Recommendations for Guidelines and Methodologies for Calculating Urban Water Use Objective

WUES-DWR-2021-01B

A Report to the State Water Resources Control Board Prepared Pursuant to California Water Code Section 10609.16

September 2022

California Department of Water Resources
Water Use Efficiency Branch

Note: This report is part of the package of reports developed by the California Department of Water Resources to meet the requirements of Senate Bill 606 and Assembly Bill 1668 of 2018 for urban water use efficiency.

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Abbreviations and Acronyms

2018 Legislation	2018 Legislation on Water Conservation and Drought Planning (Senate Bill 606 [Hertzberg] and Assembly Bill 1668 [Friedman], as amended)
AB	Assembly Bill
ACS	American Community Survey
AMI	advanced metering infrastructure
Cal-SIMETAW	California Simulation of Evapotranspiration of Applied Water
CCR	California Code of Regulations
CFM	cubic feet per minute
CII	commercial, industrial, and institutional
CII-DIM	commercial, industrial, institutional dedicated irrigation meter
CII-DIMWUS	Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard
CIILA_new	commercial, industrial, and institutional landscape area for new landscapes, post-January 1, 2020
CIILA_r	commercial, industrial, and institutional landscape area for regular landscapes, pre-January 1, 2020
CIMIS	California Irrigation Management Information System
DAC	disadvantaged community
DIM	dedicated irrigation meter
DOF	California Department of Finance
DPR	direct potable reuse
dS/m	decisiemens per meter
DWR	California Department of Water Resources
EC	evaporative cooler
ECe	plant threshold salinity
ECiw	salinity of the irrigation (recycled) water
EDSWL	estimating efficient distribution system water loss

EF	evaporation factor
EIRWU	efficient indoor residential water use
EORWU	efficient outdoor residential water use
ERLA	existing residential landscape area
ETAF	evapotranspiration factor in Model Water Efficient Landscape Ordinance design standard (on parcel level)
ETF	evapotranspiration factor (on urban retail water supplier level)
ETF_gsCrop	evapotranspiration factor based on the crop-specific growing season and reference evapotranspiration in the service area of an urban retail water supplier
ETF_SLA	evapotranspiration factor for special landscape areas' irrigation with recycled water per Model Water Efficient Landscape Ordinance, as amended
ETo	reference evapotranspiration
ETo_gs	average reference evapotranspiration during growing season in the service area of an urban retail water supplier
ETo_gsCrop	crop-specific reference evapotranspiration during growing season in the service area of an urban retail water supplier
GC	California Government Code
GIS	geographic information system
gpcd	gallons per capita per day
HOA	homeowners association
IE	irrigation efficiency
IE_Crop	crop-specific irrigation efficiency
II	irrigable-irrigated
INI	irrigable-not irrigated
IPR	indirect potable reuse
IRWUS	Indoor Residential Water Use Efficiency Standard
Kc_gs	crop coefficient during growing season
Kc_gsCrop	crop coefficients for the duration of growing season

LA	landscape area
LA_Crop	irrigated land area per crop or crop type
LAM	landscape area measurement
Legislature	California State Legislature
LR	leaching requirement
mg/L	milligrams per liter
MWELO	Model Water Efficient Landscape Ordinance
NI	not irrigable
NRLA	new residential landscape area
OR_LAM_Ag Mask	Outdoor Residential Landscape Area Measurement Agricultural Mask
ORWUS	Outdoor Residential Water Use Efficiency Standard
Peff	effective precipitation
PF	plant factor
PRISM	Parameter-elevation Relationships on Independent Slopes Model
PWS	public water system
RLA	residential landscape area
SB	Senate Bill
SDAC	severely disadvantaged community
SLA	Special Landscape Area
SLA_htds	total special landscape area irrigated with high total dissolved solids recycled water
State	State of California
State Water Board	State Water Resources Control Board
TDS	total dissolved solids
UCD	University of California, Davis
UWUO	urban water use objective
UWUO_EP	the standards-based urban water use objective during qualified emergency period(s) for the qualified emergency zone(s)

UWUO_SB	urban water use objective without any variances
WC	California Water Code
WLS	Water Loss Standard

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Executive Summary

The California State Legislature passed the 2018 Legislation on Water Conservation and Drought Planning (Senate Bill 606 [Hertzberg] and Assembly Bill 1668 [Friedman], as amended; hereinafter referred to as the "2018 Legislation"), which included provisions for advancing urban water use efficiency through developing and implementing various water use efficiency standards, variances, and performance measures. This report provides recommendations for guidelines and methodologies for an urban retail water supplier to use in calculating its urban water use objective (UWUO) consistent with the directives under California Water Code (WC) Section 10609.16. All recommended guidelines and methodologies are subject to approval and adoption by the State Water Board.

These guidelines and methodologies include recommendations for:

- Calculation of four efficient water use components based on the following standards:
  - Indoor Residential Water Use Efficiency Standard.
  - Outdoor Residential Water Use Efficiency Standard.
  - Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard.
  - Water Loss Standard.
- Calculation of the UWUO based on the water use efficiency standards (compliance with the efficiency standards is based on the overall objective and not the individual standards it comprises).
- Variances for unique uses of water that could have a material effect on an urban retail water supplier's UWUO.
- Potable reuse water bonus incentive.
- Determination of prior year actual water use.
- Data accuracy requirements and process for using alternative data.
- Comparison of the actual water use to the UWUO.

This document also summarizes key reporting requirements and State Water Board authorities.

Consistent with the legislative directive, DWR used a public process involving a diverse group of stakeholders in the review and development of the recommendations for the UWUO components and guidelines and methodologies. The Landscape Area Measurement Working Group; the Water Use Studies Working Group; and the Standards, Methods, and Performance Measures Working Group that DWR established to assist in implementing the 2018 Legislation were the primary stakeholders involved in the development process. Additional stakeholders included State of California agencies, cities, counties, water suppliers, environmental organizations, and other interested parties. Working group members and stakeholders were provided with many opportunities to comment on and inform the suitability and practical application of the recommendations, and the development and refinements of the applicable scopes, specifications, and final recommendations. Technical feasibility, financial considerations, and associated potential economic effects on urban retail water suppliers were also considered during the development process.

DWR has completed a significant body of work to meet the requirements of the 2018 Legislation and provide recommendations on different topics to the State Water Board for adoption. To streamline document development and recognize the inherent interrelationships among different topics and the need for overall consistency, DWR organized the various reports in an Urban Water Use Efficiency Recommendation Package (Recommendation Package) that allows mutual referencing and incorporates content by reference.

Recommendations for the eight variances and the deferral of one variance[2] are part of the *Recommendations for Urban Water Use Efficiency Standards, Variances, Performance Measures, and Annual Water Use Reporting* (WUES-DWR-2021-01A). The recommendations were prepared per the requirements of the 2018 Legislation and are to be transmitted to the State Water Board. All recommendations are subject to approval and adoption by the State Water Board.

Refer to the individual reports, incorporated by reference and listed in Appendix A of this report, for details on stakeholder engagement, approaches, and recommendations on the four standards listed above; variances for unique uses of water that could have a material effect on the UWUO; and potable reuse water bonus incentive accounting.

[2] See *Recommendations for Deferring Variance for Significant Water Use of Home Use Medical Devices* (WUES-DWR-2021-06) for a discussion of the deferral of this variance.

1.0 Introduction

In 2018, the California State Legislature (Legislature) enacted Senate Bill (SB) 606 (Hertzberg) and Assembly Bill (AB) 1668 (Friedman), as amended (hereinafter referred to as the "2018 Legislation"). Among other things, these two bills establish a new framework for guiding long-term improvements in urban water use efficiency. SB 606 and AB 1668 build upon Governor Edmund G. Brown Jr.'s 2016 Executive Order B-37-16 and the supporting 2017 report, *Making Water Conservation a California Way of Life, Implementing Executive Order B-37-16*, prepared by the California Department of Water Resources (DWR), State Water Resources Control Board (State Water Board), California Public Utilities Commission, California Department of Food and Agriculture, and California Energy Commission.[3] A key part of the 2018 Legislation is the implementation of a water budget–based approach to urban water use efficiency based on efficiency standards to be adopted by the State Water Board, in coordination with DWR, by June 30, 2022.

Per the 2018 Legislation, the efficiency standards are to address: (1) indoor residential water use, (2) outdoor residential water use, (3) water use by outdoor commercial, industrial, and institutional (CII) landscapes with dedicated irrigation meters (DIM), and (4) urban retail water supplier distribution system water losses. The 2018 Legislation also directs DWR and the State Water Board to establish performance measures for CII water use and appropriate variances for unique water uses that can have a material effect on an urban retail water supplier's urban water use objective (UWUO). As defined in California Water Code (WC) Section 10608.12, an urban retail water supplier is a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 customers or supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes. The UWUO is an estimate of aggregate efficient water use for the previous year based on adopted water use efficiency standards and local service area characteristics for that year.

Based on the adopted efficiency standards, urban retail water suppliers will annually calculate their UWUO, which is the sum of estimated efficient indoor and outdoor residential water use, efficient outdoor CII water use by landscapes with dedicated irrigation meters and efficient distribution system water loss, plus any water use variances granted to an urban retail water supplier by the State Water Board. Urban retail water suppliers will compare their UWUO to their actual water use for the prior year. In making this comparison, urban retail water suppliers may add to their UWUO a volume of water based on the amount of potable reuse in their service area.

[3] For additional information on SB 606, AB 1668, and the 2017 framework report, *Making Water Conservation a California Way of Life, Implementing Executive Order B-37-16*, refer to the *Primer on the 2018 Legislation on Water Conservation and Drought Planning* prepared by DWR and the State Water Board (DWR and State Water Board, 2018).

Compliance with the efficiency standards is based on the overall objective and not the individual standards it comprises. For example, if an urban retail water supplier's actual indoor residential water use is greater than its calculated efficient indoor residential water use, the difference is not considered material so long as its aggregate water use is less than its UWUO. This provision of the 2018 Legislation is intended to give urban retail water suppliers flexibility in how they meet their UWUO. As such, it is left to urban retail water suppliers to decide, given their particular circumstances, how best to meet their UWUO. However, an urban retail water supplier that does not meet its UWUO may be required by the State Water Board to enact policies and programs that result in compliance with the UWUO.

As part of the new framework for urban water use efficiency, the Legislature directed DWR, in coordination with the State Water Board, to prepare guidelines and methodologies that explain how urban retail water suppliers are to calculate their UWUO. Per WC Section 10609.16, the guidelines and methodologies are to 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 an 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.*

This document and other supporting documents incorporated by reference contain the guidelines and methodologies that fulfill this legislative requirement. The report, *Summary of Recommendations for Variances* (WUES-DWR-2021-04), summarizes DWR's efforts relative to variance development, including scope, approach, variance recommendations, and implementation considerations.

Refer to Appendix A of this report for the Urban Water Use Efficiency Recommendation Package Reports Incorporated by Reference. All reports in the Recommendation Package are given a serial number in the form of “WUES-DWR-2021-xx.” Key terms and their definitions used in this report, along with abbreviations and acronyms, are included in *Urban Water Use Efficiency Recommendation Package: Glossary and Abbreviations and Acronyms* (WUES-DWR-2021-21). All recommended guidelines and methodologies are subject to approval and adoption by the State Water Board.

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2.0 Urban Retail Water Supplier Reporting Requirements

As discussed in the previous section, urban retail water suppliers will be required to annually calculate and report their UWUOs in relation to their prior year water uses using guidelines and methodologies established by DWR and the State Water Board. Key reporting dates and requirements relative to UWUOs are as follows:

- Per WC Sections 10609.20 and 10609.22, an urban retail water supplier is required to calculate its UWUO and actual water use for the prior year no later than January 1, 2024, and by January 1 every year thereafter. These calculations are to be based on the urban retail water supplier's water use conditions for the previous calendar or fiscal year.

- Per WC Section 10609.24, an urban retail water supplier is required to submit a report to DWR no later than January 1, 2024, and by January 1 every year thereafter. The report is to include all of the following:

  - The urban retail water supplier's UWUO calculated pursuant to WC Section 10609.20, along with relevant supporting data.

  - The urban retail water supplier's actual urban water use calculated pursuant to WC Section 10609.22, along with relevant supporting data.

  - Documentation of the implementation of CII performance measures.

  - A description of the urban retail water supplier's progress towards meeting its UWUO.

  - The validated water loss audit report conducted pursuant to WC Section 10608.34.

- Per WC Section 10609.25, as part of the first report submitted to DWR, the urban retail water supplier is to provide a narrative describing the water demand management measures it plans to implement to achieve its UWUO by January 1, 2027.

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3.0 State Water Resources Control Board's Enforcement Authorities

SB 606 (as amended by AB 1414) invested the State Water Board with the following enforcement authorities with respect to urban retail water suppliers whose actual water use exceeds their UWUO:

- Starting January 1, 2024, the State Water 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 UWUO. An informational order is intended to obtain information on the urban retail water supplier's activities, water production, and conservation efforts in order to identify technical assistance needs and opportunities to help the urban retail water supplier meet its UWUO (WC Section 10609.26(a)(1)).

- Starting January 1, 2025, the State Water Board may issue written notices to an urban retail water supplier that does not meet its UWUO. The written notice may warn the urban retail water supplier that it is not meeting its UWUO and is not making adequate progress towards meeting it and may request the urban retail water supplier address areas of concern in its next annual report pursuant to WC Section 10609.24 (WC Section 10609.26(b)).

- Starting January 1, 2026, the State Water Board may issue a conservation order to an urban retail water supplier that does not meet its UWUO. A conservation order may consist of, but is not limited to, referral to DWR for technical assistance, requirements for education and outreach to customers, requirements for local enforcement, and other efforts to help the urban retail water supplier meet its UWUO (WC Section 10609.26(c)(1)). In issuing a conservation order, the State Water Board is to identify specific deficiencies in the urban retail water supplier's progress towards meeting its UWUO and identify specific actions to address these deficiencies (WC Section 10609.26(c)(2)). A conservation order may require the urban retail water supplier to take actions intended to increase water-use efficiency but may not curtail or otherwise limit the exercise of a water right or impose a civil liability pursuant to WC Section 377 (WC Section 10609.26(d)).

- In determining whether to issue an information order or written notice, the State Water Board is to consider the degree to which the UWUO has not been met, the information provided by the urban retail water supplier pursuant to WC Section 10609.24, and actions the urban retail water supplier has implemented or intends to implement to meet its UWUO (WC Section 10609.26(a)(2) and 10609.26(b)).

- Notwithstanding the above, the State Water Board is prohibited from issuing an informational order, written notice, or conservation order when both of the following conditions are met (WC Section 10609.27):
  - The State Water Board determines the urban retail water supplier is not meeting its UWUO solely because the volume of water loss exceeds the urban retail water supplier's Water Loss Standard (WLS).
  - The State Water Board is taking enforcement action against the urban retail water supplier for not meeting its WLS pursuant to WC Section 10608.34.

Additionally, the State Water Board may waive UWUO compliance requirements 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 resulting from a disaster, such as an earthquake or fire (WC Section 10609.38). In establishing the period of waiver, the State Water Board is to take into consideration the breadth of the damage and the time needed for the damaged areas to recover from the disaster.

4.0 Comparing Actual Water Use to Urban Water Use Objective

This section provides a general overview of how an urban retail water supplier is to compare its actual water use to its UWUO for the previous year. Subsequent sections provide guidelines and methodologies for calculating the volumes of water for the urban retail water supplier's UWUO and actual water use.

4.1 Urban Water Use Objective

WC Section 10609.20(c) defines an urban retail water supplier's UWUO as the sum of five water volumes, as shown in Figure 4-1.

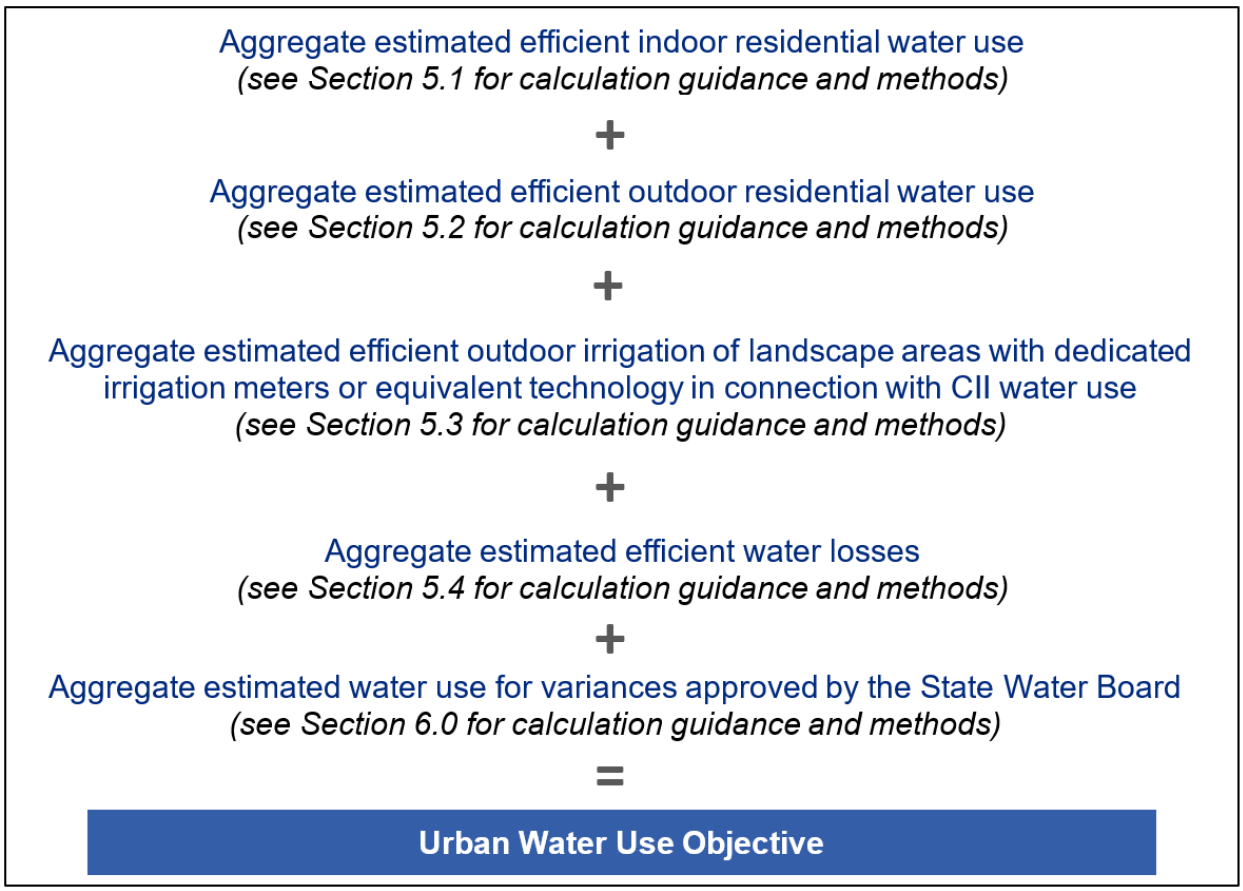

Figure 4-1 Components of Urban Water Use Objective

4.2 Potable Reuse Bonus Incentive

An urban retail water supplier that delivers water from a groundwater basin, reservoir, or other source that is augmented by potable reuse may add to their UWUO a bonus

incentive for potable reuse delivered to residential water users and commercial, industrial, and institutional dedicated irrigation meters (CII-DIM) (see *Recommendations for Bonus Incentive Methods of Calculation and Supporting Data Requirements* [WUES-DWR-2021-14]). The bonus incentive is capped at either:

- 15 percent of the UWUO, if the bonus incentive is based on potable reuse produced at an Existing Facility; or
- 10 percent of the UWUO, if the bonus incentive is based on potable reuse produced at a facility that is not an Existing Facility (i.e., Other Facility; a facility that does not meet the four criteria listed below).

Per WC Section 10609.20(d)(4), an Existing Facility for bonus incentive means a facility that meets all of the following:

- The facility has a certified environmental impact report, mitigated negative declaration, or negative declaration on or before January 1, 2019.
- The facility begins producing and delivering potable reuse water on or before January 1, 2022.
- The facility uses microfiltration and reverse osmosis technologies to produce the potable reuse water.
- For purposes of WC Section 10609.20, and notwithstanding paragraph (4) of subdivision (d) of WC 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 (WC Section 10609.21(a)).

If an urban retail water supplier has both Existing and Other Facilities of potable reuse, it may select the cap yielding the largest bonus incentive. Section 7 provides guidelines and methodologies for calculating the potable reuse bonus incentive.

4.3 Actual Water Use

Under the 2018 Legislation, an urban retail water supplier’s UWUO is to be compared to its prior year actual water use. WC Section 10609.22 defines the actual urban water use as the sum of three volumes, as shown in Figure 4-2.

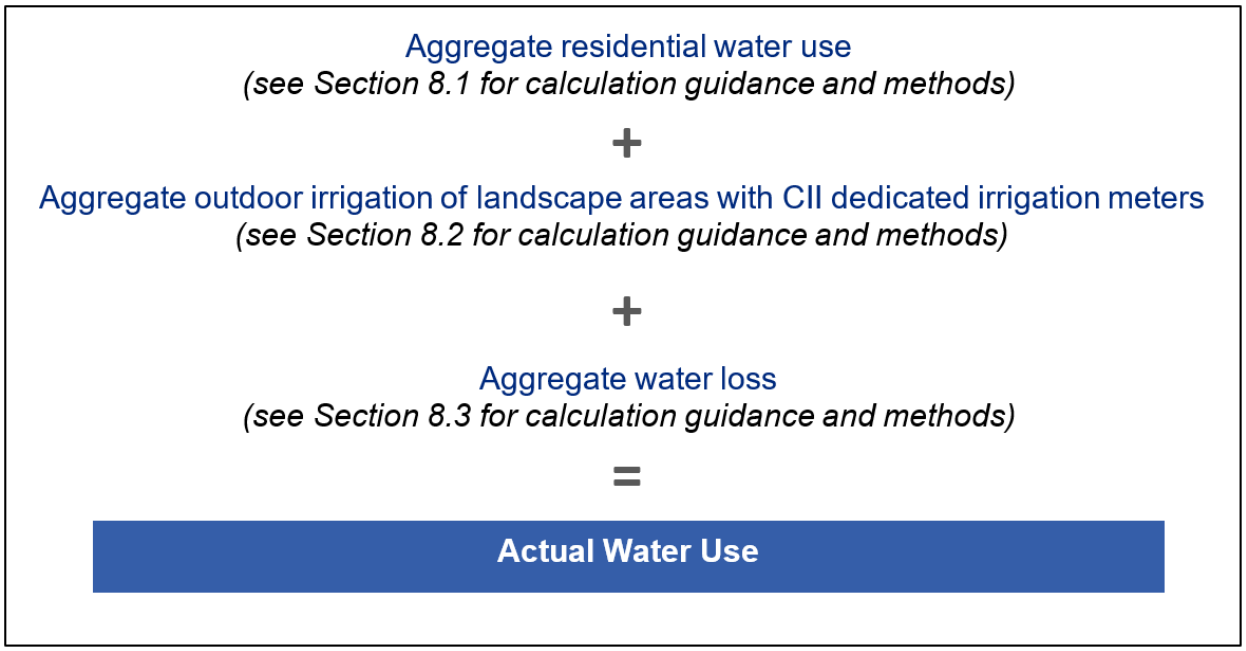

Figure 4-2 Components of Actual Water Use

4.4 Comparison of Urban Water Use Objective to Actual Water Use

Based on this comparison, an urban retail water supplier will have met its UWUO for a given reporting year if it satisfies the criterion shown in Figure 4-3, whereby its prior year actual water use is less than or equal to its UWUO, plus potable reuse bonus incentive. It is important to emphasize that compliance is based on a comparison of aggregate actual water use to the UWUO and not its individual components. Compliance with the individual components is not material to determining whether an urban retail water supplier has met its UWUO. Urban retail water suppliers have the flexibility to decide how best to meet their UWUO, given their particular circumstances (WC Section 10609(c)(1)).

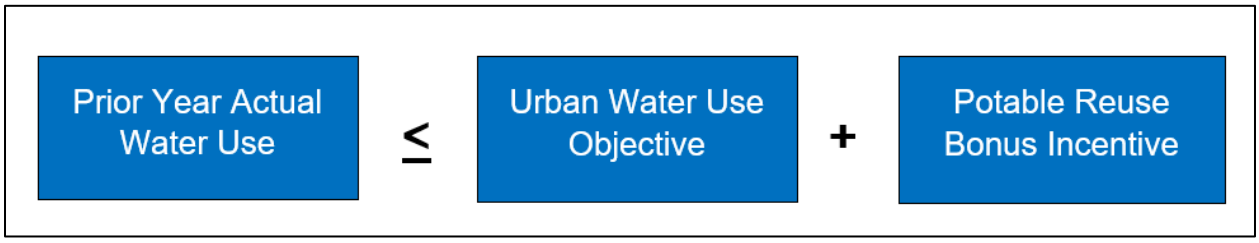

Figure 4-3 Criterion for Compliance with Urban Water Use Objective

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5.0 Guidelines and Methodologies for Calculating the Urban Water Use Objective – Part 1: Efficient Water Use Standards

This section provides guidelines and methodologies for estimating each of the efficient water volumes needed for an urban retail water supplier to calculate its UWUO.

5.1 Estimating Efficient Indoor Residential Water Use

Efficient indoor residential water use (EIRWU) is estimated as the product of the Indoor Residential Water Use Efficiency Standard (IRWUS), expressed in gallons per capita per day (gpcd), and the urban retail water supplier's residential population. This quantity must then be converted to an annual volume by multiplying it by the number of days in a year. The EIRWU calculation is:

$$EIRWU = Indoor\ Residential\ Water\ Use\ Efficiency\ Standard \times Service\ Area\ Residential\ Population \times Days/Year$$

Indoor Residential Water Use Efficiency Standard

IRWUS is set by the Legislature and specified in WC Section 10609.4. The standard is different for different time periods, as shown in Table 5-1.

Table 5-1 Indoor Residential Water Use Efficiency Standard

Period in Which Standard Applies	Indoor Residential Water Use Efficiency Standard (gpcd)
Until January 1, 2025	55.0
Beginning January 1, 2025, and until January 1, 2030	52.5
Beginning January 1, 2030	50.0

Key:
gpcd = gallons per capita per day

DWR and the State Water Board have recommended indoor residential standards that, if approved by the Legislature, replace the current standards. It is, therefore, incumbent upon the urban retail water supplier to confirm that the correct IRWUS is being used when calculating EIRWU.

Service Area Residential Population

An estimate of the service area residential population is needed to calculate EIRWU. It is paramount that the urban retail water supplier uses consistent methods and criteria to estimate its service area population as described in this section. The estimates of the total service area permanent population used in the calculation of EIRWU should adhere to "Method 2: Service Area Population" in the *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* report (DWR, 2016).

Residential population differs from total service area population by the fraction of population residing in group quarters. The U.S. Census Bureau classifies all people not living in housing units (i.e., house, apartment, mobile home, or rented room) as living in group quarters. The U.S. Census Bureau defines two types of group quarters:

- Institutional, such as:
  - Prisons.
  - Nursing homes.
  - Mental hospitals.
- Non-Institutional, such as:
  - College dormitories.
  - Military barracks.
  - Group homes.
  - Missions.
  - Shelters.

Population counts and estimates reported in the Decennial Census and American Community Survey (ACS) include populations in both institutional and non-institutional group quarters. Service area populations estimated with DWR's Population Tool (available at: https://wuedata.water.ca.gov/secure), which uses U.S. Census Bureau population counts and estimates, also includes both types of group quarters populations, as do population estimates prepared by the California Department of Finance (DOF). Thus, if the urban retail water supplier's service area population estimate is based on one of these data sources, it will include group quarters populations unless the urban retail water supplier adjusts the estimate to exclude them.

The recommended method for adjusting the service area population to remove the fraction in group quarters depends on whether the urban retail water supplier's service

area boundary coincides or substantially overlaps (≥95 percent) with jurisdictional boundaries for which official population estimates are available from the U.S. Census Bureau, DOF, or local government association (e.g., city, county, or census designated places) (CALCOG, n.d.). If it does, then it will usually be possible to obtain group quarter population estimates for these jurisdictions directly from the originating data source:

- For service area population estimates originating from DOF data, the *E-5 Population and Housing Estimates for Cities, Counties, and the State* data provides annual estimates of group quarters populations for counties and cities.
- For service area population estimates originating from the U.S. Census Bureau data, the *ACS Table B26001* data provides annual estimates of group quarters populations for counties, cities, and census designated places.
- For service area population estimates originating from a local government association, the urban retail water supplier should check with the association about whether it is able to divide the population estimates into residential and group quarters components.

If the urban retail water supplier's service area boundary does not coincide or substantially overlap with jurisdictions for which official population estimates are available, then a different estimation method will be needed. The recommended method is to use geographic information system (GIS) software to intersect the urban retail water supplier's service area boundary with census tracts and then to tally the group quarters population for each census tract falling within the service boundary using the group quarters population estimates for census tracts in ACS Table B26001. In cases where a census tract straddles the service area boundary, the group quarters population for the tract will need to be apportioned. There are different ways to do this. Two recommended ways:

- Apportion population based on the proportion of the census tract area falling within the service area boundary. For example, if 20 percent of the tract's area falls within the service area, then 20 percent of the tract's group quarters population is counted.
- Count the tract's group quarters population only if the tract's centroid falls within the service area boundary.

Urban retail water suppliers may also use estimates of the group quarters population provided by the primary entities housing this population. For example, in situations where the group quarters population is primarily housed in a few large correctional facilities, long-term care facilities, or college dormitories, adjusting the service area population estimate using reported populations for these facilities will provide a reasonably accurate estimate of the service area's residential population.

Seasonal Population

Urban retail water suppliers in unique situations, such as those with service areas experiencing a significant change in their seasonal workforce or seasonal resident population, may adjust their populations if they can provide documentation to DWR that the technique is based on or consistent with DOF or U.S. Census Bureau population data.

Alternatively, urban retail water suppliers may be eligible for the variance for significant fluctuations in seasonal populations (refer to Section 6.5 of this report and *Recommendations for Variance for Significant Fluctuations in Seasonal Populations, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-08] for details). It should be noted that the variance estimated seasonal population should not be used to determine the permanent residential population for calculating EIRWU.

Annual Efficient Indoor Residential Water Use

Multiplying IRWUS by service area residential population results in a daily estimate of EIRWU. To convert this to an annual volume, multiply the daily estimate by the number of days in the water use comparison year. The Days/Year multiplier is 365 if the water use comparison year is not a leap year and 366 if the water use comparison year is a leap year.

5.2 Estimating Efficient Outdoor Residential Water Use

Efficient outdoor residential water use (EORWU) is calculated using the Outdoor Residential Water Use Efficiency Standard (ORWUS), estimates of single- and multifamily residential landscape areas (*RLA*), reference evapotranspiration using turf grass as a reference (*ETo*), and effective precipitation (*Peff*). Before calculating EORWU, the residential landscape area must be disaggregated into the four categories shown in Table 5-2.

Table 5-2 Residential Irrigable Area Disaggregation Required to Calculate the Efficient Outdoor Residential Water Use

Categories	Irrigable-Irrigated (II)	Irrigable-Not Irrigated (INI)	Total
Existing Residential Landscape Area (*ERLA*)	ERLA_II	ERLA_INI	Total ERLA
New Residential Landscape Area (*NRLA*)	NRLA_II	NRLA_INI	Total NRLA
	Total RLA_II	Total RLA_INI	

Key:
EORWU = efficient outdoor residential water use
ERLA_II = existing irrigable-irrigated residential landscape area
ERLA_INI = existing irrigable-not irrigated residential landscape area
NRLA_II = new irrigable-irrigated residential landscape area
NRLA_INI = new irrigable-not irrigated residential landscape area
RLA_II = irrigable-irrigated residential landscape area
RLA_INI = irrigable-not irrigated residential landscape area

The existing residential landscape area (*ERLA*) comprises all residential landscape areas in existence prior to January 1, 2019. New residential landscape area (*NRLA*) consists of residential landscape areas that came into existence on or after January 1, 2019. Decomposition of *RLA* into *ERLA* and *NRLA* is necessary because different ORWUS values apply to new and existing landscape areas, as summarized in Table 5-3.

Table 5-3 Outdoor Residential Water Use Efficiency Standard Values

Name	Standard/Coefficient Value
ORWUS_E	0.80 until December 31, 2029 0.63 beginning January 1, 2030
ORWUS_N	0.55
INI_Buffer	0.20

New and existing landscape areas must be disaggregated into irrigable-irrigated (II) and irrigable-not irrigated (INI) components. This is necessary because different proportions of II and INI landscape areas are used to calculate EORWU. All of II, but only part of INI, is used. The amount of INI that is used is determined by the INI_Buffer. The INI_Buffer has been calibrated to account for irrigation water applied to landscape area classified as INI based on the irrigation statuses of the imagery that was used to classify residential landscapes. For additional information on the basis for and derivation of the

INI_Buffer, refer to the report, *Recommendations for Outdoor Residential Water Use Efficiency Standard* (WUES-DWR-2021-02).

Given the *RLA* disaggregation shown in Table 5-2, the *EORWU* calculation is:

$$EORWU = (ETo - Peff) \times 0.62 \times \left[(ERLA\_II + ERLA\_INI \times INI\_Buffer) \times ORWUS\_E + \left(NRLA_{II} + NRLA_{INI} \times INI_{Buffer}\right) \times ORWUS\_N\right]$$

ORWUS_E and ORWUS_N are outdoor residential water use standards for existing and new landscapes, respectively. In the above formula, landscape area is expressed in square feet, *ETo* and *Peff* are expressed in inches per year, and INI_Buffer, ORWUS_E, and ORWUS_N are unitless coefficients in the 0 to 1 range. A unit conversion factor, equal to 0.62, is used to express EORWU in gallons per year. In calculating EORWU, *Peff* is capped at 25 percent of total annual precipitation.

Outdoor Residential Water Use Efficiency Standard

Three coefficients in the EORWU formula comprise the outdoor residential standard:

- ORWUS_E: this coefficient determines ORWUS for *ERLA* for given levels of *ETo* and *Peff.*
- ORWUS_N: this coefficient determines ORWUS for *NRLA* for given levels of *ETo* and *Peff.*
- INI_Buffer: this coefficient determines the fraction of INI residential landscape area that may be used in the calculation of EORWU; the INI_Buffer may change based on the outcome of further studies and investigations to be conducted jointly by DWR and the State Water Board.

ORWUS values and the INI buffer that urban retail water suppliers are to use in the calculation of EORWU are provided in Table 5-3. For additional information on the basis for and derivation of these coefficients, refer to the report, *Recommendations for Outdoor Residential Water Use Efficiency Standard* (WUES-DWR-2021-02).

It is incumbent upon the urban retail water supplier when calculating EORWU to confirm that the outdoor residential standard adopted by the State Water Board is being used.

Residential Landscape Area

Urban retail water suppliers obtain an estimate of *ERLA* for their service area from DWR's landscape area measurement (LAM) project (see *Landscape Area Measurements Final Project, Report EA-133C-16-CQ-0044* [WUES-DWR-2021-02.T1]). These estimates are disaggregated into their II and INI components.

The LAM program data, however, does not include estimates of *NRLA*. Urban retail water suppliers wanting to include *NRLA* in the calculation of their EORWU will need to estimate *NRLA* and disaggregate it into its II and INI components. Guidance for estimating *NRLA* is provided below.

Residential Landscape Area Estimated with Alternative Data

Urban retail water suppliers are not required to use the *ERLA* estimates provided by DWR. They may use estimates based on alternative data, provided that these estimates meet or exceed the quality and accuracy of the DWR estimates.

If an urban retail water supplier chooses to use alternative landscape area data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data provided by DWR. Refer to Section 9.1 for the guidelines and methodologies on the alternative data process for residential landscape area.

Estimating New Residential Landscape Area

Urban retail water suppliers are responsible for estimating residential landscape areas for new developments. To identify what qualifies as new landscape, urban retail water suppliers need to review the LAM report that they received from DWR and find the year that the imagery used to measure their respective landscape areas was acquired. For most urban retail water suppliers, this would be 2018, whereas for the pilot agencies and a few others it is 2020. New developments include all residential parcels that are developed the year after the imagery was acquired. Therefore, for most urban retail water suppliers, new developments start in 2019, and for the pilot agencies and a few others, new developments start in 2021.

After identifying parcels that qualify as new developments, urban retail water suppliers must quantify II, INI, and not irrigable (NI) areas for each new landscape parcel and aggregate them to the service area scale. DWR recommends the following approaches to quantify irrigable landscape areas for new landscapes:

1. On-the-ground measurement – this approach involves physical measurement of landscape areas and produces the most accurate result, but it is time consuming and resource intensive. It also involves coordinating with the city government to get records for all new developments.

2. Using remote sensing methods – after identifying the new landscapes, urban retail water suppliers use remotely sensed data to quantify irrigable landscape areas. The accuracy of results from remote sensing methods depends on qualifications of the entity that performs the analysis and quality of the remotely sensed data. If done right, this method can produce reasonably accurate results, but it is resource intensive.

3. Using service area level averages – this is the easiest of all the approaches and less resource intensive. It may, however, be the least accurate. In this approach, urban retail water suppliers only need to identify the total number of new developments (Nnd) and average landscape areas for each class at the service area level. The following is an outline of the steps needed to estimate aggregate areas for new landscapes using this approach:

    a) Calculate the sum of areas for each of the irrigation status classes delivered by DWR or alterative data source. This involves adding each one of the three classes across all residential parcels in the service area to derive aggregate areas (II-total, INI-total, and NI-total).

    b) Obtain the total number of existing residential parcels (Np) in the service area.

    c) Divide II-total, INI-total, and NI-total by Np to get average II, INI, and NI for the service area (II-avg, INI-avg, NI-avg).

    d) Multiply II-avg, INI-avg, and NI-avg by Nnd. This produces aggregate II, INI, and NI for new developments (II-nd, INI-nd, and NI-nd).

Before adjusting the landscape area, urban retail water suppliers must submit a request to DWR and obtain approval for the new development landscape area estimates. The request can include GIS shapefiles or an excel file. DWR will provide detailed guidelines and templates for requesting an adjustment to irrigable areas for new developments.

Special Landscape Areas

Urban retail water suppliers may choose to exclude *RLAs* that qualify as Special Landscape Areas (SLA) from the calculation of their EORWU. The following guidelines apply to the designation of residential landscape area as *SLA*:

- All residential landscape areas irrigated with recycled water may be designated as SLA.

- Vegetable gardens and landscaped play areas on private homeowner land parcels may be designated as SLA only if they are irrigated with recycled water.

- Community vegetable gardens and public play fields within residential developments, such as community vegetable gardens and playgrounds managed by a homeowners association (HOA), may be designated as SLA whether or not they are irrigated with recycled water.

Qualifying residential SLA excluded from the calculation of EORWU may be included in the calculation of Commercial, Industrial, and Institutional Outdoor Irrigation of

Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard (CII-DIMWUS), as described in a subsequent section of these Guidelines and Methodologies.

Because SLA is accorded a higher ORWUS than regular landscape area, inclusion of residential *SLA* in the calculation of CII-DIMWUS will result in a larger UWUO than would be the case if this area were included in the calculation of EORWU. This will only be advantageous for an urban retail water supplier if SLA comprises a significant proportion of its *RLA*. The choice of whether to separate SLA from *RLA* is, therefore, left to each urban retail water supplier.

Agricultural Production on Residential Parcels

Under certain conditions, urban retail water suppliers may be eligible for a variance if there is significant agricultural water use occuring on residential parcels and this use is not covered by ORWUS or CII-DIMWUS. Refer to Section 6.10 of this report for guidelines and methodologies for determining eligibility and calculating the variance.

Reference Evapotranspiration and Precipitation Data Provided by the California Department of Water Resources

Urban retail water suppliers may obtain estimates of *ETo*, total precipitation, and effective precipitation data for their service areas from DWR. Descriptions of these data are as follow:

ETo – DWR has a well-established program for estimation of *ETo* at weather station sites that are managed by the California Irrigation Management Information System (CIMIS) program. *ETo* is evaporation plus transpiration from grass or alfalfa surfaces on which the weather stations stand. DWR currently manages over 155 automated agro-climatic CIMIS stations throughout the State of California (State). To fill spatial data gaps, DWR, in cooperation with the University of California, Davis (UCD), developed Spatial CIMIS. Spatial CIMIS is a model that couples remotely sensed data from the Geostationary Operational Environmental Satellite with point measurements from CIMIS stations to estimate *ETo* on a 2-kilometer grid. Urban retail water supplier boundaries are overlaid on the Spatial CIMIS grid, and a weighted average of each enclosed grid's *ETo* is derived to estimate reference *ETo* at the urban retail water supplier level.

Total and Effective Precipitation – DWR obtains daily total rainfall records from the Parameter-elevation Relationships on Independent Slopes Model (PRISM) as an input to its California Simulation of Evapotranspiration of Applied Water (Cal-SIMETAW) model to calculate annual effective precipitation. PRISM is a climate mapping model developed by the PRISM Climate Group at Oregon State University. Cal-SIMETAW is a soil water balance model developed by DWR and UCD. Effective precipitation is the portion of annual precipitation that becomes available for plant growth. It is affected by soil type, slope, land cover type, and rainfall frequency, intensity, and duration, among

other things. Since it is not practical to use all landscape landcover types in urban settings for estimation of *Peff*, Cal-SIMETAW assumes that the surface is covered with a cool season turfgrass. These models make common ground cover assumptions across different urban retail water suppliers; however, soil type is allowed to vary based on an urban retail water supplier's geographic location. Cal-SIMETAW uses the Soil Survey Geographic Database from the National Resources Conservation Service to model the soil water balance for different service areas. Using these tools, DWR will provide urban retail water suppliers with estimates of total and effective precipitation for their service areas annually.

Note that the urban retail water suppliers may use either estimated *Peff* or 25 percent of total precipitation, whichever is less, when calculating their EORWU.

Reference Evapotranspiration and Precipitation Estimated with Alternative Data

Urban retail water suppliers are not required to use *ETo*, total precipitation, and effective precipitation estimates provided by DWR. They may use estimates based on alternative data, provided that those estimates meet or exceed the quality and accuracy of data provided by DWR.

If an urban retail water supplier chooses to use alternative *ETo*, total precipitation, or effective precipitation data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data provided by DWR. Refer to Sections 9.2, 9.3, and 9.4 for the guidelines and methodologies on the alternative data process for *ETo*, *Peff*, or total precipitation, respectively.

5.3 Estimating Efficient Outdoor Water Use by Commercial, Industrial, and Institutional Dedicated Irrigation Meters

All guidelines and methodologies are subject to approval and adoption by the State Water Board.

Efficient CII-DIM Water Use is calculated using CII-DIMWUS, CII landscape areas irrigated with DIMs (or equivalent technologies), local *ETo* in inches, and local *Peff* in inches. CII landscape areas irrigated with DIMs comprise the service area aggregate *SLA*s, aggregate new or rehabilitated landscape areas developed after 2019 (*CIILA_new*), and the aggregate regular, existing (pre-2019) landscape areas (*CIILA_r*).

Two variances are identified as being related to CII-DIMWUS, and additional variances related to this standard may be added in the future.

1. *Recommendations for Variance for Significant Landscaped Areas Irrigated with Recycled Water Having High Levels of Total Dissolved Solids, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-09).

2. *Recommendations for Variance for Significant Use of Water to Supplement Ponds and Lakes to Sustain Wildlife, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-11).

Water used for commercial agriculture is categorically excluded from CII-DIMWUS.

Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meter Water Use Efficiency Standard

Efficient CII-DIM water use volume is calculated using the following equation and the CII-DIMWUS coefficients. Dates shown are based on a five-year implementation process and are subject to change for consistency with the CII Classification System implementation schedule and State Water Board approval and adoption of the standard.

From Adoption Through Year 4 After Adoption (estimated 2023 through 2027)

Efficient CII-DIM Water Use Volume = 0.62 * [(*ETo – Peff*) * *ETF* * *CIILA_r*] + (*MAWA_SLA* + *MAWA_CII_new*) + *CII-DIM Delivered Water Volume for Unmeasured Landscape Areas*

For Year 5 After Adoption and Onward (estimated 2028 and onward)

Efficient CII-DIM Water Use Volume = 0.62 * [(*ETo – Peff*) * *ETF* * *CIILA_r*] + (*MAWA_SLA* + *MAWA_CII_new*)

where,

- *CIILA_r* (commercial, industrial, and institutional landscape area for regular landscapes, pre-2019) is the service area aggregated CII regular landscape area in square feet.
- *Peff* is in inches and capped at 25 percent of modeled effective precipitation.
- *ETo* is the local reference evapotranspiration in inches.
- 0.62 is a unit conversion factor, when landscape area is measured in square feet.
- *ETF*, the evapotranspiration factor on urban retail water supplier level, is the aggregate service area expression of *ETAF,* the evapotranspiration factor used to adjust *ETo* and *Peff* in determining the water allowance.

- *CII-DIM Delivered Water Volume for Unmeasured Landscape Areas* is the aggregate CII-DIM volume of water delivered to unmeasured landscape areas.
- *ETF, MAWA_SLA, and MAWA_new* are defined in Table 5-4.

Table 5-4 CII-DIMWUS Components

Name	Value
ETF	0.80 until December 31, 2029 0.63 beginning January 1, 2030
MAWA_SLA	• MAWA for SLAs calculated using the MWELO, as amended, MAWA equation and *ETAF* for SLAs at the time the landscape was developed, applied to the service area aggregate SLA landscape area or in accordance with the local WELO at the time the landscape is developed. • For pre-2015 SLAs, the 2015 MWELO shall apply. (Note: 2015 MWELO *ETAF* =1.0 and *Peff* is optional)
MAWA_CII_new	• MAWA and *ETAF* for new or rehabilitated CII landscapes (post-2019) calculated using the MWELO, as amended, MAWA equation and *ETAF* for new and rehabilitated landscapes at the time the landscape water developed, applied to the service area aggregate new and rehabilitated landscape area or in accordance with the local WELO at the time the landscape is developed. (Note: 2015 MWELO *ETAF* = 0.45 and *Peff* is optional)

Key:
CII = commercial, industrial, and institutional
CII-DIMWUS = Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard
ETF = evapotranspiration factor (on water supplier level)
ETAF = evapotranspiration factor in MWELO design standard (on parcel scale), applied to service area aggregate SLA or new and rehabilitated CII landscapes
MAWA_SLA = aggregate maximum applied water allowance for Special Landscape Areas
MAWA_CII_new = aggregate maximum applied water allowance for new and rehabilitated CII landscapes, 2019 and onward
Peff = effective precipitation
MWELO = Model Water Efficient Landscape Ordinance
WELO = local Water Efficient Landscape Ordinance

In addition to the above, the recommended CII-DIMWUS includes the SLAs in the Model Water Efficient Landscape Ordinance (MWELO), as amended, plus three additional recommended SLAs. Water used on exempt landscapes in the MWELO, as amended, is reported but not included in CII-DIMWUS.

SLAs in the 2015 MWELO are:

- Areas dedicated solely to edible plants (e.g., community gardens).
- Active and passive recreational areas (e.g., outdoor event spaces and sports fields).
- Recycled water irrigated areas.
- Water features using recycled water.

Additional recommended SLAs:

- Bioengineered slopes.
- Public swimming pools.
- Supplemental water for ponds or lakes including, but not limited to, sustaining wildlife, recreation, or other public benefit. Note that urban retail water suppliers that provide supplemental water to ponds and lakes for sustaining wildlife under specific regulatory requirements should apply for the variance for this purpose (refer to *Recommendations for Variance for Significant Use of Water to Supplement Ponds and Lakes to Sustain Wildlife, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-11]).

Exempt Landscapes

DWR recommends that 2015 MWELO exempt landscapes be excluded from the UWUO, consistent with the MWELO maximum applied water allowance (MAWA) requirements. These include:

- Registered local, State, or federal historical sites.
- Ecological projects that do not require a permanent irrigation system.
- Mined-land reclamation projects that do not require a permanent irrigation system (pre-2015).
- Existing plant collections, botanical gardens, and arboretums open to the public (pre-2015).
- Cemeteries built before 2015.

Data Needed for Calculation

- Aggregated *SLA* (if applicable), in square feet, used to calculate *MAWA_SLA.*

- Aggregated New Landscape area (*CIILA_new*), in square feet, used to calculate *MAWA_CII_new* for new regular landscapes.
- Aggregated CII-DIM irrigated regular landscape area (*CIILA_r*), in square feet.
- *Peff* capped at 25 percent of modeled effective precipitation, in inches.
- *ETo*, in inches.
- Aggregated exempt landscape area CII-DIM water use volume (for reporting, only), in gallons.
- *CII-DIM Delivered Water Volume for Unmeasured Landscape Areas*, in gallons (applicable through Year 4 following adoption by the State Water Board, if necessary).

Data Provided or Obtained by the Urban Retail Water Supplier

Urban retail water suppliers will be responsible for obtaining all of the following data associated with CII landscapes irrigated with DIMs.

- Aggregated *SLA* (if applicable), in square feet; note that for any specific landscape area, only one type of SLA condition can be used for volume calculation even if it may qualify for multiple criteria.
- Aggregated New Landscape area (*CIILA_new*), in square feet.
- Aggregated CII-DIM irrigated regular landscape area (*CIILA_r*), in square feet.
- Aggregated exempt landscape area CII-DIM water use volume, in gallons.
- *CII-DIM Delivered Water Volume for Unmeasured Landscape Areas*, in gallons (applicable through Year 4 following adoption by the State Water Board, if necessary).

Measurement of Commercial, Industrial, and Institutional Landscape Area Irrigated with Dedicated Irrigation Meters

Urban retail water suppliers must measure the landscape area associated with CII-DIMs (or equivalent technologies).

- Where an irrigated CII landscape is served by a combination of DIM(s) and mixed-use meter(s), only the landscape area being irrigated by the DIM(s) shall be included in CII-DIMWUS.

DWR recommends that the CII landscape area measurements be conducted over a five-year implementation schedule as follows. This implementation schedule is subject to change for consistency with the CII classification system implementation schedule and as adopted by the State Water Board:

- By 2023, all CII-DIMs (and equivalent technologies) must be identified.
  - DIMs (or equivalent technologies) serving HOAs, multifamily residential areas, or other residential areas may be identified as CII-DIMs for the purposes of the UWUO, if applicable, to make use of the SLA *ETAF* for calculating efficient water use on these landscapes.
  - Identification and classification of CII-DIMs does not require changing urban retail water supplier billing systems; information may be kept in a separate look-up table. However, urban retail water suppliers are encouraged to include the identification in their billing systems or upon billing system updates.
- Starting in 2023 or upon adoption of CII-DIMWUS, urban retail water suppliers shall measure CII landscape areas served by a DIM for a minimum of 20 percent of the CII-DIM accounts each year, with 100 percent of the CII-DIM accounts' irrigated landscape area measured within five years after adoption of CII-DIMWUS.
- Urban retail water suppliers that encounter hardship with the identification of DIMs or measuring landscape area can submit an action plan for approval by the State Water Board to meet compliance.

Geolocate or Map CII-DIMs

- Urban retail water suppliers should geolocate DIMs for assisting in measurement of associated landscape area, identifying exempt landscape or SLA DIMs, and for future water management purposes.
  - Exempt landscapes can be partially identified with the North American Industry Classification System, but should be verified by the urban retail water supplier.
- For urban retail water suppliers that do not have a geographic information system, geolocation can be a record of latitude/longitude for later incorporation into a geospatial database.

CII-DIM Irrigated Landscape Area Measurement

Urban retail water suppliers must measure the landscape area irrigated with CII-DIMs (or equivalent technologies). This landscape area will include only the II area. Urban

retail water suppliers can measure the irrigated landscape area associated with each CII-DIM using any of the following methods:

- **California Urban Water Conservation Council BMP5 Handbook (1999)**. The principles described in this handbook for cost-effectively measuring irrigated landscape area associated with a DIM remain. The best method of measuring CII-DIM landscape area depends on many interrelated factors and varies by urban retail water supplier.

- **Aerial Imagery or Remote Sensing**. Aerial imagery or remote sensing followed by a Subsequent or Direct Field Measurement can provide a good estimate of irrigated landscape area.

  - Subsequent Field Measurements of the irrigated area are required landscape boundaries often do not align with DIM coverage areas.

  - Direct Field Measurements, as described below.

- **Direct Field Measurements**. Field measurements, coordinated with the site or landscape manager present to turn on irrigation systems, may be performed with an odometer wheel or drawn on a map.

- **Customer-Provided Measurements**. Customer-provided irrigated landscape area measurements are also acceptable, provided the measurements are verified by the urban retail water supplier (California Water Efficiency Partnership, 2019).

- **New CII-DIM Landscape Area**. For *CIILA_new* landscape areas, DWR recommends that the urban retail water supplier coordinate with the land use authority that approves MWELO plans and use those measurements in the CII-DIMWUS calculation. MWELO Section 492.1 requires the local agency, upon approval of the Landscape Documentation Package, described in MWELO Section 492.3, to submit to the local water purveyor the Water Efficient Landscape Worksheet.

- **Other Methods**. Other methods can be used provided they meet the Use of Alternative Data requirements specified below.

Groups or conglomerates of DIMs, together irrigating one overall landscape area, can be reported in aggregate with their overall landscape area. These must be identified in the look-up table or billing system, per the adopted CII water use classification system (see *Recommendations for Commercial, Industrial, and Institutional Water Use Classification System Performance Measure* [WUES-DWR-2021-17]).

The following additional CII landscape area measurement data is recommended:

- Identify those measured landscape areas that qualify as SLAs, if applicable.

- If pursuing a variance for irrigation with recycled water with high total dissolved solids (TDS), identify the amount of SLA area that is irrigated with high TDS recycled water (*SLA_htds*) (see *Recommendations for Variance for Significant Landscaped Areas Irrigated with Recycled Water Having High Levels of Total Dissolved Solids, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-09]).

Data Accuracy Requirements

To help ensure data accuracy, DWR recommends that urban retail water suppliers provide a detailed description of the method(s) used to identify CII-DIMs (or equivalent technologies), locate CII-DIMs, and obtain landscape area measurement data in their Annual Water Use Report. DWR recommends that the description include:

- Description of the process used to identify and verify CII-DIM (or equivalent technology) accounts.

- Description of the process used to geolocate or otherwise map and verify CII-DIMs (or equivalent technology) locations.

- Description of the CII-DIM (or equivalent technology) irrigated landscape area measurement and verification methods.

- Confirm, for each site, that the measured irrigated landscape area is not irrigated with a mixed-use meter.

  - In the cases where both DIM(s) and mixed-use meter(s) are used for landscape irrigation, the urban retail water supplier will need to measure the portion of landscape that is only irrigated by the DIM.

- Description of the methods or process used to identify SLAs and Exempt Landscape DIMs (or equivalent technologies). Include the basis for designating SLAs.

- Data collection and verification process or procedures, including, but not limited to documentation and records retention; update processes, and follow-up procedures (if necessary).

- Include credentials (e.g., licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the landscape area measurement and the entity/party that approved the data.

- Affidavit or certification of the landscape area measurement data by a qualified urban retail water supplier staff member responsible for data quality.

  - Certification of the landscape area measurement data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

- Map(s), satellite image(s), or aerial image(s) showing the location of *CIILA_r*, and SLAs; documentation of methods and data supporting the CII-DIM (or equivalent technology) identification, location, landscape area measurement, and data verification should be available upon request and retained for the period the data is used plus three years.

Measurement Schedule

Urban retail water suppliers have up to five years after State Water Board adoption to complete mapping of accounts to the recommended CII water use classification system and DIM landscape measurement.

- The minimum level of progress in account mapping per year is 20 percent of CII water accounts. For the same 20 percent of CII accounts identified, provide measurements of the irrigated landscape area being served by a DIM (or equivalent technology).

- If an urban retail water supplier does not meet the annual 20 percent mapping requirement, the urban retail water supplier is to include in its annual reporting an explanation and its plan to meet the full mapping requirement by Year 5.

- An urban retail water supplier experiencing a substantial hardship meeting the minimum level of progress by Year 3 will need to provide an implementation plan to meet the full mapping requirement subject to approval by the State Water Board.

Exempt Water Use Volume

Exempt Water Use Volume is the volume of water delivered to exempt landscape areas. DWR recommends that the exempt volume is not included in the UWUO or actual water use but reported as part of the documentation in the Annual Water Use Report.

Data and Resources Provided by the California Department of Water Resources

- *ETo*, in inches.

- *Peff* capped at 25 percent of modeled effective precipitation, in inches.

DWR has existing, well-established programs for estimating *ETo* at weather station sites that are managed by the CIMIS program and local *Peff* through the Cal-SIMETAW model. Refer to Section 5.2 for information on DWR's *ETo* and effective precipitation data source.

Use of Alternative Data

If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data and methodology provided by DWR prior to using it in the calculation of their UWUO and actual water use. Urban retail water suppliers requesting more than one type of alternative data may submit separate applications for each data type or a combined application for all data types so long as the required information is included in the combined package.

- Refer to Section 9.2 for Alternative Reference Evapotranspiration Data.
- Refer to Section 9.3 for Alternative Effective Precipitation Data.

Interdependency of Reporting Under Commercial, Industrial, and Institutional Dedicated Irrigation Meter Standard and Certain Variances and Outdoor Residential Water Use Efficiency Standard

Relationship to ORWUS

Urban retail water suppliers are allowed to report water use from DIMs serving residential landscapes in CII-DIMWUS for UWUO calculation and reporting purposes; however, the associated landscape areas and water use need to be removed from the ORWUS calculation and reporting. The “Use of Alternative Data” process is not necessary for the simple subtraction of DIM landscape area from DWR-provided residential landscape area measurement for allocation of landscape area to CII-DIMWUS for the UWUO calculation and reporting. The “Use of Alternative Data” process is only necessary when not using the DWR residential landscape area measurement by performing the measurement independently or by modifying boundaries or data.

The potential benefits of reporting water use from DIMs serving residential landscapes under CII-DIMWUS are that:

- The allowable water volume calculation may be easier for the regular landscapes if the adopted *ETF* remains the same as in ORWUS.
- Where applicable, this allows for the use of SLA provisions for qualified landscapes specified in the recommended standard.

Relationship to Variances

Two variances were identified as being related to CII-DIMWUS. This does not exclude any future variances that may be identified as being associated with CII-DIMWUS. Before using a variance, an urban retail water supplier must obtain approval for use in their calculation of the UWUO from the State Water Board as described in the

applicable variance reports and Section 6 of this report. Urban retail water suppliers that are approved to use a variance will need to measure the associated area and remove it from the CII-DIMWUS calculation.

- **Variance for Significant Landscaped Area Irrigated with Recycled Water Having High levels of TDS**. Additional water necessary to remove salt built up from plants due to significant landscape areas irrigated with recycled water having high levels of TDS should be reported under the variance, if approved. Under the recommended variance, an incremental *ETF* of up to 0.26 is allowed for high TDS recycled water irrigation. The combined *ETF*, standard plus variance, is 1.26 *ETF*. If an urban retail water supplier does not qualify for the variance, recycled water use can be reported only under CII-DIMWUS as an SLA and use an *ETF* of 1.0 for those landscapes (see *Recommendations for Variance for Significant Landscaped Areas Irrigated with Recycled Water Having High Levels of Total Dissolved Solids, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-09]).

- **Variance for Significant Use of Water to Supplement Ponds and Lakes for Sustaining Wildlife**. The second variance identified associated with CII-DIMWUS is for the significant use of water to supplement ponds and lakes including, but not limited to, sustaining wildlife, recreation, or other public benefit, as discussed in *Recommendations for Variance for Significant Use of Water to Supplement Ponds and Lakes to Sustain Wildlife, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-11). Water necessary to support regulatory ponds and lakes should be reported under the variance, if approved. If an urban retail water supplier does not qualify for the variance, water use can be reported under CII-DIMWUS as an SLA and use an *ETF* of 1.0 for those ponds and lakes.

Limitations

The recommended CII-DIMWUS does not set, rescind, or modify any existing laws and regulations on outdoor irrigation water use. For example, there are existing public health and safety laws for maintenance of public recreational areas, such as pools.

CII-DIMWUS does not modify or change the MWELO or its implementation.

- MWELO is subject to future amendments.

- MWELO includes provisions for exempt landscapes.

5.4 Estimating Efficient Distribution System Water Loss

The following guidelines and methodologies are based on the State Water Board Draft WLS. The method for estimating efficient distribution system water loss (EDSWL) depends on whether the urban retail water supplier's WLS is expressed in gallons per connection per day or gallons per mile of main per day.

If the standard is in gallons per connection per day, the calculation is:

$$\text{EDSWL} = (Active\ Connections + Inactive\ Connections) \times Water\ Loss\ Standard \times Days/Year$$

The number of connections used to calculate EDSWL for the prior year water use comparison should equal the number of active and inactive connections the urban retail water supplier reported to DWR in its annual water audit report for that year. If more than one public water system (PWS) is included in the urban retail water supplier's service area, then the total number of connections reported for these systems should equal the number of connections used to calculate EDSWL.

If the standard is in gallons per miles of main per day, the calculation is:

$$\text{EDSWL} = Miles\ of\ Main \times Water\ Loss\ Standard \times Days/Year$$

The miles of main used to calculate EDSWL for the prior year water use comparison should equal the miles of main the urban retail water supplier reported to DWR in its annual water audit report for that year. If more than one PWS is included in the urban retail water supplier's service area, then the total miles of main reported for these systems should equal the miles of main used to calculate EDSWL.

The Days/Year multiplier used to convert EDSWL to gallons per year should be 365 if the water use comparison year is not a leap year and 366 if it is a leap year.

Calculation of the Water Loss Standard

An urban retail water supplier is required to calculate its WLS using the methods and assumptions set forth in the California Code of Regulations (CCR), Title 23, Sections 980 through 986. The urban retail water supplier must use the State Water Board's Water Loss Performance Standards Economic Model to calculate its WLS (State Water Board, 2020a). This model calculates the urban retail water supplier's water loss performance standard based on an estimate of the economically feasible level of water loss in 2028, assuming the urban retail water supplier undertakes a program of active leak detection and repair starting in 2022. Urban retail water suppliers are referred to the State Water Board's Water Loss Performance Standards Economic Model guidance

document for specific instructions on data requirements and use of the economic model to calculate their WLS (State Water Board, 2020b).

If an urban retail water supplier's service area consists of multiple PWSs, the urban retail water supplier's WLS will be calculated as a weighted average of each PWS's WLS.

If all the PWS standards are expressed in gallons per connection per day, then the urban retail water supplier's WLS will be calculated as:

$$\text{WLS} = \frac{\sum_i \text{Water Loss Standard}_\text{i} \times Connections_i}{\sum_i Connections_i}$$

where,

Water Loss Standard$_i$ and *Connections*$_i$ refer to the calculated standard and total number of service connections for each PWS.

If all the PWS standards are expressed in gallons per miles of main per day, then the urban retail water supplier's water loss standard will be calculated as:

$$\text{WLS} = \frac{\sum_i \text{Water Loss Standard}_\text{i} \times Miles\ of\ Main_i}{\sum_i Miles\ of\ Main_i}$$

where,

Water Loss Standard$_i$ and *Miles of Main*$_i$ refer to the calculated standards and total miles of main for each PWS.

If some PWS standards are expressed in gallons per connection per day and others are expressed in gallons per miles of main per day, then the urban retail water supplier's water loss standard will be calculated as:

$$\text{WLS} = \frac{\sum_i \text{Water Loss Standard}_\text{i} \times Connections_i + \sum_j \text{Water Loss Standard}_\text{j} \times Miles\ of\ Main_j}{\sum_i Connections_i + \sum_j Connections_j}$$

where,

- Water Loss Standard$_i$ and *Connections*$_i$ refer to the calculated standards and total connections for each PWS whose standard is expressed in gallons per connection per day.

- Water Loss Standard$_j$, *Connections*$_j$, and *Miles of Main*$_j$ refer to the calculated standards, total connections, and miles of main for each PWS whose standard is expressed in gallons per miles of main per day.

Use of Water Audit Data in Calculation of the Individual Urban Retail Water Supplier's Water Loss Standard

In calculating its individual WLS, an urban retail water supplier will use data from the four annual water audits for 2017 to 2020 submitted to DWR pursuant to WC Section 10608.34 to determine its:

1. Average baseline real loss.
2. Average length of mains.
3. Average number of active and inactive service connections.
4. Average distribution system operating pressure.
5. Average variable production cost of water.

In calculating the above values, the urban retail water supplier may elect to use only three of the four years if audit results from one of the four years are deemed to be unreliable (e.g., the audit shows negative real loss or differs from the other three years by more than 10 gallons per connection per day). However, the same three years must be used in all of the calculations listed above.

Replacement of Default Values in Calculation of Water Loss Standard

An urban retail water supplier may replace any of the default input values used in the State Water Board's Water Loss Performance Standards Economic Model with their own values, other than the real discount rate and effective timeline for the lifecycle benefit-cost analysis, provided that their own values are adequately supported by documentation submitted to the board for review and approval.

Adjustments to input values must be submitted to the State Water Board by no later than July 1, 2023. The State Water Board will decide on the acceptability of the adjusted values within 90 days of receiving the request and supporting documentation. This period may be extended at the State Water Board's discretion upon a determination that the supporting documentation is insufficient.

Alternative Compliance Pathway

An alternative compliance pathway is available to urban retail water suppliers with low water loss and high data quality. For urban retail water suppliers meeting the following criteria, WLS can be 16 gallons per connection per day for those reporting in gallons per

connection per day or 1,184 gallons per mile of main per day for those reporting in gallons per mile per day:

1. Baseline real loss is not more than 16 gallons per connection per day or 1,184 gallons per mile of main per day.

2. Real water loss reported in the 2017 to 2020 water audit reports does not vary by more than 10 gallons per connection per day if reported in gallons per connection day or by 740 gallons per mile of main per day if reported in gallons per mile per day.

3. Causes have been identified and steps have been taken to correct any negative real water loss reported in the 2017 to 2020 water audit reports.

4. Own source, imported source, and exported water are fully metered.

5. Own source production meters accounting for not less than 95 percent of own source production are tested for accuracy annually if own source production comprises more than 5 percent of total water production.

6. Imported source production meters accounting for not less than 95 percent of imported source production are tested for accuracy annually if imported production comprises more than 5 percent of total water production.

7. Exported source production meters accounting for not less than 95 percent of exported source production are tested for accuracy annually if exported production comprises more than 5 percent of total water production.

8. All customer service connections, other than fire service connections, are metered and have at least a 90 percent meter read success rate.

9. Up to 300 customer meters are sampled and tested for accuracy each year. A sample size of less than 300 meters is allowable if the urban retail water supplier can demonstrate that it yields statistically reliable results.

10. Unbilled meters are read at the same or greater frequency as billed meters if water delivered through unbilled meters comprises more than 1 percent of total water delivered.

At its discretion, an urban retail water supplier may use its water audit results for 2021 and 2022 to demonstrate it has satisfied criteria 1 through 3 in the above list. Documentation demonstrating compliance with the above criteria must be submitted to the State Water Board before January 1, 2023.

In addition, a second alternative compliance pathway is available for urban retail water suppliers with standards that require at least a 30 percent reduction from baseline real loss. Urban retail water suppliers that meet the following criteria will be required to meet their standard by January 1, 2031 (instead of January 1, 2028):

1. The urban retail water supplier's real WLS is lower than the urban retail water supplier's average baseline real loss by 30 percent or more.

2. The urban retail water supplier's 2025, 2026, or 2027 water loss audits show progress as a reduction of real loss by at least 30 percent of the difference between the average baseline real loss and the real WLS.

3. The urban retail water supplier's data validity scores are at Level 3, or the urban retail water supplier has demonstrated improving data validity scores.

4. The urban retail water supplier has completed two full cycles of leak detection surveys.

5. The urban retail water supplier has submitted a written request for this compliance pathway to the State Water Board and received approval prior to January 1, 2028. The request shall include:

    a. Why the urban retail water supplier was unable to meet its real WLS.

    b. A list of leakage prevention activities the urban retail water supplier has engaged in to prevent water loss.

    c. How the urban retail water supplier is being a good steward with respect to other pieces of the conservation framework.

    d. A plan for how it will meet its real water loss standard no later than January 1, 2031.

Variance for Unexpected Adverse Conditions

An urban retail water supplier may seek approval for a variance to its WLS if that is needed to respond to unexpected adverse conditions that are out of the urban retail water supplier's control. Examples include major damage to its distribution system or storage infrastructure, major unexpected changes in water costs, or major changes in its financial situation (e.g., bankruptcy or substantial loss of revenue).

When requesting a variance, the urban retail water supplier must include a description and assessment of impacts from the identified adverse conditions, a clearly identified need for the revision to its standard, a proposed schedule or milestones for returning to the original standard, and documentation supporting the results.

Compliance Timeline and Standard Proration for Calculation of Water Use Objective

The deadline for complying with WLS is January 1, 2028. If the urban retail water supplier's service area has a disadvantaged community (DAC) or severely disadvantaged community (SDAC) designation, then the deadline for complying with the standard is January 1, 2031, if both of the following are true:

1. The urban retail water supplier's 2028 benefit-cost ratio calculated by the State Water Board's Water Loss Performance Standards Economic Model is less than 2.

2. The urban retail water supplier's baseline real water loss exceeds its WLS by 25 percent or more.

Beginning January 1, 2028 (or January 1, 2031, for a qualifying DAC/SDAC urban retail water supplier), the volume of water loss an urban retail water supplier will use to calculate its UWUO will be based on its WLS. Between 2023 and 2028 (or between 2023 and 2031 for a qualifying DAC/SDAC urban retail water supplier), the volume of water loss an urban retail water supplier will use to calculate its UWUO will be decided by the urban retail water supplier, between their standard and current water loss.

6.0 Guidelines and Methodologies for Calculating Urban Water Use Objective – Part 2: Variances

The 2018 Legislation requires DWR, in coordination with the State Water Board, to conduct necessary studies and investigations and develop recommendations to the State Water Board by October 1, 2021, for appropriate variances for unique uses that can have a material effect on an urban retail water supplier's UWUO, along with the corresponding thresholds of significance (WC Section 10609.14). In this context, DWR interpreted that a material effect means that this unique water use, although used in an efficient manner, could unfairly jeopardize an urban retail water supplier's ability to meet the UWUO when not explicitly addressed and calculated separately from the volume based on the four water use efficiency standards.

Per WC Section 10609.14(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.*

6.1 Modifications to Water Code List

During the stakeholder process and scoping, two of the WC-listed variances were modified (see *Stakeholder Outreach Summary for Developing Urban Water Use Efficiency Standards, Variances, and Performance Measures* [WUES-DWR-2021-20]).

Modified

1. **Significant use of water for soil compaction and dust control modified to**: **Significant use of water for dust control for horse corrals and other animal exercising arenas**.

   There was a consensus among stakeholders and technical team that "significant use of water for soil compaction and dust control" is a general topic that could be mixed with other uses already covered under different standards.

   - Water is not typically used for soil compaction except for certain specific construction activities if conditions warrant.
     - It was considered that soil compaction in the WC may have been used to address soil stabilization pertaining to maintenance of vegetation on bioengineered slopes.
     - Bioengineered slope irrigation requirements are addressed as an SLA category in CII-DIMWUS, and no variance is applicable. Refer to *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03] for the designation of bioengineering slopes as SLAs.
   - Commercial and construction dust control are CII water uses. CII water use is not included in the UWUO calculation, and no variance is applicable for these dust control purposes.
     - If there is a residential meter used for construction purposes, safety, or other unavoidable reasons to capture this specific use, DWR recommends reclassifying the meter to a CII meter for the duration of its use for this purpose and, thus, it will be excluded from the UWUO calculations.
   - Residential dust control is primarily associated with control of dust in horse corrals and arenas per Air Quality Management District requirements.
     - Owners of vacant lots are also required to control dust when it becomes a nuisance; however, there are other, better methods for dust control. Water use for this purpose would not be an efficient use of water.
     - Therefore, DWR recommends redirecting this water use to CII, which will move it out of the UWUO scope.

   As such, the original suggested variance is focused on "significant use of water for dust control for horse corrals and other animal exercising arenas."

2. **Significant use of water to irrigate vegetation for fire protection modified to**: **Significant use of water during major emergencies**.

   During the stakeholder process, it was also decided that significant use of water to irrigate vegetation for fire protection would only cover unique use during fire events and overlook other major emergencies, such as earthquakes. Therefore, this variance was renamed to cover all potential unique uses of water during qualified major emergencies.

6.2 Overall Guidelines for Using Variances for Calculating Urban Water Use Objective

Approved Use is Required

The urban retail water supplier must request and receive approval by the State Water Board for each variance it wishes to use before including any specific variance efficient water use allowance in calculating its UWUO (WC 10609.14(d)). The State Water Board is required to post on its website all of the following (WC 10609.14(e)):

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.

Urban retail water suppliers are required to submit supporting documentation for each and all variances they intend to include in their annual UWUO. Depending on the variance, some data may be provided by DWR, and some will be obtained by the urban retail water supplier. The urban retail water supplier may use estimates based on alternative data, provided that these estimates meet or exceed the quality and accuracy of DWR estimates.

For a variance to be granted, the estimated water use under the variance must meet the specific variance threshold of significance in relationship to the estimated UWUO without the variance.

Urban Water Use Objective Without Any Variances

The urban water use objective without any variances (UWUO_SB) is an UWUO that is calculated based on the four established standards, namely IRWUS, ORWUS, CII-DIMWUS, and WLS. The significance threshold for each variance is a percent of the UWUO_SB, as described below in each individual variance section. Each urban retail water supplier applying for a variance must calculate its UWUO_SB in accordance with guidelines and methodologies provided for calculation of water use based on the four established standards in Section 5.0 of this report. The determination of aggregated

efficient water use under each variance (the Variance Efficient Water Use Volume) should follow the guidelines and methodologies detailed below.

Significance Test

The estimated Variance Efficient Water Use Volume must be at least as much as the Minimum Variance Volume in order to be eligible for a variance. The Minimum Variance Volume is calculated using the following equation:

Minimum Variance Volume = Percent Variance Significance Threshold x UWUO_SB

Use of Alternative Data

Use of alternative data is discussed for each applicable variance. Submittal instructions will be posted on DWR's website. DWR will review the submittals and approve requests if the documentation is complete. DWR may require more information before approving a request and will inform the urban retail water supplier of its review outcome. The request may be retuned or rejected for incomplete documentation. DWR will respond within 60 days of receipt of the package.

Request for approval of an alternative data source can be made either separately for each type of data discussed here and in Section 9.0 of this report (e.g., landscape area, *ETo*, total precipitation, and *Peff*) or combined. If submitting them combined, only one public process is necessary so long as all data are included in the public process.

6.3 Variance for Significant Water Use of Evaporative Coolers

Urban retail water suppliers with significant water use of evaporative coolers (EC) in their service areas may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Water Use of Evaporative Coolers, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-05).

Limitations of Use

- This variance does not set, rescind, or modify existing or future laws and regulations on use of ECs in residential properties.
- ECs used in CII facilities, including warehouses and data centers, are excluded from the UWUO and a variance is not applicable (refer to Section 4.1 of this report for the components of the UWUO). Except for CII landscape irrigated with a DIM (or equivalent technology), CII water use is redirected to CII performance

measures and best management practices (see *Summary of Recommendations for Performance Measures for Commercial, Industrial, and Institutional Water Use* [WUES-DWR-2021-15] and *Recommendations for Commercial, Industrial, and Institutional Water Use Best Management Practices Performance Measure* [WUES-DWR-2021-16] for details).

- The estimated efficient water use is at least equal to the Minimum Variance Volume based on the significance threshold and UWUO calculated using only the efficient water use standards (UWUO_SB) (refer to Section 6.2 of this report).

Guidelines for Use with Other Standards or Variances

IRWUS is for indoor residential water use assuming only 'normal' water use devices, such as those present in all or most homes are used. Therefore, ECs are excluded from IRWUS.

Estimated Water Use on Urban Retail Water Supplier Level

The urban retail water supplier will base its analysis on the use of EC information collected from its customers. DWR recommends that urban retail water suppliers make the information publicly accessible and periodically verify the data with follow-up surveys or update requirements for its customers.

DWR also recommends that the urban retail water supplier establish a report form or a survey to obtain the required information. DWR will provide a template that can be tailored or directly used by urban retail water suppliers to collect the necessary information.

The calculation is based on hourly weather information, as temperatures may fluctuate throughout a day. Calculating the water use will require the urban retail water supplier to obtain and maintain a substantial amount of data. The urban retail water supplier should consider the system requirements to store that information.

DWR will develop an Excel-based utility program for use by urban retail water suppliers to assist with calculations.

Data Needed for Calculation

- Hourly weather data (dry- and wet-bulb air temperature or dry-bulb temperature and relative humidity).
- EC indicator (Does a home use EC or air conditioner or both?).
- Average number of EC operation hours (Operating Hours).

- Air exchange rate in cubic feet per minute (CFM) of reported EC systems (the CFM, which is usually marked on the front of the cooler, needs to be reported to the urban retail water supplier by customers).

- EC evaporation rate per hour (gallon per hour) calculated by:

$$EC\ Evaporation\ Rate = \frac{CFM \times \Delta T \times efficiency\ rate}{8700}$$

where,

- *CFM* is cubic feet per minute of air exchange (to be reported by customers to the urban retail water supplier).

- *ΔT* is the difference between wet-bulb temperature and dry-bulb temperature in degrees Fahrenheit.

- Representative efficiency rate is 0.80 (80 percent).

If wet-bulb temperature is unknown, it can be calculated by:

$$\begin{aligned} Tw = T \times \arctan\left[0.151977 \times \sqrt{(rh + 8.313659)}\right] \\ + \arctan(T + rh) - arctan(rh - 1.676331) \\ + 0.00391838 \times rh^{1.5} \times \arctan(0.023101 \times rh) - 4.686035 \end{aligned}$$

where,

- *Tw* is wet-bulb temperature in degrees Fahrenheit (the equation is an approximation method based on dry-bulb temperature and relative humidity; DWR will provide a tool to calculate this parameter).

- *T* is dry-bulb temperature in degrees Fahrenheit.

- *rh* is relative humidity in percentage.

Variance Efficient Water Use Volume

Using weather data, determine:

- Number of days temperature was greater than 72 degrees Fahrenheit (Operating Days).

- Number of hours per operating day the temperature was greater than 72 degrees Fahrenheit per operating day (Maximum Operating Hours per Operating Day).

This method uses an average EC evaporation rate calculation. Efficient water use estimation will need to be conducted on a daily basis for each operating day and for each customer account based on the information they provided.

1. Determine the Operating Day Average ΔT.

   - Calculate ΔT (dry-bulb temperature - wet-bulb temperature) for each hour with dry-bulb temperature greater than 72 degrees and calculate the average ΔT for the operating day (Operating Day Average ΔT).

2. For each customer, Average EC evaporation rate per hour (gallon per hour) per Operating Day is then:

   Operating Day Average EC Evaporation Rate =

$$\frac{CFM \times Operating\ Day\ Average\ \Delta T \times efficiency\ rate}{8700}$$

3. For each customer, determine actual operating hours per Operating Day (Daily Maximum Operating Hours).

   - If the average operating hours provided by the customer was greater than the Daily Maximum Operating Hours in an operating day, the Maximum Operating Hours is used in the calculations for that Operating Day.

4. For each customer account, efficient EC use per Operating Day is:

   Efficient Operating Day EC Customer Water Use = *Maximum Operating Hours per Operating Day* x *Operating Day Average EC Evaporation Rate* (gallons per hour)

   - If multiple EC units are used by a customer, an average EC evaporation rate can be used with the combined total number of operating hours:

   Efficient Operating Day EC Customer Water Use = *Sum of Maximum Operating Hours per Operating Day* x *Operating Day Average EC Evaporation Rate* (gallons per hour)

5. Variance Efficient Water Use Volume is then summed up for all operating days and all customers with ECs.

$$\text{Variance Efficient Water Use Volume (gallons)} = \sum_{customers} \left[\sum_{i=1}^{operating\ \ days} Number\ of\ Operating\ Hours \times Operating\ Day\ Average\ EC\ Evaporation\ Rate\left(\frac{gallons}{hour}\right) \right]$$

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below.

Minimum Variance Volume (gallons) = 5% x UWUO_SB

Data Provided by Urban Retail Water Supplier

- EC indicator (Does a home use EC or AC?).
- Total number of EC operating hours per customer.
- Air exchange factor of ECs (CFM).

EC Data

The number of ECs and operation factors is variable, since it is based on the urban retail water supplier's service area. Urban retail water suppliers will need to gather data on the number, capacity (CFM), and operating hours of each EC in their respective service area. Data can be gathered through a survey sent to residential water users or when a user registers for water use or goes through a recertification process, or other information gathering process. Required data includes:

- Whether an EC is present and used.
- If an EC is present and used, additional data is required, including:
  - Air exchange rate in CFM of reported EC systems (the CFM, which is usually marked on the front of the cooler, needs to be reported to the urban retail water supplier by customers).
  - Average hours per day the EC is used (Operating Hours).

Data Accuracy

To ensure data accuracy, urban retail water suppliers must provide a detailed description of the method(s) used to obtain EC data. This description must include data collection and verification process or procedures, including, but not limted to:

documentation and records retention; follow-up procedures (if necessary); and verification process and associated statitics if not verifying all data.

Urban retail water suppliers do not have to verify all survey information. A statistical sample for verification (e.g., random sample of a certain percentage of customers responding positively to a survey) may be used so long as the process is described and documentation is provided. DWR recommends that the statistical sampling meet the following minimum requirements:

- Verfiy a random sample of accounts identified with ECs.
  - At least a minimum of 10 percent of these accounts, but no less than 5.
  - A maximum of 100 verified accounts.
- Verification can include pictures, site visits, or other methods to be described in the application documentation of number of identified ECs in the service area. The person conducting site visits or verifying data should be familiar with the local codes for legal limits, if there is any, on using ECs in the residential areas.

Documentation on individual surveys or other records, statistical sample results, and any other data supporting the methods and verification should be available upon request and retained for the period the data is used in this process, plus three years.

Data Obtained by Urban Retail Water Supplier

Urban retail water suppliers will also need to obtain weather information from a reliable source where data must be published and conform to normal standards for weather data collection such as the Western Regional Climate Center Remote Automated Weather Stations USA Climate Archive (available at: https://wrcc.dri.edu).

- Hourly dry-bulb air temperature.
- Hourly wet-bulb air temperature or hourly relative humidity if wet-bulb temperature is not available.

Data and Resources Provided by the California Department of Water Resources

- DWR will develop an Excel-based utility program for use by urban retail water suppliers using the formulas presented in this section.
- CIMIS data may be used, but may not well represent urban climate, and wet-bulb temperature will need to be estimated from relative humidity.
  - Hourly dry-bulb air temperature.
  - Hourly relative humidity.

Use of Alternative Data

Alternative data and methodology for determining hourly wet-bulb temperature and EC evaporation rate can be used if the urban retail water supplier provides evidence that the alternative data are superior to DWR-provided data or DWR-suggested referenced data. Refer to Section 9.5 of this report for how to request approval of alternative data or calculation method.

6.4 Variance for Significant Populations of Horses and Other Livestock

An urban retail water supplier with significant populations of horses and other livestock in its service area may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Populations of Horses and Other Livestock, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-07).

Limitations of Use

- This variance does not set, rescind, or modify existing or future laws and regulations on populations of horses and other livestock that can be kept on residential properties, or the standard of care of horses and other livestock.
- This variance applies only to those horses and other livestock on residential properties per the 'other livestock' definition provided in the variance report.
  - Commercial feedlots or similar operations with horses and other livestock are not qualified for this variance because they are excluded from UWUO.
- The estimated efficient water use is at least equal to the Minimum Variance Volume based on the significance threshold and UWUO calculated using only the efficient water use standards (UWUO_SB) (refer to Section 6.2 of this report).

Guidelines for Use with Standards or Other Variances

Water use for horses and other livestock is categorically excluded from ORWUS as it only includes landscape irrigation.

Water use for horses and other livestock is categorically excluded from IRWUS as it only includes water use based by regular residents (i.e., humans) in the service area.

Estimated Water Use on Urban Retail Water Supplier Level

Data Needed for Calculation:

- Service area population of horses and other livestock by Animal Type-Class.
- Efficient water use by Animal Type-Class.

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume for horses and other livestock will be estimated using the following equation:

$$\text{Variance Efficient Water Use Volume (gallons)} = \sum_{Animal\ Type-Classes} \big((Service\ Area\ Total\ Number\ of\ Animals\ in\ Animal\ Type\ Class) \times (Gallons\ of\ Daily\ Water\ Use\ for\ Animal\ Type\ Class)\big) \times\ Days/Year$$

Days per year are 365 during non-leap years and 366 during leap years.

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below.

Minimum Variance Volume (gallons) = 5% x UWUO_SB

Data Provided by Urban Retail Water Supplier

Animal Populations

The number of livestock is variable, since it is based on the urban retail water supplier's service area. An urban retail water supplier will need to gather data on the number and specific type-classes of horses and/or other livestock in its service area. Data can be gathered through a survey sent to residential water users, when a user registers for water use or goes through a recertification process, or by using another information gathering process. Required data include:

- Number of livestock per Animal Type-Class: based on an urban retail water supplier's survey or other records for its service area.
  - Number of horses and each type of livestock may also be collected to determine the number of animals in each Animal Type-Class.
- For livestock not listed specifically in Table 6-1 (e.g., "between 200 and 500 pounds," or "greater than 500 pounds"), an urban retail water supplier must

indicate what types of animals are being counted and document that these animals are within the Animal Type-Class categories.

Data Accuracy

To ensure data accuracy, an urban retail water supplier must provide a detailed description of the method(s) used to obtain horses and other livestock population data. This description must include data collection and verification process or procedures, including, but not limted to: the type(s) of animal population data collected; documentation and records retention; follow-up procedures (if necessary); and verification process and associated statistics if not verifying all data.

An urban retail water supplier does not have to verify all survey information. A statistical sample for verification (e.g., random sample of a certain percentage of customers responding positively to a survey) may be used so long as the process is described and documentation is provided. DWR recommends that the statistical sampling meet the following minimum requirements:

- Verfiy a random sample of accounts identified with horses or other livestock.
  - At least a minimum of 10 percent of these accounts, but no less than 5 accounts.
  - A maximum of 100 verified accounts.
- Verification can include pictures, site visits, or other methods to be described in the application documentation of animals and populations. The person conducting site visits or verifying data should be familiar with the local codes for legal limits on large animal populations in the residential areas.

Documentation on individual surveys or other records, statistical sample results, and any other data supporting the populations and verification should be retained for the period the data are used in this process, plus three years.

Data Provided by the California Department of Water Resources

Urban retail water suppliers shall use the efficient daily water use for Animal Type-Classes in their calculations. Alternative data are allowed provided they meet or exceed the accuracy of DWR-provided data as described in the section below.

Table 6-1 Animal Type-Classes and Efficient Daily Water Use

Animal Type-Class	Daily Water Use (in gallons)
Sheep, llamas, donkeys, swine, other livestock between 200 and 500 pounds	8
Cattle, bulls, other livestock greater than 500 pounds	11
Horses, mules	13
Milking cows	16

Use of Alternative Data

If an urban retail water supplier chooses to use alternative efficient daily water use data for horses or other livestock, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data provided by DWR. Refer to Section 9.6 of this report for how to request approval of horses and other livestock alternative efficient daily water use data.

6.5 Variance for Significant Fluctuations in Seasonal Populations

Urban retail water suppliers with significant fluctuations in seasonal populations in their respective service areas may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Fluctuations in Seasonal Populations, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-08).

Limitations of Use

- This variance does not set, rescind, or modify existing or future laws and regulations on residential seasonal populations.
- The estimate of seasonal population described in this variance will not be applicable to estimate permanent resident population that will be used with IRWUS. Calculating EIRWU should follow the standard and associated guidelines and methodologies described in Section 5.1 of this report.
- This variance applies only to those seasonal populations on residential properties.
  - Seasonal populations associated with group quarters are categorically excluded from the UWUO. Refer to Section 5.1 of this report for information on group quarters.

- The estimated efficient water use is at least equal to the Minimum Variance Volume based on the significance threshold and UWUO calculated using only the efficient water use standards (UWUO_SB) (refer to Section 6.2 of this report).

Guidelines for Use with Other Standards or Variances

Water use for seasonal populations is excluded from IRWUS as it only includes water use based by regular, permanent residents in the service area.

Estimated Water Use on Urban Retail Water Supplier Level

The recommendation for this variance allows for calculation of the water use following one of two options: a simple calculation with a higher threshold of significance (Standard Method), and a more detailed calculation with a lower threshold of significance (Detailed Method). These options provide urban retail water suppliers with flexibility in how eligibility for the variance is achieved, depending on data availability. The specific steps for identification methods using the Standard Method or the Detailed Method will be provided to urban retail water suppliers by DWR.

An urban retail water supplier with a significant water use that is within the scope of this variance must follow the explained development steps to apply for the variance using one of the two calculation options, provided it meets the requirements and threshold.

1. Two methods for calculating Occupancy Rates are allowed, depending on the detail of water use information available to the urban retail water supplier. Each has a different significance threshold to reflect the method accuracy.

2. Standard Method uses monthly billing data with a significance threshold of 5 percent.

3. Detailed Method uses hourly advanced metering infrastructure (AMI) data with a significance threshold of 1 percent. DWR recommends that the urban retail water supplier that intends to use AMI data for this variance should consider including the need for using the data in its contract with the vendor.

Data Needed for Calculation

Data needed for both methods are essentially the same, except for the time interval of water use data.

- Number of units with seasonal populations.

- Monthly water use data for the Standard Method and hourly AMI water use data for the Detailed Method to determine:

  - Number of occupants.

  - Number of days with occupants.

- IRWUS (gpcd).
- The water use billing data/mailing addresses that are maintained by urban retail water suppliers.
- Other specific data needs per identification method (all in public domain or urban retail water supplier data).

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume for seasonal populations will be estimated using the following equation:

$$\begin{aligned} &Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = \\ &\quad Number\ of\ Identified\ Units\ with\ Seasonal\ Population\ \times \\ &\quad Occupancy\ Rate\ (person\ days\ per\ year) \times \\ &\quad Indoor\ Residential\ Water\ Use\ Standard\ (gpcd) \end{aligned}$$

- Standard Method:
  - Step 1. Identify the number of units with seasonal populations using monthly water use data (refer to WUES-DWR-2021-08.T1).
  - Step 2. Estimate occupancy rates using either *Occupancy Rate_M1* or *Occupancy Rate_M2*, depending on the result that better describes the local conditions.
- Detailed Method:
  - Step 1. Identify the number of units with seasonal populations using hourly AMI water use data (refer to WUES-DWR-2021-08.T1).
  - Step 2. Estimate occupancy rates using either *Occupancy Rate_M1* or *Occupancy Rate_M2*, depending on the result that better describes the local conditions.

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below.

Standard Method Minimum Variance Volume (gallons) = 5% x UWUO_SB

Detailed Method Minimum Variance Volume (gallons) = 1% x UWUO_SB

Urban retail water suppliers with a formal governing body commitment to convert to daily or hourly AMI data in two years may use a significance threshold of 3 percent of the UWUO_SB.

Estimation of Seasonal Population Occupancy Rates

The Occupancy Rate is the product of the average number of occupants per unit when it is occupied and the number of occupied days. This is approximated using either *Occupancy Rate_M1* or *Occupancy Rate_M2*. Urban retail water suppliers would need to select one of the calculation methods that better describes their local conditions.

$$\begin{aligned} Occupancy\ Rate\_M1 \\ &= [Water\ Use\ for\ Seasonally\ Occupied\ Homes \\ &\times\ Population\ of\ Usual\ Residents\ (Census\ population)] \\ &/(Water\ Use\ for\ All\ Units\ With\ Usual\ Residents) \\ &\times\ Average\ Number\ of\ Days\ with\ Occupancy \end{aligned}$$

$$\begin{aligned} Occupancy\ Rate\_M2 \\ &= \frac{Average\ Number\ of\ Rooms\ Per\ Seasonally\ Occupied\ Unit\ (from\ ACS)}{Average\ Number\ of\ Rooms\ for\ Usual\ Residents\ Units\ (from\ ACS)} \\ &\times\ People\ per\ Household\ of\ Usual\ Residents'Units \\ &\times\ Average\ Number\ of\ Days\ with\ Occupancy \end{aligned}$$

Data Provided or Obtained by Urban Retail Water Supplier

- ACS data (U.S. Census Bureau).
- IRWUS (gpcd).
- Water use data for the previous year:
  - Monthly water use data for the Standard Method.
  - Hourly AMI water use data for the Detailed Method.
- Water use billing data or mailing addresses that are maintained by the urban retail water supplier.
- Other specific data needs per identification method (all in public domain or urban retail water supplier records).

Data Provided by the California Department of Water Resources

DWR will provide technical assistance to urban retail water suppliers in using the identification methods using monthly water use or hourly AMI water use data to determine the number of seasonally occupied units in the service area.

Use of Alternative Data

If an urban retail water supplier chooses to use alternative data or methodologies, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data and methodology provided by DWR. Refer to Section 9.11 of this report for the general process to obtain approval of alternative data or methodologies.

6.6 Variance for Significant Landscaped Areas Irrigated with Recycled Water Having High Levels of Total Dissolved Solids

Urban retail water suppliers with significant areas irrigated with recycled water having high levels of TDS in their respective service areas may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified variance efficient water use allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Landscaped Areas Irrigated with Recycled Water Having High Levels of Total Dissolved Solids, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-09).

Limitations of Use

- This variance does not set, rescind, or modify existing or future law and regulations on recycled water use for water quality and environmental protection. Recycled water use for irrigation (landscape or agricultural uses) is regulated to protect surface water and groundwater quality. There are existing regulations applicable to the use of recycled water, including:
  - Local Salt and Nutrient Management Plans.
  - Waste Discharge Permits (CCR, Title 27, Section 20005 and Section 20090).
  - Anti-Degradation Policies (State Water Board Resolution No. 68-16).
  - Federal Antidegradation Policy (Clean Water Act, 40 Code of Federal Regulations Section 131.12).
  - State Water Board Recycled Water Policy and Regulations.
  - Other applicable law and regulations.

- This variance does not change the existing 2015 MWELO or its implementation, including the definition of SLA and the use of an ETAF in the MWELO design standard (on the parcel level) of 1.0 for SLA in MAWA calculation.
  - MWELO is subject to amendments in the future. The variance provides no constraint or limitations for future MWELO amendments.
  - Future amendments of MWELO may consider this variance for inclusion in relevant specifications and use.
- The estimated efficient water use is at least equal to the Minimum Variance Volume based on the significance threshold and UWUO calculated using only the efficient water use standards (UWUO_SB) (refer to Section 6.2 of this report).

Guidelines for Use with Other Standards or Variances

This variance pertains to CII-DIMWUS. Under CII-DIMWUS, recycled water irrigated landscapes are SLAs and are allowed in the calculation an evapotranspiration factor of *ETF_SLA* (which is equal to 1.0 under the current MWELO, as amended; note that MWELO is subject to future changes). This variance will allow for an incremental increase in *ETF_SLA* to accommodate the higher leaching factor necessary when irrigating with high salinity (high TDS) recycled water.

Certain urban retail water suppliers have recycled water use in residential parcels with DIMs. Using recycled water is not allowed in ORWUS. DWR encourages these urban retail water suppliers to report this use under CII-DIMWUS and subtract it from the ORWUS reporting.

Estimated Water Use on Urban Retail Water Supplier Level

Where possible, salt tolerant plants should be considered for landscape areas where recycled water is applied.

Urban retail water suppliers may receive recycled water from different sources and apply that water to different landscape areas. The application of this variance should be done separately for landscape areas using different sources of recycled water if they have significantly different water qualities.

The recommendation for this variance allows for calculation of the water use following one of two options: a simple calculation with a higher threshold of significance (Standard Method), and a more detailed calculation with a lower threshold of significance (Detailed Method). These options provide urban retail water suppliers with flexibility in how eligibility for the variance is achieved, depending on data availability.

An urban retail water supplier with a significant water use that is within the scope of this variance must follow the explained development steps to apply for the variance using

one of the two calculation options, provided it meets the requirements and significance threshold.

- In the Standard Method, recycled water with TDS between 900 and 1,600 milligrams per liter (mg/L) is provided an additional *ETF* allowance that is a linear increment between 0.0 and 0.26 (a variable *ETF* that averages plant-specific leaching requirements for irrigation with high TDS recycled water).
- In the Detailed Method, recycled water with TDS between 900 and 1,600 mg/L is provided an additional *ETF* allowance above *ETF_SLA*. There is no limit on the *ETF* adjustment above *ETF_SLA* that can be used.

Data Needed for Calculation

- Standard Method and Detailed Method:
  - *ETo* in inches.
  - Allowable *ETF* under MWELO for landscape irrigation with recycled water *(ETF_SLA).*
  - Landscape area irrigated with high TDS (*SLA_htds*) in square feet.
- Detailed Method:
  - Salinity of the irrigation (recycled) water (*ECiw*) in decisiemens per meter (dS/m).
  - Plant threshold salinity (*ECe*) in dS/m.
  - Plant Factor (*PF*) for representative plant, unitless.
  - Leaching Requirement (*LR*), unitless.
  - Irrigation system for representative plant (sprinkler systems, or micro-spray or drip).

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume for the recommended variance in gallons is the product of the reference *ETo*, *Adjusted ETF*, SLA irrigated using high TDS recycled water (*SLA_htds*), and 0.62 (a unit conversion factor). The calculation for recycled water irrigated landscapes is:

Variance Efficient Water Use Volume (gallons) = *Adjusted ETF* x *ETo* (inches) x *SLA_htds* (square feet) x 0.62

All SLAs receive an *ETF_SLA* in calculating the CII-DIMWUS efficient water use. This variance is for the incremental additional water needed for irrigating with high TDS recycled water.

- Standard Method:
  - For *TDS* less than or equal to 900 mg/L, there will be no additional allowance.
  - For 900 < *TDS* ≤ 1,600 mg/L, additional allowance is determined based on the Variance Efficient Water Use Volume using:

$$\textit{Variance Efficient Water Use Volume (gallons)} = [(0.000371 \times (\text{TDS (mg/L)} - 900)) + (1 - \textit{ETF\_SLA})] \times \textit{ETo}\ (\text{inches}) \times \textit{SLA\_htds}\ (\text{square feet}) \times 0.62$$

    where,

    the *Adjusted ETF* term should be greater than 0.

  - For *TDS* greater than 1,600 mg/L, additional allowance is determined based on the Variance Efficient Water Use Volume using:

    Variance Efficient Water Use Volume (gallons) = [0.26 + (1 – *ETF_SLA*)] x *ETo* (inches) x *SLA_htds* (square feet) x 0.62

    where,

    the *Adjusted ETF* term should be greater than 0.

- Detailed Method:
  - For sprinkler irrigation systems, the additional allowance is determined based on the Variance Efficient Water Use Volume using:

$$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = \left(\frac{PF}{0.75\ \times\ (1 - LR)} - ETF\_SLA\right) \times ETo \times SLA\_htds \times 0.62$$

  - For drip or micro-spray systems, the additional allowance is determined based on the Variance Efficient Water Use Volume using:

$$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = \left(\frac{PF}{0.81\ \times\ (1 - LR)} - ETF\_SLA\right) \times ETo \times SLA\_htds\ \times 0.62$$

- Urban retail water suppliers must identify a representative plant, the type of irrigation system used for that plant, and calculate the variance leaching requirement:
  - Representative plant is the plant type occupying 30 percent or more of the service area *SLA_htds* landscapes.
  - *PF* for representative plant.
  - Irrigation type (sprinkler systems, or drip or micro-spray systems).
- *LR* is calculated by:

Leaching requirement = irrigation water salinity (*ECiw*) / [5 x Plant Threshold Salinity (*ECe*) – irrigation water salinity (*ECiw*)]

- Where a range of salinity tolerance is provided for the representative plant, use the range average.
- Simple relationships can be used to convert TDS (mg/L) to EC (dS/m) or vice versa:[4]

EC (dS/m) = *TDS* (mg/L or parts per million [ppm]) / 640 (*EC* from 0.1 to 5 dS/m)

EC (dS/m) = *TDS* (mg/L or ppm) / 800 (*EC* > 5 dS/m)

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below.

- Standard Method Minimum Variance Volume (gallons) = 5% x UWUO_SB
- Detailed Method Minimum Variance Volume (gallons) = 1% x UWUO_SB

Data Provided or Obtained by Urban Retail Water Supplier

Data should be reported as an annual average for the aggregated landscape area irrigated with high TDS recycled water; however, urban retail water suppliers retain the flexibility to also report this information on a more detailed level or for a more frequent interval, if desired. At a minimum, the urban retail water supplier must report:

[4] https://ucanr.edu/sites/Salinity/Salinity_Management/Salinity_Basics/Salinity_measurement_and_unit_conversions/

- Standard Method and Detailed Method:
  - Landscape area measurement for area (acres) irrigated with high TDS recycled water (*SLA_htds*).
  - Annual average recycled water TDS (mg/L) applied to *SLA_htds* from recycled water purveyor.
  - *ETo* in inches.
  - Landscape area irrigated with high TDS (*SLA_htds*) in square feet.
  - Allowable *ETF* under MWELO for landscape irrigation with recycled water *(ETF_SLA).*
- Detailed Method:
  - *ECiw* in dS/m.
  - *ECe* in dS/m.
  - *PF* for representative plant, unitless.
  - *LR*, unitless.
  - Irrigation system for representative plant (sprinkler systems, or micro-spray or drip).

Data Accuracy – Standard Method and Detailed Method

Urban retail water suppliers choosing to use this variance will need to measure *SLA_htds* and subtract it from their total SLA area.

- ***SLA_htds* landscape area**. Identification and measurement of *SLA_htds* must conform to the data accuracy requirements for identification and measurement of SLAs in Section 5.2.
- Map(s), satellite image(s), or aerial image(s) showing the location of designated *SLA_htds* and other documentation should be maintained by the urban retail water supplier and should be available upon request for the duration of its applicability and at least three years following.

Data Accuracy – Detailed Method

- **Representative plant**. Urban retail water suppliers must document the process and measurements for identification of the representative plant occupying 30 percent or more of the urban retail water suppliers' *SLA_htds* area.

- **Irrigation system type**. Urban retail water suppliers must document the process for identifying the representative plant irrigation system type (sprinkler systems, micro-spray, or drip systems).

- Urban retail water suppliers must include the following in their application to the State Water Board:

  - A description of the method(s) used to estimate representative plant and type of irrigation system (e.g., field measurement, analysis of satellite or aerial imagery, and others).

  - Calculated *LR.*

Data Provided or Referenced by the California Department of Water Resources

- *ETo* (inches) from CIMIS.

- *ETF_SLA.*

- *ECe* ranges from watereuse.org.[5]

- *PF:*

  - 0 to 0.1 (for very low water use plants).

  - 0.2 to 0.3 (for low water use plants).

  - 0.4 to 0.6 (for moderate water use plants).

  - 0.7 to 1.0 (for high water use plants).

Use of Alternative Data

If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data and methodology provided by DWR. Urban retail water suppliers requesting more than one type of alternative data may submit separate applications for each data type or a combined application for all data types so long as the required information is included in the combined package.

- Refer to Section 9.2 of this report for use of alternative *ETo* data.

- Refer to Section 9.7 of this report for use of alternative *LR* salinity data.

[5] Salinity Management Guide: Choose salt-tolerant plants: https://watereuse.org/salinity-management/cp/cp_1.html

6.7 Variance for Significant Use of Water for Dust Control for Horse Corrals and Animal Exercising Arenas

Urban retail water suppliers with significant use of water for dust control for horse corrals and animal exercising arenas in their respective service areas may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Use of Water for Dust Control for Horse Corrals and Animal Exercising Arenas, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-10).

Limitations of Use

- This variance does not set, rescind, or modify existing or future law and regulations on water use for air quality and environmental protection. Water use for dust control is regulated to protect air quality. There are existing regulations applicable to the use of water for dust control, which may include but are not limited to:
  - Air Quality Management Districts and Air Quality Control Districts.
  - Local ordinances and regulations.
  - Other applicable laws and regulations.
- Commercial horse arenas are not qualified for this variance; commercial water use not using a DIM is outside of the scope of the UWUO.
- The following water use for dust control is not considered qualified for this variance for the reasons stated below. Urban retail water suppliers should modify their practices, if applicable, to reflect proper classifications of water use.
  - Water use for dust control at construction sites should be under CII water use and excluded from the UWUO.
  - Using water for dust control at vacant lots (which are excluded from ORWUS) should be discouraged. The situation can be managed through use of alternatives to water application, such as native vegetation, mulch, or other materials.

Guidelines for Use with Other Standards or Variances

In certain situations, where an unused residential meter was used for such a purpose, urban retail water suppliers should temporarily reclassify the meter as a CII meter so that the associated water use is excluded from the UWUO. The practice is fully under the control of an urban retail water supplier and, thus, the use is not considered a variance to ORWUS.

Estimated Water Use on Urban Retail Water Supplier Level

The estimate should be an aggregate for the service area. When multiple Climate Zones exist within the urban retail water supplier's service area, the Climate Zone with the largest portion of the service area is considered representative for calculating the estimate of water use under this variance.

The use of alternative data for this variance should be consistent with ORWUS as the DWR-provided referenced data are from the same source, DWR's LAM project (see *Landscape Area Measurements Final Project, Report EA-133C-16-CQ-0044* [WUES-DWR-2021-02.T1]). It is not acceptable to use one portion of the data, but not the other.

Data Needed for Calculation

- Amount of applied water (0.25 inches per application day).
- Total horse corral acreage for the service area (square feet).
- Local precipitation data (inches).

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume, in gallons, is the product of the aggregate corral acre (square feet), number of days the corral is watered per year (days), 0.021 feet (0.25 inches) of allowable application water per watering day, and a unit conversion factor (7.48 gallons per cubic foot).

> Variance Efficient Water Use Volume (gallons) = *corral area* (square feet) x *number of allowable watering days per year* x 0.021 (feet of water per watering day) x 7.48 (gallons per cubic foot)

Significance Test

For this variance, the Variance Efficient Water Use Volume must be at least equal to the minimum volume established below.

> Minimum Variance Volume (gallons) = 5% x UWUO_SB

Method For Calculating Allowable Watering Days Per Year

The number of allowable watering days per year is calculated based on records of daily precipitation data from the previous year and the Title 24 Climate Zone.

- If daily precipitation is greater than 0.10 inches, the horse corral would not be watered for the next two days, due to the rainfall irrigating the horse corral.
- For more than two days following the rainfall event, the maximum allowable watering frequency for horse corrals and animal exercising arenas are reflective of California Climate Zones as follows:
  - California Climate Zones 1 through 5, 7: two days per week.
  - California Climate Zones 6, 8 through 10, 12, 16: three days per week.
  - California Climate Zones 11, 13 through 15: four days per week.
- When multiple climate zones exist within an urban retail water supplier's service area, the climate zone with the largest portion of the service area is considered representative for calculating the estimate of water use under this variance.
- Urban retail water suppliers must examine precipitation records, identify the rainfall events exceeding 0.10 inches in a day, then determine the number of allowable application days between rainfall events exceeding 0.10 inches per day.

Data Provided or Obtained by Urban Retail Water Supplier

- Calculated number of allowable watering days in the previous year.

Data Provided or Referenced by the California Department of Water Resources

- Total amount of horse corral acreage in the urban retail water supplier's service area (from DWR's LAM project dataset).
- Daily precipitation (from CIMIS).

Use of Alternative Data

Alternative Residential Landscape Area Measurement Data

Urban retail water suppliers with DWR approval to use alternative data for their residential landscape area measurements must provide verification of the associated corral land mask data or provide alternative horse corral and arena landscape area measurements as described in Section 9.8.

Precipitation Data

Urban retail water suppliers are not required to use the daily precipitation estimates provided by DWR. They may use estimates based on alternative data, provided that those estimates meet or exceed the quality and accuracy of the DWR estimates. If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data provided by DWR. Refer to Section 9.4 for use of alternative precipitation data.

6.8 Variance for Significant Use of Water to Supplement Ponds and Lakes to Sustain Wildlife

Urban retail water suppliers with significant use of water to supplement ponds and lakes to sustain wildlife in their respective service areas may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Use of Water to Supplement Ponds and Lakes to Sustain Wildlife, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-11).

Limitations of Use

- This variance applies only to those ponds and open waters for sustaining wildlife for which there are regulatory requirements or local ordinances to maintain water elevations.

- Maintaining ponds and lakes within residential neighborhoods may be instructed by a private association or entity that does not constitute a regulatory requirement. Since this water use may provide public benefits, DWR recommends that the urban retail water supplier do one of the following:

    1. Convert it to CII-DIM and use an SLA specification in calculating the UWUO and water use reporting under CII-DIMWUS. It is not further qualified for this variance.

    2. Convert it to a regular CII account meter, which is not included in the scope of the UWUO and annual reporting requirements.

    3. Do not recognize the required water use in calculating the UWUO (however, it still must be reported in the Annual Water Use Report).

- Stormwater retention facilities for flood control purposes without any regulatory requirements for maintaining water levels do not need supplemental water. Hence, incidental contributions of water from overirrigation at nearby residential parcels or CII-DIMs are not allowed and, thus, do not qualify for this variance.

- Maintaining ponds and lakes for recreational purposes in public areas (e.g., parks), which are under CII water use, does not qualify for this variance.

  - If the public pond is receiving water from multiple sources (e.g., CII-DIM and CII mixed use meters, etc.), but there is no regulatory requirement to supplement the water, a variance does not apply.

  - If the public pond is receiving water from multiple sources (e.g., CII-DIM and CII mixed use meters, and etc.), but there is a regulatory requirement to supplement the water, the CII-DIM shall be reported as SLA to receive a variance in accordance with the guidelines and methodologies described below.

Guidelines for Use with Other Standards or Variances

- Ponds and open waters without any regulatory requirements supplemented through a DIM receive an SLA designation under CII-DIMWUS.

- Residential ponds and open waters are not included in ORWUS. If these features sustain wildlife or can be shown to serve another public benefit, DWR recommends that they be converted to DIMs and classified as CII-DIMs for the purposes of calculating the UWUO and associated Annual Water Use Report filing.

Estimated Water Use on Urban Retail Water Supplier Level

The existence of open water in any data set or mapping product does not imply the need for supplemental water to maintain them. Local knowledge and supporting documentation of specific regulatory requirements to supplement water for sustaining wildlife are required for using this variance.

It is up to the urban retail water supplier to ensure that the claimed usage rates are not in violation of any existing regulations or policies and are appropriate for the service area climate conditions and accounting.

Data Needed for Calculation

- Total open water area required to be maintained per regulatory requirements (square feet).

- *ETo* (inches).

- Evaporation Factor (*EF*) – statewide average of 1.1, unitless.

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume in gallons is the product of *ETo* (inches), Total Open Water Area (square feet), *EF* (1.1, unitless), and a unit conversion factor (0.62).

Variance Efficient Water Use Volume (gallons) = *ETo* (inches) x 1.1 x Total Open Water Area (square feet) x 0.62

Significance Test

Due to the regulatory requirements, the threshold of significance for this variance is set at zero. Therefore, there is no significance test.

Data Provided or Obtained by Urban Retail Water Supplier

- Total Open Water Area (square feet) required to be maintained per regulatory requirements.
- Documentation of regulatory requirement, including specific terms and conditions requiring supplemental water.

Data Accuracy

Urban retail water suppliers must estimate the open water surface area. There are two main methods for this determination:

- **On-the-ground measurement** – This approach involves physical measurement of open water surface area perimeter. It may provide accurate results, but it is time consuming and resource intensive, and adjustments may need to be made where access to the shoreline is restricted and where geometry of the area is irregular. This also involves coordinating with the adjacent property owners for permission to access the property and conduct measurements.
- **Using remote sensing or GIS mapping methods** –The accuracy of results from remote sensing methods depends on qualifications of the entity that performs the analysis and quality of the remotely sensed or GIS data. If done correctly, this method can produce reasonably accurate results, but requires technical resources (GIS mapping systems and trained personnel) or financial resources (contracting).

Regardless of the method chosen, urban retail water suppliers must include in their application:

- Description of the methodology and data used, including data sources and any locally applicable research and literature.
- Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.
- Affidavit or certification of the data by a qualified urban retail water supplier staff member responsible for data quality.
  - Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.
  - Referenced, published research reports do not require certification but must be cited.

Map(s), satellite image(s), or aerial image(s) showing the location of lakes and ponds, associated measurements, and other documentation must be retained by the urban retail water supplier and should be available upon request for the duration of data use plus three years.

Data Provided by the California Department of Water Resources

- *ETo.*
- *EF* of 1.1 (statewide average).

Alternative *ETo* and *EF* data are allowed provided they meet or exceed the accuracy of DWR-provided data as described in the section below.

Use of Alternative Data

If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meets or exceeds the quality and accuracy of data provided by DWR.

- Refer to Section 9.2 for alternative *ETo* data.
- Refer to Section 9.9 for use of alternative *EF* data.

6.9 Variance for Significant Use of Water During Major Emergencies

Urban retail water suppliers with significant use of water during a major emergency affecting their respective service areas may apply for this variance through the State

Water Board application process following the below guidelines and methodologies for calculating the qualified variance efficient water use allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Use of Water During Major Emergencies, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-12).

Limitations of Use

- Major emergencies covered in this variance are those specified in the recommendation and do not include drought emergencies.
- For wildfire events, the attributable period for this variance is limited by the mandatory evacuation orders and subsequent repopulation orders.
- For earthquakes, orders to shut down the water transmission system by the County Emergency Services Office or delineation of damaged areas should be used to determine the qualified period and qualified zone of the major emergency.

Guidelines for Use with Other Standards or Variances

Irrigating vegetation for fire protection is not a unique water use during non-qualified emergencies and it is covered by ORWUS or CII-DIMWUS. Fire-resistant plants do not require more water than other plants. Additionally, CalFire recommends wildfire protection practices to focus on clearing the ground and removal of dead leaves and bushes without use of water.

Estimated Water Use on Urban Retail Water Supplier Level

Major emergencies could occur in areas with known high-risk factors or unexpectedly in areas that have never experienced them before. Therefore, these major emergencies may have very different impacts on the water systems. The recommendation for this variance focuses on the administrative process to receive approval from the State Water Board to either exclude the water use or water loss during major emergencies from the calculation of UWUO or include the amount as is in the UWUO to neutralize the effect. The administrative process to receive the approval for the variance can be through one of two processes: Pre-Approval Process or Exemption Process. The specific steps for the two administrative processes will be provided to urban retail water suppliers by DWR.

An urban retail water supplier with a significant water use that is within the scope of this variance must follow the explained development steps to apply for the variance using one of the two administrative processes, provided it meets the requirements and significance threshold.

- Pre-Approval Process: Urban retail water suppliers with known high-risk factors for major emergencies may apply for a variance for significant use of water during major emergencies under a Pre-Approval Process.

- Exemption Process: Urban retail water suppliers with unexpected major emergencies may apply for a variance for significant use of water during major emergencies under an Exemption Process.

Although the volume of water use or water loss during the qualified major emergency period can be exempted from the UWUO calculation, urban retail water suppliers still need to report the duration and volume of water use or water loss in their Annual Water Use Report.

Pre-Approval Process Data Required

- Proof of the service area (in part or in full) of the urban retail water supplier being in a high-risk area (application).

- Notification of major emergency occurrence.

  - Application for delay, if seeking a delay for Annual Water Use Report filing.

  - Request for variance volume of water for which the urban retail water supplier is seeking pre-approval. Include for each evacuation area in the service area:

    - Evacuation time period or the time from shutting down the valves in water transmission system for maintenance purposes until the valves are reopened for normal operation (earthquake).

    - Total volume of residential meter and CII-DIM water use for the evacuation area during the evacuation time period, or the volume of water loss due to damage to the water transmission system.

Exemption Process Data Required

- Application for delay, if seeking a permission for submitting its Annual Water Use Report with up to six-month delay.

- Request for variance volume of water for which the urban retail water supplier is seeking an exemption. Include for each evacuation area in the service area:

  - Evacuation time period or the time from shutting down the valves in water transmission system for maintenance purposes until the valves are reopened for normal operation (earthquake).

- Total volume of residential and CII-DIMs water use for the evacuation area during the evacuation time period, or the volume of water loss due to damage to the water transmission system.

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume is the sum of actual water use in all service area–qualified major emergency zones for the duration of the qualified major emergency time period less the standards-based UWUO during qualified emergency period(s) for the qualified emergency zone(s) (UWUO_EP).

$$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = \sum_{Qualified\ Major\ Emergency\ Zones} \sum_{Qualified\ Major\ Emergency\ Period} (Total\ Residential\ Water\ Use + CIIDIM\ Water\ use + Water\ Losses) - UWUO\_EP$$

Urban retail water suppliers must obtain approval from the State Water Board prior to claiming this allowable variance volume water use, even if a delay in reporting has been approved.

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below:

Minimum Variance Water Use Volume = 5% x UWUO_SB

Estimated Qualified Major Emergency Zones and Periods Per Applicable Authority

- Major emergency is defined in California Government Code 8558.
- Major emergency is declared by local official water agencies.
- Period of major emergency based on local official information (for example).
  - Wildfires: From the date evacuation order is issued to the date evacuation order is lifted. Sources of information: County Evacuation Apps by Esri),[6] InciWeb,[7] or County Emergency Service Office's orders for mandatory evacuation and repopulation.
  - Earthquakes: County Emergency Service Office's orders or delineation of damaged areas. Qualified period may cover the time from shutting down the

[6] https://www.arcgis.com/apps/dashboards/e5cc0d2bd29f444a87f7589793d55b37
[7] https://inciweb.nwcg.gov/

valves in the water transmission system for maintenance purposes until the valves are reopened for normal operation.

- For major emergency zones:
  - Description or map of applicable evacuation areas and associated evacuation and return dates.
  - Residential and CII-DIM water use associated with evacuation areas.

Data Provided by Urban Retail Water Supplier

- Documentation of State Water Board notification (For Pre-Approval Process).
- Documentation of State Water Board application and approval (For Exemption Process).
- Proof of the qualified major emergency zones and periods allowed for this variance includes, but is not limited to, the following:
  - Documentation of the state of emergency or type of emergency.
  - Official evacuation order and when order is lifted (wildfire), or official water transmission system shut-down for maintenance and when it is back to normal operation (earthquake).
  - Official incident report from the California Department of Forestry and Fire Protection or local agencies.
  - Document or map showing impacted residential parcels.
- Total volume of residential meter and CII-DIM water use for the evacuation area during the evacuation time period.
  - Description of the method used to estimate major emergency water use.
  - Data certification or affidavit of data accuracy.

Data Accuracy

Major emergency and evacuation orders must be from an authorized entitiy and include the location and time of the evacuation order or determination of the affected area.

Urban retail water suppliers should use billing data for residential and CII-DIM water accounts within the evacuation areas, where available, to calculate the Variance Efficient Water Use.

- When daily or more frequent water use data is available, total water use for the qualified emergency time period will be used.
- When daily water use data is not available, urban retail water suppliers will estimate major emergency water use by:
  - Determining water use during the same billing period(s) as the major emergency using historic records to determine 'normal' average billing-cycle or meter read dates. Urban water suppliers can use the previous year records or an average of historic water use.
  - Emergency water use will be the difference between 'normal' water use calculated with the 'normal' average daily water use rate and actual total water use including the timeframe of the major emergency.
- Urban retail water suppliers may use other data to determine the water use where meter data is not available, such as unaccounted for water loss in excess of the previous year unaccounted for water loss.

Urban retail water suppliers must describe the methodology used for quantifying the major emergency water use, including data sources and any locally applicable research and literature.

- Include credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the analysis.
- Include an affidavit or certification of the data and sources by a qualified urban retail water supplier staff member responsible for data quality.

6.10 Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use

An urban retail water supplier with significant use of water for commercial or noncommercial agricultural use may apply for this variance through the State Water Board application process following the below guidelines and methodologies for calculating the qualified Variance Efficient Water Use Volume allowance and confirming compliance with the significance threshold. A full discussion of this variance is included in the report, *Recommendations for Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use, Methods of Calculation, and Supporting Data Requirements* (WUES-DWR-2021-13).

Limitations of Use

- CII non-DIM and agricultural water meter accounts are excluded from the UWUO; this variance is not applicable in those cases where agricultural production is served by a CII or agricultural meter.
  - Water use in areas with agricultural land use designations are excluded from the UWUO.
  - Urban retail water suppliers may consider installing a separate agricultural meter for this commercial and noncommercial agricultural use, even if the areas are within residential parcels. If a separate agricultural meter is used, the resulting water use is excluded the UWUO calculation.
- Urban community gardens could be on public lands, residential parcels, or other private lands. The occurrence of these community gardens on public and other nonresidential private lands is relatively low and their water use is under a DIM. This water use allowance should be reported under CII-DIMWUS without using this variance. To streamline the UWUO reporting, urban retail water suppliers should consider establishing a CII-DIM account for these uses.

Guidelines for Use with Other Standards or Variances

Community gardens or private agricultural areas served by a DIM should be reported under CII-DIMWUS as SLAs.

Estimated Water Use on Urban Retail Water Supplier Level

The recommendation for this variance allows for calculation of the Variance Efficient Water Use Volume following one of two options: a simple calculation with a higher threshold of significance (Standard Method), and a more detailed calculation with a lower threshold of significance (Detailed Method). These options provide urban retail water suppliers with flexibility in how eligibility for the variance is achieved, depending on data availability. If a local agency requires consideration of effective precipitation for residential landscapes in its adopted local Water Efficient Landscape Ordinance, both methods must be adjusted accordingly.

An urban retail water supplier with a significant water use that is in the scope of this variance must follow the required development steps to apply for the variance using one of the two calculation options, provided it meets the requirements and threshold.

Data Needed for Calculation

- Standard Method:
  - Qualifying irrigated land area (*LA*).

  - Variable growing season interval and duration.
  - Urban retail water supplier–specific reference evapotranspiration for the duration of growing season (*ETo_gs*).
  - Regional average crop coefficient aggregated for the region for the duration of growing season (*Kc_gs*).
  - Regional average irrigation efficiency (*IE*).
- Detailed Method:
  - Urban retail water supplier–specific crop type information from residential customers.
  - Quantifying irrigated land area per crop or crop type (*LA_Crop*).
  - Urban retail water supplier–specific growing season per crop.
  - Urban retail water supplier–specific reference evapotranspiration per crop for the duration of growing season (*ETo_gsCrop*).
  - Locally specific crop coefficients for each crop grown in the service area (*Kc_gsCrop*).
  - Irrigation efficiency information from local data for each crop type in the service area (*IE_Crop*).

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume for the recommended variance in gallons is the product of the *ETo* (inches), crop coefficient(s) divided by irrigation efficiency (unitless), irrigated crop area (square feet), and 0.62, a unit conversion factor, for the crop growing season. The calculation is:

- Standard Method:

$$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = 0.62 \times \frac{Service\ Area\ Average\ Kc\_gs}{Service\ Area\ Average\ Irrigation\ Efficiency} \times Service\ Area\ Average\ ETo\_gs \times Total\ Irrigated\ Ag\ Land\ Area$$

where,

$$Service\ Area\ Average\ ETo\_gs = \sum_{growing\ season\ start\ date}^{growing\ season\ end\ date} Service\ Area\ Average\ Daily\ ETo$$

- Detailed Method:

$$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = 0.62 \times \sum_{crop} \frac{Kc\_gsCrop}{Crop\ type\ Irrigation\ Efficiency} \times ETo\_gsCrop \times Irrigated\ Crop\ Area$$

where,

$$ETo\_gsCrop = \sum_{growing\ season\ start\ date}^{growing\ season\ end\ date} Daily\ ETo\ per\ Crop$$

Significance Test

For this variance, the Variance Efficient Water Use Volume must be equal to or greater than the minimum volume established below.

- Standard Method Minimum Variance Volume (gallons) = 5% x UWUO_SB
- Detailed Method Minimum Variance Volume (gallons) = 1% x UWUO_SB

Data Provided by the California Department of Water Resources

Standard Method

- Urban retail water supplier–specific growing season.
- Daily reference evapotranspiration for the duration of the year, *Daily ETo* (inches).
- Crop coefficient for the duration of growing season (*Kc_gs*).
- Irrigation efficiency for aggregate crops and irrigation systems in the region (*IE*).
- Total qualifying irrigated agricultural land area: attributable commercial or noncommercial agricultural land on residential parcel based on the latest DWR's LAM project. The library named "OR_LAM_Ag Mask" (*LA*) (square feet) from the LAM project should be used for the purpose of this variance; urban retail water suppliers can provide input to adjust the OR_LAM_Ag Mask through the alternative data process.

Detailed Method

- Urban retail water supplier–specific growing season per crop based on a list requested by the urban retail water supplier or common regional crops lists.
- Daily reference evapotranspiration for the duration of the year, *Daily ETo* (inch).
- Crop coefficients for the duration of growing season (*Kc_gsCrop*) based on a list requested by the urban retail water supplier or common regional crops lists.
- Irrigation efficiency for different types of crops and irrigation systems in the region (*IE_Crop).*
- Total qualifying irrigated agricultural land area: attributable commercial or noncommercial agricultural land on residential parcel based on the latest OR_LAM_Ag Mask (square feet); urban retail water suppliers can provide input to adjust the OR_LAM_Ag Mask through the alternative data process.

Data Provided by Urban Retail Water Supplier

Standard Method

- Reference evapotranspiration for the growing season (*ETo_gs*) calculated from DWR-provided or otherwise obtained aggregate growing season for the region.
- Growing season evapotranspiration factor calculated from DWR-provided *Kc_gs* and *IE_gs.*

Detailed Method

- Crop types and associated land areas.
- Irrigation system types for crops in the service area.
- Growing season evapotranspiration factor for each crop or crop-type (*ETF_gsCrop*).
- Reference evapotranspiration for the growing season for each crop or crop-type (*ETo_gsCrop*) calculated from DWR-provided or otherwise obtained crop growing season for the region (inch).
- Qualifying irrigated land area by crop or crop-type (*LA_Crop*) (square feet).

Data Accuracy

The urban retail water supplier must report all the data and supporting documentation used to estimate the water use. While DWR is supplying some of this information, it will need to be confirmed that it is correctly used in the calculation.

For the Detailed Method, to ensure data accuracy, urban retail water suppliers must also provide a detailed description of the method(s) used to obtain crop types and associated areas and irrigation systems.

Urban retail water suppliers must include in their application:

- Description of the methodology and data used, including data sources and any locally applicable research and literature.
- Description of the data verification process.
- Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.
- Affidavit or certification of the data by a qualified urban retail water supplier staff member responsible for data quality.
  - Certification of the data by the entity/party that produced it if not produced by the urban retail water supplier's staff.
  - Referenced, published research reports do not require certification but must be cited.
- Documentation on surveys, map(s), satellite image(s), or other records, statistical sample results, and any other supporting data must be retained for the period the data is used in this process, plus three years, and should be available upon request.
  - **Surveys**. If a survey is used to collect data, urban retail water suppliers do not have to verify all survey information. A statistical sample for verification (e.g., random sample of a certain percentage of customers responding positively to a survey) may be used, so long as the process is described and documentation is provided. DWR recommends that the statistical sampling meet the following minimum requirements:
    - Verfiy a random sample of accounts identified with commercial or noncommercial agricultural land on residential parcels based on the latest OR_LAM_Ag Mask.
      - A minimum of 10 percent of these accounts, but no less than 5.
      - A maximum of 100 verified accounts.

- Verification can include pictures, site visits, or other methods to be described in the application documentation.

- **Using remote sensing or GIS mapping methods**. The accuracy of results from remote sensing methods depends on qualifications of the entity that performs the analysis and quality of the remotely sensed or GIS data. If done correctly, this method can produce reasonably accurate results, but requires technical resources (GIS mapping systems and personnel trained in remote sensing crop identification) or financial resources (contracting).

Use of Alternative Data

If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data and methodology provided by DWR. Urban retail water suppliers requesting more than one type of alternative data may submit separate applications for each data type or a combined application for all data types, so long as the required information is included in the combined package.

- Refer to Section 9.2 for alternative *ETo* data.
- Refer to Section 9.8 for alternative irrigated crop area data.
- Refer to Section 9.10 for alternative *Kc_gs*, growing season, and irrigation efficiency.

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7.0 Guidelines and Methodologies for Calculating Potable Reuse Bonus Incentive

To maintain consistency with State policy encouraging potable reuse (as defined in WC Section 13561), a bonus incentive is allowed for an urban retail water supplier that delivers water from a groundwater basin, reservoir, or other source that is augmented by potable reuse water (WC Section 10609.20). The bonus incentive is to adjust the urban retail water supplier's UWUO by the eligible volume of potable reuse water delivered to residential customers and landscape areas with DIM in connection with CII water use.

7.1 Qualifying Criteria

Existing Facility

The bonus incentive adjustment is limited to 15 percent or 10 percent of the UWUO, depending on whether the facility supplying potable reuse water is existing or new. An Existing Facility must meet the following criteria:

1. The facility must have a certified environmental impact report, mitigated negative declaration, or negative declaration on or before January 1, 2019.

2. The facility must begin production and delivery of potable recycled water on or before January 1, 2022.

3. The facility must use microfiltration and reverse osmosis technologies in the treatment train producing the potable recycled water.

4. For purposes of WC Section 10609.20, and notwithstanding paragraph (4) of subdivision (d) of WC 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 (WC Section 10609.21(a)).

Any facility that does not meet the criteria of an Existing Facility is considered an Other Facility. An Other Facility must meet the following criteria:

1. The facility must have a certified environmental impact report, mitigated negative declaration, or negative declaration completed after January 1, 2019.

2. The facility may begin production and delivery of potable recycled water after January 1, 2022.

3. The facility may use any approved technologies for potable reuse, including, but not limited to, microfiltration and reverse osmosis technologies in the treatment train producing the potable recycled water.

Potable Reuse Volumes Eligible for Bonus Incentive

The allowable bonus incentive volume for potable recycled water is capped to not exceed a maximum percentage of the urban retail water supplier's UWUO. Two different maximum percentage values are allowed:

1. The bonus incentive shall not exceed 15 percent of the urban retail water supplier's UWUO for potable recycled water produced at an Existing Facility.

2. The bonus incentive shall not exceed 10 percent of the urban retail water supplier's UWUO for potable recycled water produced at a facility that does not qualify as an Existing Facility (i.e., Other Facility).

Potable Reuse Water Use Eligible for Bonus Incentive

To qualify for the bonus incentive volume, the potable recycled water must be delivered to the following end-users:

1. Residential indoor and outdoor use.

2. Landscape areas with DIM in connection with CII outdoor water use.

Due to this delivery requirement, the bonus incentive accounting must consider not only the annual volume of potable recycled water introduced to the system, but also the distribution characteristics of the water in the distribution system.

7.2 Potable Reuse Types

Direct Potable Reuse

Direct potable reuse (DPR) does not require an environmental buffer. Wastewater or stormwater is directed to a municipal wastewater treatment plan and/or advance wastewater treatment facility for treatment. Once treated, it is then directed to a drinking water treatment plant for further treatment or sent directly to a drinking water distribution system.

Indirect Potable Reuse

Indirect potable reuse (IPR) requires an environmental buffer, such as a lake, river, or a ground aquifer, that is used as a source drinking water. The water is then treated at a

drinking water treatment facility, if required per regulations, and directed into the drinking water distribution system.

7.3 Future Review for Guidelines and Method for Direct Potable Reuse

Direct potable reuse is currently not permitted in the State. Recommendations and associated guidelines and methodologies for calculating a bonus incentive for DPR is deferred until the State Water Board's adoption of criteria and regulations per AB 574 of 2017.

7.4 Bonus Incentive for Indirect Potable Reuse Through Surface Water Storage

Urban retail water suppliers receiving IPR through a surface water storage environmental buffer should use the following methodology to calculate their bonus incentive allowable volumes. The bonus incentive calculation will allow for annual reconciliation of potable water reuse for IPR using a surface water storage environmental buffer. Where multiple urban retail water suppliers receive water supplies from the surface water storage facility, only those urban retail water suppliers with a contract for the potable reuse water may receive the bonus incentive in direct proportion to their contract agreement.

Data Needed for Accounting

- Total reservoir augmentation (acre-feet).
- Loss factor for evaporation and seepage (percent).
- Waste discharge to reservoir when the filter plant first start running (acre-feet).
- Percent apportionment to urban retail water supplier (percent).
- Residential metered deliveries (acre-feet).
- Metered dedicated irrigation deliveries using potable water (acre-feet).
- Total potable use (acre-feet).
- UWUO.

Estimated Amount for Bonus Incentive

The bonus incentive allowable volume is the lesser of:

- Qualified Water Volume = Residential and Dedicated Irrigation Meter Deliveries/ Total Potable Use Deliveries x Individual Urban Retail Water Supplier Potable Reuse x 325,828.8 gallons per acre-foot, or
- Urban water use objective x (10% or 15%)/100 cap (per WC Section 10609.20(d))

Individual Urban Retail Water Supplier Potable Reuse

Individual Urban Retail Water Supplier Potable Reuse = Percent Apportionment to Urban Retail Water Supplier/100 x Volume Entering Potable Distribution System

where,

- Volume Entering Potable Distribution System = (5-Year Average Reservoir Augmentation x Loss Factor for Evaporation and Seepage) - Waste discharge to reservoir when the filter plant first starts running (if applicable).
- 5-year Average Recharge is calculated based on current and previous 4 years, or as many prior years as available, to account for variability in potable reuse production
- Percent apportionment to urban retail water suppliers is about multiple entities sharing the buffer - it is the attributable amount for potable reuse in calculations.

Residential and Dedicated Irrigation Meter Deliveries

Residential and Dedicated Irrigation Meter Deliveries = Metered Residential Deliveries + Dedicated Irrigation Meter Deliveries

Referenced Data Provided by Appropriate Surface Water Management Authority

- Attributable potable reuse amount that is allowed for a certain urban retail water supplier to use (acre-feet).
- Loss factor for evaporation and seepage (percent).

Additional Data Provided by Urban Retail Water Supplier

- Total reservoir augmentation (acre-feet).
- Waste discharge to reservoir when the filter plant first start running (acre-feet).
- Annual use from surface water reservoir (acre-feet).
- Percent apportionment to urban retail water supplier (percent).
- Residential metered deliveries (acre-feet).

- Metered dedicated irrigation deliveries using potable water (acre-feet).
- Total potable use (acre-feet).
- UWUO.

7.5 Bonus Incentive for Indirect Potable Reuse Through Groundwater Storage

Urban retail water suppliers receiving IPR through a groundwater augmentation environmental buffer should use the following method to calculate their bonus incentive allowable volumes. The bonus incentive calculation will allow for annual reconciliation of potable water reuse of IPR using a groundwater storage environmental buffer. Where multiple urban retail water suppliers receive water supplies from the groundwater basin, only those urban retail water suppliers with a contract for the potable reuse water may receive the bonus incentive in direct proportion to their contract agreement.

Data Needed for Accounting

- Total groundwater recharge per year (acre-feet).
- Total basin production (acre-feet).
- Loss factor for recharge and recovery (percent).
- Individual urban retail water supplier groundwater basin production (acre-feet).
- Total potable water entering urban retail water supplier's distribution system (acre-feet).
- Residential metered deliveries (acre-feet).
- Metered dedicated irrigation deliveries using potable water (acre-feet).
- Total potable use (acre-feet).
- UWUO.

Estimated Amount for Bonus Incentive

The bonus incentive allowable volume is the lesser of:

- Qualified Water Volume = Residential and Dedicated Irrigation Meter Deliveries/ Total Potable Use Deliveries x Individual Urban Retail Water Supplier Potable Reuse x 325,828.8 gallons per acre-foot, or

- Urban water use objective x (10% or 15%)/100 cap (per WC Section 10609.20(d))

Individual Urban Retail Water Supplier Potable Reuse

Individual Urban Retail Water Supplier Potable Reuse = (Loss Factor for Recharge and Recovery x 5-Year Average Recharge in acre-feet / Total Basin Production in acre-feet) x Individual Urban Retail Water Supplier Groundwater Basin Production in acre-feet.

- Total Basin Production is metered groundwater pumped by all users within the groundwater basin, including urban retail water suppliers and self-supplied users.
- Loss Factor for Recharge and Recovery:
  - For losses provided as a volume: Loss Factor for Recharge and Recovery = 1 – (Potable Reuse Losses in the Recharge and Recovery Processes in acre-feet / five-year Average Recharge in acre-feet).
  - For losses provided as a volume: Loss Factor for Recharge and Recovery = 1 – (Potable Reuse Losses in the Recharge and Recovery Processes in acre-feet / 5-year Average Recharge in acre-feet).
  - For losses provided as a percent: Loss Factor for Recharge and Recovery = (100- Percent Losses)/100

  Losses can include, but are not limited to, losses to the ocean, loss to other groundwater basins, evaporative losses, and conveyance losses.
- Five-year Average Recharge in acre-feet is calculated based on the current and previous four years, or as many prior years as available, to account for variability in potable reuse production.
- Individual Urban Retail Water Supplier Groundwater Basin Production is equal to the total metered volume of groundwater production for an individual producer for Potable Use (urban retail water supplier) in acre-feet.

Residential and Dedicated Irrigation Meter Deliveries

Residential and Dedicated Irrigation Meter Deliveries in acre feet = Metered Residential Deliveries in acre-feet + Dedicated Irrigation Meter Deliveries in acre-feet

Referenced Data Provided by Appropriate Groundwater Basin Management Authority

- Attributable potable reuse amount that is allowed for a certain urban retail water supplier to use in the groundwater basin (acre-feet).

- Loss factor for recharge and recovery (percent or acre-feet).

Additional Data Provided by Urban Retail Water Supplier

- Total groundwater recharge per year (acre-feet).
- Total basin production (acre-feet).
- Annual use from groundwater extraction (acre-feet).
- Individual urban retail water supplier groundwater basin production (acre-feet).
- Total potable water entering urban retail water supplier's distribution system (acre-feet).
- Residential metered deliveries (acre-feet).
- Metered dedicated irrigation deliveries using potable water (acre-feet).
- Total potable use (acre-feet).
- UWUO.

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8.0 Guidelines and Methodologies for Calculating Prior Year Actual Water Use

Per WC Sections 10609.22 and 10609.24, an urban retail water supplier must calculate and report its actual water use in relation to its UWUO beginning no later than January 1, 2024, and by January 1 every year thereafter. The calculation must be based on the urban retail water supplier's water use for the previous calendar or fiscal year and is to be composed of the sum of the following water volumes:

1. Aggregate residential water use.
2. Aggregate outdoor irrigation of landscape areas with DIM in connection with CII water use.
3. Aggregate water loss.

This section provides guidance and methods for calculating each of these water volumes.

8.1 Aggregate Residential Water Use

An urban retail water supplier's aggregate residential water use includes all potable and non-potable water for indoor and outdoor uses delivered to property classified as residential in county assessor rolls, regardless of whether the service connections and meters providing this water have been classified by the urban retail water supplier as residential. Estimating aggregate residential water use may present challenges for urban retail water suppliers when one or more of the following applies:

- The urban retail water supplier's residential population is served by a combination of residential and nonresidential meters (e.g., some or all multifamily complexes are served by meters classified as commercial or mixed residential/commercial).
- Some or all of the urban retail water supplier's residential population is served by unmetered service connections.
- Some or all communal landscape areas in residential developments are served by nonresidential meters (e.g., the urban retail water supplier does not separately classify DIM serving residential and nonresidential landscape areas).

This section provides specific guidelines and methodologies for addressing each of these situations when estimating prior year aggregate residential water use.

Residential Water Use Served by Residential Service Connections

All potable and non-potable water delivered in the prior year through residential service connections should be included in an urban retail water supplier's estimate of aggregate residential water use. This includes both metered and unmetered service connections classified as residential, single-family residential, or multifamily residential.

Metered Single-Family and Multifamily Residential Connections

If potable or non-potable water was delivered in the prior year through metered service connections classified as residential, single-family residential, or multifamily residential, the total of these deliveries should be included in an urban retail water supplier's estimate of aggregate residential water use. These volumes may be tabulated from the urban retail water supplier's billing records, such as from sales reports or by a tally of all billed volumes for qualifying meters with meter read dates falling within the year in question.

Unmetered Single-Family Residential Connections

If potable or non-potable water was delivered through unmetered single-family residential connections in the prior year, the volume of these deliveries must be estimated using the following formula:

Volume of water through unmetered single-family connections
= *Number of unmetered single-family connections*
× *average use per metered single-family connection (in gallons/year)*
× *adjustment factor*

Average use per metered single-family connection must be based on the prior year water use of metered single-family connections. The adjustment factor accounts for the average difference in water use between metered and unmetered single-family connections. Urban retail water suppliers will use an adjustment factor equal to 1.2, unless they provide documentation justifying the use of an alternative value.

Unmetered Multifamily Connections

If potable or non-potable water was delivered through unmetered multifamily residential connections in the prior year, the volume of these deliveries must be estimated using one of the following formulas.

1. If the number of dwelling units served by each multifamily connection is known, use the following formula to estimate the volume of water through unmetered multifamily connections:

Volume of water through unmetered multi-family connections
= *Number of dwelling units served by unmetered multi-family connections*
× *average use per dwelling unit served by metered multi-family connection (in gallons/year)*× *adjustment factor*

2. If the number of dwelling units served by each multifamily connection is unknown, use the following formula to estimate the volume of water through unmetered multifamily connections:

   Volume of water through unmetered multi-family connections
   = *Number of unmetered multi-family connections*
   × *average use per metered multi-family connection (in gallons/year)*
   × *adjustment factor*

Average use per dwelling unit served by metered multifamily connections (or average use per metered multifamily connection if dwelling units are unknown) must be based on the prior year water use of metered multifamily connections. The adjustment factor accounts for the average difference in water use between metered and unmetered multifamily connections. Urban retail water suppliers will use an adjustment factor equal to 1.2, unless they provide documentation justifying the use of an alternative value.

Residential Water Use Served by Nonresidential Service Connections

Potable or non-potable water delivered in the prior year to property classified as residential in the county assessor rolls by service connections classified as nonresidential must be included in the urban retail water supplier's estimate of aggregate residential water use. This may, for example, include water delivered by commercial or commercial/residential mixed-use meters serving residential property (e.g., multifamily residential developments). Another example is DIM-serving residential property that is not separately classified from DIM-serving nonresidential property. In such situations, the urban retail water supplier will need to identify its nonresidential meters serving residential property and include the potable and non-potable water delivered in the prior year by these meters in its estimate of aggregate residential water use.

Residential Property Served by Nonresidential Service Connections

If potable or non-potable water was delivered in the prior year to property classified as residential in the county assessor rolls by commercial or commercial/residential mixed-use meters, these deliveries must be included in the urban retail water supplier's estimate of aggregate residential water use.

GIS methods are recommended for meter identification. This entails intersecting meter service points with county assessor parcel boundaries to identify commercial or commercial/residential mixed-use meters located on or adjacent to parcels with a

residential classification. Meter service points need to be geocoded to do this. Geocoding provides the geographical coordinates (latitude and longitude) for the physical address (street, city, zip code) of the meter service point. Most commercial and open-source GIS software packages have built-in geocoding functionality. There are also numerous fee-based and free geocoding services that can be used to geocode a list of addresses for meter service points.

Water delivered by commercial or commercial/residential mixed-use meters to commercial/residential mixed-use parcels contains both residential and commercial water uses. Urban retail water suppliers may choose to prorate this use to remove the commercial component, provided that they document the reason and method used to prorate this use.

If any of the identified nonresidential service connections are unmetered, the methods presented in this section should be used to estimate this water use.

Communal Landscape Areas Served by Nonresidential Service Connections

If potable or non-potable water was delivered in the prior year to property classified as residential in the county assessor rolls by DIMs, these deliveries must be included in the urban retail water supplier's estimate of aggregate residential water use.

As with the commercial and commercial/residential mixed-use meters discussed in the previous section, GIS methods are recommended for meter identification in cases where DIM-serving residential and nonresidential properties are not separately classified. Refer to the previous section for specific guidance.

8.2 Aggregate Outdoor Water Use by Commercial, Industrial, and Institutional Dedicated Irrigation Meters

All potable and non-potable water delivered by DIM (or equivalent technology) in the prior year to property classified as nonresidential in the county assessor rolls should be included in an urban retail water supplier's estimate of aggregate outdoor water use by CII-DIMs. However, water delivered for commercial agricultural use meeting the definition of subdivision (b) of Section 51201 of the GC is excluded.[8]

If DIMs serving residential and nonresidential property are not separately classified, urban retail water suppliers should use the GIS methods discussed in the previous section to identify the subset of meters serving nonresidential property. Alternatively,

[8] "Agricultural use" means use of land, including, but not limited to, greenhouses, for the purpose of producing an agricultural commodity for commercial purposes (Government Code 51201(b)). Retail and wholesale commercial nurseries are included within the definition of agricultural use.

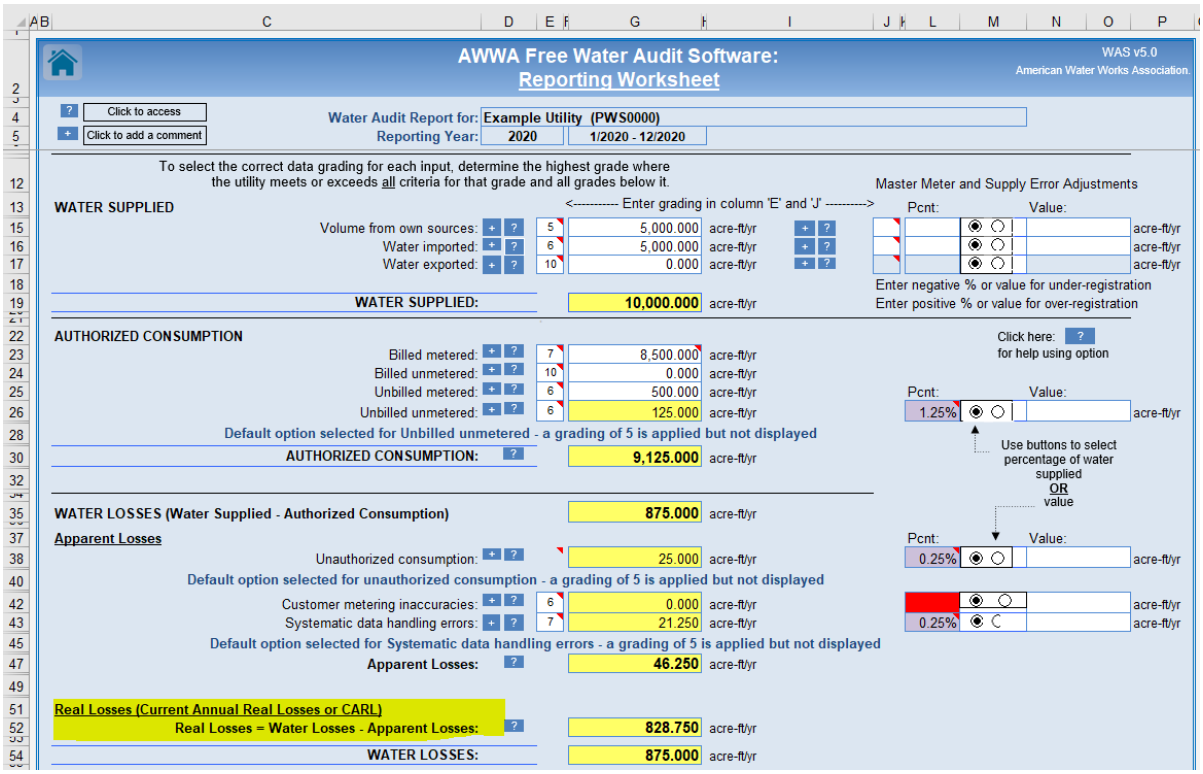
urban retail water suppliers, for the purposes of calculating the UWUO and reporting total water use, may classify some or all residential DIMs as CII-DIMs to make use of SLA provided for in CII-DIMWUS.

8.3 Aggregate Water Loss

An urban retail water supplier's prior year aggregate water loss is the volume of real losses from its water loss audit report for that year. This volume is reported in either gallons per connection per day or gallons per miles of main per day. The urban retail water supplier will need to convert the volume to gallons per year by multiplying it by either the number of service connections or miles of main reported in the water audit, and then multiplying the result by the number of days in the year (365 for non-leap years and 366 for leap years).

An urban retail water supplier can also obtain its real losses volume from the American Water Works Association Free Water Audit Software workbook it submitted with its water audit report. As illustrated in Figure 8-1, the real losses volume can be found on the Reporting Worksheet in the volume units the urban retail water supplier selected for reporting. These units will be either in acre-feet, millions of gallons, or megaliters. The urban retail water supplier will need to convert this volume to gallons per year by multiplying it by the appropriate conversion factor:

- If in acre-feet, multiply by 325,851 to convert to gallons per year.
- If in millions of gallons, multiply by 1,000,000 to convert to gallons per year.
- If in megaliters, multiply by 264,172 to convert to gallons per year.



Source: [WUEdata - Water Audit Plans (ca.gov)]

Figure 8-1 Real Water Losses Reported in American Water Works Association Free Water Audit Software

9.0 Use of Alternative Data

Request for approval of an alternative data source can be made either separately for each type of data discussed here and below (i.e., landscape area, *ETo*, total precipitation, and *Peff*) or combined. If submitting them combined, only one public process is necessary, so long as all data are included in the public process.

Submittal instructions will be posted on DWR's website. DWR will review the submittals and approve requests if the documentation is complete. DWR may require more information before approving a request and will inform the urban retail water supplier of its review outcome. The request may be returned or rejected for incomplete documentation. DWR will respond within 60 days of receipt of the package.

9.1 Alternative Residential Landscape Area Data

To request the use of alternative landscape area data, the urban retail water supplier must demonstrate that the alternative data meet or exceed the quality and accuracy of the irrigable landscape area that DWR provides by submitting a package to DWR containing the following:

1. Description of why the alternative data meet or exceed the quality and accuracy of the DWR data.
2. Description of the methodology used for quantifying the irrigable landscape area.
3. Confirmation that the residential landscape area measurement includes both II and INI classes as defined above.
4. Verification that the measured landscape area is for residential parcels only and does not include nonresidential parcels.
5. Credentials (such as licenses, certifications, educational, training, or professional background of staff) for the entity/party that conducted the landscape area measurement and the entity/party that approved the data.
6. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.
    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

7. A public process to provide the public an opportunity to review the alternative data and understand the purpose of the request to use alternative data.

8. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.2 Alternative Reference Evapotranspiration Data

To demonstrate that alternative *ETo* (and/or total precipitation) data meet or exceed the quality and accuracy of the *ETo* (and/or total precipitation) data that DWR provides, an urban retail water supplier must submit a package containing the following:

1. Description of why the alternative data meet or exceed the quality and accuracy of the DWR data.

2. Description of the methodology used to estimate *ETo* (and/or total precipitation).

3. Indication of the source of data used to estimate *ETo* (and/or total precipitation) – e.g., whether it is from a weather station or remote sensing.

4. If *ETo* (and/or total precipitation) is calculated using station data:

    a. Description of the siting condition of the weather station.

    b. List of all sensors used.

    c. Description of maintenance procedures and schedules.

    d. Description of the quality assurance/quality control procedures.

    e. Detailed description of the equation used to estimate *ETo* and *Peff.*

5. If *ETo* is estimated using remote sensing data:

    a. The specific input data source (satellite, airborne, etc.) and image resolution.

    b. Detailed description of the methodology for deriving *ETo* from remotely sensed data.

    c. Description of how the method and data was validated and documentation of validation.

6. Description of why the alternative *ETo* (and/or total precipitation) data quality and accuracy is equivalent to or better than that of DWR.

7. Certification of the alternative data by the entity that produced it.
8. A public process to provide the public an opportunity to review the alternative data and understand the purpose of the request to use alternative data.
9. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.3 Alternative Effective Precipitation Data

To request the use of alternative *Peff* data, the urban retail water supplier must demonstrate that the alternative *Peff* data meet or exceed the quality and accuracy of the *Peff* data that DWR provides by submitting a package containing the following:

1. Description of why the alternative *Peff* data meet or exceed the quality and accuracy of the DWR data.
2. Description of the source for the *Peff* data.
3. Description of the methodology used to estimate *Peff.*
4. Description of why the alternative *Peff* data meet or exceed the quality and accuracy of the DWR *Peff* data.
5. Certification of the alternative data by the entity that produced it.
6. A public process to provide the public an opportunity to review the alternative data and understand the purpose of the request to use alternative data.
7. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.4 Alternative Precipitation Data

To demonstrate that alternative precipitation data meet or exceed the quality and accuracy of the data provided by DWR, the urban retail water supplier must submit a package containing the following:

1. Description of why the alternative data meet or exceed the quality and accuracy of the DWR data.
2. Description of the methodology used to estimate daily precipitation, including the source of data – e.g., whether it is from a weather station or other.
3. If precipitation is calculated using station data:

   a. Description of the siting condition of the weather station.

   b. List of precipitation sensors used.

   c. Description of maintenance procedures and schedules.

   d. Description of the quality assurance and quality control procedures.

4. Certification of the alternative data by the entity that produced it.

5. A public process to provide the public an opportunity to review the alternative data and understand the purpose of the request to use alternative data.

6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.5 Alternative Evaporation Rate Calculation or Wet-Bulb Temperature

To request the use of alternative EC climate data or evaporation rate calculation, the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data DWR provides or references by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data.

2. Description of the methodology used for determining wet-bulb temperature or EC evaporation rate, including data sources and any locally applicable research and literature.

3. Verification that the ECs considered in the variance are for residential uses, which are categorically excluded from ORWUS and IRWUS.

4. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the analysis or provided the data.

5. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

   a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier’s staff.

   b. Referenced, published research reports do not require certification but must be cited.

6. A public process to provide the public an opportunity to review the alternative data and understand the purpose of the request to use alternative data.

7. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

Temperature and Climate Data

To request the use of alternative data or methodologies to determine wet-bulb temperature, dry-bulb temperature, or relative humidity, the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data and method DWR provides or references by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data or referenced data.

2. Description of the methodology and data used, including data sources and any locally applicable research and literature.

3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.

4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

   a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

   b. Referenced, published research reports do not require certification but must be cited.

5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.

6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.6 Alternative Horses and Other Livestock Efficient Daily Water Use Data

To request the use of alternative horses and other livestock efficient daily water use data, the urban retail water supplier must demonstrate that the alternative data meet or exceed the quality and accuracy of the data DWR provides by submitting a package containing the following:

1. Description of why the alternative data meet or exceed the quality and accuracy of the DWR data.

2. Description of the methodology used for quantifying the efficient animal daily water use, including data sources and any locally applicable research and literature.

3. Confirmation of the populations in the service area (e.g., if choosing to use UCD 2014 table to quantify efficient daily water use for weight classes and activity levels of service area horse populations, documentation and methodology used to identify and confirm the weight classes and activity levels are required).

4. Verification that the animal populations considered in the variance are for residential uses, which were categorically excluded from ORWUS and IRWUS.

5. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.

6. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

    b. Referenced, published research reports do not require certification but must be cited.

7. Submission of the request signed by the General Manager of the urban retail water supplier to DWR.

9.7 Alternative Leaching Requirement Salinity Data

To request the use of alternative data to determine the *LR* (*ECe*, *ECiw*), the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data and method DWR provides or references by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data or referenced data.

2. Description of the methodology and data used, including data sources and any locally applicable research and literature.

3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.

4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

    b. Referenced, published research reports do not require certification but must be cited.

5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.

6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

Calculation of *LR* requires an irrigation efficiency. The irrigation efficiency for sprinkler systems is 0.81, and for drip or micro-spray systems it is 0.75. These are part of the methodology for the calculation of the efficient water use for the variance for significant landscaped areas irrigated with recycled water having high levels of TDS and are not subject to alternative data requests.

9.8 Alternative Horse Corrals/Arenas and Qualifying Irrigated Agricultural Land Area Data

Urban retail water suppliers can use alternative horse corral/arena and qualifying irrigated agricultural land area acreage in the variance calculations. Areas can be measured by:

- **On-the-ground measurement** – This approach involves physical measurement of horse corrals/arenas or irrigated crop area and produces the most accurate result, but it is time consuming and resource intensive. It also involves coordinating with the residents for permission to access the property and conduct measurements.

- **Using remote sensing or GIS mapping methods** –The accuracy of results from remote sensing methods depends on qualifications of the entity that performs the analysis and quality of the remotely sensed or GIS data. If done correctly, this method can produce reasonably accurate results, but requires technical resources (GIS mapping systems).

If an urban retail water supplier chooses to use alternative data, it must receive approval from DWR and demonstrate that its data meet or exceed the quality and accuracy of data provided by DWR. To request the use of alternative data or methodologies to determine horse corral and arena acreage, the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data and methodologies DWR provides or references by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data or referenced data.

2. Description of the methodology and data used, including data sources and any locally applicable research and literature.

3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the measurements and verification.

4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.

6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.9 Alternative Evaporation Factor Data

To request the use of alternative data for *EF*, the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data DWR provides or references by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data or referenced data.

2. Description of the methodology and data used, including data sources and any locally applicable research and literature.

3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.

4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.

    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.

    b. Referenced, published research reports do not require certification but must be cited.

5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.

6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.10 Alternative *Kc_gs*, Growing Season, and Irrigation Efficiency for Standard Method Calculation

Urban retail water suppliers can use alternative *Kc_gs*, growing season, and irrigation efficiency in the efficient water use calculation for the variance for significant use of water for commercial or noncommercial agricultural use. To demonstrate that the alternative data meet or exceed the quality and accuracy of the data that DWR provides, an urban retail water supplier must submit a package containing the following:

1. Description of why the alternative data meet or exceed the quality and accuracy of the DWR data or referenced data.
2. Description of the methodology and data used, including data sources and any locally applicable research and literature.
3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the measurements and verification.
4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.
    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.
    b. Referenced, published research reports do not require certification but must be cited.
5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.
6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

9.11 Other Alternative Data or Methodologies

To request the use of alternative data or methodologies, the urban retail water supplier must demonstrate that the alternative data or methodologies meet or exceed the quality and accuracy of the data and method DWR provides by submitting a package containing the following:

1. Description of why the alternative data or methodologies meet or exceed the quality and accuracy of the DWR data.
2. Description of the methodology used for quantifying the seasonal population water use, including data sources and any locally applicable research and literature.
3. Credentials (such as licenses, certifications, education, training, or professional background of staff) for the entity/party that conducted the research or analysis and verification.
4. Affidavit or certification of the alternative data by a qualified urban retail water supplier staff member responsible for data quality.
    a. Certification of the alternative data by the entity/party that produced it if not produced by the urban retail water supplier's staff.
    b. Referenced, published research reports do not require certification but must be cited.
5. A public process to provide the public an opportunity to review the alternative data or methodologies and understand the purpose of the request to use alternative data.
6. Submission of a request signed by the General Manager of the urban retail water supplier to DWR.

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Appendix A – Urban Water Use Efficiency Recommendation Package Reports Incorporated by Reference

DWR (California Department of Water Resources). September 2022. Recommendations for Urban Water Use Efficiency Standards, Variances, Performance Measures, and Annual Water Use Reporting. DWR Report Number: WUES-DWR-2021-01A.

DWR (California Department of Water Resources). September 2022. Recommendations for Outdoor Residential Water Use Efficiency Standard. DWR Report Number: WUES-DWR-2021-02.

DWR (California Department of Water Resources). September 2022. Landscape Area Measurements Final Project, Report EA-133C-16-CQ-0044. DWR Report Number: WUES-DWR-2021-02.T1.

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