Recommendations for Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use, Methods of Calculation, and Supporting Data Requirements

WUES-DWR-2022-13

A Report to the State Water Resources Control Board Prepared Pursuant to California Water Code Section 10609.14

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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Table Of Contents

Figures

Tables

Appendices

Abbreviations and Acronyms

2018 Legislation	2018 Legislation on Water Conservation and Drought Planning (Senate Bill 606 [Hertzberg] and Assembly Bill 1668 [Friedman], as amended)
CCR	California Code of Regulations
CII	commercial, industrial, and institutional
CII-DIM	commercial, industrial, and institutional dedicated irrigation meter
CII-DIMWUS	Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard
DIM	dedicated irrigation meter
DWR	California Department of Water Resources
ETAF	evapotranspiration factor in Model Water Efficient Landscape Ordinance design standard (on parcel level)
ETF	evapotranspiration factor (on urban retail water supplier level)
ETF_gs	evapotranspiration factor based on the average reference evapotranspiration for an average growing season in the service area of an urban retail water supplier
ETF_gsCrop	evapotranspiration factor based on the crop-specific growing season and reference evapotranspiration in the service area of an urban retail water supplier
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
GIS	geographic information system
IE	irrigation efficiency
IE_Crop	crop-specific irrigation efficiency

IRWUS	Indoor Residential Water Use Efficiency Standard
Kc	crop coefficient
Kc_gs	average crop coefficient during growing season
Kc_gsCrop	crop coefficients for the duration of growing season
LA	landscape area
MAWA	maximum applied water allowance
MWELO	Model Water Efficient Landscape Ordinance
OR_LAM	Outdoor Residential Landscape Area Measurement
OR_LAM_Ag Mask	Outdoor Residential Landscape Area Measurement Agricultural Mask
ORWUS	Outdoor Residential Water Use Efficiency Standard
Peff	effective precipitation
Peff_gs	average effective precipitation during growing season
Peff_gsCrop	crop-specific effective precipitation during growing season
Recommendation Package	Urban Water Use Efficiency Recommendation Package
SB	Senate Bill
SLA	Special Landscape Area
State	State of California
State Water Board	State Water Resources Control Board
UWUO	urban water use objective
UWUO_SB	urban water use objective without any variances
WC	California Water Code
WELO	Water Efficient Landscape Ordinance
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 the purpose and details of review and development, and the recommendations for a variance for "significant use of water for commercial or noncommercial agricultural use," consistent with the directives under California Water Code (WC) Section 10609.14.

WC Section 10609.14 directs the California Department of Water Resources (DWR), in coordination with the State Water Resources Control Board (State Water Board), to conduct necessary studies to recommend appropriate variances for unique uses of water that could have a material effect on an urban retail water supplier's urban water use objective (UWUO). A variance for "significant use of water for commercial or noncommercial agricultural use" is one of the eight potential variances identified in the legislation. For each variance, the recommendations include a threshold of significance and guidelines and methodologies for calculating efficient water use allowable under the variance.

DWR conducted topic-specific research and investigations to answer three critical questions prior to developing recommendations for a variance for significant use of water for commercial or noncommercial agricultural use:

1. Is this water use outside of the scope of the UWUO? In other words, is this water for non-urban use or part of the commercial, industrial, and institutional water uses other than irrigating landscape with dedicated irrigation meters? If so, the water use is either not subject to the provisions of urban water use efficiency in the 2018 Legislation or excluded from the UWUO and, thus, there is no need for a variance.

2. Is this water use unique within the context of the UWUO? If no, it is not eligible. If yes, the water use is potentially eligible for a variance, and the following two questions need to be answered "yes" to be determined eligible:

    a. Is this water use shared by only some urban retail water suppliers or needed in unusual circumstances, but not commonly used enough to be included in one of the standards?

    b. Is this water use excluded from all urban water use efficiency standards and other variances?

3. Could this unique water use have a material effect on the UWUO of some urban retail water suppliers? If so, the water use is warranted for variance development.

After confirming the above in collaboration with stakeholders and the State Water Board, DWR proceeded with variance development with a clarified scope, whereby significant use of water for commercial or noncommercial agricultural use can be appropriately estimated and incorporated in an urban retail water supplier's UWUO.

Consistent with the legislative directive, DWR used a public process involving a diverse group of stakeholders in the review and development of the variance for significant use of water for commercial or noncommercial agricultural use. 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 variance development process. Additional stakeholders included State of California agencies, cities, counties, urban retail water suppliers, environmental organizations, and other interested parties. Working group members and stakeholders were provided with many opportunities to comment on and inform the appropriateness of recommending a variance for significant use of water for commercial or noncommercial agricultural use. Additionally, they were able to comment on, and inform the development and refinements for, the applicable scope, specifications, and methodologies for estimating the efficient water use volume for such a purpose. The resource requirements for administering the variance and associated supporting data requirements, accessibility, and quality were considered in the evaluation.

Through investigation of available data and stakeholder input, DWR has concluded that establishing a variance to accommodate the efficient water use for "significant use of water for commercial or noncommercial agricultural use" is appropriate as that water use is unique, excluded from other standards and variances, and can have a material effect on an urban retail water supplier's UWUO. In this recommended variance, DWR focused on addressing use of water for agricultural use within residential parcels that are excluded from the Outdoor Residential Water Use Efficiency Standard. DWR also provided additional considerations and guidance for certain situations, such as use of water for community gardens and other similar food production purposes that should be covered under *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* (WUES-DWR-2021-03). Implementation considerations, including the need for technical assistance, are included with the recommendations.

The recommendations for a variance for significant use of water for commercial or noncommercial agricultural use is 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 for adoption.

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1.0 Introduction

Senate Bill (SB) 606 (Hertzberg) and Assembly Bill 1668 (Friedman) of 2018, as amended (hereinafter referred to as the "2018 Legislation"), established a new foundation for long-term improvements in water conservation and drought planning to adapt to climate change and the resulting longer and more intense droughts in the State of California (State). These two bills provide expanded and new authorities and requirements to enable permanent changes and actions for those purposes, thereby improving the State's water future for generations to come. Details of these provisions are summarized in *Making Water Conservation a California Way of Life: Primer of 2018 Legislation on Water Conservation and Drought Planning, Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman)* (DWR and State Water Board, 2018).

1.1 New Approach to Urban Water Use Efficiency

Among other things, the 2018 Legislation contains provisions for advancing urban water use efficiency through developing and implementing various water use efficiency standards, variances, and performance measures per California Water Code (WC) Section 10609. The new water conservation framework is different than SB X7-7, which was established in 2009. The focus of SB X7-7 was to reduce statewide urban water use by 20 percent in 2020 compared to baseline calculated in 2010. The 2018 Legislation requires a bottom-up estimate from urban retail water suppliers of the urban water use objective (UWUO) based on the aggregated efficient water use volume by considering four urban water use efficiency standards and appropriate variances. The four standards are:

- Indoor Residential Water Use Efficiency Standard (IRWUS).
- Outdoor Residential Water Use Efficiency Standard (ORWUS).
- Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard (CII-DIMWUS).
- Water Loss Standard (WLS).

Commercial, industrial, and institutional (CII) water use not associated with dedicated irrigation meters (DIM) (or equivalent technologies) for outdoor irrigation of landscape areas is excluded from the UWUO.

Each of the procedural requirements to formalize these four standards for implementation is different. The 2018 Legislation includes a default progressively reduced IRWUS (WC Section 10609.4(a)). In November 2021, in collaboration with the

State Water Resources Control Board (State Water Board), the California Department of Water Resources (DWR) submitted the joint recommendations for IRWUS to the California State Legislature for further consideration per WC Section 10609.4(b). Separately, the State Water Board is currently conducting a rulemaking process to adopt the proposed WLS, which was originally authorized by SB 555 of 2015. For ORWUS and CII-DIMWUS, 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 (WC Sections 10609.6 and 10609.8).

Another major difference between the SB X7-7 requirements and those of the 2018 Legislation is that the anticipated outcome was measured on a statewide level per SB X7-7 and on an individual urban retail water supplier level per the 2018 Legislation. Recognizing the diversity of water use to support local economic, social, and environmental needs and varying climate conditions in the State, the 2018 Legislation requires DWR, in coordination with the State Water Board, to conduct necessary studies and investigations. It also requires DWR to develop recommendations for adoption by 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 and 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.

As a supporting recommendation, the 2018 Legislation requires DWR to develop accompanying guidelines and methodologies for calculating the UWUO (WC Section 10609.16) and provide the recommendation to the State Water Board for adoption, along with DWR's recommendations on ORWUS, CII-DIMWUS, and appropriate variances by June 30, 2022 (WC Section 10609.2). The 2018 Legislation further requires DWR and the State Water Board to solicit broad public participation throughout the development and adoption processes (WC Section 10609(b)(3)).

1.2 Appropriate Variances

Per the 2018 Legislation, appropriate variances **may include, but are not limited to,** the following eight identified in WC Section 10609.14(b):

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.

The eight identified potential variances were subject to further review to affirm the unique use and the likelihood of a material effect on an urban retail water supplier's UWUO before DWR engaged in additional efforts in variance development. Through stakeholder engagement, additional potential variances could also be identified. Additional potential variances may emerge in the future due to changes in water use to meet economic, social, and environmental needs.

When a recommended variance is adopted by the State Water Board, the variance becomes available to urban retail water suppliers. However, before a variance can be included in an urban retail water supplier's UWUO, the urban retail water supplier is required to request, with supporting data, and receive approval from the State Water Board (WC Section 10609.14(d)). This procedural requirement is urban retail water supplier–specific and variance-specific. The State Water Board is required to post on its website a list of approved variances, the specific variances approved for each urban retail water supplier, and the data requirement supporting the approval of each variance for individual urban retail water suppliers (WC Section 10609.14(e)).

1.3 Purpose of the Report

Per legislative requirements, DWR conducted studies and investigations to determine if the legislatively identified potential variances and others suggested by stakeholders should be developed and recommended for adoption. This report is one of the variance-specific reports that focuses on the potential variance for "significant use of water for commercial or noncommercial agricultural use" identified in the legislation.

Water Use for Commercial or Noncommercial Agricultural Use

There is an increasing trend in development of urban agriculture and community gardens in residential and CII parcels for both commercial and noncommercial agricultural use. Some examples include residential personal hobby farms, small residential family farms, and residential or CII community gardens that are used for food production. The increasing trend is specifically important for rural communities with abundance of large residential parcels that are used for food production for their personal use or limited distribution. However, they also have landscape areas like other

residential parcels, which are governed under ORWUS. Therefore, a properly defined scope and calculation methodology for this water use is critically important for the considerations of this potential variance.

Relationship to California Department of Water Resources' Urban Water Use Efficiency Recommendation Package

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 interrelationship 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. All reports in this Recommendation Package are given a serial number in the form of "WUES-DWR-2021-xx." For each report, Appendix A includes the list of documents within the Recommendation Package that are incorporated by reference.

Specifically, this 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), provides the detailed documentation for the review and subsequent variance development for specifications, guidelines, and methodologies for the potential variance for significant use of water for commercial or noncommercial agricultural use. The recommendations for this variance were summarized in the report, *Summary of Recommendations for Variances* (WUES-DWR-2021-04), and the corresponding guidelines and methodologies for calculating efficient water use for this variance were summarized in *Recommendations for Guidelines and Methodologies for Calculating Urban Water Use Objective* (WUES-DWR-2021-01B). The additional context, variance development process and approach, evaluation of options, and stakeholder input included in this document are incorporated by reference. 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).

Effects on Existing Law and Regulations

DWR developed this variance per legislative directive. The resulting variance, when adopted, does not set, rescind, or modify existing or future requirements for commercial or noncommercial agricultural activities on residential parcels or areas associated with urban community gardens.

1.4 Report Organization

This report is organized into six sections:

- **Section 1 – Introduction** provides the background and purpose of this document.
- **Section 2 – Scope Definition** provides the process and rationales used in confirming the scope for this potential variance that reflects unique water use with potential material effects on an urban retail water supplier's UWUO.
- **Section 3 – Approach to Variance Design** describes the technical approach and stakeholder engagement that DWR conducted to support the variance development. Options for different coverages and methods for calculating efficient water use for this variance are discussed and evaluated for technical feasibility, reasonableness, and ability to be implemented.
- **Section 4 – Recommendations** provides DWR's recommendations on this variance, including the specifications, guidelines, and methodologies for calculating efficient water use for this variance and the supporting data and information requirements.
- **Section 5 – Glossary** provides a list of key terms and their definitions used in this document.
- **Section 6 – References** provides a list of references used in this document.

This report includes two appendices:

- **Appendix A** provides the list of documents in DWR's Recommendation Package that are incorporated by reference.
- **Appendix B** provides a template for calculating the efficient water use for commercial or noncommercial agricultural use. This template is provided for illustrative purposes and is subject to revision after the State Water Board's adoption.

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2.0 Scope Definition

In accordance with the legislative directive, DWR conducted studies and investigation to develop the information necessary to determine if a variance for significant use of water for commercial or noncommercial agricultural use was needed and, if so, to support any recommendation made to the State Water Board on the guidelines and methodologies pertaining to the calculation of an urban retail water supplier's UWUO.

The goals of these studies and investigation were to achieve the following:

- Confirm whether significant use of water for commercial or noncommercial agricultural use is a unique use that could have a material effect on the UWUO of urban retail water suppliers.
- Inform the recommendations for variance specifications, including the threshold of significance.
- Provide the basis for developing guidelines and methodologies for urban retail water suppliers to use in calculating the aggregated efficient water use allowable under this variance.

The first study goal provided a clarified scope for variance development, which was to be accomplished by addressing the remaining two study goals. The process and findings for scope definition are provided in Section 2. Section 3 contains additional variance development and option evaluation to inform the recommendations in Section 4.

2.1 Interpretation of Commercial or Noncommercial Agricultural Use of Water

As previously mentioned, the agricultural water use considered under this particular variance is not related to large-scale commercial food production on nonresidential lands. The agricultural water use considered under this variance would apply to fruit and vegetable growing on residential property and pasture for livestock that live on the property. This water use is neither included in the Variance for Significant Populations of Horses and Other Livestock (see *Recommendations for Variance for Significant Populations of Horses and Other Livestock, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-07]) nor in ORWUS (see *Recommendations for Outdoor Residential Water Use Efficiency Standard* [WUES-DWR-2021-02]). The legislative directive pertains to water use for commercial or noncommercial agricultural purposes that may be included in the urban retail water supplier's UWUO. Therefore, significant commercial or noncommercial agricultural water use applies only to urban residential or CII parcels.

In this context, commercial agricultural use of water on residential parcels refers to food production with commercial purposes, such as what is produced at small farms and offered in farmer's markets. Noncommercial agricultural use of water on residential parcels refers to growing products with noncommercial intentions, such as growing food intended only for personal use, but which occurs on a large scale in some areas that may require significant water use.

While there are various situations in which water is used for food production in residential or CII lands, some of them are already covered under the available water use efficiency standards, including CII-DIMWUS or ORWUS. Within residential parcels, unless the water use is seperately metered, it is part of residential water use that may have been excluded from the considerations under ORWUS. In these cases, it is sound to include a variance to take into account the agricultural use of water in residential areas that is not included in ORWUS.

2.2 Process for Scope Refinement

In the context of the 2018 Legislation, the four water use efficiency standards cover types of water use commonly shared by most, if not all, urban retail water suppliers. The variances are effectively the less common uses that may be important for only some urban retail water suppliers due to geographic location, local climate, and other local conditions. In concept, the scopes of standards and those of variances are mutually exclusive. However, local water use, facility connection, and account management can be complex due to years of development and implementation of practices without the structure suggested in the 2018 Legislation. Therefore, DWR needed to examine different scenarios associated with water use for commercial or noncommercial agricultural use against three questions in sequence prior to developing variance recommendations:

1. Is this water use out of the scope for the UWUO? In other words, is this water for non-urban use or part of the CII water uses other than irrigating landscape with DIMs? If so, the water use is either not subject to the provisions of urban water use efficiency in the 2018 Legislation or excluded from the UWUO and, thus, there is no need for a variance.

2. Is this water use unique in the context of the UWUO? If no, it is not eligible. If yes, the water use is potentially eligible for a variance, and the following two questions need to be answered "yes" to be determined eligible:

    a. Is this water use shared by only some urban retail water suppliers or needed in unusual circumstances, but not commonly used enough to be included in one of the standards?

   b. Is this water use excluded from all urban water use efficiency standards and other variances?

3. Could this unique water use have a material effect on the UWUO of some urban retail water suppliers? If so, the water use is warranted for variance development.

The following summarizes the results of the above process of elimination for clarifying the scope of the variance.

Unique Use

The unique use for variance consideration was established by addressing the first two questions listed above.

In April 2021, DWR conducted a survey regarding potential concerns over significant water use for commercial or noncommercial agricultural use. The survey was completed by 68 urban retail water suppliers in the State. About 28 percent of the participants mentioned that agricultural use of water within residential parcels might be significant for their utilities. Urban retail water suppliers located in Sacramento River, South Lahontan, Central Coast, and Colorado River regions expected that this specific use would be more than 15 percent of their total water use. The results of this survey suggested that this water use could be considered as a variance due to its use by only some urban retail water suppliers.

DWR examined multiple scenarios in determining the status of a unique water use, as summarized below. Note that for the purpose of this variance, residential and CII parcels mean that property parcels have a residential or CII land use designation, respectively, under the governing general plans of counties and cities. Also, the conditions described below illustrate the filtering process for variance applicability. In practice, an urban retail water supplier would need to assess its actual conditions for variance applicability.

- Conditions that are categorically excluded from variance considerations due to the exclusion of the water use from the UWUO:
  - Water use in areas with agricultural land use designations is not within the UWUO considerations.
  - Urban retail water suppliers may consider installing a separate agricultural meter for water use for commercial or noncommercial agricultural use, even if the areas are within residential parcels. If a separate agricultural meter is used, the resulting water use is excluded from the UWUO calculation.

- Conditions that are within the scope of UWUO, but are categorically excluded from variance considerations because they are covered by standards or other variances:

  - Agricultural water use on residential parcels that are supplied with DIMs should be reported under CII-DIMWUS as a Special Landscape Area (SLA) (see *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03]). Therefore, the variance is not needed.

  - Agricultural use of water on residential parcels that are excluded from Outdoor Residential Landscape Area Measurement (OR_LAM) and supplied from a recycled water source should be reported under CII-DIMWUS to receive the considerations for SLAs (see *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03]). Therefore, the variance is not needed.

  - Agricultural water use on residential parcels that are included in OR_LAM and are not supplied from a recycled water source is included under ORWUS considerations (see *Recommendations for Outdoor Residential Water Use Efficiency Standard* [WUES-DWR-2021-02]). If the water is supplied from a recycled water source, the use shall be reported under CII-DIMWUS to use the SLA provisions for the UWUO accounting purposes (see *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03]). In either case, the water use is covered under current standards, there is no need for additional water allowance, and a variance is not needed.

  - Water use in community gardens on public, commercial, or residential lands served by commercial, industrial, institutional dedicated irrigation meters (CII-DIM) is included in the recommended CII-DIMWUS as an SLA for growing food and edible plants (see *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03]). If the community garden is irrigated by a private residential meter on an uninhabited parcel, the residential meter may be reclassified to a CII-DIM in order to use the SLA provision under CII-DIMWUS. Based on research, using a dedicated meter for a community garden, even if it is located on residential land, is a preferred method among the urban retail water suppliers. Note that if the community garden is irrigated by CII mixed-use meter accounts, the water use is excluded from the UWUO calculation. This CII water use is

subject to CII water use performance measures as separately recommended by DWR (see *Recommendations for Performance Measures for Commercial, Industrial, and Institutional Water Use* [WUES-DWR-2021-15]). Therefore, the variance does not apply to water use in community gardens on public, commercial, or residential lands.

- Conditions where water use is within the scope of UWUO:
  - Water use for variance for commercial or noncommercial agricultural use is not relevant to IRWUS, CII-DIMWUS, or WLS, but could occur in the context of ORWUS. It is also not relevant to other variances under consideration.
  - Water use on residential parcels by residents for fruit and vegetable growing and pasture for livestock that also live on the property is neither included in the Variance for Significant Populations of Horses and Other Livestock (see *Recommendations for Variance for Significant Populations of Horses and Other Livestock, Methods of Calculation, and Supporting Data Requirements* [WUES-DWR-2021-07]) nor in ORWUS (see *Recommendations for Outdoor Residential Water Use Efficiency Standard* [WUES-DWR-2021-02]). Therefore, this water use is potentially allowable under a variance.
  - On residential parcels irrigated with a residential meter, non-landscape irrigated areas for commercial or noncommercial agriculture that are excluded from OR_LAM and therefore excluded from ORWUS may be allowed under a variance. ORWUS covers all landscape areas on residential parcels regardless of size. Irrigated lands with landscape area less than 1 acre of agricultural area are covered under ORWUS (see *Recommendations for Outdoor Residential Water Use Efficiency Standard* [WUES-DWR-2021-02]). Therefore, the water use is potentially allowable under a variance.

In the above analyses, the unique use of water for commercial or noncommercial agricultural use on residential parcels was confirmed. Therefore, it was reasonable for DWR to proceed with the evaluation of the potential for a material effect on urban retail water suppliers' UWUO.

Potential for a Material Effect

The best available data to assess the extent of this water use throughout the State was the information from DWR's OR_LAM (see *Technical Report: Outdoor Residential Landscape Area Measurement* [WUES-DWR-2021-02.T1]). DWR used the OR_LAM data to formulate ORWUS; irrigated residential agricultural areas greater than 1 acre are excluded from ORWUS. The OR_LAM includes data for a total of 399 urban retail water suppliers (i.e., all the urban retail water suppliers subject to the provisions of urban water use efficiency under the 2018 Legislation).

Analysis of the Agricultural Land Mask of the OR_LAM (OR_LAM_Ag Mask) data suggested that areas where residential properties include a large agricultural component are not uniformly distributed in the State; they are clustered in locations such as northern California in the Sierra Nevada foothill area, and southern California outside the metropolitan area. Figure 2-1 shows the percentage of land within urban retail water suppliers' service areas that are classified under the OR_LAM_Ag Mask. Overall, nearly 62,000 acres of urban agriculture has been identified in the DWR OR_LAM_Ag Mask dataset. The results suggest that agricultural water use within residential parcels could have a material effect on the UWUO of the urban retail water suppliers with large, irrigated agricultural areas in residential parcels. Figure 2-2 provides additional insights on distribution of the associated percentages in each hydrologic region.

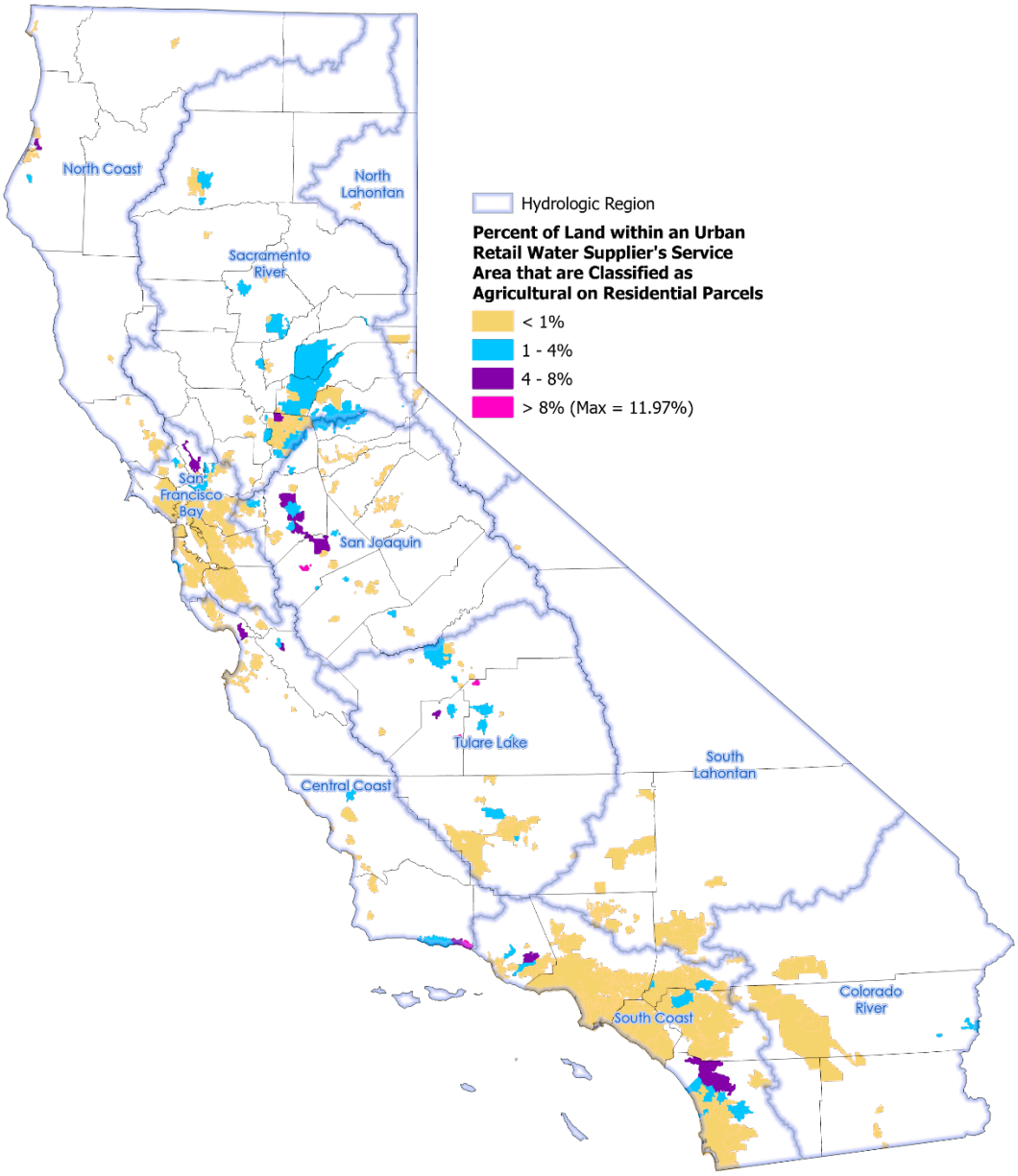
Even if there is no expansion of agricultural water use within residential parcels in the future, water requirements for crop growth and production could exceed water use allowable under ORWUS, depending on the type and quantity of crop(s) grown. Additionally, this use may be continued into the future because of changes in preferrable quality of life.

Although there are potential limitations related to the best available data, DWR confirmed that there are reasons to believe that water use for commercial or noncommercial agricultural use on residential parcels could have a material effect on the UWUO of some urban retail water suppliers and, thus, a variance is warranted.

2.3 Clarified Scope for Variance Development

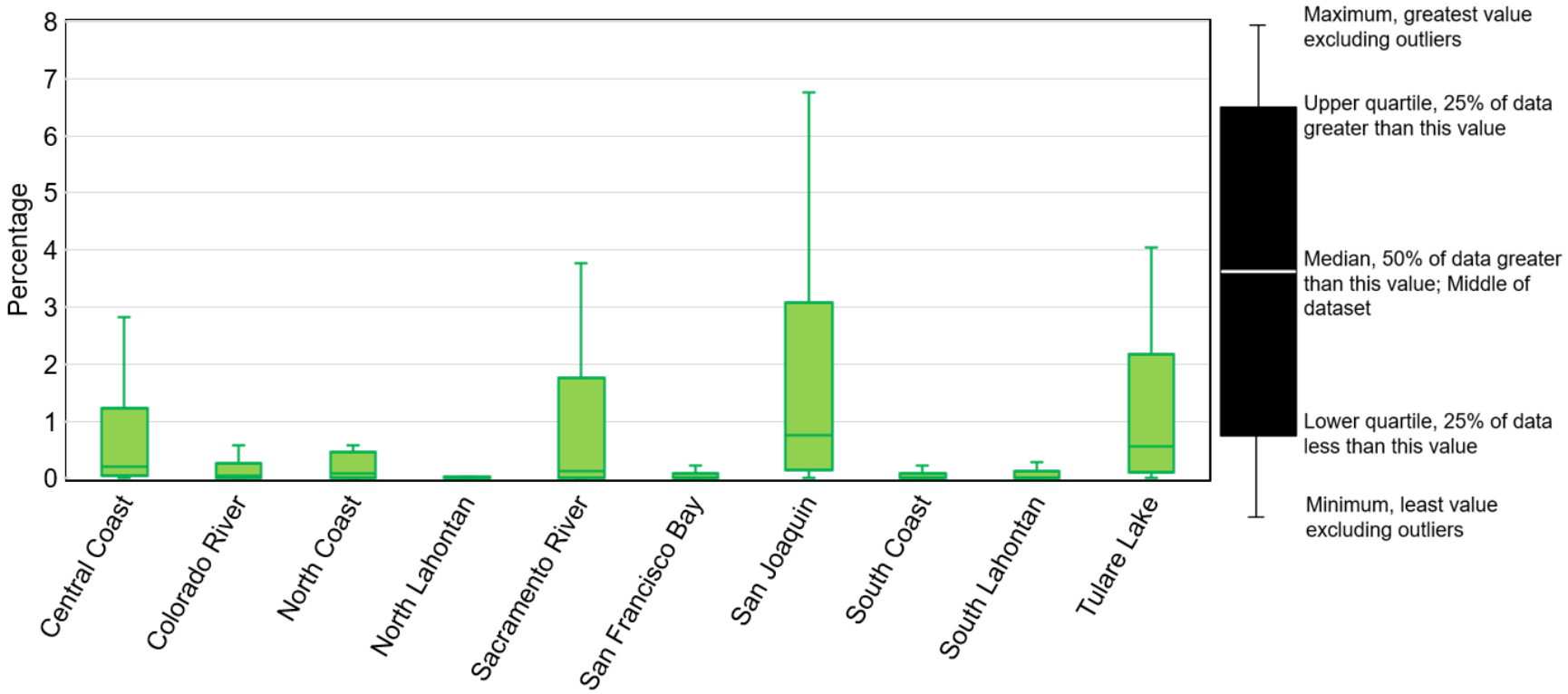
Based on the analysis, the variance for use of water for commercial or noncommercial agricultural use is limited to irrigation water use in areas with residential land use designations that are excluded from ORWUS through exclusion from the OR_LAM. Note that ORWUS covers all landscape areas on residential parcels regardless of size as well as irrigated agricultural areas less than 1 acre. Therefore, the resulting variance for use of water for commercial or noncommercial agricultural use within residential parcels would be against ORWUS.

As mentioned previously, agricultural water use within residential parcels that are supplied with DIMs or from a recycled water source is not allowed for this variance and that water use should be reported under CII-DIMWUS. Similarly, for community gardens, when used for an uninhabited residential parcel, even if they are within residential lands, the urban retail water suppliers should consider the meter a DIM and the water use should be reported under CII-DIMWUS to make use of the SLA. Therefore, the variance is not allowed.



Source of Data for 399 urban retail water suppliers: California Department of Water Resources, Landscape Area Measurements. See Technical Report: Outdoor Residential Landscape Area Measurement (WUES-DWR-2021-02.T1).

Figure 2-1 Agricultural Land Mask of the California Department of Water Resources' 2018 Outdoor Residential Landscape Area Measurement on Residential Parcels Within Individual Urban Retail Water Supplier's Service Area (by percentage)



Source of Data for 399 urban retail water suppliers: California Department of Water Resources, Landscape Area Measurements. See Technical Report: Outdoor Residential Landscape Area Measurement (WUES-DWR-2021-02.T1).

Figure 2-2 Agricultural Land Mask of the California Department of Water Resources' 2018 Outdoor Residential Landscape Area Measurement on Residential Parcels by Hydrologic Region (by percentage of Urban Retail Water Supplier's Service Area)

3.0 Approach to Variance Design

DWR's approach to variance design was an iterative process in collaboration with stakeholders and the State Water Board to assist DWR in refining options, associated specifications, and data needs. Taking into consideration findings from the studies, research, and input and feedback from the collaborative process, DWR formulated the recommendations.

3.1 Stakeholder Process

Consistent with the legislative directive, DWR used a public process involving diverse stakeholders in the review and development of the variance for significant use of water for commercial or noncommercial agricultural use. The stakeholder process was part of the larger engagement process to implement the provisions of urban water use efficiency in the 2018 Legislation (see *Stakeholder Outreach Summary for Developing Urban Water Use Efficiency Standards, Variances, and Performance Measures* [WUES-DWR-2021-20]). More focused stakeholder engagements specifically for variances started in November 2020, with periodic meetings and workshops held through early 2022.

DWR established two working groups to assist in implementing the 2018 Legislation, and these groups formed the base of the stakeholder involvement process that included State agencies, cities, counties, urban retail water suppliers, environmental organizations, professionals, and other stakeholders and interested parties. The Water Use Studies Working Group was established in July 2019 to inform DWR in developing water use studies for setting up standards, variances, and performance measures. Concurrently, the Standards, Methods, and Performance Measures Working Group was also established to provide input to DWR on developing the structure and specifications of water use efficiency standards, variances, methodologies, and performance measures. However, due to the close relationship between research and variance design, members of both working groups were invited to participate in the same stakeholder meetings and workshops. DWR also opened the working group meetings to the public to allow for broader participation in and input from other stakeholders, interested parties, and individuals.

Working group members and other participants had ample opportunities to learn about the variance design process and provide feedback on the appropriateness of this specific variance being developed and the scope, specifications, and methodologies for estimating efficient water use. They provided input on variance implementation, such as resource needs (staff), supporting data requirements, and accessibility considerations.

DWR also conducted and responded to requests for additional meetings and public outreach and engagement activities with both individuals and groups of stakeholders to

learn from their experiences, understand their specific concerns, and receive other feedback. For this variance, there were no specific studies using data from urban retail water suppliers.

3.2 Considerations for Variance Design

As stated in Section 2.3, the clarified scope for the variance for commercial or noncommercial agricultural water use is limited to use on lands with residential land use designations that are excluded from ORWUS. The resulting variance would be against ORWUS. DWR proceeded with variance development after confirming this clarified scope with stakeholders and working group members.

In variance design, DWR needed to determine what would constitute water use efficiency for commercial or noncommercial agricultural use, what level of estimated water use (i.e., significance threshold) should be achieved before an urban retail water supplier could claim the variance in its UWUO, and how to calculate the efficient water use under the variance with credible data and supporting information. Based on the research and stakeholder input, DWR considered the following factors.

- The variance focuses on outdoor water use on residential parcels for agricultural use that is not included in ORWUS.
- DWR considered that if the exclusion criteria in ORWUS change, the variance criteria will also change. Hence, reconciliation of coverage under ORWUS is necessary to establish this variance (see *Recommendations for Outdoor Residential Water Use Efficiency Standard* [WUES-DWR-2021-02]). The reconciliation must consider the following:
  - If the irrigated residential agricultural area is less than 1 acre, all agricultural area is included in ORWUS, along with all identified landscape area. A variance is not needed.
  - If the irrigated residential agricultural area is greater than 1 acre, the area greater than 1 acre is excluded from ORWUS and a variance may be applicable.
- To be consistent with ORWUS, Model Water Efficient Landscape Ordinance (MWELO) principles should be considered to design this variance.
- Water use for commercial or noncommercial agricultural use on residential parcles should follow the agronomic principles in terms of defining water requirements.
- The scale of agricultural production on residential parcels is limited, even if it is meant to use water for food production with commercial purposes. Therefore,

precision of available data that are required to estimate the variance water use may not be comparable to large-scale agricultural use of water for commercial food production on lands with agricultural or CII land use designations.

- DWR recognized that limited data availability may impede the ability of urban retail water suppliers to obtain an accurate water use estimation for this variance. Therefore, estimation of crop water requirements need to accommodate the potential lack of information for the intended calculations. Accordingly, some levels of approximation and simplifications are needed.
  - Crop types in residential agriculture is decided per personal preference and may change on a regular basis. It would be cumbersome for the urban retail water suppliers to obtain these parcel-specific data.
- Part of the variance design is to determine the threshold of significance, which sets the minimum level of use by any urban retail water supplier for claiming the variance. DWR recognized that different urban retail water suppliers may have access to different levels of details and data resolutions. Therefore, the urban retail water suppliers should not be penalized for not having access to detailed data. Accordingly, DWR considered that different thresholds of significance may be needed to account for the ability of urban retail water suppliers to calculate efficient water use with different levels of data resolution.
- DWR considered that the agricultural use of water on residential parcels should be determined only for the duration of growing season. In this context, “growing season” refers to the part of the year during which climate conditions allow plants to grow.
  - Residential agriculture does not involve a highly complex and well-recorded process that is seen in the large agricultural operations in nonresidential parcels. DWR recognized that a different approach may be needed to determine the agricultural water use in residential parcels where landowners choose to grow multiple crops, double crop, or other similar crops that will grow on a year-round basis.
- DWR recognized that specific data are needed in order to follow the agronomic principles for the calculation of water use for this variance. Many urban retail water suppliers expressed concerns over the potential burden and costs to pursue a variance in addition to compliance with many other requirements under the provisions of urban water use efficiency in the 2018 Legislation. Therefore, DWR considered the following to be reasonable:
  - The methodology for calculating aggregated water use under this variance should, to the extent reasonable, stay consistent with existing water use

efficiency laws and regulations or build on existing methodologies used by urban retail water suppliers in SB X7-7 compliance.

- The data and information required to support a variance and the calculated amount need to be credible, reasonably accessible to urban retail water suppliers or reasonably obtainable by urban retail water suppliers, or separately provided by DWR to the extent possible.
- Necessary technical assistance from DWR related to implementation should also be incorporated into the variance development process.

3.3 Variance Options

Based on the discussed principles, the variance options were designed using precise data that the urban retail water suppliers would rely on to calculate their water use for commercial or noncommercial agricultural use on residential parcels. The agricultural food production on residential parcels is operated on a limited scale compared to commercial food production on lands with commercial or agricultural land use designations. Therefore, most of the necessary details to calculate the water use are not readily available to the urban retail water suppliers. A “standard option” with a more generalized approach was designed for situations with different levels of data gaps. On the contrary, a “detailed option” was used for situations in which all the required details to estimate efficient water use would be available to the urban retail water suppliers.

Following these approaches, DWR developed three options for calculating efficient water use under this variance and discussed all options with stakeholders in working group meetings on May 13 and July 21, 2021.

The purposes of designing different options with various considerations were to explore pros and cons for different settings and solicit input from stakeholders regarding their corresponding reasonableness and ability to implement those options. Based on the resulting findings and insights, DWR then developed the recommendations (Section 4).

Options for Different Data Availability Scenarios

Three options were developed for considering different data availability scenarios that were discussed in working group meetings on May 13 and July 21, 2021.

- **Option 1 – Using Statewide Average Information to Estimate the Variance Water Use**. This option used a statewide average information to calculate the variance water use. Since data are representative of average conditions in the State, the estimated water use from this option could be a good estimate of total water for agricultural use on residential parcels across the State. However, this option could result in an unfair distribution of allowable water for the urban retail water suppliers that have crops with higher water requirements than the average

conditions. Additionally, statewide averages may not as accurately reflect individual service area conditions. Therefore, the threshold of significance was set at 10 percent of total aggregated efficient water use volume based on the four standards. Supporting data to calculate the efficient water use would be provided by DWR. The urban retail water suppliers should obtain the total attributable commercial or noncommercial agricultural land area based on the OR_LAM_Ag Mask. Submission of all the documentation and supporting data would be required to support the variance water use calculations.

- **Option 2 – Using Aggregate Urban Retail Water Supplier–Specific Information to Estimate the Variance Water Use**. Calculations for this option were based on the average conditions for the specific urban retail water supplier's service area. Unless there is a high variability in the crop types and irrigation efficiency across its service area, which is highly unlikely, using an aggregate service area crop coefficient and aggregate irrigation efficiency result in a lower margin of error in estimation of crop water requirements. Therefore, the threshold of significance was set at 5 percent of total aggregated efficient water use volume based on the four standards. This threshold is lower than Option 1 due to lower margin of error associated with using higher resolution data. Required data for the calculations would be provided by DWR. Submission of all the documentation and supporting data would be required to support the variance water use calculations.

- **Option 3 – Using Urban Retail Water Supplier–Specific Information per Crop to Estimate the Variance Water Use**. This option incorporated the ultimate accuracy in using data per crop on a specific urban retail water supplier's service area. In this case, different service area crop types and irrigation efficiencies per crop on a parcel level were taken into consideration for the calculation of water use. Therefore, this option could be considered the most accurate option among the three and correspondingly received the lowest threshold of significance; the threshold of significance was set at 3 percent of total aggregated efficient water use volume based on the four standards. Crop types and irrigated land per crop would be obtained from customers by the urban retail water suppliers, and DWR would provide other required information based on customers' data. Submission of all the documentation and supporting data would be required to support the variance water use calculations.

The working group members and stakeholders agreed that they preferred Option 2, as it could provide a closer, reality-based estimation of water use under this variance and accommoate local conditions better than Option 1. They recognized the difference between using the statewide average data and urban retail water supplier–specific data. The stakeholders believed that Option 3, while the most specific and accurate, would also be the most difficult to use, time consuming, and labor intensive. Data gathering

was mentioned as one of the biggest challenges to use Option 3. One example presented for this challenge was in nurseries where the crops are constantly changing. In addition, participants voiced privacy concerns as to how this information may be obtained and used. However, stakeholders highly appreciated the intent of providing an accurate estimation of water use using more detailed data and expressed that they would use it in future when they have reporting systems in place to compile more detailed data from customers. In terms of the differences between the significance thresholds in Options 1 and 2, the stakeholders felt it was adequate and that the associated values were conceptually fair, but hard to assess without actual data. As a result, some suggested the variance include recommendations to reassess the significance threshold after the first year of implementation.

Common Methodologies for Options

Regardless of the approach to calculating water use under this variance, there are common methodologies to be followed based on the considerations that were discussed previously in Section 3.2.

- **Inclusion Criteria**. Variance for water use for commercial or noncommercial agricultural use is only applicable when total irrigated residential agricultural area is greater than 1 acre. The calculation should focus on total irrigated agriculture area minus the area that is covered under ORWUS.

- **Overall Footprint for Commercial or Noncommercial Water Use**. DWR provided OR_LAM_Ag Mask to urban retail water suppliers to determine total attributable commercial or noncommercial agricultural area on residential parcels. The urban retail water suppliers should use updated, DWR-provided information as applicable. Note that some urban retail water suppliers may need further details about crop water use within this footprint.

- **Following MWELO Principle**. As explained further below, MWELO principles should be followed in all options to estimate the variance water use regardless of data resolution.

- **Following Agronomic Principles**. Agronomic principles should be followed to determine crop water requirements based on the evapotranspiration factor and irrigation efficiency.

Options for Calculating Efficient Water Use

DWR considered that the MWELO is an existing State regulation (California Code of Regulations [CCR], Title 23, Sections 490 through 495) providing a good foundational basis for calculating efficient water use under this variance. The MWELO was last updated in 2015 to improve water use efficiency in existing, new, and rehabilitated landscapes. The MWELO is also referenced by Title 24, Part 11, CalGreen Building

Code. All local agencies must adopt, implement, and enforce the MWELO or a local Water Efficient Landscape Ordinance (WELO) that is at least as effective as the MWELO. Usually, local agencies adopt WELOs to create a more stringent ordinance than MWELO.

The MWELO relies on a quantitative approach to determine efficient water use by setting a maximum applied water allowance (MAWA) as an upper limit of water use that can be applied annually for an irrigated landscape (CCR, Title 23, Section 491(tt)).

$$MAWA = ETo \times 0.62 \times ETAF \times LA$$

where,

- *ETo* is the reference evapotranspiration in inches.
- 0.62 is a unit conversion factor in gallons per square feet.
- *ETAF* is the evapotranspiration factor in MWELO design standard (on parcel level) based on the plant factors and irrigation methods selected for individual landscapes.
- *LA* is the total landscape area in square feet.

If a local agency requires consideration of effective precipitation in its adopted WELO, the MAWA calculation should be adjusted accordingly below.

$$MAWA = (ETo - Peff) \times 0.62 \times ETAF \times LA$$

where,

- *Peff* is the effective precipitation in inches, which is 25 percent of the annual precipitation (CCR, Title 23, Section 494).

Landscape areas dedicated solely to edible plants, recreational areas, areas irrigated with recycled water, or water features using recycled water are defined as SLAs in MWELO (CCR, Title 23, Section 491(ttt)). These SLAs are allowed to use an *ETAF* of 1.0 in the MAWA calculation (CCR, Title 23, Section 491(s)).

It is worth noting that MWELO is a design standard, and thus the *ETAF* is applied on a parcel or landscape level. Consistent with ORWUS and CII-DIMWUS, *ETF* represents the service area evapotranspiration factor on an urban retail water supplier level.

DWR considers MWELO specifications as a solid building block for the methodology to calculate efficient water use under this variance. As previously mentioned, water use considered under this variance is for commercial or noncommercial agricultural use on

residential parcels that are similar to those included for edible plants under MWELO; although the source of water may not be limited to using recycled water for this variance. Regardless of sources of water, the physics governing the water needs of plants and the process of evapotranspiration of a plant remains the same.

Reference Evapotranspiration

ETo is the rate of evapotranspiration from a hypothetical reference crop with an assumed crop height of 0.12 meter (4.72 inches), a fixed surface resistance of 70 sec m^{-1} and an albedo of 0.23, closely resembling the evapotranspiration from an extensive surface of green grass of uniform height, actively growing, well-watered, and completely shading the ground (FAO, 1998). In the reference evapotranspiration definition, grass or alfalfa is grown as the reference crop. This reference crop is assumed to be free of water stress and diseases. In the literature, the terms “reference evapotranspiration” and “reference crop evapotranspiration” have been used interchangeably and they both represent the same evapotranspiration rate. DWR’s California Irrigation Management Information System stations use a grass reference crop.

Crop Water Requirement

The crop water requirement is the amount of water required to meet the evapotranspiration loss by a disease-free crop, growing in large fields, under non-restricting soil conditions. Although the values for crop evapotranspiration and crop water requirement are identical, crop water requirement typically is used to refer to the amount of water that needs to be supplied, while crop evapotranspiration typically refers to the amount of water that is used. Weather parameters, crop characteristics, and water management conditions, among many other factors, affect crop evapotranspiration.

The crop coefficient (*Kc*) is used to adjust the reference evapotranspiration for the seasonal and regional variations as well as crop characteristics, which is the ratio of actual crop evapotranspiration to *ETo* and is equivalent to the plant factor in MWELO.

Evapotranspiration Factor

Similar to the MWELO plant factor adjustment, *Kc* is divided by *irrigation efficiency* to account for irrigation system losses in determining the *ETF* in the MAWA equation above. As discussed above, all of the parameters vary seasonally. Therefore, to estimate the water use for this variance, which is designed for the service area–specific growing season, the corresponding parameters and efficient water use should be calculated for the duration of growing season. *ETo_gs, Kc_gs, and ETF_gs* represent reference evapotranspiration, crop coefficient, and the evapotranspiration factor for the duration of growing season, respectively.

Effective Precipitation

Effective precipitation is the amount of precipitation that is available for plant uptake and growth. It is what infiltrates and remains in the plant rootzone during and after a precipitation event. The irrigation water requirement should represent the difference between the crop water requirement (what needs to be supplied via irrigation) adjusted for irrigation system efficiency and effective precipitation (what is naturally available in the soil). As with the other seasonally dependent coefficients, effective precipitation is calculated only for the duration of growing season (*Peff_gs*) to estimate the efficient water use volume.

If a local agency requires consideration of effective precipitation for SLAs in its adopted WELO, the efficient water use volume for the variance for commercial or noncommercial agricultural use would be adjusted as follows.

$$\text{Crop Water Requirement} = 0.62 \times ETF\_gs \times (ETo\_gs - Peff\_gs) \times \text{Irrigated Land Area}$$

Growing Season Efficient Water Use Volume

Growing season efficient water use volume can be calculated using the MAWA framework:

$$\text{Efficient Water Use Volume} = ETo\_gs \times 0.62 \times ETF\_gs \times LA$$

where,

- *ETF_gs* equals *Kc_gs* divided by irrigation efficiency (*IE*).
- *LA* is the irrigated land area in square feet.

Options

DWR developed three options building on MWELO principles for calculating the efficient water use under this variance and discussed these options with stakeholders in working group meetings on May 13, 2021, and July 21, 2021.

- **Option 1: Generalized Approach Based on the Statewide Average Information**.

  Option 1 used a single growing season (e.g., July through October) based on the statewide average information for crop types and their growing seasons. This option also used a statewide average *ETo_gs* and *ETF_gs*. Statewide average *ETF_gs* is based on the statewide average crop coefficient during the average growing season for all urban retail water suppliers along with the statewide average *IE*:

ETF_gs = Average statewide *Kc_gs* / Average statewide *IE*

Under Option 1, the urban retail water suppliers' total water use would vary only based on the total irrigated agricultural land acreage in their service areas. The efficient water use in this option is calculated by:

Efficient Water Use Volume = 0.62 x (Average statewide *Kc_gs*)/(Average statewide *IE*) x Average statewide *ETo_gs* x Total Irrigated Ag Land Area

- **Option 2: Generalized Approach Based on Urban Retail Water Supplier–Specific Information on Urban Retail Water Supplier Level**.

  Option 2 included the urban retail water supplier–specific growing season based on the average regional growing season for all the available crops in their respective service areas. Compared to Option 1, Option 2 provided more details specific to agricultural operations in residential parcels in the urban retail water suppliers' service areas to use in the calculations. However, the data still represented average conditions on a service area level. The average *ETo_gs* of an urban retail water supplier's service area for an average growing season would also be used along with a service area *ETF_gs* based on the average *Kc_gs* and *IE* for the service area or region.

  ETF_gs = Service Area Average *Kc_gs* / Service Area Average *IE*

  Therefore, the efficient water use in Option 2 is calculated by:

  Efficient Water Use Volume = 0.62 x (Service Area Average *Kc_gs*)/(Service Area Average *IE*) x Service Area Average *ETo_gs* x Total Irrigated Ag Land Area

- **Option 3: Detailed Approach Based on Urban Retail Water Supplier–Specific Information and Detailed Crop Distribution**.

  Option 3 was the most detailed option and used the growing seasons, *Kc* and *IE*, for each different crop in the urban retail water supplier's service area, which was used to calculate the growing season *ETF* for each crop (*ETF_gsCrop*):

  ETF_gsCrop = *Kc_gsCrop* / Crop Type *IE*

  where,

  - *Kc_gsCrop* is crop coefficient per crop type during growing season.

This estimation of water use included higher levels of accuracy that accounted for the actual, rather than average, conditions on residential parcels in each service area. In this option, growing season is determined by urban retail water suppliers' local knowledge about type and duration of crop growing seasons. Total agricultural water use in an urban retail water supplier's service area is then the sum of water use by each crop on each parcel during the associated growing season for that crop. Reference evapotranspiration during each specific growing season per crop (*ETo_gsCrop*) is determined and efficient water use is calculated based on the crop-specific evapotranspiration factor during its growing season (*ETF_gsCrop*) and irrigated landscape area for each crop (*LA_Crop*):

Efficient Water Use Volume = Sum of (*ETo_gsCrop*) x 0.62 x (*ETF_gsCrop*) x *LA_Crop*

A summary of different options and sources of data for each option are provided in Table 3-1. Each option and important characteristics, including data requirements, data source, and threshold of significance, are shown in the table. This comparison was presented to the stakeholders during workshop held on July 21, 2021, and the feedback received is explained below.

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Table 3-1 Summary of the Three Options for Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use

Items	Option 1	Option 2	Option 3
Threshold of significance	More than 10 percent of the total aggregated efficient water use volume based on the four standards without variances.	More than 5 percent of the total aggregated efficient water use volume based on the four standards without variances.	More than 3 percent of the total aggregated efficient water use volume based on the four standards without variances.
Level of detail	Generalized approach based on **statewide average information**.	Generalized approach based on **urban retail water supplier–specific information**.	Detailed approach based on **local conditions and crop-specific specifications**.
Equation	Efficient Water Use Volume = 0.62 x (Average statewide *Kc_gs*)/(Average statewide *IE*) x Average statewide *ETo_gs* x Total Irrigated Ag Land Area	Efficient Water Use Volume = 0.62 x (Service Area Average Kc_gs)/(Service Area Average IE) x Service Area Average ETo_gs x Total Irrigated Ag Land Area	Efficient Water Use Volume = Sum of (*ETo_gsCrop*) x 0.62 x (*ETF_gsCrop*) x *LA_Crop*
Growing season	Statewide average growing season to be used by all urban retail water suppliers. In this case, a set growing season is assumed for all urban retail water suppliers (e.g., July, August, September, October). *Source of data*: DWR	Urban retail water supplier–specific growing season to be used by each urban retail water supplier. In this case, variable growing season is determined for various urban retail water suppliers based on their average crop information. *Source of data*: DWR	Urban retail water supplier–specific growing season per crop to be used by each urban retail water supplier for each crop. In this case, variable growing season per crop should be obtained by urban retail water suppliers. *Source of data*: To be developed by urban retail water suppliers.
Reference evapotranspiration coefficient for the duration of growing season (ETo_gs)	Statewide average reference evapotranspiration coefficients for the duration of growing season to be used by all urban retail water suppliers. *Source of data*: DWR	Urban retail water supplier–specific reference evapotranspiration coefficients for the duration of growing season to be used by each urban retail water supplier. *Source of data*: DWR	Urban retail water supplier– specific reference evapotranspiration coefficients for the duration of growing season per crop to be used by each urban retail water supplier. *Source of data*: DWR
Evapotranspiration factor for the duration of growing season	Average statewide *Kc_gs* / Average statewide *IE* *Kc_gs* = a **statewide** average value for all urban retail water suppliers for the duration of growing season. *Source of data*: DWR	Service Area Average *Kc_gs* / Service Area Average *IE* *Kc_gs* and *Service Area Average IE* = **urban retail water supplier–specific** average of values for crops and associated irrigation efficiencies in the service area for the duration of growing season. *Source of data*: DWR	*ETF_gsCrop* = *Kc_gsCrop* / Crop Type *IE* *Source(s) of data*: • Urban retail water supplier should obtain the crop type information from customers in residential parcels. • Crop coefficient for growing season is provided by local DWR offices or other references. • Irrigation efficiency information comes from local data (provided by the local DWR office based on crop type and local conditions).
Irrigated acreage on the urban retail water supplier level	*Source of data*: OR_LAM_Ag Mask is developed by DWR from a current effort.	*Source of data*: OR_LAM_Ag Mask is developed by DWR from a current effort. In the future, it may need to be developed by urban retail water suppliers.	*Source of data*: Urban retail water supplier should obtain the irrigated land per crop per crop from residential customers.

Key:
DWR = California Department of Water Resources
ETo_gsCrop = reference evapotranspiration per crop during growing season
IE = *irrigation efficiency*
ETFgs_Crop = evapotranspiration factor per crop during growing season
ETo_gs = reference evapotranspiration during growing season
Kc_gs = Crop coefficient during growing season
OR_LAM_Ag Mask = Outdoor Residential Land Area Measurements Agricultural Mask

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During the workshop, stakeholders agreed that Option 1 was the easiest option in terms of data collection and calculation. However, they acknowledged that this option was likely to overlook extreme cases, because it does not take into account the effect of different climates and growing seasons, which could be dramatically different across the State. Option 2 was selected by stakeholders as a feasible option with enough accuracy that would be easily implemented by the urban retail water suppliers. They suggested this option could be used for short-term implementation of the variance and later, when more detailed data are available, the urban retail water suppliers could use Option 3 to estimate their efficient water use under this variance.

The stakeholders agreed that the threshold of significance of 3 percent in Option 3 was higher than it should be, considering the level of effort and associated details in the calculation of water use in this option.

3.4 Summary of Findings

Based on research and input from working group members and stakeholders, DWR concluded that water use for commercial or noncommercial agricultural on residential parcels that is excluded from ORWUS should be recognized and provided a variance. Following MWELO principles, different options to accommodate different data accessibilities were designed to estimate the variance efficient water use. It was agreed that using the statewide average information does not result in a reasonable estimation of agricultural water use on the urban retail water supplier level. Due to lack of data, some flexibility and simplification in the calculation options are needed to support urban retail water suppliers with varied abilities and resources to access data and perform calculations. The threshold of significance of 5 percent was supported by stakeholders for use with the aggregate data on an urban retail water supplier level. However, the more detailed calculation should have a lower threshold of significance. Per discussion with stakeholders, a threshold of significance of 1 percent was considered reasonable for using the more complex and detailed option. Because implementation of the detailed approach is heavily dependent upon local information on agricultural operations within residential parcels in the service area, urban retail water suppliers would have the best knowledge for developing the required data for calculating the efficient water use volume.

DWR's CII-DIMWUS recommendation includes SLA for irrigation of edible plants on residential and CII parcels that are supplemented using CII-DIMs. This recommendation provides a reasonable accommodation for urban retail water suppliers to account for the water use of urban community gardens on public, CII, or residential lands served by DIMs. If an urban community garden is served water from a residential meter on an uninhabited parcel, DWR recommends reporting the water use of the residential meter under CII-DIMWUS to receive the provisions of an SLA. An urban retail water supplier can choose whether to re-classify the meter as a CII-DIM (see *Recommendations for*

Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard [WUES-DWR-2021-03]). There would be no additional accommodation for other conditions. The corresponding water use in these situations is not allowed under the variance for significant use of water for commercial or noncommercial agricultural use.

4.0 Recommendations

This section provides DWR's recommendations for the variance for significant use of water for commercial or noncommercial agricultural use, including guidelines and methodologies, reporting requirements, and implementation considerations.

These recommendations and the resulting variance adopted by the State Water Board do not set, rescind, or modify existing or future requirements for commercial or noncommercial agricultural use of water.

4.1 Summary of Recommendations

Based on the analysis and stakeholder input, DWR's recommendations include two parts. **These recommendations are contingent upon DWR's recommended ORWUS and CII-DIMWUS and their adoption by the State Water Board**.

Recommendations for the Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use

DWR recommends that a variance should be established for significant use of water for commercial or noncommercial agricultural use on residential parcels that are excluded from ORWUS and supplied with residential meters. In this context, residential parcels mean that property parcels have a residential land use designation under the governing general plans of counties and cities. The recommended variance against ORWUS should have the specifications detailed in Section 4.2. The calculation of aggregated efficient water use for significant use of water for commercial or noncommercial agricultural use (Variance Efficient Water Use Volume) as part of an urban retail water supplier's UWUO should be subject to the guidelines and methodologies detailed in Section 4.3.

Coordinated Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard

DWR recommends that urban community gardens on public, commercial, or residential lands should be served by CII-DIMs, and water use should be reported under CII-DIMWUS as SLAs (see *Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard* [WUES-DWR-2021-03]).

DWR also recommends that agricultural use of water on residential parcels that are supplied from a recycled water source be reported under CII-DIMWUS for UWUO accounting purposes in order to use SLA provisions (see *Recommendations for*

Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard [WUES-DWR-2021-03]).

4.2 Specifications

DWR recommends that a variance be established for "significant use of water for commercial or noncommercial agricultural use on residential parcels" with the following specifications.

- Eligible water use is water used only during the growing season for commercial or noncommercial agricultural use on residential parcels that is excluded from ORWUS.
  - Commercial or noncommercial agricultural use does not include large-scale agricultural practices for which land use classification is either agriculture or commercial. The agricultural practices can produce fruits and vegetables for personal use, community consumption or sale in local markets, and pasture for livestock that live on the residential property.
- Consistent with MWELO, the Variance Efficient Water Use Volume should be expressed using reference evapotranspiration and evapotranspiration factors in relation to the qualified irrigated agricultural land.
- The Variance Efficient Water Use Volume should be calculated following agronomic principles.
  - Crop Water Requirements are the product of reference evapotranspiration adjusted for the type of crop grown and irrigation efficiency, irrigated landscape area, and unit conversion coefficient.
  - Crop water requirements should be calculated on a growing season basis using growing season reference evapotranspiration, crop coefficient, irrigation efficiency, and agricultural land area, which should be derived using a Standard Method (the minimum requirement) or a Detailed Method (crop-specific).
  - Effective precipitation should be accounted for in the water use calculations if the local agency requires it for irrigated SLAs.
- The Variance Efficient Water Use Volume for commercial or noncommercial agricultural use can be calculated using one of two methods: Standard Method or Detailed Method.
  - **Standard Method**. The Variance Efficient Water Use Volume should be calculated for the service area based on regional local averages: service area

average growing season reference evapotranspiration (*ETo_gs*) (based on the hydrological region), service area average growing season crop coefficient (*Kc_gs*), service area average *IE*, and service area average growing season evapotranspiration factor (*ETF_gs*). The OR_LAM_Ag Mask should be used to for Total Irrigated Ag Land Area in acres. Urban retail water suppliers may update the data as needed in accordance with the Guidelines and Methodologies Use of Alternative Data (Section 4.3).

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

- **Detailed Method**. The Variance Efficient Water Use Volume should be calculated based on crop-specific growing season, growing season reference evapotranspiration for each crop (*ETo_gsCrop*), irrigation efficiency per crop based on crop type and hydrologic region (Crop type *IE*), growing season crop coefficient (*Kc_gsCrop*), and irrigated area associated with each crop or crop-type in the service area. Urban retail water suppliers should obtain the irrigated area associated with each crop in their service areas.

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

- The Variance Efficient Water Use Volume for commercial or noncommercial agricultural use should be greater than the significance thresholds associated with the two calculation methods.
  - The Variance Efficient Water Use Volume in the Standard Method should be greater than 5 percent of the sum of the aggregated estimate of efficient water use based on four established standards, namely IRWUS, ORWUS, CII-DIMS, and WLS (UWUO_SB).
  - The Variance Efficient Water Use Volume in the Detailed Method should be greater than 1 percent of the sum of the aggregated estimate of efficient water use based on four established standards, namely IRWUS, ORWUS, CII-DIMS, and WLS (UWUO_SB).
- The calculation of the Variance Efficient Water Use Volume should follow the guidelines and methodologies provided by DWR (see next section).

4.3 Guidelines and Methodologies

DWR recommends the following guidelines and methodologies for the variance for "significant use of water for commercial or noncommercial agricultural use."

- An urban retail water supplier will be allowed to include the variance for commercial or noncommercial agricultural use of water in calculating its UWUO when all the following conditions are satisfied.

    1. The use of this variance by the urban retail water supplier has been previously approved by the State Water Board. (Reminder: The State Water Board's approval is for using the variance, but not for the quantity, which may vary every year).

    2. The Variance Efficient Water Use Volume for commercial or noncommercial agricultural use is greater than the significance thresholds associated with the two calculation methods. This condition should be verified by the urban retail water supplier every year before using the variance to calculate the UWUO.

        - The Variance Efficient Water Use Volume in the Standard Method is greater than 5 percent of the sum of the aggregated estimate of efficient water use based on four established standards, namely IRWUS, ORWUS, CII-DIMS, and WLS (UWUO_SB).

        - The Variance Efficient Water Use Volume in the detailed, crop-specific method is greater than 1 percent of the sum of the aggregated estimate of efficient water use based on four established standards, namely IRWUS, ORWUS, CII-DIMS, and WLS (UWUO_SB).

    3. A variance for water use for commercial or noncommercial agricultural use is applied only when total irrigated agriculture on a residential parcel is greater than 1 acre. The calculation should focus on total irrigated land on residential parcels minus the area that is covered under ORWUS.

    4. The Variance Efficient Water Use Volume should be calculated based on data applicable to the conditions of the previous year.

- DWR, in coordination with the State Water Board, may recommend revisions of the guidelines and methodologies in the future, as needed.

- Use of alternative data is allowed if the urban retail water supplier can provide evidence that the alternative data is equal to or superior to DWR-provided data or DWR-suggested referenced data. Refer to "Use of Alternative Data" in the following sections.

- Urban retail water suppliers should provide all necessary data and information to support the use of this variance and an associated calculated amount of estimated water use to be included in UWUO. The data and information should be made publicly available. Where applicable, DWR will specify validation and certification requirements for certain data use.

For general guidelines and methodologies for using variances for calculating UWUO, refer to *Recommendations for Guidelines and Methodologies for Calculating Urban Water Use Objective* (WUES-DWR-2021-01B, Section 6.2).

Methodology for Estimating Variance Efficient Water Use Volume 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 *Peff* for residential landscapes in its adopted WELO, both methods must be adjusted accordingly.

Appendix B provides a template for calculating the Variance Efficient Water Use Volume for commercial or noncommercial agricultural use. This template is provided for illustrative purposes and is subject to revision after the State Water Board's adoption.

An urban retail water supplier with a significant water use that is within 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. Additionally, the urban retail water supplier must report to DWR all the data and supporting documentation used to estimate the water use.

Data Needed for Calculation

- Standard Method:
  - Qualifying irrigated agricultural land area (*LA*).
  - Variable growing season interval and duration.
  - Urban retail water supplier service area average 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.
  - Qualifying irrigated land area per crop (*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 derived from local data for each crop type in the service area (*IE_Crop*).

Variance Efficient Water Use Volume

The Variance Efficient Water Use Volume, 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 or Referenced by 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*).
- Total qualifying irrigated agricultural land area: attributable commercial or noncommercial agricultural land on residential parcels based on the latest OR_LAM_Ag Mask (*LA*) (square feet); 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* (inches).
- 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 on the latest OR_LAM_Ag Mask (*LA*) (square feet); urban retail water suppliers can provide input to adjust the OR_LAM_Ag Mask through the alternative data process.

Data Provided or Obtained by Urban Retail Water Supplier

Standard Method

- Reference evapotranspiration for growing season (*ETo_gs*) calculated from DWR-provided or otherwise obtained average growing season for the region (inches).
- 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 growing season for each crop or crop-type (*ETo_gsCrop*) calculated from DWR-provided or otherwise obtained crop growing season for the region (inches).
- Qualifying irrigated land area by crop or crop type (*LA_Crop*) (square feet).

Summary of Guidelines and Methodologies to Calculate the Variance Efficient Water Use Volume

A summary of guidelines and methodologies to calculate the Variance Efficient Water Use Volume for commercial or noncommercial agricultural use on residential parcels is provided in Table 4-1.

Table 4-1 Summary of Guidelines and Methodologies for Calculation of Efficient Water Use for Commercial or Noncommercial Agricultural Use on Residential Pacels

Guidelines and Methodologies	Standard Method for 5 Percent Threshold	Detailed Method for 1 Percent Threshold
Data needed for calculation	• Urban retail water supplier–specific growing season. • Average service area reference evapotranspiration coefficient for the duration of growing season (*ETo_gs*) (inches). • Average service area crop coefficient for the duration of growing season (*Kc_gs*). • Average service area irrigation efficiency (*IE*). • Qualifying irrigated land acreage on residential parcels (*LA*) (square feet).	• Urban retail water supplier–specific growing season per crop. • Reference evapotranspiration coefficient for the duration of growing season per crop or crop-type (*ETo_gsCrop)* (inches). • Crop coefficient for the duration of growing season for each crop or crop type (*Kc_gsCrop).* • Crop or crop-type irrigation efficiency (*IE_Crop*). • Qualifying irrigated land acreage on residential parcels per crop *(LA_Crop*) (square feet).
Evapotranspiration factor (*ETFgs_Crop*)	$ETF\_gs = \frac{Kc\_gs}{IE}$	$ETF\_gsCrop = \frac{Kc\_gsCrop}{IE\_Crop}$
Equation	$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = 0.62 \times \frac{Service\ Area\ Average\ Kc\_gs}{Service\ Area\ Average\ Irrigation\ Efficiency} \times Service\ Area\ Average\ ETo\_gs \times Total\ Irrigated\ Ag\ Land\ Area$	$Variance\ Efficient\ Water\ Use\ Volume\ (gallons) = 0.62 \times \sum_{crop} \frac{Kc\_gsCrop}{Crop\ type\ Irrigation\ Efficiency} \times ETo\_gsCrop \times Irrigated\ Crop\ Area$
Source(s) of data	***Provided by DWR***: • Urban retail water supplier–specific growing season. • Daily reference evapotranspiration coefficient for the duration of the year (*ETo*) (inches). • Crop coefficient for the duration of growing season (*Kc_gs*). • Qualifying agricultural land area (*LA*) based on the latest LAM (square feet); urban retail water suppliers can provide input to adjust DWR OR_LAM_Ag Mask. • Effective precipitation for urban retail water supplier–specific growing season, *Peff_gs* (inches), if needed. ***To be obtained/developed by urban retail water supplier***: • Growing season reference evapotranspiration (*ETo_gs*). • Evapotranspiration factor for the duration of growing season (*ETF_gs*).	***Provided by DWR***: • Urban retail water supplier–specific growing season per crop. • Daily reference evapotranspiration coefficient for the year (*ETo*) (inches). • Crop coefficients for the duration of growing season (*Kc_gsCrop*) based on list requested by urban retail water supplier or common regional crops lists. • Irrigation efficiency for different types of crops and irrigation systems in the region *(IE_Crop*). • Qualifying agricultural land area (*LA*) based on the latest OR_LAM_Ag Mask (square feet); urban retail water suppliers can provide input to adjust the OR_LAM_Ag Mask. • Effective precipitation for urban retail water supplier–specific growing season per crop, *Peff_gs* (inch), if needed. ***To be obtained/developed by urban retail water supplier***: • Crop types and associated land areas. • Growing season reference evapotranspiration per crop or crop-type (*ETo_gsCrop*). • Evapotranspiration factor for the duration of growing season (*ETFgs_Crop*). • Qualifying irrigated land area per crop (*LA_Crop*).

Key:
DWR = California Department of Water Resources
ETF_gsCrop = evapotranspiration factor per crop during growing season
ETo_gsCrop = reference evapotranspiration per crop during growing season
IE_Crop = irrigation efficiency per crop
LA = qualifying agricultural Landscape Area
OR_LAM_Ag Mask = Outdoor Residential Landscape Area Measurement Agricultural Mask
ETF_gs = evapotranspiration factor during growing season
ETo_gs = reference evapotranspiration during growing season
IE = irrigation efficiency
Kc_gs = crop coefficient during growing season
LA_Crop = irrigated Landscape Area per crop
Peff_gs = effective precipitation during growing season

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Data Accuracy

The urban retail water supplier must report all data and supporting documentation used to estimate water use. While DWR is supplying some of this information, it will need to be confirmed by DWR 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 of surveys, map(s), satellite image(s), statistical sample results, and any other records or supporting data must be retained for the period the data is used in this process, plus three years, and must 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:
    - Verify a random sample of accounts identified with commercial or noncommercial agricultural land on a residential parcel based on the OR_LAM_Ag Mask (a minimum of 10 percent of these accounts, but no less than 5; and maximum of 100 verified accounts). Verification can

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

- **Remote sensing or geographic information system (GIS) mapping methods**. The accuracy of results from remote sensing methods depends on the qualifications of the entity that performs the analysis and the quality of the GIS or remotely sensed 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 meets or exceeds 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.

Alternative ETo Data

To demonstrate that alternative *ETo* (and/or total precipitation) data meets or exceeds 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 meets or exceeds the quality and accuracy of the DWR data.
2. Description of the methodology used to estimate *ETo* (and/or precipitation).
3. Indication of the source of data used to estimate *ETo* (and/or precipitation) (e.g., whether it is from a weather station or remote sensing).
4. If *ETo* (and/or 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 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.

Alternative Precipitation Data (if needed)

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

1. Description of why the alternative *Peff_gs* data meets or exceeds the quality and accuracy of the DWR data.

2. Description of the source for the *Peff_gs* data.

3. Description of the methodology used to estimate *Peff_gs.*

4. Description of why the alternative *Peff_gs* data meets or exceeds the quality and accuracy of the DWR *Peff_gs* 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.

Alternative Qualifying Irrigated Agricultural Land Area

Urban retail water suppliers can use alternative qualifying irrigated agricultural land area data in this variance calculation. Areas can be measured by surveys or remote sensing and GIS, as described above.

- **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.

- **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 GIS or remotely sensed 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 meets or exceeds the quality and accuracy of data provided by DWR. To request the use of alternative data or method to determine qualifying irrigated agricultural land area, the urban retail water supplier must demonstrate that the alternative data or method meets or exceeds 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 meets or exceeds 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 methodology 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.

Alternative Kc_gs, Growing Season, and IE

Urban retail water suppliers can use alternative *Kc_gs*, growing season, and *IE* in this variance calculation. To demonstrate that the alternative data meets or exceeds 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 meets or exceeds 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 methodology 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.

4.4 Implementation Considerations

Urban retail water suppliers may consider installing a separate agricultural meter for the commercial or noncommercial agricultural use under this variance, even if the areas are within residential parcels. Note that if a separate agricultural meter is used, the resulting water use is excluded from the UWUO calculation.

Urban retail water suppliers should make necessary adjustments relative to the estimated area for landscape irrigation based on the area served by this separate

agricultural meter, if warranted. If the separate meter is not specifically for agricultural use and the associated water use remains the scope of UWUO, it should be reported under CII-DIMWUS with allowable SLA provisions.

4.5 Reporting Requirements

Official documentation to verify the accuracy of the data must be submitted with the package. All data used by an urban retail water supplier in its calculation(s), regardless of whether they were obtained by the urban retail water supplier or provided by DWR, must be reported with the variance application as listed below.

Reporting Requirements for Standard Method

The following information must be submitted if the urban retail water supplier uses the Standard Method with the 5 percent significance threshold.

1. Average urban retail water supplier–specific growing season.
2. Reference evapotranspiration coefficient for the duration of growing season (*ETo_gs*) (inches).
3. Average crop coefficient for the duration of growing season (*Kc_gs*).
4. Average evapotranspiration factor for the duration of growing season (*ETF_gsCrop*).
5. Average irrigation efficiency in the region (*IE*).
6. Effective precipitation for urban retail water supplier–specific growing season if the urban retail water supplier is required by a local agency to include it in the calculations (*Peff_gs*) (inches).
7. Qualifying irrigated agricultural land area and attributable commercial or noncommercial agricultural land on residential parcel based on OR_LAM_Ag Mask (*LA*) (square feet).
8. DWR-signed approval of alternative data, if any is used.
9. Associated documentation for all supporting data.

Reporting Requirements for Detailed Method

The following information must be submitted if the urban retail water supplier uses the Detailed Method with the 1 percent significance threshold.

1. Urban retail water supplier–specific growing season per crop.

2. Reference evapotranspiration coefficient for the duration of growing season per crop (*ET_gsCrop*) (inches).
3. Crop type(s).
4. Crop coefficients for the duration of growing season (*Kc_gsCrop*).
5. Irrigation efficiency for each crop (*IE_Crop*).
6. Evapotranspiration factor for the duration of growing season for each crop (*ETF_gsCrop*).
7. Effective precipitation for urban retail water supplier–specific growing season per crop if the urban retail water supplier is required by a local agency to include it in the calculations (*Peff_gs*) (inches).
8. Qualifying irrigated agricultural land area and attributable commercial or noncommercial agricultural land on residential parcel based on the OR_LAM_Ag Mask and local knowledge to identify irrigated land per crop (*LA_Crop*) (square feet).
9. DWR-signed approval of alternative data, if any is used.
10. Associated documentation for all supporting data.

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5.0 Glossary

The following key terms are listed below for easy reference. Where applicable, existing definitions from statutes and regulations are provided.

commercial agricultural use of water in residential parcels. Water used for products produced on residential parcels for commercial purposes.

commercial, industrial, and institutional parcels. For the purposes of variance development, commercial, industrial, and institutional parcels are property parcels with a commercial, industrial, and institutional land use designation under the governing general plans of counties and cities.

commercial, industrial, and institutional water use. Water used by commercial water users, industrial water users, institutional water users, and large landscape water users, as defined in California Water Code Section 10608.12(d).

commercial water user. A water user that provides or distributes a product or service, as defined in California Water Code Section 10608.12(e).

dedicated irrigation meter. A meter used only for irrigation of outdoor landscape areas. However, a mixed-use meter with no more than five percent of total delivered water serving non-landscape irrigation purposes can also be considered a dedicated irrigation meter for the purpose of the urban water use objective and actual water use calculations and reporting.

evapotranspiration. The amount of water transpired by plants, retained in plant tissues, and evaporated from plant tissues and surrounding soil surfaces.

industrial water user. A water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development, as defined in California Water Code Section 10608.12(i).

institutional water user. A water user dedicated to public service. This type of user includes, among other users, higher education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit research institutions, as defined in California Water Code Section 10608.12(j).

irrigation efficiency. The efficiency of water application and use, calculated by dividing a portion of applied water that is beneficially used by the total applied water, expressed as a percentage. The two main beneficial uses are crop water use (evapotranspiration) and leaching to maintain a salt balance.

material effect. Having real importance or great consequences. In the context of California Department of Water Resources' recommendations regarding the urban water use objective and variances, a material effect is an effect on the urban water use objective that could influence the compliance status of an urban retail water supplier.

noncommercial agricultural use of water in residential parcels. Water used to grow products on residential parcels with noncommercial intentions.

performance measures. Actions to be taken by urban retail water suppliers that will result in increased water use efficiency by commercial, industrial, and institutional water users. Performance measures may include, but are not limited to, educating commercial, industrial, and institutional water users on best management practices, conducting water use audits, and preparing water management plans. Performance measures do not apply to process water, as defined in California Water Code Section 10608.12(n).

recycled water. Water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is, therefore, considered a valuable resource, as defined in California Water Code Section 13050(n), as defined in California Water Code Section 10608.12(q).

reference evapotranspiration. The evapotranspiration rate from an extended surface of 3- to 6-inch-tall (8- to 15-centimeter-tall) green grass cover of uniform height, actively growing, completely shading the ground, and not short on water (the reference evapotranspiration rate reported by the California Irrigation Management Information System).

residential parcels. For the purposes of variance development, residential parcels are property parcels with a residential land use designation under the governing general plans of counties and cities.

Special Landscape Area. An area of the landscape dedicated solely to edible plants, areas irrigated with recycled water, water features using recycled water and areas dedicated to active play such as parks, sports fields, golf courses, and where turf provides a playing surface, as defined in California Code of Regulations, Title 23, Section 491(iii).

threshold of significance. A minimum volume of unique water use in an urban retail water supplier's service area that could have a material effect on that urban retail water supplier's urban water use objective.

urban retail water supplier. A water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes, as defined in California Water Code Section 10608.12(t).

urban water use efficiency standards. The standards effective through California Water Code Section 10609.4 (indoor residential use) or adopted by the State Water Resources Control Board (outdoor residential, water loss, and commercial, industrial, and institutional outdoor irrigation of landscape areas with dedicated meters) pursuant to California Water Code Section 10609.2.

urban water use objective. 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, as described in California Water Code Section 10609.20, as defined in California Water Code Section 10608.12(u).

water loss. The total of apparent loss and real loss (California Code of Regulations, Title 23, Section 638.1(a) and Section 638.1(k), respectively) in an urban retail water supplier's system. Apparent loss means loss due to unauthorized consumption and/or nonphysical (paper) loss attributed to inaccuracies associated with customer metering or systematic handling errors. Real loss means the physical water loss from the pressurized potable water system and the urban retail water supplier's potable water storage tanks, up to the point of customer consumption.

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6.0 References

DWR and State Water Board (California Department of Water Resources and State Water Resources Control Board). 2018. Making Water Conservation a California Way of Life. Primer of 2018 Legislation on Water Conservation and Drought Planning Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman). Accessed at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Final-WCL-Primer.pdf?la=en&hash=B442FD7A34349FA91DA5CDEFC47134EA38ABF209

FAO (Food and Agriculture Organization). 1998. Introduction to evapotranspiration, Chapter 1. Accessed at: http://www.fao.org/3/X0490E/x0490e04.htm

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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 Guidelines and Methodologies for Calculating Urban Water Use Objective. DWR Report Number: WUES-DWR-2021-01B.

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. Technical Report: Outdoor Residential Landscape Area Measurement. DWR Report Number: WUES-DWR-2021-02.T1.

DWR (California Department of Water Resources). September 2022. Recommendations for Commercial, Industrial, and Institutional Outdoor Irrigation of Landscape Areas with Dedicated Irrigation Meters Water Use Efficiency Standard. DWR Report Number: WUES-DWR-2021-03.

DWR (California Department of Water Resources). September 2022. Summary of Recommendations for Variances. DWR Report Number: WUES-DWR-2021-04.

DWR (California Department of Water Resources). September 2022. Recommendations for Variance for Significant Populations of Horses and Other Livestock, Methods of Calculation, and Supporting Data Requirements. DWR Report Number: WUES-DWR-2021-07.

DWR (California Department of Water Resources). September 2022. Recommendations for Performance Measures for Commercial, Industrial, and Institutional Water Use. DWR Report Number: WUES-DWR-2021-15.

DWR (California Department of Water Resources). September 2022. Stakeholder Outreach Summary for Developing Urban Water Use Efficiency Standards, Variances, and Performance Measures. DWR Report Number: WUES-DWR-2021-20.

DWR (California Department of Water Resources). September 2022. Urban Water Use Efficiency Recommendation Package: Glossary and Abbreviations and Acronyms. DWR Report Number: WUES-DWR-2021-21.

Appendix B – Template for Calculating the Efficient Water Use for Variance for Significant Use of Water for Commercial or Noncommercial Agricultural Use

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

*Fill in the grey rows to determine: 1. efficient water use under this variance, and 2. whether your (urban retail water supplier) are qualified to apply for this variance.

Growing Season	Date
Start Date	
End Date	

Parameter	Value
Reference Evapotranspiration (*Eto_gs,* inches) [a]	
Effective Precipitation (*Peff_gs*) [b]	0
Average Crop Coefficient (*Kc_gs*) [c]	
Average Irrigation Efficiency (*IE_gs*) [d]	
Evapotranspiration Factor (*ETF_gs*) [e]	#DIV/0!
Qualifying Irrigated Agricultural Land Area (*LA*, square feet) [f]	

Variance Efficient Water Use Volume (gallons) [g]	#DIV/0!

What is your Annual Urban Water Use Objective? (gallons)	
Are you qualified to apply for this variance?	**#DIV/0!**

For this option, the **growing season** will be provided by DWR for each urban retail water supplier that requests this information.

a. Reference evapotranspiration in your service area during growing season (*ETo_gs*) is calculated from *Daily Eto for the growing season*, which are provided by DWR.

b. Effective precipitation in your service area during growing season (*Peff_gs*) is provided by DWR, if necessary. Default is 0.

c. Average crop coefficient in your service area during grwoig season (*Kc_gs*) is provided by DWR.

d. Average irrigation efficiency in your service area during growing season (*IE_gs*) is provided by DWR.

e. Evapotranspiration factor in your service area during growing season (*ETF_gs*) is calculated based on *Kc_gs* divided by *IE,* which are provided by DWR.

f. Qualifying irrigated argicultural lands area (*LA*) in your service area should be obtained from OR_LAM_Ag Mask

* only LAM agricultural areas > 1 acre that are excluded from Outdoor Residential Standard are qualifying irrigated agricultural lands.

g. **Variance Efficient Water Use Volume** = 0.62 × (Service Area Average Kc_gs)/(Service Area Average Irrigation Efficiency) × Service Area Average ETo_gs × Total Irrigated Ag Land Area

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

*Fill in the grey rows to determine: 1. water use under this variance, and 2. whether you (urban retail water supplier) are qualified to apply for this variance.
* If there are more than five crop types in your service area, add tables as needed.

Crop #1

Growing Season	Date
Start Date	
End Date	

Crop #2

Growing Season	Date
Start Date	
End Date	

Crop #1

Parameter	Value
Reference Evapotranspiration (*ETo_gsCrop*) [a]	
Effective Precipitation (*Peff_gsCrop*) [b]	0
Crop coefficient (*Kc_gsCrop*) [c]	
Irriigation efficiency (*IE_gsCrop*) [d]	
Evapotranspiration Factor *(ETF_gsCrop*) [e]	#DIV/0!
Irrigated Agricultural Area per Crop (*LA_Crop*, square foot) [f]	

Crop #2

Parameter	Value
Reference Evapotranspiration (*ETo_gsCrop*) [a]	
Effective Precipitation (*Peff_gsCrop*) [b]	0
Crop coefficient (*Kc_gsCrop*) [c]	
Irriigation efficiency (*IE_gsCrop*) [d]	
Evapotranspiration Factor *(ETF_gsCrop*) [e]	#DIV/0!
Irrigated Agricultural Area per Crop (*LA_Crop*, square foot) [f]	

Crop #1

Variance Efficient Water Use Volume for Crop #1 (gallons) [g]	#DIV/0!

Crop #2

Variance Efficient Water Use Volume for Crop #2 (gallons) [g]	#DIV/0!

Total Variance Efficient Water Use Volume for all Crops (gallons)	**#DIV/0!**
What is your Annual Urban Water Use Objective? (gallons)	
Are you qualified to apply for this variance?	**#DIV/0!**

For this option, a **variable growing season per crop** will be provided for different water suppliers.

a. Reference evapotranspiration per crop in your service area during growing season (*ETo_gsCrop*) is calculated from *Daily Eto for the growing season of each crop*, which are provided by DWR.
b. Effective precipitation in your service area during growing season of each crop (*Peff_gsCrop*) is provided by DWR, if necessary. Default is 0.
c. Crop coefficient in your service area during its grwoig season (*Kc_gsCrop*) is provided by DWR.
d. Irrigation efficiencyper crop in your service area during growing season (*IE_gsCrop*) is provided by DWR.
e. Crop evapotranspiration factor in your service area during growing season (*ETF_gsCrop*) is calculated based on *Kc_gs* divided by *IE,* which are provided by DWR.
f. Qualifying irrigated argicultural lands area per crop (*LA_Crop*) in your service area should be obtained based on local information.
* only LAM agricultural areas > 1 acre that are excluded from Outdoor Residential Standard are qualifying irrigated agricultural lands.
g. **Variance Efficient Water Use Volume** = $0.62 \times \sum_{crop}(Kc\_gsCrop)/(\text{Crop type Irrigation Efficiency}) \times ETo\_gsCrop \times \text{Irrigated Crop Area}$

Crop #3

Growing Season	Date
Start Date	
End Date	

Crop #3

Parameter	Value
Reference Evapotranspiration (*ETo_gsCrop*) [a]	
Effective Precipitation (*Peff_gsCrop*) [b]	0
Crop coefficient (*Kc_gsCrop*) [c]	
Irriigation efficiency (*IE_gsCrop*) [d]	
Evapotranspiration Factor *(ETF_gsCrop)* [e]	#DIV/0!
Irrigated Agricultural Area per Crop (*LA_Crop*, square foot) [f]	

Crop #3

Variance Efficient Water Use Volume for Crop #3 (gallons) [g]	#DIV/0!

Crop #4

Growing Season	Date
Start Date	
End Date	

Crop #4

Parameter	Value
Reference Evapotranspiration (*ETo_gsCrop*) [a]	
Effective Precipitation (*Peff_gsCrop*) [b]	0
Crop coefficient (*Kc_gsCrop*) [c]	
Irriigation efficiency (*IE_gsCrop*) [d]	
Evapotranspiration Factor *(ETF_gsCrop)* [e]	#DIV/0!
Irrigated Agricultural Area per Crop (*LA_Crop*, square foot) [f]	

Crop #4

Variance Efficient Water Use Volume for Crop #4 (gallons) [g]	#DIV/0!

Crop #5

Growing Season	Date
Start Date	
End Date	

Crop #5

Parameter	Value
Reference Evapotranspiration (*ETo_gsCrop*) [a]	
Effective Precipitation (*Peff_gsCrop*) [b]	0
Crop coefficient (*Kc_gsCrop*) [c]	
Irriigation efficiency (*IE_gsCrop*) [d]	
Evapotranspiration Factor *(ETF_gsCrop*) [e]	#DIV/0!
Irrigated Agricultural Area per Crop (*LA_Crop*, square foot) [f]	

Crop #5

Variance Efficient Water Use Volume for Crop #5 (gallons) [g]	#DIV/0!

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