GLOSSARY, CONVERSION TABLES AND REFERENCES

Mobile Irrigation Lab Glossary

Allowable depletion - That part of soil moisture stored in the plant root zone managed for use by plants, usually expressed as equivalent depth of water in acre inches per acre, or inches.

Application efficiency (Ea) - The ratio of the average depth of irrigation water infiltrated and stored in the root zone to the average depth of irrigation water applied, expressed as a percentage. Also referred to as AE.

Application efficiency low quarter (Eq) - The ratio of the average of the lowest one-fourth of measurements of irrigation water infiltrated to the average depth of irrigation water applied, expressed as a percentage. Also called AELQ. Used as an indication for uniformity of application.

Application rate - Usually expressed in inches per hour.

Application rate, sprinkler - The rate at which water is applied to a given area by a sprinkler system.

Application time, set time - The amount of time that water is applied to an irrigation set.

Available soil water - The difference between actual water content of a soil and the water held by that soil at the permanent wilting point.

Available water capacity (AWC) - The portion of water in a soil that can be readily absorbed by plant roots of most crops, expressed in inches per inch, inches per foot, or total inches for a specific soil depth. It is the amount of water stored in the soil between field capacity (FC) and permanent wilting point (WP). It is typically adjusted for salinity (electrical conductivity) and rock fragment content. Also called available water holding capacity (AWHC).

Average daily peak use rate - Calculated or measured water used by plants in 1 day through evapotranspiration, expressed as inches per day (in/day).

Backflow prevention device - Safety device that prevents the flow of water from the water distribution system back to the water source.

Bubbler irrigation - Micro irrigation application of water to flood the soil surface using a small stream or fountain. The discharge rates for point-source bubbler emitters are greater than for drip or subsurface emitters, but generally less than 1 gallon per minute (225 L/h). A small basin is usually required to contain or control the water.

Chemigation - Application of chemicals to crops through an irrigation system by mixing them with irrigation water.

Christiansen's uniformity coefficient (CU) - A measure of the uniformity of irrigation water application. The average depth of irrigation water infiltrated minus the average absolute deviation from this depth, all divided by the average depth infiltrated. Also called coefficient of uniformity. Typically used with sprinkle irrigation systems.

Compensating emitter - Microirrigation system emitters designed to discharge water at a near constant rate over a wide range of lateral line pressures.

Consumptive use See Evapotranspiration and Crop evapotranspiration.

Continuous flushing emitter - Microirrigation system emitters designed to continuously permit passage of large solid particles while operating at a trickle or drip flow, thus reducing filtration requirements.

Crop evapotranspiration (ETc) - The amount of water used by the crop in transpiration and building of plant tissue, and that evaporated from adjacent soil or intercepted by plant foliage. It is expressed as depth in inches or as volume in acre inches per acre. It can be daily, peak, design, monthly, or seasonal. Sometimes referred to as consumptive use.

Crop growth stages Periods of like plant function during the growing season. Usually four or more periods are identified:

Initial - Between planting or when growth begins and approximately 10 percent ground cover.

Crop development - Between about 10 percent ground cover and 70 or 80 percent ground cover.

Mid season - From 70 or 80 percent ground cover to beginning of maturity.

Late - From beginning of maturity to harvest.

Crop rooting depth - Crop rooting depth is typically taken as the soil depth containing 80 percent of plant roots, measured in feet or inches.

Crop water use - Calculated or measured water used by plants, expressed in inches per day. Same as ETc except it is expressed as daily use only.

Depth of irrigation - (1) Depth of water applied, measured in acre inches per acre. (2) Depth of soil affected by an irrigation event.

Distribution uniformity (DU) - The measure of the uniformity of irrigation water distribution over a field. NRCS typically uses DU of low one-quarter. DU of low one-quarter is the ratio of the average of the lowest one-fourth of measurements of irrigation water infiltrated to the average depth of irrigation water infiltrated, expressed as a decimal. Each value measured represents an equal area.

Distribution system - A network of open canals or pipelines to distribute irrigation water at a specific design rate to multiple outlets on a farm or in a community.

Drip irrigation - A micro irrigation application system wherein water is applied to the soil surface as drops or small streams through emitters. Discharge rates are generally less than 2 gallons per hour (8 L/h) for single outlet emitters and 3 gallons per hour (12 L/h) per meter for line source emitters.

Effective precipitation (Pe) The portion of precipitation that is available to meet crop evapotranspiration. It does not include precipitation that is lost to runoff, deep percolation, or evaporation before the crop can use it.

Effective rooting depth - The depth from which roots extract water. The effective rooting depth is generally the depth from which the crop is currently capable of extracting soil water. However, it may also be expressed as the depth from which the crop can extract water when mature or the depth from which a future crop can extract soil water. Maximum effective root depth depends on the rooting capability of the plant, soil profile characteristics, and moisture levels in the soil profile.

Emitter - A small micro irrigation dispensing device designed to dissipate pressure and discharge a small uniform flow or trickle of water at a constant discharge. Also called a dripper or trickler.

Compensating emitter - Designed to discharge water at a constant rate over a wide range of lateral line pressures.

Continuous flushing emitter - Designed to continuously permit passage of small solid particles while operating at a trickle or drip flow, thus reducing filter fineness requirements.

Flushing emitter - Designed to have a flushing flow of water to clear the discharge opening every time the system is turned on.

Line-source emitter - Water is discharged from closely spaced perforations, emitters, or a porous wall along the tubing.

Long-path emitter - Employs a long capillary sized tube or channel to dissipate pressure.

Multi-outlet emitter - Supplies water to two or more points through small diameter auxiliary tubing.

Orifice emitter - Employs a series of orifices to dissipate pressure.

Vortex emitter - Employs a vortex effect to dissipate pressure.

Evapotranspiration (ET) - The combination of water transpired from vegetation and evaporated from soil and plant surfaces. Sometimes called consumptive use.

Feel and appearance method - A method to estimate soil moisture by observing and feeling a soil sample with the hand and fingers. With experience, this method can be accurate.

Field capacity - The amount of water retained by a soil after it has been saturated and has drained freely by gravity. Can be expressed as inches, inches per inch, bars suction, or percent of total available water.

Float valve - A valve, actuated by a float, that automatically controls the flow of water.

Flood irrigation, wild flooding - A surface irrigation system where water is applied to the soil surface without flow controls, such as furrows, borders (including dikes), or corrugations.

Flushing emitter - A micro irrigation application device designed to have a flushing flow of water to clear the discharge opening each time the system is turned on.

Foot valve - (1) A check valve used on the bottom of the suction pipe to retain the water in the pump when it is not in operation. (2) A valve used to prevent backflow.

Frost protection - Applying irrigation water to affect air temperature, humidity, and dew point to protect plant tissue from freezing. The primary source of heat (called heat of fusion) occurs when water turns to ice, thus protecting sensitive plant tissue. Wind machines and heating devices are also used.

Full irrigation - Management of water applications to fully replace water used by plants over an entire field.

Fungicide - Chemical pesticide that kills fungi or prevents them from causing diseases on plants.

Furrow - (1) A trench or channel in the soil made by a tillage tool. (2) Small channel for conveying irrigation water downslope across the field. Sometimes referred to as a rill or corrugation.

Furrow irrigation - A surface irrigation system where water is supplied to small channels or furrows to guide water downslope and prevent cross flow. Called rill or corrugation irrigation in some areas.

Furrow stream - The streamflow in a furrow, corrugation, or rill.

Gate, slide gate - A device used to control the flow of water to, from, or in a pipeline or open channel. It may be opened and closed by screw or slide action either manually or by electric, hydraulic, or pneumatic actuators. In open channels, gates slide on rails and are used to control drainage or irrigation water.

Gated pipe - Portable pipe that has small gates installed at regular intervals along one side for distributing irrigation water to corrugations, furrows, or borders.

Ground water - Water occurring in the zone of saturation in an aquifer or soil.

Growing season - The period, often the frost-free period, during which the climate is such that crops can be produced.

Hydrant - An outlet, usually portable, used for connecting surface irrigation pipe to an alfalfa valve outlet.

Infiltration, infiltration rate - The downward flow of water into the soil at the air-soil interface. Water enters the soil through pores, cracks, wormholes, decayed-root holes, and cavities introduced by tillage. The rate at which water enters soil is called intake rate or infiltration rate.

Irrigable area – Area capable of being irrigated, principally based on availability of water, suitable soils, and topography of land.

Irrigation - Applying water to the land for growing crops, reclaiming soils, temperature modification, improving crop quality, or other such uses.

Irrigation frequency, interval - The time, generally in days, between irrigation events. Usually considered the maximum allowable time between irrigation's during the peak ET period.

Irrigation method - One of four irrigation methods used to apply irrigation water: surface, sprinkle, micro, and subirrigation. One or more irrigation systems can be used to apply water by each irrigation method.

Irrigation scheduling - Determining when to irrigate and how much water to apply, based upon measurements or estimates of soil moisture or crop water used by the plant.

Irrigation set - The area irrigated at one time within a field.

Irrigation set time, irrigation period - The amount of time required to apply a specific amount of water during one irrigation to a given area, typically refilling the plant root zone to field capacity minus expected rainfall.

Irrigation system - Physical components (pumps, pipelines, valves, nozzles, ditches, gates, siphon tubes, turnout structures) and management used to apply irrigation water by an irrigation method. All properly designed and managed irrigation systems have the potential to uniformly apply water across a field.

Irrigation water management - Managing water resources (precipitation, applied irrigation water, (IWM) humidity) to optimize water use by the plant. S oil and plant resources must also be considered.

Irrigation water requirement - The calculated amount of water needed to replace soil water used by the crop (soil water deficit), for leaching undesirable elements through and below the plant root zone, plus other needs; after considerations are made for effective precipitation.

Leaching fraction - The ratio of the depth of subsurface drainage water (deep percolation) to the depth of infiltrated irrigation water. (See Leaching requirement.)

Leaching requirement - (1) The amount of irrigation water required to pass through the plant root zone to reduce the salt concentration in the soil for reclamation purposes. (2) The fraction of water from irrigation or rainfall required to pass through the soil to prevent salt accumulation in the plant root zone and sustain production. (See Leaching fraction.)

Leaching - Removal of soluble material from soil or other permeable material by the passage of water through it.

Length of run - The distance down the furrow, corrugation, or border to the planned end of irrigation, typically the edge of the field.

Line-source emitter - Water is discharged from closely spaced perforations, emitters, or a porous wall along a micro irrigation lateral.

Long-path emitter - Employs a long capillary sized tube or channel to dissipate pressure and discharge water in discrete droplets or seeps.

Low energy precision application (LEPA) - A water, soil, and plant management regime where precision down-in-crop applications of water are made on the soil surface at the point of use. Application devices are located in the crop canopy on drop tubes mounted on low pressure center pivot and linear move sprinkler irrigation systems. Generally limited to circular plantings on less than 1 percent slopes and no translocation of applied water. Furrow dikes, good soil condition, and crop residue are usually required to control water translocation.

Low pressure in canopy (LPIC) - A low pressure in-canopy system that may or may not include a complete water, soil, and plant management regime as required in LEPA. Application devices are located in the crop canopy with drop tubes mounted on low pressure center pivot and linear move sprinkler irrigation systems. Limited water translocation within the field and some minor non uniformity of water application usually exists.

Management allowed depletion (MAD) - The planned soil moisture deficit at the time of irrigation. It can be expressed as the percentage of available soil water capacity or as the depth of water that has been depleted from the root zone. Sometimes called allowable soil depletion.

Maximum application rate - The maximum discharge, in inches per hour, at which sprinklers can apply water without causing significant translocation.

Microirrigation - The frequent application of small quantities of water as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line. The microirrigation method encompasses a number of systems or concepts, such as bubbler, drip, trickle, line source, mist, or spray.

Multi-outlet emitter - Supplies water to two or more points through small diameter auxiliary tubing.

Net irrigation - The actual amount of applied irrigation water stored in the soil for plant use or moved through the soil for leaching salts. Also includes water applied for crop quality and temperature modification; i.e., frost control, cooling plant foliage and fruit. Application losses, such as evaporation, runoff, and deep percolation, are not included. Generally measured in inches of water depth applied.

Net irrigation water requirement - The depth of water, exclusive of effective precipitation, stored soil moisture, or ground water, that is required for meeting crop evapotranspiration for crop production and other related uses. Such uses may include water required for leaching, frost protection, cooling, and chemigation.

Orifice emitter - A microirrigation system application device employing a series of orifices to dissipate pressure.

Orifice An opening with a closed perimeter through which water flows. Certain shapes of orifices are calibrated for use in measuring flow rates.

Overhead irrigation - See Sprinkler irrigation.

Peak use rate - The maximum rate at which a crop uses water, measured in inches (acre inches per acre) per unit time; i.e., inches per month, inches per week, inches per day.

Percolation - Movement of the water through the soil profile. The percolation rate is governed by the permeability or hydraulic conductivity of the soil. Both terms are used to describe the ease with which soil transmits water.

Permeability - (1) Qualitatively, the ease with which gases, liquids, or plant roots penetrate or pass through a layer of soil (2) Quantitatively, the specific soil property designating the rate at which gases and liquids can flow through the soil or porous media.

Potential Water Savings(PWS) (ac-ft) – The total amont of water that can be saved annually by following the recommendations derived from an irrigation evaluation.

PWS Due to Irrigation System Efficiency Improvements (ac-ft) - The amount of irrigation water that can be saved annually by improving the DU or EU of the irrigation system, which should lead to a reduction in hours of irrigation needed.

PWS Due to Irrigation System Scheduling (ac-ft) - The amount of irrigation water that can be saved annually if schedule changes (run time and frequency) alone are implemented.

PWS Due to the Repair of Leaks and/or any Applicable Irrigation System Components (ac-ft) - the amount of irrigation water that can be saved annually by repairing irrigation system leaks or components, or replacing faulty irrigation system components.

Rainfall management - Managing soil, water, and plant resources to optimize use of rainfall.

Return-flow facilities, reuse facilities - A system of ditches, pipelines, pump(s), and reservoirs to collect and convey surface or subsurface runoff from an irrigated field for reuse. Sometimes called tailwater reuse facilities or pumpback facilities.

Root zone - Depth of soil that plant roots readily penetrate and in which the predominant root activity occurs. Preferred term is plant root zone.

Saturation - To fill all (100%) voids between soil particles with water.

Soil crusting - Compaction of the soil surface by droplet impact from sprinkle irrigation and precipitation. Well graded, medium textured, low organic matter soils tend to crust more readily than other soils.

Soil compaction - Consolidation, increase in bulk density, reduction in porosity, and collapse of the soil structure when subjected to surface loads or the downward and shearing action of tillage implement surfaces.

Soil horizon - A layer of soil differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics.

Soil profile - Vertical section of the soil from the surface through all its horizons.

Spray irrigation - The application of water by a small spray or mist to the soil surface where travel through the air becomes instrumental in the distribution of water. Used with sprinkler and microirrigation methods.

Sprinkler distribution pattern - Water depth-distance relationship measured from a single sprinkler head.

Sprinkler head A nozzle or device, which may or may not rotate, for distributing water under pressure through the air. Water is delivered to sprinkler heads by a system of pressurized pipelines.

Sprinkle irrigation Method of irrigation in which water is sprayed or sprinkled through the air to plant or ground surface. See Sprinkler irrigation system.

Sprinkler irrigation system Facility used to distribute water by the sprinkle irrigation method. Sprinkler systems are defined in the following general categories:

Periodic-move system - A system of laterals, sprinkler heads (gun types), or booms that are moved between irrigation settings. They remain stationary while applying water.

Fixed/solid-set system - A system of portable surface or permanently buried laterals totally covering the irrigated area or field. Typically several adjacent laterals or heads are operated at one time. Portable laterals are typically removed from the field at end of germination, plant establishment, or the irrigation season and are replaced the next irrigation season.

Continuous/self-move system - A lateral, sprinkler (traveler), or boom that is continuous or self moving while water is being applied. Power for moving the facility is typically provided by electric or hydraulic (water) motors or small diesel engines. Specific types of sprinkler systems under each general category include:

Boom - An elevated, cantilevered boom with sprinklers mounted on a central stand. The sprinkler-nozzle trajectory back pressure rotates the boom about a central pivot, which is towed across the field by a cable attached to a winch or tractor. Can be either periodic move or continuous move type system.

Center pivot - An automated irrigation system consisting of a sprinkler lateral rotating about a pivot point and supported by a number of selfpropelled towers. Water is supplied at the pivot point and flows outward through the pipeline supplying the individual sprinklers or spray heads. A continuous/self-move type system.

Corner pivot - An additional span or other equipment attached to the end of a center pivot irrigation system that allows the overall radius to increase or decrease in relation to field boundaries.

Gun type - A single sprinkler head with large diameter nozzles, supportedon skids or wheels. Periodically moved by hand or mechanically with a tractor, cable, or water supply hose. When the travel lane (or path) has been irrigated, the sprinkler head is relocated at the far end of the next travel lane and irrigation continues.

Lateral move, linear move - An automated irrigation machine consisting of a sprinkler line supported by a number of self-propelled towers. The entire unit moves in a generally straight

path perpendicular to the lateral and irrigates a basically rectangular area. A continuous/self move type system.

Linear move - See Lateral move.

Portable handmove - Sprinkler system moved to the next irrigation set by uncoupling and picking up the pipes manually, requiring no special tools. A periodic move type system.

Side-move sprinkler - A sprinkler system with the supply pipe supported on carriages and towing small diameter trailing pipelines each fitted with several sprinkler heads. A periodic move type system.

Side-roll (wheel line) sprinkler - The supply pipe is usually mounted on wheels with the pipe as the axle and where the system is moved across the field by rotating the pipeline by engine power. A periodic move type system.

Solid-set, fixed-set - System that covers the complete field with pipes and sprinklers in such a manner that all of the field can be irrigated without moving any of the system. Laterals may be permanently buried or portable.

Towed sprinkler - System where lateral lines are mounted on wheels, sleds, or skids and are pulled or towed in a direction approximately parallel to the lateral. Rollers or wheels are secured in the ground near the main water supply line to force an offset in the tow path equal to half the distance the lateral would have been moved by hand. A periodic move type system.

Traveler - A single large, gun type sprinkler head with a large diameter nozzle mounted on a unit that is continuously moved across the field by supply hose or cable. The hose reel may be mounted with the sprinkler head on a trailer or on a separate trailer secured at the water supply main line, which is typically located at or near the center of the field. Sometimes called traveling gun or hosepull.

Subirrigation - Applying irrigation water below the ground surface either by raising the water table or by using a buried perforated or porous pipe system that discharges water directly into the plant root zone. Primary source of water for plant growth is provided by capillary rise of soil water above the water table (up flux) or capillary water movement away from the line source.

Surface irrigation - Broad class of irrigation systems in which water is distributed over the soil surface by gravity flow (preferred term is surface irrigation method).

Tailwater runoff - Surface irrigation system water leaving a field or farm from the downstream end of a graded furrow, corrugation, border. Best surface irrigation distribution uniformity across the field is obtained with 30 to 50 percent tailwater runoff, unless tailwater reuse facilities are used.

Tensiometer - Instrument, consisting of a porous cup filled with water and connected to a manometer or vacuum gauge, used for measuring the soil-water matric potential.

Total dissolved solids (TDS) - The total dissolved mineral constituents of water.

Translocation - Movement of water to other area(s) than where it was applied.

Transpiration - The process of plant water uptake and use, beginning with absorption through the roots and ending with transpiration at the leaf surfaces. See Evapotranspiration.

Trickle irrigation - A micro irrigation system (low pressure and low volume) wherein water is applied to the soil surface as drops or small streams through emitters. Preferred term is Drip irrigation.

Unavailable soil water - That portion of water in a soil held so tightly by adhesion and other soil forces that it cannot be absorbed by plants rapidly enough to sustain growth without permanent damage. The soil water remaining at the permanent wilting point of plants.

Valve - A device to control flow that includes:

Pressurized system:

Air relief valve - Device that releases air from a pipeline automatically without permitting loss of water.

Air vacuum, air relief valve - Device that releases air from a pipeline automatically without permitting loss of water or admits air automatically if the internal pressure becomes less than atmospheric.

Backflow prevention valve - A check valve that allows flow in one direction. When closed, air is admitted to the low pressure (supply) side to prevent siphoning or backflow of water and chemicals to a water source.

Ball valve - A valve in a pipeline used to start or stop flow by rotating a sealed ball with a transverse hole approximately equal to the diameter of the pipeline. Ball rotation is typically 90 degrees for single-port control. With hole modifications, several outlets may be controlled. In this case, only partial rotation of the handle may be used. Ball valves should be opened and closed slowly to avoid high surge pressures. Headloss through a ball valve is very low.

Butterfly valve - A valve in a pipeline to start or stop flow by rotating a disk 90 degrees. The disk is about the same diameter as the pipeline. Butterfly valves should be opened and closed slowly to avoid high surge pressures (water hammer). Headloss through a butterfly valve is low.

Check valve - Valve used in a pipeline to allow flow in only one direction.

Drain valve - (a) Automatic has spring-loaded valve that automatically opens and drains the line when the pressure drops to near zero. (b) Flushing type has a valve on the end of a line to flush out dirt and debris. This may be incorporated into an end plug or end cap.

Float valve - A valve, actuated by a float, that automatically controls the flow of water.

Gate valve - A valve in a pipeline used to start or stop water flow. It may be operated by hand with or without mechanical assistance or by high or low voltage (solenoid) electric controlled mechanical assistance. Gate valves consist of seated slide or gates operating perpendicular to the flow of water. Head loss through a gate valve is typically less than a globe valve, but more than a ball or butterfly valve.

Globe valve - A valve in a pipeline used to start or stop water flow. Globe valves stop flow by positioning a disk and gasket over a machined seat about the same diameter as the pipe. Globe valves are limited to smaller sizes because of the high velocities and very high head loss through the valve.

Pressure relief valve - A spring loaded valve set to open at a pressure slightly above the operating pressure, used to relieve excessive pressure and surges.

Solenoid valve - A misused term meaning a low voltage electrically controlled, mechanically actuated valve; typically a gate valve. Often a spring is used to hold the valve in a closed (or open) position when water pressure is low or electric energy is discontinued. (When ignition electric energy for an internal combustion engine or electric energy to a motor is discontinued, a spring closes the valve.)

Vacuum relief valve—Valve used to prevent a vacuum in pipelines and avoid collapsing of thin-wall pipe.

Non-pressure or very low pressure system:

Alfalfa valve - An outlet valve attached to the top of a short vertical pipe (riser) with an opening equal in diameter to the inside diameter of the riser pipe and an adjustable lid or cover to control water flow. A ring around the outside of the valve frame provides a seat and seal for a portable hydrant. Typically used in border or basin irrigation.

Orchard valve - An outlet valve installed inside a short vertical pipe (riser) with an adjustable cover or lid for flow control. Similar to an alfalfa valve, but with lower flow capacity. Typically used in basin irrigation.

Surge valve - A device in a pipe T fitting to provide flow in alternate directions at timed intervals. Used in surge irrigation.

Vortex emitter - A microirrigation water application device that employs a vortex effect to dissipate pressure.

Water amendment - (1) Fertilizer, herbicide, insecticide, or other material added to water for the enhancement of crop production. (2) A chemical water treatment to reduce drip irrigation system emitter clogging.

Water holding capacity Total amount of water held in the soil per increment of depth. It is the amount of water held between field capacity (FC) and oven dry moisture level, expressed in inch per inch, inch per foot, or total inches for a specific soil depth. Soils that are not freely drained because they have impermeable layers can have temporary saturated conditions just above the impermeable layers. This can temporarily increase water holding capacity. Sometimes called total water holding capacity. See Available water capacity.

Water table The upper surface of a saturated zone below the soil surface where the water is at atmospheric pressure.

Conversion Tables

Irrigation related units conversion factors

Volume

1 gallon (gal)	= 231 cubic inches (in^3) = 0.1337 cubic feet (ft^3) = 3.785 liters (l)
1 million gallons (mg)	= 3.0689 acre-feet (ac-ft) = 133,681 cubic feet (ft^3)
1 cubic foot water (ft^3)	= 1728 cubic inches (in^3) = 7.4805 gallons = 28.316 liters
1 acre-inch (ac-in)	= 27,152.4 gallons
1 acre-foot (ac-ft)	= amount of water to cover 1 acre 1 foot deep = 43,560 cubic foot (ft^3) = 325,851 gallons = 12 acre-inches (ac-in)
1 cubic inch/in (in^3/in)	= 16.387 milliliter/inch (ml/in)
1 cubic meter (m^3)	= 264.2 gallons (gal)
1 liter (l)	= 0.2642 gallons (gal) = 1000 milliliters (ml)

Length

1 millimeter (mm)	= 0.03937 inch (in)
1 centimeter (cm)	= 0.3937 inch (in)
1 meter (m)	= 39.37 inches (in) = 3.2808 feet (ft)
1 kilometer (km)	= 3 ,280.8 feet (ft)
1 mile (mi)	= 5,280 feet (ft) = 1.60934 kilometers (km)

Irrigation related units conversion factors - Continued

Rate of Flow

1 acre-inch per day (ac-in/day)	= 18.9 gallons per minute (gpm)
1 acre-inch per hr (ac-in/hr)	= 452.57 gallons per minute (gpm)
1 million gallons per day(mgd)	= 1.547 cubic feet per second (ft^3/s) = 695 gallon per minute (gpm)
1 cubic foot per second	= 448.83 (typically rounded to 450) gallons per minute (gpm) = 7.48 gallons per second = 0.646 million gallons per day (mgd) = 0.992 (typically rounded to 1) acre-inch per hour (ac-in/hr) = 1.983 (typically rounded to 2) acre-feet per day (ac-ft/d) = 40 miners inches (11.25 gpm) - AZ, CA, MT,NV, OR = 50 miners inches (9 gpm) – ID, KA, NE, NM, ND, UT = 38.4 miners inches – CO
1 gallon per minute (gpm)	= 1440 gallons per day (gpd) = 0.0023 cubic feet per second (cfs)
1 gallon per hour	= 0.951 milliliter per second (ml/sec)
1 cubic foot per minute (cfm)	= 7.48 gallons per minute (gpm)

Weight

1 gallon of water weighs	= 8.326 pounds (lb)
1 cubic foot of water weighs	= 62.428 pounds (lb)

Area

1 acre (ac)	= 43,560 square feet (ft^2)
1 hectare (ha)	= 2.471 acres

Pressure units

1 atmosphere	= 14.696 pounds per square inch (lb/in^2) = 2116.2 pounds per square foot (lb/ft^2) = 33.899 feet of water = 29.92 inches of mercury
1 pound per square inch	= 144 pounds per square foot = 2.31 feet of head of water
1 pound per square foot	= 48 Pa = 0.048 kPa
1 foot head of water (ft)	= 0.433 pounds per square inch = 0.0295 atmospheres (bars) = 0.883 inches of Mercury (Hg)
1 inch of mercury (Hg)	= 1.133 feet of water

Irrigation related units conversion factors - Continued

Temperature

Degrees C = (5/9)(F-32^o)
Degrees F = (9/5) C+32^o

Energy Units

1 hp = 0.746 kw
1 kw = 1.3405 hp

Soil and Water Chemistry Units

1 meq/liter = 1 mg/liter/equivalent weight
1 mg/L = 1 ppm = 0.227 lbs/ac-in = 8.35 x 10^6 lbs/gal
1 ml of water = 1 cc water
1 ml water = 1 gram

Element	Equivalent Weight	Element	Equivalent Weight
Ca	2.0	CO_3	30
Mg	12.2	HCO_3	61
Na	23	SO_4	48
Cl	35.4	NO_3-N	14

Common conversion units pertaining to water quality

10 ppm Nitrate – Nitrogen = 27 lb/ac-ft of water
= 2.25 lb/ac-in of water