Comments on the January 2011 Revised Draft Specification for Weather-Based Irrigation Controllers

May 19, 2011

Commenter

Commenter: Edward Norum
Affiliation: California State University — Fresno
Comment Date: March 2, 2011

ERG Staff: The attached file contains my comments on the revised draft as invited in your email of !/20/2011.

Commenter's Name: Edward Norum
Agricultural Engineer
Fresno, CA
Commenter's Affiliation: None
Date: February 28, 2011
Topic: Summary of Major Changes to the Revised Draft Specification for Weather-Based Irrigation Controllers

Comments on Weather-Based Irrigation Controllers Testing Protocols as per the following Documents:

From EPA Summary of Major Changes to the Revised Draft Specifications for Weather-Based Irrigation Controllers – January 20, 2011

General:

The irrigation industry's effort to develop a smart controller was an attempt to integrate the effects of soils, plant physiology, climate, topography and the irrigation system to provide effective and efficient use of water. It was recognized that to minimize irrigation water requirements, the effects of rainfall needed to be maximized. It was also considered critical that the system operate without human intervention. A testing protocol was developed and used to evaluate the degree of effectiveness of 25-30 controllers over a period of 5-6 years. The documents referenced are an attempt to modify the testing protocol based on flawed logic as stated in the comments.

3.1.3 Root Zone Working Water Storage Starting Point: During the performance test training the licensed certifying bodies and the University of Florida found that starting the performance test with the root zone working water storage (RZWWS) at full, rather than at half full as indicated in the current version of the SWAT protocol, ensured that the reference RZWWS and controller's RZWWS start at the same level. EPA made this change to the specification to reflect this finding. (Page 3)

There is no scientific basis for making this change. In managing the RZWWS there is no logical reason for completely filling the root zone with irrigation water. In fact, if rainfall is to be used effectively, a portion of the RZWWS should be left unfilled to allow for the storage of rainfall. Even in dry periods, there is no incentive to completely fill the root zone and risk runoff in the wet portion of the sprinkler pattern.

3.1.4 ..The results from testing the controllers during a rainy period indicated that performance scores are not transferable from dry to wet climates. As a result, EPA decided to add a requirement that would test a controller's ability to handle rainfall. WaterSense is proposing the 30-day test period include at least four days that receive at least 0.10 inches of rain. (Page 3)

There is no science behind this conclusion. The original testing protocol assumes that the product is best testing in the natural environment in which it will be required to perform. Clearly, any arbitrary variation from the natural nature of the rainfall risks biasing the results. The controller should have a demonstrated ability to deal with the naturally occurring weather conditions on site.

3.1.5 Order of Operations: In the early stages of specification development, some stakeholders were concerned that the order of operations in the SWAT protocol moisture balance unfairly penalized controllers for not being able to predict rainfall. The original research conducted at the University of Florida in 2008 and 2009 aimed to examine this concern, but was inconclusive due to a lack of rainfall during the study period. However, the University of Florida follow-up research examined this same concern under periods of heavy rain and concluded that the order of operations did impact performance scores. Based on this conclusion, WaterSense is proposing that the order of operations implemented during the SWAT protocol daily water balance calculation be ET first, then irrigation, and then rainfall, rather than rainfall occurring first, as designated by the SWAT protocol. (Pages 3-4)

There is no science to support this conclusion. The comment that during heavy rains, the protocol impacted performance scores is not justification for the change. The change downgrades the importance of maximizing rainfall effectiveness as needed to meet consumptive use. Given that the consumptive use is fixed by climatic conditions and that rainfall's contribution is downgraded, the contribution from irrigation will need to be increased. This change will result in wasting of irrigation water.

We should be encouraging the controller to adopt ever more sophisticated techniques for managing the RZWWS. This could for example include the development of a rainfall "look ahead" feature that improves the controller's grasp of rainfall probabilities. Improvements in dealing with rainfall probabilities will save irrigation water while not sacrificing vegetative quality.

From Examination of SWAT Protocol Utilizing a Performance Analysis of Weather-based Irrigation Controllers: Update With Extended Data, Michael Dukes, – January 20, 2011

General:

Instead of being a critique of the science involved in the SWAT testing protocol, the investigation concentrates primarily on the subtleties involved in developing passing scores.

The results of this study indicated that an ET controller's ability to handle rainfall is still one of the most important influences over the SWAT scores. Consequently, the dependence of SWAT scores on weather patterns indicates that the SWAT test is not transferable throughout the United States. An improvement to this problem would be to declare a minimum number of rainfall events within the 30-day period. This would benefit the transferability of the SWAT scores by increasing the potential for a higher amount of rainfall. It is likely that a controller that performs well in a frequent rainfall environment.

In general, the addition of a rain sensor increased or did not affect the SWAT scores obtained in any of the study periods. (Page 18)

Agree: "The Results of the Study..."
Disagree: "Consequently, the dependence..."

The variability of scores has nothing to do with the SWAT test transferability. The scores are an indication of how well each manufacturer has dealt with the challenge of integrating the

influences of the sciences involved. The best way to increase the rainfall events is to change the test period length from say one to two months and increase the minimum rainfall requirement to 0.80 in.

The removal of any runtime less than three minutes did not affect the number of reportable scores and only minimally affected the values of the scores by as much as a few percentile points. Though it may not have made a large difference for these study periods requiring a minimum runtime would create a more realistic test that would encourage more efficient irrigation practices.

There is no science to support this conclusion. Until the science is available, the controller programmers should have the latitude to establish programs that best demonstrate their system capabilities.

The controllers met the proposed minimum score threshold of 80% for irrigation adequacy, but generally failed to meet the 95% threshold for scheduling efficiency throughout all the study periods when using the minimum score of the six zones. This indicated that the scheduling efficiency score is critical to passing the SWAT test.
....The low scores from the Florida SWAT test were in contrast to the scores reported from the official SWAT tests that were nearly 100% for these controller brands...(pages 18-19)

It must be remembered that the 95% threshold for scheduling efficiency is purely arbitrary and has never been written into the testing protocol. The testing protocol reports the values for each zone. Averaging values was instituted by the SWAT committee. As originally visualized, the threshold values were best set by individual water purveyors. In chronically water short areas, high values could be justified. National standards may not be practical.

Further the values obtained represent the current “state of the art”.

...The effects of using an average may increase the passing rate of the test, but it would be at the cost of encouraging over-irrigation...(page 19)

I agree that performance values should not be averaged across zones.

....Accounting for rainfall before irrigation on a daily basis resulted in decreased scheduling efficiency scores in all of the study periods, but was most prominent in the frequent rainfall period and during the periods of frequent rainfall in the high and low ET_O *periods. The combination of using the average score across all zones and changing the order of calculations to the order of* ET_o*, irrigation, and rainfall ensured the highest rate of passing scores whereas using the minimum score across all zones and changing the order of calculations increased the passing rate to a lesser extent while encouraging appropriate scheduling techniques for all landscapes. (Page 19)*

Apparently the objective of the Florida study was to increase “passing scores” by changing the mechanics of the protocol. The objective of the overall effort should be to produce acceptable vegetation with a minimum of irrigation water.

The following definition was taken from the irrigation association website:

> *Smart controllers estimate or measure depletion of available plant soil moisture in order to operate an irrigation system, replenishing water as needed while minimizing excess water use. A properly programmed smart controller requires initial site specific set-up and will*

make irrigation schedule adjustments, including run times and required cycles, throughout the irrigation season without human intervention.

Note reference to “replenishing water as needed.” The actual value required is determined by maintaining a root zone water balance, including the contribution from rainfall, and replenishing the deficit with irrigation water; changing the order of calculation amounts to ignoring rainfall. This will surely result in wasting irrigation water just to ensure “the highest rate of passing scores.”

File: 1000-9 (Cont/11)
Final Date: March 21, 2011
Submit to: WaterSense-products@erg.com

Commenter: George Alexanian
Affiliation: Alex-Tronix
Comment Date: March 2, 2011

Attached are our comments regarding the second WaterSense draft specification for weather based controllers.
George Alexanian

Alex-Tronix Irrigation Controls
4761 W. Jacquelyn Ave.
Fresno, CA 93722
(559) 276-2888
www.alextronix.com

Commenter Name: George Alexanian
Commenter Affiliation: Alex-Tronix Controls, Irrigation controller manufacturer since 1977
Date of Comment Submission: March 2, 2011 revision 2
Topic: Section 1.0: Qualified WaterSense smart technology methods.
Comment: It is proper ***to not*** limit WateSense labeled products to ET based methods.
Rationale: Limiting smart technology to ET based methods would have limited innovation of potentially simpler methods.
Suggested change (clarification): Last bullet point: “Using non ET based weather or climate sensors”
Topic 2.0: SWAT report criteria
Comment: Adhering strictly to a 5% surplus per zone in combination while starting with a full root zone makes it unreasonably difficult to pass for many controllers
Rationale: It will be difficult for controllers with 3 programs to satisfy six diverse irrigation needs of the virtual landscape which will rarely if ever be present in a real landscape environment. By Imposing a strict 5% surplus per zone in addition to that limitation is not reasonable, particularly starting with a full root zone.
Suggested change: Irrigation excess for the six zones shall not exceed a 5% average, or 10% on any one zone.
Topic: Section 3.1.3 Root zone working water storage
Comment: It is unreasonable to begin with a full root zone. Any irrigation on the first or second watering day will result in a potentially large surplus causing most controllers to fail by exceeding the strict 5% surplus requirement.
Rationale: Since the manufacturer has no control whatsoever in adjusting the setup as would normally be done by the user in the real world, any error, for example irrigating on the first or second day, will result in an immediate surplus.
Suggested change: Leave the starting point as the root zone being half full to allow for initial startup minor adjustments and the allowed surplus as an average of 5% for the six zones, with no zone exceeding 10%.

Topic: Section 5.2: Testing of add-on devices
Comment: I agree that the add-on need not be sold with the mated conventional controller. However, it is not practical and is cost prohibitive to require testing the add-on with every controller it could be mated to.
Rationale: An add-on simply breaks the common line to the valves much like some rain switches or soil moisture sensors. All controllers have a common line, and it makes no electrical or operational difference if irrigation is terminated or disabled by breaking the common line from one 24 VAC controller to another. For consistency, the EPA must then apply the same criteria for compatibility to rain switches and soil moisture sensors. I also understand the requirement for the add-on and existing controller to with meet the WaterSense specifications listed in sections 3 and 4. However, insisting that the add-on must be tested with every controller it may possibly be mated with would ignore the 13 million existing controllers which could immediately save a significant amount of water with a much reduced return on investment.
Suggested change: For WaterSense labeling, an add-on that only breaks the common line from a controller to valves must be SWAT tested with a conventional (non-smart) controller that in combination satisfy sections 3 and 4 testing and features criteria. Upon the successful completion of that representative SWAT test, the add-on may carry the WaterSense label when used with the controllers that the manufacturer certifies are in compliance that in combination satisfy sections 3 and 4 of this specification.
Topic: Section 8.0: Definition of an Add-on:
Comment: The distinction between an add-on and a plug- in is correct. However, the add-on ***does not communicate*** with the standard controller through a common wire connection, while a plug-in does communicate with the existing controller microprocessor by providing it data. The add-on is merely a switch that breaks the common line. There is no data transfer between the add-on and controller, hence no communication by definition.
Suggested change: Redefine the add-on device as: A product that modifies an existing system equipped with standard clock timer controller to use current climatological data as a basis for controlling the irrigation schedule. For the purposes of this specification, add-on devices are defined as those ***that break the common line wire connection between a standard clock timer and one or more of its valves.***
This revised definition can then properly apply to rain switches and soil moisture sensors.
Topic: Draft Supplemental Guidance document, section 3.2.2.2
Comment: It is not possible for the controller instruction manual to provide the information required to perform the SWAT test as representative of a real environment. If this must be included within the owners manual, it must be made clear that the settings cited were specifically made to accommodate the SWAT testing and that they are not to be used for the user's specific landscape watering needs.
Rationale: No real landscape has all six diverse soils, precipitation rates, slopes, sun/shade ratios, etc… The user may be misled into using those specific settings for his landscaping unless it is clearly stated other wise.
Suggested change: Omit the list of settings used for SWAT testing in the owners manual. They will only confuse the users.
Topic: Section 3.2.2.3: Add-on testing configuration

Comment: modify this section to match section 5.2 of the specifications that an add-on need only be tested with one representative controller that satisfies sections 3 and 4 and that a list of other controllers that in combination satisfy sections 3 and 4 be certified by the manufacturer of the add-on and not be tested or sold with those controllers.
Topic: Section 3.2.3: Product documentation
Comment: Modify section that requires the listing of all the controllers that the add-on was tested with to say that it should list ***the*** controller it was tested with and that a list of other controllers that in combination with the add-on satisfy the WaterSense labeling is also provided.

Topic: Product retesting section 3.6.2 in Supplemental Guide
Comment: Since the labeling has been extended to commercial systems, It is not practical or reasonable for retesting purposes that a product may be chosen from a job site by the LCB either annually or every five years. For instance, if the existing controller is a pedestal mounted controller as part of a central system, it would be totally unreasonable to ask that the pedestal unit be removed from the field in order for it to be SWAT tested at a different location. For one thing, the field pedestal is not generally programmable by itself and is reliant upon a central computer system. The cost of a field mounted pedestal, cost of testing, and replacement may be well over $10,000 while the add-on may be less than $100. This another example where the add-on can be certified to be compatible with the controller if together they meet the sections 3 and 4 requirements without separate SWAT testing.

Commenter: Tom Fairey
Affiliation: DB Live
Comment Date: March 2, 2011

A completed Public Comment Template is attached. (Third try!)

Thank you

Tom Fairey

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Tom Fairey

Commenter Affiliation: DbLive Corp

Date of Comment Submission: March 2, 2011 (Fourth submission: first submitted during question and answer period, later submitted Feb. 26, 2011 without this template, second submission earlier today using this template.)

Topic: Change Name of Test and the Subject Device

Comment: Michael D. Dukes, University of Florida, Publication # AE442 provides factual basis for changing name to "Climatologically-based Controllers". "Weather-based is incorrect for the subject devices. Basis for change is more fully developed in the Rationale at the bottom of this form.

Rationale: If left unchanged, EPA will be encouraging market misrepresentation.

Suggested Change (or Language): "Climatologically-based Controllers"

Topic: If name is not changed, require a sticker or prominent sign on the device clarifying its functionality.

Comment: Sticker necessary to avoid abetting misrepresentation of controller functionality to the purchasing public. Sticker should say, "Not a weather forecasting or weather predictive controller"

Rationale: You will in the future write a specification for weather-forecasting controllers. To avoid confusion the current specification should be properly named.

Suggested Change (or Language): Climatologically-based Controllers

Rationale:

The term, "weather based controller" may possess the acceptable etymology for your purpose, but, accounting for what the general public understands by the term, "weather based", its use is ambiguous to describe the class of controllers on which your specification is focused and will result in marketing misrepresentation. I do not believe you intend to do that. The general public will imply or assume weather prediction or forecasting capability along with the meanings you intend. Please conduct your own poll outside of your group. I believe you will find that most people understand the term "weather based" to connote predictive or forecast functionality as well as current and historic observed weather elements. The more precise terms, "climate based controllers" or "climatologically-based controllers" may be rejected by marketers because most consumers and many professional irrigators do not know the precise meaning of "climate" and make no distinction between "weather" and "climate". Other correct descriptive terms would be "historic/current weather based controller", or "Irrigation Controller based on Historic/Current Weather", but, both of those, of course, would be awkward for a manufacturer's promotions and labeling.

If you feel you must persist in the use of the term "weather-based", it would be appropriate to require a sticker or other notice on the unit and in the users guides that it specifically does not have weather forecast capabilities.

Another reason you may wish to solve this issue now is that you may soon be faced with creating a specification for a true "weather forecasting controller". The water-saving potential of such technology is nine times that of a toilet replacement and six times that of a rain sensor. FYI, DbLive Corp (www.dblive.com) has developed, manufactured and is selling such a device. An add-on to existing controllers, its water saving performance is so great and its cost so small that it is readily selling without the Water Sense label. Because of the stochastic nature of future weather, it will be extremely challenging to fashion a test protocol for this technology, and, of course, it would be impractical to test it in combinations with the millions of controllers up to 40 years old which it converts

to superior water saving performance. Note that converting these existing water wasting controllers to greater water saving performance than the latest non-forecasting systems offered will save far more water than incremental improvement in the one million new controllers installed each year.
Our common goal is to save water! We look forward to helping the Water Sense program any way we are able.

Topic:

Comment:

Rationale:

Suggested Change (or Language):

Topic:

Comment:

Rationale:

Suggested Change (or Language):

Commenter: Gary Okafuji
Affiliation: The Toro Company
Comment Date: March 11, 2011

To EPA WaterSense,
As requested, my comments are resubmitted in the format requested.

Regards,

Gary Okafuji
Manager, Electronic Test Lab
The Toro Company - Irrigation division
951-785-3378
Gary.Okafuji@toro.com

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Gary Okafuji

Commenter Affiliation: The Toro Company

Date of Comment Submission: 3-14-11

Topic: **"**All runtimes during testing must be greater than 3 minutes"

Comment: This should be brought down to greater than or equal to 2 minutes or made not a requirement at all.

Rationale: Zone #2 of the virtual landscape only allows a maximum of 6.60 minutes at a time before runoff starts to occur.
For smaller controllers that only have 3 programs and 3 start times per program, to keep this moisture balance in check, you have to water this zone everyday.
Using the hottest time of the year (at the site chosen) as a reference point, a weather-based controller would compare the current weather conditions with this reference point and subsequently adjust controller runtimes. Most of the year will have percent adjustments less than 100%.
The 3 minute requirement isn't an issue during the hottest time (percent adjust = 100%). But in cooler temperatures, if the percent adjust dips to 40% or lower, each runtime will be under 3

minutes. For cooler areas with smaller ETs, it's more problematic.

Suggested Change (or Language): Either the 3-minute requirement needs to change or the 6.60 minute max. runtime should be increased for zone #2 to approximately 12 minutes. This can be achieved by either or both of the following:

* Change the soil type
* Change the slope

Topic: "The Root Zone Working Water Storage (RZWWS), as defined in the SWAT protocol, must be programmed as full at the beginning of the test."

Comment: I'm not clear on this. If you mean the moisture balance (MB), at the beginning of 30-day test cycle, the moisture balance should start at ½ the RZWWS. e.g. Zone #2. RZWWS = 0.55 in. At the beginning of the 30-day test cycle, the MB = 0.28 in.
You can't have the test start with the zones' moisture balances at field capacity.

Rationale: With a rolling 30-day test period, a weather-based controller is making irrigation adjustments based on weather information from the past few day(s). If the 30-day cycle begins where the previous days are sunny, the controller will incorrectly irrigate, resulting in over-watering. This is an unfair and unrealistic assessment. The controller can't anticipate where the 30-day test cycle will begin. It needs weather data to make decisions. Having the test cycle start in the middle of the RZWWS allows the weather-based controller to make the appropriate adjustments.

Suggested Change (or Language): Keep the moisture balance as ½ of RZWWS at the beginning of the test.

Topic: "There shall be at least four days during test period with 0.10 inches or greater of precipitation for the test to be considered valid."

Comment: If the test is done in California (or other dry areas with little rainfall), this may be difficult to achieve.

Rationale: It's hard enough to meet the criteria with the current SWAT protocol. There's only about 2 periods out of the year where you can meet both the minimum requirements of ETo = 2.50 in. and rain = 0.40 in.. After crunching 2010 data from CIMIS Sta. #80, I found the additional 4-day requirement reduces the qualification period to only one period in the year (mid-Feb to mid-Apr) (see attached chart). If you reduce the requirement to 3 days, it opens up

another small opportunity in the fall. Another option is to extend test period to 60 days, and doubling the ETo and rainfall requirements to 5.00 inches and 0.80 inches, respectively.

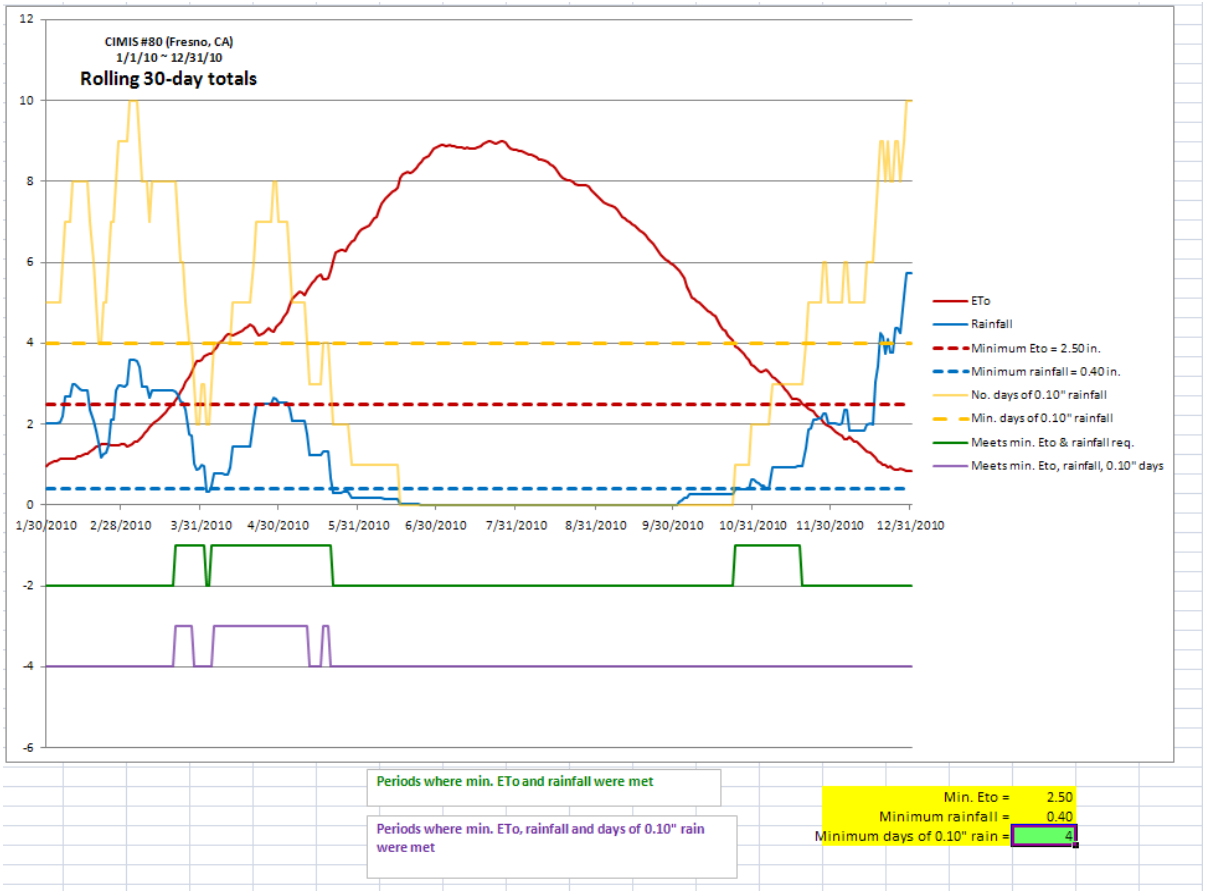
Suggested Change (or Language): Keep the current 30-day requirements but reduce the requirement of 0.10 inch rain days from four to three.

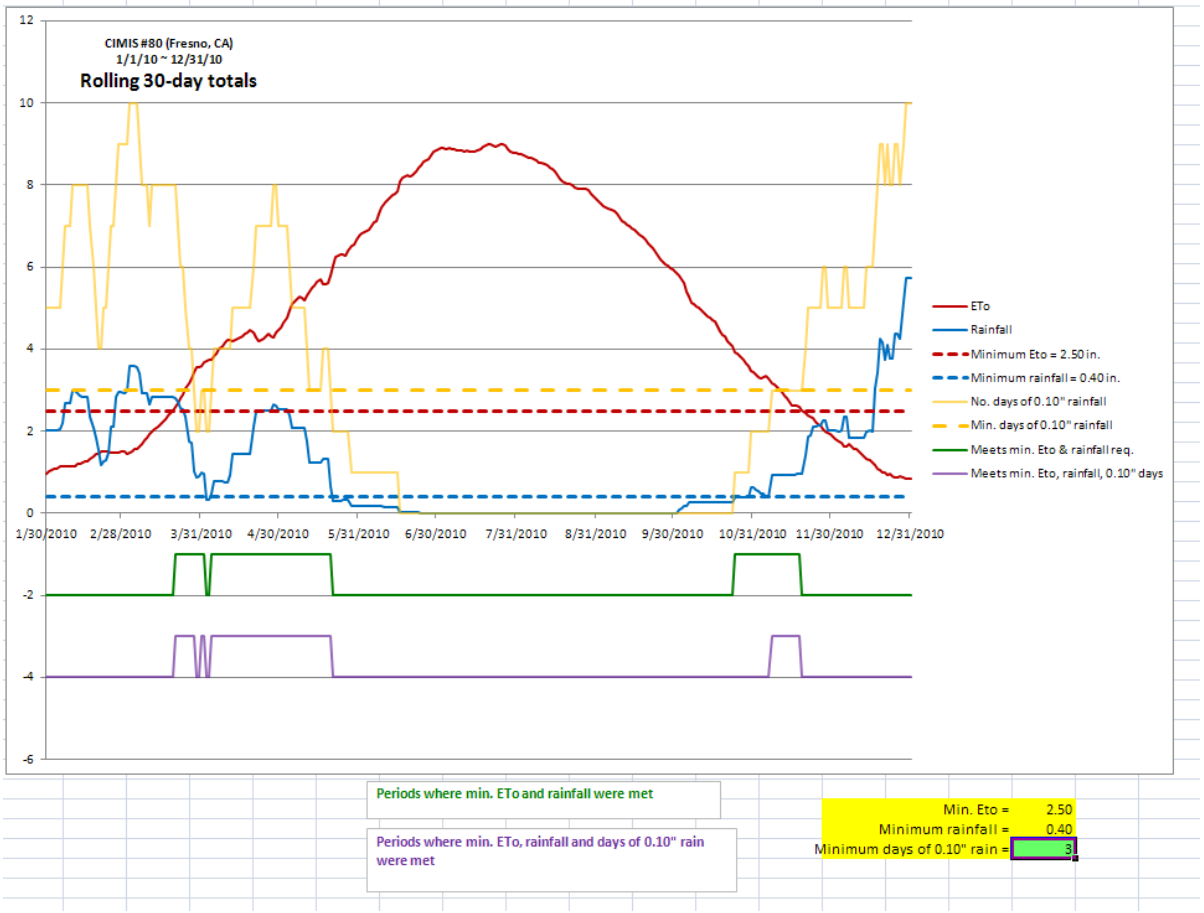
Topic:

Comment:

Rationale:

Suggested Change (or Language):




CIMIS #80 (Fresno, CA)
1/1/10 ~ 12/31/10
Rolling 30-day totals
12
10
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6
4
2
0
-2
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-6
1/30/2010
2/28/2010
3/31/2010
4/30/2010
5/31/2010
6/30/2010
7/31/2010
8/31/2010
9/30/2010
10/31/2010
11/30/2010
12/31/2010
ETo
Rainfall
Minimum Eto = 2.50 in.
Minimum rainfall = 0.40 in.
No. days of 0.10" rainfall
Min. days of 0.10" rainfall
Meets min. Eto & rainfall req.
Meets min. Eto, rainfall, 0.10" days
Periods where min. ETo and rainfall were met
Periods where min. ETo, rainfall and days of 0.10" rain were met
Min. Eto = 2.50
Minimum rainfall = 0.40
Minimum days of 0.10" rain = 3

Commenter: Karen Guz
Affiliation: San Antonio Water System
Comment Date: March 14, 2011

To the EPA WaterSense staff involved with the Weather Based Irrigation Controllers specifications:

Attached is input from the San Antonio Water System Conservation Department. Please see that our comments are included in the public record.

Best regards,

Mark A. Peterson
Project Coordinator – Conservation
SAWS

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Karen Guz

Commenter Affiliation: Director of Water Conservation – San Antonio Water System

Date of Comment Submission: March 14, 2011

Topic: Testing Modification to the SWAT protocol 3.1.1. Irrigation events totaling 3 minutes or less shall be excluded from the daily water balance.

Comment: Keep the Alliance for Water Efficiency's draft language but ensure each test is identified as "cycle and soak" so as to prevent manufacturer "gaming" the testing.

Rationale: Short run times can be effective in clay soils as part of a cycle and soak component. However, they also can be used during the testing to maintain performance effectiveness not based in realty.

Suggested Change (or Language): Retain the Alliance for Water Efficiency committee's suggested language.

Topic: Section 3.2 Performance Requirements.

Comment: Manufacturers of these products and water purveyors have expressed strong disagreement on whether an average of the zones meets the performance threshold or each zone meet the performance threshold. This is an important conservation concern and will affect the WaterSense "brand".

Rationale: The EPA modified the original language as a result of follow-up research by the University of Florida. A passing rate for each zone rather than an average of six (6) zones clearly demonstrates the performance of the controller.

Suggested Change (or Language): Retain the EPA's proposed language.

Topic: Section 3.1.5 Order of Operations

Comment: Based on the follow-up research by the University of Florida, the order of operations "did impact performance scores", i.e., permitted more to pass testing. However, to retain some credibility, the order of operations should remain under current SWAT protocol.

Rationale: The proposal in the new protocol to allow rainfall to be taken into account later which would make it so that the water balance does not reflect that the controller may have irrigated the day or day before a big rain. Some think this is "more fair" to the controllers. Our concern should not be what is "fair to the controllers" but how well the controllers manage to minimize use of supplemental irrigation and allow maximal use of rainfall. If some controllers manage this better than others by either not completing filling soil with water, by having more accurate rain devices (tipping buckets or better rain sensors), or by using more complete weather data to anticipate rainfall to prevent irrigation then that should be reflected in the results for consumers. It is not good to take this as a comparison option out of the reports for the consumer. The proposed change also makes it appear that the controllers perform better against a person managing the irrigation system than they actually do.

There has been concern expressed that without this change, fewer controllers will pass and earn the WaterSense label. This is not a bad thing. It may be exactly what the program needs to retain credibility. There is a lot of concern among water purveyors that many WBIC products increase water consumption or do not save despite manufacturer claims. If fewer earn the label and there is more rigor to the standards, that could help overcome that perception.

Suggested Change (or Language): Retain the EPA proposed language.

Topic: Revision of the term "Irrigation Adequacy"

Comment: The minimum of 80% irrigation adequacy infers a poorer performance than a 100% adequacy, which the manufacturer may pursue by adjusting the controller. Yet the 80% achieves the greater water conservation.

Rationale: Although 80% is considered excellent from a conservation perspective, it is instinctive to look for 100% if you are a customer. Therefore the manufacturers are trying to get that adequacy closer to 100% than to 80%. This is a detriment to getting them to function well to not over-water. It may be part of why some controllers are not saving as much as we'd like to see. If the metric were re-worded in some way such that it was a proportion of how close it got to the 80% perhaps it could address that. In other words, make it sound good to be close to 80% instead of close to 100%.

Suggested Change (or Language): Provide for gradient terms such as Maximum Efficiency (80%) to Acceptable Efficiency (100-105%) or something similar.

Topic: Ensure that tests are performed by qualified testers, not the manufacturers

Comment:

Rationale: Testing by non-biased 3rd parties lends credence to the WaterSense label and prevents the input of illogical settings by the manufacturer.

Suggested Change (or Language):

Commenter: Peter Carlson
Affiliation: Hydropoint Data Systems, Inc.
Comment Date: March 15, 2011

Please find HydroPoint Data Systems, Inc. comments / questions to the WaterSense Revised Draft Specification for Weather-Based Irrigation Controllers

If you have any questions, please feel free to contact me.

--Peter

Peter Carlson | VP Product Management & Technology
HydroPoint Data Systems, Inc., provider of WeatherTRAK
1720 Corporate Circle | Petaluma, CA 94954
t 707-285-3236 | m 707-338-7033| f 707-769-9695
800-362-8774 | pcarlson@hydropoint.com
www.hydropoint.com

The green initiative with the fastest payback. Find out why:
www.weathertrak.com

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Peter Carlson, Vice President of Product Management & Marketing

Commenter Affiliation: HydroPoint Data Systems, Inc. Makers of WeatherTRAK ET Irrigation controllers

Date of Comment Submission:

Topic: Suggested new language on section 3.1.1 – minimum runtimes

Comment: Using a minimum cycle time of 3 minutes for a single irrigation cycle can be in contradiction to the WaterSense goals of water conservation due to the water lost to run-off.

Rationale: Cycle time requirements should be determined by a landscapes soil type (each soil has a different water infiltration rate), sprinkler precipitation rate and slope. If the landscape has soil with a low infiltration rate, like clay soils, a spray head with a standard precipitation rate on a steep slope, the ideal runtime will be less than 3 minutes.

In contrast, the total daily station runtime should not be less than 3 minutes. The controller should irrigate as infrequently as possible to promote a healthy landscape with deep root depths.

More detailed calculations can be provided if required.

Suggested Change (or Language):
Minimum Runtimes: The total station daily runtime (sum of all the daily irrigation cycles) that occurs during the test period must be greater than three minutes in duration. The total water applied to an individual station during a day's irrigation events totaling three minutes or less shall be excluded from the daily water balance calculation.

Topic: How will we be provided the Weather data by the certifying laboratory?

Comment: The WeatherTRAK controller utilizes ASCE-ET weather data to accurately calculate the amount of water a landscape needs and how often to irrigate. How will HydroPoint get access to the weather data so we can send the appropriate ET data to our controller?

Rationale:

Suggested Change (or Language): Using the SWAT protocol, CIT handled this situation by making the source of the ET value available.

Topic: How do we verify the quality of the weather data used by the test?

Comment: How is the weather data (ET data) used as part of the test validated and quality assured?

Rationale: Weather station measurement equipment is subject to outdoor real-world conditions that require the data to be validated. Some of these conditions include birds setting up nests on a tipping rain bucket, or on an anemometer.
Also, weather stations must be properly sited to ensure that the data they collect is not biased by nearby equipment such as a air condition or air flow interrupted by a building. Both the National Weather Service (NWS) and CIMIS (California Irrigation Management and Information System) have weather station citing criteria for ET based weather stations.

http://www.cimis.water.ca.gov/cimis/infoStnSiting.jsp

Suggested Change (or Language):

Topic: More clarification on section 4.1 – duration to maintain time with loss power source

Comment: It is not clearly defined how long the correct calendar data and time must be maintained without an external power source.

Rationale: To keep time some power source is required. It is reasonable for a controller to maintain time through intermittent power outages that might affect a home or commercial property. However, since most outages last less than 4 hours (the actual number depends on where the location of the property). For remote areas, a power outage can last much longer.

Suggested Change (or Language): The controller shall be capable of preserving the contents of the irrigation program settings and the correct calendar date and time when the normal line power source is lost and without relying on an external battery backup for at least 72 continuous hours.

Topic: Removal or modification of manual operation limit in section 4.8

Comment: Troubleshooting is one of the many reasons landscape contractors utilize manual operation. Limiting the overall time a controller can run manual irrigation will require inefficient workarounds by landscape contractors to perform required operations.

Rationale: Troubleshooting is only one method of manual operation usage. Manual operation can also be used to learn station based flow (which helps find small leaks in the system) or syringe fertilizers put on the landscape. For higher station count controllers (48), learned flow takes about 4 minutes per station or about 3 and a half hours.
Since manual operation will normally be performed by a landscape contractor while he/she is onsite, it is unlikely that manual operation will be abused.

Suggested Change (or Language): The controller shall be capable of allowing for a manual operation troubleshooting test cycle. The manual operation shall be limited to 60 minutes per station per day. The controller shall automatically return to default mode even if a switch is still positioned for manual operation.

Or

Remove Section 4.8

Topic: Table 4.0 format confusing

Comment: The two columns provided in table 4.0 – Supplemental Capability Requirements are confusing. Remove the two columns.

Rationale: A controller that has the WaterSense label will be “Smart” and should always be in some smart mode. If the controller has lost communication with its signal or local senor it should still be in some “Smart” mode. By removing the columns, required in Smart Mode and Required in Standard Mode, these will just be requirements that all WaterSense controllers must meet.

Suggested Change (or Language):

Topic:

Comment:

Rationale:

Suggested Change (or Language):

Topic:

Comment:

Rationale:

Suggested Change (or Language):

Commenter: Thomas Reynolds
Affiliation: Water Balance, LLC
Comment Date: March 15, 2011

It is my pleasure and privilege to contribute to this important work.

Find my comments attached.

Tom Reynolds
Tempe, AZ
602-463-5072

Commenter Name: Thomas Reynolds

Commenter Affiliation: Water Balance. LLC

Date of Comment Submission: March 15, 2011

Topic: Section 1.0

Comment: "+ Storing historical crop evapotranspiration (Etc) data characteristics of the site and modifying these data with an on-site sensor." I appreciate the brevity, but for general consumption, you might expand, to be clear.

Rationale: While the integration directly to Etc is subtle, the term "historical" is best applied to Eto. The crop or species adjustment factors are developed through remote research, ground-truthing methods, or an expert panel and perhaps some long-term validation in the field.

Suggested Change (or Language): Consider: Storing historical reference evapotranspiration (Eto) data characteristic of the site and modifying these data with an on-site sensor to make them more site- and period-specific. Generally, the localized Eto is then manipulated with credible crop or species adjustment coefficient(s), and perhaps also micro-climate and density factors.

Alternatively, or additionally, indicate to those new to the terms that for a complete explanation of "historical reference and crop evapotranspiration', please see IA SWAT Protocol.

Topic: Section 1.0

Comment: Again, I appreciate the brevity, you might expand, to be clear: Your "Using onsite sensors as a basis for calculating real time ETc" integrates such distinct elements almost to a fault. It is clear to me the authors really refer to controllers that will use on-site sensors to estimate site-specific, real-time Eto, which then can be modified for crop/species using coefficients that have been transferred from remote site research, ground-truthing methods, and long-term validation in the field. Non-turf species are then further modified with estimated factors to account for micro-climate and density.

Rationale: The use of sensors on-site to generate an estimate of Eto is accurate. The correction to this site-generated estimate can be modified just like the previous technique using historical Eto.

Suggested Change (or Language): Consider: Utilize on-site, non-plant, but climatologic sensors to generate estimates of Eto, then manipulate this estimate with additional estimates or coefficients that have been developed through transfer of remote research, ground-truthing methods, and long-term validation in the field and modified further for micro-climate and density.

Topic: Section 1.0

Comment: third bullet can be more explicit without getting overly wordy.

Rationale: People with no back ground will be utilizing this.

Suggested Change (or Language): Using a remote weather station as a basis for Eto and subsequent Etc calculations, transmission of the data to individual users at remote user sites

---

Topic: Section 1.0

Comment: "Using on-site weather or climate sensors" seems redundant, but that's OK. Others may ask, "Why does second bullet so resemble the last bullet?" But since it is there, it begs the question, isn't a soil moisture sensor is the ultimate weather sensor. Weather stations attempt to do what soil moisture sensors do directly. If you want to know what Eto is, measure it directly. Might consumers challenge the EPA with "There is a good reason we don't use weather data to calculate what room temperature is going to be."

Rationale: A logical conclusion. At this juncture, the public does not know WaterSense will, or will not, develop a soil moisture based specification. So what happens to this bullet point if the words "weather or climate" are removed?

Suggested Change (or Language): Using on-site weather or climate sensors, but ground-truthing sensors, such as stem-gauges or soil moisture sensors are not included at this time.

Topic: Section 2.0

Comment: "Irrigation adequacy and excess" has been rigorously scrutinized by the leading minds in the irrigation industry. The EPA can put a few more of the cards on the table. If the WaterSense seal of approval means we all can purchase these systems assured that over the course of a season, we can take soil cores to determine actual soil moisture content, and it is within 80% or 5%, as compared to the water-balance calculation residing in the controller's processor and log examined at any time, then fine. Early developers of the AZMet system in Arizona, at a seminar on expert systems in agriculture in 1982 stated (paraphrasing), "due to errors in the model, and additional errors across sensors, periodic ground-truthing to re-set the cotton soil water balance will be necessary."

An imperfect model is be used to validate and assure citizens that a distant relative at a research facility has been mimicked in their man-made, non-conforming back yard. The nutrition of the plants has just a bit do with ET principals reliability.
Rationale: Problem with transfer to non-conforming sites

Suggested Change (or Language): Weather-based Irrigation Controllers for Conforming Facilities

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Topic: Section 3.0

Comment: In 3.1.3**,** I totally appreciate the desire of the irrigation industry to provide assurance measures to the market. With the proper leadership and will every parcel and property with more than 1,200 SF of turf would receive one of these systems for $50.00 to $500.00, and it would handle all of the nation's turf, by law. Expect each installation could be tweaked to excellent efficiency, with the givens, on turf.

Bt, does the SWAT Protocol simplify matters a bit for non-turf areas in landscapes.

Rationale: The testing can not reveal what will really happen at properties across the nation and in the hidden, wetted root masses around plants and trees because the SWAT Protocol set plant densities Zones 3, 4, and 5 at or above 1. A density factor of "1" translates to full cover. Furthermore, it is unclear, but I hazard to guess, the assumption is that 100% of the areas are wetted, though it states, "…the protocol uses a simplified approach… where complete wetting may not be required."

Suggested Change (or Language): Root Zone Working Water Storage (RZWWS) starting point: The RZWWS, as defined in the SWAT Protocol, must be programmed as full at the beginning of the test. By full, we refer to turf zones at field capacity, not to be confused with Zones 3, 4, and 5 which must, in the interest of expediency, also be fully wetted zones. Future amendments to this specification Must address such realities as: **1)** usually less than 50% of the micro-drip irrigated areas are actually wetted, yet full production is easily achieved, albeit not without more frequent irrigation deliveries and (theoretically) closer attention to plant nutrition, **2)** criteria that embrace "xeriscapes", a construct from Colorado, whereby often there are significant spaces where plant canopy cover is incomplete, **3)** for nearly all new landscapes, canopies and root systems expand and/or become more dense, which effectively reduces the application rates, and **4)** conventional calculations of "precipitation rate" may need better explanation and assessment. All four items put pressure on us to further explore the term RZWWS in non-turf zones.

Topic: Section 3.0

Comment: Again 3.1.3 **-**The EPA has adopted The IA's SWAT Protocol, which includes a Table 1: Description of Zones Part (2)- Root Zone Working Water Storage (RZWWS) Calculations. The group consensus has remained that the root zone depths have been appropriately set. However, with root zone depths beyond 6 to 10 inches, with each additional increment, we make the challenge I have established above more implausible. The more shallow the rooting depth, the more likely those tests from the lab would agree with the data logged by the processor.

Rationale: Soil texture and bulk density will typically change with depth, as a function of man's interventions or as laid down over very long time.

Suggested Change (or Language): Add 3.1.6 *Particularly Critical Challenges for Future Consideration*: At this time, the IA SWAT Protocol assumes uniformity in soil physical properties throughout and slightly even beyond 2 feet in depth, which is reasonable for woody plants and trees. Users with plants and trees, particularly micro-drip irrigated ones, will be advised by manufacturers that periodic evaluation of the soil moisture content will be required with this first generation of controllers since your controller may be incapable of integrating variable soil properties below 10"-12", thus incapable of rendering a true estimate of soil moisture depletion verifiable by laboratory analysis.

Topic: Section 4.0

Comment: 4.5 - The relationship between station count and critical need for flow sensors may be a bit off point. Yet, station count is the only categorization available, it seems.

Rationale: The first rule of water management is water measurement. The reality is likely that water prices must increase, or rather stringent water budgets must be established and enforced, as a matter of regulation for dual metering to be affordable. Perhaps with millions of sensors deployed, sensor cost will decline.

Suggested Change (or Language): Clocks with 9 or more stations shall be capable…with a flow sensor.

Topic: Section 4.0

Comment: 4.1 – The model uses a checkbook method, and that value is present, yet inaccessible.

Rationale: The processor calculates estimated soil water balance, and acts upon those calculations.

Suggested Change (or Language): Furthermore, continuous, moving- 30 days of time & date stamps associated with the calculated RZWWS for each zone just preceding each cycle start shall be stored and accessible through a simple data port. Additionally, a button shall be available, which when pressed at any point in time for each zone, the calculated current balance in each RZWWS is shown by scrolling through stations on the display.

Commenter: Diana Schulz
Affiliation: Cyber-Rain
Comment Date: March 16, 2011

Thank you for the opportunity to comment on your latest draft specification, which are attached. Please confirm receipt of this message.

Best regards,
Diana Schulz

cyber rain
Diana Schulz
CEO
Cyber-Rain, Inc
6345 Balboa Blvd, Suite 230
Encino, CA 91316
818-749-7480 (mobile)
818-343-5200 (main)
818-343-5220 (fax)
DSchulz@cyber-rain.com
http://www.cyber-rain.com

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Diana Schulz

Commenter Affiliation: CEO, Cyber-Rain

Date of Comment Submission: March 16, 2011

Topic: 1.0 Scope and Objective

Comment: Slightly modify the 4 bullets to broaden their applicability and recognize that there is not a single ET calculation.

Rationale: The bullets are a little narrow in specifying how a controller receives weather information. They also refer to using 'ET' instead of 'ET principles' when modifying schedules, which does not reflect the fact that manufacturers use different ET equations. The language modifications are proposed to avoid inadvertently inhibiting innovation by excluding methods of collecting and using weather information.

Suggested Change (or Language):

Bullet #1: Add italicized phrase at the end so it reads: Storing historical crop evapotranspiration data characteristics of the site and modifying these data with an onsite sensor *or real-time weather inputs transmitted daily to the controller*

Bullet #2: Slightly reword (indicated in italics): Using onsite sensors as a basis for calculating real time *irrigation schedule adjustments based on ET principles*

Bullet #3: Slightly reword (indicated in italics): Using a central weather station as the basis for *irrigation schedule adjustments based on ET principles* and transmitting the data to individual users from remote sites

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Topic: 2.0 Each zone must individually meet performance threshold

Comment: The zone configurations being tested represent a wide range of landscape parameters, including some that do not occur commonly. Such 'extreme' conditions make compliance with some of the virtual landscape zones less probable than would be expected with less exotic, real-world conditions. Requiring each zone pass individually raises the performance threshold on manufacturers beyond a point of benefit for the majority of customers.

Rationale: The landscape parameters being tested represent a wide range of conditions and restrictions, with hydro-zones 3, 4 and 5 being fairly exotic. By requiring each controller to pass individual zones, manufacturers will need to increase the cost of their product to address the wide range of requirements. Measuring on combined results would be more representative of the majority of users.

Suggested Change (or Language): Performance should be measured in aggregate

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Topic: 3.1.1 Minimum run time of 3 minutes

Comment: Requiring a 3 minute continuous minimum run time on zones with clay soil and slopes (such as zone 2) are likely to cause significant surface runoff. The standard should be changed to allow manufacturers to cycle their watering so that the 3 minute standard is achieved through the sum of cycles within a specified period of time.

Rationale: Run-off is a well established problem and manufacturers have effectively addressed this problem through cycle and soak technology. Consumers are already receiving the benefit through reduced testing time. By artificially imposing a minimum 3 minute cycle time, consumers will incur increased runoff with no other benefit.

Suggested Change (or Language): Either no minimum run time or the aggregate of irrigation cycles within a 24 hour period of time is a minimum of 3 minutes.

Topic: 3.1.2.1 Missing Data

Comment: Refer to data as 'weather inputs' vs 'ET data'

Rationale: The term ET data is erroneous at its core. ET is not directly measurable. It is the summation of various Environmental Parameters (Weather Inputs) within the framework of a mathematical model (Penman equation or some variant) to calculate ET. Not all systems use the same modeling protocol so the term 'weather inputs' is more appropriate. Similarly, the source of the data should be more flexible, not limited only to an 'ET gauge' or similar device as the ET data moniker would seem to imply.

Suggested Change (or Language): Replace 'ET Data' with 'Weather Inputs' and replace 'reference weather station' with 'weather source data'

Topic: 3.1.3 Root Zone Working Water Storage Starting Point

Comment: Change assumed testing start point to 50%

Rationale: Few home owners or irrigation professionals know their root zone working water storage starting point when programming their controller. Therefore, in order to make programming more user-friendly, many manufacturers do not require the user to enter their starting point. For those that are required, most professionals assume a 50% starting point for ease. Therefore, using 50% is the most representative of how the controller will be used.

Furthermore, assuming a 100% MAD point when the product is sold to consumers could run counter to EPA goals. Instead of manufacturers sharing the universal goal of bringing the landscape up to field capacity immediate, the controllers would immediately begin reducing irrigation times. This could lead to widespread landscape stress and consumer dissatisfaction. In reaction, consumers could increase their water budget or even abandon their smart controller.

The concern was raised that it is difficult to achieve an accurate 50% MAD point in a testing environment. However, even a reasonable variation from this starting point in the testing environment will be considerably better representative of real-world use than a fully accurate 100% starting point.

Suggested Change (or Language): Root Zone Working Water Storage Starting Point should be programmed at 50%

Topic: Appendix A 1.0: Testing and Configuration

Comment: Manufacturer's should provide input into the initial scheduling of the controller.

Rationale: Irrigation controllers differ from many of the other WaterSense tested products (i.e. shower heads or rain gauges, which conserve water in a very specific, uniform way) in that there is a lot of variability in the underlying conditions imposed via the environment in which they must operate. Plant types, emitters, slope, soil, climate, root depth, etc. In addition, many of the people using the products are not educated on the subtleties of their landscapes. Manufacturer's are challenged to deliver devices that efficiently irrigate under varying conditions yet are both affordable and easy for consumers to use.

The drafted testing approach is exacerbating this situation, particularly since each zone must pass individually. The hydrozone parameters deviate widely from real-world landscape conditions and are not representative of a typical consumer experience. In particular, hydrozones 3, 4 and 5 are quite exotic in their conditions and restrictions. If manufacturers are not allowed to provide input as to how their controller should be initially programmed, they will be required to complicate their controller / user experience and instruction manual solely so the controller can be successfully tested. Yet the water savings benefits to the consumers will be minimal as few will encounter the extremes being tested in the hydrozones. It could even be argued that the consumer experience would be negatively impacted due to the increased complexity of the product and/or user manual.

Giving the manufacturer input into the initial scheduling is also consistent with the certification goals. The two criteria being measured are irrigation adequacy and irrigation excess, which are intended measure how well controllers adjust irrigation with changes in the weather. Inaccurate initial programming can adversely impact the results of a controller that would otherwise adjust irrigation times appropriately. The SWAT protocol recognizes this by allowing manufacturer's to fully program the controller prior to testing.

If the EPA wishes to test a typical consumer experience including both programming and weather adjustments, then the test criteria should be adjusted. Hydrozones should be redefined to be typical of a consumer landscape and/or the testing should be aggregate results across zones.

Suggested Change (or Language): Manufacturers may program the controller initially or provide specific instructions on the initial programming of the controller for each hydrozone to accommodate the virtual landscape.

Commenter: Steven Moore
Affiliation: Irrisoft, Inc.
Comment Date: March 21, 2011

To EPA WaterSense team,

Please accept my comments regarding the WaterSense Revised Draft Specification for Weather-Based Irrigation Controllers

Sincerely

Steven Moore
Irrisoft, Inc.
Office: 435-755-0400
Mobile: 435-770-3896

Public Comment Submission on WaterSense Documents

Response to: WaterSense® Revised Draft Specification for Weather-Based Irrigation Controllers – Version 1.0 dated January 20, 2011

Commenter Name: Steven Moore
smoore@irrisoft.net
435-755-0400

Commenter Affiliation: Irrisoft, Inc. – PO box 6266 North Logan, Utah 84341

Date of Comment Submission: March 19, 2011

Topics:

1. Add-On Device Testing
2. Seasonal Crop Coefficients
3. 3-Minute Run Time
4. Root Zone Water Working Storage (RZWWS)
5. Rainfall Requirement
6. Rain
7. “Mode” Requirements
8. “Rain Sensor”
9. Prohibited Watering
10. Manual Watering
11. Full Root Zone
12. Testing Location
13. SWAT Protocol

Topic 1: Add-On Device Testing

Comment: The Add-on testing requirement needs to be changed. It currently states in section 5.2:

> "Add-on devices must be tested with each base controller model with which the manufacturer intends it to be connected".

Allow me to reword part of a paragraph from the WaterSense Program News:

> "An estimated 13.5 million irrigation systems are currently installed in residential lawns across the United States. Of the 13.5 million units installed, the majority use standard clock timer controllers. *The simple installation of a WaterSense labeled Add-on device or* replacing a standard clock timer controller with a WaterSense labeled controller could save more than 10,000 gallons of water per household annually—that's nearly 150 billion gallons per year across the United States."

The biggest water savings will come from improvements to existing irrigation systems. There is a market for a simple add-on device that will reduce water use and perform to the specification.

Rationale:

1) Testing an add-on device with every possible controller will never happen. There are hundreds of models of controllers. It would be too costly and not practical.

2) It is not necessary.

3) When you see differences in performance results between add-on devices or the same add-on device tested with various controllers, the root cause of the difference has nothing to do with the capabilities of the base controller. The differences are caused by either weakness of the add-on device or a problem with the test process.

4) I have been working with add-on devices for 10 years and have yet to find a "Standard" controller that would not work with our equipment.

5) The principle behind an add-on device is very simple. The device interrupts the common wire to prevent the controller from activating a valve. The base controller performs the core function of how long a valve runs and when a cycle starts and the add-on device is smart enough to know if the cycle should water. Differences in the base controller do not affect the results.

6) Testing of add-on devices has demonstrated they are just as effective as fully integrated Smart Controllers.

7) I participated in the testing of add-on devices. We elected to test it with 2 different controllers; one feature rich and the other was a very basic low-cost controller. The results were not the same, but the difference in performance had nothing to do with the controller. The difference in performance scores had to do with the order of operations problem that has been identified and corrected. The interesting thing about that test was, the setup that earned the highest score was the low-cost controller.

8) If an add-on device can control the diverse landscape described by the SWAT protocol without over or under watering it is an amazing work of technology. It deserves the Water Sense Mark and the EPA should be grateful for such innovation.

Do NOT encumber the creative minds of this industry with the unnecessary cost of countless useless tests.

Suggested Change (or Language): Change section 5.2 Add-On Devices to read:

> The add-on device is not required to be packaged with the base controller(s) that it was tested with to meet the requirements of this specification. However, the product documentation for the add-on device must list ~~each~~ *the required specification* of the base controller model that the device was tested with to meet the requirements of this specification and with which the manufacturer intends it to be connected. The documentation must also contain a statement to the effect that the device is only WaterSense labeled when used in combination with a base controller that meets *the required specification* ~~on the provided list~~. *The add-on device shall be tested with a controller chosen by the Licensed Certificating Body that meets the specification as published by the add-on device manufacturer.*

Change Appendix A section 2.0 Add-on Devices to read:

> Add-on devices must be tested with ~~each~~ *a* base controller model *that meets the specification published by* ~~with which~~ the *add-on device* manufacturer ~~intends it to be connected~~. As a unit, the add-on device and the base controller must meet all of the requirements contained in this specification.

Change Appendix B section 3.2 to read:

> Only add-on devices certified to meet the requirements of this specification may bear the WaterSense label. Base controllers that the add-on devices are tested with and that are sold separately from the add-on devices shall not bear the WaterSense label. Product documentation shall indicate that the add-on device is only WaterSense labeled when used in combination with ~~the~~ a base controller~~(s)~~ that meet*s* the *required specification* listed in product documentation as described in Section 5.0 of this specification.

Topic 2: Seasonal Crop Coefficients

Comment: There is no detail in the specification to tell a Licensed Certificating Body how to deal with seasonal crop coefficients at testing locations. Read fine print associated with Table 2 called "Crop (Turf) Coefficients (Kc)" on page 6 in Draft 8 of the SWAT test protocol. The footnote states:

> "The Kc values in this table are meant to be representative for test purposes only. They should be verified before being accepted in specific locations."

1) What is the verification process?
2) How will the Licensed Certificating Body determine the values in this table?

3) How will those values be communicated to the Smart Controller Manufacturer?
4) How should this be documented in the User Manual, per requirement 5.1?

I would also like to point out that the test protocol does NOT provide any means to verify a Smart Controller responds to the season changes of the crop coefficient. The test period is only 30 days. A manufacturer can set a static Kc value for the month the device will be tested and achieve a passing score.

Rationale: Seasonal crop coefficients vary from region to region. I can site many references to this fact. But landscape water managers who have been implementing ETbased control for the last 20 years typically use a constant Kc value. They have not implemented seasonal Kc curves because of the complexity of the process, insufficient research and documentation of the Kc curves for most parts of the country.

The Irrigation Association BMP teaches a static Kc value incorporated into the KL value (Landscape Coefficient). There is no reference to a sesaonal Kc.

Suggested Change (or Language): The simplest solution to this problem is to eliminate the seasonal Kc table and use fixed Kc values for all zones. The better solution is to provide seasonal Kc tables for each testing location.

To get the specification released I recommend the simpler approach and suggest the following change:

Table 1: “Description of Zones” to be changed as follows:

- Zone 1, Item #6 Crop (turf) Coefficient (Kc) change to 0.64
    i. (Species factor - Cool Season Grass 0.8 x Microclimate factor - Low 0.8 x Density factor – Average 1.0)
- Zone 2, Item #6 Crop (turf) Coefficient (Kc) change to 0.6
    i. (Species factor - Warm Season Grass 0.6 x Microclimate factor - Average 1.0 x Density factor – average 1.0)
- Zone 6, Item #6 Crop (turf) Coefficient (Kc) change to 0.6
    i. (Species factor - Warm Season Grass 0.6 x Microclimate factor - Average 1.0 x Density factor – average 1.0)

Topic 3: 3-Minute Run Time

Comment: There is no question water is wasted when a sprinkler valve only comes on for 3 minutes. There is no time for the water to soak in. There are times a controller is used for other purposes such as; filling a pond, flushing a filter, cooling the turf etc. These functions may require valves to operate for a minute or less.

Rationale: Don’t impose changes to a controller design specification. But make sure the controller will perform as expected.

Suggested Change (or Language):

1) I want to make sure a Licensed Certificating Body does not misunderstand the intent. A controller manufacturer may design a controller to actuate a valve for less than 3 minutes; this should be allowed.

2) The test should ignore run-times less than 3 minutes. But station timing and the logging process may need to allow for a slight margin of error. I propose this minimum time be changed to 2 minutes and 55 seconds.

Topic 4: Root Zone Water Working Storage (RZWWS)

Comment: The heart of the SWAT Protocol is the RZWWS. The current RZWWS ranges from .55" to 2.25". These are unrealistically high for most landscapes. A more realistic RZWWS range is .25" to .8". The current range in the RZWWS makes it very easy to get a good score. Because a Smart Controller can earn the Water Sense mark with only an 80% adequacy score the controller should be tested under more realistic conditions.

Rationale: RZWWS is based in part on root depth. Many landscapes have turf roots at only 3" to 4" and shrubs and trees at 12" to 18". Yes, it would be better if landscapes had deeper roots and many do, but that is not the normal reality.

A tighter range will more accurately demonstrate the controller's ability to adequately water without excess. If a controller can demonstrate it waters efficiently with shallow rooted plants it will do just as well with deep rooted plants.

Suggested Change (or Language): Modify the RZWWS calculations table in the Protocol to shallower root systems resulting in RZWWS values ranging from .27 to a maximum of 1.14".

Zone 1: 5" root depth = 0.42"
Zone 2: 4" root depth = 0.27"
Zone 3: 12" root depth = 0.54"
Zone 4: 16" root depth = 1.14"
Zone 5: 20" root depth = 1.8"
Zone 6: 6" root depth = 0.35"

Topic 5: Rainfall Requirement

Comment: Paragraph 3.1.4 states:

> "….four days during the test period with 0.10 inches or greater of precipitation…."

I agree with this change. There needs to be some clarification in the definition of rain.

Rationale: The SWAT test protocol table 5.1 has two definitions of rain:

1) R = Gross amount of rainfall as reported in inches.
2) Rn = Net amount of daily rainfall to be used in moisture balance calculation.

Suggested Change (or Language): Add the word “gross” to paragraph 3.1.4:

> “….four days during the test period with 0.10 inches or greater of ***gross*** precipitation ….”
>
> However a better approach is described next:

Topic 6: Rain

Comment: The report from the University of Florida had numerous references to affect of rain on test results. This new revised specification addressed some of the issues by changing the “Order of Operations” and the requirement for at least 4 rain events. But there is room for additional refinement in the test protocol. The soil moisture model that defines performance standard should more accurately reflect real-time conditions.

Rationale: Rain is a bigger variable than ET. In the growing season ET rates will generally fluctuate between 0.10” and 0.35”. And changes from day to day normally do not vary more and 0.10.” In most of the country annual rain exceeds annual ET. To date so much of the market focus has been on ET and rain is often a secondary feature. I believe that we can look to California to see the reason for this. A majority of Smart Controllers have been developed with the needs of the southwest in mind. California gets very little rain and most rain comes in the “off” season, when people turn off automatic watering.

Generally smart controllers earning better scores have features that better incorporate rain measurements.

Rain that falls faster than the soil can absorb may run-off. Using the soil intake rate compared to hourly rainfall rates is accepted science in quantifying effective rain. Many manufacturers use soil intake rates as the means to limit effective rain.

The SWAT protocol is uses an older, less sophisticated, approach to quantifying effective rain:

> “RN = 0.8 (R), in. - Allows for an arbitrary loss of 20% of the rainfall to non-uniformity and runoff.”

The key word in this statement is “arbitrary”. Why should the EPA use an arbitrary value in this test when better science is available?

Suggested Change (or Language):

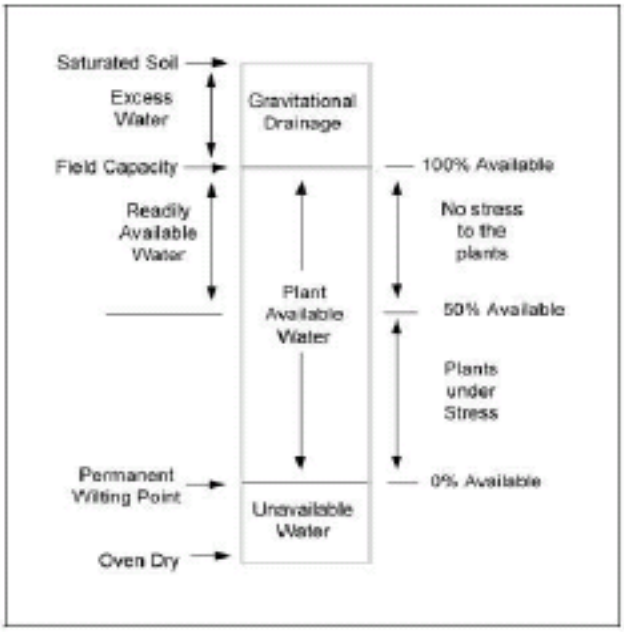
1) Change the Moisture Balance Spread Sheet calculations to an hourly time step. This means rainfall, ET and irrigation would be accounted for on an hourly basis. The model is far more accurate.

2) Eliminate RN = 0.8 (R), in. from the protocol and quantify Effective Rain based on the soil intake rate by ignoring rain that falls faster than the soil can absorb.

> a. Note: The SWAT Protocol already recognizes the soil intake rate to ignore run-off from sprinklers, this should be applied to quantify effective rain.

3) The SWAT protocol ignores the difference between Saturation and Field Capacity. This needs to be changed. The following diagram is taken from the Irrigation Association's Best Management Practices:

Figure 1-1
Soil Water Relationships within the Root Zone



The Irrigation Association BMP states, "Field capacity is the amount of water retained in the soil after ample irrigation or heavy rain when the rate of downward movement due to gravity has substantially decreased, usually one to three days after soil saturation."

Central Irrigation Control Systems and Smarter Smart Controllers recognize this fact and quantify the excess water to delay irrigation events. Excess soil moisture storage should be available to store rainfall but not irrigation. The additional water savings can be significant. I not only have science to back up this principle but years of experience utilizing this principle in Smart Control products.

Topic 7: "Mode" Requirements

Comment: The capability table in Section 4.0 Supplemental Capability Requirements can be simplified by eliminating the two columns labeled:

"Required In Smart Mode"
"Required In Standard Mode"

Rationale: Capability 4.2 and 4.3 should be required in Smart mode. Section 4.7 clearly describes the performance requirements. Having the two columns to differentiate between Smart Mode and Standard Mode does not add clarity.

Suggested Change (or Language): Eliminate the columns labeled “Required in Smart Mode” & “Required in Standard Mode”.

Topic 8: “Rain Sensor”

Comment: The capability table in Section 4.4 requires the input from a “Rain Sensor. A tipping bucket rain gauge should be recognized as a “rain Sensor”.

Rationale: Rain input to a Smart Controller may come from a variety of sources not just a traditional “Rain Sensor” often called a “Rain Shut-off Device”

Suggested Change (or Language): Add *tipping bucket rain gauge* to section 4.4 to read:

> 4.4 The controller shall either include a rain sensor or be capable of interfacing with a rain sensor or *tipping bucket rain gauge* and shall have a means for indicating to the user when the rain *event* ~~sensor~~ has suspended irrigation.

Topic 9: Prohibited Watering

Comment: Paragraph 4.6.3 states:

> “The ability to set irrigation runtimes to avoid watering during a prohibited time of day (e.g., irrigation will not occur between 9 a.m. and 9 p.m.)”

Why is this requirement? Are you looking for a new feature? I hope not.

Rationale: This can already be done with any controller.

A limited number of advanced control systems have a blackout period. This type of feature adds complexity. Plus most Smart controllers do not have a blackout window.

Suggested Change (or Language):

> **1)** Eliminate the language.
>
> And
>
> **2)** Add a requirement to the test that would not recognize any watering occurring between 9:00 am and 9:00 pm. (Similar to section 3.1.1 that excludes any watering less than 3 minutes.)

Topic 10: Manual Watering

Comment: Paragraph 4.8 states:

> "The controller shall be capable of allowing for a manual operation troubleshooting test cycle. The window for manual operation shall be limited to two hours, and the controller shall automatically return to default mode, even if the switch is still positioned for manual operation."

This is not SMART.

Rationale: Whoever added this feature has not spent even a week working in the field with irrigation systems. This is not needed, it will only create problems. Every controller has manual station control. If the user makes a mistake and leaves it in Manual Mode water will be saved because the clock will not activate a valve automatically.

Suggested Change (or Language): Eliminate paragraph 4.8

Topic 11: Full Root Zone

Comment: Section 3.1.3 states:

> " …The Root Zone Working Water Storage (RZWWS), ….. must be programmed as full at the beginning of the test.

I agree with change, but there still an inherent weakness in the starting point. The problem is related to the time of day when the test starts and when the smart controller receives or calculates ET and if rain occurs on the first day.

Rationale: Some controllers work with daily ET and others calculate ET on an hourly basis. Those that receive weather information from remote sites may be updated hourly or daily.

Rain and ET occur in real time. The ASCE standardized ET equation recommends an hourly ET calculation. Rainfall is typically measured on an hourly basis.

Test results could vary based on the time of day the test started depending on the ET and rainfall values occurring during the day.

Suggested Change (or Language): There are several options EPA could consider to resolve this issue:

1) Implementing moisture balance calculations on an hourly time step would resolve this issue very easily.
OR
2) Allowing the Licensed Certificating Body to adjust rainfall or ET values on the first day.
OR
3) See that testing begins early in the morning.

Topic 12: Testing Location

Comment: The Licensed Certificating Body should publish testing locations. The manufacturer should be able to choose the testing location.

Rationale: Smart Control systems that use central weather stations as a basis for the ET calculations transmit data to remote sites may not have available weather stations or communication infrastructure to any location in the United States.

Suggested Change (or Language): The Licensed Certificating Body shall publish testing locations. The manufacturer shall be able to choose the testing location.

Topic 13: SWAT Protocol

Comment: Section 3.0 Performance Criteria - The first introductory paragraph states:

> "…tested in accordance with the most recent version of the Smart Water Application Technologies (SWAT) test protocol for climatologically based controllers…"

Because the SWAT test protocol is incorporated into the testing process, I recommend the EPA review and approve changes to the SWAT test protocol.

In the "Summary of Major Changes" section 3.1 there is several recommended changes to the SWAT protocol. I recommend the EPA review and approve the changes when implemented.

Rationale: Leaving the language as it stands leaves the EPA open to the risk that the Irrigation Association could modify the SWAT test protocol without EPA approval or knowledge.

Suggested Change (or Language): Add "EPA approved" to the language:

> "…tested in accordance with the most recent ***EPA Approved*** version of the Smart Water Application Technologies (SWAT) test protocol for climatologically based controllers…"

Commenter: Brian Lennon
Affiliation: IRROMETER Co., Inc.
Comment Date: March 21, 2011

Please accept the comments attached.

Brian Lennon
Director of Sales

Office (951) 689 1701
Fax (951) 689 3706
Cell (951) 258 2988

www.irrometer.com

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Tom Penning/Brian Lennon

Commenter Affiliation: IRROMETER Co., Inc.

Date of Comment Submission: March 14, 2011

Topic: 2.0 Summary of Criteria

Comment: Irrigation excess of only 5% is too low.

Rationale: The 5% excess limitation is less than the normal leaching requirement practiced for salinity management of 10%.

Suggested Change (or Language): Change the zone excess criteria to 10% here as well as in 3.2.2.

Topic: Section 3.1.1 Minimum Runtimes

Comment: Short duration run times of 3 minutes or less should not be excluded from the calculations.

Rationale: Such short duration run times are very realistic for steep slope and fine textured soil applications. While the University of Florida research indicates that longer run times may be realistic for purposes of the certification testing, it may send a message to users of the equipment not to schedule short run times in practice. With the primary intent of this program for residential and small commercial applications, it must be realized that such small systems do not have long pipe runs and often do not necessitate long run times for hydraulic considerations.

Suggested Change (or Language): Eliminate this short duration run time requirement.

Topic: 5.2 Add-On Devices
5.3 Plug-in Devices
Appendix A, 2.0 Add-On Devices

Comment: Requiring the testing and labeling of add-on or plug-in devices with every specific model of controller is too prescriptive. This will inhibit innovation, and drive up the cost of the device for manufacturers and ultimately consumers.

Rationale: Irrigation controllers are typically designed in "platforms" or model groups which share the same basic infrastructure. New iterations of the same platform are introduced frequently to allow for cosmetic changes, variations in station count, market specific brands, etc.

Functionally these model groups have the same capabilities and their compatibility with add-on or plug-in devices remains unchanged because the manufacturers wants to manage costs and ensure compatibility with their own ancillary devices.

Add-on devices such as rain, flow, and soil moisture sensors have been used in the industry for years and have a proven track record in testing. These devices are universal in nature and require minimal controller capabilities to function.

These add-on or plug-in devices could be tested with a representative sample from each controller model group since the outcome would be consistent across the controller capability set. The controller manufacturer would benefit from consolidated testing

efforts. This would also reduce costs and inventory burdens for the retailer and reduce confusion for the consumer.

The controller manufacturer can provide labeling on their packaging that serves to identify what type of add-on or plug-in interface is compatible with their product platforms. The packaging for the add-on device can be labeled to match up with platform types. For example the controller could be labeled to indicate that it is "compatible with dry contact type switch closure devices, or compatible with common interrupt type add-on devices". The add-on device can be labeled that it was tested with certain controller model groups that use the appropriate interface capability.

Suggested Change (or Language): Require that the controller manufacturer identifies and displays a interface capability based on model groups or "platforms" in order to allow integration of add-on or plug-in devices.

Suggested language: The add-on device is not required to be packaged with the base controller(s) that it was tested with to meet the requirements of this specification. However, the product documentation for the add-on device must list which controller model group(s) the device has been tested with and the interface capabilities necessary to perform as tested. The controller manufacturer must also provide a designation on the controller packaging to indicate its model group and interface capabilities required to ensure compatibility with the add-on device. The documentation must also contain a statement to the effect that the device is only WaterSense labeled when used in combination with a controller identified as belonging to the same model group as tested and labeled.

Example: The Acme Rain Switch is a dry contact type switch closure device. It has a WaterSense label only when used in combination with the following controllers: Coyote model groups A, C, F,- Yosemite model groups #1, # 7S.

Topic: 8.0 Definitions, Add-on device

Comment: Such add-on devices may interface with a controller through a common wire connection or as a switch input to a defined auxiliary input connection (sensor port).

Rationale: Depending on an individual controller's capabilities, it may be better suited to interface as a sensor input rather than as a common interrupt device.

Suggested Change (or Language): For purposes of this specification, add-on devices are defined as those that communicate with the standard controller through a common wire connection *or interface with a controller through a defined sensor input connection.*

Topic: Draft Supplemental Guidance for WaterSense® Certification and Labeling of Weather-Based Irrigation Controllers, Section 3.6.2 Product retesting

Comment: Random testing every year is not realistic for a manufacturer with a small number of applicable devices.

Rationale: Many manufacturers of such equipment may only offer a relative few items applicable for certification. With fewer than five applicable devices some products will have been tested multiple times within the five year cycle

Suggested Change (or Language): Require a random testing cycle relative to the number of products a manufacturer offers, for example:

Less than five products offered –one test in five years.
Six to twelve products offered - random testing every other year.
Thirteen or more products offered- annual random testing of one product.

Commenter: Ben Silverman
Affiliation: Rain Bird Corporation
Comment Date: March 21, 2011

Please find Rain Bird's comments on the current draft of the WBIC specification attached.

Ben Silverman
Director, Consumer Products Division
Rain Bird Corporation
6119 E. Southpoint Road
Tucson, AZ 85715
520-741-6159 work
bsilverman@rainbird.com

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Ben Silverman

Commenter Affiliation: Rain Bird Corporation

Date of Comment Submission: March 21, 2011

Topic:
Irrigation Adequacy and Excess (Sections 2.0 and 3.2)

Comment:
We agree that irrigation adequacy should be greater than or equal to 80% for each zone.

We strongly feel that irrigation excess should be less than or equal to 5% for the average of all zones, the measure our industry has been working with for years.

Rationale:
Irrigation Excess is a measure to minimize excess or wasted water. The change in the current WaterSense Draft Specification for Weather-Based Irrigation Controllers to limit excess to 5% on each zone instead of 5% of the average of the six zones will adversely affect the scope of the WaterSense program and the ability of labeled controllers to save the most water. The SWAT test is the basis for the WaterSense specification and has been the reference test for Rain Bird and other manufacturers for many years. Our industry has worked with, designed to, and invested millions of dollars to develop products based on the expectation that excess would be measured as the average of the

six SWAT zones. Changing this measure now will inhibit or prevent some very good products from earning the label, succeeding in the market and thereby saving more water.

Measuring irrigation excess by zone and setting this performance specification too tightly may cause the Weather-Based Irrigation Controllers (WBIC) that have the potential to save the most water, those likely to be understood and installed by homeowners, to fail or inconsistently pass the test. The rationale for this belief is that the ability for a WBIC to save water is based as much on the controller's ease-of-use and understandability as on how accurately the controller calculates ET. Due to some design constraints, Weather-Based Irrigation Controllers that are much easier for average homeowners to understand generally will not perform as well on the WaterSense test. However, they are easy to use, will appeal to the mass market, and as a result they will be priced much lower than many other models of WBICs. If sold with the WaterSense label, these products will get installed in more homes and save much, much more water. Limiting excess to 5% on each zone instead of the average of the six zones will not save much, if any, additional water, and meeting a 5% average excess is very efficient compared with controllers in use today. Changing at this late date from the traditional SWAT specification that has been used for many years to the tighter WaterSense specification could very well prevent some of the WBIC products with the highest potential to save water from earning the important WaterSense label.

WBICs with simple user-interfaces are very capable of measuring and predicting ET, so the replenishment of water is accurate. However, with a simple user interface it is not possible to calculate the Root Zone Working Water Storage (RZWWS) in the controller logic and know when the root zone is "full". Generally, this is not a major issue, but at certain times of year when ET is low, even a few minutes of excess watering on a spray zone can lead to 5% excess. Despite providing the greatest opportunity to truly save water, with the 5% excess per zone requirement, the most promising, easy-to-use, mass market WBICs may be disqualified. More complex WBICs which calculate RZWWS are often not understood by the user. This lack of understanding will not show up in the WaterSense testing where the RZWWS variables are clearly defined, but it will result in wasted water in the real world when the controller inputs are less well understood and often programmed incorrectly. Programming confusion can lead to misapplication of water and has been a major contributor to slow WBIC adoption.

In order to get the greatest breadth of product with the most potential to save significant amounts of water, the EPA should keep the measurement of excess irrigation as the average of the six zones, as has been the reporting criteria for many years.

Suggested Change (or Language):
2.0 (bullet 2) – "Irrigation excess average for all zones shall be…"

3.2.2 – "…shall be less than or equal to 5 percent for the average of all zones."

Topic:
Minimum Runtimes (Section 3.1.1)

Comment:
We agree that it is often, but not always, desirable to have runtimes that are 3 minutes or greater, but any potential benefit of requiring a 3 minute minimum runtime is overshadowed by the potential to cause wasted water and expensive product changes for manufacturers.

Companies have already invested millions to put WBIC products on the market. Some controllers are not currently designed with a 3 minute minimum watering time. Adding this requirement at this late date will cause many manufacturers to add product development cost. At the same time this requirement will save little or no additional water.

In fact, adding this requirement could cause wasted water in some circumstances. When a cycle/soak feature is used on clay soils with a slope, very short runtimes (less than 3 minutes) are used to allow irrigation to soak into the soil without running off.

Rationale:
The minimal or zero incremental water savings do not justify adding this incremental requirement.

Suggested Change (or Language):
Eliminate Section 3.1.1

Topic:
Root Zone Working Water Storage Starting Point (Section 3.1.3)

Comment:
The RZWWS starting point should be the mid-point of the root zone as has been the case with prior SWAT testing. Many manufacturers have been working for years to the SWAT protocol. Changing this requirement at this late date unfairly penalizes manufacturers who believed they were doing the right thing by following a previously prescribed definition.

Rationale:

The RZWWS starting point may seem like an inconsequential choice for the specification, but there are a few important reasons to start the test with RZWWS at the midpoint of the root zone rather than with a full root zone.

First, if the controller comes out of the box set to anticipate a full root zone, users (who experience has shown rarely follow manufacturer's instructions) must saturate the irrigated area or they will think the product is not working when watering does not occur soon enough. Such a saturation requirement, even if followed in practice by the user would be a water wasting exercise. Also, if users skip this step, watering could be significantly delayed and plants will suffer and may die. It is safer and more practical to start the cycle with RZWWS water level at the mid-point. Based on real world practice, many users will not follow start up instructions to saturate their soil at startup.

Second, as discussed in the prior comments on Irrigation Excess, starting with a full root zone strongly favors WBICs that use more complex inputs over WBICs with simple user interfaces. It is not a good policy to penalize easy to use products as these are the WBICs that are most likely to benefit average homeowners. Additionally, manufacturers have invested millions of dollars to develop many of the controllers on the market with this starting calculation in mind. Changing this requirement at this late date, will cause some manufacturers added development expense to compensate for an administrative change to the test and will have no beneficial effect on saving water.

Third, we have heard of concerns about the difficulty of starting the test with the root zone half full. Starting half full or completely full are each easy, clear and understandable starting conditions for monitoring for the six standard SWAT zones. Since, the RZWWS is a fixed number for each zone, starting the test tracking spreadsheet with a full or half full RZWWS is equally easy.

Suggested Change (or Language):
Eliminate Section 3.1.3 or change the wording to start with all root zones 50% full of water.

Topic:
Order of Operations (Section 3.1.5)

Comment:
We agree with this change.

Rationale:
WBICs should not be expected to predict rain events. This change prevents penalizing a controller's test score for watering before a rain event occurs.

Suggested Change (or Language):
None

Topic:
Manual Operation (Section 4.8)

Comment:
A specific limit on the window of watering during manual operation is not needed as long as the user must specify a specific time. There are occasions where watering a zone manually for more than two hours is appropriate. However, having a timer-controlled manual operating mode and reverting to default operations following manual operation are important.

Rationale:
Adding the brand new 2-hour manual watering limit requirement at this late date will require many manufacturers to redesign products and add development cost to meet a specification that will not save additional water. We agree that manual watering should be limited, just not to 2 hours. The feature of returning to smart operation following the completion of a manual cycle is good practice and should be incorporated into WBICs.

Suggested Change (or Language):
Section 4.8 – Eliminate the words "to two hours".

Topic:
General

Comment:
Rain Bird acknowledges the great work of the EPA to incorporate input from a wide range of interested parties in the current revision of the Draft Specification for Weather Based Irrigation Controllers. This new specification is significantly improved from the prior specification. The EPA is to be commended on a job well done.

With this in mind, Rain Bird limited comment to what we consider VERY important improvements to the specification. Rain Bird and other manufacturers have invested millions of dollars in the development of a range of Weather Based Irrigation Controller products designed to save considerable water for customers in the commercial, professionally installed residential, and Do-It-Yourself residential market segments. These investments were made with the best available information: the SWAT testing

criteria. Rain Bird feels that the changes to the irrigation excess calculations, the 3 minute minimum runtime, and the RZWWS starting point in the current Draft WBIC Specification will not lead to meaningful incremental water savings, but they will likely have the effect of severely limiting the adoption of some very good products.

The specification changes we recommend will help manufacturers promote products with the WaterSense label to meet the needs of all customer segments and help the WaterSense program to accomplish much greater water savings.

Rationale:

Suggested Change (or Language):

Commenter: Eugene Carlson
Affiliation: CE Technical
Comment Date: March 21, 2011

Gentlemen:

Please find enclosed the re-submission of public comments in .PDF format

Eugene Carlson
CE Technical

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Eugene Carlson

Commenter Affiliation: CE Technical, Fresno Ca.

Date of Comment Submission: Saturday, 19 March 2011

Topic: 1.0 Scope and Objective

Comment: ETc as mentioned in Section 1 is a little confusing and may not be appropriate to stand alone controllers that will be tested under this protocol. To specify ETc as the basis for a controller's water application calculation requires a very large amount of resources and may not be applicable in a specific landscape environment. The use of ETo has much broader application without much, if any, degradation in results.

Rationale: ETc is ETo modified by a crop coefficient K. Each crop has a different crop coefficient. Present controllers mostly use a weather derived ETo and then base a water schedule upon the length of watering duration for a specific landscape environment. The adjustment for ETc from ETo is inherent in the protocol. In practicality, it is difficult to use ETc in a landscape irrigation controller and it may produce no benefit.

Suggested Change (or Language): First sentence is OK.
"Using onsite sensors collecting ETo as a basis for approximating real time ETc; Using a central weather station collecting ETo as a basis for ETc approximations and transmitting the data to individual users from remote sites; or"
Last sentence is OK.
"Because rain sensors do not modify ETo or ETc but interrupt irrigation events based on rainfall, they do not meet this onsite sensor requirement when used alone."

Topic: 3.0 Performance Criteria - 3.1.1 Minimum Runtimes

Comment: Run times less than 3 minutes are very practical and may be more desirable than any longer run time in some cases.

Rationale: "Cycle and soak" operation requiring runtimes less than 3 minutes may be used to successfully compensate for slope. An algorithm in a controller can be developed using short run times, less than 3 minutes, to compensate for or "interact" with rain events. It would be desirable to base a minimum runtime on a value that can be used to resolve application problems in the field.

Suggested Change (or Language): Eliminate the reference to minimum runtimes or make the minimum runtime a more practical value such as 30 seconds.

Topic: 3.0 Performance Criteria - 3.1.2.1 and 3.1.2.1.1

Comment: ET" ought to be replaced with "ETo"

Rationale: Provide a well defined type of ET received from the reference weather station. "ET" is very general and can be easily mistaken for other types of ET.

Suggested Change (or Language): Replace reference "ET" with "ETo".

Topic: 3.1.3 Root Zone Working Water Storage Starting Point

Comment: A RZWWS starting point ought to be placed at half full.

Rationale: A full RZWWS starting point does not allow a controller that must sense the environmental conditions over a period of time to disallow irrigation, enough time to gather that information. This could lead to an over irrigation condition of an otherwise fully qualified controller.

Suggested Change (or Language): Change "must be programmed as full at the beginning of the test." to "must be programmed as half full at the beginning of the test."

Topic: 3.1.4 Rainfall Requirement

Comment: The requirement of four days of rainfall greater than 0.1 inches is very restrictive in some areas of the country.

Rationale: In dry climates there may long periods of little or rainfall, this may, in some cases, extend the test for many months in dry climates when the rainfall events are under 0.1 inches.

Suggested Change (or Language): Maintain the general requirement but instead of using an average of 0.1 inches of rainfall across the country use a minimum. This minimum would be based upon the specific area of the country and a maximum expected time to test the unit. As an example: The minimum rainfall would be 0.025 inches over four events and, with this criteria, the test would be expected to last no more than 60 days.

Topic: Performance Requirements - 3.2.2 Irrigation Excess

Comment: The requirement of all zones meeting the maximum of 5% excess may be unrealistic in the light of the testing procedure.

Rationale: Very well qualified controllers are subject to a number of variables outside of the test protocol and parameters that affect their ability to provide consistent outcomes within this 5% tolerance. A consideration ought to be build into this protocol to allow for these unpredictable and uncontrolled variables.

Suggested Change (or Language): Maintain the overall efficiency at 5% but allow 1 or 2 zones to exceed the excess by some figure between 5% and 10%

Topic: 4.8 Manual Operation Window

Comment: The manual operation window is a little vague. The window of operation could be better defined by specifying a starting point.

Rationale: Manual operation can start with a zone or with an overall operation, going through a number of zones.

Suggested Change (or Language): The window of manual operation shall be limited to two hours from its last operator input and, if no further input is received from the operator within the last two hours, the controller shall automatically return to its default mode.

Topic: 5.1 General: Applies to Stand-Alone, Add-On Devices, and Plug-In Devices

Comment: The sentence instructing that the packaging materials "include an instruction manual that lists the settings and specific parts used during the performance test as described in Section 3.0." Do these also go to the end user or just to the testing facility?

Rationale: If they go only to the testing facility than it is appropriate and this document does not need to be placed into the marketed packaging. If it also goes to the user it appears there is little or no use to the user.

Suggested Change (or Language): Define to whom this literature is intended. If only to the testing facility it is appropriate. If it goes to the user then it can be eliminated or a renaming from "instruction manual" to " calibration certificate" would be appropriate if it must go to the end user.

Topic: 5.1 General: Applies to Stand-Alone, Add-On Devices, and Plug-In Devices

Comment: The marking of the product package ought to mention, as part of its features, that it can be used in "standard" mode. Many users do put their controllers in standard mode on occasion. It allows testing of the controller without interrupting or corrupting any of the weather based data to which they will return.

Rationale: The marking on the package ought to be left up to the manufacturer in accordance with good marketing practice. The "standard mode" of the controller is a very valuable feature for the user and it maintains the integrity of the weather based operation and its programming.

Suggested Change (or Language): Remove the sentence "The product shall not be packaged or marked to encourage operation of the controller in standard node.

Topic: 1.0 General

Comment: The sentence "The controller shall be programmed according to the list of settings provided by the manufacturer in the product's instruction manual, as described in Section 5.1 of this specification" is a little confusing

Rationale: The manufacturer's instruction manual will supply information on how the user is to properly manipulate the controller's input, "the list of settings provided by the manufacturer" is not definitive. Does it mean how to set the numbers or does it mean the value of the number themselves? A list of settings and how to set them will be supplied to the testing facility but may not be appropriate for inclusion in the manufacturer's instruction manual. It is appropriate the user receive information on how to set the list of settings they derive but probably not the settings themselves.

Suggested Change (or Language): Change to: "The controller shall be programmed according to the list of settings provided by the manufacturer, as described in section 5.1 of this specification

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Commenter: Loc Truong
Affiliation: WaterOptimizer, Inc.
Comment Date: March 21, 2011

Dear EPA,
Attached please find our comments to the Revised Draft Specification for Weather-Based Irrigation Controllers date Jan. 20, 2011.
Thanks,

--
Loc Truong
WATER OPTIMIZER, INC
TAMPA - JACKSONVILLE - SARASOTA - MIAMI - AUSTIN - DALLAS
4921 Memorial Highway, Suite 300, Tampa, FL 33634
V: 866-880-4030 F: 866-657-3665
http://WaterOptimizer.com

WaterOptimizer, INC.
U.S. & Foreign Patents Pending

March 21, 2011

WaterSense
United States Environmental Protection Agency (USEPA)
WaterSense
Office of Wastewater Management (4204M)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Re: Comments to Revised Draft Specification for Weather-Based Irrigation Controllers

Dear USEPA:

WaterOptimizer, Inc. is pleased to submit our comments to the latest Revised Draft Specification for Weather-Based Irrigation Controllers dated January 20, 2011. Please note that we had previously provided comments in January 2010 to the USEPA regarding the proposed specifications. We question the need to provide supplemental capability requirements as defined in Section 4.0. Our current comments are as follows in *Italics*:

3.1.1 Minimum Runtimes: All runtimes (irrigation cycles) that occur during the test period must be greater than three minutes in duration. Water applied during irrigation events totaling three minutes or less shall be excluded from the daily water balance calculation.

Comment: Was this intended to read "each zone must run for three (3) minutes"?

4.1 The controller shall be capable of preserving the contents of the irrigation program settings and the correct calendar date and time when the power source is lost and without relying on an external battery backup.

Comment: Many manufacturers have different means and methods of preserving the contents of the irrigation program settings and date/time without the use of a battery. For instance our controller, maintains both the irrigation program settings locally in non-volatile memory and is also able to maintain these settings remotely and can be sent to the controller after a power outage. While we meet this feature requirement as it is worded and we agree that it is an important feature, we do not feel that EPA should need to dictate a battery can or cannot be used (i.e. means and methods) since it does not either promote or help conserve water in any fashion. Please consider modifying the language to read as follows:

"The controller shall be capable of preserving the contents of the irrigation program settings and the correct calendar date and time when the power source is lost and power restored to the controller.

4.4 The controller shall either include a rain sensor or be capable of interfacing with a rain sensor and shall have a means for indicating to the user when the rain sensor has suspended irrigation.

Comment: What is the purpose of "having a means for "indicating to the user when the rain sensor has suspended irrigation." How long should the message on the controller appear for the user to see the message? Until the next irrigation event? This feature appears to be a "nice-to-have" feature vs. a feature that is consistent with water conservation mission of WaterSense. Please consider removing the second part of this feature requirement such that it reads:

"The controller shall either include a rain sensor or be capable of interfacing with a rain sensor to suspend irrigation."

4.6 The controller shall be capable of accommodating water restrictions as follows:
4.6.1 Operating on a prescribed day(s)-of-week schedule (e.g., Monday-Wednesday-Friday, Tuesday-Thursday-Saturday, any two days, any single day, etc.).

4.6.2 Even day or odd day scheduling or any day interval between 2 and 7, such as 3rd day, or every 4th, 5th, 6th, or 7th day interval.
4.6.3 The ability to set irrigation runtimes to avoid watering during a prohibited time of day (e.g., irrigation will not occur between 9 a.m. and 9 p.m.)
4.6.4 Complete shutoff (e.g., on/off switch) to accommodate outdoor irrigation prohibition restrictions.

Comment: We question if the above criteria actually provides water conservation or smart irrigation. Many times, individuals who have restrictions like these, will actually irrigate more. We would suggest that these criteria be left to each state or local government entity to determine if they require this criteria.

4.8 The controller shall be capable of allowing for a manual operation troubleshooting test cycle. The window for manual operation shall be limited to two hours, and the controller shall automatically return to default mode, even if the switch is still positioned for manual operation.

Comment: What is the purpose of limiting the manual operation of to two (2) hours? If a system has 48 zones, that means if a user starts a manual cycle it would only allow each zone to run 2.5 minutes, which is barely enough time to perform maintenance checks on irrigation systems to see if broken heads are present or check for adequate coverage of each zone. Please consider removing the time limit in this requirement so that it reads as follows:

"The controller shall be capable of allowing for a manual operation troubleshooting test cycle. The window for manual operation shall be user adjustable, and the controller shall automatically return to default mode, even if the switch is still positioned for manual operation".

If you have any questions or require additional information, please do not hesitate to contact us at 866-880-4030.

WaterOptimizer, Inc.

Loc P. Truong
cc: File

Commenter: Brian Vinchesi
Affiliation: Irrigation Association
Comment Date: March 21, 2011

Please accept these comments on behalf of Bran Vinchesi, chair of the Irrigation Association SWAT Initiative.

John Farner

_____
John R. Farner, Jr.
Federal Affairs Director
Irrigation Association

6540 Arlington Blvd
Falls Church, VA 22042-6638
T: 703.536.7080
F: 703.536.7019
john@irrigation.org
www.irrigation.org

Template for Public Comment Submission on WaterSense Documents

Commenter Name:	**Brian Vinchesi**
Commenter Affiliation:	**Chair, Irrigation Association SWAT Initiative**
Date of Comment Submission:	**March 21, 2011**

Topic: 1.0 Scope and Objectives – Data Sources and Use

Comment:
The revised specification has evolved significantly in its recognition that not all technologies must rely on ET. However, the IA's SWAT Initiative believes that there is still too much language throughout the specification invoking of the concept of ET within the scope. Examples of this bias include "…this specification applies to controllers that create or modify irrigation schedules based on evapotranspiration (ET) principles by...using onsite sensors as a basis for calculating ET…using a central weather station as a basis for ETc," etc.

The revised draft of the weather-based irrigation controller specification currently places a bias towards ET. The IA SWAT Initiative recommends using terms like "weather-based controllers using a water balance approach" or something similarly generic in nature.

The EPA should recognize that ET is only used as the benchmark for determining the effectiveness and performance of the controller in modeling landscapes' need for water. The actual approaches or mechanisms manufacturers may develop should be left to their discretion.

Rationale:
Controllers that use sources of weather data other than ET can perform at a very efficient level.

Suggested Change (or Language):
This specification applies to controllers that create or modify irrigation schedules that adequately supply water without excess compared to a soil moisture balance that is calculated using crop evapotranspiration rates based upon the ASCE Standardized Penman-Monteith equation by:

- Storing historical crop water use data characteristics of the site and modifying these data with an onsite sensor;
- Using onsite sensors as a basis for calculating real time plant water requirement
- Using a central weather station as a basis for determining plant water requirements and transmitting the data to individual users from remote sites; or
- Using onsite weather, climate or environmental sensors.

Topic: 1.0 Scope and Objective – Station Count Requirement

Comment:
The original concept of the SWAT testing protocol for "smart controllers" is for residential and light commercial controllers. The application of the protocol for commercial controllers is valid; however it is insufficient to adequately test products that have been developed to be centrally controlled when connected to a computer system, therefore the IA SWAT Initiative believes that this specification should not apply to central control systems. The controllers for the WaterSense label should be able to function as stand alone units and that station count should not exceed 48 stations.

Rationale:
Stating a maximum station count in the scope and objective section will define the intent of the testing protocol.

Suggested Change (or Language):
This specification applies to controllers for use in residential or commercial settings, not to exceed a maximum of 48 stations. Irrigation control systems that are often referred to as "central control" systems are excluded for labeling.

Add to definitions section:
Irrigation Central Control System: A computerized system that manages the operation of multiple controllers at one or more sites.

Topic: Performance Criteria – 3.1.1: Minimum Runtimes

Comment:
While the IA SWAT Initiative acknowledges that a minimum runtime may be desirable, three minutes may not be the ideal minimum time for an irrigation cycle. The ideal runtime is based upon the precipitation rate and the landscape characteristics, such as soil texture class, slope and the water requirement of the vegetation. Smart controllers should have the flexibility to calculate the runtime without (what appears to be) a random restriction that could disrupt an appropriate irrigation strategy of "cycle and soak," which minimizes runoff.

Rationale:
A reasonable programming instruction (whether calculated by the individual or by the algorithms within the controller) may lead to cycles of less than three minutes. The protocol as written will exclude such run events from the moisture balance calculation.

Suggested Change:
Irrigation days shall have a minimum of three minutes of run time, either as a single application or applied in a "cycle and soak" strategy, so that a minimum of three minutes of run time is achieved and the soak time does not exceed 30 minutes between cycle starts.

Topic: Performance Criteria – 3.1.2: Missing Data from the Reference Weather Station

Comment:
The IA SWAT Initiative supports the proposed approach for dealing with missing data sources.

Rationale:

Suggested Change (or Language):
None

Topic: Performance Criteria – 3.1.3: Root Zone Working Water Storage Starting Point

Comment:
The Irrigation Association SWAT Initiative recognizes that assuming a full RZWWS will be easier for licensed certifying bodies to implement. Selecting the first day for irrigation to

happen would require the licensed certifying body to do some calculations depending on the average ET_C for the time of year, which could be any number of days. By starting with a full root zone, depending on the time of year, there could be sufficient rainfall to refill some root zones, thus leading to no irrigation events for those zones during the testing period.

The IA SWAT Initiative believes that beginning the RZWWS at half-full is a better option, as it most accurately simulates real-world conditions (most root zone starting points are neither full nor empty).

Rationale:
SWAT recognizes the reasons behind the change, but believes that every zone should have at least one irrigation event occur during the testing period in order to qualify for product labeling.

Suggested Change (or Language):
All zones should have at least one irrigation event during the testing period.

Topic: Performance Criteria – 3.1.4: Rainfall Requirement

Comment:
The IA's SWAT Initiative generally supports this requirement. However the requirement may lengthen the time the controllers will be in testing mode to meet the minimum ET and rainfall requirements set forth by the specification.

Rationale:
N/A
Suggested Change (or Language):
None

Topic: Performance Criteria – 3.1.5: Order of Operations

Comment:
While the EPA recognizes correctly that the order of calculations do impact the scores, it is worth noting that the neither approach can be considered perfect or erroneous, rather they represent differing philosophies.

The approach taken in the SWAT protocol is to maximize the effectiveness of rainfall first. Irrigation is meant to be supplemental, meaning that irrigation takes place when there is insufficient precipitation to meet the water need of plants. As responsible irrigation managers and stewards of water resources, the IA SWAT Initiative believes that the effectiveness of rainfall should be maximized.

The IA SWAT Initiative also believes that controllers tested under the revised draft specification's order of operations will achieve a label easier than under the current SWAT protocol, as the use of rainfall is minimized during the testing period.

The IA SWAT Initiative also believes that the use of rainwater harvesting should be used wherever possible. The current SWAT protocol allows the controller to maximize this use of rainwater.

Rationale:
Irrigation is meant to be supplemental, meaning that irrigation takes place when there is insufficient precipitation to meet the water need of plants.

Suggested Change (or Language): Change the order of operations to count rainfall before irrigation. [Consistent with the most recent SWAT protocol].

Topic: Supplemental Capability Requirements – 4.2

Comment:
The Irrigation Association SWAT Initiative recommends that the controller should either be capable of independent, zone-specific programming, or storing a minimum of three different programs to allow for separate schedules for zones with differing water needs.

Rationale:
The language used to determining the controller's capabilities is vague.

Suggested Change (or Language):
"The controller shall either be capable of independent, zone-specific programming, or storing a minimum of three different programs to allow for separate schedules for zones with differing water needs."

Topic: Supplemental Capability Requirements – 4.5

Comment:
There are no provisions within the current SWAT testing protocol to use a flow sensor/flow meter to help initiate or alter an irrigation decision by the controller, such as low or excessive flow rates, which would indicate a problem, or to measure a specific amount of water being applied by a particular station. Since there are not any criteria within this draft protocol to validate the usefulness of what a flow sensor/flow meter would do, the flow sensor/flow meter requirement is beyond the scope of the protocol. The Irrigation Association SWAT Initiative recommends the elimination of this requirement.

Rationale:
There are currently no set definitions or protocols in place for determining the effectiveness of a flow sensor/flow meter. The IA SWAT Initiative believes that the current testing protocol, with a maximum 48 station count will achieve the goals set forth by the EPA's WaterSense program.

Suggested Change (or Language):
Remove the requirements set forth in section 4.5 and refer to station count in Section 1.0 Scope and Objectives.

Topic: Section 8.0 Definitions – Flow Sensor

Comment:
The Irrigation Association SWAT Initiative is recommending the removal of the flow sensor requirement.

Rationale:
See previous comments re: use of flow sensor.

Suggested Change (or Language):
Remove the flow sensor definition.

Commenter: Dan Nourian
Affiliation: National Diversified Sales, Inc.
Comment Date: March 21, 2011

Attached are comments related to January 20, 2011 WaterSense draft specification for Weather-Based Irrigation Controllers.

Best Regards,
~Dan

NDS: We Put Water In Its Place
(Powered by Our Core Values: Teamwork ● Communication ● Results ● Customer Focus ● Integrity and Trust)

Dan Nourian
Director of R&D
National Diversified Sales, Inc.

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Dan Nourian

Commenter Affiliation: NDS, Inc.

Date of Comment Submission: March 21, 2011

Topic:
Weather-Based Irrigation Controllers Draft Spec (January 20, 2011)
1.0 Scope and Objective

Comment:
Supported.

Rationale:
-

Suggested Change (or Language):
-

Topic:
Weather-Based Irrigation Controllers Draft Spec (January 20, 2011)
2.0 Summary of Criteria

Comment:
See comments related to 3.0 Performance Criteria below.

Rationale:
-

Suggested Change (or Language):
Revise in response to section 3.0 Performance Criteria below.

Topic:
Weather-Based Irrigation Controllers Draft Spec (January 20, 2011)
3.0 Performance Criteria

- 3.1.1 Minimum Runtimes
- 3.1.3 Root Zone Working Water Storage Starting Point
- 3.2 Performance Requirements

Comment:
A combination of three "Testing Modification to the IA SWAT Protocol" requirements are too restrictive:

1) A minimum runtime of three minutes;
2) Starting with a full root zone; and
3) Requiring "each zone" to pass adequacy and excess requirements.

Rationale:

- It will be a confusing requirement that undercuts the credibility of the WaterSense specification if testing requires three minutes but actual field applications do not. Actual field applications and conditions could exist where slopes, plant species, and soil types require less than three minutes of irrigation to prevent run-off. For water conservation, I'm confident the EPA does not want to mandate a three minute minimum for testing that may also impact longer field irrigation application when not necessary.

- There is no experiential or scientific data supporting the full RZWWS change requirement to the SWAT protocol. A half-full RZWWS starting point is a good starting point as actual conditions in the field will vary and the extreme of either full or empty RZWWS in the field is likely unrealistic.

- Each zone and real life field landscape designs vary. The IA SWAT test protocol mixes various soil types and is just one representation of many potential landscape applications mixed together. The test is to rate the performance of the controller as a whole … not one specific zone or one specific set of landscape parameters. Using an average of the six zones is a better representation of performance when actual real life landscape designs, irrigation method/components, and scheduling methods vary. Also, EPA reported that many who commented recommended the average of six zones be used to meet the performance criteria. These recommendations are from professionals that have been in the irrigation industry for many years and have a passion for water conservation and a desire to make smart controllers and the WaterSense program successful.

Suggested Change (or Language):

- Revise 3.1.1 language to one minute minimum runtime.
- Remove 3.1.3 RZWSS section.
- Revise 3.2.1 and 3.2.2 to reflect "average irrigation adequacy" and "average irrigation excess".

Topic:

Draft Supplemental Guidance for WaterSense Certification and Labeling of Weather-Based Irrigation Controllers (January 20, 2011)

3.2.2.2 General Controller Testing Configuration

- Manufacturers must have no interaction with the device during testing …

Comment:

Manufactures should be allowed some interaction with the device and certifying body before start of testing and during testing.

Rationale:

- Interaction should be allowed to validate the controller was set-up and programmed correctly as people can make mistakes or interpret instructions differently than what was intended.
- Electronics and components (controller and test equipment) are not 100% fail proof and could experience a failure at anytime.
- As smart controller technology is not an exact science and varying climates and/or geographic conditions can produce differing results, manufacturers

should be given the accessibility to fine tune irrigation schedules for the specific test location prior to the formal start of testing.

- Manufacturers have invested a lot of time and resources in developing smart controllers. It would be a waste of time and money for the manufacturer and LCB if the controller was not set-up or programmed correctly or if an electronic failure occurred during testing.

Suggested Change (or Language):

Revise 3.2.2.2 to allow the manufacturer the ability to:

- Check and accept set-up and programming parameters;
- Provide for a scheduling fine-tune period; and
- Review periodic test reports to monitor performance.

Commenter: Kent Sovocool
Affiliation: Southern Nevada Water Authority
Comment Date: March 21, 2011

Hello,

Enclosed are SNWA's comments on EPA's WaterSense Revised Draft Specification for Weather-Based Irrigation Controllers. If you have any questions or needs for clarification, please contact me.

Sincerely,

Kent

(See attached file: public_comment_SNWA.doc)

Kent Sovocool
Senior Conservation Research Analyst
Southern Nevada Water Authority
Phone: 702-862-3738
E-mail: kent.sovocool@snwa.com

PHYSICAL ADDRESS
100 City Parkway, Suite 700
Las Vegas, NV 89106

CORRESPONDENCE ADDRESS
Southern Nevada Water Authority
P.O. Box 99956
Las Vegas, NV 89193-9956

The Southern Nevada Water Authority and the Las Vegas Valley Water District operate on a four-day work week. Business Hours are Mondays - Thursdays 7 AM to 6 PM. Closed on Fridays - Sundays.

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Kent Sovocool

Commenter Affiliation: Southern Nevada Water Authority

Date of Comment Submission: 3/21/2011

Topic: EPA's development of a WaterSense Specification for weather-based controllers

Comment: SNWA is broadly supportive and appreciative of EPA's efforts to develop such a specification.

Rationale: A specification is necessary to highlight to customers the value of smart controllers, especially to the typical single-family customer who may not have an advanced understanding of plant water requirements. Furthermore, such a specification will provide for a standardized testing regime to assure customers and utilities that claims of performance are justified and meaningful and that products can be differentiated as potentially more efficient than others.

Suggested Change (or Language):

Topic: Section 1.0 Scope and Objective

Comment: The revised specification has evolved significantly in its recognition that not all technologies must rely on ET. That said, there is still too much invoking of the concept of ET within the scope as written. Some examples of these include the phrases "This specification applies to controllers that create or modify irrigation schedules based on evapotranspiration (ET) principles by", "Using onsite sensors as a basis for calculating ET", "Using a central weather station as a basis for ETc", etc. SNWA perceives the EPA is still implying a bias, probably inadvertently, towards ET. EPA would be better served using more generic terminology.

Rationale: The EPA should recognize that ET is only used as the benchmark for determining the effectiveness and performance of the controller in modeling landscapes' need for water. The actual approaches or mechanisms manufacturers may develop to approximate this should be left wholly to manufacturers' creativity and discretion. Also, the only "or" option appears in the third bullet possibly implying that the first two bullets are linked as requirements.

Suggested Change (or Language): Multiple – see below (any other references that imply bias towards ET throughout the document should also be checked and resolved using more neutral language):

". . .based on ~~evapotranspiration (ET)~~ **weather-based irrigation scheduling** principles . . ."

"Storing historical ~~crop evapotranspiration~~ data **on weather or irrigation needs** and characteristics of the site and modifying these data with an onsite sensor**; or**"

"Using onsite sensors as a basis for calculating real time ~~Et$_c$~~**irrigation need; or**".

"**Systems** using a ~~central~~ **remote** weather station as a basis for ~~ET$_c$~~ irrigation calculations **and the transmission ~~of~~ data to individual ~~users~~ controllers from remote sites; or**"

"Because rain sensors do not modify ~~ET_c~~ **irrigation schedule programming** but interrupt . . ."

Topic: Section 1.0 Scope and Objectives and throughout.

Comment: Though SNWA agrees the protocol should work for controllers sold for use in the light commercial market, SNWA perceives that both the original SWAT protocol and this specification are insufficient in testing scope to measure the performance characteristics of central control systems.

Rationale: Central control systems and the irrigation configurations used with these are more complex and diverse and the protocol developed by SWAT was not intended to evaluate these.

Suggested Change (or Language): Delete all references to central control throughout the protocol. As a practical means of doing this, here in the scope SNWA suggests the following language change :

"The specification applies to controllers capable of **accommodating no more than 48 irrigation stations designed** for use in residential **and/**or **light** commercial setting**s**."

Topic: Section 3.1.1 Minimum Runtimes

Comment: Though the desire for a three minute runtime to more closely approximate real-world conditions is understandable, whether three minutes is an ideal minimum runtime is unknown.

Rationale: In clay soils, especially on slopes, it is reasonable to expect that three minutes may result in runoff conditions with fixed pop-up sprays. Thus reasonable programming instruction may lead to cycles of less than three minutes ideally. The protocol as written though would exclude such run events from the moisture balance calculation.

Suggested Change (or Language): It is suggested EPA consider alternatively either a shorter run time minimum or deleting the requirement.

Topic: Section 3.1.2 Missing Data

Comment: SNWA supports WaterSense's proposed approach for dealing with missing data sources.

Rationale: Some type of standardized approach for dealing with missing data is needed for a national protocol. While CIT typically relied upon the quality controls associated with CIMIS this is probably unreasonable for a WaterSense Specification.

Suggested Change (or Language):

Topic: Section 3.1.3 Root Zone Working Water Storage (RZWWS)

Comment: SNWA recognizes that the change to assuming full RZWWS at the start of the test will likely make it easier for the testing labs to practically implement the testing regime. That stated, EPA must use caution in this approach.

Rationale: The revised assumption may cause some zones to never require irrigation during the testing period. A test in which certain zones never required irrigation may lead to erroneous conclusions and such a test would be non sequitur with the declared specification intent. SNWA is especially concerned about this possibility with respect to zones 4 and 5.

A full initial RZWSS may also not be consistent with the practical background assumptions manufacturers make with respect to the initial setup of smart controllers. If this is the case then the testing over this timeframe may be a poor indicator of real performance over longer time periods.

Suggested Change (or Language): At the least EPA should add the following statement, or something similar, to section 3.0:

"At a minimum every virtual zone must cycle at least twice during the performance period before a test may be deemed completed. The test must continue until this threshold is achieved."

Beyond the above language which appears to resolve the first concern, the EPA is encouraged to interview manufacturers regarding their assumptions that are made about initial conditions before the decision to implement a full initial RZWWS assumption is finalized.

Topic: Section 3.1.5 Order or Operations

Comment: The order of operations change is among the more controversial aspects of the revised specification. While the EPA recognizes correctly that the order of calculations do impact the scores, it is worth noting that the neither approach should considered perfect nor erroneous, rather they represent differing philosophies. SNWA can be supportive of either approach but feels EPA's initial understanding of the dynamics of this issue could be lacking and thus wanted to provide more clarity.

Rationale: SWAT's order of operations was designed to stress that the controller had to manage to allow room for rainfall in the water balance. The University of Florida in contrast observes that many controllers had "unfairly" negatively impacted scores because rainfall would occur later in the day (by extension this means that approach is more tolerant of overwatering). Ultimately SWAT was trying to push the envelope of the technology such that manufactures are encouraged to consider probability of future rainfall occurrences. U. of Florida was trying to determine if the calculation method was fair given the current state of smart controller technology.

It is important to recognize that everything else being equal this change is expected to improve the scores of controllers relative to SWAT testing.

Suggested Change (or Language):

Topic: Section 3.2 Performance Requirements

Comment: SNWA strongly supports the approach suggested in this draft that each zone must make the performance criteria.

Rationale: In many parts of the country irrigation of turfgrass does not represent the majority use for an irrigation system (ex. parts of the desert southwest). It is reasonable for both utilities and customers to expect that a WaterSense labeled product be able to perform in this type of environment as in any other.

Suggested Change (or Language):

Topic: Section 4.1 Supplemental Capabilities

Comment: It is unclear how long the controller must be capable of preserving the settings.

Rationale: This would appear to have to be defined if this is a specification.

Suggested Change (or Language): The language development should be straightforward once EPA determines how long it wants to have the reserve power / program memory last. Two-weeks seems like a reasonable minimum (if battery operated this would be per a new / fully-charged battery).

Topic: Section 4.5 Supplemental Capabilities

Comment: The suggested requirement that controllers with more than 48 stations have to be able to include or be capable of interfacing with a sensor seems unsupportable.

Rationale: As mentioned, SNWA's preference is to limit the specification to those with no more than 48 stations. If though EPA is committed to controllers with unlimited numbers of stations, it should be clarified that the SNWA considers the sentence portion "shall either include a flow sensor or be capable of interfacing with a flow sensor" to be vague to the point of uselessness and insufficient to assure a flow sensor capable central control unit or, for that matter, a quality central control product.

Suggested Change (or Language): Delete Section 4.5.

Topic: Section 4.6 Supplemental Capability Requirements

Comment: The SNWA appreciates EPA's attempts to assure WaterSense Weather-Based Irrigation Controllers will work well practically in field installations. Especially noteworthy is EPA's attempts to accommodate jurisdiction's varied watering restrictions as demonstrated in this section.

Rationale: In practical terms, utilities and other jurisdictions have and will have watering restrictions in response to possible water shortage conditions. EPA has made a strong effort to try to assure these products will align with these by covering essentially all of the common types of restrictions in this supplemental capabilities section. This is much more feasible than expecting jurisdictions to implement special exemptions for those with smart controllers.

Suggested Change (or Language):

Topic: Section 5.2 Add-on Devices

Comment: This is one of the controversial aspects of the proposed specification. SNWA's view on this depends on how EPA interprets the language. If the text means that the device may be labeled as WaterSense and that the manufacturer need only declare with packaging notes which product(s) the device was actually tested with using unbiased language then SNWA can be supportive of the approach.

If the marking of the package creates the impression on the customer that the device is only a WaterSense product when used with the devices WaterSense tested with then SNWA considers this to essentially exclude manufacturers of such products practically from the marketplace, slowing down significantly adoption of smart technology, and thus opposes this.

Rationale: In the United States there are countless existing irrigation controllers in the residential sector alone. So called add-on controllers that essentially make a traditional controller "smart" at a fraction of the cost should be of interest to utilities as they may be more readily adoptable by the property owner than the, on average, more expensive stand-alone controllers. Thus it should be of interest to EPA to attempt to facilitate these into the WaterSense program. Sections 5.1 and 5.2 suggest EPA recognizes the validity of this argument and is making a good faith effort to attempt to resolve it and accommodate it, but that EPA also has concerns with respect to these technologies.

SNWA's understanding of EPA's concerns with respect to add-ons is that just because an add-on achieved a particular level of performance with a given base controller, that performance level is in no way guaranteed or evenly necessarily proximal to that which might be achieved with a different base controller. SNWA agrees that EPA's concerns have validity, but believes that the approach outlined here will essentially be impractical to implement as a manufacturer of add-ons may have to test with every possible base controller/add-on combination to assure broad applicability of the label. The outcome will be that essentially these products will be severely disadvantaged versus stand-alone controllers and more importantly that the adoption of smart controllers will be seriously hampered by the language in the section. A different approach is needed.

SNWA suggests that EPA was generally on the right track with development of the prospective outlined here, but that it needs further tuning to be practical and effective to facilitating marketplace transformation. SWAT has never evaluated possible interactions between the base controllers and tested add-on products, but in logically considering the issue, there are three areas of capabilities of the base controller where interactions may cause significant issues:

The number of programs a base controller has,

The number of stations a base controller has, and

The number of start times the controller has per irrigation station.

These three aspects delimit the fundamental way an add-on smart controller can be configured to work with a base controller.

SNWA can foresee no other meaningful interactions (differing time increment capabilities could create minor interactions, but these are deemed de minimis in overall performance measures). So SNWA's following suggestion builds off these observations.

Suggested Change (or Language):

"The add-on device is not required to be packaged with base controller(s) that it was tested with to meet the requirements of this specification. However **the product must include documentation on the outside packaging stating the base controller the add-on device was tested with and the number of programs, stations and start times per station of said baseline controller. The language must be as follows:**

"*This is an add-on type of WaterSense Weather-based Irrigation Controller that was tested with a <manufacturer of base controller> <model of base controller>, an irrigation controller with <number of programs of base controller>, < number of stations of base controller>, and <number of start times per controller>. In principle the device should provide smart control functionality when used with similar base controller configurations, but such functionality and performance cannot be guaranteed by this label.*

The language is designed to give consumers practical information on the base controller specifications with which the device was tested, but does not force EPA into a guarantee of performance they are unable to make.

Topic: 5.3 Plug-in Devices and 8.0 Definitions

Comment: SNWA suggests changing this term to an alternative in Sections 5.3 and 8.0.

Rationale: The term "plug-in devices" is not broadly known in the irrigation industry and may imply a level of broad performance that is not consistent with EPA's interests or aforementioned concerns.

Suggested Change (or Language): SNWA suggests the term "proprietary devices" to clarify any confusion. For 8.0 while the term would be substituted here as well, the actual definition though should still work.

Commenter: Chris Brown
Affiliation: California Urban Water Conservation Council
Comment Date: March 22, 2011

Attached please find my comments on the WBIC spec. I have recieved a request by a Board member that the Council be given two weeks to gather a consensus position which can be made on behalf of the entire organization. This request is made due to the fact that the Council was left off the immediate notifaction of the comment process and workshop opportunity, despite being on the EPA's contact list, and that I had submitted comments in the first round.

If you see fit to give us the additional time, i commit to organizing a conference call meeting and working up comments which will incorporate all of the ouncil's diverse points of view: Water agencies, environmental advocacy organizations, and manufacturers/service providers.

thanks for your consideration.

--
*Chris Brown
*Executive Director
CUWCC
716 10th St. Suite 200
Sacramento, CA 95814

Template for Public Comment Submission on WaterSense Documents

Commenter Name: Chris Brown

Commenter Affiliation: Executive Director at CUWCC

Date of Comment Submission: 3/21/2011

Topic: Request for two weeks to submit a comment on behalf of CUWCC

Comment: Board members of the CUWCC, the largest standing statewide water conservation organization in the U.S. are requesting an opportunity to submit comments on behalf of the organization.

Rationale: the Executive Director and staff of the organization were not notified directly of the workshop opportunities or comment period by the EPA. This was verified in a

conversation with EPA staff who indicated that there was no evidence of delivery of notice to the CUWCC in the email program which was used to notify interested parties – despite the fact that the Executive Director has been on the list for a number of years.

Suggested Change (or Language): This will be developed by a committee of the Board which represents environmental organizations, water utilities, and manufacturers.

Topic: Test protocol

Comment: the SWAT test protocol is not robust enough for this labeling process as it is a bench test of the cpu, and not a field test of the actual equipment in the field.

Rationale: EPA's own analysis has pointed out the problems with the lack of specificity in the SWAT protocol, and

Suggested Change (or Language): Include a field test protocol of the irrigation controller.

Topic: 20% savings over existing technology

Comment: the WBIC technology has not shown in field studies the consistent ability to deliver the 20% water savings over existing technology that is the hallmark of the water sense label.

Rationale: The largest field study of WBIC technology completed in 2009 in California indicated that a significant portion of study sites saw water use increase with a WBIC. This most likely had to do with operational, maintenance, and installation issues. The Need for clear communication with potential end users that this technology will not deliver water savings unless it is properly used is paramount.
Suggested Change (or Language): include package labeling that clearly indicates that savings are not guaranteed, and that proper installation, operation and maintenance are required for water savings to be realized.

Topic:

Comment:

Rationale:

Suggested Change (or Language):

Commenter: Derres Catalano
Affiliation: Hunter Industries
Comment Date: March 22, 2011

Hello, Stephanie. I hope you received my voicemail regarding the submission of our notes on the Water Sense Specification draft. Please find Hunter's comments in the attached Word file.

Thank you and, again, I apologize for the late submission.

Derres Catalano
Product Manager, Controllers & Sensors
Hunter Industries
760-304-7278 office
760-521-3791 mobile
derres.catalano@hunterindustries.com
(See attached file: Hunter Industry Comments - Water Sense Draft Spec.docx)

Water Sense Draft Specification

- Section 2.0: "Irrigation Adequacy for each zone shall be greater than or equal to 80 percent as specified in Section 3.0"
  "Irrigation excess for each zone shall be less than or equal to 5 percent, as specified in Section 3.0"

  Comment: This requirement does not match SWAT protocol, which states that the average of all station must be greater to or equal to 80 percent. It would be difficult to achieve 80% or more efficiency and 5% or less excess.

- Section 3.1.4: "…there shall be at least four days during the test period with ,1 inches or greater of precipitation…."

  Comment: This may prove to be a difficult requirement to achieve, depending on the test lab location and the time of year. The comment was made during the last conference call that the manufacturer submitting the controller for testing has no input as to the location of the test lab. If it is the middle of the summer, for example, and the test is performed in Fresno, CA, there is a very low probability of passing this requirement.

- Section 3.1.5: "order of operations"
  Comment: This requirement puts all ET sensors that do not measure rainfall at a disadvantage.

- Section 4.8: “The window for manual operation shall be limited to two hours, and the controller shall automatically return to default mode, even if the switch is still positioned for manual use. “
  Comment: This requirement would be very difficult to implement in controllers, specifically the part about automatically returning to default mode. Currently Hunter’s irrigation controllers
  (and most others) use a physical switch to program various functions. In order to comply with this requirement irrigation controllers would require software based switch that could be programmed with logic to automatically return to default mode after a set period of time. Currently the“dial” is used my many manufacturers as the way to scroll through the different programming functions. This requirement would add cost to the product, and would change the design of current irrigation controllers significantly.

- Section 5.2 & 5.3 “…that the product documentation for the add-on (or plug-in) device must list each base controller that the device was tested with the meet the requirements of the specification and with which the manufacturer intends to be connected.”
  Comment: We support the current draft documentation. It makes complete sense that, in order to enjoy the benefits of the WaterSense label, the product must be confirmed (through actual testing) to meet the standards outlined in the test protocol with each controller.

Commenter: Mary-Ann Dickinson
Affiliation: Alliance for Water Efficiency
Comment Date: March 30, 2011

Dear Veronica and Stephanie:
Thank you once again for giving the Alliance for Water Efficiency an extension to file comments on the Revised Draft WBIC Specification. Our board has now officially approved the attached set of comments which we are hereby formally transmitting to you. If you need any further information please let me know.

Mary Ann

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Mary Ann Dickinson
President and CEO
Alliance for Water Efficiency
300 W. Adams, Suite 601
Chicago, IL 60606
773-360-5100 Phone
866-730-A4WE Toll free
773-345-3636 Fax
www.a4we.org

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Public Comment Submission on WaterSense® Revised Draft Specification for Weather-Based Irrigation Controllers

Commenter Name: Mary Ann Dickinson, President and CEO

Commenter Affiliation: Alliance for Water Efficiency, Chicago, IL

Date of Comment Submission: Monday, March 21, 2011

Topic: Appropriateness of Labeling Weather-Based Irrigation Controllers at this Time

Comment: The Alliance for Water Efficiency (AWE) supports labeling of weather-based irrigation controllers.

Rationale: AWE views weather-based control as an important technological improvement. In addition to several studies regarding water savings, the Bonneville Power Administration has launched a two-year study in 2010 to quantify expected energy savings due to reduced water distribution pumping as a result of

the use of weather-based irrigation controllers. Establishing these product specifications at this time positively influences technology development, and adds a key water- and energy-efficiency resource for professionals and consumers alike.

Suggested Change (or Language): None.

Topic: Definition of Weather Based Irrigation Controller: Exclude Soil Moisture Sensors

Comment: In our previous comments submitted January 2010 we suggested clarification of the definition of weather based irrigation controllers. Clarifying language in several sections of the January 2011 draft specification accomplishes this goal. However, soil moisture sensors are not specifically excluded as we suggested in January 2010**.**

Rationale: During our committee discussions we concluded that since soil moisture is not a component of weather, language excluding soil moisture sensors is not needed. The language in section 1.0 excluding rain sensors when used alone is sufficient clarification regarding weather related sensors.

Suggested Change (or Language): None.

Topic: 1.0 Narrowing Scope to Controllers that use ET

Comment: Unfortunately the introductory text of section 1.0 continues to narrow the scope to include only devices that utilize ET.

Rationale: AWE believes it is in the interest of all concerned that the doors remain open for currently unknown technology to earn the WaterSense label if it can be tested and proven to perform according to this specification.

Suggested Change (or Language): 1.0 First paragraph, last sentence: This specification applies to controllers that create or modify irrigation schedules reliably comparable to evapotranspiration (ET) principles and methods such as: (followed by the bullet list in section 1.0 with “or” after each bullet)

Topic: 1.0 Application of Specification

Comment: The January 2011 draft specification partially addresses AWE concerns regarding application of the specification as determined by number of zones by not specifying any number of zones. However, the current text “this specification applies to controllers for use in residential or commercial settings” is open to wide interpretation.

Rationale: The SWAT protocol “was developed to test products designed and sold for use at homes and similar scale light commercial and institutional properties.” The protocol “may not be suitable for products

using larger more demanding systems used at parks, golf courses, etc." It might make sense to include SWAT scope language because it is consistent with the intent of the protocol on which this WaterSense specification is based.

Suggested Change (or Language): Replace last sentence in 1.0 with: This specification applies to controllers used at homes and similar scale light commercial and institutional properties. This specification does not apply to central control systems.

Change stand-alone controller definition:
This includes a single controlling device (i.e. the irrigation controller) and all of the on-site sensors and/or on-site receiver for direct climatological data without intermediary hardware/software.

Add to definitions section:
Central control system: A system of one or more controllers connected to a central processing unit or other intermediary hardware/software interface between the controller and a weather station.

Topic: Section 4.0

Comment: The January 2010 AWE comments specifically pointed out that 4.2 and 4.4 of the November 2009 draft specification were nearly identical. AWE also suggested performance based criteria rather than restrict innovation due to prescribed criteria. AWE applauds most of the January 2011 draft specification changes to 4.0 Supplemental Capability Requirements.

Rationale: The table format of the January 2011 draft specification is concise, readable and easy to understand. The current language in 4.0 is for the most part performance based.

Suggested Change (or Language): See following comments regarding section 4.0

Topic: 4.3 Indicating to the User when the Controller is not Receiving a Signal or Local Sensor Input

Comment: The table titles for columns make it unclear whether the capability is required when the controller interface indicates that the controller should be in smart/standard mode or whether the capability is required when the controller is actually operating in smart/standard mode. For example if a dial on a controller is set for smart mode on the controller and the weather sensor connection is lost, the controller interface says that the controller is in smart mode, but the controller is operating in standard mode. Adding an "X" to the smart mode column assures the capability for indicating to the user when the controller is not receiving a signal or local sensor input regardless of interface settings.

Rationale: User notification that a device is not adjusting irrigation based on current weather conditions due to an interruption in receiving signals and/or local sensor inputs is important for assuring water saving potential.

Suggested Change (or Language): Add a second 'X' under "Required in Smart Mode".

Topic: 4.5 Definition of Large Commercial Controller

Comment: Reinserting language regarding number of stations at this juncture, especially a large number of stations such as 48, creates ambiguity regarding whether this specification might apply to central control irrigation systems.

Rationale: While 1.0 defines the controller as stand-alone, it may be clearer to add language to exclude central control systems from testing and labeling using this specification.

Suggested Change (or Language): See AWE March 2011 comments regarding 1.0 Application of specification.

Topic: 4.5 Flow Sensor

Comment: Delete 4.5 in its entirety.

Rationale: 4.5 specifies a sensor unrelated to weather. In addition, while a flow sensor could very well save water, there is no testing protocol within this specification nor does AWE know of a third party testing protocol available or in development intended to assure flow sensor performance as there is with rain sensors.

Suggested Change (or Language): Delete 4.5 in its entirety.

Topic: 4.8 Manual Operation Limited to Two Hours

Comment: 4.8 appears to be written in response to AWE January 2010 comments (and perhaps the comment of others): "Manual operation – the controller shall allow for manual operation and troubleshooting test cycle at the physical location of the controller installation"

The manual operation of the controller runs each zone and then defaults to the original program. Total run time of all zones may be longer than two hours.

A troubleshooter test function runs each zone for a short prescribed amount of time to allow for visual/field inspection of operation of the equipment in each zone.

Rationale: The language of 4.8 can be construed to confuse the manual operation and the troubleshooting functions. The manual operation function can be used for troubleshooting therefore the language could be simplified.

Suggested Change (or Language): The controller shall be capable of allowing for manual operation.

The window for manual operation shall be limited, and the controller shall automatically return to default mode, even if the switch is still positioned for manual operation.

Topic: 5.1 Packaging and Product Documentation Requirements: General

Comment: The Alliance for Water Efficiency (AWE) supports specifying that any controller sold with a transformer or power supply align with external power supply requirements for ENERGY STAR labeled product. As of December 31, 2010 ENERGY STAR discontinued labeling of power supplies and instead requires that external power supplies for ENERGY STAR labeled products (such as computers, displays and televisions) meet Level V as designated under the International Efficiency Marking Protocol.

Reference:
http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/eps_eup_sunset_decision_july2010.pdf
Reference:
http://www.energystar.gov/ia/partners/prod_development/revisions/downloads/International_Efficiency_Marking_Protocol.pdf

Rationale: Water and energy efficiency should be addressed simultaneously in specifications whenever possible.

Suggested Change (or Language): Any external power supply intended for use with the controller shall be tested and labeled in accordance with the most recent version of ENERGY STAR specification for end-use products using external power supplies.

Topic: 5.1 Packaging and Product Documentation Requirements: General

Comment: The product should be packaged or marked to encourage initial adjustments of the default settings to maximize the potential water savings of smart controllers. An instruction or operator manual for a WaterSense labeled weather based irrigation controller would align this specification with the homeowner education requirement (5.1 Operating Manual) in the WaterSense Homes specification.

Rationale: Efficient irrigation programming is complex and complicated by many variables including the plant water requirement, irrigation equipment and layout, routine maintenance, soil type, slope, sun exposure to name a few. In a practical sense the defaults provided by Smart controller manufacturers must cover a range of conditions. To maximize the potential water savings the initial settings need to be adjustments or calibrated to the unique conditions of the site. It is unrealistic to expect that the initial settings can hit the bull's-eye without initial fine tuning.

Suggested Change (or Language): The product packaging shall include an instruction manual that lists how the default settings can be adjusted to apply more or less water to each zone if, after operating for two weeks, the root zone is determined to be too wet or too dry.