since 2015

Topic	CWC Section	Legislative Bill	Summary
Seismic Risk	Section 10632.5	SB 664 Hertzberg 2015	The Water Code now requires Suppliers to specifically address seismic risk to various water system facilities and to have a mitigation plan.
Energy Use Information	Section 10631.2	SB 606 Hertzberg 2018	The Water Code now requires Suppliers to include readily obtainable information on estimated amounts of energy for their water supply extraction, treatment, distribution, storage, conveyance, and other water uses. The reporting of this information was voluntary in the 2015 UWMP.
Water Loss Reporting for Five Years	Section 10631(d)(3)(C)	AB 1414 Friedman 2019	The Water Code added the requirement to include the past five years of water loss audit reports as part of the 2020 UWMP
Water Shortage Contingency Plan (WSCP)	Section 10632	SB 606 Hertzberg 2019	In 2018, the Legislature modified the UWMP laws to require a WSCP with specific elements. The WSCP is a document that provides a Supplier with an action plan for a drought or catastrophic water supply shortage.
Groundwater Supplies Coordination	Section 10631	AB 1414 Friedman 2019	In 2014, the Legislature enacted the Sustainable Groundwater Management Act (SGMA) to address groundwater conditions throughout California. The Water Code now requires Suppliers' 2020 UWMPs to be consistent with Groundwater Sustainability Plans, in areas where those plans have been completed by Groundwater Sustainability Agencies.
Lay Description	Section 10630.5	SB 606 Hertzberg 2019	The Legislature included a new statutory requirement for Suppliers to include a lay description of the fundamental determinations of the UWMP, especially regarding water service reliability, challenges ahead, and strategies for managing reliability risks.

1.2.3. Water Conservation Act of 2009 (SB X7-7)

With the adoption of the Water Conservation Act of 2009, also known as SB X7-7, the State of California is required to reduce urban per capita water use by 20 percent by the year 2020. To achieve this statewide objective, the Legislature required each urban supplier to report in their 2015 UWMPs their Base Daily per Capita Water Use (Baseline Gallons per Capita Day (GPCD)), 2015 Interim Urban Water Use Target, 2020 Urban Water Use Target (2020 Target), and Compliance Daily per Capita Water Use. The Legislature stated that the cumulative results of each urban supplier's reduction would meet the statewide legislative requirement.

No new requirements were created for water use targets, baselines, or compliance since the UWMP 2015. However, for this 2020 UWMP, urban suppliers must demonstrate whether they have achieved their 2020 Target as reported in their 2015 UWMP. The City's compliance with their 2020 Confirmed Target is detailed in Chapter 5 of this 2020 UWMP.

1.3. Urban Water Management Plan in Relation to Other Planning Efforts

Urban suppliers provide information on water management specific to their service areas. However, water management does not happen in isolation; there are other planning processes that integrate with the UWMP to accomplish urban planning. Some of these plans include City, District and County General Plans, Water Master Plans, Recycled Water Master Plans, integrated resource plans, Integrated Regional Water Management Plans, Groundwater Management Plans, and others.

1.4. 2020 UWMP Organization

The information contained in this 2020 UWMP corresponds to items in the UWMPA and other amendments to the Water Code. This 2020 UWMP has been organized following the DWR's recommended outline and the following is a description of each chapter and a brief description of the content in each chapter:

- **Chapter 1 - Introduction and Overview:** This introductory chapter describes the UWMP Act, the UWMP preparation and adoption process, and amendments to the Water Code since the preparation of the 2015 UWMP. This Chapter also provides a discussion on the importance and extent of the City's water management planning efforts.
- **Chapter 2 - Plan Preparation:** This chapter provides information on the process followed for developing the UWMP, including efforts in coordination and outreach.
- **Chapter 3 - System Description:** This chapter includes a general description of the City's water supply system, including a description of the City's service area, climate, projected population, and other social, economic, and demographic factors.
- **Chapter 4 - System Water Use:** This chapter describes and quantifies the current and projected water uses within City's service area.
- **Chapter 5 – SB X7-7 Baselines, Targets and 2020 Compliance:** This chapter describes the City's compliance with the 2020 per-capita target value that was adopted in 2015 UWMP and states the City's compliance value based on actual 2020 customer water use.
- **Chapter 6 - System Supplies:** This chapter describes and quantifies the current and projected sources of water available to the City. This chapter also includes a description and quantification of potential recycled water uses and supply availability.
- **Chapter 7 - Water Supply Reliability and Drought Risk Assessment:** This chapter presents an assessment of the reliability of the City's water supply and projects the reliability over a 20-year planning horizon, for normal, single dry years, and five consecutive dry years.
- **Chapter 8 - Water Shortage Contingency Plan:** This chapter provides City's staged plan for dealing with water shortages, incorporating prescriptive information and standardized action levels, along with implementation actions in the event of a catastrophic supply interruption.
- **Chapter 9 - Demand Management Measures:** This chapter describes the City's efforts to promote conservation and to reduce demand on its water supply and addresses several demand management measures.

- **Chapter 10 - Plan Adoption, Submittal, and Implementation:** This chapter describes the steps taken to adopt and submit the 2020 UWMP and to make it publicly available. This chapter also includes a discussion of City’s plan to implement the UWMP.

CHAPTER 2 - PLAN PREPARATION

2.1. Introduction

This chapter provides the basis for preparing the 2020 UWMP and describes the various levels of regional coordination that City has employed. It also describes the reporting period and the units of measure used by City to report water volumes throughout the 2020 UWMP.

Finally, this chapter also provides a description of the coordination and outreach efforts followed in the preparation of the 2020 UWMP. Coordination and outreach are key elements to developing a useful and accurate UWMP.

2.2. Basis for Preparing a Plan

> *CWC Section 10617*
>
> *"Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems.*
>
> *CWC Section 10620*
>
> *(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.*
>
> *CWC Section 10621*
>
> *(a) Each urban water supplier shall update its plan at least once every five years on or before July 1, in years ending in six and one, incorporating updated and new information from the five years preceding each update.*

The City of Kerman supplies water for municipal purposes to a population of approximately 16,016 through a total of number of 3,767 metered service connections (as of December 31, 2020). Thus, the City is classified as an "urban water supplier" as defined in Section 10617 of the CWC. In accordance with the CWC, as an urban water supplier, the City is required to update its urban water management plan every five years. The City submitted its first UWMP to the Department of Water Resources (DWR) in 2010. This 2020 UWMP will be the third UWMP submitted by the City of Kerman.

2.2.1. Public Water Systems

> *CWC Section 10644*
>
> *(a)(2) The plan, or amendments to the plan, submitted to the department … shall include any standardized forms, tables, or displays specified by the department.*
>
> *California Health and Safety Code 116275 (h)*
>
> *"Public Water System" means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.*

The City of Kerman owns and operates a public water system (PWS# CA1010018) that is regulated by the State Water Resources Control Board, Division of Drinking Water (SWRCB-DDW). The SWCRB-DDW requires reporting on public water systems.

The City files electronic Annual Reports to the Drinking Water Program (eARDWP) to the Board, which include annual reports of water usage and other information. The information provided in this UWMP is consistent with the data reported in the eARDWP.

2.2.2. Agencies Serving Multiple Service Areas/Public Water Systems

The City serves only one PWS. Information about that PWS is shown below in Table 2-1.

Table 2-1 Public Water Systems (Submittal Table 2-1)

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020 (MG)
CA1010018	City of Kerman	3,767	1,010

2.3. Individual or Regional Planning and Compliance

The City has developed this 2020 UWMP reporting solely for its own service area to address all requirements of the CWC. The City's 2020 UWMP was not developed as a Regional Plan.

Table 2-2 Plan Identification (Submittal Table 2-2)

Select Only One	Type of Plan		Name of RUWMP or Regional Alliance
☒	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	
	☐	Water Supplier is also a member of a Regional Alliance	
	Regional Urban Water Management Plan (RUWMP)		

2.4. Fiscal or Calendar Year and Units of Measure

> *CWC Section 10608.20*
>
> *(a)(1) Urban retail water suppliers…may determine the targets on a fiscal year or calendar year basis.*

2.4.1. Fiscal or Calendar Year

Water suppliers may report on either a fiscal or calendar year basis. DWR prefers that agencies report on a calendar year basis in order to ensure UWMP data is consistent with data submitted for other reports to the State. The City is reporting on a calendar year basis. All data included in this 2020 UWMP is consistent with the calendar year basis.

2.4.2. Reporting Complete 2015 Data

The 2020 UWMPs are required to include the water use and planning data for the entire calendar year of 2020, if an agency is reporting on a calendar year basis. This 2020 UWMP contains information for the entire 2020 year.

2.4.3. Units of Measure

Water agencies use various units of measure when reporting water volumes, such as acre-feet (AF), million gallons (MG), or hundred cubic feet (CCF). Agencies may report volumes of water in any of these units, but must maintain consistency throughout the UWMP. The City is reporting water volumes in million gallons (MG). Table 2-3 shows the type of agency, type of reporting year, and the units of measurement used throughout this 2020 UWMP.

Table 2-3 Supplier Identification (Submittal Table 2-3)

Type of Supplier	
☐	Supplier is a wholesaler
☒	Supplier is a retailer
Fiscal or Calendar Year	
☒	UWMP Tables are in calendar years
☐	UWMP Tables are in fiscal years
Units of measure used in UWMP	
Unit	MG

2.5. Coordination and Outreach

> *CWC Section 10631 (h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).*

2.5.1. Wholesale and Retail Coordination

When a water supplier relies upon a wholesale agency for a water supply, both suppliers are required to provide each other with information regarding projected water supply and demand. The projections should be consistent with each agency's supply and demand projections.

The City of Kerman does not receive water from any wholesale agency. Standard Table 2-4 is included below indicating that the information requested does not apply to the City of Kerman.

Table 2-4 Water Supplier Information Exchange (Submittal Table 2-4)
The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631.
Wholesale Water Supplier Name
Not Applicable

2.5.2. Coordination with Other Agencies and the Community

CWC Section 10620

(d)(3) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

CWC Section 10642

Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of both the plan and the water shortage contingency plan...

In the preparation this 2020 UWMP, the City has coordinated with other appropriate agencies in the area, to the extent practicable. The City has contacted with the following agencies in the preparation of this 2020 UWMP.

- City of Fresno
- County of Fresno
- Fresno Irrigation District
- North Kings Groundwater Sustainability Agency
- Kings Basin Water Authority

Copies of the letters sent to each of those agencies are included in Appendix B.

2.5.3. Notice to Cities and Counties

CWC Section 10621(b)

Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

Agencies must notify cities and counties within which they serve water that the UWMP is being updated and reviewed. As indicated above, the City of Fresno, County of Fresno, Fresno Irrigation District, North Kings Groundwater Sustainability Agency, and the Kings Basin Water Authority have been notified of the preparation of the 2020 UWMP and invited to participate in the process.

CHAPTER 3 - SYSTEM DESCRIPTION

3.1. Introduction

This Chapter provides a general description of the City of Kerman's water supply system, including a description of the service area, climate, projected population, land use, and other social, economic, and demographic factors.

3.2. General Description

> *CWC Section 10631.*
>
> *(a) Describe the service area of the supplier, including current and projected population, climate, and other social, economic, and demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available. The description shall include the current and projected land uses within the existing or anticipated service area affecting the supplier's water management planning. Urban water suppliers shall coordinate with local or regional land use authorities to determine the most appropriate land use information, including, where appropriate, land use information obtained from local or regional land use authorities, as developed pursuant to Article 5 (commencing with Section 65300) of Chapter 3 of Division 1 of Title 7 of the Government Code.*

The City of Kerman provides potable water service to a population of approximatley 16,016 residents, as well as commercial, industrial, institutional, and public facilities within its service area boundary. Located on the west side of Fresno County, in the southern portion of the San Joaquin Valley. The City is situated approximately 15 miles west of the City of Fresno and 20 miles south of the City of Madera. The City is bisected by State Route 145 (Madera Ave), which runs north/south, and State Route 180 (Whitesbridge Road), which runs east/west.

The City of Kerman is the governing agency and the sole purveyor of water within City limits. The City owns and operates a public water system that provides water services to 3,767 metered connections. Historically, the City has provided water to residential, commercial, institutional/governmental, and industrial customers and for fire protection and flushing activities by use of groundwater wells. The City currently uses six active wells, Well Nos. 09A, 10, 12, 14, 15, and 17, to extract groundwater from the Kings Subbasin. The City's groundwater wells have individual capacities ranging from 900 gallons per minute (gpm) to 1,500 gpm.

The groundwater underlying the City is part of the larger San Joaquin Valley Groundwater Basin within the San Joaquin River Hydrologic Region. The San Joaquin Valley Groundwater Basin is further divided into nine subbasins. The City of Kerman lies within the Kings Subbasin. The City's wells currently draw water from this non-adjudicated groundwater subbasin with no limits on pumping and that has been labeled as being in a critical state of overdraft.

The City is a predominantly agricultural area, and the local economy is dependent upon agricultural industries. According to the City's 2040 General Plan, about three-quarters of the land in City's planning area was used for agricultural purposes in 2018. The primary crops grown in the Kerman area include raisin grapes, almonds, cotton, and alfalfa. Vineyards and orchards are the principal crops found north and east of the City, while row crops are predominant in the south and west.

3.3. Service Area Map

A service area map is included in Appendix C of this 2020 UWMP. The service area map contains the City Limits, the potable water service area boundary.

3.4. Service Area Climate

> *CWC Section 10631(a)*
>
> *A plan shall… Describe the service area of the supplier, including … climate…*
>
> *CWC Section 10630*
>
> *It is the intention of the Legislature, in enacting this part, to permit levels of water management planning… while accounting for impacts from climate change.*

The City is located on the west side of Fresno County and is characterized as a Central Valley desert climate. Summers are typically hot and dry with average monthly highs near 100° F, while winters are mild, humid and slightly wetter with average monthly lows near 35° F. Nearly nine-tenths of the annual precipitation falls during the period of November through April. Rainfall during the summer is rare and very light. Kerman enjoys a very high percentage of sunshine, receiving more than 80 percent of the possible amount during all but the four months of November, December, January, and February. Reduction of sunshine during these months is caused by fog and short periods of stormy weather.

The Western Regional Climate Center (WRCC) has maintained historical climate records for the past 100 years for areas within Fresno county. However, the website does not include complete data for the City. The closest monitoring station with recent data is the located at the Fresno Yosemite International Airport (Station 043257), which is located approximately 21 miles east of the City. According to the WRCC, average January temperatures are a maximum of 54.6°F and a minimum of 37.6°F. Average July temperatures are a maximum of 98.3°F and a minimum of 65.7°F. According to the WRCC records from the years of 1948 to 2016, annual precipitation within the City's service area averages approximatley 10.90 inches. Snow is a rare occurrence for the City.

Similar to the WRCC, the California Irrigation Management Information System (CIMIS) web site tracks and maintains records of evapotranspiration (ET_o) for select cities only. Since there are no CIMIS stations located in the City of Kerman, the ET_o statistics presented in the table below come from the Westlands Station, which is assumed to be a representative of the Kerman distribution area. The ET_o is an an indicator of how much water is required to maintain healthy agriculture and landscaping, ranges from 1.28 to 9.30 inches per month (in/month) and averages 5.24 inches (in) per month, with highest ETo occurring during the months of May through September.

Table 3-1 below displays the average monthly precipitation, maximum and minimum average temperatures, and average evapotranspiration within the City's service area.

Table 3-1 Climate Data

Month	Avg. Precipitation (in)[1]	Avg. Snowfall (in)[1]	Avg. Max Temp (°F)[1]	Avg. Min Temp (°F)[1]	Avg. Et_o (in)[2]
January	2.09	0.0	54.6	37.6	1.30
February	1.90	0.0	61.5	40.7	2.24
March	1.89	0.0	67.0	43.8	4.17
April	1.03	0.0	74.4	48.0	6.15
May	0.36	0.0	83.5	54.3	8.26
June	0.16	0.0	91.7	60.5	8.83
July	0.01	0.0	98.3	65.7	9.30
August	0.01	0.0	96.4	64.0	8.33
September	0.15	0.0	90.8	59.7	6.38
October	0.53	0.0	79.7	51.2	4.39
November	1.13	0.0	65.3	42.4	2.21
December	1.64	0.0	54.7	37.3	1.28
Annual Total/Average	**10.90**	**0.0**	**76.5**	**50.4**	**62.84**

NOTES:
(1) Data obtained from the WRCC based on records from January 1, 1948 through June 9, 2016 for the Fresno Yosemite Intonational Airport, CA (043257).
(2) Data obtained from the CIMIS, for the Westlands Station.

3.5. Service Area Population and Demographics

3.5.1. Service Area Current and Projected Population

> *CWC Section 10631(a)*
>
> *Describe the service area of the supplier, including current and projected population …The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.*

The City of Kerman, along with a number of other communities in the region, have experienced steady population growth and future projections anticipate further growth. The persistent increase in population is primarily a reflection of the regional growth pressures that are affecting the Central Valley as people living in more expensive regions look for affordable housing in the Valley. Anticipating increased demand from population growth and new enterprise are important aspects of the City's UWMP. The City's UWMP anticipates the effects of increased demand on water resources arising from sustained population growth.

According to the United States Census Bureau (Census), population within the City during 2020 was 16,016, which was up from 13,544 at the 2010 Census and up from 8,291 at the 2000 Census. According to these population figures, the City has experienced an average annual growth rate of approximatley 1.69 percent over the last 10 years. Table 3-2 shows the population projections for next twenty-five years, in five-year increments, assuming a 1.69 percent annual growth rate through 2045

Table 3-2 Population - Current and Projected (Submittal Table 3-1)

	2020	2025	2030	2035	2040	2045
Population Served	16,016	17,416	18,939	20,595	22,396	24,354

NOTES:
(1) An annual growth rate of 1.69% is used to project population growth within the City of Kerman's service area through 2045.

3.5.2. Other Social, Economic and Demographic Factors

> *CWC Section 10631*
>
> *(a) Describe the service area of the supplier, including… other social, economic and demographic factors affecting the supplier's water management planning.*

Based on 2015-2019 data provided by the 2019 American Community Survey (ACS), the most represented ethnicity in the City of Kerman is Hispanic or Latino at approximatley 78 percent of the population. The median age of the City's population is roughly 27.7 years old. The Census estimates that approximatley 9.1 percent of the population is under 5 years, 32.6 percent of the population is under 18 years, 67.4 percent of the population is 18 years or older, and 10.2 percent is 65 years or older. Approximatley 3.8 percent of the population consists of veterans, of which 100 percent are male.

According to the 2015-2019 Census data, approximately 27.8 percent of the population within the City have received their high school diploma or equivalent degree, 15.9 percent have received some college experience but no degree, 6.9 percent have received an associate degree, 5.8 percent have received a bachelor's degree, and 1.7 percent have received a graduate or professional degree. The Median Household Income (MHI) for the City is $46,499, which is approximately 58 percent of the statewide average MHI of $80,440. The Census estimates that approximatley 20 percent of the population of the City lives in poverty, which is almost double the statewide average of 11.8 percent.

The main industries for the civilian employed population 16 years or older in the City of Kerman consists of

agriculture, forestry, fishing, hunting, and mining (21.7 percent), educational services and health care and social assistance (18.4 percent), manufacturing (10.6 percent), retail trade (8.9 percent), transportation and warehousing and utilities (8.3 percent), arts, entertainment, and recreations, and accommodation and food services (7.4 percent), construction (5.5 percent), wholesale trade (4.7 percent), other services, except public administration (4.6 percent), professional, scientific, and management and administrative and waste management services (3.6 percent), public administration (3.0 percent), finance and insurance, real estate and rental and leasing (2.3 percent), and information (0.8 percent).

3.6. Land Uses Within Service Area

The City of Kerman's 2040 General Plan (General Plan) was adopted in July 2020. California State Law requires every city to prepare and maintain a general plan "for the physical development of the city and any land outside its boundaries that bears relation to its planning." A general plan serves as the jurisdiction's "constitution" or "blueprint" for future decisions concerning a variety of issues including land use, health and safety, and resource conservation. The Kerman General Plan contains the goals and policies upon which the City Council and Planning Commission base their decisions.

The City controls the use and development of land withing the Kerman City limits. Currently, the Kerman City limits contains 2,150 acres (3.36 square miles). The SOI is a line that is typically situated outside the city limits boundary and marks where the city is expected to grow via annexation. The SOI is a boundary that encompasses lands that are expected to ultimately be annexed by the City, although until annexed it falls under the jurisdiction of the County of Fresno. The City's SOI is determined by the Fresno Local Agency Formation Commission (LAFCO), which is an entity empowered to review and approve proposed boundary changes and annexations by incorporated municipalities. As of 2020, Kerman's SOI contained approximately 2,980 acres (4.66 square miles) The SOI is recognized as the ultimate City growth boundary over the life of the City's current General Plan. This 2020 Urban Water Management Plan assumes that the SOI describes the future service area of the City's water system.

Land uses within the City of Kerman city limits and SOI includes residential (very low density, low density, medium density, and high density), mixed use, commercial (neighborhood, general, service, and regional), office, industrial, public, quasi-public, schools, parks, ponding basins, urban reserve, and agriculture. Residential is the predominant land use within Kerman accounting for approximatley 52.4 percent of the total area within the city limits, while commercial and industrial land uses account for approximatley 10.8 and 15.5 percent respectively.

Table 3-3 summarizes the acreage for each land use designation in both the city limits and SOI, as presented in the City's 2035 General Plan.

Table 3-3 Land Use Designation within City of Kerman

Land Use Designation	City Limits		Sphere of Influence	
	Acres	Percent of Total	Acres	Percent of Total
Very Low Density Residential	27	1.2%	27	0.9%
Low Density Residential	2	0.1%	2	0.1%
Medium Density Residential	973	45.2%	1,143	38.4%
High Density Residential	125	5.8%	143	4.8%
Mixed Use	17	0.8%	17	0.6%
Neighborhood Commercial	94	4.4%	188	6.3%
General Commercial	10	0.5%	10	0.3%
Service Commercial	46	2.1%	46	1.5%
Regional Commercial	82	3.8%	223	7.5%
Office	13	0.6%	13	0.4%
Industrial	333	15.5%	693	23.2%
Public	84	3.9%	121	4.0%
Quasi-Public	32	1.5%	41	1.4%
Schools	120	5.6%	120	4.0%
Parks	18	0.8%	18	0.6%
Ponding Basins	161	7.5%	161	5.4%
Urban Reserve	0	0.0%	0	0.0%
Agriculture	13	0.6%	13	0.4%
TOTAL	**2,150**	**100%**	**2,980**	**100%**

CHAPTER 4 - WATER USE CHARACTERIZATION

4.1. Introduction

This chapter describes and quantifies the City's current water use and future water use projections through the year 2045, as based on currently available information. Water use records, combined with projections of population, provide the basis for estimating future water requirements. The data provided in this chapter will allow the City to accurately analyze the use of the water resources and conduct good resource planning. The future demand estimates presented in this chapter will allow the City to adequately manage the water supply and appropriately plan their infrastructure investments. The terms "water use" and "water demand" will be used interchangeably. These terms will also be used to refer to all the demand sectors listed in Section 4.2.

4.2. Non-Potable Versus Potable Water Use

The City's potable water supply is exclusively groundwater. The City currently does not use recycled water to meet any of their water demands. Currently, the City's wastewater is not treated to tertiary effluent quality where it can be used to meet any of the City's water demands.

4.3. Past, Current, and Projected Water Use by Sector

> *CWC Section 10635.*
>
> *(a) Every urban water Supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.*
>
> *Section 10631(d)*
>
> *(1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following…*
>
> *(2). The water use projections shall be in the same five-year increments described in subdivision (a).*
>
> *(4)(A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.*
>
> *(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following: (i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections. (ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances,*

> *or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.*

This 2020 UWMP includes past, current, and projected water use in five-year increments. The City will determine the reliability of their projected water supply based upon that information.

4.3.1. Water Use Sectors Listed in Water Code

> *CWC Section 10631(d)*
>
> *(1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:*
>
> *(A) Single-family residential.*
>
> *(B) Multifamily.*
>
> *(C) Commercial.*
>
> *(D) Industrial.*
>
> *(E) Institutional and governmental.*
>
> *(F) Landscape.*
>
> *(G) Sales to other agencies.*
>
> *(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.*
>
> *(I) Agricultural.*
>
> *(J) Distribution system water loss.*

This 2020 UWMP also identifies the water use by sector. The City's breaks down metered water deliveries into the following water demand sectors as listed below, per the CWC. The number of water service accounts and volume of water consumed provides insight into the different customer's water use, which can be useful in defining effective water conservation measures. Tables 4-3 and 4-5 provide the City's actual 2020 water demands, and projected water demands through 2045.

- Single-Family Residential – A single-family dwelling unit is a lot with a free-standing building containing one dwelling unit that may include a detached secondary dwelling.
- Multi-Family Residential – Multiple dwelling units contained within one building or several buildings within one complex.
- Commercial – Commercial customers typically provide or distribute a product or service.
- Institutional – Institutional water customers are typically public services, such as higher-education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit institutions.
- Industrial – Industrial customers typically manufacture or process materials.
- Landscape – The City tracks the water uses for landscape irrigation, which is provided through metered and unmetered connections. Potable water is currently used to irrigate the City's public park, medians, and landscape strips. The City estimates that approximatley 53.21 MG of potable

water is used to irrigate unmetered City owned landscape areas, which include approximately 51 acres of parks, medians, mow strips, and government building landscape areas.

- Distribution System Losses – Reporting distribution system losses is required by the CWC. Distribution system losses are discussed further in Section 4.3.4.

For this 2020 UWMP, the following sectors are not applicable to the City's water service area:

- Sales to Other Agencies
- Conjunctive Use
- Saline Water Intrusion Barriers
- Agricultural

4.3.2. Water Use Sectors in Addition to Those Listed in Water Code

To provide clarity, the following water use sectors are also not applicable to the City's UWMP:

- Exchanges
- Surface Water Augmentation
- Transfers
- Wetlands or Wildlife Habitat

The City currently meters water usage that is used for flushing activities (directional flushing program, auto flushers and tank cleaning). This type of water usage is considered unbilled, metered authorized consumption that is derived from the summation of manual meter reads calculated from flushing volumes. According to the City, approximately 18 MG gallons was used in 2020 for flushing activities. For this 2020 UWMP, this type of water usage is classified as "other potable."

4.3.3. Past Water Use

Table 4-1 summarizes the City's water usage by water use sector over the past 5 years. These historical volumes are consistent with those presented in the 2015 UWMP, electronic annual reports (EAR), and annual water audit reports submitted to the DWR for the years of 2015 to 2019.

Table 4-1 Historical Water Use by Sector

Use Type	Water Use (MG)				
	2015	2016	2017	2018	2019
Single Family Residential	484	591	478	527	521
Multi-Family Residential	89	53	202	83	91
Commercial	46	31	36	39	39
Institutional/Governmental	40	26	27	30	32
Industrial	9	7	9	9	5
Landscape Irrigation	95	95	93	96	90
Losses	135	84	88	159	157
TOTAL	**898**	**888**	**932**	**942**	**936**

4.3.4. Distribution System Water Losses

> *CWC Section 10631(d)(1)*
>
> *For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following…*
>
> *(J) Distribution system water loss….*
>
> *CWC Section 10631(d)(3)*
>
> *(A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.*
>
> *(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.*
>
> *(C) In the plan due July 1, 2021, and in each update thereafter, data shall be included to show whether the urban retail water supplier met the distribution loss standards enacted by the board pursuant to Section 10608.34.*

Water distribution system losses are the difference between the actual volume of water treated and delivered into the distribution system and the actual metered consumption. Such apparent losses are always present in a water system due to pipe leaks, unauthorized connections or use, faulty meters, systematic data handling errors, and unmetered services such as water used for dust control for construction activities, fire protection and training.

New regulations require retail water suppliers to include potable distribution system water losses for the preceding five years. Over the last few years, the City has used the American Water Works Association (AWWA) method to annually evaluate its distribution system losses each fiscal year. The City has submitted annual water audit reports to the DWR since 2016. A copy of the City's annual water reports from 2016 to 2019 are included in Appendix D.

Table 4-2 summarizes the water distribution system losses for the last five calendar years. The most recent 12-month period began on January 1, 2019.

Table 4-2 Last Five Years of Water Loss Audit Reporting (Submittal Table 4-4)

Reporting Period Start Date	Volume of Water Loss
01/2015	135
01/2016	84
01/2017	88
01/2018	159
01/2019	157

To reduce real and apparent losses in the future, the City's is actively removing turf from City owned medians and replacing them with drought tolerant plants to reduce water consumption. The City is also evaluating the feasibility of installing automatic radio read meters (AMRs) at all City owned parks that currently remain unmetered.

4.3.5. Current Water Use

The City's actual potable water demands for the 2020 calendar year are reported in Table 4-3. All of the City's residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered. The City's landscape irrigation connections include both metered and unmetered connections. The City's unmetered connections consist of approximately 51 acres of City owned parks, medians, mow strips, and government building landscape areas. The 2020 potable water demands for landscape irrigation provided in Table 4-3 was determined by adding the actual water demand of the 91 metered connections to the estimated demand of the unmetered connections, which is assumed to be approximatley 53.21 MG.

Water losses are calculated by subtracting the amount of water produced by the City's six groundwater wells by the total amount of authorized consumption. For the 2020 calendar year, water losses accounted for approximately 14 percent of the water that was produced and distributed.

Table 4-3 Demands for Potable Water - Actual (Submittal Table 4-1)

Use Type	2020 Actual		
	Additional Description	Level of Treatment When Delivered	Volume (MG)
Single Family Residential	3,237 Metered Connection	Drinking Water	550
Multi Family Residential	198 Metered Connection	Drinking Water	102
Commercial	185 Metered Connection	Drinking Water	34
Institutional/Governmental	46 Metered Connection	Drinking Water	43
Industrial	10 Metered Connection	Drinking Water	9
Landscape(1)	91 Metered Connection & Unmetered Connections	Drinking Water	112
Other Potable	Flushing (Metered)	Drinking Water	18
Losses	Unaccounted Water	Drinking Water	142
		TOTAL	**1,010**

NOTES:
[1]Includes both metered and unmetered connections. The unmetered water consumption accounts for water used to irrigate approximately 51 acres of city owned parks, medians, mow strips, and government building landscape areas.

4.3.6. Projected Water Use

CWC Section 10635 (a).

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

CWC Section 10631

(h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available… The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

CWC Section 10631(d)(4)

(A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

Table 4-4 lists the projected number of connections by user type. The number of connections were projected by multiplying the total number of metered accounts for 2020 by the annual average growth rate of 1.69 percent growth rate, which is consistent with the population growth rate determined in Section 3.5.1 of this UWMP. It has been assumed that the projected number of connections for industrial and landscape irrigation use types will remain constant.

Table 4-4 Table 4-4 Projected Number of Total Connections by User Type

Use Type	2025	2030	2035	2040	2045
Single Family Residential	3,520	3,828	4,163	4,527	4,923
Multi Family Residential	215	234	254	276	300
Commercial	201	219	238	259	282
Institutional/Governmental	50	54	59	64	70
Industrial	10	10	10	10	10
Landscape	91	91	91	91	91
TOTAL	**4,087**	**4,436**	**4,815**	**5,227**	**5,676**

Table 4-5 lists the projected water demands through years 2045. The projected water demands were obtained by multiplying the City's annual average growth rate of 1.69 percent by the user's 2020 annual water consumption. Water losses in the distribution system are difficult to predict. On one hand losses will increase as the distribution system deteriorates over time and residential water fixtures age. However, the City is evaluating the feasibility of installing AMR meters at all City owned parks that currently remain unmetered, which will further reduce water loss in the system. Therefore, the volume of water losses is assumed to remain constant through year 2045.

Table 4-5 Use for Potable Water - Projected (Submittal Table 4-2)

Use Type	Projected Water Use (MG)				
	2025	2030	2035	2040	2045
Single Family Residential	599	651	708	770	837
Multi Family Residential	111	120	131	142	155
Commercial	36	40	43	47	51
Institutional/Governmental	47	51	56	61	66
Industrial	10	10	11	12	13
Landscape	122	133	144	157	170
Other Potable	20	21	23	25	27
Losses	142	142	142	142	142
TOTAL	**1,086**	**1,168**	**1,258**	**1,356**	**1,462**

The City's projected water demands through the year 2045 are summarized in Table 4-6. The City's recycled water demands are detailed further in Section 6.6 of this 2020 UWMP. Recycled water is not included in the City's potable water demand and the City does not have any plans to use recycled water as a potable source in the foreseeable future.

Table 4-6 Total Water Use (Potable and Non-Potable) (Submittal Table 4-3)

	2020	2025	2030	2035	2040	2045
Potable Water, Raw, Other Non-potable	1,010	1,086	1,168	1,258	1,356	1,462
Recycled Water Demand	0	0	0	0	0	0
TOTAL WATER USE	**1,010**	**1,086**	**1,168**	**1,258**	**1,356**	**1,462**

4.3.7. Characteristic Five-Year Water Use

CWC Section 10635(b)

> *Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following…*
>
> *(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period. [Emphasis added]*
>
> *(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.*

A critical component of the new statutory language included in CWC Section 10635(b) is the requirement to prepare the five-year Drought Risk Assessment (DRA), which is found in Chapter 7 of this 2020 UWMP. A five-year DRA can also be used to provide the water service reliability assessment for a drought lasting five years. As a first step of the DRA, the DWR recommends that the expected gross water use for the next five years without drought conditions, also known as unconstrained demand, be estimated. Chapter 7 details the DRA, but the City's unconstrained demand projections over the next five years are summarized in Table 4-7. These projections were developed by applying an annual increase of 1.46 percent, that is demonstrated between the actual 2020 water demands and the 2025 projected water demands presented in Tables 4-5 and 4-6 above.

Table 4-7 Five-Year Water Use - Projected

Use Type	Projected Water Use (MG)				
	2021[1]	2022[1]	2023[1]	2024[1]	2025
Potable Water	1,025	1,040	1,055	1,070	1,086

NOTES:
[1] An annual increase of 1.46 percent is applied from the previous year's water usage.

4.4. Water Use for Lower Income Households

> *Section 10631.1.*
>
> *(a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.*
>
> *California Health and Safety Code Section 50079.5 (a)*
>
> *"Lower income households" means persons and families whose income does not exceed the qualifying limits for lower income families… In the event the federal standards are discontinued, the department shall, by regulation, establish income limits for lower income households for all geographic areas of the state at 80 percent of area median income, adjusted for family size and revised annually.*

Urban water suppliers are required to identify water demand required for lower income housing in its water use projections. State legislation (SB 1087 and Government Code §65589.7), effective January 1, 2006, specifies that local water agencies and sewer districts must grant priority for service hook-ups to projects that help meet the community's fair housing need. The City of Kerman's share of regional housing needs originates with the California Department of Housing and Community Development (HCD). HCD first estimates a statewide need for housing, which is broken down into regions, each of which then has an assigned share of estimated housing needs. The Fresno County Council of Governments (Fresno COG) is the local agency mandated by California Government Code §65554(a) to distribute the "Fair Share Allocation" of the regional housing need to each jurisdiction in Fresno County. The "Fair Share Allocation" of housing is a specific number of residential units, in different price ranges, assigned to each local jurisdiction, including the City of Kerman.

The Fresno COG's 2015-2023 Multi-Jurisdictional Housing Element estimates that a total of 41,470 housing units will be needed in the County through the end of year 2023. The City of Kerman's share of those units is 909, or approximatley 2 percent. The 2016 Multi-Jurisdictional Housing Element also estimates that approximately 49 percent of the total housing needs in the City of Kerman are for low-income households. The needs allocation is further classified as low income, very low income, and extremely low income. The extremely low-income families require rental assistance, and these units are assumed to be multi-family residential (MFR) units. The low income and very low income are assumed to be single-family residential (SFR) units.

Based on the projected low-income housing residential unit needs, Table 4-8 lists the projected number of housing units through 2040.

Table 4-8 Projected Number of Additional Low Income Housing Units

Use Type	Income[1]	MCAG Allocation	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045
Extremely Low Income	<30%	13.1%	3	2	3	3	3
Very Low Income	31%-50%	13.1%	37	40	44	48	52
Low Income	51%-80%	23.2%	66	71	78	84	92
Moderate Income	81%-120%	22.2%	63	68	74	81	88
Above Moderate Income	>120%	28.4%	80	87	95	103	112
	TOTAL	**100.0%**	**249**	**268**	**294**	**319**	**347**

NOTES:
(1) As a percentage of the County's Median Household Income

Table 4-9 displays the estimated volume of water needed to meet the projected lower income housing units through 2045. The projected water needed for additional low-income units was estimated by first dividing the gross volume of water delivered to either multi-family or single-family residents by the total number of service connections for each use type, and then multiplied by the projected number of additional housing units determined in Table 4-8

Table 4-9 Projected Water Use Needed for Additional Low Income Housing Units

Use Type	2025	2030	2035	2040	2045
Extremely Low Income	1.5	1.0	1.5	1.5	1.5
Very Low Income	6.3	6.8	7.5	8.2	8.8
Low Income	11.2	12.1	13.3	14.3	15.6

Table 4-9 Projected Water Use Needed for Additional Low Income Housing Units

Use Type	2025	2030	2035	2040	2045
TOTAL	19.1	19.9	22.3	24.0	26.0

The projected water demands for lower income housing are included in the projections of water demands shown in Tables 4-5 and 4-6. Demand for existing lower income housing is being met and is included in the volumes shown in Tables 4-5 and 4-6.

Table 4-10 Inclusion in Water Use Projections (Submittal Table 4-5)

Are Future Water Savings Included in Projections?	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	
Are Lower Income Residential Demands Included In Projections?	Yes

4.5. Climate Change Considerations

DWR Guidelines recommend that the 2020 UWMP include a discussion of potential climate change impacts on projected demand. The City of Kerman is part of the Kings Basin Integrated Regional Water Management Plan (IRWMP). Appendix E contains the climate change assessment found in Chapter 16 of the Kings IRWMP.

There is mounting scientific evidence that global climate conditions are changing and will continue to change as a result of the continued build-up of greenhouse gases (GHGs) in the Earth's atmosphere. Changes in climate can affect municipal water supplies through modifications in the timing, amount, and form of precipitation, as well as water demands and the quality of surface runoff. These changes can affect all elements of water supply systems, from watersheds to reservoirs, conveyance systems, and treatment plants.

Indications of climate change have been observed over the last several decades throughout California. Statewide average annual temperatures have risen by approximatley 2°F since the early 20th century. Although the State's weather has followed the expected pattern of a largely Mediterranean climate throughout the past century, no consistent trend in the overall amount of precipitation has been detected, except that a larger proportion of total precipitation is falling as rain instead of snow.

The correlation between temperature and water demand is well documented and understood. The City's largest percentage of the water demand is driven by outdoor irrigation. Higher temperatures will increase evapotranspiration rates and increase demands. Higher temperatures will also extend the duration of the outdoor landscaping growing season increasing the maximum day demands on the spring and fall seasons.

It is evident that climate change adds new uncertainties to the challenges of planning. Changes in weather could significantly affect water supply planning. Since climatic pressures could potentially affect supply reliability, continual attention to this issue will be necessary in the future.

CHAPTER 5 - SB X7-7 BASELINES, TARGETS, AND 2020 COMPLIANCE

5.1. Introduction

In November 2009, the Water Conservation Act of 2009, also known as the SB X7-7, was signed into law as part of a comprehensive water legislation package. This legislation addressed both urban and agricultural water conservation and set a goal of achieving a 20 percent statewide reduction in urban per capita water use by December 31, 2020. To meet the urban water use target requirement, each retail supplier was required to determine its baseline water use, as well as its target water use for the year 2020. Water use is measured in gallons per capita per day (GPCD).

In 2015, the City of Kerman calculated their baselines and targets based on the requirements and methodologies presented in the 2015 UWMP Guidebook. In the 2015 UWMP, the City demonstrated compliance with their interim water use target for the year 2015 and that the City was on track to achieve its 2020 target.

This chapter provides a review of the methodology the City used to calculate its 2020 Urban Water Use Target (2020 Target), its baseline, and how the baseline was calculated. This chapter demonstrates that the City has achieved its 2020 Target. Compliance with the urban water use target requirement is verified in the SB X7-7 2020 Compliance Form, which is included as Appendix F of this Plan.

For additional details on how the per capita goals were established refer to the City of Kerman’s 2015 UWMP.

5.2. Overview and Background

The City’s compliance with SB X7-7 was first addressed in their 2015 UWMP, in which the City determined its baseline per capita water use and established and adopted its urban water use targets for 2015 and 2020. Actual water usage data and population figures provided by the Census and Department of Finance (DOF) were used to calculate GPCD water use. The City demonstrated that it successfully achieved its 2015 interim target and confirmed its 2020 Target in its 2015 UWMP.

5.3. General Requirements for Baseline and Targets

SB X7-7 required each urban water retailer to determine its baseline daily per capita water use over a 10-year or 15-year baseline period. The 10-year baseline period is defined as a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010. SB X7-7 also defined that urban water retailers that met at least 10 percent of their 2008 water demand using recycled water could extend the baseline GPCD calculation for a maximum of a continuous 15-year baseline period, ending no earlier than December 31, 2004, and no later than December 31, 2010.

Since the City did not use recycled water to meet any of their 2008 water demand, the baseline was calculated over a 10-year period. In their 2015 UWMP, the City selected the 10-year baseline period from 2001 through 2010. SB X7-7 and DWR provided four different methods for calculating an urban water retailer’s 2020 Target. Three of these methods are defined in CWC Section 10608.20(a)(1), and the fourth method was developed by DWR. The 2020 Target may be calculated using one of the following four methods:

- Method 1: 80 percent of the City's base daily per capita water use;
- Method 2: Per capita daily water use estimated using the sum of performance standards applied to indoor residential use; landscaped area water use; and commercial, industrial, and institutional uses;
- Method 3: 95 percent of the applicable State hydrologic region target as stated in the State's April 30, 2009, Draft 20x2020 Water Conservation Plan; or
- Method 4: An approach that considers the water conservation potential from: 1) indoor residential savings, 2) metering savings, 3) commercial, industrial, and institutional savings, and 4) landscape and water loss savings.

In their 2015 UWMP, the City selected Method 1 to calculate its 2020 Target.

5.4. Service Area Population

To correctly calculate its compliance year GPCD, the City must first determine the population that it served in 2020. As stated in Section 3.5.1, the Census reported population within the City as of April 1, 2020, to be 16,016.

5.5. Gross Water Use

Gross water use represents the total volume of water entering a distribution system (but excludes recycled water deliveries, water placed into long term storage, water conveyed to another supplier, water delivered for agricultural use, and process water if there is a substantial percentage used for industrial purposes) over a 12-month period. The City's gross water use amounts are based on the total amount of water produced by the City's nine active groundwater wells and pumped into the distribution system during calendar year 2020 minus the amount of process water.

As reported in Chapter 4 of this UWMP, the amount of water produced and pumped into the distribution system in 2020 was 1,010 MG, as reported in Chapter 4 of this UWMP. Since industrial process water was not greater than 12 percent of the City's gross water usage for 2020, it has not been excluded from the City's gross water use provided in the SB X7-7 Verification Form (Table 4).

5.6. Baseline and Targets Summary

Annual gross water use is divided by annual service area population to calculate the annual per capita water use for each year in the baseline periods. As previously stated, the City calculated its baseline and 2020 Target in their 2015 UWMP. The City's 10-year base daily per capita water use is 253 GPCD. Using Method 1 for 2020 Target calculation as described in Section 5.3, the City's confirmed 2020 compliance target is 203 GPCD. The City's baseline and 2020 Target are summarized in Table 5-1.

Table 5-1 Baselines and Targets Summary From SB X7-7 Verification Form (Submittal Table 5-1)

Baseline Period	Start Year	End Year	Average Baseline (GPCD)	Confirmed 2020 Target (GPCD)
10-15 year	2001	2010	253	203

Table 5-1 Baselines and Targets Summary From SB X7-7 Verification Form (Submittal Table 5-1)

5 Year	2006	2010	249	

5.7. 2020 Compliance Daily Per Capita Water Use

This section presents the procedure used to meet the requirements of SB X7-7 as defined in the Water Conservation Act of 2009.

5.7.1. 2020 Adjustments for Factors Outside of Supplier's Control

CWC Water Code Section 10608.24

(d)(1) When determining compliance daily per capita water use, an urban retail water supplier may consider the following factors:

(A) Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.

(B) Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period.

(C) Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

(2) If the urban retail water supplier elects to adjust its estimate of compliance daily per capita water use due to one or more of the factors described in paragraph (1), it shall provide the basis for, and data supporting, the adjustment in the report required by Section 10608.40.

The City has not included any adjustments (including Extraordinary Institutional Water Use, Economic Adjustment (CII) or Weather Norminlization) for their 2020 GPCD compliance.

5.7.2. 2020 Compliance Daily Per Capita Water Use

Sections 5.4 and 5.5 presented the City's 2020 population and gross water use, respectively. The City calculated its actual daily per capita water use for the 2020 calendar year in accordance with DWR's Methodologies document. As shown in Table 5-2, the City's urban per capita water use in 2020 was 173 GPCD, which is well below the confirmed 2020 Target of 203 GPCD. Therefore, the City has met its 2020 final water use target.

Table 5-2 2020 Compliance from SB X7-7 2020 Compliance Form (Submittal Table 5-2)

2020 GPCD			2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020? Y/N
Actual 2020 GPCD	2020 TOTAL Adjustments	Adjusted 2020 GPCD		
173	-	173	203	Yes

The City has also demonstrated compliance with the 2020 Water Use Target by completing the SB X7-7 2020 Compliance Form, attached in Appendix F.

5.8. Regional Alliance

As discussed in Section 2.4, the City’s 2020 UWMP was not developed as part of a Regional Alliance. Information from the City’s 2020 UWMP is not required to be reported in a Regional Alliance report.

CHAPTER 6 - SYSTEM SUPPLIES CHARACTERIZATION

6.1. Introduction

This chapter presents an analysis of the City's water supplies, as well as an estimate of water-related energy-consumption. The intent of this chapter is to present a comprehensive overview of City of Kerman's water supplies, estimate the volume of available supplies over the UWMP planning horizon, and assess the sufficiency of City's water supplies to meet projected demands under "normal" hydrologic conditions.

6.2. Purchased or Imported Water

The City of Kerman does not purchase water from any other urban water suppliers or other entities.

6.3. Groundwater

> *Section 10631(b)(4)*
>
> *If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information:*
>
> *(A) The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.*
>
> *(B) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).*
>
> *(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.*
>
> *(D) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.*

The City's sole source of water supply is the underlying groundwater basin. The City currently has six wells in various locations throughout the community. Well Nos. 09A, 10, 12, 14, and 15 currently serve as active groundwater sources. The City's existing well capacities range from 900 to 1,500 gallons per minute (gpm), with a total combined capacity of approximately 6,700 gpm. With the largest well out of service, Well No. 10, the combined capacity of the system is approximately 5,200 gpm. The City's booster pumps can add an additional 4,000 gpm to the water system. Information on the City's wells is summarized in Table 6-1.

Table 6-1 Existing Groundwater Well Capacity

Well No.	HP	Design Capacity		
		gpm	MGD	MGY
09A	200	1,200	1.73	630.72
10	150	1,500	2.16	788.4
12	100	1,200	1.73	630.72
14	150	900	1.30	473.04
15	150	900	1.30	473.04
17	125	1,000	1.44	525.6
	TOTAL	**6,700**	**9.65**	**3,522**

Water is distributed through approximatley 63.1 miles of water mains located throughout the City. Water lines within the system range in diameter from 4 to 12-inches. The water mains are usually placed in a grid pattern with 12-inch mains every half-mile and 8-inch mains at the quarter mile locations. Depending on the number of units served, the intervening mains are either 6 or 8-inches in diameters. The City operates the system at a pressure that ranges for 50 to 60 pounds per square inch (psi). The City's water system also includes two 750,000-gallon water storage tanks that are used for water storage.

6.3.2. Groundwater Basin Description

For planning purposes, DWR has subdivided the State of California into ten separate hydrologic regions, corresponding to the State's major drainage basins. Furthermore, groundwater within the State is divided into distinct groundwater basins; some of which are further divided into smaller interconnected subbasins. The City of Kerman is located within the geomorphic province known as the Central Valley, which is divided into the Sacramento Valley and the San Joaquin Valley. The groundwater underlying the City is part of the larger San Joaquin Valley Groundwater Basin within the San Joaquin River Hydrologic Region. The San Joaquin Valley Groundwater Basin is further divided into nine subbasins. The City extracts its groundwater from the Kings Subbasin (DWR Subbasin 5-22.08).

As part of the San Joaquin Valley Groundwater Basin, the Kings Subbasin covers a surface area of approximately 976,000 acres (1,530 square miles), and straddles portions of both the Sacramento and San Joaquin Valleys in Fresno, Kings, and Tulare Counties. The Subbasin is bounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley.

According to DWR's Bulletin 118, the Subbasin is primarily comprised of marine deposits from periodic inundation of the Pacific Ocean and continental deposits from erosion of surrounding mountains. The principal aquifers consist of unconsolidated continental deposits (older deposits from the Tertiary and Quaternary age overlain with younger deposits from the Quaternary age), and coarse oxidized deposits of the alluvium. Quaternary deposits consist of older alluvium, lacustrine and marsh deposits, younger alluvium, flood-basin deposits, and sand dunes. The older alluvium is the most important aquifer in the

Subbasin and yields from these wells can reach above 3,000 gpm. The flood-basin, lacustrine, and marsh deposits located in the western part of the sub-basin consist of silt and clay that restrict vertical movement of water and do not produce appreciable wells. In the Sanger area, the soils are typically coarse sands with high percolation rates and specific yields, but areas of clay soils exist in some areas. DWR Bulletin 118 – Update 2006, attached in Appendix G, contains a detailed description of the Delta-Mendota Subbasin and its characteristics and conditions.

The primary source of surface water from the Kings Subbasin occurs from diversions from the Kings River. Additional sources of surface water occur from diversions from the San Joaquin Rive via the Friant-Kern Canal, Mendota Pool, and from intermittent streams. Millerton and Pine Flat Reservoirs and Mendota Pool are the main locations for locations for storage and regulation of surface water supplies for the Kings Subbasin.

6.3.3. Multiple Groundwater Basins

The City only utilizes the groundwater supply from the Kings Subbasin and does not utilize groundwater from multiple basins.

6.3.4. Groundwater Sustainability Plan

On September 16, 2014, Governor Jerry Brown signed into law a three-bill package collectively known as the Sustainable Groundwater Management Act (SGMA) of 2014, which codified in Section 10720 et seq. of the CWC. This legislation requires local governments and water agencies of high and medium priority basins to halt groundwater overdraft and bring groundwater basins into balance levels of pumping and recharge. SGMA established a framework for local governments and water agencies to develop a Groundwater Sustainability Agency (GSA) and sustainably manage groundwater through implementation of a Groundwater Sustainability Plan (GSP). Under SGMA, high and medium priority basins should reach sustainability within 20 years of implementing their sustainability plans.

Following the passage of SGMA in 2014, the City of Kerman became a member of the North Kings GSA (NKGSA). The NKGSA is a Joint Powers Authority (JPA) formed for the purpose of developing and implementing a GSP. Other members of the SKGSA include the City of Fresno, City of Clovis, Bakman Water Company, Biola Community Services District, County of Fresno, Fresno Irrigation District, Fresno Metropolitan Flood Control District, Garfield Water District, and International Water District. The NKGSA is located within Fresno County and outlined by the Fresno Irrigation District border to the south and the Kings Subbasin boundary to the north. The GSA's plan area is approximatley 311,000 acres and is approximately 40 miles (east-west) by 12 miles (north-south).

In accordance with the 2014 legislation, the NKGSA finalized and submitted a GSP to the DWR on January 28, 2020, ahead of the January 31, 2020, mandate. A copy of the NKGSA's GSP can be found at the following website: Groundwater Sustainability Plan – North Kings Groundwater Sustainability Agency (northkingsgsa.org). The sustainability goal of the Kings Basin and the NKGSA is to ensure that, by 2040, the Subbasin is being managed in a sustainable manner to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results. According to the NKGSA's GSP, this goal will be met by balancing water demand with available water supply and stabilizing the long term declining groundwater levels without significantly and unreasonably impacting groundwater storage, water quality, land subsidence, or interconnected surface water. SGMA identifies six sustainability indicators to be monitored and reported to document sustainability: chronic lowering groundwater levels, reduction of groundwater storage, seawater intrusion, degraded groundwater quality, land subsidence, and depletions of interconnected surface water. Since the Kings Subbasin is approximately 100 miles from the Pacific Ocean, seawater intrusion has been identified in the GSP as not being applicable to the region. The remining five sustainability indicators are documented in the NKGSA's GSP.

Each GAS in the Kings Subbasin is responsible for implementing project and management actions required to reach sustainability and meet their initial mitigation requirements for storage change. The measures that will be implemented to ensure the Subbasin will be operated within the sustainable yield are described in detail in Section 6 of the NKGSA's GSP. Collectively, these project and programs have been identified to ensure that the Subbasin reaches sustainability by 2040, but are dependent on hydrology, management, and capture of local water supplies.

The GSA's withing the Kings Subbasin have agreed to a phase approach of increasing mitigation to achieve sustainability. The GAS's have set incremental targets for correcting overdraft by 10 percent in 2025, 30 percent in 2030, 60 percent in 2035, and 100 percent in 2040. Each GSA in the Subbasin is planning to implement projects and management actions in accordance with the agreed mitigation targets. The GSA's will continue to meet regularly to review data to ensure that all GSA's ae meeting their milestones and progress is being made toward sustainability.

6.3.5. Overdraft Conditions

SGMA directs the DWR to identify groundwater basins and subbasins in conditions of critical overdraft. As defined by SGMA, "a basin is subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft related environmental, social, or economic impacts." The Kings Subbasin has been determined to be in a state of overdraft consistently since the first edition of the DWR Bulletin 118 in 1978, and the future of the Subbasin has been projected to see continued overdraft conditions.

According to the NKGSA's GSP, the existence of overdraft in the Kings Subbasin in documented by the historical decline in groundwater levels and is confirmed by the historical water budget for the period of Water Year 1996-97 through 2010-11, which represents an average hydrological period on the Kings River. The estimated annual decline in groundwater storage for the NKGSA during this period, as directly estimated based on groundwater levels, specific yield, and measured groundwater subsidence, is approximately 24,000 acre-feet per year (AF/year). The Subbasin's current overdraft, based on the Water Budget for 2016-17, shows an annual increase in groundwater storage of approximatley 39,200 AF/year. According to the NKGSA's GSP, this is considered the best estimate of current overdraft conditions; however, it should be noted that the NKGSA was in an overall surplus in 2016-17, based on localized agency water budgets, several agencies are currently in overdraft and will be required to mitigate their condition.

The NKGSA has determined the overdraft responsibility for each of the GSA's in the Subbasin by estimating their "groundwater impact," which is essentially their groundwater pumping minus any natural and artificial forms of recharge. According to the NKGSA's GSP, each agency is responsible for developing projects that will augment the water supply through either the use of surface water to meet potable water demands or providing groundwater recharge within the area of extraction. It is estimated that the projects that are currently being considered will yield an average annual volume of approximatley 200,000 AF/year if fully implemented as envisioned. As stated in Section 6 of the NKGSA's GSP, the City of Kerman plans to implement the Lions Park Groundwater Recharge Project. The City's Lion's Park Stormwater Basin currently serves the majority of the west side of the City. The stormwater collection system for the Basin currently includes an intertie with Fresno Irrigation District's (FID) Siskiyou Lateral No. 146 pipeline at a structure on the west side of Siskiyou Ave, north of Kearney Boulevard. The intertie currently only allows for occasional overflows via overtopping of a weir into the City's stormwater collection system. The proposed project will install valving, piping ad metering equipment necessary to allow for regular distribution of FID surface water into the City's stormwater collections system and be conveyed to the Lion's Park Stormwater Basin for groundwater recharge purposes. The proposed Project will provide an estimated 300 acre-feet (97.7 MG) of recharge per year and likely be completed by or before 2024.

6.3.6. Historical Groundwater Pumping

The total annual volume of groundwater pumped by the City's wells for the period between 2016 to 2020 is presented in Table 6-2. Pumping of City wells during this period averaged 944 MG/year, which is approximatley 12.4 percent less than the annual average for the five years (2011-2015) preceding this timeframe. For the 2011-2015 period, pumping averaged 1,078 MG/year.

Table 6-2 Groundwater Volume Pumped (Submittal Table 6-1)

☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
☐	All or part of the groundwater described below is desalinated.					
Groundwater Type	**Location or Basin Name**	**2016**	**2017**	**2018**	**2019**	**2020**
Alluvial Basin	Kings Subbasin	889	929	951	944	1,010
	TOTAL	**889**	**929**	**951**	**944**	**1,010**

6.4. Surface Water

As previously stated, the City's sole water supply source is groundwater provided by municipal wells. Currently, the City of Kerman does not use self-supplied surface water as part it its water supply. There are no natural surface water features such as streams or lakes in the Kerman area. However, according to the 2040 General Plan, the City is evaluating the use of a dual water system. The primary system would provide potable water for uses from deep wells, while the secondary system would carry non-potable water for landscaping, industrial and fire protection from surface water and/or shallow groundwater. The secondary system would have its own mains, services, pumps, wells, and storage tanks.

6.5. Stormwater

The City maintains stormwater facilities within existing right-of-ways. The City's stormwater system consist of a system of drains and ponding basins located throughout the City. The stormwater ponding basins consist of eleven percolation basins that provide groundwater recharge. The percolated stormwater is subsequently pumped as groundwater for local crop irrigation.

6.6. Wastewater and Recycled Water

6.6.1. Recycled Water Coordination

> *CWC Section 10633*
>
> *The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area, and shall include all of the following:*
>
> *(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.*
>
> *(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.*
>
> *(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.*
>
> *(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.*
>
> *(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.*
>
> *(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.*
>
> *(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.*

The City owns and operates a citywide wastewater collection and treatment system. The City does not currently recycle effluent discharged from their wastewater treatment facilities. While the wide-scale systematic direct use of recycled water in the City is technically feasible, it is not currently economically supported. Since the current Wastewater Treatment Plant (WWTP) is located south of the City and no recycled water distribution infrastructure currently exists between the City and the WWTP, the cost to develop piping from the WWTP to areas throughout the City is substantial. Additionally, there are no large-scale users that would benefit in proportion to the cost of installing separate distribution systems.

6.6.2. Wastewater Collection, Treatment, and Disposal

> *CWC Section 10633(a)*

> *A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.*

The City provides wastewater collection treatment, and disposal system that provides sewer service to residents and the small industries of the City of Kerman. The City's existing sewer collection system consists of network of 6 and 8-inch diameter "collection" lines that connect to larger "mains" that range from 10 to 27-inches in diameter. Wastewater from most of the southern half of Kerman flows into an 18-inch trunk line that runs along Madera Avenue from California Avenue to Church Avenue, and then to a 27-inch trunk line that runs along Church Avenue from Madera Avenue to the WWTP. The remainder of the City's collection lines flow into an 18-inch trunk line that runs along Del Norte Avenue from Whitesbridge Avenue to Church Avenue and then along Church Avenue from the Del Norte Avenue alignment to the WWTP. The City's sewer collection system operates with one permanent lift station that is located at the intersection of Siskiyou and Kearney. This facility currently receives flows from the areas generally to the north and west of the lift station and discharges into the Del Norte Avenue line.

The City owns and operates the existing WWTP under the current Waste Discharge Requirements (WDRs) Order No. R5-2007-0115. The WWTP is located south of Church Avenue on the Del Norte Avenue alignment. The WWTP was originally designed with a hydraulic capacity of approximately 1.2 million gallons per day (MGD), and consisted of an influent pump station, a headworks with an auger for grinding solids, a Parshall flume flowmeter, a lift station with pumps, a primary aeration pond (Complete Mixed Lagoon No. 1), three secondary aeration ponds (Partially Mixed Lagoons Nos. 1, 2, and 3), three settling ponds (Settling Ponds Nos. 1, 2 and 3), and three disposal ponds (Disposal Ponds Nos. 4, 5 and 6).

In 2011, the City's WWTP was upgraded to provide secondary level of treatment and the plant's designed hydraulic capacity was increased to 2.0 MGD. The upgraded WWTP meets State requirements for the removal of Nitrates, Biochemical Oxygen Demand (BOD) and sludge handling, and consists of an consist of an influent pump station, headworks, two new clarifiers, a sludge press and one acre of new drying beds. To make use of the original plant, the old aeration tanks were converted to digesters. A Biolac aeration treatment system was also installed as part of the upgrade. By using the aerobic and anaerobic cycle, the treatment system aerates the water, releasing nitrogen to eliminate additional nitrates to the groundwater table. The exiting storage ponds and disposal ponds were significantly expanded, and a new 5,000-gallon storage tank for receiving domestic septic was installed. As part of the upgrade, the City also installed a 0.5 megawatt solar park to buffer rising power cost to operate the WWTP.

Treated wastewater from the WWTP is currently discharged to 30 acres of disposal ponds where it is allowed to evaporate and percolate into the soil and recharge the groundwater table. The City's secondary effluent is not disinfected and is therefore classified as an "oxidized" (undisinfected secondary) wastewater according to California Code of Regulations (CCR) Title 22. Table 6-3 summarizes the total volume of wastewater collected within the City's service area in 2020.

Table 6-3 Wastewater Collected Within Service Area in 2020 (Submittal Table 6-2)

☐	There is no wastewater collection system. The supplier will not complete the table below.
100%	Percentage of 2020 service area covered by wastewater collection system.
100%	Percentage of 2020 service area population covered by wastewater collection system.
Wastewater Collection	**Recipient of Collected Wastewater**

Table 6-3 Wastewater Collected Within Service Area in 2020 (Submittal Table 6-2)

Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Kerman	Metered	366	City of Kerman	City of Kerman WWTP	Yes	No
Total Wastewater Collected from Service Area in 2020:		**366**				

Table 6-4 identifies the wastewater treated and disposed of within the City's service area in 2020. As discussed above, the City's WWTP is located within the City's water service area and provides primary and secondary treatment of wastewater generated within the City. During 2020, 366 MG of undisinfected secondary effluent from the WWTP was discharged to plant's evaporation/percolation ponds that are located on 30 acres of City owned land.

6.6.3. Recycled Water System

> *CWC Section 10633 (c)*
>
> *A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.*

As shown in Table 6-5, recycled water is not currently utlizied and the City does not have a plan to implement the use of recycled water in the near future. The City does not currently treat any wastewater to disinfected tertiary water standards to allow it to be used as a component of its water supply. However, a majority of the effluent from the City's WWTP is discharged to evaporation/percolation ponds where it either evaporates or percolates into the soil and is used to recharge the groundwater table. By way of this process, the majority of the treated wastewater is recycled as groundwater recharge and subsequently pumped for local crop irrigation.

6.6.4. Potential, Current, and Projected Recycled Water Uses

> *CWC Section 10633*
>
> *(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.*
>
> *(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.*
>
> *(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.*

Table 6-4 Wastewater Treatment and Discharge Within Service Area in 2020 (Submittal Table 6-3)

☐ No wastewater is treated or disposed of within the UWMP service area.

Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 Volumes				
						Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
City of Kerman	Percolation ponds	City of Kerman WWTP	Evaporation/ Percolation	No	Secondary, Undisinfected	366	366	0	0	0
					TOTAL	**366**	**366**	**0**	**0**	**0**

Table 6-5 Recycled Water Direct Beneficial Uses Within Service Area (Submittal Table 6-4)

☒	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.									
Name of Supplier Producing (Treating) the Recycled Water:		City of Kerman								
Name of Supplier Operating the Recycled Water Distribution System:		City of Kerman								
Supplemental Water Added in 2020 (volume)		0 MG								
Source of 2020 Supplemental Water										
Beneficial Use Type	**Potential Beneficial Uses of Recycled Water**	**Amount of Potential Uses of Recycled Water**	**General Description of 2020 Uses**	**Level of Treatment**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
Agricultural irrigation										
Landscape irrigation (exc golf courses)										
Golf course irrigation										
Commercial use										
Industrial use										
Geothermal and other energy production										
Seawater intrusion barrier										
Recreational impoundment										
Wetlands or wildlife habitat										
Groundwater recharge (IPR)										
Reservoir water augmentation (IPR)										
Direct potable reuse										
Other (Description Required)										
TOTAL										

As previously stated in the above sections, the City's treated undisinfected secondary effluent is discharged to evaporation/percolation ponds, which percolates into the soil and is used to recharge the groundwater table. While the direct use of recycled water technically feasible, it is not currently economically supported. Since the existing WWTP is located south of the City and there is no recycled water infrastructure currently in place, the cost associated with the construction of distribution piping from the WWTP to areas throughout the City is cost prohibitive. Additionally, there are no large-scale users that would benefit in proportion to the cost of installing separate distribution systems.

The existing WWTP produces undisinfected secondary effluent, which cannot be used as a component of the City's water supply and is approved only for the irrigation of non-potable crops. In the past, the City has provided treated effluent to agricultural customers for the irrigation of non-potable crops. However, in 2020, no recycled water was provided to agricultural customers and 100 percent of treated effluent was discharged to the City's evaporation/percolation ponds.

According to the City's 2015 UWMP, it was estimated that the City would apply approximately 103 MG of effluent for agricultural irrigation in 2020. In 2020, no treated effluent from the City's WWTP was applied to local agricultural fields for the irrigation of folder crops. Additionally, approximatley 366 MG of undisinfected secondary effluent was discharged from the WWTP to the 30 acres of evaporation/percolation ponds, which percolates into the soil and recharges the groundwater table. Table 6-6 displays the 2015 UWMP projection for recycled water versus the 2020 actual use.

Table 6-6 2015 UWMP Recycled Water Use Projection Compared to 2020 Actual (Submittal Table 6-5)

☐	Recycled water was not used in 2015 nor projected for use in 2020. The supplier will not complete the table below. If recycled water was not used in 2020, and was not predicted to be in 2015, then check the box and do not complete the table.	
Beneficial Use Type	**2015 Projection for 2020**	**2020 Actual Use**
Agricultural irrigation	103	0
Landscape irrigation (exc golf courses)		
Golf course irrigation		
Commercial use		
Industrial use		
Geothermal and other energy production		
Seawater intrusion barrier		
Recreational impoundment		
Wetlands or wildlife habitat		
Groundwater recharge (IPR)		
Reservoir water augmentation (IPR)		
Direct potable reuse		
Other (Percolation)	-	366
TOTAL	**103**	**366**

6.6.5. Actions to Encourage and Optimize Future Recycled Water Use

CWC Section 10633

> *The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier… and shall include the following:*
>
> *(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.*

As demonstrated in Table 6-7, at this time, the City does not have any plans to implement the use of recycle water in the near future. Given the current usage of treated wastewater for recharge purposes, there is no hydrological benefits to increasing such recycling use. Since recycled water options have been determined to be infeasible at this time, Table 6-7 shows no methods to expand the City's recycled water use.

Table 6-7 Methods to Expand Future Recycled Water Use (Submittal Table 6-6)

☒	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
	Provide page location of narrative in UWMP		
Name of Action	**Description**	**Planned Implementation Year**	**Expected Increase in Recycled Water Use**
		TOTAL	**0**

6.7. Desalinated Water Opportunities

> *CWC Section 10631(g)*
>
> *Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.*

The UWMPA requires water agencies to consider options for desalination. The City of Kerman is located a considerable distance from the Pacific Ocean, so constructing a transmission main to move either sea water or desalinated water directly to the City is not feasible and cost prohibitive.

6.8. Water Exchanges or Transfers

> *CWC Section 10631(c)*
>
> *Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.*

The municipal groundwater system that supplies the City's water has historically been a consistent, reliable source of water; therefore, the City has not had to exchange or transfer water to meet its water demands. In the event that untreated groundwater can no longer provide a consistent potable water source, new wells, well head treatment and a treated surface water supply will be used as needed to avoid a supply shortfall. It would not be practical to use surface water on a short-term or emergency basis. These water source options are being evaluated for their use in meeting future water demands.

The purchase and delivery of surface water supplies to the City can only be used at this time for groundwater recharge or for non-potable uses, as the City does not have a surface water treatment plant

(SWTP). On June 7, 2022, the City and FID executed a Surface Water Supply Agreement, which authorizes the transfer of 2,150 acre-feet of surface water on an average annual basis from FID to the City. The City intends to utilize this surface water supply to address its groundwater sustainability obligations by diverting this surface water supply into the City's groundwater basins for the purpose of groundwater banking and recovery. Under the terms of the Agreement, this surface water supply from FID cannot be treated and used by the City for municipal, industrial, or residential use.

6.9. Future Water Projects

> *CWC Section 10631 (f)*
>
> *Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.*

As previously stated, the City currently relies solely on groundwater for its water supply. According to the City's 2040 General Plan, the City is currently evaluating the feasibility of a dual water system. The primary system would provide potable water for uses from deep wells, while the secondary system would carry non-potable water for landscaping, industrial and fire protection from surface water and/or shallow groundwater. The secondary system would have its own mains, services, pumps, wells, and storage tanks.

Table 6-8 lists the City's future water projects. At this time, the City does not have any plans to implement projects that will increase the City's domestic water supply. The City does plan to implement the Lions Park Groundwater Recharge Project, which is scheduled to be implemented by or before 2024.

The City's Lion's Park Stormwater Basin currently serves the majority of the west side of the City. The stormwater collection system for the Basin currently includes an intertie with FID's Siskiyou Lateral No. 146 pipeline at a structure on the west side of Siskiyou Ave, north of Kearney Boulevard. The intertie currently only allows for occasional overflows via overtopping of a weir into the City's stormwater collection system. The proposed project will install valving, piping ad metering equipment necessary to allow for regular distribution of FID surface water into the City's stormwater collections system and be conveyed to the Lion's Park Stormwater Basin for groundwater recharge purposes. It is estimated that the Project will provide an estimated 300 acre-feet (97.7 MG) of recharge per year. Additionally, under the Surface Water Supply Agreement with FID, the City will be receiving 2,150 acre-feet of surface water on an average annual basis for groundwater recharge.

Expected Future Water Supply Projects or Programs (Submittal Table 6-7)					
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.				
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.				
	Provide page location of narrative in the UWMP				
Name of Future Projects or Programs	Joint Project with other suppliers?		Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier
	(Yes/No)	If Yes, Supplier Name			
Lion's Park Stormwater Basin	No	-	2024	Average Year	300 AF (Recharge)
Surface Water Supply from FID	Yes	Fresno Irrigation District	2022	Average Year	2,150 AF (Recharge)

6.10. Summary of Existing and Planned Sources

CWC Code 10631

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information, including all of the following…

(b)(2) When multiple sources of water supply are identified, a description of the management of each supply in correlation with the other identified supplies.

(h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

Water pumped form the City's underlying groundwater basin has historically been the only source of potable water supply. The well network has been expanded over the years with a total of 17 well having been drilled and placed into service, although not all of these wells have been in service simultaneously. During 2020, the City's water supply was obtained using six active groundwater wells, Well Nos. 09A, 10, 12, 14, 15, and 17. The six wells have a combined design capacity of 6,700 gpm.

Water is distributed through a network approximatley 63.1 miles of water mains located throughout the City. Water lines within the system range in diameter from 4 to 12-inches. The City operates the system at a pressure that ranges for 50 to 60 pounds per square inch (psi). The City's water system also includes two 750,000-gallon water storage tanks that are used for water storage. Table 6-8 displays the actual water volume that was pumped from each of the City's groundwater supply wells in 2020.

Table 6-8 Water Supplies (Submittal Table 6-8)

Water Supply	Additional Detail on Water Supply	2020		
		Actual Volume	Water Quality	Total Right or Safe Yield
Groundwater (not desalinated)	Well No. 09A	181	Drinking Water	631
Groundwater (not desalinated)	Well No. 10	57	Drinking Water	788
Groundwater (not desalinated)	Well No. 12	52	Drinking Water	631
Groundwater (not desalinated)	Well No. 14	307	Drinking Water	473
Groundwater (not desalinated)	Well No. 15	187	Drinking Water	473
Groundwater (not desalinated)	Well No. 17	224	Drinking Water	526
	TOTAL	**1,010**	-	**3,522**

As population and development within the City increases, additional wells and storage tanks will be added to the water system to meet the growing demand. Table 6-10 summarizes the future projected water supplies for the City. As previously descripted, the City will continue to utilize groundwater as their sole water source.

Table 6-9 Water Supplies — Projected (Submittal Table 6-9)

Water Supply	Projected Water Supply									
	2025		2030		2035		2040		2045	
	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield
Groundwater (not desalinated)	1,086	3,522	1,168	3,522	1,258	3,522	1,356	3,522	1,462	3,522
TOTAL	**1,086**	**3,522**	**1,168**	**3,522**	**1,258**	**3,522**	**1,356**	**3,522**	**1,462**	**3,522**

6.11. Climate Change Impacts to Water Supply

The climatic conditions of the central San Joaquin Valley demand careful water management practices because of the typically low amount of rainfall and short rainy season and because of the high temperatures that frequently occur in the summer months. The average annual precipitation for the Kerman area is 10.9 inches. The rainy season typically runs from the beginning of November till the end of April. Drought conditions are not uncommon and can last for multiple years. Summer water consumption varies directly with daily temperature maximums and the Kerman region can experience temperatures over 100 degrees during these months.

The City overlies the Kings groundwater Subbasin within the San Joaquin Valley Groundwater Basin. Much of the recharge on this basin occurs from river, stream, and canal seepage, percolation of irrigation water, and intentional recharge. Drought periods will reduce the availability of surface water and will limit the amount of recharge. The reduced recharge in combination with increased pumping will cause groundwater levels to decline. Additionally, climate change impacts may cause increased evapotranspiration and a longer growing season, further exacerbating groundwater overdraft and high salinity levels. A copy of the Kings Basin Water Authority IRWMP Climate Change Vulnerability Assessment is included in Appendix E.

6.12. Energy Use

> *CWC Section 10631.2. (a)*
>
> *In addition to the requirements of Section 10631, an urban water management plan shall include any of the following information that the urban water supplier can readily obtain:*
>
> *(1) An estimate of the amount of energy used to extract or divert water supplies.*
>
> *(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.*
>
> *(3) An estimate of the amount of energy used to treat water supplies.*
>
> *(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.*
>
> *(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.*
>
> *(6) An estimate of the amount of energy used to place water into or withdraw from storage.*
>
> *(7) Any other energy-related information the urban water supplier deems appropriate.*

For this 2020 UWMP, suppliers are required to include information that could be used to calculate the energy intensity of their water service, as listed in Water Code Section 10631.2(a). Energy intensity is defined as the amount of energy used to collectively divert, store, convey, treat, and distribute each unit volume of water. For the City of Kerman’s water system, this means the energy required to pump water from the underlining groundwater basin and into the distribution system. These processes are metered for electricity use in kilowatt-hours (kWh).

In accordance with the CWC Section 10631.2(a), an energy intensity analysis was performed for the reporting period of January 1, 2020, through December 31, 2020. The energy intensity analysis for the water system is shown below in Table 6-11. The final calculated energy intensity for the water system is 1,740 kilowatt-hours per million gallons (kWh/MG). The City does not generate any electricity to offset their electricity use for the water system.

Table 6-10 Recommended Energy Reporting - Total Utility Approach (DWR Table O-1B:)

Enter Start Date for Reporting Period	**1/1/2020**	**Urban Water Supplier Operational Control**		
End Date	**12/30/2020**			
☐ **Is upstream embedded in the values reported?**		**Sum of All Water Management Processes**	**Non-Consequential Hydropower**	
		Total Utility	**Hydropower**	**Net Utility**
Volume of Water Entering Process (MG)		1,010	0	1,010
Energy Consumed (kWh)		1,756,689	0	1,756,689
Energy Intensity (kWh/MG)		**1,740**	**0**	**1,740**

As discussed in Section 6.6, the City collects, treats, and discharges wastewater generated from a combination of residential, commercial, and industrial sources. The energy intensity associated with the City’s wastewater treatment and disposal systems for the reporting period of January 1, 2020, through December 31, 2020, is provided in Table 6-12. The final calculated energy intensity for the wastewater system is 3,844 kWh/MG. The City does not generate any electricity to offset their electricity use for the water system.

Table 6-11 Recommended Energy Reporting - Wastewater & Recycled Water (DWR Table O-2:)

Enter Start Date for Reporting Period	**1/1/2020**	**Urban Water Supplier Operational Control**			
End Date	**12/30/2020**				
☐ **Is upstream embedded in the values reported?**		**Water Management Process**			
		Collection/ Conveyance	**Treatment**	**Discharge/ Distribution**	**Total**
Volume of Wastewater Entering Process (MG)		0	366	0	366
Wastewater Energy Consumed (kWh)		0	1,407,203	0	1,407,203
Wastewater Energy Intensity (kWh/MG)		**0**	**3,844**	**0**	**3,844**
Volume of Recycled Water Entering Process (MG)		0	0	0	0
Recycled Water Energy Consumed (kWh)		0	0	0	0
Recycled Water Energy Intensity (kWh/MG)		**0**	**0**	**0**	**0**

The City’s energy intensity tables and associated narratives are provided in Appendix H.

CHAPTER 7 - WATER SUPPLY RELIABILITY AND DROUGHT RISK ASSESSMENT

7.1. Introduction

Assessing water service reliability is the fundamental purpose for an urban water supplier to prepare and update their UWMP. Water service reliability reflects the supplier's ability to meet the water needs of its customers with water supplies under varying conditions. This 2020 UWMP considers the reliability of meeting customer water use by analyzing plausible hydrological variability, regulatory variability, climate conditions, and other factors that could affect the City's water supply and its customers' water uses. The UWMPA also requires that a supplier's UWMP include information on the quality of water supplies and how this affects management strategies and supply reliability. In addition, this chapter includes a new requirement for a Drought Risk Assessment (DRA) that enables the City to evaluate risk under a severe drought period lasting for the next five consecutive years.

7.2. Water Service Reliability Assessment

> *CWC Section 10635(a)*
>
> *Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.*

The water service reliability assessment presented in the following sections summarizes the City's expected water service reliability for a normal year, single dry year, and five consecutive dry year projections for 2025, 2030, 2035, and at least through 2040.

7.2.1. Constraints on Water Sources

> *Section 10631 (b)(1)*
>
> *A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.*

There are a variety of factors that can impact water supply reliability. These factors include water quality, legal constraints, and climatic issues. A brief discussion on each of these factors is provided below.

7.2.1.1. Water Quality

The City conducts periodic sampling of the water quality from all water supply wells. Table 7-1 below contains a summary of the City's most recent water quality results from each of the water supply wells.

Table 7-1 Groundwater Quality by Well

Constituent	Raw Water						MCL
	09A	10	12	14	15	17	
Primary							
Aluminum, µg/L	0	0	0	0	0	0	1,000
Antimony, µg/L	0	0	0	0	0	0	6
Arsenic, µg/L	0	5.8	3.0	6.5	7.6	3.6	10
Barium, µg/L	0	0	0	0	0	0	1,000
Beryllium, µg/L	0	0	0	0	0	0	4
Cadmium, µg/L	0	0	0	0	0	0	5
Chromium, µg/L	84	27	0	31	29	19	50
Cyanide, µg/L	NR	0	NR	NR	NR	NR	150
Fluoride, mg/L	0.11	0.15	0.10	0.15	0.15	0.12	2
Hexavalent chromium, µg/L	28	6.5	26	29	27	18	50
Mercury, µg/L	0	0	0	0	0	0	2
Nickel, µg/L	0	0	0	0	0	0	100
Nitrate (as Nitrogen), mg/L	2.0	2.4	2.8	2.4	2.8	2.1	10
Nitrate + Nitrite (sum as Nitrogen), mg/L	1.8	2.0	2.5	2.0	1.7	1.7	10
Nitrite (as nitrogen), mg/L	0	0	0	0	0	0	1
Perchlorate, µg/L	0	0	0	0	0	0	6
Selenium, µg/L	0	0	0	0	0	0	50
Thallium, µg/L	0	0	0	0	0	0	2
Secondary							
Color, Units	5	0	0	0	0	0	15
Copper, µg/L	0	0	0	0	0	0	1,000.0
Foaming Agents (MBAS), mg/L	0	0	0	0	0	0	0.5
Iron, µg/L	0	0	120	0	0	0	300
Manganese, µg/L	0	0	0	0	0	0	50
Methyl-tert-butyl ether (MTBE), µg/L	0	0	0	0	0	0	13
Odor (Threshold at 60°C), Ton	1.5	0	1.5	0	0	0	3
Silver, µg/L	0	0	0	0	0	0	100
Thiobencarb, µg/L	0	0	NR	0	0	NR	70
Turbidity, NTU	0.14	0.18	0.88	0	0	0	5
Zinc, µg/L	0	0	0	0	0	0	5,000
Total Dissolved Solids, mg/L	NR	NR	NR	NR	NR	NR	1,000
Specific Conductance, µS/L	190	290	350	180	340	200	1,600
Chloride, mg/L	1,000	6.7	28	5.7	6.2	5.1	500
Sulfate, mg/L	6.1	3.8	15	3.8	3.5	3.2	500

Hexavalent chromium, or chromium 6, is currently the largest threat to the City’s water supply. Sections 116365 and 116365.5 of the California Safe Drinking Water Act requires the State to adopt a maximum containment level (MCL) for chromium 6 in drinking water. Contaminants regulated by MCLs are harmful and maybe biological, chemical or mineral in nature, and may be naturally occurring or the result of human activities; therefore, MCL is a standard applied to public water systems intended for human consumption, including drinking, cooking, bathing and oral hygiene. Established MCL's are enforceable under the California Safe Drinking Water Act, and state and regional water quality control boards have the authority to regulate contamination of groundwater, including hexavalent chromium contamination of groundwater which occurred as a result of business or industrial practices.

The California Department of Public Health (CDPH) as well as the U.S. Environmental Protection Agency (EPA) work to establish drinking water standards that protect public health and require public water systems to provide safe, potable, reliable, and protective drinking water to their customers. A drinking water standard specific for chromium 6 currently does not exist at the national or state level. In 2013, the CDPH proposed an MCL for chromium 6 of 10 micrograms per liter (µg/L) based on the criteria of the MCL corresponding as closely as feasible to the public health goal of 0.02 µg/L set by the California Office of Environmental Health and Hazard Assessment (OEHHA) and based on a cost benefit analysis for water suppliers to detect, monitor, treat, and remove chromium 6 from contaminated water supplies. This MCL became a standard on September 4, 2015, with the passage of Senate Bill 385 (SB 385). The primary purpose of SB 385 was to provide public water systems time to come into compliance without being deemed in violation of the MCL if they have sources that produce water with chromium 6 concentration above the State's adopted MCL.

On May 31, 2017, the Superior Court of Sacramento County issued a judgement invalidating the chromium 6 MCL for drinking water. The court's primary reason for finding the MCL invalid is that the CDPH, which was responsible for the drinking water program before it was transferred to the SWRCB, failed to comply with one of the requirements in the Safe Drinking Water Act for adopting an MCL. In particular, the department "failed to properly consider the economic feasibility of complying with the MCL." The change became effective with the Office of Administrative Law filing the change with the Secretary of State, on September 11, 2017, and the MCL for chromium 6 was no longer in effect on this date. The court also ordered the SWRCB to adopt a new MCL for chromium 6.

Since 2017, chromium 6 has been regulated under the 50-µg/L primary drinking water standard (MCL) for total chromium. California's MCL for total chromium was established in 1977, to address exposures to chromium 6, the more toxic form of chromium. The State is currently revisiting the economic feasibility component for establishing an MCL for chromium-6 through the development of a white paper. The white paper will act as a foundational piece to allow the State to move forward with presenting a package on this subject to the SWRCB and proceeding with establishing a new MCL for chromium 6.

As shown in Table 7-1, five of the City's wells do not meeting the SB 385 chromium 6 MCL of 10 µg/L; however, all of the City's wells are in compliance with the total chromium MCL limit of 50 µg/L. Due to the unknown future of the MCL for chromium 6, and the fact that the court's decision did not make a determination on the new MCL level as it pertains to public health, the City is pursuing funding to evaluate treatment options to reduce chromium 6 below the 10 µg/L MCL.

In addition to the chromium contamination, Well No.10 has a history of producing higher levels of uranium. Though Well No. 10 is still connected to the City's water distribution system, the water is only in emergency situations with plans to use Well No. 10 only for purple pipe sometime in the future.To avoid contaminants such as uranium and chromium 6, the City is planning to drill future wells deeper than the existing wells.

7.2.1.2. Climatic Changes

The climatic conditions of the central San Joaquin Valley demand careful water management practices because of the typically low amount of rainfall and short rainy season and because of the high temperatures that frequently occur in the summer months. The average annual precipitation for the Kerman area is 11.8 inches. The rainy season runs from November through April. Drought conditions are not uncommon and can last for multiple years. Summer water consumption varies directly with daily temperature maximums and the Kerman region can experience temperatures over 100 degrees during these months.

The reliability and vulnerability of the City's water supply to seasonal or climactic changes can be easily qualified, but reliability and vulnerability are difficult to quantify. Because the City relies entirely on groundwater using multiple extraction wells, the intermittent overdraft will obviously be more severe during drought periods. As growth in the area continues and increased demands are placed on the groundwater resources of the area, a condition of sustained overdraft may be reached but this condition is not expected to occur for many years. Recharge, conservation, and seeking a secondary water source, such as surface water, will all reduce vulnerability and increase reliability.

7.2.1.3. Legal Constraints

Legal factors, such as pumping limitations in adjudicated groundwater basins and surface water contracts, are capable of affecting the reliability of a water distribution system. The City's sole source of water supply, the Kings Subbasin, is not an adjudicated groundwater basin. Therefore, adjudication-related legal limitations are unlikely to affect the amount of groundwater that the City can extract from this sub basin.

7.2.2. Year Type Characterization

Water supply reliability is assessed based on the characteristics of the City's water supplies during various water year types which are provided in this section. CWC Section 10635(a) requires that the City's water service reliability be assessed based on the following three water year types:

- Normal Year – This condition represents the water supplies the City considers available during normal conditions. This could be a single year or averaged range of years that most closely represents the average water supply available to the Supplier. To determine the amount of water available during a normal year, the City evaluated the total volume of water supplied over the last twenty years. During this period, the City's maximum water usage occurred during 2008. Therefore, the average year selected is 2008, when 1,273 MG of water was supplied.
- Single Dry Year – The single dry year is recommended to be the year that represents the lowest water supply available. The year 2001 represents the single dry year for the City, during which, the City supplied 787 MG of water.
- Five-Consecutive Year Drought – The driest five-year historical sequence for the supplier, which may be the lowest average water supply available for five years in a row. For the five-year drought period, the City evaluated the average volume of water that was supplied during the State's most recent drought period, which occurred during the years of 2012 to 2016. During this period, the

average volume of water that was supplied was approximatley 1,043 MG. Between 2012 and 2016, the volume of water supplied decreased at an average annual rate of approximatley 5.7 percent.

Table 7-2 summarizes the City's historical supply reliability during the water years described above. The available supplies columns specify the volume and percentage of the City's total water supply expected if the hydrology from that type of year were to repeat.

Table 7-2 Basis of Water Year Data (Reliability Assessment) (Submittal Table 7-1)

Year Type	Base Year	Available Supplies if Year Type Repeats	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location ______________________
		☒	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available (MG)	% of Average Supply
Average Year	2008	1,273	100%
Single-Dry Year	2001	787	62%
Consecutive Dry Years 1st Year	2012	1,043	82%
Consecutive Dry Years 2nd Year(1)	2013	984	77%
Consecutive Dry Years 3rd Year(1)	2014	928	73%
Consecutive Dry Years 4th Year(1)	2015	876	69%
Consecutive Dry Years 5th Year(1)	2016	826	65%

NOTES:
(1)Assumes a 5.7 percent decrease in the available water supply from previous year.

7.2.3. Supply and Demand Comparison

CWC Section 10635(a)

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

The following sections compare City's projected water demands, as presented in Chapter 4 of this 2020 UWMP, with the projected water supplies available during normal, single, and multiple dry years to assess the reliability of City's water supply. Under the various water year types, the total water supply that is available on an annual basis is compared to the total annual projected water use for the City service area from 2025 to 2045 in five-year increments.

7.2.3.1. Normal Year

The reliability of the City's water supply and lack of vulnerability to seasonal or climatic shortage is discussed in Chapter 6 of this UWMP. As previously stated, based on the resiliency of the groundwater basin and if potable groundwater can be extracted by the City wells, which are individual sources in certain respects, it is not anticipated that a single or multiple dry year period will critically reduce the availability of water supply to the City. Groundwater has and will continue to provide drought protection for the City. However, the City has engaged in extensive emergency planning in preparation for potential service interruptions and has prepared a Water Shortage Contingency Plan (WSCP) that will be implemented during drought conditions. The City's WSCP is presented in Chapter 8 of the UWMP.

Table 7-3 displays the projected supply and demand totals for a normal year. The supply and demands totals are consistent with those in Table 6-9 and Table 4-6, respectively. The City is expected to have adequate water supplies during normal years to meet its projected demands through 2045.

Table 7-3 Normal Year Supply and Demand Comparison (Submittal Table 7-2)

	2025	2030	2035	2040	2045
Supply Totals (From Table 6-9)	1,086	1,168	1,258	1,356	1,462
Demand Totals (From Table 4-6)	1,086	1,168	1,258	1,356	1,462
Difference	0	0	0	0	0

7.2.3.2. Single Dry Year

Single-dry year effects are simulated through a methodology which assumes that the supply and demand totals will decrease by approximately 38 percent below normal year demands as a consequence of mandatory water use restrictions. As shown in Table 7-4, it is not anticipated that a single dry year period will reduce the availability of water supply to the City.

Table 7-4 Single Dry Year Supply and Demand Comparison (Submittal Table 7-3)

	2025	2030	2035	2040	2045
Supply Totals	671	722	778	838	903
Demand Totals	671	722	778	838	903
Difference	0	0	0	0	0

7.2.3.3. Five Consecutive Dry Years

Table 7-4 shows the projected supply and demands totals for multiple dry year period extending five consecutive years over the planning period. The City assumes that the supply and demand totals will decrease below normal year demands by approximately 18 percent in the first year, 23 percent in the second year, 27 percent in the third year, 31 percent in the fourth year, and 35 percent in the fifth year.

Table 7-5 Multiple Dry Years Supply and Demand Comparison (Submittal Table 7-4)

		2025	2030	2035	2040	2045
First year	Supply totals	890	957	1,031	1,111	1,198

Table 7-5 Multiple Dry Years Supply and Demand Comparison (Submittal Table 7-4)

		2025	2030	2035	2040	2045
	Demand totals	890	957	1,031	1,111	1,198
	Difference	0	0	0	0	0
Second year	Supply totals	839	903	973	1,048	1,130
	Demand totals	839	903	973	1,048	1,130
	Difference	0	0	0	0	0
Third year	Supply totals	792	852	917	988	1,066
	Demand totals	792	852	917	988	1,066
	Difference	0	0	0	0	0
Fourth year	Supply totals	747	804	866	933	1,006
	Demand totals	747	804	866	933	1,006
	Difference	0	0	0	0	0
Fifth year	Supply totals	705	758	816	880	949
	Demand totals	705	758	816	880	949
	Difference	0	0	0	0	0

As shown in Tables 7-2, 7-3, and 7-4, anticipated groundwater supplies are sufficient to meet all demands through year 2045 even under drought conditions. To continue to utilize groundwater, it is essential that City continue its current efforts towards conservation.

7.2.4. Description of Management Tools and Options

> *CWC Section 10620(f)*
>
> *An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.*

The City recognizes the importance of maintaining a high quality, reliable water supply. Although water is a renewable resource, there is a limit on the amount of water that can be sustainably drawn from a given supply source (e.g., groundwater basins, surface water sources). Due to the City's location and the lack of other available supply sources, the use of groundwater as a primary water supply source is expected to continue through 2045.

Determining the supply reliability for the City is difficult because of the complex factors that accompany groundwater use in general. The City's existing wells currently draw water from a non-adjudicated groundwater basin (Kings Subbasin) with no limits on pumping; however, the Subbasin has been labeled as being in a critical state of overdraft. Therefore, reliability of the groundwater supply will depend on the long-term balance between groundwater extraction and recharge for the Subbasin as a whole.

To minimize its contribution to groundwater depletion, sustainable use of groundwater supply sources is the primary focus of the City's urban water management activities extending into the future. Consequently, a focus for the City is to maximize the efficient use of water and to promote conservation. This will be accomplished through the implementation of demand management measures (DMMs) that have not been implemented by the City, continued implementation of DMMs that have currently been implemented by the City, and other conservation activities.

7.3. Drought Risk Assessment

> *CWC Section 10635(b)*
>
> *Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following:*
>
> *(1) A description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts five consecutive water years, starting from the year following when the assessment is conducted.*
>
> *(2) A determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.*
>
> *(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.*
>
> *(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.*

New to the 2020 UWMP, CWC 10635 (b) now requires a Drought Risk Assessment (DRA). The DRA provides a quick snapshot of the anticipated supply surplus or deficit should a five-consecutive year drought occur in the next five years. The DRA can be modified or updated outside of the UWMP's five-year plan cycle, so a description of the data, methodology, and basis for shortage conditions must be included in this 2020 UWMP. The DRA evaluates each water supply's reliability and compares available water supplies and projected demands during a five consecutive dry years scenario. This short-term analysis can help water suppliers foresee undesired risks, such as upcoming shortages, and provide time to evaluate and implement the necessary response actions needed to mitigate shortages in a less impactful manner to the community and environment. If demands cannot be met by the expected available supply, shortage response actions from the City's WSCP may be implemented.

The following assumptions were considered during the preparation of the City's DRA for the next five consecutive years:

- The five consecutive year drought period associated with this 2020 UWMP is based on five consecutive dry years from 2012 to 2016, which represents the most recent and historical five consecutive year drought. During this period, the average volume of water that was supplied was 1,043 MG. Between 2012 and 2016, the volume of water supplied decreased at an average annual rate of approximatley 5.7 percent.
- It has been assumed that the projected water supplies available during this five consecutive year period will decrease below normal year demands by approximately 18 percent in the first year, 23 percent in the second year, 27 percent in the third year, 31 percent in the fourth year, and 35 percent in the fifth year.

- The projected demands during this five consecutive year drought are based on the unconstrained projected water demands presented in Table 4-7, which is included in Section 4.3.7 of this 2020 UWMP.
- The projected demands were compared to the projected supplies to identify potential water supply deficits which will require implementation of the City's WSCP. To adequately meet water demands during this five consecutive drought year period, the City will need to implement Stage 2 of the WSCP during the first and second years, State 3 of the WSCP during the third year, and State 4 of the WSCP during the fourth and fifth years of the drought period. Conservation measures associated with each Stage are further discussed in Chapter 8 of this 2020 UWMP.

As shown in Table 7-5, during a five-year drought beginning in 2021, the City can adequately meet projected demands through 2025 with the implementation of water conservation measures.

Table 7-6 Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b) (Submittal Table 7-5)

2021	**Total**
Total Water Use	1,025
Total Supplies	890
Surplus/Shortfall w/o WSCP Action	(135)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	135
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	13%
2022	**Total**
Total Water Use	1,040
Total Supplies	839
Surplus/Shortfall w/o WSCP Action	(200)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	200
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	19%
2023	**Total**
Total Water Use	1,055
Total Supplies	792
Surplus/Shortfall w/o WSCP Action	(263)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	263
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	25%
2024	**Total**

Table 7-6 Five-Year Drought Risk Assessment Tables to address Water Code Section 10635(b) (Submittal Table 7-5)	
Total Water Use	1,070
Total Supplies	747
Surplus/Shortfall w/o WSCP Action	(323)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	323
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	30%
2025	839
Total Water Use	1,086
Total Supplies	705
Surplus/Shortfall w/o WSCP Action	(381)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	
WSCP - use reduction savings benefit	381
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	35%

CHAPTER 8 - WATER SHORTAGE CONTINGENCY PLAN

8.1. Introduction

> *CWC Section 10632.3*
>
> *It is the intent of the Legislature that, upon proclamation by the Governor of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, the board defer to implementation of locally adopted water shortage contingency plans to the extent practicable.*

This chapter describes the Water Shortage Contingency Plan (WSCP) developed for the City of Kerman as required by Section 10632.3 of the CWC. Water shortage contingency planning is a strategic planning process to prepare for and respond to water shortages. The WSCP includes the stages of response to a water shortage, such as a drought, that occur over a period of time, as well as catastrophic supply interruptions which occur suddenly. The primary objective of the WSCP is to ensure that the City has in place the necessary resources and management responses needed to protect health and human safety, minimize economic disruption, and preserve environmental and community assets during water supply shortages and interruptions. This locally developed plan will be the first point of reference and implementation during (1) an Agency declared water shortage, (2) a City or County proclamation of a local water supply emergency, or (3) a declared statewide drought emergency.

In response to the severe drought of 2012 to 2016, new legislation in 2018 created a WSCP mandate replacing the water shortage contingency analysis under former law. While overlapping aspects of the prior law, the new requirements have several prescriptive elements an urban water supplier’s WSCP must now include, such as:

- Key attributes of its Water Supply Reliability Analysis conducted pursuant to Water Code Section 10635.
- Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage.
- Locally appropriate “shortage response actions” for each shortage level, with a corresponding estimate of the extent the action will address the gap between supplies and demands.
- Procedures for conducting an annual water supply and demand assessment with prescribed elements.
- Under Water Code Section 10632.1, urban water Suppliers are required to submit, by July 1 of each year, beginning in the year following adoption of the 2020 UWMP, an annual water shortage assessment report to the DWR.
- Communication protocols and procedures to inform customers, the public, and government entities of any current or predicted water shortages and associated response actions.
- Monitoring and reporting procedures to assure appropriate data is collected to monitor customer compliance and to respond to any state reporting requirements.
- A reevaluation and improvement process to assess the functionality of its WSCP and to make appropriate adjustments as may be warranted.

As part of the 2020 UWMP update, CWC Section 10632 requires urban water suppliers to prepare and adopt a WSCP that consist of the following elements:

8.1 Water Supply Reliability Analysis

8.2 Annual Water Supply and Demand Assessment Procedures

8.3 Six Standard Water Shortage Stages

8.4 Shortage Response Actions

8.5 Communication Protocols

8.6 Compliance and Enforcement

8.7 Legal Authorities

8.8 Financial Consequences of WSCP Activation

8.9 Monitoring and Reporting

8.10 WSCP Refinement Procedures

8.11 Special Water Feature Distinction

8.12 Plan Adoption, Submittal, and Availability

8.2. Water Supply Reliability Analysis

CWC Section 10632(a)(1)

The analysis of water supply reliability conducted pursuant to Section 10635.

As part of the 2020 UWMP requirements, Chapter 7 of this UWMP includes a supply reliability analysis for the following scenarios: normal year, single-dry year, and five-year consecutive dry years. The City expects to meet demands under all water year scenarios with groundwater, while promoting water conservations measures, and where feasible, develop projects and management actions to offset groundwater extractions above the City’s sustainable yield and protect the Kings subbasin. The City anticipates utilizing between approximately 705 MG to 1,462 MG of groundwater from the Kings subbasin, depending on the year type and population. It is anticipated that this range of supply volume will be available to meet the City’s demands.

Chapter 7 also includes the required Drought Risk Assessment (DRA), that analyzes supply reliability for the period of 2021 to 2025. The DRA analyzes historical data to allow the City to view patterns and more reliably determine if there could be any water shortages within a given time frame. The DRA looks at historical consumption data by customer class, populated from billing records, and historical supply data by source from groundwater production reports. Future demand and supply estimates for the planning period are then analyzed to determine if there are any gaps between supply and demand. As mentioned above, the City does not anticipate a supply shortage.

Since the City sole source of water supply is currently obtained from the critical overdraft Kings subbasin, the City is committed to promoting water conservation measures to maintain the reliability of the groundwater basin.

On February 3, 2010, the Kerman City Council adopted Resolution No. 10-05, establishing the City's WSCP pursuant to CWC Section 375 et seq., which permits public agencies that supply water to adopt and enforce a water conservation program to reduce the quantity of water used by people for the purpose of conserving the City's water supplies. The Resolution was adopted based on the City's need to conserve water supplies and to avoid or minimize the effects of any future water shortage. The Resolution details the City's WSCP, which specifies what actions the City can take in response to different stages of water supply shortages or emergencies. A copy of the Resolution is provided in Appendix I.

On June 6, 2018, the Kerman City Council adopted Ordinance No. 18-08, which repealed Section 13.04.160 of the Kerman Municipal Code (Municipal Code) and added Chapter 13.28 relating to water conservation. The purpose of Chapter 13.28 is to establish a water conservation plan that will reduce water consumption within the City through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, maximize the efficient use of water within the City to avoid and minimize the effect and hardship of water shortage to the greatest extent possible, and meet any state laws or state regulations requiring water conservation. The Chapter also establishes water conservation standards intended to alter behavior related to water use efficiency at all times. Finally, the Chapter authorizes the City Council to adopt further measures to be implemented during times of a declared water shortage or declared water shortage emergencies, with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies. A copy of Chapter 13.28 is provided in Appendix J.

To meet the new requirements established by the DWR for this 2020 UWMP, this Chapter presents the City's 2020 Water Shortage Contingency Plan (WSCP). The intention of the 2020 WSCP is to build upon the City's 2010 WSCP and Ordinance No. 18-08, while implementing new elements mandated by Section 10635 of the CWC. A significant change from the 2010 WSCP to the 2020 WSCP is the expansion of the Water Conservation Stages from three stages to six stages, which is a requirement of the State.

8.3. Annual Water Supply and Demand Assessment Procedures

> *CWC Section 10632(a)(2)*
>
> *The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following:*
>
> *(A) The written decision-making process that an urban water supplier will use each year to determine its water supply reliability.*
>
> *(B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:*
>
> *(i) Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.*
>
> *(ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.*
>
> *(iii) Existing infrastructure capabilities and plausible constraints.*

(iv) A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment.

(v) A description and quantification of each source of water supply.

CWC Section 10632.1.

An urban water supplier shall conduct an annual water supply and demand assessment pursuant to subdivision (a) of Section 10632 and, on or before July 1 of each year, submit an annual water shortage assessment report to the department with information for anticipated shortage, triggered shortage response actions, compliance and enforcement actions, and communication actions consistent with the supplier's water shortage contingency plan. An urban water supplier that relies on imported water from the State Water Project or the Bureau of Reclamation shall submit its annual water supply and demand assessment within 14 days of receiving its final allocations, or by July 1 of each year, whichever is later.

If the groundwater supply provided by the City's municipal groundwater wells continues to meet the water demand of the City's customers without supply shortages, there is no further action required. However, if in any given year, if the typical customer demand appears to be great than available supply, the Program Manager (Director of Public Works), or a designated representative, is authorized to implement the provisions of the WSCP upon the determination that water conservation measures are necessary to protect the public welfare and safety. The Program Manager, or designated representative, will evaluate several data sources, including but not limited to internal and external hydrologic data, as well as all customer consumption records. A water shortage emergency may be declared based on several conditions, including:

- An actual or potential local water supply restriction or emergency affecting the City's water system.
- A formal water supply shortage notification by the Governor.

A water conservation stage will normally be implemented in a progressive manner; however, it may be necessary for the City to skip stages outlined in the WSCP in response to catastrophic supply reductions. In general, conservation/use reduction stages will be set according to the anticipated reduction in available water supplies. The City may use one or more of the following measures to determine actual reductions in water consumption:

- Establish an average water use baseline.
- Review customer meter records on a more frequent basis.
- Perform leak detections and repair on more frequent basis.
- Perform meter checking and repair on more frequent basis.
- Perform periodic water system audit.

8.3.1. Decision Making Process

In accordance with CWC 10632 the City will conduct an annual water supply and demand assessment, or annual assessment by July 1st of each year. The Annual Assessment team will consist of the Public Works Director and the City Engineer. This team will draft and prepare a written report that discusses the results of the Annual Water Supply and Demand Assessment (Annual Assessment). This Annual Assessment will be presented to the City Council annually during a regular City Council meeting that is held during the month of May each year. The final Annual Assessment will be provided to DWR no later than July 1 of each year.

The Annual Assessments will be instrumental in providing guidance to the City for decisions regarding potential declarations of a water supply shortage and implementation of water conservation stages, instituting mandatory water restrictions, promoting water use efficiency and conservation programs, water rates, and the necessity of pursuing alternative water supplies. This process will help ensure that adequate water supplies resources are available to the City.

8.3.2. Data and Methodologies

The key data inputs and methodologies which will be evaluated by the City during the preparation of the Annual Assessment will include the following:

- Evaluation Criteria – The locally applicable evaluation criteria used to prepare the Annual Assessment will be identified. The evaluation criteria will include, but is not limited to, an analysis of current local hydrology (including rainfall and groundwater levels), current water demands, a review of water system improvement plans which may impact infrastructure availability, and water quality regulations which may impact groundwater availability.
- Water Supply – A description of each available water supply source will be provided. The descriptions will include a quantification of each available water supply source and will be based on review of current production capacities, historical production, UWMPs, and prior water supply studies (including Water Supply Assessments and/or Master Plans).
- Unconstrained Water Demand – The potential unconstrained water demands during the current year and the upcoming (potential single dry) year, prior to any special shortage response actions, will be reviewed. The review will include factors such as weather, existing and projected land uses and populations, actual customer consumption and water use factors, Urban Water Supplier Monthly Reports, and existing water shortage levels.
- Planned Water Use for Current Year Considering Dry Subsequent Year – The water supplies available to meet the demands during the current year and the upcoming (potential single dry) year will be considered and identified for each source of supply. The evaluation will include factors such as estimated water demands, weather, groundwater basin operating safe yields, water quality results, existing available pumping capacities, regulatory issues, use of emergency interconnections, and the costs associated with producing each water supply source.
- Infrastructure Considerations – The capabilities of the water distribution system infrastructure to meet the water demands during the current year and the upcoming (potential single dry) year will be considered. Available production capacities and distribution system water losses will be reviewed. In addition, capital improvement and replacement projects, as well as potential projects which may increase water system and production capacities will be considered.
- Other Factors – Additional local considerations, if any, which can affect the availability of water supplies will be described.

The City will begin to collect and evaluate the water supply availability in January of each year and will submit the Annual Assessment report to the DWR by July 1st of each year.

8.4. Six Standard Water Shortage Stages

> *CWC Section 10632(a)(3)*
>
> *(A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.*
>
> *(B) An urban water supplier with an existing water shortage contingency plan that uses different water shortage levels may comply with the requirement in subparagraph (A) by developing and including a cross-reference relating its existing categories to the six standard water shortage levels.*

In accordance with CWC Section 10632(a)(3) and the 2020 UWMP Guidebook, all urban water supplier's WSCP must include at least six standard water shortage stages and cover a possible reduction in supply of more than 50 percent. The purpose of this new requirement of the CWC is to provide a consistent regional and statewide approach to measure water supply shortage conditions in the State.

The WSCP presented in this Chapter updates the City's previous WSCP adopted by Resolution No. 10-05 and presented in Chapter 8 of the 2015 UWMP. The WSCP presented in the City's 2015 UWMP included only three stages of mandatory water conservation measures. For this 2020 WSCP, each of the six water shortage stages represent an increasing gap between the City's estimated water supplies and the unconstrained demand as determined in the Annual Assessment or the gap between supply and demand at any time due to an unforeseen event that interrupts water supplies. The six shortage stages correspond to 10, 20, 30, 40, 50 percent, and greater than 50 percent shortage compared to the normal reliability conditions.

As stated in CWC Section 10632(a)(3) and the 2020 UWMP Guidebook, an urban water supplier's existing WSCP that uses different water shortage levels may comply with these six levels by developing a cross-reference relating the existing categories to the six standard water shortage levels. Table 8-1 displays the City's existing water conservation stages and their relationship to the six standard water shortage states prescribed by the CWC and the 2020 UWMP Guidebook.

Table 8-1 Cross Reference for Mandated State and Existing Kerman Water Shortage Levels

Mandated State Standard Levels		Cross Walk	Kerman Corresponding Shortage Levels		
Shortage Level	Percent Shortage Range		Newman Shortage Level	Percent Supply Reduction	Shortage Response Actions
1	Up to 10%	→	1	Up to 20%	Mandatory
2	Up to 20%	→			
3	Up to 30%	→	2	Up to 35%	Mandatory
4	Up to 40%	→ ↘			
5	Up to 50%	↘	3	Up to 50%	Mandatory
6	>50%	→			

8.5. Shortage Response Actions

CWC Section 10632 (a)(4)

Shortage response actions that align with the defined shortage levels and include, at a minimum, all of the following:

(A) Locally appropriate supply augmentation actions.

(B) Locally appropriate demand reduction actions to adequately respond to shortages.

(C) Locally appropriate operational changes.

(D) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions.

(E) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action

In accordance with CWC Section 10632(a)(4), this section describes the response action that may be implemented or considered for each water shortage stage to minimize social and economic impacts to the community. The City expects to mitigate supply shortages through a variety of response actions including demand reduction actions, conservation, operational changes, outreach, and mandatory prohibitions.

This 2020 WSCP identifies various actions to be considered by the City during water shortage conditions. In the event of a water shortage, the City will evaluate the cause of the shortage to help inform which response actions should be implemented. Depending on the nature of the water shortage, the City may elect to implement a combination of response actions to mitigate the shortage and reduce gaps between supply and demand. It should be noted that implementation of each stage is cumulative; meaning that implementation of a higher stage shall also include implementation of all previous stages. If necessary, the City may enact additional actions that are not listed in this WSCP. The stages determined by the percent water supply shortage are summarized in Table 8-2.

Table 8-2 Water Shortage Contingency Plan Levels (Submittal Table 8-1)

Shortage Level	Percent Shortage Range	Severity	Shortage Response Actions
1	Up to 10%	Potential Shortage	Up to a 10% reduction in the City's water supply due to any combinations of conditions.
2	Up to 20%	Minor Shortage	Between a 10% and 20% reduction in the City's water supply due to any combinations of conditions.
3	Up to 30%	Moderate Shortage	Between a 20% and 30% reduction in the City's water supply due to any combinations of conditions.
4	Up to 40%	Severe Shortage	Between a 30% and 40% reduction in the City's water supply due to any combinations of conditions.
5	Up to 50%	Critical Shortage	Between a 40% and 50% reduction in the City's water supply due to any combinations of conditions.
6	> 50%	Extreme Emergency Shortage	More than 50% reduction in the City's surface water supply due to any combinations of conditions.

Depending on the stage of the water shortage, the City may implement a combination of demand reductions, operational changes, and mandatory restrictions. Demand reductions required for each stage are included in Table 8-3 below.

Table 8-3 Water Usage Reduction by State

Shortage Level	Mandatory or Voluntary Percent Demand Reduction	Severity
1	5%	Potential Shortage
2	10%	Minor Shortage
3	20%	Moderate Shortage
4	30%	Severe Shortage
5	50%	Critical Shortage
6	60%	Extreme Emergency Shortage

8.5.2. Demand Reductions

The narrative below describes the specific rationing measures associated with each WSCP stage reported in this 2020 WSCP. The specific rationing measures for the six stages are summarized in Table 8-4.

The City's water customers will be required to comply with the applicable water conservation measures of the stage in effect. Mandatory conservation measures reported in the City's 2015 WSCP were used a reference; however, the six states described below have been modified and updated to meet the new requirements of the CWC.

State 1 – Potential Shortage

Stage 1 will consist of mandatory water conservation measures that will be implemented during a potential water supply shortage. Stage 1 calls for a low level of informational outreach and enforcement of the City's permanent water use ordinances. The City will direct water customers to limit the amount of water used on a year-round basis. During Stage 1, there is up to a 10 percent water supply shortage and a 5 percent or greater reduction in demand is suggested. The following conservation measures will be implemented by the City during this stage:

- Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of 6:00 a.m. and 8:00 a.m. and 12:00 p.m. (Noon) to 7:00 p.m. on any day, for very short periods of time for the express purpose of adjusting or repairing an irrigation system, and provided such manual use is controlled and attended.
- Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to no more than fifteen (15) minutes watering per day per station.
- Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited.
- Washing down hard or paved surfaces, including but not limited to sidewalks, walkways, driveways, parking areas, tennis courts, patios or alleys, is prohibited except when necessary to alleviate safety or sanitary hazards, and then only by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off device, a low-volume, high-pressure cleaning machine quipped to recycle any water used, or a low-volume high-pressure water broom.
- Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than seven days of receiving notice from the City is prohibited.
- Operating a water fountain or other decorative water feature that does not use re-circulated water is prohibited.
- Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer, whether motorized or not is prohibited, except by use of a hand-held bucket or similar container or a hand-held hose equipped with a positive self-closing water shut-off nozzle or device. This does not apply to any commercial car washing facility.
- Eating or drinking establishments or other public places where food or drinks are sold, served, or offered for sale, are prohibited from providing drinking water to any person unless expressly requested.
- Installation of single pass cooling systems is prohibited in buildings requesting new water service.
- Installation of non-recirculating water systems is prohibited in new commercial conveyor car wash and new commercial laundry systems.

- Irrigating outdoors during and within 48 hours following measurable rainfall is prohibited.
- Flood irrigation of residential landscapes is expressly prohibited.

State 2 – Minor Shortage

During Stage 2 of a water supply shortage, there is between a 10 to 20 percent water supply shortage and a 10 percent or greater mandatory reduction in water usage is required for the City to meet the immediate needs of its customers. Water alert conditions are declared, the water shortage situation is explained to the public, and consumers are asked for a 10 percent or greater mandatory water use reduction. In addition to Stage 1 conservation measures, the City will implement the following conservation measures during State 2:

- Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to three times per week on an odd-even basis. If the address ends in an even number, the water days will be Wednesday, Friday and Sunday. If the address ends in an odd number, the water days will be Tuesday, Thursday and Saturday.
  - Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday.
- Large commercial landscapes and City parks shall have individual watering schedules approved by the Public Works Department.
- Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday. This does not apply to any commercial car washing facility.
- The filling of swimming pools between the hours of 6:00 a.m. and 8:00 a.m. and 12:00 p.m. (Noon) to 7:00 p.m. on any day is prohibited.

State 3 – Moderate Shortage

During Stage 3, the water supply shortage is between 20 and 30 percent. The City aggressively continues its public information outreach and education programs. Consumers are asked for a 20 percent or greater mandatory water use reduction. All requirements of Stages 1 and 2 remain in effect. Additional requirements include the following:

- Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to two times per week on an odd-even basis. If the address ends in an even number, the water days will be Wednesday and Sunday. If the address ends in an odd number, the water days will be Tuesday and Saturday.
  - Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday, Thursday, and Friday.
- Large commercial landscapes and City parks shall also be limited to two days per week, as scheduled by the Public Works Department.
- Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday, Thursday, and Friday. This does not apply to any commercial car washing facility.
- Hotels, motels, and lodges must offer guests the option of not having towels and linens laundered daily by displaying notices prominently in each guestroom.

- Further use of decorative fountains or reflection ponds shall be disconnected until further notice.
- The City will contact its highest water users to encourage use of water conservation methods.
- The City will evaluate its water use for main flushing to see if reductions are possible.

State 4 – Severe Shortage

During Stage 4 of a water supply shortage, the shortage is between 30 and 40 percent and a 30 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. The City aggressively continues its public information outreach and education programs, and consumers are asked for a 30 percent or greater mandatory water use reduction. All requirements of Stages 1 through 3 remain in effect. Additional requirements include the following:

- Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to one time per week on an odd-even basis. If the address ends in an even number, the watering day will be Sunday. If the address ends in an odd number, the watering day will be Saturday.
    - Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday through Friday.
- Large commercial landscapes and City parks shall also be limited to one day per week, as scheduled by the Public Works Department.
- Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday through Friday. This does not apply to any commercial car washing facility.
- Main flushing is only done on a sand, odor, or taste complaint basis or due to contamination and public health reasons

State 5 – Critical Shortage

During Stage 5, there is between a 40 to 50 percent water supply shortage and a 50 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. The City aggressively continues its public information outreach and education programs, and consumers are asked for a 50 percent or greater mandatory water use reduction. All requirements of Stages 1 through 4 remain in effect. Additional requirements include the following:

- Immediately notify appropriate media outlets and post local road signage notifying the public of the current water use restrictions.
- All watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited. This includes multipurpose commercial landscapes and City parks and median strips.
- Industry and commercial businesses are required to curtail consumption to maintain adequate supplies of water for health and safety.
- Use of water for dust control, earth compaction, and other outdoor construction activities is prohibited.
- Fire hydrants shall be used only for emergency purposes.

State 6 – Extreme Emergency Shortage

During Stage 6, the water supply shortage is over 50 percent and a 60 percent or greater reduction in water usage is required for the City to meet the immediate needs of its customers. The City aggressively continues its public information outreach and education programs and asks customers for a 60 percent or greater mandatory water use reduction. All requirements of Stages 1 through 5 remain in effect. Additional requirements include the following:

- Commercial kitchens are required to use pre-rinse spray valves.
- Potable water service will not be provided to new land development projects except under the following circumstances:
  - A valid building permit has been issued for the project, or
  - The project is necessary to protect public health, safety, and welfare, or
  - The applicant provides evidence that the project will include conservation offsets prior to the provision of new water service.
- Additional restrictions may be implemented as determined by the Public Works Director, after notice to customers.
- If there is total well failure, disaster relief from outside the City of Kerman shall be required.

Table 8-4 summarizes the demand reduction actions that will be implemented during each stage of water conservation.

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
1	Landscape - Limit landscape irrigation to specific times	10%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of 6:00 a.m. and 8:00 a.m. and 12:00 p.m. (Noon) to 7:00 p.m. on any day.	Yes
1	Landscape - Restrict or prohibit runoff from landscape irrigation	10%	Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to no more than fifteen (15) minutes watering per day per station.	Yes
1	Landscape - Restrict or prohibit runoff from landscape irrigation	10%	Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
			sidewalk, driveway, street, alley, gutter or ditch is prohibited.	
1	Other - Prohibit use of potable water for washing hard surfaces	10%	Washing down hard or paved surfaces is prohibited except when necessary to alleviate safety or sanitary hazards, and then only by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off device, a low-volume, high-pressure cleaning machine quipped to recycle any water used, or a low-volume high-pressure water broom.	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	10%	Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than seven days of receiving notice from the City is prohibited.	Yes
1	Water Features - Restrict water use for decorative water features, such as fountains	10%	Operating a water fountain or other decorative water feature that does not use re-circulated water is prohibited.	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
1	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	10%	Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer, whether motorized or not is prohibited, except by use of a hand-held bucket or similar container or a hand-held hose equipped with a positive self-closing water shut-off nozzle or device. This does not apply to any commercial car washing facility.	Yes
1	CII - Restaurants may only serve water upon request	10%	Eating or drinking establishments or other public places where food or drinks are sold, served, or offered for sale, are prohibited from providing drinking water to any person unless expressly requested.	Yes
1	Other	10%	Installation of single pass cooling systems is prohibited in buildings requesting new water service.	Yes
1	Other	10%	Installation of non-recirculating water systems is prohibited in new commercial conveyor car wash and new commercial laundry systems.	Yes
1	Landscape - Other landscape restriction or prohibition	10%	Irrigating outdoors during and within 48 hours following measurable rainfall is prohibited.	Yes
1	Landscape - Other landscape restriction or prohibition	10%	Flood irrigation of residential landscapes is expressly prohibited.	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
2	Landscape - Limit landscape irrigation to specific days	20%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to three times per week on an odd-even basis. If the address ends in an even number, the water days will be Wednesday, Friday and Sunday. If the address ends in an odd number, the water days will be Tuesday, Thursday and Saturday.	Yes
2	Landscape - Limit landscape irrigation to specific days	20%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday.	Yes
2	Landscape - Limit landscape irrigation to specific days	20%	Large commercial landscapes and City parks shall have individual watering schedules approved by the Public Works Department.	Yes
2	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	20%	Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday. This does not apply to any commercial car washing facility.	Yes
2	Other water feature or swimming pool restriction	20%	The filling of swimming pools between the hours of 6:00 a.m. and 8:00 a.m. and 12:00 p.m. (Noon) to 7:00 p.m. on any day is prohibited.	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
3	Landscape - Limit landscape irrigation to specific days	30%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to two times per week on an odd-even basis. If the address ends in an even number, the water days will be Wednesday and Sunday. If the address ends in an odd number, the water days will be Tuesday and Saturday.	Yes
3	Landscape - Limit landscape irrigation to specific days	30%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday, Thursday, and Friday.	Yes
3	Landscape - Limit landscape irrigation to specific days	30%	Large commercial landscapes and City parks shall also be limited to two days per week, as scheduled by the Public Works Department.	Yes
3	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	30%	Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday, Thursday, and Friday. This does not apply to any commercial car washing facility.	Yes
3	CII - Lodging establishment must offer opt out of linen service	30%	Hotels, motels, and lodges must offer guests the option of not having towels and linens laundered daily by displaying notices prominently in each guestroom.	Yes
3	Water Features - Restrict water use for decorative	30%	Further use of decorative fountains or reflection ponds shall be disconnected until further notice.	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
	water features, such as fountains			
3	Increase Water Waste Patrols	30%	The City will contact its highest water users to encourage use of water conservation methods.	Yes
3	Decrease Line Flushing	30%	The City will evaluate its water use for main flushing to see if reductions are possible.	Yes
4	Landscape - Limit landscape irrigation to specific days	40%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is limited to one time per week on an odd-even basis. If the address ends in an even number, the watering day will be Sunday. If the address ends in an odd number, the watering day will be Saturday.	Yes
4	Landscape - Limit landscape irrigation to specific days	40%	Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited on Monday through Friday.	Yes
4	Landscape - Limit landscape irrigation to specific days	40%	Large commercial landscapes and City parks shall also be limited to one day per week, as scheduled by the Public Works Department.	Yes
4	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	40%	Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer is prohibited on Monday through Friday. This does not apply to any commercial car washing facility.	Yes

Table 8-4 Demand Reduction Actions (Submittal Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap?	Additional Explanation or Reference	Penalty, Charge, or Other Enforcement?
4	Decrease Line Flushing	40%	Main flushing is only done on a sand, odor, or taste complaint basis or due to contamination and public health reasons	Yes
5	Expand Public Information Campaign	50%	Immediately notify appropriate media outlets and post local road signage notifying the public of the current water use restrictions.	Yes
5	Landscape - Prohibit all landscape irrigation	50%	All watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited. This includes multipurpose commercial landscapes and City parks and median strips.	Yes
5	CII - Other CII restriction or prohibition	50%	Industry and commercial businesses are required to curtail consumption to maintain adequate supplies of water for health and safety.	Yes
5	Other - Prohibit use of potable water for construction and dust control	50%	Use of water for dust control, earth compaction, and other outdoor construction activities is prohibited.	Yes
5	Other	50%	Fire hydrants shall be used only for emergency purposes.	Yes
6	CII - Commercial kitchens required to use pre-rinse spray valves	>50%	Commercial kitchens are required to use pre-rinse spray valves.	Yes
6	Other	>50%	Potable water service will not be provided to new land development projects except under the approved circumstances	Yes

8.5.3. Supply Augmentation

Given the City's sufficient groundwater supply, the City does not have any immediate plans to augment supply in response to shortages.

8.5.4. Operational Changes

During shortage conditions, operations may be affected by demand reduction responses. Operational changes to address a short-term water shortage may be implemented based on the severity of the reduction goal. The City will maximize its supply by implementing operational strategies and demand reduction measures.

As part of the Annual Assessment process, the City will consider their operational procedures at the time of a shortage to identify changes that can be implemented to address water shortage on a short-term basis, including but not limited to:

- Expansion of public information campaign to educate and inform customers of the water shortage emergency and required water savings.
- Decrease water main flushing to only on a compliant basis.
- Review water metering devices for accuracy.
- Implement water waste patrols by recruiting staff from other departments, if necessary.
- Implement or modify drought rate structure or surcharge or water emergency tiered pricing, pursuant to the requirements of Proposition 218 and in accordance with California Law.
- Contact the highest water users to encourage use of water conservation methods.
- Monitor construction meters and fire hydrant meters for efficient water use if a meter identified wastes water.

8.5.5. Emergency Response Plan

Water Code Section 10632(c) requires development of an Emergency Response Plan (ERP) documenting actions to be undertaken by a water supplier to prepare for and implement during a catastrophic interruption of water supplies. A catastrophic event that constitutes a proclamation of a water shortage would be any event, either natural or manmade, that causes a severe shortage of water. Water shortages may result from variations in weather, natural disasters, or unanticipated situations (i.e. systems failures, acts of terror).

The City has included emergency conditions as a triggering action for advancement to a subsequent shortage level. A catastrophic interruption could be considered an emergency condition. During the preparation of this 2020 UWMP, the City implemented an Emergency Response Plan (ERP) for the water system. The purpose of the ERP is to prepare for an interruption in the drinking water supply and potential consequences to water system's integrity and public health. The ERP contains procedures for the distribution of potable water in a disaster and are consistent with guidelines prepared by the California State Office of Emergency Services.

8.5.6. Seismic Risk Assessment and Mitigation Plan

Section 10632.5.(a)

> *In addition to the requirements of paragraph (3) of subdivision (a) of Section 10632, beginning January 1, 2020, the plan shall include a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities.*
>
> *(b) An urban water supplier shall update the seismic risk assessment and mitigation plan when updating its urban water management plan as required by Section 10621.*
>
> *(c) An urban water supplier may comply with this section by submitting, pursuant to Section 10644, a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk.*

The City's water system infrastructure, including the groundwater wells, pump stations, storage tanks, and pipelines, could be damaged during a strong earthquake. Although the City is not located within a highly active seismic zone, some facilities could be damaged as the result of an earthquake up to a magnitude of 6.0 on the Richter scale. The City has planned for this potential by constructing redundancy into its water system. The City's use of groundwater as its primary water source creates redundancy to limit dependence of a geographic area on a single water supply source (i.e., areas are served by multiple groundwater wells). In the event of a regional power outage, the groundwater wells would be powered using emergency generators. The City maintains redundant power supplies for each of its well sites through the use of emergency power generators.

In the event of an earthquake, the City may experience a regional power outage and the water distribution system may suffer breaks at multiple locations. The City's distribution system contains valves to isolate portions of the distribution system in the event of water main breaks. During declared emergency, or when a shortage declaration appears imminent, the Public Works Director will be responsible to assemble and oversee a water shortage management team that will include City staff members from public works, fire protection, planning, health, and emergency services. Actions and procedures for implementation during a catastrophic event will be developed and may include, but not be limited to, backup power generation, emergency deliveries of trucked and/or bottled water, temporary water storage for fire suppression, contamination isolation by partial system closure, etc. Table 8-5 report the emergency actions that will be implemented during a water supply catastrophe.

Emergency Actions from Emergency Response Plan	
Situation	**Steps to be Taken by City**
Regional Power Outage	Request information from PG&E on estimated down time, if backup generation is available assess ability to supply fuel for extended periods. Notify affected users and issue "Boil Water" or "Do Not Drink" orders as needed.
Earthquake	Contact emergency assistance as necessary. Notify customers, media, state and local authorities if service is disrupted or significant demand management is necessary. Issue "Boil Water" or "Do Not Drink" orders as needed.
Flood	Contact local representative of National Weather Service for information on exact location and probable extent (stage) of flooding relative to utility facilities. Contact emergency assistance as necessary. Notify customers, media, state and local authorities if service is disrupted or

	significant demand management is necessary. Issue "Boil Water" or "Do Not Drink" orders as needed.
Water Supply Interruption	Depending on the percentage of water reduction needed (i.e. 10% to 50%), institute water prohibitions within water shortage contingency plan. Take action to provide alternate drinking water supply and fire protection including area water haulers, temporary storage options, etc. Issue "Boil Water" or "Do Not Drink" orders as needed.
Sabotage	Notify local law enforcement and Department of Homeland Security. Take actions to isolate portions of system containing suspect water. Issue "Boil Water" or "Do Not Drink" orders as needed. Take action to provide alternate drinking water supply and fire protection.

8.5.7. Shortage Response Action Effectiveness

As previously stated throughout this UWMP, all of the City’s residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered. These meters record the amount of water consumed at each location. Customer consumption totals are tallied on a monthly basis for billing purposes. The City’s billing staff will inform the Public Works Director of any increase in water consumed or decrease in water supplies. The Public Works Director will then make recommendations to the City Manager and City Council on whether to change the water shortage stage and will provide supporting reports of consumption or supply as required.

Under normal water supply conditions, water supply and consumption figures are reported, at minimum, monthly. From this information, month-to-month and year-to-year statistics can be calculated to track water use and subsequent increases or reductions in consumption levels. This data allows the City to determine the effectiveness of the implemented shortage response actions. If reduction goals are not being met, the Public Works Director will make the necessary decisions for corrective actions to be taken.

During water shortages, savings are measured in comparison to what is considered to be normal year demand or in reference to a specific base year as may be dictated by Statewide requirements. Estimates of the effectiveness for actions has been included in Table 8-4. It is assumed that each water supply shortage addressed in each stage can be met by quantifiable measures and the remainder of shortage can be addressed by unquantifiable measures or operational changes. It is expected that response action effectiveness is also a result of successful communication and outreach efforts made by the City.

8.6. Communication Protocols

Section 10632 (a)(5)

Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all of the following:

(A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1.

(B) Any shortage response actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1.

(C) Any other relevant communications

Communications regarding water shortage and conservation efforts will be sent to individual customers and will be available through media and the City's website. When conservation measures are needed, the City will create a bill insert with conservation information, post additional conservation information on its website and host informational sessions to inform the public of water shortage and conservation efforts. The insert, online campaign, and informational sessions will focus on providing examples of ways consumers can reduce their water usage and optional programs they can take part in such as home reuse of greywater, maintenance of leaks, and high efficiency fixture installation. Additional information will be provided on water usage reduction and any water shortage surcharge that may be implemented.

When a water shortage stage is enacted or changed, a notice will be mailed to customers and posted on the City's website. Additionally, a notice may be published in a newspaper of general circulation. The declaration of any stage beyond State 1 will be reported to the City Council at its next regular meeting. Based on the severity of the shortage, the City may also advertise on the local radio, hang door tags, or send additional mail notifications to all its customers.

8.7. Compliance and Enforcement

CWC Section 10632 (a)(6)

For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption procedures for triggered shortage response actions as determined pursuant to Section 10632.2.

The Public Works Director is authorized to implement water conservation measures and enact a water shortage stage. The Public Works Director is also authorized to make minor or limited exceptions to prevent undue hardships or unreasonable restrictions, provided that water shall not be wasted or used unreasonable and the purpose of the WSCP can be accomplished.

Per Section 13.28.090 of the Kerman Municipal Code, whenever the City as inspected or caused to be inspected any property and has determined that there exists a violation of this WSCP or Section 13.28 of the Municipal Code, the City in its sole discretion may proceed as follows:

- Prosecution as an infraction or misdemeanor.
- Issuance of an administrative citation pursuant to Chapter 1.18 of the Municipal Code.
- Treat the violation as a public nuisance pursuant to Chapter 8.32 of the Municipal Code and proceed with enforcement as authorized therein.
- Request the City Attorney to institute legal action including but not limited to injunctive or criminal action.

8.8. Legal Authorities

CWC Section 10632 (a)(7)

(A) A description of the legal authorities that empower the urban water supplier to implement and enforce its shortage response actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions.

(B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1. [see below]

> *(C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code.*
>
> *Water Code Section Division 1, Section 350*
>
> *Declaration of water shortage emergency condition. The governing body of a distributor of a public water supply, whether publicly or privately owned and including a mutual water company, shall declare a water shortage emergency condition to prevail within the area served by such distributor whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection.*

Implementation of the WSCP and the mandatory water conservation stages shall be determined by the Public Works Director. The Public Works Director is authorized to implement water conservation measures and enact a water shortage stage upon a determination that it is necessary to protect the public welfare and safety.

8.9. Financial Consequences of WSCP Activation

> *CWC Section 10632(a)(8)*
>
> *A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:*
>
> *(A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).*
>
> *(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).*
>
> *(C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1. [retail urban suppliers only]*

As previously stated, all of the City's residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered; therefore, the City's water fund operating revenue will be closely tied to water use and significantly impacted by the water conservation measures in the WSCP. With the implementation of the WSCP, expenditures may increase due to an increase in the water consumption reduction methods described in this Chapter and revenue from water bills may decrease due to the reduction in water use encouraged in the WSCP's stages. To counteract the financial impact of conservation, the City may initiate an increase in the rate structure so that lower projected water consumption would generate added revenue needed by the City's water fund. Another option would be the use of reserve funds to minimize the need for additional rate increases. A full analysis of the water rates based on the financial conditions at the time water reduction would occur would be presented to the City Council for their approval. Additionally, the City may consider temporarily increasing water rates or delaying capital improvements until the shortage has ended.

8.10. Monitoring and Reporting

> *CWC Section 10632(a)(9)*

> *For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.*

In accordance with CWC Section 10632(a)(9), this section describes the reporting requirements and monitoring procedures required to implement the WSCP and track and evaluate the response actions effectives. As previously stated in Section 8.2, the City intends to track its groundwater production volumes and customer's water demands on an annual basis, and if a supply shortage is projected, the City will implement the appropriate stage of their WSCP, as declared by the Public Works Director. Monitoring customer water demands will be essential to ensure that the WSCP's response actions are adequately meeting reductions and decreasing the supply/demand gap. This will also help to analyze the effectiveness of the WSCP or identify the need to activate additional response actions or implement a subsequent stage.

Water savings associated with the implementation of the WSCP will be determined based on customer's monthly water metered records which will be compared to meter records from prior months or the same period of the prior year. At first, the customer's cumulative consumption records will be evaluated for reaching target demand reduction levels. If needed, individual customer accounts will be monitored. Weather and other possible influences may be accounted for in the evaluation.

City staff will report the impact of demand reductions actions to the City Council and to the State, if required. The City will also update its customers as to the impact of the actions taken as part of their customer outreach program.

8.11. WSCP Refinement Procedures

> *CWC Section 10632 (a)(10)*
>
> *Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed.*

This WSCP is best prepared and implemented as an adaptive management plan. The City will use results obtained from their Annual Assessment and monitoring and reporting program described above to evaluate any needs for revisions. The WSCP is used to provide guidance to City staff, the City Council, and the public by identifying response actions to allow for efficient management of any water shortage with predictability and accountability.

To maintain a useful and efficient standard of practice in water shortage conditions, the requirements, criteria, and response actions need to be continually evaluated and improved upon to ensure that its shortage risk tolerance is adequate, and the shortage response actions are effective and up-to-date based on lessons learned from implementing the WSCP's stages. Potential changes to the WSCP that would warrant an update include, but are not limited to, any changes to shortage level triggers, changes to the shortage level structure, and/or changes to the response actions. Any prospective changes to the WSCP would need to be presented at a regular City Council meeting, where City staff would obtain any comments from the public and the City Council. The City Council would then formally approve the updated WSCP through the adoption of a Resolution.

8.12. Special Water Feature Distinction

> *CWC Section 10632 (b)*
>
> *For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.*

CWC 10623 (b) now requires that suppliers analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code. Non-pool or non-spa water features may use or be able to use recycled water, whereas pools and spas must use potable water for health and safety considerations, so limitations to pools and spas may require different considerations compared to non-pool or non-spa water features.

For the purposes of the WSCP, water features are not categorized under defined terminology. Pools, spas, recreational ponds, decorative fountains, and the like will all be called out specifically during each stage that requires their decrease or fully terminated use.

8.13. Plan Adoption, Submittal, and Availability

> *CWC Section 10632 (c)*
>
> *The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan.*

The WSCP followed the same development process as the City's 2020 UWMP. The WSCP shall be adopted, submitted, implemented, and amended alongside the City's UWMP. The City had a public review period of the 2020 UWMP, which included the WSCP, from April 6, 2022, to June 8, 2022. On June 8, 2022, the draft UWMP and WSCP were presented to the City Council and the public hearing was opened to receive comments from the public. Shortly prior to the public hearing staff received comments by the Fresno Irrigation District (FID) via email and additional comments were received by a resident during the public hearing. In order to address all newly received comments, the Council voted to continue the public hearing to July 13, 2022.

The City reviewed and prepared a written response letter to the comments received at the June 8, 2022, public hearing, which were mailed on June 28, 2022. Notices of the continued public hearing was printed in the Fresno Bee, mailed to agencies, and posited at City Hall. At the continued public hearing, no additional comments were received from the public and City Council adopted the UWMP and WSCP on July 13, 2022. The City will make the Final 2020 UWMP and WSCP publicly available through the City's website no later than 30 days after it is adopted. The public will also be notified of any amendments to the WSCP which will be made public available once adopted.

CHAPTER 9 - DEMAND MANAGEMENT MEASURES

9.1. Introduction

Demand management measures (DMMs) are specific actions a water supplier takes to support its water conservation efforts. The goal of this Chapter is to provide a comprehensive description of the water conservation programs that the City has implemented, is currently implementing, and plans to implement in order to meet its urban water use reduction targets.

The section of the CWC addressing DMMs was significantly modified in 2014, based on recommendations from the Independent Technical Panel (ITP) to the legislature. The ITP was formed by DWR to provide information and recommendations to DWR and the Legislature on new demand management measures, technologies and approaches to water use efficiency. In its report to the Legislature, the ITP recommended that the UWMP Act should be amended to simplify, clarify, and update the DMM reporting requirements. The ITP recommended, and the legislature enacted, streamlining the retail agency requirements from 14 specific measures to six more general requirements plus an “other” category.

The City realizes the importance of DMMs to ensure a reliable future water supply. The City is committed to implementing water conservation programs to maximize sustainability in meeting future water needs for its customers. The following sections provide a description of the City’s DMMs.

9.2. Demand Management Measures for Retail Agencies

> *CWC Section 10631*
>
> *(e)Provide a description of the supplier’s water demand management measures. This description shall include all of the following:*
>
> *(1)(A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measure that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.*
>
> *(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:*
>
> *(i) Water waste prevention ordinances.*
>
> *(ii) Metering.*
>
> *(iii) Conservation pricing.*
>
> *(iv) Public education and outreach.*
>
> *(v) Programs to assess and manage distribution system real loss.*
>
> *(vi) Water conservation program coordination and staffing support.*
>
> *(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.*

The UWMP Act requires a discussion of DMMs, including a description of each of the DMMs currently being implemented/scheduled for implementation, the schedule of implementation for all DMMs, and the methods, if any, the City will use to evaluate the effectiveness of DMMs.

9.2.1. Water Waste Prevention Ordinance

This DMM consists of adopting and enforcing a water waste ordinance that explicitly states that the waste of water is to be prohibited. On June 6, 2018, the Kerman City Council adopted Ordinance No. 18-08, which repealed Section 13.04.160 of the Kerman Municipal Code and added Chapter 13.28 relating to water conservation. The purpose of Chapter 13.28 is to establish a water conservation plan that will reduce water consumption within the City through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, maximize the efficient use of water within the City to avoid and minimize the effect and hardship of water shortage to the greatest extent possible, and meet any state laws or state regulations requiring water conservation. The Chapter also establishes water conservation standards intended to alter behavior related to water use efficiency at all times. Finally, the Chapter authorizes the City Council to adopt further measures to be implemented during times of a declared water shortage or declared water shortage emergencies, with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies.

Over the last decade, the City has expanded its public outreach and education on water conservation and has increased enforcement of water waste prohibitions within its service area. Water wasting within the City is prevented by prohibiting excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than seven days of receiving notice from the City. Per Section 13.28.060 of the Municipal Code, water waste is prevented by requiring the use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off device, a low-volume, high-pressure cleaning machine equipped to recycle any water used, or a low-volume high-pressure water broom for the washing of paved surfaces or vehicles. This increased vigilance and enforcement by the City officials has been reflected in the per capita water use associated with residential users, which has decreased approximately 18 percent over the last decade, from 218 GPCD in 2010 to 175 GPCD in 2020.

9.2.2. Metering

> *CWC Section 526*
>
> *(a) Notwithstanding any other provisions of law, an urban water supplier that, on or after January 1, 2004, receives water from the federal Central Valley Project under a water service contract or subcontract... shall do both of the following:*
>
> *(1) On or before January 1, 2013, install water meters on all service connections to residential and nonagricultural commercial buildings... located within its service area.*
>
> *Water Code Section 527*
>
> *(a) An urban water supplier that is not subject to Section 526 shall do both the following:*

> *(1) Install water meters on all municipal and industrial service connections located within its service area on or before January 1, 2025.*

This DMM requires that water meters be installed for all new connections to allow billing by volume of use. This program also applies to retrofitting any existing unmetered connections. According to Section 13.04.130 of the Municipal Code, a water meter specified or approved by the City's Public Works Director shall be installed to measure the water service provided to the following water service connections: all new connections, any property at time of transfer, conveyance or on sale, when required by a conditional use permit at the discretion of the planning commission, any user who is found to be habitually wasting water, and any existing commercial or industrial water customer not having metered water service upon written notice of the Public Works Director.

As previously stated, all of the City's residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered. The only unmetered connections consist of 51 acres of City owned parks, medians, mow strips, and government building landscape areas. According to the City's 2020 Validated Water Audit, the City's existing customer meters consist of radio read meters that transport meter readings electronically. The City installed these meters between 2014 and 2016. While the City does not have a meter testing program currently in place, the City's customer meters are equipped with an asset management system that notifies City staff when the meter is malfunctioning. The Public Works Department then sends out operators to inspect and fix the meter.

9.2.3. Conservation Pricing

As described above, all of the City's residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered. The City charges these customers for water usage on a monthly basis. The City does not charge for water that is used to irrigate City owned landscape areas, which include approximately 51 acres of parks, medians, mow strips, and government building landscape areas.

The City charges for water service based on the quantity of water consumed, which encourages water conservation. The Kerman City Council approved the current water rates on October 17, 2018. In 2020, the City's tiered rate structure consisted of a monthly fixed service charge based on the size of the customer's meter and volumetric charge based on the total volume water consumed by the customer during the billing period. For example, a residential customer with a meter size of 3/4-inch paid a fixed base charge of $21.50 and a consumption charge of $1.12 per 1,000 gallons. Assuming a customer consumed a total of 14,000 gallons during the billing period, their total cost for water would be $37.18 ($21.50 + $15.68). A copy of the rate structure is provided in Appendix K.

At this time, the City has not considered pursuing a water budget based on conservation pricing. A water budget-based pricing would become much more complex with various rates needed for various size single-family lots, multi-family parcels, different types of commercial businesses and industrial users.

9.2.4. Public Education and Outreach

The City distributes public information regarding water issues in mass mailings to all water service customers, through the City's website, and directly to walk-in customers at City Hall and the Public Works Department. Also, when warranted, time-critical public information is dispersed through the local print media, radio station announcements, and public events.

Water use regulations and the annual Drinking Water Consumer Confidence Report (water quality report) are mailed each year to all customers. The City takes advantage of these mailings when necessary to provide its customers with additional information on water conservation and other demand management measures. Display cases and bulletin boards at City Hall augment the mailings by providing a permanent posting of the most current mailings.

Additionally, the City's monthly water bill that is distributed to all water service customers is another vehicle used for public education purposes. The bill mailing also contains public service announcements and Utility News Letters, which are used to remind citizens of conservation and demand management measures.

9.2.5. Programs to Assess and Manage Distribution System Real Loss

The City recognizes distribution system leakage can be a primary type of loss. While it is essential to control losses, the initial step is to assemble a water audit to identify the nature and volumes of losses and financial impacts that these losses exert. A water audit is a process of reviewing water use throughout a water system in order to quantify the volume of water not accounted for by the metering system of the water customers, which is typically the difference between metered well production, in the case of the City of Kerman, and metered usage on a system-wide basis.

The Public Works Department surveys and repairs water pipelines on an as-needed basis or at the request of the customer. City staff also review the volume of groundwater produced versus the volume of water sold to customers monthly. This internal review assists the City in identifying problems, such as leaks and meter problems in the system.

9.2.6. Water Conservation Program Coordination and Staffing Support

The City's Director of Public Works is the designated Water Conservation Coordinator. In addition, the public works department staff supports the coordinator and the water conservation activities of the City and its customers. The Water Conservation Coordinator's responsibilities include:

- Coordination with internal departments and the community at large to promote the principles of responsible water resource stewardship.
- Monitoring the practice and application of DMMs.
- Supervising the activities of the Water Patrol (only if in place).
- Planning and participating in community water conservation education projects.

The Water Conservation Coordinator has authorized use of City funds to support water conservation efforts. The water conservation activities are part of the full-time Director of Public Works position, and the City does not track expenditures or time spent associated with water conservation activities separately within the budget for the position.

9.2.7. Other Demand Management Measures

9.2.7.1. Residential Plumbing Retrofit

This program benefits existing customers by reducing their water consumption while minimizing the impact of their lifestyle. State legislation requires the installation of efficient plumbing in new construction, and effective 1994 requires that only Ultra Low Flush Toilets be sold in California.

Several studies suggest that savings resulting from miscellaneous interior retrofit fixtures can range between 25 and 65 gallons per day per housing unit. The studies also suggest that installation of retrofit fixtures in older single-family homes tend to produce more savings, while newer multi-family homes tend to produce less savings per housing unit.

To help strengthen the City efforts to reduce water usage, the Kerman City Council has approved funding for a high efficiency toilet residential rebate program. According to the City of Kerman's website, residents can receive a $100 rebate if they replace their high-water use toilet that was manufactured before 1992 and uses more than 1.6 gallons per flush (gpf), with a new high efficiency toilet that uses 1.28 gpf or less. The rebate program is offered on a first come first serve basis until the allocated funds are depleted.

9.2.7.2. High-Efficiency Washing Machine Rebate Program

This program generally provides a financial incentive (rebate offer) to qualifying customers who install high efficiency washing machines in their home. From August 1, 2015, through March 30, 2016, the City offered a high efficiency (HE) washing machine rebate program to customers who replaced their high use washing machine with a HE machine. This program is no longer offered by the City. However, the City will seek grant funding when available to offer rebate programs to customers.

9.3. Reporting Implementation

9.3.1. Implementation over the Past Five Years

> *CWC Section 10631*
>
> *(e) Provide a description of the supplier's water demand management measures. This description shall include all of the following:*
>
> *(1)(A) For an urban retail water supplier,…a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years.*

The following is a description of the water conservation efforts that City has implemented over the last five years:

I. Ordinance

The City Council adopted Ordinance No. 18-08 on June 6, 2018, repealing Section 13.04.160 of the Kerman Municipal Code and adding Chapter 13.28 relating to water conservation. Chapter 13.28 establishes a water conservation plan that aims reduce water consumption within the City through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, maximize the efficient use of water within the City to avoid and minimize the effect and hardship of water shortage to the greatest extent possible, and meet any state laws or state regulations requiring water conservation. The Chapter also establishes water conservation standards intended to alter behavior related to water use efficiency at all times. The Chapter ultimately authorizes the City Council to adopt further measures to be implemented during times of a declared water shortage or declared water shortage emergencies, with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies.

II. Metering

As discussed in Section 9.2.2, all of the City's residential, commercial, institutional/governmental, and industrial customers, and flushing activities are metered. The only unmetered connections consist of 51 acres of City owned parks, medians, mow strips, and government building landscape areas. The City's existing customer meters consist of radio read meters that transport meter readings electronically. The City installed these meters between 2014 and 2016. The existing meters are equipped with an asset management system that notifies City staff when the meter is malfunctioning. The Public Works Department then sends out operators to inspect and fix the meter.

III. Conservation Pricing

As discussed in 9.2.3, the City has not considered pursuing a water budget based on conservation pricing. The tiered water rates have the same allocations for residential, commercial, and industrial. A water budget-based pricing would become much more complex with various rates needed for various size single-family lots, multi-family parcels, different types of commercial businesses and industrial users. Currently, the City's rate structure includes a monthly fixed base charge based on the size of the customer's meter, a monthly service charge based upon the size of the customer's meter, in addition to a volumetric charge based upon the total volume of water consumed by the customer during the billing period.

IV. Public Education and Outreach

The programs described above were either expanded or started in the last five years.

V. Water Distribution System Losses

The City's Public Works Department surveys and repairs pipelines on an as-needed basis or at the request of the customer. customer. City staff also review the volume of groundwater produced versus the volume of water sold to customers monthly. This internal review assists the City in identifying problems, such as leaks and meter problems in the system.

VI. Water Conservation Program Coordination and Staffing Support

The City has enlisted the assistance of all staff in any City department that is in the field for purposes of reporting running water or potential waste. These outside working staff are to report such observations to the Public Works Department.

9.3.2. Implementation to Achieve Water Use Targets

CWC Section 10631

(e)(1)(A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measure that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

Over the last decade, the City has valued and promoted conservation measures and will continue to do so in the future. As a result, the City water use is well below target objectives set by the State. Despite meeting their 2020 Target, the City will continue to implement existing conservation programs and DMMS and explore additional programs to avoid substantial increases in demands.

9.4. Water Use Objectives (Future Requirements)

Within the next year, the City plans to begin working with the DWR to develop Water Use Objectives pursuant to AB 1668 and SB 606. Beginning in 2024, water agencies, including the City, are required to begin reporting compliance of their Water Use Objectives consisting of indoor residential water use, outdoor residential water use, commercial, industrial and institutional, irrigation with dedicated meters, water loss, and other unique local uses. The City plans to meet its Water Use Objectives through continued implementation of the water conservation measure and DMMs discussed in this 2020 UWMP.

CHAPTER 10 - PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

10.1. Inclusion of all 2020 Data

This 2020 UWMP includes the water use and planning data for the entire calendar year 2020.

10.2. Notice of Public Hearing

Water suppliers must hold a public hearing prior to adopting the 2020 UWMP. The public hearing provides an opportunity for the public to provide input on the Plan before it is adopted. The Kerman City Council shall consider all public input before the 2020 UWMP is adopted.

10.2.1. Notice to Cities and Counties

> *CWC Section 10621*
>
> *(b) Every urban water supplier required to prepare a plan shall…at least 60 days prior to the public hearing on the plan…notify any city or county within which the supplier provides waters supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.*
>
> *CWC Section 10642*
>
> *…The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies. Notices by a local public agency pursuant to this section shall be provided pursuant to Chapter 17.5 (commencing with Section 7290) of Division 7 of Title 1 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area…*

The City of Kerman is the sole water supplier and water management agency for its service area. For this reason, the City did not participate in an area, regional, watershed, or basin wide UWMP. While preparing the 2020 UWMP, however, City coordinated its efforts with relevant agencies to ensure that the data and issues discussed in the UWMP are presented accurately.

The City provided formal written notification to the City of Fresno, County of Fresno, Fresno Irrigation District, North Kings Groundwater Sustainability Agency, and the Kings Basin Water Authority that City’s 2020 UWMP was being prepared. Copies of the Notification letters are included in Appendix B. Copies of the final UWMP will be provided to these agencies no later than 30 days after its submission to DWR.

10.2.1.1.60-Day Notification

As discussed in Section 2.5, the City coordinated the preparation of this 2020 UWMP with the City of Fresno, County of Fresno, Fresno Irrigation District, North Kings Groundwater Sustainability Agency, and the Kings Basin Water Authority. The City notified these agencies, at least sixty (60) days prior to the public hearing, invited them to review and provide comments on the draft 2020 UWMP and WSCP. A copy of the notification letters sent to these agencies is provided in Appendix L.

10.2.1.2. Notice of Public Hearing

> *Government Code Section 7291*

> *…every local public agency… serving a substantial number of non-English-Speaking people, shall employ a sufficient number of qualified bilingual persons in public contact positions or as interpreters to assist those in such positions, to ensure provision of information and services in the language of the non-English-speaking person."*

The City published a notice of the public hearing in the City's local newspaper, April 6, 2022 and on April 13, 2022. A copy of the publication is provided in Appendix M.

10.2.1.3. Submittal Tables

Table 10-1 summarizes the cities and counties which were provided notifications by the City.

Table 10-1 Notification to Cities and Counties (Submittal Table 10-1)

City Name	60 Day Notice	Notice of Public Hearing
City of Fresno	Yes	Yes
County Name	**60 Day Notice**	**Notice of Public Hearing**
Fresno County	Yes	Yes

10.2.2. Notice to Public

> *CWC Section 10642*
>
> *…Prior to adopting either [the plan or water shortage contingency plan], the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon. Prior to any of these hearings, notice of the time and place of the hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code [see below]. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies.*
>
> *Government Code section 6066*
>
> *Publication of notice pursuant to this section shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. The period of notice commences upon the first day of publication and terminates at the end of the fourteenth day, including therein the first day.*

The City encouraged the active involvement of the population within its service area prior to and during the preparation of the UWMP. Pursuant to Section 6066 of the Government Code, the City published a notice of public hearing in the local newspaper during the weeks of April 6, 2022 and on April 13, 2022. A notice of public hearing was also posted on the City's website. A copy of the published notice is provided in Appendix M.

10.3. Public Hearing and Adoption

> *CWC Section 10642*

> *…Prior to adopting either, the [plan or water shortage contingency plan], the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon.*
>
> *Water Code Section 10608.26*
>
> *(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:*
>
> *(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.*
>
> *(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.*
>
> *(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20 for determining its urban water use target.*

Pursuant to the requirements of the UWMPA, this section summarizes the adoption, submittal, and implementation of City's 2020 UWMP.

10.3.1. Public Hearing

The City had a public review period of the 2020 UWMP and WSCP from April 6, 2022, to June 8, 2022. On June 8, 2022, the draft UWMP and WSCP was presented to the City Council and the public hearing was opened to receive comments from the public. Shortly prior to the public hearing staff received comments by the Fresno Irrigation District (FID) via email and additional comments were received by a resident during the public hearing. In order to address all newly received comments, the Council voted to continue the public hearing to July 13, 2022.

The City reviewed and prepared a written response letter to the comments received at the June 8, 2022, public hearing, which were mailed on June 28, 2022. Notices of the continued public hearing was printed in the Fresno Bee, mailed to agencies, and posited at City Hall. At the continued public hearing, no additional comments were received from the public.

10.3.2. Adoption

> *CWC Section 10642*
>
> *…After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.*

Following the continued public hearing on July 13, 2022, the City adopted both the draft 2020 UWMP and draft 2020 WSCP (included in Chapter 8 of the UWMP). A copy of the resolution adopting the 2020 UWMP and the 2020 WSCP is provided in Appendix N.

10.4. Plan Submittal

> *CWC Section 10621*
>
> *(e) Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021…*
>
> *Water Code Section 10644*

(a)(1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.

Water Code Section 10635

(c) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

The City's submittal process for its 2020 UWMP is discussed below.

10.4.1. Submitting a UWMP and Water Shortage Contingency Plan to DWR

The Kerman City Council adopted the 2020 UWMP in July of 2022, and within 30 days of adoption, the City submitted the adopted 2020 UWMP (including the WSCP) to DWR. The 2020 UWMP was submitted through DWR's "Water Use Efficiency (WUE) Data Portal" website.

The DWR developed a checklist which was used by the City to assist DWR with its determination that the City's 2020 UWMP has addressed the requirements of the CWC. The City has completed the DWR checklist by indicating where the required CWC elements can be found within the City's 2020 UWMP, and it is included in Appendix O.

10.4.2. Electronic Data Submittal

Section 10644 (a)(2)

The plan, or amendments to the plan, submitted to the department ... shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

Within 30 days of adoption of the 2020 Plan, the City submitted all data tables associated with the 2020 UWMP through DWR's "Water Use Efficiency Data Portal" website.

10.4.3. Submitting UWMP, including WSCP, to the Cities and Counties

Within 30 days of adoption of the 2020 UWMP by the City Council, a copy (CD or hardcopy) of the 2020 UWMP was submitted to the State of California Library. A copy of the letter to the State Library will be maintained in the City's file. The 2020 UWMP will be mailed to the following address if sent by regular mail:

California State Library
Government Publications Section
Attention: Coordinator, Urban Water Management Plans
P.O. Box 942837
Sacramento, CA 94237-0001

10.4.4. Submitting UWMP to the Cities and Counties

Within 30 days of adoption of the 2020 UWMP by the City Council, a copy of the 2020 was submitted to the Central California Irrigation District, Merced Irrigation District, City of Gustine, City of Patterson, City of Turlock, Stanislaus County, and Merced County.

10.5. Public Availability

> *CWC Section 10645*
>
> *(a) Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.*
>
> *(b) Not later than 30 days after filing a copy of its water shortage contingency plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.*

Within 30 days after submittal of the 2020 UWMP to the DWR, the City made the final 2020 UWMP (including the WSCP) available for public review at City Hall during normal business hours. In addition, a copy of the final 2020 UWMP will also be posted on the City's website.

10.6. Notification to Public Utilities Commission

> *CWC Section 10621 (c)*
>
> *An urban water supplier regulated by the Public Utilities Commission shall include its most recent plan and water shortage contingency plan as part of the supplier's general rate case filings.*

The City is not regulated by the California Public Utilities Commission

10.7. Amending an Adopted Plan

> *Section 10621*
>
> *(d) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).*
>
> *Water Code Section 10644*
>
> *(a)(1) Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.*

The City's amendment process for the 2020 UWMP and WSCP is discussed below.

10.7.1. Amending a UWMP

If major changes are made to this 2020 UWMP, the amended UWMP will undergo adoption by the City Council. Within 30 days of adoption, the amended Plan will then be submitted to DWR, the State of California Library, and Stanislaus County.

10.7.2. Amending a Water Shortage Contingency Plan

> *Section 10644 (b)*
>
> *If an urban water supplier revises its water shortage contingency plan, the supplier shall submit to the department a copy of its water shortage contingency plan prepared…no later than 30 days after adoption, in accordance with protocols for submission and using electronic reporting tools developed by the department.*

If the City amends the adopted 2020 UWMP (including the WSCP), the amended UWMP (and WSCP) will undergo adoption by the City Council. Within 30 days of adoption, the amended Plan will then be submitted to DWR, the State of California Library, and Stanislaus County.

APPENDIX A

LEGISLATIVE REQUIREMENTS

WATER CODE - WAT

DIVISION 6. CONSERVATION, DEVELOPMENT, AND UTILIZATION OF STATE WATER RESOURCES [10000 - 12999] *(Heading of Division 6 amended by Stats. 1957, Ch. 1932.)*

PART 2.55. SUSTAINABLE WATER USE AND DEMAND REDUCTION [10608 - 10609.42] *(Part 2.55 added by Stats.2009, 7th Ex. Sess., Ch. 4, Sec. 1.)*

CHAPTER 1. General Declarations and Policy [10608 - 10608.8] *(Chapter 1 added by Stats. 2009, 7th Ex. Sess., Ch. 4, Sec. 1.)*

10608.

The Legislature finds and declares all of the following:

(a) Water is a public resource that the California Constitution protects against waste and unreasonable use.

(b) Growing population, climate change, and the need to protect and grow California's economy while protecting and restoring our fish and wildlife habitats make it essential that the state manage its water resources as efficiently as possible.

(c) Diverse regional water supply portfolios will increase water supply reliability and reduce dependence on the Delta.

(d) Reduced water use through conservation provides significant energy and environmental benefits, and can help protect water quality, improve stream flows, and reduce greenhouse gas emissions.

(e) The success of state and local water conservation programs to increase efficiency of water use is best determined on the basis of measurable outcomes related to water use or efficiency.

(f) Improvements in technology and management practices offer the potential for increasing water efficiency in California over time, providing an essential water management tool to meet the need for water for urban, agricultural, and environmental uses.

(g) The Governor has called for a 20 percent per capita reduction in urban water use statewide by 2020.

(h) The factors used to formulate water use efficiency targets can vary significantly from location to location based on factors including weather, patterns of urban and suburban development, and past efforts to enhance water use efficiency.

(i) Per capita water use is a valid measure of a water provider's efforts to reduce urban water use within its service area. However, per capita water use is less useful for measuring relative water use efficiency between different water providers. Differences in weather, historical patterns of urban and suburban development, and density of housing in a particular location need to be considered when assessing per capita water use as a measure of efficiency.

(*Added* by Stats. 2009, 7th Ex. Sess., Ch. 4, Sec. 1. (SB 7 7x) Effective February 3, 2010.)

10608.4

It is the intent of the Legislature, by the enactment of this part, to do all of the following:

(a) Require all water suppliers to increase the efficiency of use of this essential resource.

(b) Establish a framework to meet the state targets for urban water conservation identified in this part and called for by the Governor.

(c) Measure increased efficiency of urban water use on a per capita basis.

(d) Establish a method or methods for urban retail water suppliers to determine targets for achieving increased water use efficiency by the year 2020, in accordance with the Governor's goal of a 20-percent reduction.

(e) Establish consistent water use efficiency planning and implementation standards for urban water suppliers and agricultural water suppliers.

(f) Promote urban water conservation standards that are consistent with the California Urban Water Conservation Council's adopted best management practices and the requirements for demand management in Section 10631.

(g) Establish standards that recognize and provide credit to water suppliers that made substantial capital investments in urban water conservation since the drought of the early 1990s.

(h) Recognize and account for the investment of urban retail water suppliers in providing recycled water for beneficial uses.

(i) Require implementation of specified efficient water management practices for agricultural water suppliers.

(j) Support the economic productivity of California's agricultural, commercial, and industrial sectors.

(k) Advance regional water resources management.

(Added by Stats. 2009, 7th Ex. Sess., Ch. 4, Sec. 1. (SB 7 7x) Effective February 3, 2010.)

10608.8

(a) (1) Water use efficiency measures adopted and implemented pursuant to this part or Part 2.8 (commencing with Section 10800) are water conservation measures subject to the protections provided under Section 1011.

(2) Because an urban agency is not required to meet its urban water use target until 2020 pursuant to subdivision (a) of Section 10608.24, an urban retail water supplier's failure to meet those targets shall not establish a violation of law for purposes of any state administrative or judicial proceeding prior to January 1, 2021. Nothing in this paragraph limits the use of data reported to the department or the board in litigation or an administrative proceeding. This paragraph shall become inoperative on January 1, 2021.

(3) To the extent feasible, the department and the board shall provide for the use of water conservation reports required under this part to meet the requirements of Section 1011 for water conservation reporting.

(b) This part does not limit or otherwise affect the application of Chapter 3.5 (commencing with Section 11340), Chapter 4 (commencing with Section 11370), Chapter 4.5 (commencing with Section 11400), and Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code.

(c) This part does not require a reduction in the total water used in the agricultural or urban sectors, because other factors, including, but not limited to, changes in agricultural economics or population growth may have greater effects on water use. This part does not limit the economic productivity of California's agricultural, commercial, or industrial sectors.

(d) The requirements of this part do not apply to an agricultural water supplier that is a party to the Quantification Settlement Agreement, as defined in subdivision (a) of Section 1 of Chapter 617 of the Statutes of 2002, during the period within which the Quantification Settlement Agreement remains in effect. After the expiration of the Quantification Settlement Agreement, to the extent conservation water projects implemented as part of the Quantification Settlement Agreement remain in effect, the conserved water created as part of those projects shall be credited against the obligations of the agricultural water supplier pursuant to this part.

(Added by Stats. 2009, 7th Ex. Sess., Ch. 4, Sec. 1. (SB 7 7x) Effective February 3, 2010.)

WATER CODE - WAT

DIVISION 6. CONSERVATION, DEVELOPMENT, AND UTILIZATION OF STATE WATER RESOURCES [10000 - 12999] *(Heading of Division 6 amended by Stats. 1957, Ch. 1932.)*

PART 2.55. SUSTAINABLE WATER USE AND DEMAND REDUCTION [10608 - 10609.42] *(Part 2.55 added by Stats. 2009, 7th Ex. Sess., Ch. 4, Sec. 1.)*

CHAPTER 9. Urban Water Use Objectives and Water Use Reporting [10609 - 10609.38] *(Chapter 9 added by Stats. 2018, Ch. 15, Sec. 7.)*

10609. (a) The Legislature finds and declares that this chapter establishes a method to estimate the aggregate amount of water that would have been delivered the previous year by an urban retail water supplier if all that water had been used efficiently. This estimated aggregate water use is the urban retail water supplier’s urban water use objective. The method is based on water use efficiency standards and local service area characteristics for that year. By comparing the amount of water actually used in the previous year with the urban water use objective, local urban water suppliers will be in a better position to help eliminate unnecessary use of water; that is, water used in excess of that needed to accomplish the intended beneficial use.

(b) The Legislature further finds and declares all of the following:

(1) This chapter establishes standards and practices for the following water uses:

(A) Indoor residential use.

(B) Outdoor residential use.

(C) CII water use.

(D) Water losses.

(E) Other unique local uses and situations that can have a material effect on an urban water supplier’s total water use.

(2) This chapter further does all of the following:

(A) Establishes a method to calculate each urban water use objective.

(B) Considers recycled water quality in establishing efficient irrigation standards.

(C) Requires the department to provide or otherwise identify data regarding the unique local conditions to support the calculation of an urban water use objective.

(D) Provides for the use of alternative sources of data if alternative sources are shown to be as accurate as, or more accurate than, the data provided by the department.

(E) Requires annual reporting of the previous year’s water use with the urban water use objective.

(F) Provides a bonus incentive for the amount of potable recycled water used the previous year when comparing the previous year’s water use with the urban water use objective, of up to 10 percent of the urban water use objective.

(3) This chapter requires the department and the board to solicit broad public participation from stakeholders and other interested persons in the development of the standards and the adoption of regulations pursuant to this chapter.

(4) This chapter preserves the Legislature’s authority over long-term water use efficiency target setting and ensures appropriate legislative oversight of the implementation of this chapter by doing all of the following:

(A) Requiring the Legislative Analyst to conduct a review of the implementation of this chapter, including compliance with the adopted standards and regulations, accuracy of the data, use of alternate data, and other issues the Legislative Analyst deems appropriate.

(B) Stating legislative intent that the director of the department and the chairperson of the board appear before the appropriate Senate and Assembly policy committees to report on progress in implementing this chapter.

(C) Providing one-time-only authority to the department and board to adopt water use efficiency standards, except as explicitly provided in this chapter. Authorization to update the standards shall require separate legislation.

(c) It is the intent of the Legislature that the following principles apply to the development and implementation of long-term standards and urban water use objectives:

(1) Local urban retail water suppliers should have primary responsibility for meeting standards-based water use targets, and they shall retain the flexibility to develop their water supply portfolios, design and implement water conservation strategies, educate their customers, and enforce their rules.

(2) Long-term standards and urban water use objectives should advance the state's goals to mitigate and adapt to climate change.

(3) Long-term standards and urban water use objectives should acknowledge the shade, air quality, and heat-island reduction benefits provided to communities by trees through the support of water-efficient irrigation practices that keep trees healthy.

(4) The state should identify opportunities for streamlined reporting, eliminate redundant data submissions, and incentivize open access to data collected by urban and agricultural water suppliers.

(Amended by Stats. 2019, Ch. 497, Sec. 287. (AB 991) Effective January 1, 2020.)

10609.2. (a) The board, in coordination with the department, shall adopt long-term standards for the efficient use of water pursuant to this chapter on or before June 30, 2022.

(b) Standards shall be adopted for all of the following:

(1) Outdoor residential water use.

(2) Outdoor irrigation of landscape areas with dedicated irrigation meters in connection with CII water use.

(3) A volume for water loss.

(c) When adopting the standards under this section, the board shall consider the policies of this chapter and the proposed efficiency standards' effects on local wastewater management, developed and natural parklands, and urban tree health. The standards and potential effects shall be identified by May 30, 2022. The board shall allow for public comment on potential effects identified by the board under this subdivision.

(d) The long-term standards shall be set at a level designed so that the water use objectives, together with other demands excluded from the long-term standards such as CII indoor water use and CII outdoor water use not connected to a dedicated landscape meter, would exceed the statewide conservation targets required pursuant to Chapter 3 (commencing with Section 10608.16).

(e) The board, in coordination with the department, shall adopt by regulation variances recommended by the department pursuant to Section 10609.14 and guidelines and methodologies pertaining to the calculation of an urban retail water supplier's urban water use objective recommended by the department pursuant to Section 10609.16.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.4. (a) (1) Until January 1, 2025, the standard for indoor residential water use shall be 55 gallons per capita daily.

(2) Beginning January 1, 2025, and until January 1, 2030, the standard for indoor residential water use shall be the greater of 52.5 gallons per capita daily or a standard recommended pursuant to subdivision (b).

(3) Beginning January 1, 2030, the standard for indoor residential water use shall be the greater of 50 gallons per capita daily or a standard recommended pursuant to subdivision (b).

(b) (1) The department, in coordination with the board, shall conduct necessary studies and investigations and may jointly recommend to the Legislature a standard for indoor residential water use that more appropriately reflects best practices for indoor residential water use than the standard described in subdivision (a). A report on the results of the studies and investigations shall be made to the chairpersons of the relevant policy committees of each house of the Legislature by January 1, 2021, and shall include information necessary to support the recommended standard, if there is one. The studies and investigations shall also include an analysis of the benefits and impacts of how the changing standard for indoor residential water use will impact water and wastewater management, including potable water usage, wastewater, recycling and reuse systems, infrastructure, operations, and supplies.

(2) The studies, investigations, and report described in paragraph (1) shall include collaboration with, and input from, a broad group of stakeholders, including, but not limited to, environmental groups, experts in indoor plumbing, and water, wastewater, and recycled water agencies.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.6. (a) (1) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, standards for outdoor residential use for adoption by the board in accordance with this chapter.

(2) (A) The standards shall incorporate the principles of the model water efficient landscape ordinance adopted by the department pursuant to the Water Conservation in Landscaping Act (Article 10.8 (commencing with Section 65591) of Chapter 3 of Division 1 of Title 7 of the Government Code).

(B) The standards shall apply to irrigable lands.

(C) The standards shall include provisions for swimming pools, spas, and other water features. Ornamental water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, shall be analyzed separately from swimming pools and spas.

(b) The department shall, by January 1, 2021, provide each urban retail water supplier with data regarding the area of residential irrigable lands in a manner that can reasonably be applied to the standards adopted pursuant to this section.

(c) The department shall not recommend standards pursuant to this section until it has conducted pilot projects or studies, or some combination of the two, to ensure that the data provided to local agencies are reasonably accurate for the data's intended uses, taking into consideration California's diverse landscapes and community characteristics.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.8. (a) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, standards for outdoor irrigation of landscape areas with dedicated irrigation meters or other means of calculating outdoor irrigation use in connection with CII water use for adoption by the board in accordance with this chapter.

(b) The standards shall incorporate the principles of the model water efficient landscape ordinance adopted by the department pursuant to the Water Conservation in Landscaping Act (Article 10.8 (commencing with Section 65591) of Chapter 3 of Division 1 of Title 7 of the Government Code).

(c) The standards shall include an exclusion for water for commercial agricultural use meeting the definition of subdivision (b) of Section 51201 of the Government Code.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.9. For purposes of Sections 10609.6 and 10609.8, "principles of the model water efficient landscape ordinance" means those provisions of the model water efficient landscape ordinance applicable to the establishment or determination of the amount of water necessary to efficiently irrigate both new and existing landscapes. These provisions include, but are not limited to, all of the following:

(a) Evapotranspiration adjustment factors, as applicable.

(b) Landscape area.

(c) Maximum applied water allowance.

(d) Reference evapotranspiration.

(e) Special landscape areas, including provisions governing evapotranspiration adjustment factors for different types of water used for irrigating the landscape.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.10. (a) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, performance measures for CII water use for adoption by the board in accordance with this chapter.

(b) Prior to recommending performance measures for CII water use, the department shall solicit broad public participation from stakeholders and other interested persons relating to all of the following:

(1) Recommendations for a CII water use classification system for California that address significant uses of water.

(2) Recommendations for setting minimum size thresholds for converting mixed CII meters to dedicated irrigation meters, and evaluation of, and recommendations for, technologies that could be used in lieu of requiring dedicated irrigation meters.

(3) Recommendations for CII water use best management practices, which may include, but are not limited to, water audits and water management plans for those CII customers that exceed a recommended size, volume of water use, or other threshold.

(c) Recommendations of appropriate performance measures for CII water use shall be consistent with the October 21, 2013, report to the Legislature by the Commercial, Industrial, and Institutional Task Force entitled "Water Use Best Management Practices," including the technical and financial feasibility recommendations provided in that report, and shall support the economic productivity of California's commercial, industrial, and institutional sectors.

(d) (1) The board, in coordination with the department, shall adopt performance measures for CII water use on or before June 30, 2022.

(2) Each urban retail water supplier shall implement the performance measures adopted by the board pursuant to paragraph (1).

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.12. The standards for water loss for urban retail water suppliers shall be the standards adopted by the board pursuant to subdivision (i) of Section 10608.34.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.14. (a) The department, in coordination with the board, shall conduct necessary studies and investigations and, no later than October 1, 2021, recommend for adoption by the board in accordance with this chapter appropriate variances for unique uses that can have a material effect on an urban retail water supplier's urban water use objective.

(b) Appropriate variances may include, but are not limited to, allowances for the following:

(1) Significant use of evaporative coolers.

(2) Significant populations of horses and other livestock.

(3) Significant fluctuations in seasonal populations.

(4) Significant landscaped areas irrigated with recycled water having high levels of total dissolved solids.

(5) Significant use of water for soil compaction and dust control.

(6) Significant use of water to supplement ponds and lakes to sustain wildlife.

(7) Significant use of water to irrigate vegetation for fire protection.

(8) Significant use of water for commercial or noncommercial agricultural use.

(c) The department, in recommending variances for adoption by the board, shall also recommend a threshold of significance for each recommended variance.

(d) Before including any specific variance in calculating an urban retail water supplier's water use objective, the urban retail water supplier shall request and receive approval by the board for the inclusion of that variance.

(e) The board shall post on its Internet Web site all of the following:

(1) A list of all urban retail water suppliers with approved variances.

(2) The specific variance or variances approved for each urban retail water supplier.

(3) The data supporting approval of each variance.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.15. To help streamline water data reporting, the department and the board shall do all of the following:

(a) Identify urban water reporting requirements shared by both agencies, and post on each agency's Internet Web site how the data is used for planning, regulatory, or other purposes.

(b) Analyze opportunities for more efficient publication of urban water reporting requirements within each agency, and analyze how each agency can integrate various data sets in a publicly accessible location, identify priority actions, and implement priority actions identified in the analysis.

(c) Make appropriate data pertaining to the urban water reporting requirements that are collected by either agency available to the public according to the principles and requirements of the Open and Transparent Water Data Act (Part 4.9 (commencing with Section 12400)).

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.16. The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, guidelines and methodologies for the board to adopt that identify how an urban retail water supplier calculates its urban water use objective. The guidelines and methodologies shall address, as necessary, all of the following:

(a) Determining the irrigable lands within the urban retail water supplier's service area.

(b) Updating and revising methodologies described pursuant to subparagraph (A) of paragraph (1) of subdivision (h) of Section 10608.20, as appropriate, including methodologies for calculating the population in an urban retail water supplier's service area.

(c) Using landscape area data provided by the department or alternative data.

(d) Incorporating precipitation data and climate data into estimates of a urban retail water supplier's outdoor irrigation budget for its urban water use objective.

(e) Estimating changes in outdoor landscape area and population, and calculating the urban water use objective, for years when updated landscape imagery is not available from the department.

(f) Determining acceptable levels of accuracy for the supporting data, the urban water use objective, and compliance with the urban water use objective.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.18. The department and the board shall solicit broad public participation from stakeholders and other interested persons in the development of the standards and the adoption of regulations pursuant to this chapter. The board shall hold at least one public meeting before taking any action on any standard or variance recommended by the department.

(Added by Stats. 2018, Ch. 15, Sec. 7. (AB 1668) Effective January 1, 2019.)

10609.20. (a) Each urban retail water supplier shall calculate its urban water use objective no later than January 1, 2024, and by January 1 every year thereafter.

(b) The calculation shall be based on the urban retail water supplier's water use conditions for the previous calendar or fiscal year.

(c) Each urban water supplier's urban water use objective shall be composed of the sum of the following:

(1) Aggregate estimated efficient indoor residential water use.

(2) Aggregate estimated efficient outdoor residential water use.

(3) Aggregate estimated efficient outdoor irrigation of landscape areas with dedicated irrigation meters or equivalent technology in connection with CII water use.

(4) Aggregate estimated efficient water losses.

(5) Aggregate estimated water use in accordance with variances, as appropriate.

(d) (1) An urban retail water supplier that delivers water from a groundwater basin, reservoir, or other source that is augmented by potable reuse water may adjust its urban water use objective by a bonus incentive calculated pursuant to this subdivision.

(2) The water use objective bonus incentive shall be the volume of its potable reuse delivered to residential water users and to landscape areas with dedicated irrigation meters in connection with CII water use, on an acre-foot basis.

(3) The bonus incentive pursuant to paragraph (1) shall be limited in accordance with one of the following:

(A) The bonus incentive shall not exceed 15 percent of the urban water supplier's water use objective for any potable reuse water produced at an existing facility.

(B) The bonus incentive shall not exceed 10 percent of the urban water supplier's water use objective for any potable reuse water produced at any facility that is not an existing facility.

(4) For purposes of this subdivision, "existing facility" means a facility that meets all of the following:

(A) The facility has a certified environmental impact report, mitigated negative declaration, or negative declaration on or before January 1, 2019.

(B) The facility begins producing and delivering potable reuse water on or before January 1, 2022.

(C) The facility uses microfiltration and reverse osmosis technologies to produce the potable reuse water.

(e) (1) The calculation of the urban water use objective shall be made using landscape area and other data provided by the department and pursuant to the standards, guidelines, and methodologies adopted by the board. The department shall provide data to the urban water supplier at a level of detail sufficient to allow the urban water supplier to verify its accuracy at the parcel level.

(2) Notwithstanding paragraph (1), an urban retail water supplier may use alternative data in calculating the urban water use objective if the supplier demonstrates to the department that the alternative data are equivalent, or superior, in quality and accuracy to the data provided by the department. The department may provide technical assistance to an urban retail water supplier in evaluating whether the alternative data are appropriate for use in calculating the supplier's urban water use objective.

(Amended by Stats. 2019, Ch. 239, Sec. 2. (AB 1414) Effective January 1, 2020.)

10609.21. (a) For purposes of Section 10609.20, and notwithstanding paragraph (4) of subdivision (d) of Section 10609.20, "existing facility" also includes the North City Project, phase one of the Pure Water San Diego Program, for which an environmental impact report was certified on April 10, 2018.

(b) This section shall become operative on January 1, 2019.

(Added by Stats. 2018, Ch. 453, Sec. 4. (SB 875) Effective September 17, 2018. Section operative January 1, 2019, by its own provisions.)

10609.22. (a) An urban retail water supplier shall calculate its actual urban water use no later than January 1, 2024, and by January 1 every year thereafter.

(b) The calculation shall be based on the urban retail water supplier's water use for the previous calendar or fiscal year.

(c) Each urban water supplier's urban water use shall be composed of the sum of the following:

(1) Aggregate residential water use.

(2) Aggregate outdoor irrigation of landscape areas with dedicated irrigation meters in connection with CII water use.

(3) Aggregate water losses.

(Amended by Stats. 2019, Ch. 239, Sec. 3. (AB 1414) Effective January 1, 2020.)

10609.24. (a) An urban retail water supplier shall submit a report to the department no later than January 1, 2024, and by January 1 every year thereafter. The report shall include all of the following:

(1) The urban water use objective calculated pursuant to Section 10609.20 along with relevant supporting data.

(2) The actual urban water use calculated pursuant to Section 10609.22 along with relevant supporting data.

(3) Documentation of the implementation of the performance measures for CII water use.

(4) A description of the progress made towards meeting the urban water use objective.

(5) The validated water loss audit report conducted pursuant to Section 10608.34.

(b) The department shall post the reports and information on its internet website.

(c) The board may issue an information order or conservation order to, or impose civil liability on, an entity or individual for failure to submit a report required by this section.

(Amended by Stats. 2019, Ch. 239, Sec. 4. (AB 1414) Effective January 1, 2020.)

10609.25. As part of the first report submitted to the department by an urban retail water supplier no later than January 1, 2024, pursuant to subdivision (a) of Section 10609.24, each urban retail water supplier shall provide a narrative that describes the water demand management measures that the supplier plans to implement to achieve its urban water use objective by January 1, 2027.

(Added by Stats. 2019, Ch. 239, Sec. 5. (AB 1414) Effective January 1, 2020.)

10609.26. (a) (1) On and after January 1, 2024, the board may issue informational orders pertaining to water production, water use, and water conservation to an urban retail water supplier that does not meet its urban water use objective required by this chapter. Informational orders are intended to obtain information on supplier activities, water production, and conservation efforts in order to identify technical assistance needs and assist urban water suppliers in meeting their urban water use objectives.

(2) In determining whether to issue an informational order, the board shall consider the degree to which the urban retail water supplier is not meeting its urban water use objective, information provided in the report required by Section 10609.24, and actions the urban retail water supplier has implemented or will implement in order to help meet the urban water use objective.

(3) The board shall share information received pursuant to this subdivision with the department.

(4) An urban water supplier may request technical assistance from the department. The technical assistance may, to the extent available, include guidance documents, tools, and data.

(b) On and after January 1, 2025, the board may issue a written notice to an urban retail water supplier that does not meet its urban water use objective required by this chapter. The written notice may warn the urban retail water supplier that it is not meeting its urban water use objective described in Section 10609.20 and is not making adequate progress in meeting the urban water use objective, and may request that the urban retail water supplier address areas of concern in its next annual report required by Section 10609.24. In deciding whether to issue a written notice, the board may consider whether the urban retail water supplier has received an informational order, the degree to which the urban retail water supplier is not meeting its urban water use objective, information provided in the report required by Section 10609.24, and actions the urban retail water supplier has implemented or will implement in order to help meet its urban water use objective.

(c) (1) On and after January 1, 2026, the board may issue a conservation order to an urban retail water supplier that does not meet its urban water use objective. A conservation order may consist of, but is not limited to, referral to the department for technical assistance, requirements for education and outreach, requirements for local enforcement, and other efforts to assist urban retail water suppliers in meeting their urban water use objective.

(2) In issuing a conservation order, the board shall identify specific deficiencies in an urban retail water supplier’s progress towards meeting its urban water use objective, and identify specific actions to address the deficiencies.

(3) The board may request that the department provide an urban retail water supplier with technical assistance to support the urban retail water supplier’s actions to remedy the deficiencies.

(d) A conservation order issued in accordance with this chapter may include requiring actions intended to increase water-use efficiency, but shall not curtail or otherwise limit the exercise of a water right, nor shall it require the imposition of civil liability pursuant to Section 377.

(Amended by Stats. 2019, Ch. 239, Sec. 6. (AB 1414) Effective January 1, 2020.)

10609.27. Notwithstanding Section 10609.26, the board shall not issue an information order, written notice, or conservation order pursuant to Section 10609.26 if both of the following conditions are met:

(a) The board determines that the urban retail water supplier is not meeting its urban water use objective solely because the volume of water loss exceeds the urban retail water supplier’s standard for water loss.

(b) Pursuant to Section 10608.34, the board is taking enforcement action against the urban retail water supplier for not meeting the performance standards for the volume of water losses.

(Added by Stats. 2019, Ch. 203, Sec. 1. (SB 134) Effective January 1, 2020.)

10609.28. The board may issue a regulation or informational order requiring a wholesale water supplier, an urban retail water supplier, or a distributor of a public water supply, as that term is used in Section 350, to provide a monthly report relating to water production, water use, or water conservation.

(Added by Stats. 2018, Ch. 14, Sec. 12. (SB 606) Effective January 1, 2019.)

10609.30. On or before January 10, 2024, the Legislative Analyst shall provide to the appropriate policy committees of both houses of the Legislature and the public a report evaluating the implementation of the water use efficiency standards and water use reporting pursuant to this chapter. The board and the department shall provide the Legislative Analyst with the available data to complete this report.

(a) The report shall describe all of the following:

(1) The rate at which urban retail water users are complying with the standards, and factors that might facilitate or impede their compliance.

(2) The accuracy of the data and estimates being used to calculate urban water use objectives.

(3) Indications of the economic impacts, if any, of the implementation of this chapter on urban water suppliers and urban water users, including CII water users.

(4) The frequency of use of the bonus incentive, the volume of water associated with the bonus incentive, value to urban water suppliers of the bonus incentive, and any implications of the use of the bonus incentive on water use efficiency.

(5) The early indications of how implementing this chapter might impact the efficiency of statewide urban water use.

(6) Recommendations, if any, for improving statewide urban water use efficiency and the standards and practices described in this chapter.

(7) Any other issues the Legislative Analyst deems appropriate.

(Added by Stats. 2018, Ch. 14, Sec. 13. (SB 606) Effective January 1, 2019.)

10609.32. It is the intent of the Legislature that the chairperson of the board and the director of the department appear before the appropriate policy committees of both houses of the Legislature on or around January 1, 2026, and report on the implementation of the water use efficiency standards and water use reporting pursuant to this chapter. It is the intent of the Legislature that the topics to be covered include all of the following:

(a) The rate at which urban retail water suppliers are complying with the standards, and factors that might facilitate or impede their compliance.

(b) What enforcement actions have been taken, if any.

(c) The accuracy of the data and estimates being used to calculate urban water use objectives.

(d) Indications of the economic impacts, if any, of the implementation of this chapter on urban water suppliers and urban water users, including CII water users.

(e) The frequency of use of the bonus incentive, the volume of water associated with the bonus incentive, value to urban water suppliers of the bonus incentive, and any implications of the use of the bonus incentive on water use efficiency.

(f) An assessment of how implementing this chapter is affecting the efficiency of statewide urban water use.

(Added by Stats. 2018, Ch. 14, Sec. 14. (SB 606) Effective January 1, 2019.)

10609.34. Notwithstanding Section 15300.2 of Title 14 of the California Code of Regulations, an action of the board taken under this chapter shall be deemed to be a Class 8 action, within the meaning of Section 15308 of Title 14 of the California Code of Regulations, provided that the action does not involve relaxation of existing water conservation or water use standards.

(Added by Stats. 2018, Ch. 14, Sec. 15. (SB 606) Effective January 1, 2019.)

10609.36. (a) Nothing in this chapter shall be construed to determine or alter water rights. Sections 1010 and 1011 apply to water conserved through implementation of this chapter.

(b) Nothing in this chapter shall be construed to authorize the board to update or revise water use efficiency standards authorized by this chapter except as explicitly provided in this chapter. Authorization to update the standards beyond that explicitly provided in this chapter shall require separate legislation.

(c) Nothing in this chapter shall be construed to limit or otherwise affect the use of recycled water as seawater barriers for groundwater salinity management.

(Added by Stats. 2018, Ch. 14, Sec. 16. (SB 606) Effective January 1, 2019.)

10609.38. The board may waive the requirements of this chapter for a period of up to five years for any urban retail water supplier whose water deliveries are significantly affected by changes in water use as a result of damage from a disaster such as an earthquake or fire. In establishing the period of a waiver, the board shall take into consideration the breadth of the damage and the time necessary for the damaged areas to recover from the disaster.

(Added by Stats. 2018, Ch. 14, Sec. 17. (SB 606) Effective January 1, 2019.)

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DIVISION 6. CONSERVATION, DEVELOPMENT, AND UTILIZATION OF STATE WATER RESOURCES [10000 - 12999]
(Heading of Division 6 amended by Stats. 1957, Ch. 1932.)

PART 2.6. URBAN WATER MANAGEMENT PLANNING [10610 - 10657] *(Part 2.6 added by Stats. 1983, Ch. 1009, Sec..)*

CHAPTER 1. General Declaration and Policy [10610 - 10610.4] *(Chapter 1 added by Stats. 1983, Ch. 1009, Alec. 1.)*

10610 This part shall be known and may be cited as the “Urban Water Management Planning Act.”

(Added by Stats. 1983, Ch. 1009, Sec. 1.)

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California’s businesses and economic climate, and increasing long-term water conservation among Californians, improving water use efficiency within the state’s communities and agricultural production, and strengthening local and regional drought planning are critical to California‘s resilience to drought and climate change.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years now and into the foreseeable future, and every urban water supplier should collaborate closely with local land-use authorities to ensure water demand forecasts are consistent with current land-use planning.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.

(7) Water quality regulations are becoming an increasingly important factor in water agencies‘ selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.

(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.

(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

(Amended by Stats. 201B, Ch. 14, Sec. 18. (SB 606) Effective January 1, 201 9.)

10610.4 The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

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CHAPTER 2. Definitions [10611 - 1 0618] ***(Chapter 2 added by Stats. 1983, Ch. 1009, iec. 1.)***

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

(Added by Stats. 1983, Ch. 1009, Sec. 1.)

10611.3 "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

Added by renumbering Section 10612 by Stats. 2018, Ch. 14, Sec. 20. (SB 606) Effective January 1, 2019.)

10611.5 "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

(Amended by Stats. 1995, Ch. 854, Sec. 3. Effective January 1, 1996.)

10612 "Drought risk assessment" means a method that examines water shortage risks based on the driest five- year historic sequence for the agency's water supply, as described in subdivision (b) of Section 10635.

(Added by Stats. 2018, Ch. 14, Sec. 21. (SB 606) Effective January 1, 201 9.)

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

(Added by :3tats. 1983, Ch. 1009, Exec. 1.)

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

(Added by Stats. 1983, Ch. 1009, Sec. 1.)

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

(Amended by Stats. 1995, *Ch. 854, Sec. 4. Effective January 1, 1996.)*

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

(Added by Stats. 1983, Ch. 1009, Sec. 1.)

10616.5 "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

(Added by Stats. 1995, Ch. 854, Sec. 5. Effective January 1, 1996)

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

(Amended by Stats. 1996, *Ch. 1023, Sec. 428. Effective January 29, 1996.)*

10617.5. “Water shortage contingency plan” means a document that incorporates the provisions detailed in subdivision (a) of Section 10632 and is subsequently adopted by an urban water supplier pursuant to this article.

(Added by Stats. 2018, Ch. 14, Sec. 22. (SB 606) Effective January 1, 2019)

10618 “Water supply and demand assessment” means a method that looks at current year and one or more dry year supplies and demands for determining water shortage risks, as described in Section 10632.1.

(Added by Stats. 2018, Ch. 14, Sec. 23 (SB 606). Effective January 1, 2019)

CHAPTER 3. Urban Water Management Plans [10620 - 10645] *(Chapter 3 added by* Stabs. *1983, Ch. 1009, Sec. 1.)*

ARTICLE 1. General Provisions [10620 - 1 0621] *(Article 1 added by Stats. 1 983, Ch. 1009, Sec. 1.)*

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (I) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation, efficient water use, and improved local drought resilience.

(2) Notwithstanding paragraph (1), each urban water supplier shall develop its own water shortage contingency plan, but an urban water supplier may incorporate, collaborate, and otherwise share information with other urban water suppliers or other governing entities participating in an areawide, regional, watershed, or basinwide urban water management plan, an agricultural management plan, or groundwater sustainability plan development.

(3) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

(Amended by Stats. 2018, Ch. 14, Sec. 24. (SB 606) Effective January 1, 2019.)

10621 (a) Each urban water supplier shall update its plan at least once every five years on or before July 1, in years ending in six and one, incorporating updated and new information from the five years preceding each update.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) An urban water supplier regulated by the Public Utilities Commission shall include its most recent plan and water shortage contingency plan as part of the supplier's general rate case filings.

(d) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640)

(e) Each urban water supplier shall update and submit its 2015 plan to the department by July1, 2016

(f) Each urban water supplier shall update and submit its 2020 plan to the department by July 1,2021

(Amended by Stats. 2019, Ch. 239, Sec. 7. (AB 1414) Effective January 1, 2020.)

CHAPTER 3. Urban Water Management Plans [10620 - 10645] *(Chapter 3 added by Stats. 1983, Ch. 1009, Sec. 1.)*

ARTICLE 2. Contents of Plans [10630 - 1 0634] *(Article 2 added by Stats. 1 983, Ch. 1009, Sec. 1.)*

10630 It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied, while accounting for impacts from climate change.

(Amended by Stats. 2018, Ch. 14, Sec. 26. (SB 606) Effective January 1, 201 9.)

10630.5 Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency's strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency's plan.

(Added by Stats. 2018, Ch. 14, Sec. 27. (SB 606) Effective January 1, 2019.)

10631 A plan shall be adopted in accordance with this chapter that shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other social, economic, and demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available. The description shall include the current and projected land uses within the existing or anticipated service area affecting the supplier's water management planning. Urban water suppliers shall coordinate with local or regional land use authorities to determine the most appropriate land use information, including, where appropriate, land use information obtained from local or regional land use authorities, as developed pursuant to Article 5 (commencing with Section 65300) of Chapter 3 of Division 1 of Title 7 of the Government Code.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information, including all of the following:

(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

(2) When multiple sources of water supply are identified, a description of the management of each supply in correlation with the other identified supplies.

(3) For any planned sources of water supply, a description of the measures that are being undertaken to acquire and develop those water supplies.

(4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information:

The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.

(A) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).

(B) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(C) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(d) (I) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(3) (A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(C) In the plan due July 1, 2021, and in each update thereafter, data shall be included to show whether the urban retail water supplier met the distribution loss standards enacted by the board pursuant to Section 10608.34.

(4) (A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use

plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

(e) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) For the supplement required of urban retail water suppliers by paragraph (2) of subdivision (f) of Section 10621, a narrative that describes the water demand management measures that the supplier plans to implement to achieve its urban water use objective by January 1, 2027, pursuant to Chapter 9 (commencing with Section 10609) of Part 2.55.

(C) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph (C) of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

(f) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single-dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(g) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

(Amended by Stats. 2018, Ch. 14, Sec. 28. (SB 606) Effective January 1, 2019.)

10631 1 (a) The water use projections required by Section 10631 shall include projected water use for single- family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

(b) It is the intent of the Legislature that the identification of projected water use for single-family and multifamily residential housing for lower income households will assist a supplier in complying with the requirement under Section 65589.7 of the Government Code to grant a priority for the provision of service to housing units affordable to lower income households.

(Added by Stats. 2005, Ch. 727, Sec. 2. Effective January 1, 2006.)

10631.2. (a) In addition to the requirements of Section 10631, an urban water management plan shall include any of the following information that the urban water supplier can readily obtain:

(1) An estimate of the amount of energy used to extract or divert water supplies.

(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.

(3) An estimate of the amount of energy used to treat water supplies.

(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.

(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.

(6) An estimate of the amount of energy used to place water into or withdraw from storage.

(7) Any other energy-related information the urban water supplier deems appropriate.

(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

(c) The Legislature finds and declares that energy use is only one factor in water supply planning and shall not be considered independently of other factors.

(Amended by Stats. 2018, Ch. 14, Sec. 29. *(SB* 606a *Effective January 1, 2019.)*

10632 (a) Every urban water supplier shall prepare and adopt a water shortage contingency plan as part of its urban water management plan that consists of each of the following elements:

(1) The analysis of water supply reliability conducted pursuant to Section 10635.

(2) The procedures used in conducting an annual water supply and demand assessment

that include, at a minimum, both of the following:

(A) The written decision making process that an urban water supplier will use each year to determine its water supply reliability.

(B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:

(i) Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.

(ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.

(iii) Existing infrastructure capabilities and plausible constraints.

(iv) A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment.

(v) A description and quantification of each source of water supply.

(3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.

(B) An urban water supplier with an existing water shortage contingency plan that uses different water shortage levels may comply with the requirement in subparagraph (A) by developing and including a cross-reference relating its existing categories to the six standard water shortage levels.

(4) Shortage response actions that align with the defined shortage levels and include, at a minimum, all of the following:

(A) Locally appropriate supply augmentation actions. Locally appropriate demand reduction actions to adequately respond to shortages.

(B) Locally appropriate operational changes.

(C) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions.

(D) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action.

(5) Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all of the following:

(A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1.

(B) Any shortage response actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1.

(C) Any other relevant communications.

(6) For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption

procedures for triggered shortage response actions as determined pursuant to Section 10632.2.

(7) (A) A description of the legal authorities that empower the urban water supplier to implement and enforce its shortage response actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions.

(B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1.

(C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code.

(8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:

(A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).

(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).

(C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1.

(9) For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.

(10) Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed.

(b) For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

(c) The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan.

(Repealed and added by Stats. 2018, Ch. 14, Sec. 32. (SB 606) Effective January 1, 2019.)

10632.1 An urban water supplier shall conduct an annual water supply and demand assessment pursuant to subdivision (a) of Section 10632 and, on or before June 1 of each year, submit an annual water shortage assessment report to the department with information for anticipated shortage, triggered shortage response actions, compliance and enforcement actions, and communication actions consistent with the supplier's water shortage contingency plan. An urban water supplier that relies on imported water from the State Water Project or the Bureau of Reclamation shall submit its annual water supply and demand assessment within 14 days of receiving its final allocations, or by June 1 of each year, whichever is later.

(Added by Stats. 2018, Ch. 14, Sec. 33. (SB 606) Effective January 1, 2019.)

10632.2. An urban water supplier shall follow, where feasible and appropriate, the prescribed procedures and implement determined shortage response actions in its water shortage contingency plan, as identified in subdivision

(a) of Section 10632, or reasonable alternative actions, provided that descriptions of the alternative actions are submitted with the annual water shortage assessment report pursuant to Section

10632.1. Nothing in this section prohibits an urban water supplier from taking actions not specified in its water shortage contingency plan, if needed, without having to formally amend its urban water management plan or water shortage contingency plan.

(Added by Stats. 2018, Ch. 14, Sec. 34. (SB 606) Effective January 1, 2019.)

10632.3 It is the intent of the Legislature that, upon proclamation by the Governor of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, the board defer to implementation of locally adopted water shortage contingency plans to the extent practicable.

(Added by Stats. 2018, Ch. 14, Sec. 35. (SB 606) Effective January 1, 2019.)

10632.5 (a) In addition to the requirements of paragraph (3) of subdivision (a) of Section 10632, beginning January 1, 2020, the plan shall include a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities.

(b) An urban water supplier shall update the seismic risk assessment and mitigation plan when updating its urban water management plan as required by Section 10621.

(c) An urban water supplier may comply with this section by submitting, pursuant to Section 10644, a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk.

(Added by Stats. 2015, Ch. 681, Sec. 1. (SB 664a *Effective January 1, 2OJ* 6.g

10633 The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier’s service area, and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier’s service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

(c) A description of the recycled water currently being used in the supplier‘s service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier’s service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier’s service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

(Amended by Stats. 2009, Ch. 534, Sec. 2. (AB 1465) Effective January 1, 2010.)

10634 The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

(Added by Stats. 2001, Ch. 644, Sec. 3. Effective January 1, 2002.)

CHAPTER 3. Urban Water Management Plans [10620 - 10645] ***(Chapter 3 added by*** **Stabs.** ***1983, Ch. 1009, Sec. 1.)***

ARTICLE 2.5. Water Service Reliability [10635- 10635.] ***(Article 2.5 added by Stats. 1995, Ch. 854, Sec. 11.)***

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following:

(1) A description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts five consecutive water years, starting from the year following when the assessment is conducted.

(2) A determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.

(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

(c) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(d) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(e) Nothing in this article is intended to change existing law concerning an urban water supplier’s obligation to provide water service to its existing customers or to any potential future customers

(Amended by Stats. 2018, Ch. 14, Sec. 36. (SB 606) Effective January 1, 2019.)

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CHAPTER 3. Urban Water Management Plans [10620 - 10645] *(Chapter 3 added by* Stabs. *1983, Ch. 1009, Sec. 1.)*

ARTICLE 3. Adoption and Implementation of Plans [1 0640 - 10645] *Article 3 added by Stats. 1983, Ch. 1009, Sec. 1.)*

10640. (a) Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630). The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

(b) Every urban water supplier required to prepare a water shortage contingency plan shall prepare a water shortage contingency plan pursuant to Section 10632. The supplier shall likewise periodically review the water shortage contingency plan as required by paragraph (10) of subdivision (a) of Section 10632 and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

(Amended by Stats. 2018, Ch. 14, Sec. 37. (SB 606a *Effective January 1, 2OJ* 9.g

10641 An urban water supplier required to prepare a plan or a water shortage contingency plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

(Amended by Stats. 2018, Ch. 14, Sec. 38. (SB 606a *Effective January 1, 20J* 9.g

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of both the plan and the water shortage contingency plan. Prior to adopting either, the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon. Prior to any of these hearings, notice of the time and place of the hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies. Notices by a local public agency pursuant to this section shall be provided pursuant to Chapter 17.5 (commencing with Section 7290) of Division 7 of Title 1 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.

(Amended by Stats. 2018, Ch. 14, Sec. 39. (SB 606$ *Effective January 1, 70J* 9.g

10643 An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

(Added by Stats. 1983, Ch. 1009, Sec. 1.)

10644 (a) (1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1)

shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) If an urban water supplier revises its water shortage contingency plan, the supplier shall submit to the department a copy of its water shortage contingency plan prepared pursuant to subdivision (a) of Section 10632 no later than 30 days after adoption, in accordance with protocols for submission and using electronic reporting tools developed by the department.

(c) (1) (A) Notwithstanding Section 10231.5 of the Government Code, the department shall prepare and submit to the Legislature, on or before July 1, in the years ending in seven and two, a report summarizing the status of the plans and water shortage contingency plans adopted pursuant to this part. The report prepared by the department shall identify the exemplary elements of the individual plans and water shortage contingency plans. The department shall provide a copy of the report to each urban water supplier that has submitted its plan and water shortage contingency plan to the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans and water shortage contingency plans submitted pursuant to this part.

(B) The department shall prepare and submit to the board, on or before September 30 of each year, a report summarizing the submitted water supply and demand assessment results along with appropriate reported water shortage conditions and the regional and statewide analysis of water supply conditions developed by the department. As part of the report, the department shall provide a summary and, as appropriate, urban water supplier specific information regarding various shortage response actions implemented as a result of annual supplier-specific water supply and demand assessments performed pursuant to Section 10632.1.

(C) The department shall submit the report to the Legislature for the 2015 plans by July 1, 2017, and the report to the Legislature for the 2020 plans and water shortage contingency plans by July 1, 2022.

(2) A report to be submitted pursuant to subparagraph (A) of paragraph (1) shall be submitted in compliance with Section 9795 of the Government Code.

(d) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

(Amended by Stats. 2018, Ch. 14, Sec. 40. (SB 606) Effective January 1, 2019.)

10645. (a) Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

(b) Not later than 30 days after filing a copy of its water shortage contingency plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

(Amended by Stats. 2018, Ch. 14, Sec. 41. (SB 606) Effective January 1, 201 9.)

CHAPTER 4. Miscellaneous Provisions [1 0650 - 10657] *(Chapter 4 added by :itats. 1 983, Ch. 1009, iec. 1.)*

10650 Any actions or proceedings, other than actions by the board, to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan or a water shortage contingency plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan or water shortage contingency plan, or action taken pursuant to either, does not comply with this part shall be commenced within 90 days after filing of the plan or water shortage contingency plan or an amendment to either pursuant to Section 10644 or the taking of that action.

(Amended by Stats. 2018, Ch. 14, Sec. 42. (SB 606) Effective January 1, 2019.)

10651 In any action or proceeding to attack, review, set aside, void, or annul a plan or a water shortage contingency plan, or an action taken pursuant to either by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

(Amended by Stats. 2018, Ch. 14, Sec. 43. (SB 606) *Effective January 1, 2019*

10652 The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

(Amended by Stats. 1995, Ch. 854, Sec. 6. *Effective January 1, 1996.)*

10653 The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the board and the Public Utilities Commission, for the preparation of water management plans, water shortage contingency plans, or conservation plans; provided, that if the board or the Public Utilities Commission requires additional information concerning water conservation, drought response measures, or financial conditions to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan that complies with analogous federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

(Amended by Stats. 2018, Ch. 14, Sec. 45. (SB 606) *Effective January 1, 2019)*

10654 An urban water supplier may recover in its rates the costs incurred in preparing its urban water management plan, its drought risk assessment, its water supply and demand assessment, and its water shortage contingency plan and implementing the reasonable water conservation measures included in either of the plans.

(Amended by Stats. 2018, Ch. 14, Sec. 44. (SB 606) *Effective January 1, 2019)*

10655 If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

(Amended by Stats. 1983, Ch. 1009, Sec. 1)

10656 An urban water supplier is not eligible for a water grant or loan awarded or administered by the state unless the urban water supplier complies with this part.

(Amended by Stats. 2018, Ch. 14, Sec. 46. (SB 606) *Effective January 1, 2019)*

10657 The department may adopt regulations regarding the definitions of water, water use, and reporting periods, and may adopt any other regulations deemed necessary or desirable to implement this part. In developing regulations pursuant to this section, the department shall solicit broad public participation from stakeholders and other interested persons.

(Amended by Stats. 2018, Ch. 14, Sec. 47. (SB 606) *Effective January 1, 2019)*

APPENDIX B

NOTICE OF PLAN PREPARATION

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
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December 28, 2021

City of Fresno
Scott Mozier
Public Works Director
2600 Fresno Street, Room 4016
Fresno, CA 93721

Subject: 2020 Urban Water Management Plan Update

Dear Mr. Mozier,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City) is currently preparing an update to their 2015 UWMP in compliance with the 2020 UWMP Guidebook. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions.

In conformance with California Water Code Section 10621(b), the City is notifying agencies and cities in the area that the City's 2020 UWMP is being renewed and updated. We invite your participation in this process. A draft plan will be made available for public review within the next month. Public hearings will be scheduled sixty (60) days before adoption of the 2020 UWMP by the City Council.

Please contact me if you have any questions or would like more information regarding the City's 2020 UWMP update.

Sincerely,

Michael

Michael Barajas
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December 28, 2021

County of Fresno
Bernard Jimenez
Assistant Director of Public Works and Planning
2220 Tulare Street, 6th Floor
Fresno, CA 93721

Subject: 2020 Urban Water Management Plan Update

Dear Mr. Jimenez,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City) is currently preparing an update to their 2015 UWMP in compliance with the 2020 UWMP Guidebook. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions.

In conformance with California Water Code Section 10621(b), the City is notifying agencies and cities in the area that the City's 2020 UWMP is being renewed and updated. We invite your participation in this process. A draft plan will be made available for public review within the next month. Public hearings will be scheduled sixty (60) days before adoption of the 2020 UWMP by the City Council.

Please contact me if you have any questions or would like more information regarding the City's 2020 UWMP update.

Sincerely,

Michael B

Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

December 28, 2021

North Kings Groundwater Sustainability Agency
Kassy Chauhan
Executive Officer
2907 S. Maple Avenue
Fresno, CA 93725

Subject: 2020 Urban Water Management Plan Update

Dear Mrs. Chauhan,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City) is currently preparing an update to their 2015 UWMP in compliance with the 2020 UWMP Guidebook. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions.

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Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

December 28, 2021

Kings Basin Water Authority
Soua Lee
Program Manager
4886 E. Jensen Avenue
Fresno, CA 93725

Subject: 2020 Urban Water Management Plan Update

Dear Soua Lee,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City) is currently preparing an update to their 2015 UWMP in compliance with the 2020 UWMP Guidebook. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions.

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Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

December 28, 2021

Fresno Irrigation District
Bill Stretch
General Manager
2907 S. Maple Ave.
Fresno, CA 93725

Subject: 2020 Urban Water Management Plan Update

Dear Mr. Stretch,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City) is currently preparing an update to their 2015 UWMP in compliance with the 2020 UWMP Guidebook. The UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions.

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Michael B

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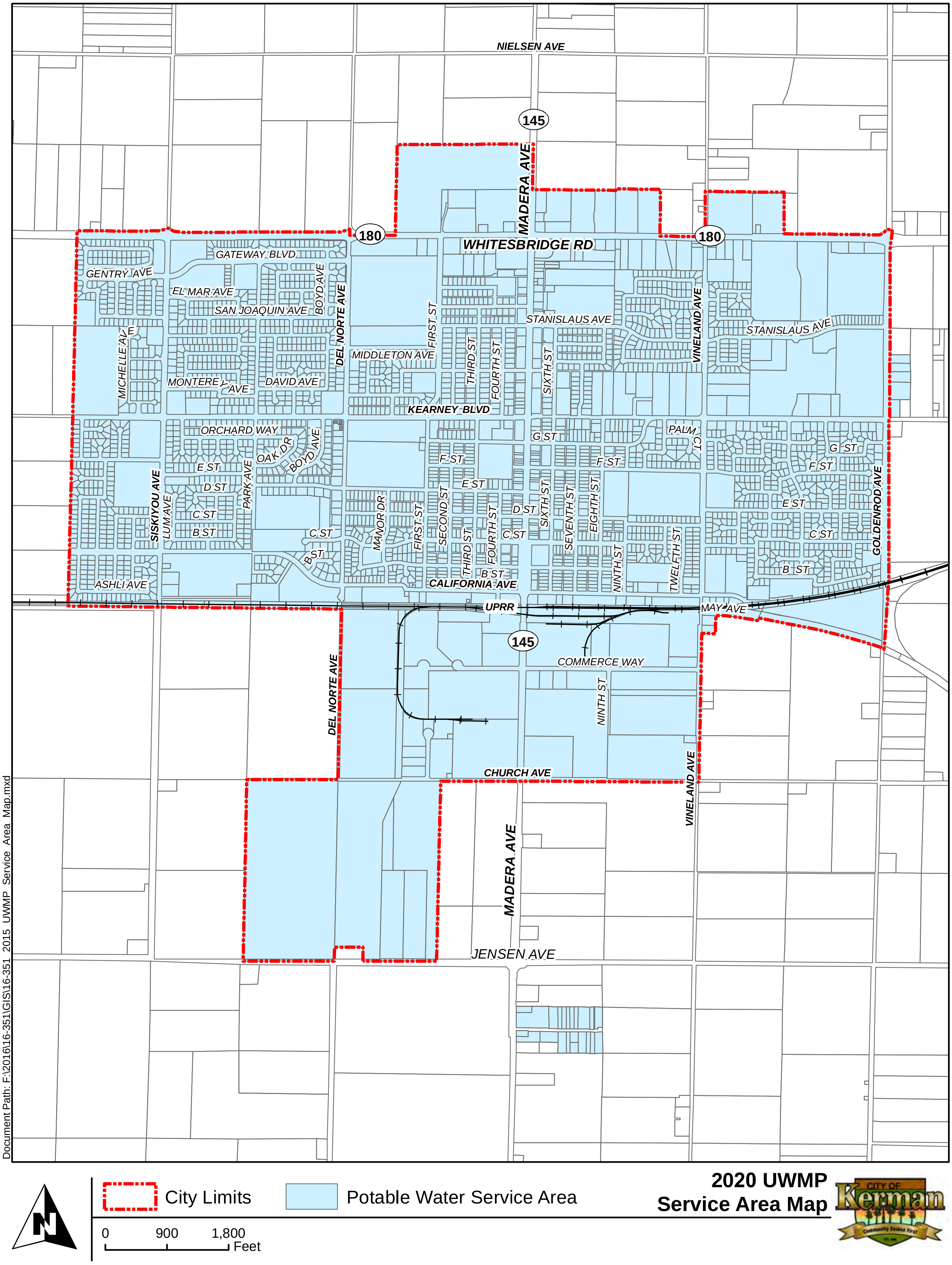
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

APPENDIX C

SERVICE AREA MAP



2020 UWMP
Service Area Map

Document Path: F:\2016\16-351\GIS\16-351_2015_UWMP_Service_Area_Map.mxd

APPENDIX D

ANNUAL WATER AUDIT REPORTS

American Water Works Association
California-Nevada Section

CA-NV AWWA Water Loss Technical Assistance Program

Wave 4 Water Audit Level 1 Validation Document

Validator Provided

Audit Information:

Utility: Kerman
PWS ID: 1010018
System Type: Potable
Audit Period: Calendar 2016
Utility Representation: Lydia Madruga, Ken Moore, Edward Vallejo
Validation Date: 5/16/2017
Call Time: 9:00am
Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 58
Data Validity Band (Level): Band III (51-70)
ILI: 1.16
Real Loss: 13.06 (gal/conn/day)
Apparent Loss: 6.40 (gal/conn/day)
Non-revenue water as percent of cost of operating system: 2.2

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: Will Jernigan
Validator Qualifications: Contractor for CA-NV AWWA Water Loss TAP

American Water Works Association
California-Nevada Section

CA-NV AWWA Water Loss Technical Assistance Program

Wave 4 Water Audit Level 1 Validation Document

Utility Provided

Water System Name: City of Kerman

Water System ID Number: 1010018

Water Audit Period: Calendar 2016

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:

1. Completed residential meter installation project; all homes are now metered.
2. Implemented annual meter calibration for meters on all water wells.
3. Implementing a random residential small meter testing program.
4. Working with programmers to utilize the SCADA system for documentation of operating pressures.

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.

Ken Moore	Director of Public Works	Ken Moore	9/21/17
Executive Name (Print)	Executive Position	Signature	Date

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person: Lydia Madruga
Email Address: lmadruga@cityofkerman.org
Telephone | Ext.: 559-846-9372
Name of City / Utility: City of Kerman
City/Town/Municipality: City of Kerman
State / Province: California (CA)
Country: USA
Year: 2016 Calendar Year

Audit Preparation Date: 3/8/2017
Volume Reporting Units: Million gallons (US)
PWSID / Other ID: 1010018

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

☐	Value can be entered by user
🟨	Value calculated based on input data
🟪	These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% ● ○ Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2016 1/2016 - 12/2016

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where

<----------- Enter grading in column 'E' and 'J' ---------->

WATER SUPPLIED

Master Meter and Supply Error Adjustments

		Grading	Value	Unit		Grading	Pcnt:		Value:	
Volume from own sources:	+ ?	7	888.248	MG/Yr	+ ?	3		○ ●	5.346	MG/Yr
Water imported:	+ ?	n/a	0.000	MG/Yr	+ ?			● ○		MG/Yr
Water exported:	+ ?	n/a	0.000	MG/Yr	+ ?			● ○		MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 882.902 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

		Grading	Value	Unit	Pcnt:		Value:	
Billed metered:	+ ?	3	486.794	MG/Yr				
Billed unmetered:	+ ?	1	300.732	MG/Yr				
Unbilled metered:	+ ?	10	16.294	MG/Yr				
Unbilled unmetered:	+ ?	1	53.210	MG/Yr		○ ●	53.210	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: ? 857.030 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

25.872 MG/Yr

Apparent Losses

		Grading	Value	Unit	Pcnt:		Value:	
Unauthorized consumption:	+ ?		2.207	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

		Grading	Value	Unit	Pcnt:		Value:	
Customer metering inaccuracies:	+ ?	3	5.082	MG/Yr	1.00%	● ○		MG/Yr
Systematic data handling errors:	+ ?		1.217	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 8.506 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 17.366 MG/Yr

WATER LOSSES: 25.872 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 95.376 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

		Grading	Value	Unit
Length of mains:	+ ?	8	59.6	miles
Number of active AND inactive service connections:	+ ?	8	3,644	
Service connection density:	?		61	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 6 47.0 psi

COST DATA

		Grading	Value	Unit
Total annual cost of operating water system:	+ ?	10	$1,554,608	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	4	$0.83	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	+ ?	5	$320.25	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 58 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Billed metered
3: Billed unmetered

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2016 1/2016 - 12/2016

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 58 out of 100 ***

System Attributes:

Apparent Losses:	8.506	MG/Yr	
+ Real Losses:	17.366	MG/Yr	
= Water Losses:	25.872	MG/Yr	
? Unavoidable Annual Real Losses (UARL):	14.91	MG/Yr	
Annual cost of Apparent Losses:	$7,060		
Annual cost of Real Losses:	$5,562		Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	10.8%	
	Non-revenue water as percent by cost of operating system:	2.2%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	6.40	gallons/connection/day
	Real Losses per service connection per day:	13.06	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.28	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	17.37	million gallons/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.16	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

WAS v5.0

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	Amounts calculated using the Compliance Test Accuracy modifiers.
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	Average Usage for unmetered homes is estimated to abe 19,000 gallons per month, 228,000 annually. 1319 unmetered accounts x 228,000 = 300,732,000 gallons.
Unbilled metered:	MOU with Kerman Unified School District; City uses playground and ball field areas as City parks after school hours. City provides irrigation to Kerman Middle School and Goldenrod Elementary for those properties.

Audit Item	Comment
Unbilled unmetered:	City parks, medians, mowstrips and building landscapes total 51 acres.Calculating average annual water for turf at 1" per week, the city uses 3.2 acre feet of water per acre annually, x 51 acres = 163.29 acre feed or 53,209,658 gallons per year.
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for: **City of Kerman (1010018)**
Reporting Year: **2016** **1/2016 - 12/2016**
Data Validity Score: **58**

<table>
<tr><td rowspan="8">Own Sources
(Adjusted for known errors)
<i>882.902</i></td><td rowspan="11">System Input
<i>882.902</i></td><td>Water Exported
<i>0.000</i></td><td colspan="3">Billed Water Exported</td><td>Revenue Water
0.000</td></tr>
<tr><td rowspan="10">Water Supplied
<i>882.902</i></td><td rowspan="4">Authorized Consumption
<i>857.030</i></td><td rowspan="2">Billed Authorized Consumption
<i>787.526</i></td><td>Billed Metered Consumption (water exported is removed)
<i>486.794</i></td><td rowspan="2">Revenue Water
787.526</td></tr>
<tr><td>Billed Unmetered Consumption
<i>300.732</i></td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
<i>69.504</i></td><td>Unbilled Metered Consumption
<i>16.294</i></td><td rowspan="8">Non-Revenue Water (NRW)
95.376</td></tr>
<tr><td>Unbilled Unmetered Consumption
<i>53.210</i></td></tr>
<tr><td rowspan="6">Water Losses
<i>25.872</i></td><td rowspan="3">Apparent Losses
<i>8.506</i></td><td>Unauthorized Consumption
<i>2.207</i></td></tr>
<tr><td>Customer Metering Inaccuracies
<i>5.082</i></td></tr>
<tr><td>Systematic Data Handling Errors
<i>1.217</i></td></tr>
<tr><td rowspan="3">Water Imported
<i>0.000</i></td><td rowspan="3">Real Losses
<i>17.366</i></td><td>Leakage on Transmission and/or Distribution Mains
<i>Not broken down</i></td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks
<i>Not broken down</i></td></tr>
<tr><td>Leakage on Service Connections
<i>Not broken down</i></td></tr>
</table>

AWWA Free Water Audit Software: Dashboard

WAS v5.0

American Water Works Association.

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

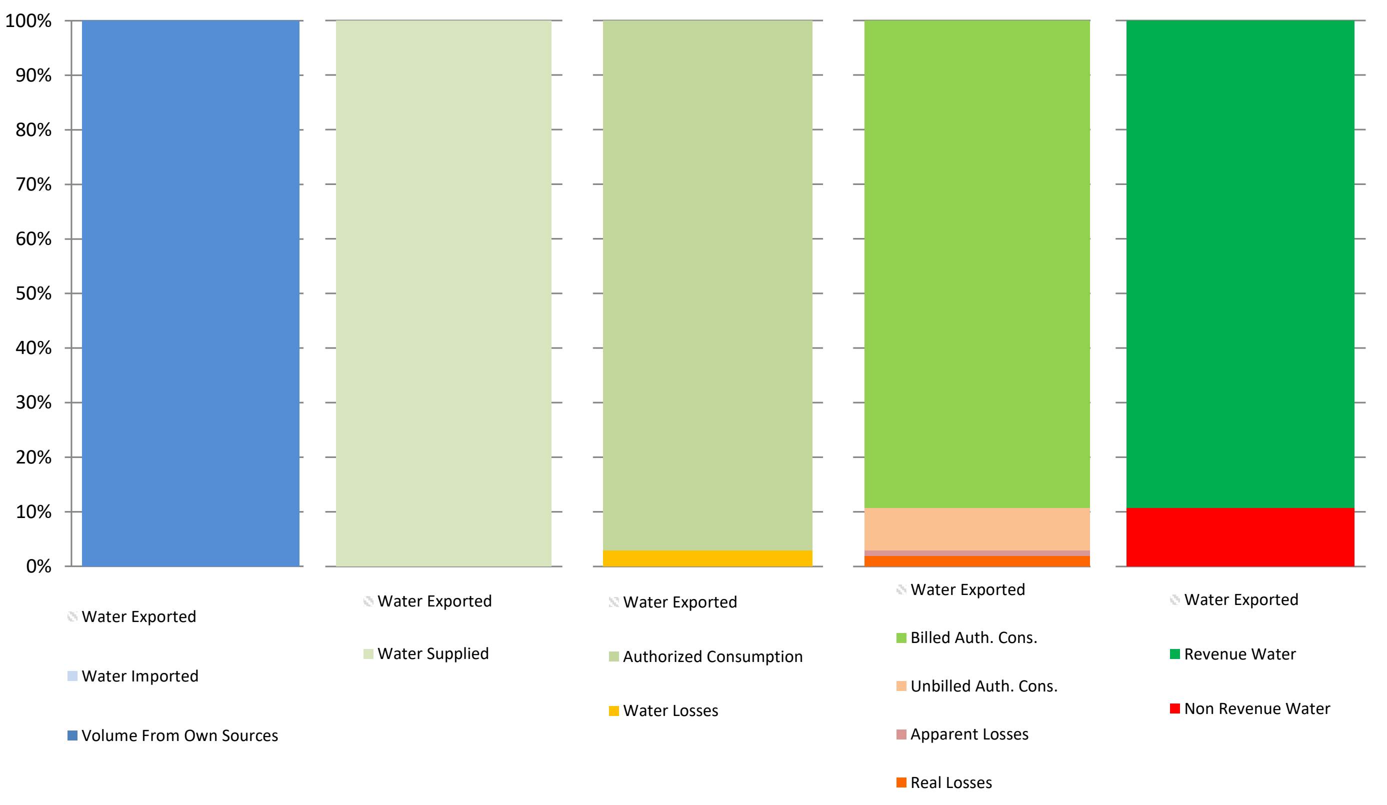
Water Audit Report for: **City of Kerman (1010018)**

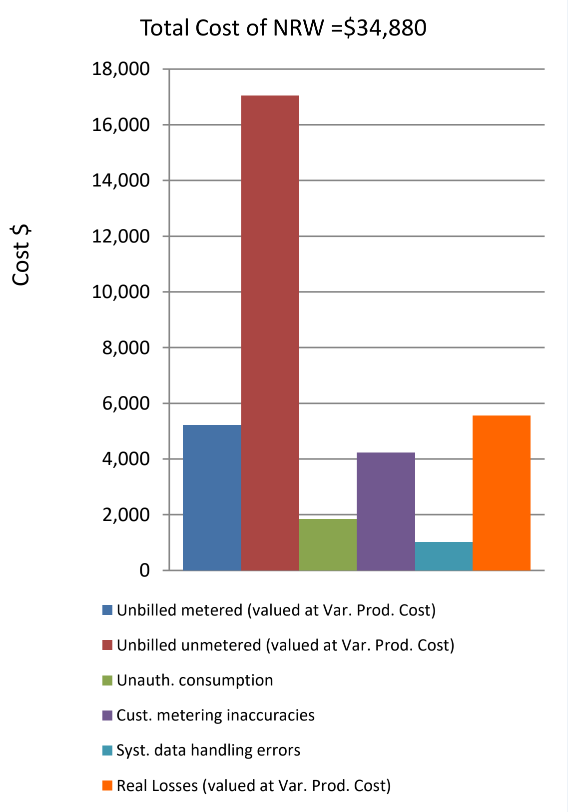
Reporting Year: **2016** **1/2016 - 12/2016**

Data Validity Score: **58**

○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:	▨	to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:	▨	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: *(Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)*	▨	to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	<u>to qualify for 4</u>: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		<u>to qualify for 6</u>: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		<u>to qualify for 8</u>: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		<u>to qualify for 10</u>: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		<u>to maintain 10</u>: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		<u>to qualify for 2:</u> Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	<u>To qualify for 4</u>: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		<u>to qualify for 6</u>: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8</u>: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10</u>: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remainding accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:	▨	Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:	▨	to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:	▨	to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:	▨	Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:	▨	to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:	▨	Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does <u>not</u> include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:	▨	to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:	▨	Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:	▨	to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:	▨	Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:	▨	to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:	▨	to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:	▨	to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2016 1/2016 - 12/2016
Data Validity Score: 58

Water Loss Control Planning Guide

	Water Audit Data Validity Level / Score				
Functional Focus Area	**Level I** (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Water Audit Level 1 Validation - Review Document

Validator Provided

Audit Information:

Utility: Kerman PWS ID: 1010018

System Type: Potable Audit Period: Calendar 2017

Utility Representation: Lydia Madruga, Ken Moore

Validation Date: 9/20/2018 Call Time: 12:00pm Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 64 Data Validity Band (Level): Band III (51-70)

ILI: 3.10 Real Loss: 33.88 (gal/conn/day) Apparent Loss: 12.11 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 3.6%

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 Validator Qualifications: Contractor for California Water Loss TAP

2017 AWWA Water Audit Level 1 Validation

Water System Name: City of Kerman **Water System ID Number:** 1010018 **Water Audit Period:** CY2017

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:

The City of Kerman installed over 1300 water meters in 2017/2018. All residential buildings are now metered. This also included meters for the remaining commercial buildings in Kerman. The only water services that are currently unmetered are the City parks, buildings and medians. They are tentatively scheduled to be metered by FY19-20.

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.

Ken Moore	Director of Public Works	Ken Moore	9/24/18
Executive Name (Print)	Executive Position	Signature	Date

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits
for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person: Lydia Madruga
Email Address: lmadruga@cityofkerman.org
Telephone | Ext.: 559-846-9372 |
Name of City / Utility: City of Kerman
City/Town/Municipality: City of Kerman
State / Province: California (CA)
Country: USA
Year: 2017 | Calendar Year

Audit Preparation Date: 4/27/2018
Volume Reporting Units: Million gallons (US)
PWSID / Other ID: 1010018

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

☐	Value can be entered by user
🟨	Value calculated based on input data
🟪	These cells contain recommended default values

Use of Option (Radio) Buttons:

Pcnt:			Value:
0.25%	●	○	

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2017 | 1/2017 - 12/2017

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where

WATER SUPPLIED

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

			Grading					Grading	Pcnt:		Value:	
Volume from own sources:	+	?	7	932.213	MG/Yr	+	?	3		○ ●	2.913	MG/Yr
Water imported:	+	?	n/a	0.000	MG/Yr	+	?			● ○		MG/Yr
Water exported:	+	?	n/a	0.000	MG/Yr	+	?			● ○		MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 929.300 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ?
for help using option buttons below

						Pcnt:		Value:	
Billed metered:	+	?	6	598.138	MG/Yr				
Billed unmetered:	+	?	5	202.703	MG/Yr				
Unbilled metered:	+	?	10	13.366	MG/Yr				
Unbilled unmetered:	+	?	4	53.210	MG/Yr		○ ●	53.210	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

AUTHORIZED CONSUMPTION: ? 867.417 MG/Yr

Use buttons to select percentage of water supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption) 61.883 MG/Yr

Apparent Losses

						Pcnt:		Value:	
Unauthorized consumption:	+	?		2.323	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	+	?	3	12.480	MG/Yr	2.00%	● ○		MG/Yr
Systematic data handling errors:	+	?		1.495	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 16.298 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 45.585 MG/Yr

WATER LOSSES: 61.883 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 128.459 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	+	?	8	59.6	miles
Number of active AND inactive service connections:	+	?	8	3,686	
Service connection density:		?		62	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 5 46.0 psi

COST DATA

Total annual cost of operating water system:	+	?	10	$1,424,426	$/Year
Customer retail unit cost (applied to Apparent Losses):	+	?	4	$0.85	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	+	?	5	$327.50	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 64 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Customer retail unit cost (applied to Apparent Losses)

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2017 | 1/2017 - 12/2017

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 64 out of 100 ***

System Attributes:

	Apparent Losses:	16.298	MG/Yr
+	Real Losses:	45.585	MG/Yr
=	Water Losses:	61.883	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	14.70	MG/Yr
	Annual cost of Apparent Losses:	$13,854	
	Annual cost of Real Losses:	$14,929	Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	13.8%	
	Non-revenue water as percent by cost of operating system:	3.6%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	12.11	gallons/connection/day
	Real Losses per service connection per day:	33.88	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.74	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	45.58	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	3.10	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	

Audit Item	Comment
Unbilled unmetered:	
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

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Water Audit Report for:	City of Kerman (1010018)	
Reporting Year:	2017	1/2017 - 12/2017
Data Validity Score:	64	

<table>
<tr><td rowspan="8">Own Sources
(Adjusted for known errors)
929.300</td><td rowspan="11">System Input
929.300</td><td>Water Exported
0.000</td><td colspan="3">Billed Water Exported</td><td>Revenue Water
0.000</td></tr>
<tr><td rowspan="10">Water Supplied
929.300</td><td rowspan="4">Authorized Consumption
867.417</td><td rowspan="2">Billed Authorized Consumption
800.841</td><td>Billed Metered Consumption (water exported is removed)
598.138</td><td rowspan="2">Revenue Water
800.841</td></tr>
<tr><td>Billed Unmetered Consumption
202.703</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
66.576</td><td>Unbilled Metered Consumption
13.366</td><td rowspan="8">Non-Revenue Water (NRW)
128.459</td></tr>
<tr><td>Unbilled Unmetered Consumption
53.210</td></tr>
<tr><td rowspan="6">Water Losses
61.883</td><td rowspan="3">Apparent Losses
16.298</td><td>Unauthorized Consumption
2.323</td></tr>
<tr><td>Customer Metering Inaccuracies
12.480</td></tr>
<tr><td>Systematic Data Handling Errors
1.495</td></tr>
<tr><td rowspan="3">Water Imported
0.000</td><td rowspan="3">Real Losses
45.585</td><td>Leakage on Transmission and/or Distribution Mains
Not broken down</td></tr>
<tr><td>Leakage and Overflows at Utility's Storage Tanks
Not broken down</td></tr>
<tr><td>Leakage on Service Connections
Not broken down</td></tr>
</table>

AWWA Free Water Audit Software:

Dashboard

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The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

Water Audit Report for:	City of Kerman (1010018)	
Reporting Year:	2017	1/2017 - 12/2017
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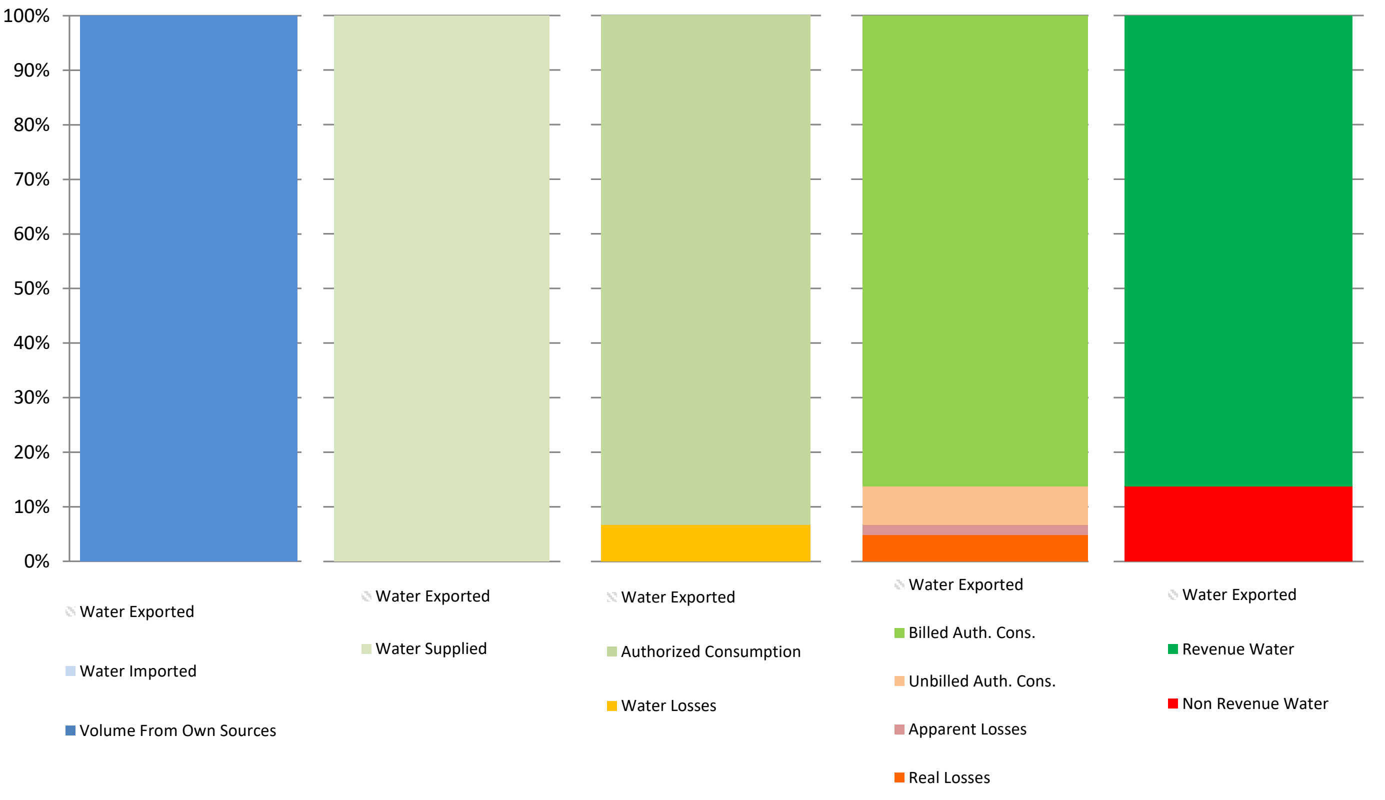
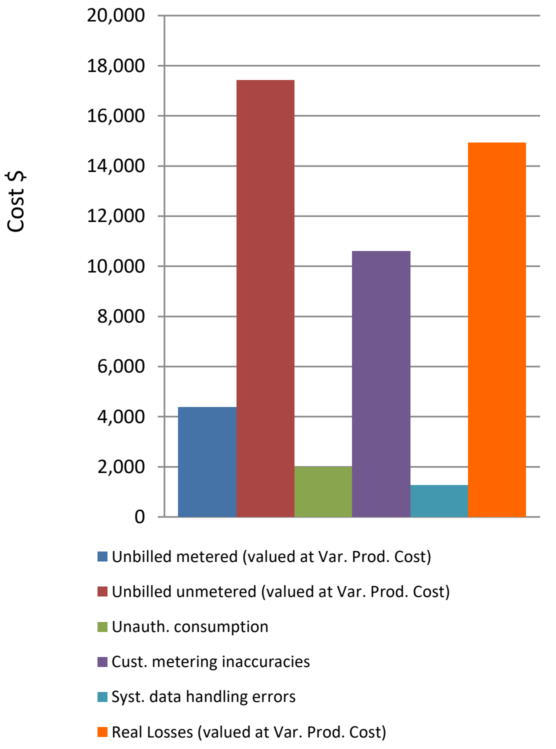
○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water



Total Cost of NRW =$50,586



AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:	▨	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remainding accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:	▨	Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:	▨	to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:	▨	to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:	▨	Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:	▨	to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:	▨	Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:	▨	Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:	▨	to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:	▨	to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:	▨	to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2017 1/2017 - 12/2017
Data Validity Score: 64

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

<u>Note:</u> this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Water Audit Level 1 Validation - Review Document

Validator Provided

Audit Information:

Utility: Kerman PWS ID: 1010018

System Type: Potable Audit Period: Calendar 2018

Utility Representation: Lydia Madruga, Ken Moore, Edward Vallejo

Validation Date: 5/21/2019 Call Time: 10:30am Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 72 Data Validity Band (Level): Band IV (71-90)

ILI: 4.40 Real Loss: 49.61 (gal/conn/day) Apparent Loss: 16.82 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 4.0%

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, Will Jernigan, P.E. Validator Qualifications: Contractor for California Water Loss TAP

Utility Provided

2018 AWWA Water Audit Level 1 Validation

Water System Name:

Water System ID Number:

Water Audit Period:

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:

- Completed water meter installation for all residential services
- Completed accuracy tests on all water well meters in the system
- Budgeted for a water meter accuracy tester to perform tests on meters
- Budgeted funds to install water meters for public parks and irrigation systems in street medians

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.

Ken Moore
Executive Name (Print)

Director of Public Works
Executive Position

Ken Moore
Signature

6/4/19
Date

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2018 | 1/2018 - 12/2018

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<----------- Enter grading in column 'E' and 'J' ---------->

		Grading	Value	Unit		Grading	Pcnt:		Value:	Unit
Volume from own sources:	+ ?	8	942.004	MG/Yr	+ ?	3		○ ●	-8.556	MG/Yr
Water imported:	+ ?	n/a	0.000	MG/Yr	+ ?			● ○		MG/Yr
Water exported:	+ ?	n/a	0.000	MG/Yr	+ ?			● ○		MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 950.560 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ?
for help using option buttons below

		Grading	Value	Unit	Pcnt:		Value:	Unit
Billed metered:	+ ?	7	786.621	MG/Yr				
Billed unmetered:	+ ?	7	0.860	MG/Yr				
Unbilled metered:	+ ?	10	17.649	MG/Yr				
Unbilled unmetered:	+ ?	4	53.210	MG/Yr		○ ●	53.210	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied
OR
value

AUTHORIZED CONSUMPTION: ? 858.340 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 92.220 MG/Yr

Apparent Losses

		Grading	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption:	+ ?		2.376	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

		Grading	Value	Unit	Pcnt:		Value:	Unit
Customer metering inaccuracies:	+ ?	3	19.011	MG/Yr		○ ●	19.011	MG/Yr
Systematic data handling errors:	+ ?		1.967	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 23.354 MG/Yr

Real Losses (Current Annual Real Losses or CARL)
Real Losses = Water Losses - Apparent Losses: ? 68.866 MG/Yr

WATER LOSSES: 92.220 MG/Yr

NON-REVENUE WATER
NON-REVENUE WATER: ? 163.079 MG/Yr
= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

		Grading	Value	Unit
Length of mains:	+ ?	8	59.6	miles
Number of active AND inactive service connections:	+ ?	8	3,803	
Service connection density:	?		64	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ? (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 6 48.0 psi

COST DATA

		Grading	Value	Unit
Total annual cost of operating water system:	+ ?	10	$1,562,318	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	7	$0.85	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	+ ?	5	$309.31	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 72 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Variable production cost (applied to Real Losses)

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2018 | 1/2018 - 12/2018

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

	Apparent Losses:	23.354	MG/Yr
+	Real Losses:	68.866	MG/Yr
=	Water Losses:	92.220	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	15.64	MG/Yr
	Annual cost of Apparent Losses:	$19,851	
	Annual cost of Real Losses:	$21,301	Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	17.2%	
	Non-revenue water as percent by cost of operating system:	4.0%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	16.82	gallons/connection/day
	Real Losses per service connection per day:	49.61	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	1.03	gallons/connection/day/psi

	From Above, Real Losses = Current Annual Real Losses (CARL):	68.87	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	4.40	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

WAS v5.0

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	

Audit Item	Comment
Unbilled unmetered:	
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for: **City of Kerman (1010018)**
Reporting Year: **2018** **1/2018 - 12/2018**
Data Validity Score: **72**

Own Sources **(Adjusted for known errors)** *950.560*	**System Input** *950.560*	**Water Exported** *0.000*	**Billed Water Exported**			**Revenue Water** **0.000**
		Water Supplied *950.560*	**Authorized Consumption** *858.340*	**Billed Authorized Consumption** *787.481*	**Billed Metered Consumption (water exported is removed)** *786.621*	**Revenue Water** **787.481**
					Billed Unmetered Consumption *0.860*	
				Unbilled Authorized Consumption *70.859*	**Unbilled Metered Consumption** *17.649*	**Non-Revenue Water (NRW)** **163.079**
					Unbilled Unmetered Consumption *53.210*	
			Water Losses *92.220*	**Apparent Losses** *23.354*	**Unauthorized Consumption** *2.376*	
					Customer Metering Inaccuracies *19.011*	
					Systematic Data Handling Errors *1.967*	
Water Imported *0.000*				**Real Losses** *68.866*	**Leakage on Transmission and/or Distribution Mains** *Not broken down*	
					Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
					Leakage on Service Connections *Not broken down*	

AWWA Free Water Audit Software:
Dashboard

WAS v5.0

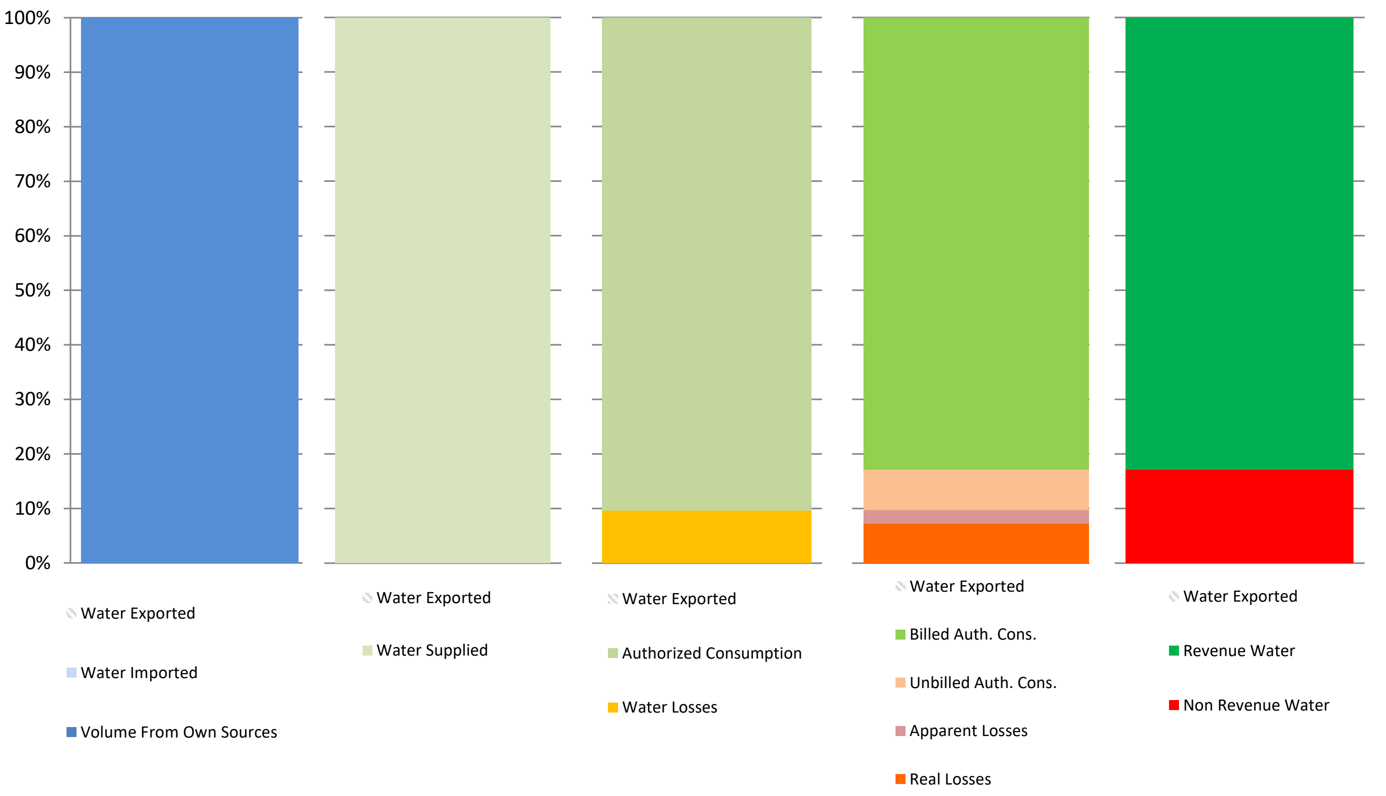
American Water Works Association.

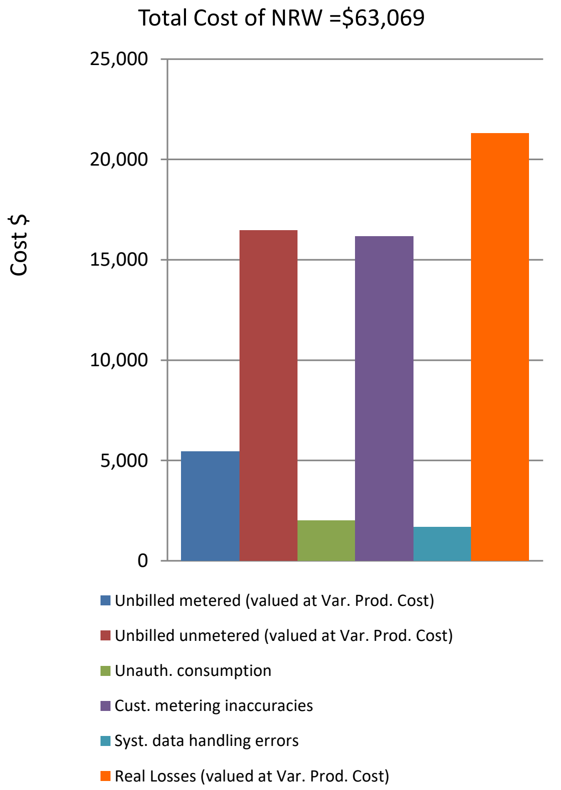
The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

Water Audit Report for:	City of Kerman (1010018)	
Reporting Year:	2018	1/2018 - 12/2018
Data Validity Score:	72	

○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:	▨	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remainding accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	**n/a**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:	▨	Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:	▨	to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:	▨	to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:	▨	to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

Water Audit Report for: City of Kerman (1010018)
Reporting Year: 2018 | 1/2018 - 12/2018
Data Validity Score: **72**

Water Loss Control Planning Guide

	Water Audit Data Validity Level / Score				
Functional Focus Area	**Level I** (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Water Audit Level 1 Validation - Review Document

Validator Provided

Audit Information:

Utility: Kerman
PWS ID: 1010018
System Type: Potable
Audit Period: Calendar 2019
Utility Representation: Lydia Madruga, Ken Moore
Validation Date: 6/30/2020
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 IV (71-90)
ILI: 4.77
Real Loss: 52.13 (gal/conn/day)
Apparent Loss: 14.49 (gal/conn/day)
Non-revenue water as percent of cost of operating system: 4.5%

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: Drew Blackwell
Validator Qualifications: Certified Water Audit Validator (CA)

2019 AWWA Water Audit Level 1 Validation

Water System Name: Kerman, City of

Water System ID Number: 1010018

Water Audit Period: CY 2019

Utility Provided

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 2019 the City of Kerman began the Xeriscaping of our medians and mow strips. We replaced pop-up sprayers with drip systems in 15 medians and mow strips, and have installed AMR meters to more accurately track water usage.

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.

Kenneth Moore	Director of Public Works	Ken Moore	8/20/20
Executive Name (Print)	Executive Position	Signature	Date

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: City of Kerman
Reporting Year: 2019 1/2019 - 12/2019

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where

<----------- Enter grading in column 'E' and 'J' ---------->

WATER SUPPLIED

					Master Meter and Supply Error Adjustments				
						Pcnt:		Value:	
Volume from own sources:	+ ?	5	935.654	MG/Yr	+ ? 3		○ ●	-8.416	MG/Yr
Water imported:	+ ?	n/a	0.000	MG/Yr	+ ?		● ○		MG/Yr
Water exported:	+ ?	n/a	0.000	MG/Yr	+ ?		● ○		MG/Yr
WATER SUPPLIED:			**944.070**	MG/Yr					

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ?
for help using option buttons below

					Pcnt:		Value:	
Billed metered:	+ ?	5	777.544	MG/Yr				
Billed unmetered:	+ ?	n/a	0.000	MG/Yr				
Unbilled metered:	+ ?	10	18.796	MG/Yr				
Unbilled unmetered:	+ ?	4	53.210	MG/Yr		○ ●	53.210	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

AUTHORIZED CONSUMPTION:	?	**849.550**	MG/Yr

Use buttons to select percentage of water supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption)

94.520 MG/Yr

Apparent Losses

					Pcnt:		Value:	
Unauthorized consumption:	+ ?		2.360	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	+ ?	3	16.252	MG/Yr	2.00%	● ○		MG/Yr
Systematic data handling errors:	+ ?		1.944	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses:	?	**20.556**	MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	?	**73.964**	MG/Yr
WATER LOSSES:		**94.520**	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER:	?	**166.526**	MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	+ ?	8	63.1	miles
Number of active AND inactive service connections:	+ ?	9	3,887	
Service connection density:	?		62	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: + ?

(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure:	+ ?	6	46.0	psi

COST DATA

Total annual cost of operating water system:	+ ?	10	$1,652,576	$/Year
Customer retail unit cost (applied to Apparent Losses):	+ ?	10	$0.98	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	+ ?	5	$368.16	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 61 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Billed metered

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.

Water Audit Report for: City of Kerman
Reporting Year: 2019 1/2019 - 12/2019

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 61 out of 100 ***

System Attributes:

	Apparent Losses:	20.556	MG/Yr
+	Real Losses:	73.964	MG/Yr
=	Water Losses:	94.520	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	15.52	MG/Yr
	Annual cost of Apparent Losses:	$20,145	
	Annual cost of Real Losses:	$27,231	Valued at Variable Production Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	17.6%	
	Non-revenue water as percent by cost of operating system:	4.5%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	14.49	gallons/connection/day
	Real Losses per service connection per day:	52.13	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	1.13	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	73.96	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	4.77	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

WAS v5.0

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	

Audit Item	Comment
Unbilled unmetered:	
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for: **City of Kerman**

Reporting Year: **2019** **1/2019 - 12/2019**

Data Validity Score: **61**

Own Sources (Adjusted for known errors) *944.070*	**System Input** *944.070*	**Water Exported** *0.000*			**Billed Water Exported**	**Revenue Water** 0.000
		Water Supplied *944.070*	**Authorized Consumption** *849.550*	**Billed Authorized Consumption** *777.544*	**Billed Metered Consumption (water exported is removed)** *777.544*	**Revenue Water** 777.544
					Billed Unmetered Consumption *0.000*	
				Unbilled Authorized Consumption *72.006*	**Unbilled Metered Consumption** *18.796*	**Non-Revenue Water (NRW)** 166.526
					Unbilled Unmetered Consumption *53.210*	
			Water Losses *94.520*	**Apparent Losses** *20.556*	**Unauthorized Consumption** *2.360*	
					Customer Metering Inaccuracies *16.252*	
					Systematic Data Handling Errors *1.944*	
Water Imported *0.000*				**Real Losses** *73.964*	**Leakage on Transmission and/or Distribution Mains** ***Not broken down***	
					Leakage and Overflows at Utility's Storage Tanks ***Not broken down***	
					Leakage on Service Connections ***Not broken down***	

AWWA Free Water Audit Software:

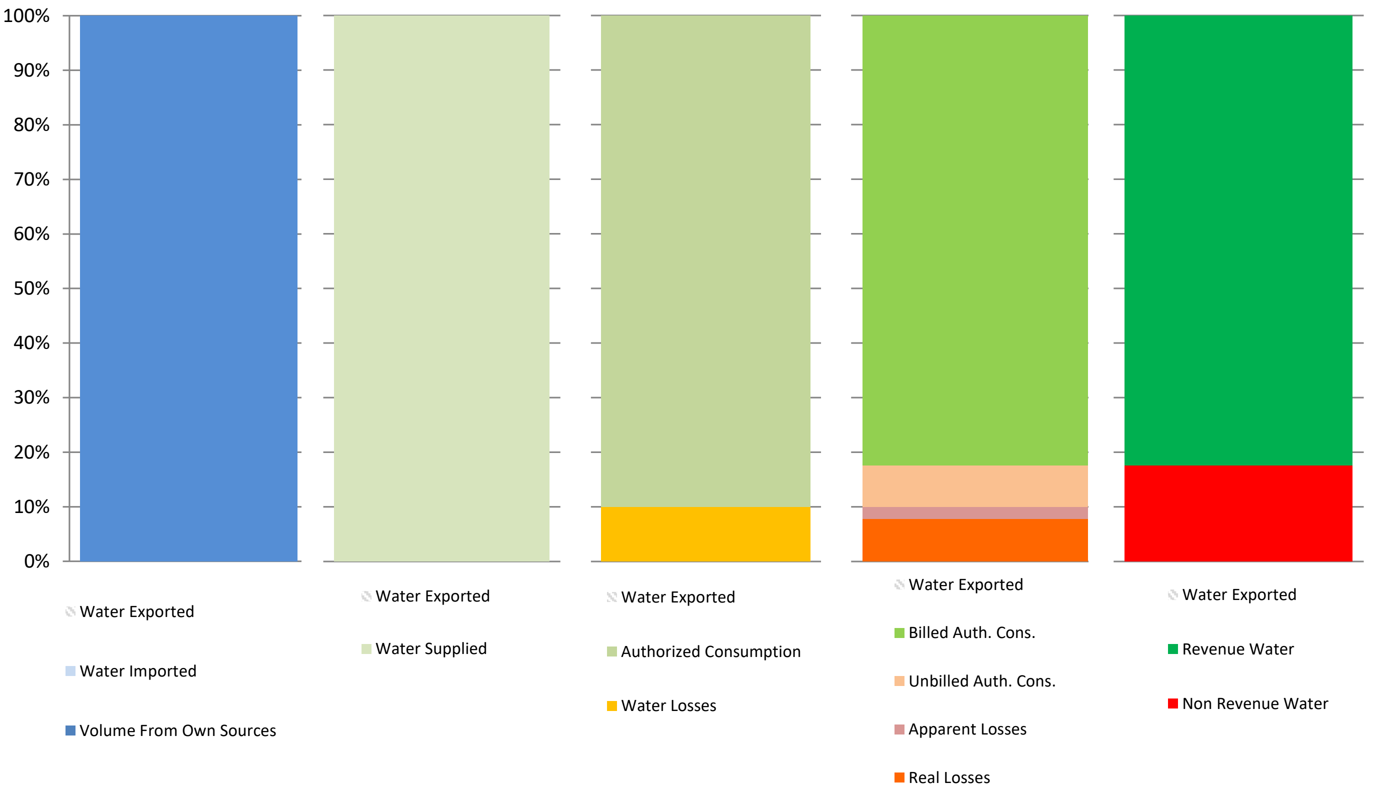
Dashboard

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

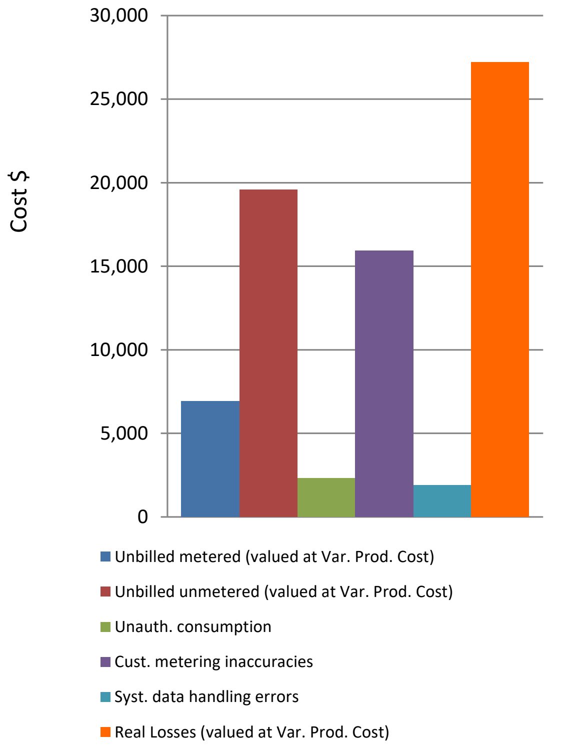
Water Audit Report for:	City of Kerman	
Reporting Year:	2019	1/2019 - 12/2019
Data Validity Score:	61	

○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water



Total Cost of NRW =$73,885



AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	**n/a**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:	▨	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remainding accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:	▨	to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:	▨	to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:	▨	Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:	▨	to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:	▨	Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:	▨	to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:	▨	to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:	▨	Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:	▨	to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:	▨	Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:	▨	to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:	▨	Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:	▨	to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:

Determining Water Loss Standing

WAS v5.0

Water Audit Report for: City of Kerman
Reporting Year: 2019 1/2019 - 12/2019
Data Validity Score: 61

Water Loss Control Planning Guide

	Water Audit Data Validity Level / Score				
Functional Focus Area	**Level I** (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

VALIDATOR PROVIDED INFORMATION

Certified Validation Report

Audit Information

Water Supplier Information: City of Kerman

PWS ID: 1010018

System Type: Potable

Audit Period: January - December 2020

Utility Representation: Michael Barajas Public Works Director and Randy Johnson, Interim Chief Plant Operator

Validation Date: October 18, 2021

Interview Time: 1:15 pm

Validation Findings & Confirmation Statement

Key Audit Metrics

Data Validity Score: 65

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

ILI: 4.79

Real Loss: 52.36 gallons/connection/day

Non-Revenue Water as Percent by Cost of Operating System: S.2%

Apparent Loss: 9.44 gallons/connection/day

Certification Statement By Validator

This water loss audit report has been Level One (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 the volume derivation and Data Validity Grades were incorporated into the water audit
If not, rejected recommendations are included here:

Validator Information

Water Audit Validator: Angela Hall
Qualifications: Water Audit Validator Certificate issued by the CA-NV Section of the AWWA

UTILITY PROVIDED INFROMATION

Water Supplier Name: City of Kerman
Water Supplier ID Number: 1010018
Water Audit Period: January - December 2020

Water Audit & Water Loss Improvement Steps:

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

To reduce real loss and apparent loss as informed by the annual Water Audit, the City of Kerman plans to install radio read meters at all City owned parks. As demonstrated in this 2020 Water Audit, the City does not meter water that is used to irrigate City owned landscape areas, such as 51 acres of parks, medians, mow strips, and government building landscape areas. The City is also actively removing turf from City owned medians and replacing them with drought tolerant plants and installing drip irrigation.

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 Audit and Loss Control Programs, Manual M36, Fourth Edition* and in the Free Water Audit Software version 5.

Name (Print)
Michael Barajas

Title
Public Works Director

Signature
Michael B

Date
10/21/2021

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person: Michael Barajas
Email Address: MBarajas@cityofkerman.org
Telephone | Ext.:
Name of City / Utility: City of Kerman
City/Town/Municipality: Kerman
State / Province: California (CA)
Country: Fresno
Year: 2020 Calendar Year

Audit Preparation Date: 9/21/2021
Volume Reporting Units: Million gallons (US)
PWSID / Other ID: CA1010018

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

☐	Value can be entered by user
🟨	Value calculated based on input data
🟪	These cells contain recommended default values

Use of Option (Radio) Buttons:	Pcnt:			Value:
	0.25%	●	○	

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0
American Water Works Association.

? Click to access definition
\+ Click to add a comment

Water Audit Report for: City of Kerman (CA1010018)
Reporting Year: 2020 | 1/2020 - 12/2020

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

	Grading	Value	Unit	Grading	Pcnt:		Value:	Unit
Volume from own sources:	6	1,009.548	MG/Yr	3		● ○		MG/Yr
Water imported:	n/a	0.000	MG/Yr			● ○		MG/Yr
Water exported:	n/a	0.000	MG/Yr			● ○		MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: **1,009.548** MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grading	Value	Unit	Pcnt:		Value:	Unit
Billed metered:	6	849.913	MG/Yr				
Billed unmetered:	n/a	0.000	MG/Yr				
Unbilled metered:	9	18.579	MG/Yr				
Unbilled unmetered:	4	53.210	MG/Yr		○ ●	53.210	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied
OR
value

AUTHORIZED CONSUMPTION: **921.702** MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

87.846 MG/Yr

Apparent Losses

	Grading	Value	Unit	Pcnt:		Value:	Unit
Unauthorized consumption:		2.524	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

	Grading	Value	Unit	Pcnt:		Value:	Unit
Customer metering inaccuracies:	4	8.773	MG/Yr	1.00%	● ○		MG/Yr
Systematic data handling errors:		2.125	MG/Yr	0.25%	● ○		MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: **13.421** MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: **74.425** MG/Yr

WATER LOSSES: **87.846** MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **159.635** MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grading	Value	Unit
Length of mains:	8	63.1	miles
Number of active AND inactive service connections:	10	3,894	
Service connection density:		62	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 8 | 46.0 psi

COST DATA

	Grading	Value	Unit
Total annual cost of operating water system:	10	$1,784,669	$/Year
Customer retail unit cost (applied to Apparent Losses):	8	$2.59	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	5	$394.66	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 65 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Customer metering inaccuracies

3: Billed metered

AWWA Free Water Audit Software:

System Attributes and Performance Indicators

WAS v5.0

American Water Works Association.

Water Audit Report for: City of Kerman (CA1010018)

Reporting Year: 2020 1/2020 - 12/2020

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 65 out of 100 ***

System Attributes:

	Apparent Losses:	13.421	MG/Yr
+	Real Losses:	74.425	MG/Yr
=	Water Losses:	87.846	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	15.54	MG/Yr
	Annual cost of Apparent Losses:	$34,761	
	Annual cost of Real Losses:	$29,372	Valued at Variable Production Cost Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	15.8%	
	Non-revenue water as percent by cost of operating system:	5.2%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	9.44	gallons/connection/day
	Real Losses per service connection per day:	52.36	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	1.14	gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL):	74.42	million gallons/year
? Infrastructure Leakage Index (ILI) [CARL/UARL]:	4.79	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	The City of Kerman's water source is exclusively groundwater from six active groundwater wells. 100% of treated water production sources are metered. Metered data from each groundwater well is used in VOS total. Meter readings are collected manually by water operators daily, seven days a week, and imported manually to an electronic spreadsheet. Meter readings are reviewed at least monthly, and adjustments are made when a gross error is detected. City confirmed that electronic calibration is conducted on an annual basis and provided supporting documentation of testing for each well during 2020. Since the City conducts electronic calibration on an annual basis, a DVG of a 6 applies.
Vol. from own sources: Master meter error adjustment:	The City of Kerman has two 750,000-gallon storage tanks in their water system. The City's SCADA system monitors the tank levels. Meter reading are manually collected and then logged into an electronic format by City staff daily. Production meter data is then reviewed at least monthly by Staff. Since net change in storage for the audit reporting year is not provided, a DVG of 3 is applied.
Water imported:	Not applicable, the City does not import potable water. No additional comments.
Water imported: master meter error adjustment:	Not applicable, the City does not import potable water. No additional comments.
Water exported:	Not applicable, the City does not export potable water. No additional comments.
Water exported: master meter error adjustment:	Not applicable, the City does not export potable water. No additional comments.
Billed metered:	All water billed includes all rate classes (residential, commercial, industrial, institutional, and irrigation). Water that is sent to City owned facilities, such as parks, median islands, right of way areas, and government buildings is not billed for consumption and has not been included in the BMAC total. The existing customer meters consist of radio read meters that transport meter readings electronically. The City installed these meters between 2014 and 2016. While the City does not have a meter testing program in place, the City’s customer meters are equipped with an asset management system that notifies City staff when the meter is malfunctioning. The City then sends out operators to inspect and fix the meter. The City replaces water older water meters or when a malfunction occurs. Good customer meter records exist, but only limited meter testing accuracy is conducted. Computerized billing records exist, with annual auditing of summary statistics conducted by utility personnel. For this reason, a DVG of a 6 is applied.
Billed unmetered:	Not applicable. All water is metered in the City and no unmetered accounts exist.
Unbilled metered:	Approximately 18,000,000 gallons per year is used for flushing activities (directional flushing program, auto flushers and tank cleaning), or within City facilities that are not billed. A clear written policy identifies the accounts that fall under this category. This category is limited to City owned facilities (Parks, landscaping, public facilities, flushing, etc.). Volume of water consumed from this category is derived from monthly meter readings. For this reason, a DVG of 9 is applied.

Audit Item	Comment
Unbilled unmetered:	The City provided an estimate of 53.209. The City does not meter or bill water that is used to irrigate City owned landscape areas, such as 51 acres of parks, medians, mow strips, and government building landscape areas. The City is currently looking into the feasibility of installing meters at all City owned parks. The City is also actively removing turf from City owned medians and replacing them with drought tolerant plants to reduce water consumption. Since formulas are used to quantify the volume of water, a DVG score of 4 is applied.
Unauthorized consumption:	Default value has been applied.
Customer metering inaccuracies:	Utility applied a value within AWWA recommended rage of 1% to 10%.Customer meter accuracy testing is performed on problem meters (customer complaints, suspicious billing reads, etc..). Since meter testing is triggered by meter system error message, customer requests or consumption flags, a DVG of 4 is applied.
Systematic data handling errors:	Default grade applied
Length of mains:	According to the City of Kerman, there are 63.1 miles of water mains within the City's service area. The length of water mains is derived from GIS mapping, which tracks some assessment condition characteristics of water mains. Electronic recordkeeping such as GIS exists to determine the total amount of water mains and the GIS utilizes an asset management system that tracks condition assessment characteristics. For this reason, a DVG of 8 can be applied.
Number of active AND inactive service connections:	There is a total of 3,894 service connections within the City's service area, this includes both active and inactive connections. Policies and procedures for new account activation and billing operations are written and well-structured and managed. The City maintains a computerized information management system, computerized billing system and GIS to keeps track of all active connections. Internal system audits are conducted at least on an annual basis, and the City estimates that the number of connections is less than 1% in error. For this reason, a DVG of 10 is applied.
Average length of customer service line:	Default input and grade applied. Customer meters are typically located at the property boundary.
Average operating pressure:	63.1 psi is the average operating pressure. A Realtime monitoring system (SCADA) exists to monitor each well and collect data. SCADA system can collect pressure readings every minute. The AOP is determined from reliable monitoring system data. The SCADA system monitors real time pressure reading in the distribution system as well. For this reason, a DVG of 8 has been applied.
Total annual cost of operating water system:	The annual operating costs were obtained from the City of Kerman FY 19/20 adopted financial audit. Operating cost is limited to potable water system only. The City has a reliable electronic, industry standard cost accounting system in place, with all pertinent water system tracked. Additionally, data is audited monthly by utility personnel and annually by a third-party CPA. For these reasons, a DVG of 10 has been applied.
Customer retail unit cost (applied to Apparent Losses):	The total consumption revenue was obtained from the City of Kerman's customer consumption revenue actuals, provided by City of Kerman. Rate structure: classes, tiered rates. The input value was calculated from actuals for customer consumption revenue ($2,201,818.45) divided by total billed consumption (849.912 MG). Since an up to date rate schedule is in place and applied reliably in billing operations a DVG of 8 has been applied.
Variable production cost (applied to Real Losses):	Values provided by City of Kerman FY 19/20 actual water expences. Variable production cost includes only primary and scondary cost, fixed cost are not included. Since only a strict variable product cost (power, and chlorine) is used, a DVG of 5 has been applied.

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for: **City of Kerman (CA1010018)**

Reporting Year: **2020** **1/2020 - 12/2020**

Data Validity Score: **65**

Own Sources **(Adjusted for known errors)** *1,009.548*	**System Input** *1,009.548*	**Water Exported** *0.000*	**Billed Water Exported**			**Revenue Water** 0.000
		Water Supplied *1,009.548*	**Authorized Consumption** *921.702*	**Billed Authorized Consumption** *849.913*	**Billed Metered Consumption (water exported is removed)** *849.913*	**Revenue Water** 849.913
					Billed Unmetered Consumption *0.000*	
				Unbilled Authorized Consumption *71.789*	**Unbilled Metered Consumption** *18.579*	**Non-Revenue Water (NRW)** 159.635
					Unbilled Unmetered Consumption *53.210*	
			Water Losses *87.846*	**Apparent Losses** *13.421*	**Unauthorized Consumption** *2.524*	
					Customer Metering Inaccuracies *8.773*	
					Systematic Data Handling Errors *2.125*	
Water Imported *0.000*				**Real Losses** *74.425*	**Leakage on Transmission and/or Distribution Mains** *Not broken down*	
					Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
					Leakage on Service Connections *Not broken down*	

AWWA Free Water Audit Software:

Dashboard

WAS v5.0

American Water Works Association.

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

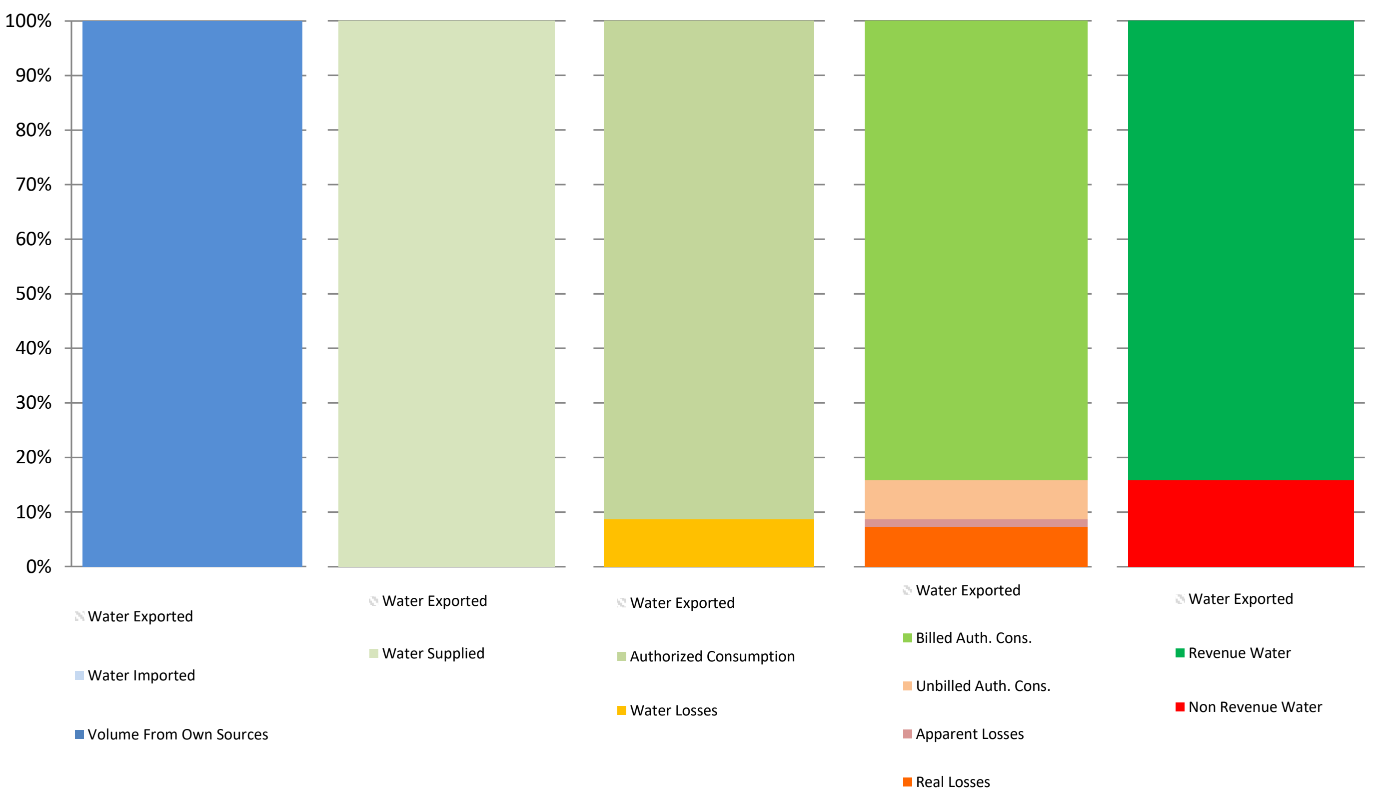
Water Audit Report for: **City of Kerman (CA1010018)**

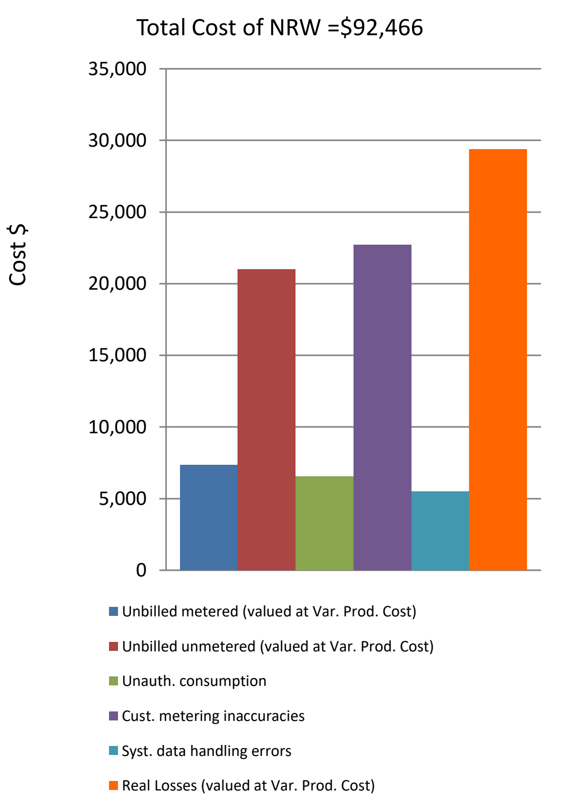
Reporting Year: **2020** **1/2020 - 12/2020**

Data Validity Score: **65**

○ Show me the VOLUME of Non-Revenue Water

● Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:	▨	to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:	▨	Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some observed unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:	▨	to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water meters are located	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:	▨	Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by a third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:	▨	to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:	▨	to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:	▨	to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

AWWA Free Water Audit Software:

Determining Water Loss Standing

WAS v5.0

Water Audit Report for: City of Kerman (CA1010018)
Reporting Year: 2020 1/2020 - 12/2020
Data Validity Score: **65**

Water Loss Control Planning Guide

Functional Focus Area	**Water Audit Data Validity Level / Score**				
	Level I (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

APPENDIX E

KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN CLIMATE CHANGE ASSESSMENT

17 CLIMATE CHANGE

17.1 Introduction

Climate change is a long-term alteration in global weather patterns such as precipitation, temperature, wind and severe weather events. Climate change can occur from both natural and anthropogenic effects. Scientists believe that a primary driver of climate change is greenhouse gas concentrations, including methane and carbon dioxide. Anthropogenic release of these gases is expected to accelerate the rate of natural climate change. Paleoclimatic evidence, such as ice cores, lake varves, and tree rings show a direct correlation between greenhouse gas concentrations and global temperatures (Ruddiman, 2002). There is broad scientific agreement that climate change is occurring and that emissions of heat-trapping gases are the primary cause.

Climate change impacts in the Kings Basin cannot be precisely predicted, but if they occur, they could include different precipitation patterns and river flows, higher temperatures, and earlier snowmelt. The California Department of Water Resources (DWR) recognizes that current climate change projections are not precise, but they require that climate change planning be incorporated into Integrated Regional Water Management Plans (IRWMPs). Further, due to the uncertainty in predictions, water managers should prepare for a range of future conditions.

The general strategy to plan for climate change in the Kings Region includes: 1) identify vulnerabilities 2) implement adaptation measures; and 3) monitor for climate change. This planning process is shown in **Figure 17-1**.

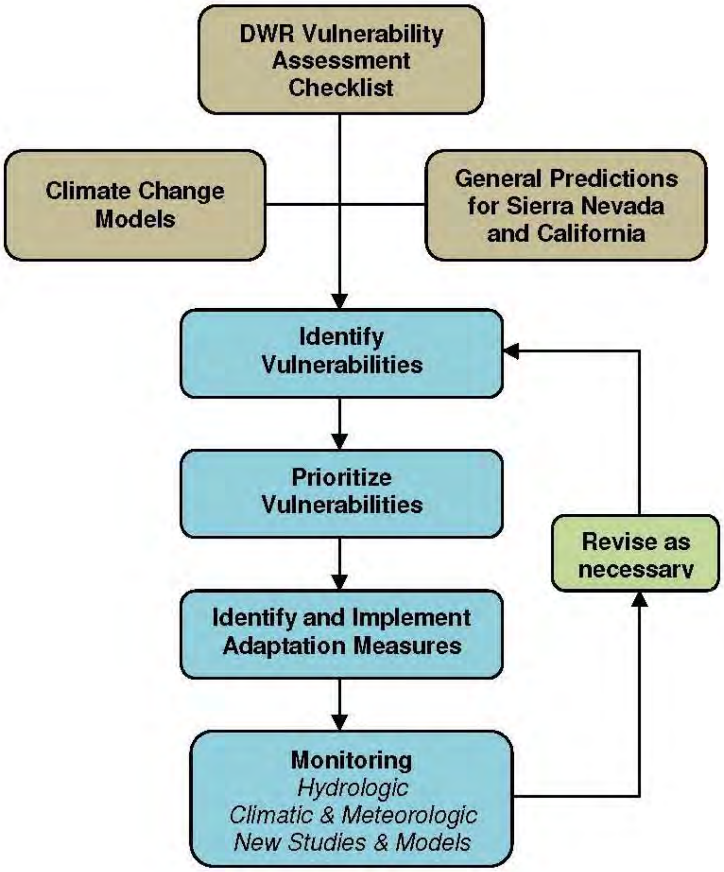


Figure 17-1: Process for Climate Change Planning

Specific topics addressed in this section include: climate change literature, general impacts from climate change, a vulnerability assessment for the Kings Basin, climate change modeling results, adaptation measures, climate change monitoring, and consideration of greenhouse gas emissions in the project review process.

17.2 Literature Review

Numerous documents were used to evaluate climate change in the Kings Basin. The primary document was the *Climate Change Handbook for Regional Water Planning*, (DWR and EPA, 2011). This handbook is the most recent, practical climate change document published by the DWR, and provides numerous tools for addressing climate change. This document is not required for preparing IRWMPs; however, DWR does recommend that it be used.

Other important climate change documents that were used include California Natural Resources Agency (2009), California State University at Fresno (2008), Conrad (2012), Climatewise (2010), DWR (October 2008), and U.S. Global Change Research Program

(2009). Lastly, several reports that describe climate change modeling results were reviewed. These are discussed in Section 17.5.

Several local water and land use plans address climate change. The climate change goals and policies in these plans are consistent with this IRWMP. For example, the General Plans for the City of Selma, Tulare County and Kings County outline numerous climate change mitigation measures such as energy efficiency requirements at new developments, compact urban development, and promoting development of renewable energy. The City of Clovis Urban Water Management Plan proposes water conservation measures to reduce energy demands and mitigate for climate change. The City of Fresno Metropolitan Water Resources Management Plan (2007) identifies a need for more flood control space to address more frequent flood flows caused by climate change. The City of Fresno also assumes a ten percent decrease in Kings River and San Joaquin River water supplies to Fresno from climate change impacts, although there is no specific basis used to determine this number. Climate change is missing from many older planning documents; however, it is being addressed in most new planning efforts.

17.3 General Impacts from Climate Change

This section discusses potential general impacts from climate change on the Kings Basin. Specific impacts are uncertain, but it is generally agreed that the climate will warm and have a variety of impacts on precipitation, hydrology, and the ecosystem. Some of the potential climate change impacts listed by DWR (Oct. 2008), California Natural Resources Agency (2009) and the U.S. Global Change Research Program (June 2009) include:

Precipitation

- Changes in the seasonality of precipitation
- Increase in frequency and intensity of droughts
- More precipitation and less snowfall, resulting in less water stored in the snowpack
- Increased frequency of rain-on-snow events
- Changes in temperatures and cloud cover that inhibit or prevent cloud seeding
- Lower overall precipitation and increased aridity

Streamflow

- Changes in the timing of spring runoff
- Increased flood risk, creating conflicts between water storage and flood control

Water Demands

- Higher temperatures leading to higher evapotranspiration rates from plants, soils and open water surfaces
- Extended growing seasons resulting in higher evapotranspiration for urban landscape and permanent crops

Water Quality

- Higher water temperatures leading to fish distress and algae growth
- Changes in erosion patterns resulting from changes in runoff and overland flow

Other

- Increased fire risk to rangeland and forests
- Potential for increase in diseases, pest invasions and weed invasions
- Heat waves and crop stress leading to lower crop yield
- Overall geographic changes in distribution of flora and fauna

The California water system is especially vulnerable to climate change due to its dependence on mountain snow accumulation and snowmelt processes. Sierra snow is the largest water reservoir in California and is an important storage mechanism for the Kings Basin. Earlier peak runoff, more intense storms that quickly wash through the system, and lower snowpack levels could all contribute to lower water availability, and increased demand on groundwater.

Predicted changes in precipitation vary, but most predictions include a reduction in overall moisture. For example, Koopman et al. (2010) states that six climate change models described in several California Energy Commission reports showed a drier climate for Central California. On the other hand, California State University at Fresno (2008) states that global climate change models suggest near similar precipitation regimes but with a potential variation of 15-25%. Bashford et al. evaluated two climate change scenarios, including one wet scenario and one dry scenario. The purpose of listing these different predictions is not to throw doubt onto climate change science, but rather show that some uncertainty exists, and water managers should therefore plan for a range of conditions.

Climate change could also have some positive impacts including less frost damage to crops, longer agricultural growing seasons, and less demand for winter heat. However, the Kings Basin water system is designed for a specific climate, and warmer temperatures will generally be detrimental since they will increase water demands and reduce snowpack storage in a water-short area. The risks to the region from no action are clear and include a reduction in available water supply, greater groundwater overdraft, urban water shortages, higher water costs, and lower agricultural output.

17.4 Vulnerability Assessment

A local vulnerability assessment was performed using the ‘Vulnerability Assessment Checklist’ found in the *Climate Change Handbook for Regional Water Planning* (DWR and EPA, 2011). This checklist, provided below, evaluates vulnerabilities to water demand, water supply, water quality, flooding, ecosystems and habitats, and hydropower from potential climate change.

1. Water Demand

1.a - Are there major industries that require cooling/process water in your planning region?

The region includes a large number of fruit, vegetable, and meat processing plants, but the temperature of the process water is not likely a major factor. The Kings River Conservation District (KRCD) operates a natural gas peaking powerplant (Malaga Peaking Plant) in the area, but cooling water is provided entirely from groundwater. No other major thermal powerplants are located in the region.

1.b - Does water use vary by more than 50% seasonally in parts of your region?

Seasonal water use varies substantially (greater than 50%) in the region. The majority of water is used in the summer for crop irrigation and some landscape irrigation. Water demands are very low in the winter when much of the farmland is idle, most permanent crops are dormant, and effective precipitation provides most of the needed moisture. Approximately one-third of urban water demands occur in the winter with the other two-thirds in the summer.

1.c - Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?

The region experiences hot dry summers, and, as a result, most of the crops grown have a relatively good resistance to heat. Changes in heat patterns would probably only impact crop yields if there is a significant increase in temperature. Changes in heat patterns could increase the demand for crop irrigation water. Although freezing temperatures do harm some crops, they are beneficial to some permanent crops that need a certain number of chilling hours below freezing for an effective dormancy. Freezing temperatures also kills some types of pests. Therefore, a reduction in the number of freezing days could negatively impact some crops.

1.d - Do groundwater supplies in your region lack resiliency after drought events?

Groundwater provides an important supplement to surface water in the Kings Basin. Groundwater is used to meet demands not met by surface water, and the demand for groundwater increases during droughts. The region has experienced several severe droughts and the groundwater supply has proven resilient, although there is generally still a steady decline in groundwater levels due to long-term overdraft.

1.e - Are water use curtailment measures effective in your region?

Surface water curtailments include urban water conservation measures and reductions in surface water allocations. Historically, water users have been able to supplement surface water supplies with groundwater, resulting in few water shortages. However, if groundwater levels continue to decline then groundwater will become less reliable as a backup supply. The area has a hardened demand due to a large number of permanent plantings, so new water conservation programs may have to be implemented in the future if less surface water is available.

1.f - Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?

Minimum in-stream flow requirements are almost always met. These flows have the highest priority for the surface waters, and flows would be insufficient only in an extreme drought.

2. Water Supply

2.a - Does a portion of the water supply in your region come from snowmelt?

Yes, most of the surface water comes from snowmelt in the Sierra Nevada Mountains. This surface water is used throughout the region. Therefore, the Kings Basin is vulnerable to potential climate change impacts on snow including earlier spring runoffs, less water storage as snowpack, and more frequent rain-on-snow events that could cause flood releases out of reservoirs.

2.b - Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?

A small portion of the Kings Basin, including James Irrigation District, Tranquillity Irrigation Districts, and Fresno Slough Water District, use Delta water as a portion of their water supply. However, as part of their water contracts, these districts can receive San Joaquin River water in place of Delta water if Delta water is not available.

2.c - Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?

No, the region does not rely on coastal aquifers.

2.d - Would your region have difficulty in storing carryover supply surpluses from year to year?

The local reservoirs have some capacity to store carryover water from year to year without encroaching on flood control space. The space to store the water, and ability to keep it in storage, depends on the hydrology. In some years, agencies can carryover water and in other years they cannot. Additional carryover storage capacity would be welcomed by the local water agencies. The region does have very large sub-surface storage capacity. New groundwater banks are needed to further utilize this underground storage space.

2.e - Has your region faced a drought in the past during which it failed to meet local water demands?

Surface water supplies are reduced during droughts, but groundwater is generally used to meet shortfalls, in addition to some urban water conservation. As a result, almost all water demands have been met in past droughts. If groundwater levels continue to decline, then it may not be a reliable backup supply in the future and some demands may not be met.

2.f - Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

Some invasive plant species can clog natural channels and canals if they are not properly managed, so most agencies include this as part of their maintenance activities. Agencies in the area have been alerted to the potential for invasive species such as quagga mussels and how to help prevent their spread.

3. Water Quality

3.a - Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

No reservoirs are located in the Kings Basin itself, but several reservoirs are found in the watersheds that provide surface water to the region. Vegetation surrounds these reservoirs, but it is generally sparse in the immediate vicinity of the larger reservoirs and would not pose a large water quality concern from increased erosion. Some reservoirs at higher elevations have thick forest on the reservoir rim or are located in steeper terrain where post-fire erosion could potentially affect water quality.

3.b - Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?

Warmer water could cause conditions that lead to eutrophication. However, the surface waters in the region, Kings River and San Joaquin River, are derived from Sierra snowmelt, and are cold and very pure. These waters have few nutrients that support algae growth and it is generally not a problem. However, algae is a problem in the canals that carry Kings River water to treatment facilities and can become a problem during very low flows at the distal end of the rivers.

3.c - Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?

No decreases in low flows for the local water bodies have been observed, although no detailed analysis has been performed. Changes in annual low flows from climate change would be difficult to identify since low flows already vary due to natural climate variations and management of reservoir releases.

3.d - Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

Local surface water supplies are able to meet all beneficial uses, which include recreation, hydropower, aquatic habitat, irrigation, and municipal water use. However, operational adjustments are often made to improve water quality for fish. Groundwater quality varies throughout the region and is not suitable for municipal use in some areas. Groundwater quality may degrade further as groundwater levels continue to decline.

3.e Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

Yes, even though surface waters in the region generally have excellent water quality, storm activity can cause very high turbidity spikes that can affect the operation of surface water treatment facilities.

4. Sea Level Rise

The Kings Basin is at an average elevation of about 300 feet above mean sea level and is approximately 100 miles from the ocean. Therefore, sea level rise is not a threat to the region.

5. Flooding

5.a - Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/.

Most of the floodplains in the Kings Basin are farmland. Some houses, roads, and water supply infrastructure (wells, canals, etc.) are also located in the floodplains. Major flooding would not likely cause serious disruptions to essential emergency-response services.

5.b - Does part of your region lie within the Sacramento-San Joaquin Drainage District?

No.

5.c - Does aging critical flood protection infrastructure exist in your region?

Major flood control facilities include Pine Flat Dam and Kings River levees. In addition, Friant Dam on the San Joaquin River impacts flooding along the San Joaquin River, on the northern boundary of the Kings Basin. These facilities are all considered to be in good condition.

5.d - Have flood control facilities (such as impoundment structures) been insufficient in the past?

Major flood control facilities including dams and levees have been sufficient in past years. Levee breaks along the Kings River would likely not cause serious problems and in most cases would only flood farmland.

5.e - Are wildfires a concern in parts of your region?

Wildfires are not generally a concern in the Kings Basin, but they are a concern in the San Joaquin River and Kings River watersheds which are largely forested. Wildfires can result in severe short-term erosion and water quality degradation of surface waters.

6. Ecosystem and Habitat Vulnerability

6.a - Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?

No.

6.b - Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?

No.

6.c - Do climate-sensitive fauna or flora populations live in your region?

A variety of flora and fauna live in the area and some are likely climate sensitive. Due to urban and agricultural development, some have limited ability to migrate as a means of adapting to climate change.

6.d - Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?

Yes, several threatened and endangered species are found in the area. No noticeable changes in species distribution are known to have occurred since the region was developed.

6.e - Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?

Recreation is an important part of the local culture on the Kings River, San Joaquin River and in Pine Flat Reservoir. These recreational opportunities also provide a minor benefit to the local economy.

6.f - Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?

The San Joaquin River and Kings River both have schedules for minimum environmental flows. These flows are the highest priority water uses, and are likely to be met, except possibly in an exceptionally dry year.

6.g - Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?

No.

6.h - Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?

The Kings Basin is not included in the list of top 10 habitats vulnerable to climate change. However, the Kings River watershed is located in the Sierra Nevada Mountains, which is on the list.

6.i - Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

Due to the large amount of urban and agricultural development, prime wildlife habitat is generally fragmented in the valley portion of the Kings Basin. However, wildlife could feasibly travel between prime habitat areas through agricultural land, or along the Kings River corridor and its tributaries. In the foothills, and forested areas east of the basin, large un-fragmented wilderness areas are found. A high-speed rail project is proposed that could further fragment habitats in the Kings Basin.

7. Hydropower

7.a - Is hydropower a source of electricity in your region?

Yes. Hydropower is generated on the Kings River, San Joaquin River, and along the Friant-Kern Canal. The electricity is sold to the local power company and delivered to the electric grid, so it is not necessarily used directly in the Kings Basin but is a valuable resource.

7.b - Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?

Energy demands are likely to increase in the region due to population growth, and to accommodate any climate change. No new major hydropower projects are planned for the area and are probably not likely to be pursued due to permitting difficulties. Some small hydropower projects are being considered along canals or at existing dams to utilize fish release flows. However, the energy generated from these projects would be small.

Conclusions from Vulnerability Assessment

Based on the analysis above the following vulnerabilities were identified for the Kings Basin. These vulnerabilities are listed in their order of priority.

1. **Backup Water Supplies.** The region has a reliable water supply, largely because groundwater is a dependable backup supply during droughts and the dry season. However, the groundwater level is declining, and groundwater demands may increase if climate change reduces precipitation or causes earlier spring runoff that cannot be stored. If groundwater levels decline too much then the groundwater will become a less reliable supply, and groundwater quality may decline. This vulnerability can be measured with several parameters including groundwater overdraft, groundwater level decline, groundwater remaining in storage, and changes in well yields.
2. **Inadequate Water Storage.** Storage facilities in the Kings Basin include Pine Flat reservoir, several smaller reservoirs in the upper Kings River watershed, and groundwater banks in the valley. These facilities have been successful in helping the region regulate seasonal and year-to-year flows; however, there is still demand for more storage. These facilities may be inadequate if warming reduces water storage in the form of snow. Obtaining permits to construct large dams is difficult, and, therefore, storage would have to be developed with numerous groundwater banks and off-channel reservoirs. This vulnerability can be measured by the volume of new storage developed in acre-feet.
3. **Climate Sensitive Crops.** Warmer temperatures could reduce losses for some crops from winter freezes, but other crops depend on some winter freezes to kill pests or ensure an effective dormancy. Higher temperatures could result in lower

yields for these crops. No adaptation measures are available for this impact, other than changing crop types, which is expensive if permanent plantings are impacted. This vulnerability can be measured with the number of chilling hours below freezing and impacts to crop productivity each year.

4. **Flooding.** Flooding is not currently a large problem but increases in high flows could create future problems since it is unlikely that large flood control dams can be constructed. Therefore, proper floodplain zoning and limiting high-value development on floodplains is crucial to preventing future problems. This vulnerability can be measured by the number of essential structures constructed in the 200-year floodplain.

These vulnerabilities will be re-evaluated at least every five years to reflect changes in local cropping, water demands, water supplies, new facilities, and climate change projections.

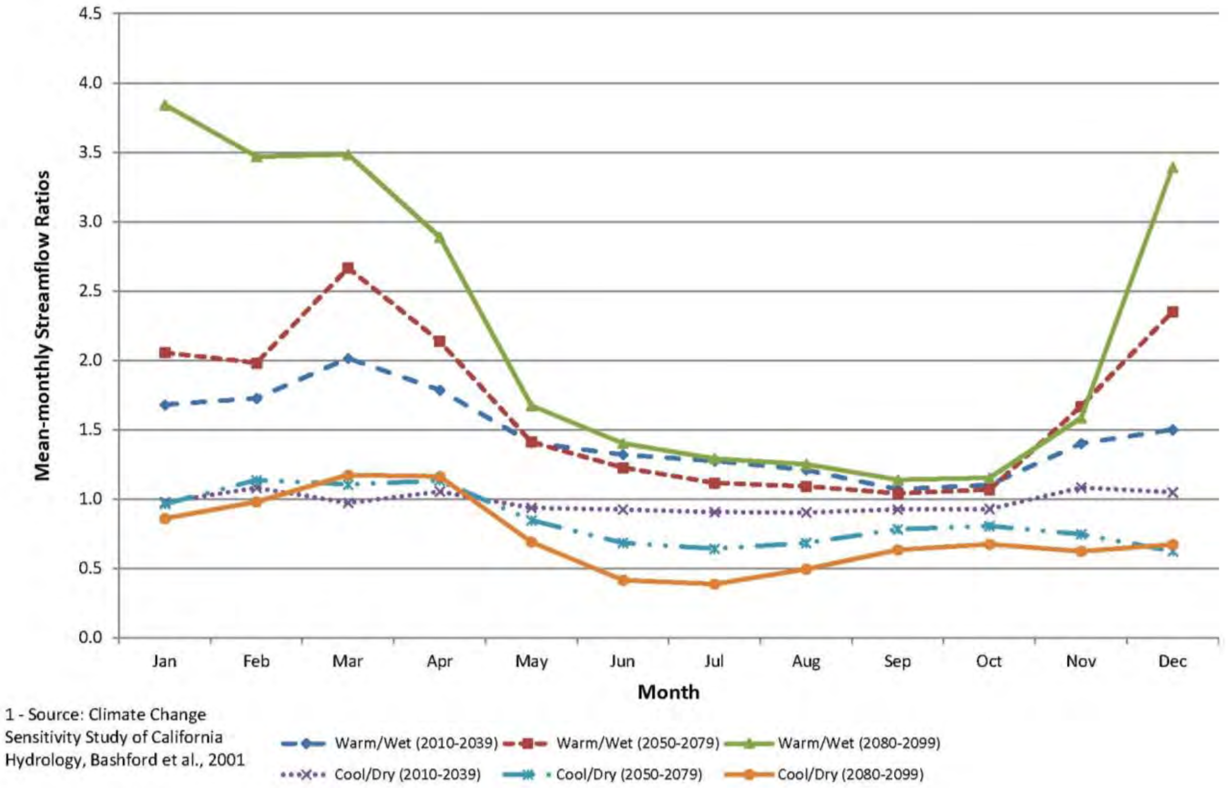
17.5 Climate Change Models

Climate change models are tools that can help identify a range of possible future climatic conditions. The Kings Basin Water Authority (Authority) did not perform model studies, primarily because several other organizations have modeled the local area. The results from each model differ, likely a result of different assumptions and differences in understanding the earth’s processes and feedbacks. Taken as a group, however, climate models present a range of possible future conditions. Two models are described below followed by several general predictions for the State of California and Sierra Nevada mountain range.

Climate Change Sensitivity Study of California Hydrology

In 2001, the Lawrence Berkeley National Laboratory and National Oceanic and Atmospheric Administration published a report entitled ‘*Climate Change Sensitivity Study of California Hydrology*’. Six headwater basins in California were evaluated including the Kings River Basin. Two climate change projections were used including a warm/wet scenario (HadCM2 run 1) and a cool/dry scenario (PCM run B06.06), based on projections provided by the Third Assessment Report of the Intergovernmental Panel on Climate Change. The ‘cool/dry’ scenario still includes increasing temperatures, but at a slower rate than the ‘warm/wet’ scenario. The conditions described by these global models were used to assess local conditions in specific areas of California.

The study provided estimated changes in temperature and precipitation for the two scenarios during different time periods. These impacts are ultimately reflected in changes to streamflows, which are illustrated in **Figure 17-2**. The streamflow ratios represent the ratio of projected streamflow to historical conditions (historical conditions have a ratio of 1.0).



1 - Source: Climate Change Sensitivity Study of California Hydrology, Bashford et al., 2001

Figure 17-2: Estimated Impacts to Kings River Flows
(Warm/Wet and Cool/Dry Climate Change Scenarios)

Figure 17-2 shows two vastly different scenarios and illustrates both the uncertainty in climate change predictions and the importance of being prepared for a range of impacts.

The warm/wet scenario would provide additional water, which would be welcome in the water-short Kings Basin. However, some of this moisture would be lost to higher evaporation and transpiration, and some would leave the basin as flood flows. This scenario could also present serious flooding problems throughout the Kings Basin, especially along the Kings River.

The cool/dry scenario would result in less overall moisture. Streamflows would be higher in the late winter and early spring due to earlier snowmelts. Late spring and summer flows would be lower, which could have serious water supply impacts.

The report also lists seven previous studies that suggested Sierra Nevada streams are likely to peak earlier in the season under global warming. In addition, a key finding was that basin elevation has the greatest influence on streamflow sensitivity to climate change. The Kings Basin watershed is at a high elevation compared to some of the other basins modeled and was less sensitive to rising temperatures.

Future Climate Conditions in Fresno County and Surrounding Counties

In 2010, the National Center for Conservation Science and Policy (NCCSP), prepared a report entitled '*Future Climate Conditions in Fresno County and Surrounding Counties'*. The report predicted climate change impacts in Fresno, Madera, Kings and Tulare Counties. The entirety of the Kings Basin is included in the study area.

The report is based on climate change model outputs provided by the USDA Forest Service Pacific Northwest Research Station and mapped by the NCCSP. Three global climate models were selected that represent a range of projections for temperature and other climate variables. These three models are Hadley (HADCM from the UK), MIROC (from Japan), and CSIRO (from Australia). Model outputs were converted to local scales using data on historic precipitation and temperature patterns. NCCSP mapped climate variables for a historical period (1960-1990) and for two future periods (2035-2045 and 2075-2085). Results were divided into a lower region (<1,000 feet elevation) and an upper region (> 1,000 ft elevation). The predicted changes in precipitation and temperature are summarized in **Table 17-1** and **Table 17-2**. The report did not provide predicted changes in streamflow.

Table 17-1: Projected Changes in Precipitation

Time Period	Average Precipitation (% change from historic)			
	Lower Region		Upper Region	
Historic	9.4 in	-	29.9 in.	-
2035-2045	6.9 – 10.6 in.	-27% to +13%	21.7 – 33.6 in.	-28% to 12%
2075-2085	6.8 – 8.8 in.	-28% to -7%	20.5 – 28.2 in.	-32% to -6%

Note: USDA Forest Service Model

Projections for future precipitation varied among the three models, but all three agreed on drier conditions, on average, by late century, especially in the spring.

Table 17-2: Projected Increased in Temperature

Time Period	Upper Region (F°)	Lower Region (F°)
Historic	46.4	62.3
2035-2045	+2.5 – 4.8	+2.3 – 4.3
2075-2085	+5.2 – 8.9	+4.7 – 8.2

Note: USDA Forest Service Model

General Predictions for California and the Sierra Nevada Mountain Range

Several publications provide general statements on predicted climate change in California and the Sierra Nevada range. These general statements are not specific to the Kings Basin and are generally considered less reliable than local modeling results. However, they are useful for discussion and comparison purposes, and are listed in **Table 17-3**.

Table 17-3: General Climate Change Predictions

Source	Prediction
Climate Change Adaptation Strategies for California's Water (DWR, 2008)	Water managers should use a drought component that assumes, until more accurate information is available, a 20 percent increase in the frequency and duration of future dry conditions.
	DWR projects that Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050.
Sierra Climate Change Toolkit, 2nd Edition (Sierra Nevada Alliance, 2007)	In most cases, total annual streamflow into major Sierra Nevada reservoirs is projected to drop about 10 to 20 percent before mid-century and 25 to 30 percent before the end of the century.
The Ahwannee Principles for Climate Change (Local Government Commission, 2009)	The State's largest reservoir (snowpack) is predicted to lessen by one third over the next 50 years and to half its historic size by the end of the century.

17.6 Adaptation Measures

Climate change adaptation is a response that seeks to reduce the severity of climate change impacts to human and natural systems. The adaptation measures identified below do not address a specific quantified impact, but rather focus on a range of potential impacts. Since climate change predictions will never be perfect, flexibility and diversity in adaptation measures is fundamental. The adaptation measures will also help the region to improve resiliency, which is defined as the ability to return to original conditions after a disturbance or impact.

The DWR defines 'no-regret' strategies as actions that provide measurable benefits today while also reducing vulnerability to climate change (DWR, 2011). In other words, they are strategies that provide benefits with or without climate change. For instance, constructing a water bank would provide needed water supply benefits in the present, but could mitigate climate change impacts through floodwater capture, increasing water storage, and enhancing wetland habitat. The Water Education Foundation (2010) believes that planning for climatic uncertainty will also benefit planning for regulatory, environmental, economic, and social uncertainty.

The IRWMP Update Workgroup concluded that no-regret strategies should comprise the majority of adaptation measures. Consequently, the threat of climate change further justifies the need for many water management strategies already being used in the region. Furthermore, climate change adaptation is not in conflict with current Goals and Objectives of the region.

Most of the resource management strategies described in Section 6 would assist with climate change adaptation. However, the following strategies were deemed the most practical and effective for climate change adaptation in the Kings Basin:

- Improve urban and agricultural water efficiency
- Increase use of recycled water (where energy efficient)
- Revise land use planning policies to encourage conservation (e.g. low impact development or water efficiency standards)
- Develop groundwater recharge and banking projects
- Develop water storage projects inside and outside of the Kings Basin
- Increase ability to capture floodwater both for flood control and water supply
- Restore mountain meadows, wetlands, and riparian areas to regulate flows resulting in more summer runoff
- Change crop types to accommodate climate change

The overall theme with these strategies is to expand the extreme conditions (drought and floods) that the region can accommodate. Eliminating or reducing groundwater overdraft is considered the primary strategy for addressing water supply impacts from climate change.

17.7 Climate Change Monitoring

Climate change monitoring includes two components: 1) monitoring hydrologic and meteorologic parameters for climate change; and 2) monitoring climate change literature, legislation and modeling results.

The Kings Basin already includes a robust network for monitoring the hydrology, meteorology, water demands, water use, crop yields and wildlife. No immediate improvements are needed to monitor for climate change. The monitoring programs are periodically evaluated and upgraded, and the need for improvements to evaluate climate change will also be periodically evaluated.

Water projects were designed and are operated on the assumption that future hydrology will mimic past hydrology. Climate change will likely change future hydrology. However, the specific changes to the hydrology are uncertain, and some scientists are still undecided on whether the region will have a wetter or drier climate. Consequently, future projects will continue to be designed based on past hydrology until more definitive predictions are available. However, the potential change in hydrology is the driving force behind adaptation measures which will be pursued by the Authority.

The science of climate change, and the tools to mitigate and adapt to climate change, are still evolving. As a result, every five years as part of the California Water Plan Update process, DWR will provide revised estimates of changes to sea levels, droughts, and flooding that can be expected over the following 25 years. The Authority will also stay apprised of new studies, reports, literature, legislation, and climate change model runs that are pertinent to the area. When needed this literature will be shared with the Authority members and interested parties and incorporated into the IRWMP updates.

17.8 Mitigation of Greenhouse Gas Emissions

Mitigation of climate change can be achieved by selecting and promoting projects that help to reduce greenhouse gas emissions (GHG) emissions. While the Authority is not responsible for air quality management, and they can only have a small impact on global emissions, it is sensible to consider emissions in project selection in view of the negative impacts climate change may have on water resources. The Authority is also dedicated to helping the State meet GHG emission reduction goals. These goals, prescribed in the California Global Warming Solutions Act of 2006 (AB 32), include reaching 2000 emission levels by 2010, 1990 levels by 2020, and 80% below 1990 levels by 2050.

All of the resource management strategies described in Chapter 6 can assist with climate change mitigation through reduction in energy demand, ecosystem enhancement, or carbon sequestration. For instance, water conservation can reduce energy demands to pump, convey, and treat water supplies. Another example is riparian area restoration, which can sequester carbon and create habitat for species impacted by climate change.

Projects are primarily ranked based on their water supply benefits, but GHG emissions and climate change adaptation were added as secondary considerations. Specifically, the following questions were added to the Project Review Process form:

1. Will this project result in reduced greenhouse gas emissions? If yes, explain how and quantify.
2. Will this project increase greenhouse gas emissions? If yes, explain how and quantify.
3. Will this project contribute to adaptation strategies to respond to climate change impacts?

Beginning July 1, 2012, GHG emissions for California Environmental Quality Act (CEQA) studies are required to be calculated using the California Emissions Estimator Model (CalEEMod). CalEEMod quantifies potential criteria pollutant and GHG emissions from construction and operations for a variety of projects. The Authority will also require that this model be used on projects considered for funding.

17.9 Climate Change in other IRWMP Sections

Climate change is discussed in several other IRWMP sections including:

- **Chapter 5 – Goals and Objectives.** This chapter includes general goals related to climate change adaptation and mitigation.
- **Chapter 6 - Resource Management Strategies –** This chapter discusses the impacts of climate change on the efficacy of different strategies, and the ability of strategies to help adapt to climate change.
- **Chapter 7 - Project Review Process –** The project review process includes new questions related to GHG emissions (Section 17.8)
- **Chapter 12 - Relation to Local Water Planning –** This chapter summarizes the climate change adaptation and mitigation strategies from local water plans and evaluates their consistency with the goals of this IRWMP.

APPENDIX F

SB X7-7 COMPLIANCE FORM

SB X7-7 Table 0: Units of Measure Used in 2020 UWMP* *(select one from the drop down list)*
Million Gallons
**The unit of measure must be consistent throughout the UWMP, as reported in Submittal Table 2-3.*
NOTES:

SB X7-7 Table 2: Method for 2020 Population Estimate

Method Used to Determine 2020 Population (may check more than one)	
☑	**1. Department of Finance** (DOF) or **American Community Survey** (ACS)
☐	**2. Persons-per-Connection Method**
☐	**3. DWR Population Tool**
☐	**4. Other** DWR recommends pre-review

NOTES:

SB X7-7 Table 3: 2020 Service Area Population	
2020 Compliance Year Population	
2020	16,016
NOTES:	

SB X7-7 Table 4: 2020 Gross Water Use

Compliance Year 2020	2020 Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	2020 Deductions					2020 Gross Water Use
		Exported Water *	Change in Dist. System Storage* (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use*	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
	1,010	-	-	-	-	-	**1,010**

*** Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-A: 2020 Volume Entering the Distribution System(s), Meter Error Adjustment

Complete one table for each source.

Name of Source	City of Livingston
This water source is *(check one)* **:**	
☑	The supplier's own water source
☐	A purchased or imported source

Compliance Year 2020	Volume Entering Distribution System [1]	Meter Error Adjustment [2] *Optional* *(+/-)*	Corrected Volume Entering Distribution System
	1,010	-	1,010

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] ***Meter Error Adjustment*** *- See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES

SB X7-7 Table 4-B: 2020 Indirect Recycled Water Use Deduction *(For use only by agencies that are deducting indirect recycled water)*									
2020 Compliance Year	**2020 Surface Reservoir Augmentation**					**2020 Groundwater Recharge**			**Total Deductible Volume of Indirect Recycled Water Entering the Distribution System**
	Volume Discharged from Reservoir for Distribution System Delivery[1]	Percent Recycled Water	Recycled Water Delivered to Treatment Plant	Transmission/ Treatment Loss[1]	Recycled Volume Entering Distribution System from Surface Reservoir Augmentation	Recycled Water Pumped by Utility[1,2]	Transmission/ Treatment Losses[1]	Recycled Volume Entering Distribution System from Groundwater Recharge	
			-		-			-	-

[1] ***Units of measure (AF, MG , or CCF)*** *must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.*

[2] *Suppliers will provide supplemental sheets to document the calculation for their input into "Recycled Water Pumped by Utility". The volume reported in this cell must be less than total groundwater pumped - See Methodology 1, Step 8, section 2.c.*

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C: 2020 Process Water Deduction Eligibility **(For use only by agencies that are deducting process water) Choose Only One**	
☐	**Criteria 1**- Industrial water use is equal to or greater than 12% of gross water use. Complete SB X7-7 Table 4-C.1
☐	**Criteria 2** - Industrial water use is equal to or greater than 15 GPCD. Complete SB X7-7 Table 4-C.2
☐	**Criteria 3** - Non-industrial use is equal to or less than 120 GPCD. Complete SB X7-7 Table 4-C.3
☑	**Criteria 4** - Disadvantaged Community. Complete SB x7-7 Table 4-C.4
NOTES:	

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.1: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 1)*

Criteria 1

Industrial water use is equal to or greater than 12% of gross water use

2020 Compliance Year	2020 Gross Water Use Without Process Water Deduction	2020 Industrial Water Use	Percent Industrial Water	**Eligible for Exclusion Y/N**
	1,010	9	1%	NO

NOTES:

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.2: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 2)*

Criteria 2

Industrial water use is equal to or greater than 15 GPCD

2020 Compliance Year	2020 Industrial Water Use	2020 Population	2020 Industrial GPCD	**Eligible for Exclusion Y/N**
	9	16,016	2	NO

NOTES:

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.3: 2020 Process Water Deduction Eligibility

(For use only by agencies that are deducting process water using Criteria 3)

Criteria 3

Non-industrial use is equal to or less than 120 GPCD

2020 Compliance Year	2020 Gross Water Use Without Process Water Deduction *Fm SB X7-7 Table 4*	2020 Industrial Water Use	2020 Non-industrial Water Use	2020 Population *Fm SB X7-7 Table 3*	Non-Industrial GPCD	**Eligible for Exclusion Y/N**
	1,010	9	1,001	16,016	171	NO

NOTES:

Data from this table will not be entered into WUEdata.
Instead, the entire table will be uploaded to WUEdata as a separate upload in Excel format.

SB X7-7 Table 4-C.4: 2020 Process Water Deduction Eligibility *(For use only by agencies that are deducting process water using Criteria 4)*

Criteria 4

Disadvantaged Community. A “Disadvantaged Community” (DAC) is a community with a median household income less than 80 percent of the statewide average.

SELECT ONE

"Disadvantaged Community" status was determined using one of the methods listed below:

1. IRWM DAC Mapping tool https://gis.water.ca.gov/app/dacs/

☐ If using the IRWM DAC Mapping Tool, include a screen shot from the tool showing that the service area is considered a DAC.

2. 2020 Median Income

	California Median Household Income*		Service Area Median Household Income	Percentage of Statewide Average	**Eligible for Exclusion? Y/N**
☑	**2020**	**$75,235**	46,449	62%	YES

*California median household income 2015 -2019 as reported in US Census Bureau QuickFacts.

NOTES

Data from these tables will not be entered into WUEdata. Instead, the entire tables will be uploaded to WUEdata as a separate upload in Excel format.

This table(s) is only for Suppliers that deduct process water from their 2020 gross water use.

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 1*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 2*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 3*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 4*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 5*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 6*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 7*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 8*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 9*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 4-D: 2020 Process Water Deduction - Volume

Complete a separate table for each industrial customer with a process water exclusion

Name of Industrial Customer	*Enter Name of Industrial Customer 10*				
Compliance Year 2020	Industrial Customer's Total Water Use *	Total Volume Provided by Supplier*	% of Water Provided by Supplier	Customer's Total Process Water Use*	Volume of Process Water Eligible for Exclusion for this Customer
					-

* **Units of measure (AF, MG , or CCF)** must remain consistent throughout the UWMP, as reported in SB X7-7 Table 0 and Submittal Table 2-3.

NOTES:

SB X7-7 Table 5: 2020 Gallons Per Capita Per Day (GPCD)

2020 Gross Water *Fm SB X7-7 Table 4*	2020 Population *Fm SB X7-7 Table 3*	2020 GPCD
1,010	16,016	**173**

NOTES:

SB X7-7 Table 9: 2020 Compliance

Actual 2020 GPCD[1]	Optional Adjustments to 2020 GPCD					2020 Confirmed Target GPCD [1, 2]	**Did Supplier Achieve Targeted Reduction for 2020?**
	Enter "0" if Adjustment Not Used			TOTAL Adjustments[1]	Adjusted 2020 GPCD [1] *(Adjusted if applicable)*		
	Extraordinary Events[1]	Weather Normalization[1]	Economic Adjustment[1]				
173		-	-	-	173	203	**YES**

[1] *All values are reported in GPCD*

[2] ***2020 Confirmed Target GPCD*** *is taken from the Supplier's SB X7-7 Verification Form Table SB X7-7, 7-F.*

APPENDIX G

GROUNDWATER SUBBASIN BULLETIN 118

San Joaquin Valley Groundwater Basin
Kings Subbasin

- Groundwater Subbasin Number: 5-22.08
- County: Fresno, Kings, and Tulare
- Surface Area: 976,000 acres (1,530 square miles)

Subbasin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Kings Subbasin is bounded on the north by the San Joaquin River. The northwest corner of the subbasin is formed by the intersection of the east line of the Farmers Water District with the San Joaquin River. The west boundary of the Kings Subbasin is the eastern boundaries of the Delta-Mendota and Westside Subbasins. The southern boundary runs easterly along the northern boundary of the Empire West Side Irrigation District, the southern fork of the Kings River, the southern boundary of Laguna Irrigation District, the northern boundary of the Kings County Water District, the southern boundaries of Consolidated and Alta Irrigation Districts, and the western boundary of Stone Corral Irrigation District. The eastern boundary of the subbasin is the alluvium-granitic rock interface of the Sierra Nevada foothills.

The San Joaquin and Kings Rivers are the two principal rivers within or bordering the subbasin. The Fresno Slough and James Bypass are along the western edge of the subbasin and connect the Kings River with the San Joaquin River. Average annual precipitation values range from seven to 10 inches, increasing eastward.

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

The Kings Subbasin groundwater aquifer system consists of unconsolidated continental deposits. These deposits are an older series of Tertiary and Quaternary age overlain by a younger series of deposits of Quaternary age. The Quaternary age deposits are divided into older alluvium, lacustrine and marsh deposits, younger alluvium, and flood-basin deposits.

The older alluvium is an important aquifer in the subbasin. It consists of intercalated lenses of clay, silt, silty and sandy clay, clayey and silty sand, sand, gravel, cobbles, and boulders. It is, generally, fine grained near the trough of the valley. Lacustrine and marsh deposits are interbedded with the older alluvium in the western portion of the subbasin.

The younger alluvium is a sedimentary deposit of fluvial arkosic beds that overlies the older alluvium and is interbedded with the flood-basin deposits. Its lithology is similar to the underlying older alluvium. Beneath river channels, the younger alluvium is highly permeable. Beneath flood plains, it may be of poor permeability. The flood-basin deposits occur along the Fresno Slough and James Bypass. They consist of sand, silt, and clay.

The continental deposits of Tertiary and Quaternary age crop out beneath the extreme southeastern part of the subbasin and yield small amounts of water to wells. The deposits of Quaternary age are exposed over most of the area and yield more than 90 percent of the water pumped from wells (Page and LeBlanc 1969).

Page and LeBlanc (1969) indicate that the specific yields in the subbasin range from a low of 0.2 percent to 36 percent. To calculate storage capacity in the 10 to 200 foot depth range, Davis and others (1959) used a range of specific yields from approximately six percent to 18 percent. Williamson and others (1989) used an average specific yield of 11.3 percent in the area of the subbasin for computer modeling purposes.

Restrictive Structures

The lacustrine and marsh deposits contain silts and clays and restrict the vertical movement of water. The Corcoran Clay (E-clay) member of the Tulare formation is the most extensive of these deposits and occupies the western one-quarter to one-third of the subbasin. Its depth ranges from about 250-550 feet (DWR 1981) although much of the information shown on the map is indicated as inferred. The A-clay and C-clay are less extensive and lie above the Corcoran Clay. These clay layers cause confined groundwater conditions beneath them.

Recharge Areas

Groundwater recharge occurs from river and stream seepage, deep percolation of irrigation water, canal seepage, and intentional recharge. The Cities of Fresno and Clovis, Fresno Irrigation District, and Fresno Metropolitan Flood Control District have a cooperative effort to utilize individually owned facilities to recharge water in the greater urban area. Fresno Irrigation District, Consolidated Irrigation District, and others have recharge efforts in the subbasin. The Fresno-Clovis metropolitan area uses a regional sewage treatment facility that disposes of water in percolation ponds southwest of Fresno.

Groundwater Level Trends

Groundwater flow is generally to the southwest. Two notable groundwater depressions exist. One is centered in Fresno-Clovis urban area. The other is centered approximately 20 miles southwest of Fresno (DWR 2000) in the Raisin City Water District.

Most well water levels indicated a response to the 1976-77 drought. After the 1987-92 drought, wells in the northeast showed water levels from 10 to 40 feet below pre-1976-77 drought water levels. Water levels in the western subbasin experienced declines of 10 to 50 feet during the 1987-92 drought and are in various stages of recovery to mid-1980s levels. Water levels in the southeast have, generally, recovered to mid-1980s levels.

Groundwater Storage

Groundwater in Storage.
Williamson (1989) indicates that the groundwater in storage was 93,000,000 af in 1961. This estimate was to a depth of 1,000 feet or less.

Groundwater Budget (Type C)

The potential for subsurface flows south and westward exists. Depending upon groundwater conditions in the Westside Subbasin, subsurface flows may occur in that direction. The potential for groundwater flow in either direction along the southern boundary exists. Groundwater depressions on either side of the boundary and groundwater mounding from recharge along the Kings River complicate flow patterns in the area.

Groundwater Quality

Characterization. The groundwater is predominantly of bicarbonate type. The major cations are calcium, magnesium, and sodium. Sodium appears higher in the western portion of the subbasin where some chloride waters are also found (Page and LeBlanc 1969).

Page and LeBlanc (1969) noted that the TDS of groundwater in the Fresno area seldom exceeds 600 mg/L although at greater depths, 2,000 mg/L groundwater has been encountered. A typical range of groundwater quality in the basin is 200 to 700 mg/L.

DHS data indicates an average TDS of 240 mg/L from 414 samples from Title 22 water supply wells. These samples ranged from 40 to 570 mg/L.

Impairments. Dibromochloropropane (DBCP), a soil fumigant nematicide, and nitrates can be found in groundwater along the eastern side of the subbasin. Shallow brackish groundwater can be found along the western portion of the subbasin. Elevated concentrations of fluoride, boron, and sodium can be found in localized areas of the subbasin.

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	457	8
Radiological	443	24
Nitrates	463	23
Pesticides	495	105
VOCs and SVOCs	468	17
Inorganics – Secondary	457	41

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: – 20-3,000 (Page And LeBlanc 1969)	Average: 500-1,500
	Total depths (ft)	
Domestic	Range: - Not determined	Average: Not determined
Municipal/Irrigation	Range: - 100-500 (Page and LeBlanc 1969 Table 14)	Average: 210

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR and Cooperating Agencies	Groundwater levels	909 Semi-annually
Local Agencies	Miscellaneous water quality	Varies
Department of Health Services and Cooperators	Title 22 Water quality	722 Varies

Basin Management

Groundwater management:	The County of Fresno has an adopted groundwater management ordinance. The following entities have adopted AB3030 management plans: Alta Irrigation District, Consolidated Irrigation District, County of Fresno, Fresno Irrigation District, James Irrigation District, Kings River Conservation District, Kings River Water District, Liberty Canal Company, Liberty Water District, Liberty Mill Race Company, Mid Valley Water District, Orange Cove Irrigation District, Raisin City Water District, and Riverdale Irrigation District.
Water agencies	
Public	City of Fresno, City of Clovis, Alta I.D., Consolidated I.D., Fresno I.D., Hills Valley I.D., James I.D., Kings River Conservation District, Kings River Water District, Laguna I.D., Liberty Water District, Mid-Valley W.D., Orange Cove I.D., Raisin City W.D., Riverdale I.D., and Tri-Valley I.D.
Private	California Water Service Co., Bakman Water Company

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Errata

Updated groundwater management information and added hotlinks to applicable websites. (1/20/06)

APPENDIX H

ENERGY INTENSITY TABLES

Urban Water Supplier: *City of Kerman*

Water Delivery Product (If delivering more than one type of product use Table O-1C)

Retail Potable Deliveries

Table O-1B: Recommended Energy Reporting - Total Utility Approach

Enter Start Date for Reporting Period	1/1/2020	**Urban Water Supplier Operational Control**		
End Date	12/30/2020			
☐ Is upstream embedded in the values reported?		**Sum of All Water Management Processes**	**Non-Consequential Hydropower**	
Water Volume Units Used	*MG*	Total Utility	Hydropower	1452331
Volume of Water Entering Process (volume unit)		*1010.00*	*0*	*1010*
Energy Consumed (kWh)		*1756689.43*	*0*	*1756689.43*
Energy Intensity (kWh/volume)		*1739.3*	*0.0*	*1739.3*

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Metered Data

Data Quality Narrative:

Data was provided by the City of Kerman Public Works Department. The 1,010 MG is the total amount of groundwater produced by the City's six active goundwater wells during 2020. A total of 1,756,689.43 kWh was used to extract groundwater from the underlining groundwater basin at each of the six active groundwater wells and pump the water into the distribution system.

Narrative:

In the water system, energy is consumed to pump water from the underlining groundwater basin at each of the six active groundwater wells and pump the water into the distribution system. The City does not produce any form of renewable engery for the water system and all engery consumped is produced by PG&E.

Urban Water Supplier: *Groveland Comm*

Table O-1C: Recommended Energy Reporting - Multiple Water Delivery Products

Enter Start Date for Reporting Period 1/1/2020

End Date 12/30/2020

☐ Is upstream embedded in the values reported?

Water Volume Units	*Total Volume of Water Entering Process (volume units)*	
MG		*Retail Potable Deliveries (%)*
		Retail Non-Potable Deliveries (%)
		Wholesale Potable Deliveries(%)
		Wholesale Non-Potable Deliveries (%)
		Agricultural Deliveries (%)
		Environmental Deliveries (%)
		Other (%)
		Total Percentage [must equal 100%]
		Energy Consumed (kWh)
		Energy Intensity (kWh/volume units)

		Water Delivery Type
		Retail Potable Deliveries
		Retail Non-Potable Deliveries
		Wholesale Potable Deliveries
		Wholesale Non-Potable Deliveries
		Agricultural Deliveries
		Environmental Deliveries
		Other
		All Water Delivery Types

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Da*

Metered Data

Data Quality Narrative:

Narrative:

unity Services District

Urban Water Supplier Operational Co

Water Management Process

Extract and Divert	Place into Storage	Conveyance	Treatment	Distribution	Total Utility
0	*0*	*0*	*0*	*0*	*N/A*
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	
0%	*0%*	*0%*	*0%*	*0%*	*N/A*
0	*0*	*0*	*0*	*0*	*0*
0.0	*0.0*	*0.0*	*0.0*	*0.0*	*N/A*

Production Volume (volume units defined above)	*Total Utility (kWh/volume)*	*Net Utility (kWh/volume)*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*
0	*0.0*	*0.0*

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Non-Consequential Hydropower (if applicable)

Hydropower	Net Utility
0	*N/A*
0%	
0%	
0%	
0%	
0%	
0%	
0%	
0%	*N/A*
0	*0*
0.0	*N/A*

APPENDIX I

WATER CONSERVATION RESOLUTION

(RESOLUTION NO. 10-05)

Resolution No. 10-05

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF KERMAN ADOPTING WATER SHORTAGE CONTINGENCY PLAN FOR THE CITY OF KERMAN

WHERAS, the City of Kerman supplies water to its residents for domestic, industrial and commercial uses; and

WHERAS, California Water Code Section 375 et. seq. permits public agencies that supply water to adopt and enforce a water conservation program to reduce the quantity of water used by the people therein for the purpose of conserving the water supplies of the city; and

WHEREAS, the Council has considered the Water Shortage Contingency Plan for the City of Kerman as shown in attached Exhibit A.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF KERMAN DOES RESOLVE AS FOLLOWS:

1. The Council adopts the Water Shortage Contingency Plan for the City of Kerman as shown in attached Exhibit A.

2. The council finds and determines that certain conditions could occur in the City to require that the water sources available be placed to maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such water be encouraged with a view to the maximum reasonable and beneficial use thereof in the interest of the people and for the public welfare.

The foregoing resolution was introduced at a regular meeting of the City Council of the City of Kerman held on the 3rd day of February, 2010, and passed at said meeting by the following vote:

AYES: Dhaliwal, Sidhu, Jones, Rodriguez, Stockwell
NOES: None
ABSENT: None
ABSTAIN: None

The foregoing resolution is hereby approved.

TRINIDAD M. RODRIGUEZ
MAYOR

ATTEST:

Renee Holdcroft

L. RENEE HOLDCROFT
CITY CLERK

WATER SHORTAGE CONTINGENCY PLAN FOR THE CITY OF KERMAN

Section 1. Declaration of Policy.

California Water Code Section 375 et. seq. permits public entities that supply water at retail to adopt and enforce a water conservation program to reduce the quantity of water used by the people therein for the purpose of conserving the water supplies of such public entity. The City Council of Kerman (Council) herby establishes a water conservation program pursuant to California Water Code Sections 375 et. seq. based upon the need to conserve water supplies and to avoid or minimize the effects of future storage.

Section 2. Findings.

The council finds and determines that certain conditions could occur in the City to require that the water sources available be placed to maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such water be encouraged with a view to the maximum reasonable and beneficial use thereof in the interest of the people and for the public welfare.

Section 3. Application.

The provisions of this policy shall apply to all water served to persons, customers and property by the City.

Section 4. Authorization.

The Program Manager (Director of Public Works) or a designated representative is hereby authorized to implement the provisions of this policy as directed by the Council. Additionally, the Program Manager designated representative is herby authorized to make minor and limited exceptions to prevent undue hardship or unreasonable restrictions, provided that water shall not be wasted or used unreasonably and the purpose of this policy can be accomplished.

Section 5. Water Conservation Stages.

No persons shall knowingly use water or permit the use of water supplied by the City for commercial, industrial, agricultural, governmental or any other purpose in a manner contrary to the provisions of this policy. At no time shall water be wasted or used unreasonably.

The following stages shall take effect upon declaration as herein provided:

a) Stage 1 - Enforcement Required – Minor Shortage Potential

Stage 1 applies during periods that the City determines that water usage should be reduced approximately 10%-20% in order to meet all of the water demands of its customers, either now or in the foreseeable future. Implementation of Stage 1 should result in a minimum of 10% reduction in water use from a base period to be determined at the time of declaration.

b) Stage 2 – Enforcement Required – Moderate Shortage Potential

Stage 2 applies during periods when the City determines that water usage should be reduced by approximately 20%-35% in order to meet all of the water demands of its customers now or in the foreseeable future, Implementation of Stage 2 should result in a minimum of 20% reduction in water used from a base period to be determined at the time of declaration.

c) Stage 3 – Enforcement Required – Critical Shortage Potential

Stage 3 applies during periods when the City determines that water usage should be reduced by approximately 35%-50% in order to meet all of the water demands of its customers now or in the foreseeable future, Implementation of Stage 3 should result in a minimum of 35% reduction in water used from a base period to be determined at the time of declaration.

Specific mandated restrictions in water use for Stages 1, 2, and 3 shall be determined by the Council and may include, but not be limited to:

1) Landscape (except residential) – Eliminate watering of ornamental turf areas. Water only actively used turf areas no more than twice per week. Trees and shrubs may be watered only twice per week using a hand-held hose with a positive shutoff nozzle or drip irrigation systems. Use of reclaimed water, however, is exempt.

2) Household and household members (residential landscapes) – Water no more than twice per week using only a hand-held hose with positive shutoff nozzle or drip irrigation systems. Eliminate sprinkler use.

3) Construction Usage – All construction water must be reclaimed or no potable. Issuance of construction meters will be only for testing and disinfection of potable water lines.

4) Development Construction – Prior to the issuance of any building permit, the developer will be required to certify that a reduction (20% for Stage 1, 35% for Stage 2, and 50% for Stage 3) of the projected water usage for that development shall be achieved.

Section 6. Implementation of Conservation Stages.

The City shall monitor the projected supply and demand for water by its customers on a daily basis. The Program Manager shall recommend to the Council the extent of the conservation required through implementation and/or termination of particular conservation stages in order for the City to prudently plan for and supply water to its customers. Thereafter, the Council may order that the appropriate stage of water conservation be implanted or terminated in accordance with the applicable provisions of this policy. The declaration of any stage shall be done by mass mailing, and a public announcement and notice shall be published a minimum of three (3) consecutive times in a newspaper of general circulation. The stage designated shall become effective immediately upon announcement.

Section 7. Violations, Notices, Penalties.

The violations of any provisions in this policy are subject to the penalties specified in the Kerman Municipal Code.

APPENDIX J

WATER CONSERVATION CODE

Chapter 13.28
WATER CONSERVATION

Sections:

13.28.010 Title.

This chapter will be known as the water conservation ordinance. (Ord. 18-08 §2(part), 2018).

13.28.020 Findings.

A. A reliable minimum supply of potable water is essential to the public health, safety, and welfare of the people and economy of the Central Valley region. The city of Kerman is located in central California which is a semiarid region and is largely dependent upon water supplies. A growing population, climate change, environmental concerns, and other factors in other parts of the state and western United States make the region highly susceptible to water supply reliability issues.

B. Careful water management that includes active water conservation measures not only in times of drought, but at all times, is essential to ensure a reliable minimum supply of water to meet current and future water supply needs.

C. Article X, Section 2 of the California Constitution declares that the general welfare requires that water resources be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented; and that the conservation of water be fully exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.

D. Article XI, Section 7 of the California Constitution declares that a city may make and enforce within its limits all local, police, sanitary and other chapters and regulations not in conflict with general laws.

E. California Water Code Section 375 authorizes water suppliers to adopt and enforce a comprehensive water conservation program to reduce water consumption and conserve supplies by ordinance or resolution.

F. The adoption and enforcement of a water conservation program is necessary to manage the city of Kerman’s potable water supply in the short and long term and to avoid or minimize the effects of drought and shortage within the city. Such program is essential to ensure a reliable and sustainable minimum supply of water for the public health, safety, and welfare. (Ord. 18-08 §2(part), 2018).

13.28.030 Declaration of purpose and intent.

A. The purpose of this chapter is to establish a water conservation plan that will reduce water consumption within the city through conservation, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, maximize the efficient use of water within the city to avoid and minimize the effect and hardship of water shortage to the greatest extent possible, and meet any state laws or state regulations requiring water conservation.

B. This chapter establishes water conservation standards intended to alter behavior related to water use efficiency at all times and authorizes the city council to adopt further measures to be implemented during times of declared water shortage or declared water shortage emergencies, with increasing restrictions on water use in response to worsening drought or emergency conditions and decreasing supplies. (Ord. 18-08 §2(part), 2018).

13.28.040 Definitions.

The following words and phrases whenever used in this chapter have the meaning defined in this section:

A. "Person" means any natural person or persons, corporation, public or private entity, governmental agency or institution, including all agencies and departments of the city of Kerman or any other user of water provided by the city of Kerman.

B. "Landscape irrigation system" means an irrigation system with pipes, hoses, spray heads, drip emitters or sprinkling devices that are operated by hand or through an automated system.

C. "Single pass cooling systems" means equipment where water is circulated only once to cool equipment before being disposed.

D. "Potable water" means water which is suitable for drinking. (Ord. 18-08 §2(part), 2018).

13.28.050 Application.

A. The provisions of this chapter apply to any person using any potable water provided by the city.

B. The provisions of this chapter do not apply to uses of water necessary to protect public health and safety or for essential government services, such as police, fire and other similar emergency services.

C. The provisions of this chapter do not apply to the use of water by commercial nurseries and commercial growers when necessary as a result of climatic conditions to sustain plants, trees, shrubs, crops or other vegetation intended for commercial sale.

D. This chapter is intended solely to further the conservation of water. It is not intended to implement any provision of federal, state, or local statutes, ordinances, or regulations relating to protection of water quality or control of drainage or runoff. (Ord. 18-08 §2(part), 2018).

13.28.060 Permanent water conservation requirements.

The following water conservation requirements are effective at all times and are permanent unless amended by ordinance or resolution as authorized by Water Code Section 375:

A. Limits on Watering Hours. Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of six a.m. and eight a.m. and twelve p.m. (noon) to seven p.m. Pacific Standard Time on any day, except for very short periods of time for the express purpose of adjusting or repairing an irrigation system, and provided such manual use is controlled and attended.

B. Limited Water Days. By resolution, the city council shall establish limited watering days and times based on the current drought conditions, an emergency declared by the Governor, and/or regulations set by the State Water Quality Control Board ("SWQCB").

C. Limit on Watering Duration. Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to no more than fifteen minutes of watering per day per station. This subsection does not apply to landscape irrigation systems that exclusively use very low-flow drip type irrigation systems when no emitter produces more than two gallons of water per hour and weather based controllers or stream rotor sprinklers that meet a seventy percent efficiency standard.

D. No Excessive Water Flow or Runoff. Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited.

E. No Washing Down Hard or Paved Surfaces. Washing down hard or paved surfaces, including but not limited to sidewalks, walkways, driveways, parking areas, tennis courts, patios or alleys, is prohibited except when necessary to alleviate safety or sanitary hazards, and then only by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off device, a low-volume, high-pressure cleaning machine equipped to recycle any water used, or a low-volume high-pressure water broom.

F. Obligation to Fix Leaks, Breaks or Malfunctions. Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than seven days of receiving notice from the city is prohibited.

G. Recirculating Water Required for Water Fountains and Decorative Water Features. Operating a water fountain or other decorative water feature that does not use recirculated water is prohibited.

H. Limits on Washing Vehicles. Using water to wash or clean a vehicle, including but not limited to any automobile, truck, van, bus, motorcycle, boat or trailer, whether motorized or not, is prohibited, except by use of a hand-held bucket or similar container or a hand-held hose equipped with a positive self-closing water shut-off nozzle or device. This subsection does not apply to any commercial car washing facility.

I. Drinking Water Served upon Request Only. Eating or drinking establishments or other public places where food or drinks are sold, served, or offered for sale are prohibited from providing drinking water to any person unless expressly requested.

J. No Installation of Single Pass Cooling Systems. Installation of single pass cooling systems is prohibited in buildings requesting new water service.

K. No Installation of Non-Recirculating Water Systems in Commercial Car Wash and Laundry Systems. Installation of non-recirculating water systems is prohibited in new commercial conveyor car wash and new commercial laundry systems.

L. Limitation on Irrigation Following Measurable Rainfall. Irrigating outdoors during and within forty-eight hours following measurable rainfall is prohibited.

M. Flood Irrigation. Flood irrigation of residential landscapes is expressly prohibited. (Ord. 18-08 §2(part), 2018).

13.28.070 Additional water conservation measures adopted by resolution.

In addition to the prohibited uses of water identified in Section 13.28.060, in the event of an emergency or as may be required by state law or regulation, the city may approve such additional measures by resolution of the city council. (Ord. 18-08 §2(part), 2018).

13.28.080 Violation.

A. General. A violation of this chapter is considered waste and an unreasonable use of water.

B. Public Nuisance. A violation of this chapter including additional water measures adopted under the authority of Section 13.28.070 constitutes a public nuisance.

C. Separate Offenses. Each day that a violation of this chapter including additional water measures adopted under the authority of Section 13.28.070 occurs constitutes a separate offense. (Ord. 18-08 §2(part), 2018).

13.28.090 Proceedings for enforcement and penalties.

Whenever the city has inspected or caused to be inspected any property and has determined that there exists a violation of this chapter upon the property, the city in its sole discretion may proceed as follows:

A. Prosecution as an infraction or misdemeanor;

B. Issuance of an administrative citation pursuant to Chapter 1.18;

C. Treat the violation as a public nuisance pursuant to Chapter 8.32 and proceed with enforcement as authorized therein; and/or

D. Request the city attorney to institute legal action including but not limited to injunctive or criminal action. (Ord. 18-08 §2(part), 2018).

13.28.100 Courtesy notice of violation.

The city, in its sole discretion, may issue a courtesy notice or warning of violation to the record owner and/or occupant of the property upon which a violation of this chapter exists. (Ord. 18-08 §2(part), 2018).

The Kerman Municipal Code is current through Ordinance 21-05, passed July 28, 2021.

City Website: https://cityofkerman.net/
City Telephone: (559) 846-9384

Code Publishing Company

APPENDIX K

RATE STRUCTURE

PROPOSED UTILITY RATE CHANGES - FISCAL YEAR 2020-2021

WATER RATES		Current Rate	Increase Effective 1/1/2021	Total Base Cost Effective 1/1/2021		Flow Cost	Total Cost
Residential & Multi-Family (3/4" Meter)		21.50	4.55	26.05	+	Usage	See Examples Below
Residential & Multi-Family (1" Meter)		32.20	6.80	39.00	+	Usage	
Commercial (Metered-Rate Determined by Meter Size)							
	3/4" Meter	21.50	4.55	26.05	+	Usage	See Examples Below
	1" Meter	32.20	6.80	39.00	+	Usage	
	1.5" Meter	64.00	11.07	75.07	+	Usage	
	2" Meter	110.00	7.09	117.09	+	Usage	
	3" Meter	220.41	8.73	229.14	+	Usage	
	4" Meter	341.66	13.54	355.20	+	Usage	
	6" Meter	678.48	26.88	705.36	+	Usage	
	Water Usage Cost per 1,000 Gallons	$ 1.12	0.05	$ 1.17		Per 1,000 Gallons	

WATER USE EXAMPLES	Cost Effective 1/1/2020		Flow Cost		Total Cost
14,000 gallons of usage	26.05	+	$16.38	=	$42.43
24,000 gallons of usage	26.05	+	$28.08	=	$54.13

SEWER RATES	Current Rate (Base + Flow)	Increase Effective 1/1/2021	Cost Effective 1/1/2021		Flow Cost Efffective 1/1/2021		Total Cost
Residential	32.83	0.60	13.00	+	20.43	=	33.43
Multi-Family Residential per unit	22.44	1.28	10.39	+	13.33	=	23.72
Commercial	11.73	1.27	13.00	+	Usage		
Low Strength	1.50	0.26			$1.76	*	
Medium Strength	1.90	0.25			$2.15	*	
High Strength	2.92	0.08			$3.00	*	

*Cost per 1,000 Gallons of Water Usage

Solid Waste Rates Effective 7/1/2020 to 6/30/2021

SOLID WASTE	Current Rate	Proposed Increase	Total Cost
Residential	18.49	0.47	18.96
Commercial			2.53% Increase

STREET SWEEPING	Current Rate	Proposed Increase	Total Cost
Residential	1.00	0.00	1.00
Multi-Family Residential per unit	0.57	0.00	0.57

STORM DRAIN	Current Rate	Proposed Increase	Total Cost
Residential	1.60	0.00	1.60

Commercial (Metered) - Based on Flow @ .0736 per 1,000 Gallons of Water Usage

RECAP	Current Rate	Increase Effective 1/1/2021	Total Cost	% Increase
Metered customers estimated using 14,000 gallons of water with 3/4" meter (7/1/2020 to 12/31/2020)	91.10	0.47	91.57	0.52%
Metered customers estimated using 14,000 gallons of water with 3/4" meter (1/1/2021 to 6/30/2021)	91.57	5.85	97.42	6.39%

APPENDIX L

NOTICE OF PUBLIC HEARING (NOT INCLUDED IN DRAFT UWMP)

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

March 24, 2022

City of Fresno
Scott Mozier
Public Works Director
2600 Fresno Street, Room 4016
Fresno, CA 93721

Subject: Notice of Public Hearing for the City of Kerman 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan

Dear Mr. Mozier,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City has prepared its Draft 2020 Urban Water Management Plant (UWMP) and Water Shortage Contingency Plan (WSCP), and it is now available for public review.

The City Council will conduct a public hearing to receive public comments and consider adoption of the Draft 2020 UWMP and 2020 WSCP on **Wednesday, June 8, 2022, at 6:00 p.m.,** or as soon thereafter as the matter may be heard, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630. Following the public hearing, the City Council may adopt the Draft 2020 UWMP and 2020 WSCP with recommended modifications as a result of public input.

The Draft 2020 UWMP and WSCP is available for public review at City Hall and on the City's website. During the public hearing, the City Council will hear and consider all comments. All interested persons are invited to attend and speak on this matter. Written comments can also be submitted up until the date of the public hearing to:

Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

We invite your participation in this process.

Sincerely,

Michael B

Michael Barajas
City of Kerman

Director of Public Works

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

March 23, 2022

Fresno Irrigation District
Bill Stretch
General Manager
2907 S. Maple Ave.
Fresno, CA 93725

Subject: Notice of Public Hearing for the City of Kerman 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan

Dear Mr. Stretch,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City has prepared its Draft 2020 Urban Water Management Plant (UWMP) and Water Shortage Contingency Plan (WSCP), and it is now available for public review.

The City Council will conduct a public hearing to receive public comments and consider adoption of the Draft 2020 UWMP and 2020 WSCP on **Wednesday, June 8, 2022, at 6:00p.m.,** or as soon thereafter as the matter may be heard, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630. Following the public hearing, the City Council may adopt the Draft 2020 UWMP and 2020 WSCP with recommended modifications as a result of public input.

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Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

We invite your participation in this process.

Sincerely,

Michael B

Michael Barajas
City of Kerman

Director of Public Works

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

March 23, 2022

North Kings Groundwater Sustainability Agency
Kassy Chauhan
Executive Officer
2907 S. Maple Avenue
Fresno, CA 93725

Subject: Notice of Public Hearing for the City of Kerman 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan

Dear Mrs. Chauhan,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City has prepared its Draft 2020 Urban Water Management Plant (UWMP) and Water Shortage Contingency Plan (WSCP), and it is now available for public review.

The City Council will conduct a public hearing to receive public comments and consider adoption of the Draft 2020 UWMP and 2020 WSCP on **Wednesday, June 8, 2022, at 6:00p.m.,** or as soon thereafter as the matter may be heard, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630. Following the public hearing, the City Council may adopt the Draft 2020 UWMP and 2020 WSCP with recommended modifications as a result of public input.

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Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

We invite your participation in this process.

Sincerely,

Michael

Michael Barajas
City of Kerman
Director of Public Works

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

March 23, 2022

County of Fresno
Bernard Jimenez
Assistant Director of Public Works and Planning
2220 Tulare Street, 6th Floor
Fresno, CA 93721

Subject: Notice of Public Hearing for the City of Kerman 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan

Dear Mr. Jimenez,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City has prepared its Draft 2020 Urban Water Management Plant (UWMP) and Water Shortage Contingency Plan (WSCP), and it is now available for public review.

The City Council will conduct a public hearing to receive public comments and consider adoption of the Draft 2020 UWMP and 2020 WSCP on **Wednesday, June 8, 2022, at 6:00p.m.,** or as soon thereafter as the matter may be heard, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630. Following the public hearing, the City Council may adopt the Draft 2020 UWMP and 2020 WSCP with recommended modifications as a result of public input.

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Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

We invite your participation in this process.

Sincerely,

Michael B

Michael Barajas
City of Kerman

Director of Public Works

Public Works Department
Michael Barajas, Director

Mayor – Gary Yep
Mayor Pro Tem – Ismael Herrera
Council Members
Jennifer Coleman
Bill Nijjer
Kevin Nehring

850 S. Madera Avenue
Kerman, CA 93630

Phone: (559) 846-6122
Fax: (559) 846-7488

March 23, 2022

Kings Basin Water Authority
Soua Lee
Program Manager
4886 E. Jensen Avenue
Fresno, CA 93725

Subject: Notice of Public Hearing for the City of Kerman 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan

Dear Soua Lee,

Existing State law requires each urban water supplier to prepare and adopt an Urban Water Management Plan (UWMP) at least once every 5 years. The City of Kerman (City has prepared its Draft 2020 Urban Water Management Plant (UWMP) and Water Shortage Contingency Plan (WSCP), and it is now available for public review.

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Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
E-mail: mbarajas@cityofkerman.org

We invite your participation in this process.

Sincerely,

Michael B

Michael Barajas
City of Kerman

Director of Public Works

APPENDIX M

PUBLICATION OF NOTICE OF PUBLIC HEARING (NOT INCLUDED IN DRAFT UWMP)

NOTICE OF PUBLIC HEARING

The Kerman City Council will hold a public meeting as follows:

Date: Wednesday, June 8, 2022

Time: 6:00 PM

Place: Kerman City Council Chambers, 850 S. Madera Ave., Madera, CA.

The City Council will conduct a public hearing to receive public comments and consider adoption of the Draft 2020 UWMP and 2020 WSCP on Wednesday, June 8, 2022, at 6:00 p.m., or as soon thereafter as the matter may be heard, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630. Following the public hearing, the City Council may adopt the Draft 2020 UWMP and 2020 WSCP with recommended modifications as a result of public input. The Draft 2020 UWMP and WSCP is available for public review at City Hall and on the City's website www.cityofkerman.org. During the public hearing, the City Council will hear and consider all comments. All interested persons are invited to attend and speak on this matter. Written comments can also be submitted up until the date of the public hearing to: Michael Barajas City of Kerman, Director of Public Works, 850 S. Madera Avenue, Kerman, CA 93630, (559) 846-6122 mbarajas@cityofkerman.org.

1410:k14-15c

KerWest, Inc.
652 S. Madera Ave.
Kerman, CA 93630

The Kerman News
Firebaugh Mendota Journal
West Side Advance

Invoice

Date	Invoice #
3/30/2022	22592

Bill To	Remit To
City of Kerman Public Works Dept. 850 S. Madera Ave. Kerman, CA 93630	KerWest, Inc. 340 Wilcox Drive Stonewall, TX 78671

Terms	Due Date	Insert Date	Insert No.
	3/30/2022	04/06/22	1410

Item	Qty/In/Wds	Description	Price	Auth. By:	Amount
Legal	6.5	Notice of Public Hearing on June 8, 2022 04/06/22	23.30		151.45
Legal	6.5	Notice of Public Hearing on June 8, 2022 04/13/22	23.30		151.45
Proof of Publi...		Proof of Publication	50.00		50.00

Subtotal	$352.90
Sales Tax (0.0%)	$0.00
Total	$352.90
Balance Due	$352.90

Phone #	Fax #
(559) 846-6689	(559) 846-8045

PUBLIC WORKS DEPARTMENT
Michael Barajas, Director

15201 W. California Avenue
Kerman, CA 93630
(559) 846-93430
mbarajas@cityofkerman.org

NOTICE OF AVAILABILITY OF CITY OF KERMAN DRAFT 2020 URBAN WATER MANAGEMENT PLAN UPDATE, 2020 WATER SHORTAGE CONTINGENCY PLAN, AND PUBLIC HEARING TO RECEIVE COMMENTS

NOTICE IS HEREBY GIVEN that the City of Kerman's Draft 2020 Urban Water Management Plan Update (2020 UWMP) and Draft 2020 Water Shortage Contingency Plan (WSCP) is available for public review and comment, and that the City Council of the City of Kerman has continued the public hearing which commenced on June 8, 2022. The continued public hearing to receive comments on the 2020 UWMP and 2020 WSCP will be held on **Wednesday, July 13, 2022, at 6:00 p.m.,** or as soon thereafter, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630.

This hearing will be conducted both in person and via teleconferencing pursuant to State of California Executive Order No. N-29-20 issued on March 17, 2020. The Zoom weblink and telephone number will be provided in the City Council meeting agenda that will be posted 72 hours prior to the meeting. City Council agenda items can be accessed at www.cityofkerman.net/city-council-meeting-agendas-minutes/. The public may provide public comment in person, telephonically during the meeting, or by email to Michael Barajas at mbarajas@cityofkerman.org.

The Draft 2020 UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands under a range of water supply conditions, including water shortages. The Draft WSCP documents the City's plans to manage and mitigate an actual water shortage condition, should one occur because of drought or other impacts on water supplies. Copies of the Draft 2020 UWMP and 2020 WSCP will be made available for public review on the City of Kerman's website and at the Kerman City Hall.

During the public hearing, the City Council will hear and consider all comments. All interested persons are invited to attend and speak on this matter. Written comments can also be submitted up until the date of the public hearing to:

Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, Ca 93630
Office: (559) 846-6122
mbarajas@cityofkerman.org

MCCLATCHY

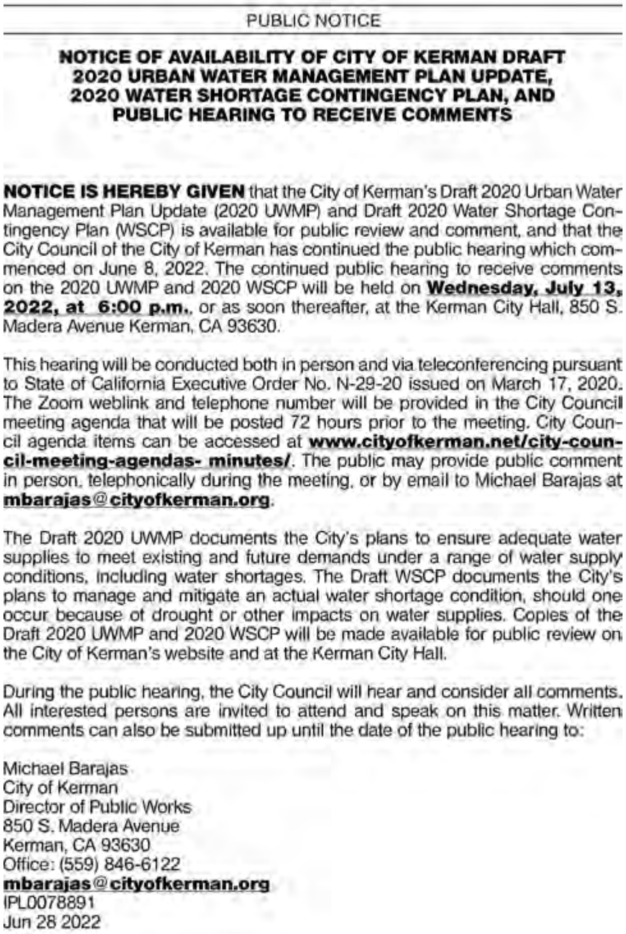
Beaufort Gazette
Belleville News-Democrat
Bellingham Herald
Bradenton Herald
Centre Daily Times
Charlotte Observer
Columbus Ledger-Enquirer
Fresno Bee
The Herald - Rock Hill
Herald Sun - Durham
Idaho Statesman
Island Packet
Kansas City Star
Lexington Herald-Leader
Merced Sun-Star
Miami Herald
el Nuevo Herald - Miami
Modesto Bee
Raleigh News & Observer
The Olympian
Sacramento Bee
Fort Worth Star-Telegram
The State - Columbia
Sun Herald - Biloxi
Sun News - Myrtle Beach
The News Tribune Tacoma
The Telegraph - Macon
San Luis Obispo Tribune
Tri-City Herald
Wichita Eagle

AFFIDAVIT OF PUBLICATION

Account #	Order Number	Identification	Order PO	Amount	Cols	Depth
23743	282256	Print Legal Ad - IPL0078891		$798.00	2	49 L

Attention: Olivia Pimentel

CITY OF KERMAN
850 S MADERA AVE
KERMAN, CA 93630



PUBLIC NOTICE

NOTICE OF AVAILABILITY OF CITY OF KERMAN DRAFT 2020 URBAN WATER MANAGEMENT PLAN UPDATE, 2020 WATER SHORTAGE CONTINGENCY PLAN, AND PUBLIC HEARING TO RECEIVE COMMENTS

NOTICE IS HEREBY GIVEN that the City of Kerman's Draft 2020 Urban Water Management Plan Update (2020 UWMP) and Draft 2020 Water Shortage Contingency Plan (WSCP) is available for public review and comment, and that the City Council of the City of Kerman has continued the public hearing which commenced on June 8, 2022. The continued public hearing to receive comments on the 2020 UWMP and 2020 WSCP will be held on **Wednesday, July 13, 2022, at 6:00 p.m.**, or as soon thereafter, at the Kerman City Hall, 850 S. Madera Avenue Kerman, CA 93630.

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The Draft 2020 UWMP documents the City's plans to ensure adequate water supplies to meet existing and future demands under a range of water supply conditions, including water shortages. The Draft WSCP documents the City's plans to manage and mitigate an actual water shortage condition, should one occur because of drought or other impacts on water supplies. Copies of the Draft 2020 UWMP and 2020 WSCP will be made available for public review on the City of Kerman's website and at the Kerman City Hall.

During the public hearing, the City Council will hear and consider all comments. All interested persons are invited to attend and speak on this matter. Written comments can also be submitted up until the date of the public hearing to:

Michael Barajas
City of Kerman
Director of Public Works
850 S. Madera Avenue
Kerman, CA 93630
Office: (559) 846-6122
mbarajas@cityofkerman.org
IPL0078891
Jun 28 2022

COUNTY OF DALLAS
STATE OF TEXAS

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.
The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 28, 1994, Action No. 520058-9.
The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

No. of Insertions: 1

Beginning Issue of: 06/28/2022

Ending Issue of: 06/28/2022

Isabel Capps

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated: 06/28/2022

Stefani Beard

Notary Public in and for the state of Texas, residing in Dallas County

STEFANI SCOTT BEARD
My Notary ID # 131768951
Expires October 23, 2022

Extra charge for lost or duplicate affidavits.
Legal document please do not destroy!

APPENDIX N

2020 UWMP AND WSCP ADOPTION RESOLUTION (NOT INCLUDED IN DRAFT UWMP)

RESOLUTION NO. 22-51

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF KERMAN, CALIFORNIA, ADOPTING THE 2020 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Urban Water Management Planning Act ("Act") (California Water Code Sections 10610 et. seq.) requires urban water suppliers providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to develop an Urban Water Management Plan; and

WHEREAS, the Act requires that an urban water management plan be updated every five years and submitted to the California Department of Water Resources by July, in the years ending in 1 and 6; and

WHEREAS, the City of Kerman last updated its Urban Water Management Plan in June of 2017; and

WHEREAS, the City's 2020 Urban Water Management Plan must be adopted, after public review and hearing, and filed with the California Department of Water Resources; and

WHEREAS, a Draft 2020 Urban Water Management Plan has been prepared and circulated for public review, and all comments received have been reviewed and considered; and, following the publication of notices on April 6, 2022, and April 13, 2022, a properly noticed public hearing was held by the City Council on June 8, 2022, and continued for subsequent Council hearing date; and

WHEREAS, the City Council held a duly noticed continued public hearing on July 13, 2022; and

WHEREAS, all prerequisites under the Act for the adoption of the Final Urban Water Management Plan have been met.

NOW, THEREFORE the City Council of the City of Kerman resolves as follows:

1. The above recitals are true and correct.

2. The Council adopts the City of Kerman's 2020 Urban Water Management Plan presented at the public hearing and attached to this resolution as Exhibit 'A' which is incorporated by reference.

3. The Council authorizes the Public Works Director to file the Final 2020 Urban Water Management Plan with the California Department of Water Resources, submit copies as required by the Act, make it available for public review, and take actions necessary or advisable to carry out the purpose of this resolution.

4. This resolution is effective immediately upon adoption.

The foregoing resolution was adopted at a regular meeting of the City Council of the City of Kerman held on the 12th day of July 2022, and passed at the said meeting by the following vote:

AYES: Nehring, Coleman, Herrera, Nijjer, Yep
NOES: None
ABSENT: None
ABSTAIN: None

The foregoing resolution is hereby approved.

Gary Yep
Mayor

ATTEST:

Marci Reyes
City Clerk

RESOLUTION NO. 22-52

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF KERMAN, CALIFORNIA, ADOPTING THE 2020 WATER SHORTAGE CONTINGENCY PLAN

WHEREAS, the California Urban Water Management Planning Act ("Act") (California Water Code Sections 10610 et. seq.) requires urban water suppliers providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to develop an Urban Water Management Plan; and

WHEREAS, the City's 2020 Water Shortage Contingency Plan must be adopted, after public review and hearing, and filed with the California Department of Water Resources; and

WHEREAS, the City of Kerman last updated its Urban Water Management Plan in June of 2017; and

WHEREAS, the City's 2020 Urban Water Management Plan must be adopted, after public review and hearing, and filed with the California Department of Water Resources; and

WHEREAS, the on June 8, 2022, the City Council opened a public hearing to consider the 2020 Urban Water Management Plan and the 2020 Water Shortage Contingency Plan, heard comments and testimony, and continued the public hearing for further analysis; and WHEREAS, a Draft 2020 Water Shortage Contingency Plan has been prepared and circulated for public review; and all comments received have been reviewed and considered; and, following the publication of notices on April 6, 2022, April 13, 2022, and June 28, 2022, a properly noticed public hearing was held by the City Council on June 8, 2022, and July 13, 2022, prior to the adoption of the Final Water Shortage Contingency Plan, all in compliance with the requirements of the Act.

NOW, THEREFORE the City Council of the City of Kerman resolves as follows:

1. The above recitals are true and correct.

2. The Council adopts the City of Kerman's 2020 Water Shortage Contingency Plan attached hereto as Exhibit 'A' which is incorporated by reference.

3. The Council authorizes the Public Works Director to file the Final 2020 Water Shortage Contingency Plan with the California Department of Water Resources, submit copies as required by the Act, make it available for public review, and take actions necessary or advisable to carry out the purpose of this resolution.

4. This resolution is effective immediately upon adoption.

The foregoing resolution was adopted at a regular meeting of the City Council of the City of Kerman held on the 12th day of July 2022, and passed at the said meeting by the following vote:

AYES:	Nehring, Coleman, Herrera, Nijjer, Yep
NOES:	None
ABSENT:	None
ABSTAIN:	None

The foregoing resolution is hereby approved.

Gary Yep
Mayor

ATTEST:

Marci Reyes
City Clerk

APPENDIX O

2020 UWMP CHECKLIST

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
Chapter 1	10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities.	Introduction and Overview	Chapter 1, pg. 9-13
Chapter 1	10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Lay Description, pg. 1-8
Section 2.2	10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.2
Section 2.6	10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5
Section 2.6.2	10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	Section 2.5
Section 2.6, Section 6.1	10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	Sections 2.5.1 & 6.4
Section 2.6	10631(h)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Not Applicable
Section 3.1	10631(a)	Describe the water supplier service area.	System Description	Chapter 3, pg. 18-22
Section 3.3	10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.4
Section 3.4	10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	Section 3.5.1, Table 3-2
Section 3.4.2	10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	Section 3.5.2
Sections 3.4 and 5.4	10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Section 3.5.1
Section 3.5	10631(a)	Describe the land uses within the service area.	System Description	Section 3.6
Section 4.2	10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.3
Section 4.2.4	10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	Section 4.3.3
Section 4.2.6	10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans and other policies or laws.	System Water Use	Section 4.3.6
Section 4.2.6	10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	Section 4.3.6
Section 4.3.2.4	10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	Section 4.3.3
Section 4.4	10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.4
Section 4.5	10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	Section 4.5
Chapter 5	10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Section 5.6
Chapter 5	10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	Section 5.7
Section 5.1	10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Not Applicable
Section 5.2	10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.7.1
Section 5.5	10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7
Section 5.5 and Appendix E	10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Section 5.7.2
Sections 6.1 and 6.2	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	Sections 6.2, 6.4 & 7.2

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
Sections 6.1	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, *including changes in supply due to climate change.*	System Supplies	Section 6.11
Section 6.1	10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	Not Applicable
Section 6.1.1	10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	Section 6.9
Section 6.2.8	10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	Section 6.10
Section 6.2	10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.3
Section 6.2.2	10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.3.3
Section 6.2.2	10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	Section 6.3.1
Section 6.2.2	10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.3.4
Section 6.2.2.1	10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	Section 6.3.1 & 6.3.4
Section 6.2.2.4	10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.3.5
Section 6.2.2	10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Section 6.3.5
Section 6.2.7	10631(c)	Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis.	System Supplies	Section 6.2
Section 6.2.5	10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.6
Section 6.2.5	10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.6
Section 6.2.5	10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.6.4
Section 6.2.5	10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.6.4
Section 6.2.5	10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.6.5
Section 6.2.5	10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.6
Section 6.2.6	10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.7
Section 6.2.5	10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods.	System Supplies (Recycled Water)	Section 6.6
Section 6.2.8, Section 6.3.7	10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years.	System Supplies	Section 6.9
Section 6.4 and Appendix O	10631.2(a)	The UWMP must include energy information, as stated in the code, that a supplier can readily obtain.	System Suppliers, Energy Intensity	Section 6.12
Section 7.2	10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.2
Section 7.2.4	10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.2.4
Section 7.3	10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.2
Section 7.3	10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	Section 7.3

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
Section 7.3	10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	Section 7.3
Section 7.3	10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	Section 7.3
Section 7.3	10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	Section 7.3
Section 7.3	10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	Section 7.3
Chapter 8	10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	Chapter 7 pg. 54-63
Chapter 8	10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	Section 8.2
Section 8.10	10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	Section 8.10
Section 8.2	10632(a)(2)(A)	Provide the written decision-making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	Section 8.3
Section 8.2	10632(a)(2)(B)	Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	Section 8.3
Section 8.3	10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	Section 8.4
Section 8.3	10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	Section 8.4, Table 8-1
Section 8.4	10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	Section 8.4, Table 8-1
Section 8.4	10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	Section 8.5
Section 8.4	10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	Section 8.5
Section 8.4	10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions are appropriate to local conditions.	Water Shortage Contingency Planning	Section 8.5
Section 8.4	10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	Section 8.5
Section 8.4.6	10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Plan	Section 8.5.6
Section 8.5	10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	Section 8.6
Section 8.5 and 8.6	10632(a)(5)(B) 10632(a)(5)(C)	Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications.	Water Shortage Contingency Planning	Section 8.6
Section 8.6	10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	Section 8.7
Section 8.7	10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	Section 8.8
Section 8.7	10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	Section 8.8
Section 8.7	10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	Section 8.8
Section 8.8	10632(a)(8)(A)	Describe the potential revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Section 8.9

2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location (Optional Column for Agency Review Use)
Section 8.8	10632(a)(8)(B)	Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Section 8.9
Section 8.8	10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought	Water Shortage Contingency Planning	Section 8.9
Section 8.9	10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	Section 8.10
Section 8.11	10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	Section 8.12
Sections 8.12 and 10.4	10635(c)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4
Section 8.12	10632(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	Section 10.4
Sections 9.1 and 9.3	10631(e)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Section 9.2
Sections 9.2 and 9.3	10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Section 9.3
Chapter 10	10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	Chapter 10 pg. 96-100
Section 10.2.1	10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	Section 10.2.1
Section 10.4	10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	Section 10.4
Sections 10.2.2, 10.3, and 10.5	10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2 - 10.4, Appendices I & m
Section 10.2.2	10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Section 10.2.1
Section 10.3.2	10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Appendix N
Section 10.4	10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4
Section 10.4	10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4
Sections 10.4.1 and 10.4.2	10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Section 10.4
Section 10.5	10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
Section 10.5	10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
Section 10.6	10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	Section 10.6
Section 10.7.2	10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	Section 10.7.2