

Outdoor Residential Water Use Standard Draft Recommendation

California Department of Water Resources

November 15, 2021

Background

The 2018 water conservation legislation, Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman), directed the Department of Water Resources (DWR), in coordination with the State Water Resources Control Board (Water Board), to conduct necessary studies and investigations and recommend standards for outdoor residential use for adoption by the Water Board. It further specified that the standards incorporate the principles of the Model Water Efficient Landscape Ordinance (MWELO) adopted by the department pursuant to the Water Conservation in Landscaping Act.

The principles of MWELO were defined in the legislation as provisions of the model water efficient landscape ordinance applicable to the establishment or determination of the amount of water necessary to efficiently irrigate both new and existing landscapes, and include, but not limited to, evapotranspiration adjustment factors (ETAF), landscape area (LA), maximum applied water allowance (MAWA), reference evapotranspiration (ET_o), and special landscape areas (SLA).

DWR conducted studies and investigations, coordinated with the Water Board, established working groups that provided invaluable feedback, held several workshops to inform stakeholders and receive feedback, and developed outdoor residential water use standard. Reference evapotranspiration, effective precipitation (Pe_{eff}), and irrigable landscape areas for the study were provided by DWR¹. Outdoor residential water use (ORWU) data was estimated using Water Boards' electronic annual report (eAR).

This brief document is prepared as a meeting material for the November 16, 2021 stakeholder workshop. It presents the recommended provisional outdoor residential water use standard (ORWUS) that has been developed based on studies and investigations conducted by DWR and consultants, in coordination with the Water Board, and with feedback from working group members and other stakeholders. DWR considers the recommended standards to be simple to use, equitable, fair, and feasible. The recommended long-term outdoor residential water use standards in 2030 will make water conservation a California way of life and result in significant reductions of water use.

¹ For determining compliance with the water use objective requirement, urban retail water suppliers have the choice of using alternative data source for calculating their efficient outdoor water use, provided that the alternative data is of the same, or superior, quality as that provided by DWR.

ORWUS Development Process

DWR's studies and investigations for developing long-term outdoor residential water use standard were guided by the principles of MWELo. The following fundamental equation was used to assess the status of outdoor residential water use in California by calculating each supplier's evapotranspiration factor (ETF) and its statistical moments (such as the mean, median, and standard deviation).

$$\text{ORWU} = (\text{ETo} - \text{Peff}) * (0.62) * (\text{ETF}) * (\text{LAs}) \quad (1)$$

Where:

ORWU = Outdoor Residential Water Use (gallons)

ETo = Reference evapotranspiration (inches)

Peff = Effective precipitation (inches)

ETF = Supplier level ET factor (unitless)

LAs = Residential landscape area within a water supplier's service area (sq. ft)

0.62 = Unit conversion factor

Data Inputs

- ORWU was obtained from the annual water use report that suppliers submit to the Water Board through the electronic annual report (eAR). The total residential water use that suppliers submit to the Water Board went through stringent quality control processes and were disaggregated into indoor and outdoor water use using various modeling techniques.
- ETo is obtained from DWR's California Irrigation Management Information System (CIMIS) program. It represents evaporation plus transpiration from a well-watered grass surfaces on which CIMIS stations stand. CIMIS has over 155 stations throughout the state. To mitigate spatial data gaps of ETo, CIMIS developed Spatial CIMIS model that provides ETo values at 2-km grid for the entire state on daily time steps. Spatial CIMIS couples remotely sensed satellite data with point measurements from CIMIS stations to produce spatially distributed values of ETo. Area weighted average Spatial CIMIS ETo values were used in this study.
- Peff represents the portion of total precipitation that becomes available for plant growth. It is affected by soil type, slope, land cover type, and frequency, intensity, and duration of rainfall, among other things. DWR is using a soil water balance model known as Cal-SIMETAW to estimate Peff. To be consistent with MWELo guidelines on Peff, and due to limitations of some input data to the model, Peff was capped at 25% of total annual precipitation.
- LAs is the product of DWR's Landscape Area Measurement (LAM) project. DWR contracted with Quantum Spatial, Inc. to produce irrigable landscape areas to urban retail water suppliers as directed by the legislation. Using the object-based classification

system of high resolution remotely sensed data, each object (feature) in a parcel is assigned to a predetermined class using an imputation model and aggregated into three irrigation classes for each supplier. The three irrigation status classes are Irrigable-Irrigated (II), Irrigable-Not Irrigated (INI), and Not Irrigable (NI).

The II class represents landscape areas of healthy vegetation where the vegetation appears to be in growth, not senesced, and is foliated. The area is presumed to be maintained and managed through active irrigation, comprising an irrigated hydro-zone. The INI class represents areas of planted and previously maintained vegetation that appears water stressed (brown or leafless plants). These are areas that are not currently being irrigated, but were irrigated in the past, or intended to be managed with irrigation in the future. Finally, the NI class represents native or undeveloped areas within, or adjacent to, a developed lot that show no signs of active or previous irrigation, are not adjacent to irrigated vegetation, and generally not located adjacent to structures. Impervious, solid, or compacted materials are 'not irrigable' because they cannot directly support growing vegetation or hold water.

- DWR used county assessor's parcel designations and land use codes (LUCs) to classify residential landscapes based on irrigation statuses. It is understood that these designations may not always match how suppliers deliver water to their customers. If there are differences, it is the responsibility of water suppliers to make adjustments in order to align residential landscape area with residential water use.
- Irrigable landscape area for the purpose of calculating an urban retail water supplier's efficient outdoor residential water use (EORWU) is defined as II plus 20% INI. The 20% INI addition to II was established using data analysis of ETF, II, and INI and determining the contributions of INI to the ETF.
- Residential parkway strips were not included in the irrigable landscape area that are provided to the suppliers because they are usually not inside parcel residential boundaries. If suppliers believe that they have significant amount of irrigable landscape area in parkway strips in their service area, they can request for an adjustment before they submit their reports. DWR will provide guidelines on how suppliers can incorporate their estimate of parkway strips into their irrigable landscape area.
- Agricultural areas in urban settings that are greater than 1 acre are masked out and not included in residential landscape area measurements. Suppliers can request agricultural water use budgets through the variance process.
- Vacant parcels were also excluded because it was determined that most of them are not occupied. Suppliers can request an adjustment of irrigable landscape areas after the vacant residential parcels are occupied.
- Swimming pools, spas, and small water features are captured as irrigable irrigated class and no further adjustments are needed.

- Open water surfaces (ponds, lakes, rivers) and horse corrals are not included in the residential landscape area and may be considered as variances.
- Residential landscape areas that are irrigated with recycled water can be subtracted from the total irrigable areas and added to the CII outdoor water use with dedicated irrigation meter as special landscape areas (SLA).
- ETF is an evapotranspiration factor that guides the development of outdoor residential water use standard. ETF can be calculated either by rearranging Equation 1 or using specific PF and IE values, if known. Plant factors convert ETo to evapotranspiration from specific landscape plant types and are usually established through research. Irrigation efficiency accounts for inherent losses of water through surface run off, deep percolation, evaporation of water spray into the atmosphere. DWR used both methods to determine the status of water use efficiency throughout the state and to estimate statewide average ETF based on horticultural and irrigation sciences.

Considerations for Setting the Outdoor Standard

DWR considered the following scenarios in analyzing the input data listed above for setting the outdoor residential water use standard.

- Current outdoor residential water use status was assessed using statistical moments (mean, median, standard deviation, and range) of ETF calculated from Equation 1 for 249 suppliers geographically and climatically representative of the state. These analyses informed the study team about the status of current water use throughout the state.
- Consistency of supplier's ETF with MWELo's ETAF values was assessed and 185 suppliers that have ETF values below 1.0 were identified². This informed the study team what could be achieved if water conservation measures are implemented.
- Landscape areas for 168 sample suppliers were grouped into two broad categories of canopied and non-canopied land cover types and PFs were assigned using peer reviewed scientific publications. IE was assigned based on MWELo's IE numbers for spray heads and drip systems. Average ETF was then calculated.
- The above three considerations resulted in a provisional outdoor residential water use standard of **0.70** that DWR proposed at the June 30, 2021 workshop.
- Stakeholder comments and suggestions on the proposed provisional standard were considered in revising the outdoor standard and designing a new approach that assessed the immediate impacts on retail water suppliers and improved long-term outlook for water conservation.
- Calculated ETF values and stakeholder comments led to the development of a phase-in approach for the outdoor residential water use standard (ORWUS).

² The suppliers with ETF values less than 1.0 are assumed to be using water within the range of ETAF values of the MWELo.

Draft Recommendation for ORWUS

Based on the above considerations, DWR is recommending the following standards for outdoor residential water use:

- 2023 – 2029: **0.80**
- 2030 and thereafter: **0.65**
- New developments: **0.55** (or current MWELO ETAF value)
- Special landscape area (SLA): **1.0**
- Irrigable landscape area = **II + 0.20INI**

SB X7-7 Legislative Requirement

WC Section 10609.2. (d) *The long-term standards shall be set at a level designed so that the water use objectives, together with other demands excluded from the long-term standards such as CII indoor water use and CII outdoor water use not connected to a dedicated landscape meter, would exceed the statewide conservation targets required pursuant to Chapter 3 (commencing with Section 10608.16).*

DWR developed an objective analyzer tool to test the SB X7-7 requirement using the above draft recommendations for outdoor residential water use and the corresponding recommended standards for the other components of the water use objective. The tool compared the statewide average objective based total water use to the statewide SB X7-7 target for different time periods (2023, 2027, 2030). The results show that the statewide objective based total water use is less than the SB X7-7 target, implying that DWR's draft recommendations satisfy SB X7-7 legislative requirement.

Calculating Efficient Outdoor Residential Water Use (EORWU)

After the outdoor residential water use standard is recommended by DWR and adopted by the Water Board, retail water suppliers will calculate their efficient outdoor residential water use by multiplying the standard by net evapotranspiration and supplier's aggregate irrigable landscape area. In equation form,

$$\text{EORWU} = (\text{ETo} - \text{Peff}) * (0.62) * (\text{ORWUS}) * (\text{LAs}) \quad (2)$$

Where:

EORWU = Efficient Outdoor Residential Water Use (gallons)

ETo = Reference evapotranspiration (inches)

Peff = Effective precipitation (inches)

ORWUS = Outdoor Residential Water Use Standard (unitless)

LAs = Residential landscape area within a water supplier's service area (sq. ft)

0.62 = Unit conversion factor

LAs in Equation 2 represents $II + 20\%INI$ and is provided to the retail water suppliers by DWR. DWR will also provide ETo and Peff data needed to calculate EORWU to the retail water suppliers annually. Guidelines on when and where the ETo and Peff data will be made available to the suppliers will be provided in near future. Suppliers have the option of using alternative data sources by demonstrating to DWR that their data meets, or exceeds, the quality and accuracy of data provided by the DWR. Detailed guidelines on the use of alternative data sources for each input data will be provided by DWR. The following are only some of the general requirements:

- Description of why the alternative data quality and accuracy is equivalent to or better than that of DWR.
- Credentials (such as licenses, certifications, educational and professional background of water supplier staff) for the entity/party that produced the alternative data.
- Certification of the alternative data by the entity that produced it.
- Water supplier's Board of Director's Resolution, or its equivalent, approving the use of alternative data, after conducting at least one public hearing.
- Submittal of the request signed by the General Manager of the water supplier to DWR.