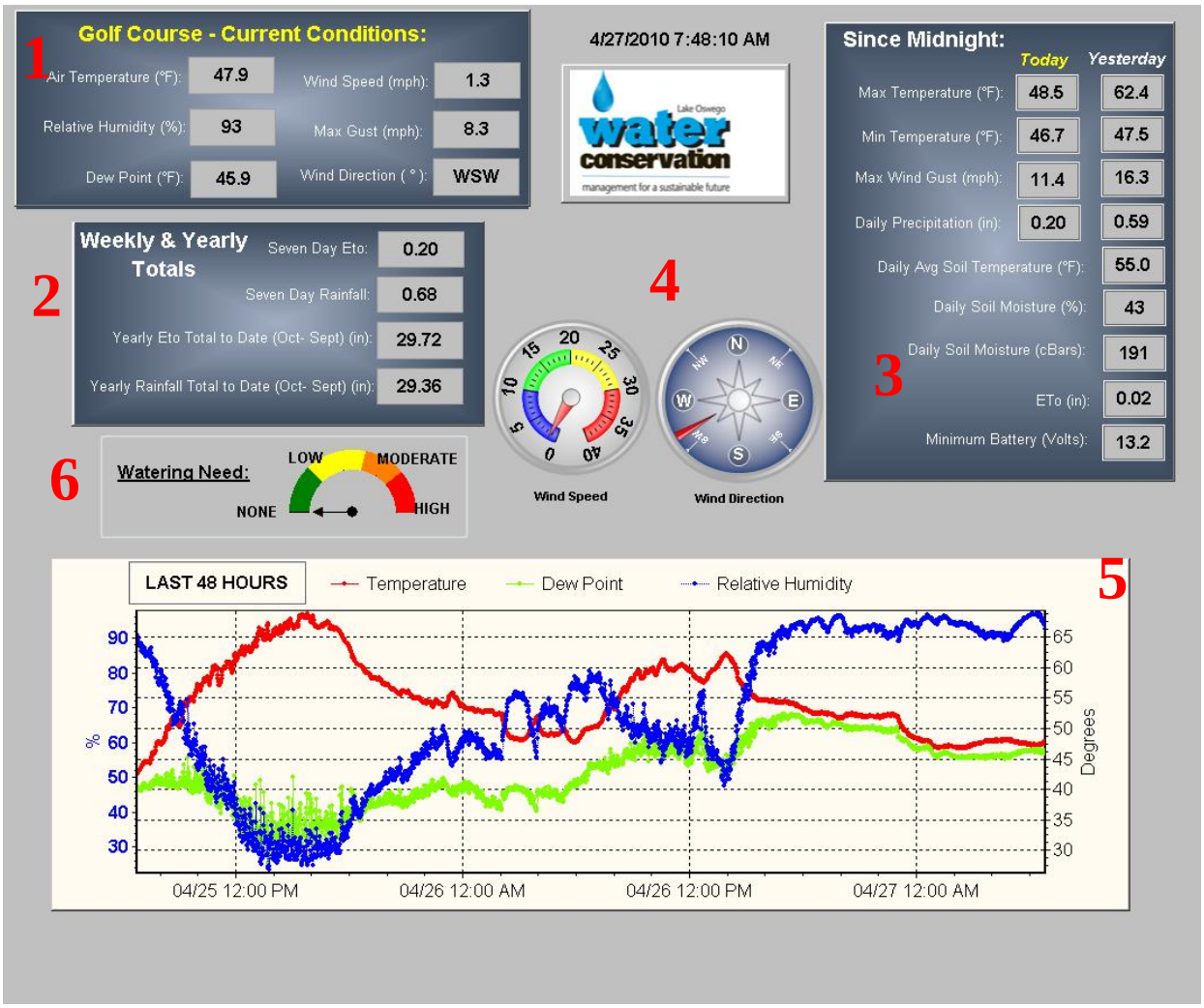
How to use these weather Stations

The weather stations have been installed to assist residents, businesses and service providers in managing their outdoor water use. These stations provide up to the minute information on Lake Oswego climate and soil conditions and help users make educated decisions on whether or not to water turf or landscape shrubs and flowers. Both weather stations offer the same information with one exception that relates to soil moisture and watering need. The soil moisture sensors at the Golf Course are placed at a depth of 6" which reflects the root depth of turf and at the West Lake Fire Station they are placed at 12" indicative of shrubs. Other than these exceptions, either station will provide current and accurate weather data that is relevant to conditions anywhere in the city. The City of Lake Oswego hopes that people will utilize these tools not only to help reduce excessive summer outdoor water use, but to also lighten the load on our aging infrastructure and reduce the burdens on our environment. Following is a step by step "How To" guide to assist in how to effectively use these tools and significantly reduce outdoor water usage.



Key:

1) **Current Conditions:** Updated every minute. Includes wind direction, wind speed, maximum gusts, temperature, dew point and relative humidity.
2) **Weekly and Yearly Totals:** Updated Daily. Seven day accumulations and year to date totals of rainfall and ETo.
3) **Since Midnight:** Updated daily totals and previous day's averages. Updated every minute. Includes comparisons of maximum temperature, minimum temperature and precipitation. Shows daily averages of soil temperature, soil moisture, (%) and (cBars). Also shows daily ETo and battery status (Solar).
4) **Up to the Minute Wind Speed and Direction**
5) **Graph Tracking Temperature, Dew Point and Relative Humidity over last 48 hours**
6) **Water Need:** Adjusted weekly

Using the Watering Need Meters:

Located at the left of the display between the graph and the weekly/yearly totals box is a meter that indicates water need. The display is semi-circular with colored divisions indicating None, Low, Moderate and High. These levels indicate when watering is needed and at what level. The Golf Course indicates turf needs and the Westlake Fire Station indicates shrub needs. The needle will indicate water requirements based upon what is considered an appropriate schedule for normal irrigation. Turf will be based upon a 3 day per week schedule and shrubs 1 per week. The needle will reach "Moderate" if normal watering is required. The displays will change based upon climate and soil conditions and will adjust accordingly as needed.

Definitions: (* indicates important tool to use in managing outdoor water use)

- **Air Temperature:** The current outside air temperature
- **Daily Average Soil Temperature:** Temperature of the soil at the level of the sensor
- **Daily Precipitation:** Current accumulation of rainfall *
- **Daily Soil Moisture (%):** Percentage of water to soil content
- **Daily Soil Moisture (cBars):** Relative moisture calculation (How Wet/How Dry) The lower the number the drier the soil
- **Dew Point:** The temperature at which water vapor in the air becomes saturated and condensation begins
- **ETo (Evapo-Transpiration):** A number calculated to represent the loss of water in the soil from a combination of climate conditions (Evaporation) and water that a plant uses (Transpiration) *
- **(F) Fahrenheit:** Temperature measurement in degrees
- **(in): Inches:** A measurement in volume or depth of water

- **Max. Temperature:** Highest temperature attained over a 24 hour period
- **Max. Wind Gust:** Highest wind speed measured over a 24 hour period
- **Min. Temperature:** Lowest temperature attained over a 24 hour period *
- **(MPH) Miles per hour:** A measurement of speed
- **Relative Humidity:** A measurement of how much water is in the air compared to how much it can hold, given as a percentage
- **Wind Direction:** Direction from which a wind originates
- **Wind Speed:** Consistent speed of wind or movement of air *
- **(Oct-Sept) Water Year:** Calendar year used in the water industry to better reflect seasonal changes. Runs from October 1st through September 30 of two different calendar years
- **Seven Day ETo:** Accumulative **evapo-transpiration** totals in a continuous seven day cycle. Measured in inches *
- **Seven Day Rainfall:** Accumulative rainfall amounts in a continuous seven day cycle. Measured in inches *
- **Yearly ETo Total to Date:** Accumulative total of **evapo-transpiration** levels on a daily progression across the current water year (Oct-Sept)
- **Yearly Rainfall Total to Date:** Accumulative total of **precipitation (rainfall)** levels on a daily progression across the current water year (Oct-Sept)

Step by step use of the weather stations:

1) The first step to any management scenario is to know how much water (in inches) your system currently applies. To do this you will need to find out a couple of things 1) How much area (sq ft) each zone is watering, or in the case of hose users the total area (sq ft) that you are watering and 2) How much water in inches you are applying.

a. Turn on your irrigation system and measure how much total area being watered is turf and or shrubs. Whatever that number is multiply by .62 (how many gallons equals 1 inch of water on 1 square foot) and that will equal how many gallons of water is necessary to be applied to equal 1 inch. Some shapes and configurations of landscape areas may be hard to measure accurately and it may require some good educated guessing on your part. Be as accurate as you can.

Example: Area of Zone 2 = 1800 sqft 1800 X .62 = 1116 gallons (round up to even number) or **1120.** This is how much water it will take for Zone 2 to put down 1"of water on this area.

b. Now we need to find out how long it will take for Zone 2 to put down this much water. To do this go to your water meter, lift up the lid and clear out any debris that may be covering the dial. Turn on Zone 1 and wait until all air is out of the pipes and system is operating normally. Go back to the meter and time for one

minute, watch how many times the sweep hand moves around a complete circle. At one minute note the number on the dial where the hand is and write it down. **Example: Zone 2 is activated.** Timing starts as the sweep hand crosses 0. If during the 1 minute it crosses zero twice and at one minute crosses the 5, then the number you would write down is 2.5. This number multiplied by 7.5 will give you how many gallons per minute is being applied by Zone 2. **2.5 X 7.5 = 18.75 gallons per minute.** Round up to 19. For hose users, turn on the sprinkler that you are using and perform the same procedure.

c. **Calculating how long to run your sprinkler(s) to put down 1 inch:** Divide the amount needed by the amount applied.
Example: 1120 (amount needed to equal 1 inch) ÷ 19 (gallons per minute) = how many minutes it will take for that zone or sprinkler to put down 1 inch. 1120 ÷ 19 = 58.9 (round up) **60 minutes.** This is how long it will take to apply 1 inch of water on this particular landscape.

2) **ETo**: Write down current and 7 day total. This represents how much water is being taken from the soil daily and weekly. When calculating schedules for established plants, shrubs and grasses, this number represents how much water needs to be replaced (supplemented).
3) **Daily and seven day rainfall totals:** Write down the daily and 7 day totals of rainfall. This represents how much "natural moisture" the landscape has received.
4) **Calculate how much water needs to be applied:** Different plants have different water needs, and need different frequency of cycles. If you are watering your grass more frequently than (every other day) and/or watering pots or annuals, then you would use the daily number for calculations. If you are watering on a weekly cycle (so many days per week) then you will use the weekly number. Studies by universities and other research organizations are showing that the majority of plants require less water than ETo to be healthy. A good rule of thumb is that turf grasses need about 85% of ETo, medium to large shrubs need about 75% of ETo, and small shrubs and annuals need about 90% of ETo. To perform this calculation, multiply the ETo number by the percentage required for the particular type of plant.

   Example: 7 day total ETo = 1.8 inches. Calculation: (Turf = 1.8 X .85 = 1.53 inches of water required) (Lg Shrubs = 1.8 X.75 = 1.35 inches)

5) This number equals how much water needs to be supplemented to compensate for the amount lost. Now multiply this number with the amount of time you calculated the system needs to run in order to water 1 inch and you can set your timer accordingly.

Example: Zone 2 has to run 60 minutes to put down 1 inch of water and we need 1.55 inches to supplement for loss. So: 60 X 1.55 = 93 minutes. This is how long Zone 2 would need to run to put down the correct amount of water.
(Shrubs: 60 X 1.35 = 81 minutes)

6) Now you can decide how many times you need to water for the week to set your timer. Let's say you ware watering turf and want to water 3 days per week. Simply divide 93 by 3 and that is how long you need to set up your daily run times.
Example: 93 ÷ 3 = 31 minute per day. The schedule might look like this: Mon 31 Tues 0, Wed 31, Thurs 0, Fri 31, Sat 0, Sun 0. (Remember to always round to the easiest number for programming. In this example you would use 30 minutes).
For those that use hoses, the number of minutes would be the same for each placement. In other words, if you water 2 days per week and it takes four placements to water your yard the example would look more like this: **93 ÷ 2 = 46.5 or 47 minutes.** This time would not change for all four of the placements. If you water every day, the steps will be the same only you will divide the final total by 7. **Example: 93 ÷ 7 = 13.28 or 13 minutes per day/every day.**

7) Some Other Things to be Aware Of :

a. Run off: Soils are often unable to absorb water as fast as our sprinkler systems put it down. This creates run off which not only wastes water that we have paid for, but also increases pollutants into the stream system. To avoid run off, turn on your irrigation system, use your watch to time the station cycle and observe if puddles or streams occur during normal cycle duration. If run off appears, note how long into the cycle the system worked until it appeared. That is the longest span of time that the zone can be operated during a cycle. For zones in which run off occurs, you will need to set up a second program with a different start time. (It is important to allow one hour to pass if possible before the next cycle begins). Consult your owner's manual for instructions on how to do this.

b. Rainfall: Natural precipitation is always the best way to water and we certainly don't need to waste our water when a sufficient amount of rainfall occurs. If you have an automatic irrigation system, hopefully you have already installed a rain sensor. If not, one can be purchased from the City at the third floor reception desk for $5.00 ($25.00 to $50.00 retail). These devices will not affect programming, but they will stop the system from watering during and immediately after a rain event. However, they do not measure the amount of rain that has fallen. For that information, go to the weather stations and check how much precipitation fell in the last 24 hours or for the week. While all rainfall is

beneficial to the planet, not all is readily usable for our landscapes. Often it rains harder than our landscape soils can absorb. Much of it can be intercepted by tree canopy, and rarely is it evenly distributed. What is usable is typically significantly lower than what fell. Usable rainfall is figured at about 50% of what was registered. For irrigation operation purposes, figure that if a ¼ inch or more was received on any day scheduled for irrigation, that day's irrigation should be suspended. For weekly scheduling, usable rainfall would be deducted (in inches) from the total water needed. **Example: Using the previous information, if Zone 2 needed 93 minutes to put down 1. 55 inches of water, and it rained .5 inches during the week, then for the week Zone two would need only 1.05 inches of water to meet ETo. The calculation would look like this: 1.55 ETo - .5 inches of rain = 1.05 inches of water needed. Zone 2 can put out 1 inch in 60 minutes so: 60 X 1.05 = 63 or 65 minutes of water for the week.**

c. **Wind Speed:** Wind speeds that exceed 5-8 mph are strong enough to create considerable loss from drift. Remember, we want to get the biggest bang for our water buck and that means doing everything we can to ensure that the water we pay for stays on our property. Monitor wind speeds at the weather stations to determine if it is appropriate to water.

d. **Minimum Temperature:** Minimum temperature relates to what time of year is appropriate to start or stop watering. Looking at the daily minimum temperature tells us if freezes are still occurring. A severe freeze can damage or break pipes, sprinklers and other irrigation equipment. Moisture on roadways or sidewalks can, if it freezes, create safety hazards for the public and our own families. We should be mindful of when we need to irrigate and be certain we wait until the appropriate time of year to begin watering and also ensure that we stop activities before the threat of freezing conditions are upon us.