Implementing a Water Management Plan
Checklist for Facility Managers

This check list has been developed to cover a wide variety of facilities, you are encouraged to modify the checklist to remove water uses that do not apply to your individual facility and add any water uses that are not listed. Descriptions of equipment and processes that utilize water, as well as water saving technologies can be found on the ADWR Conservation website - Technologies Section.
When replacing or purchasing new equipment, always look for the Water Sense and ENERGY STAR® labels.

Preventive maintenance is an important factor in maintaining water-use efficiency. A scheduled program of leak detection and repair can provide considerable savings in water and energy costs for a small increase in maintenance effort, particularly at larger and older facilities.

LEAK DETECTION AND REPAIR
Detecting and repairing leaks should be a high priority and part of your facility's regular maintenance program because undetected leaks, even small ones, can result in large quantities of lost water. Large leaks are not the worst culprits; in fact, small leaks can result in greater loss of water because they often go undetected and persist for long periods of time. In addition to water losses, water leaks can damage and cause deterioration of building(s), parking garages and basements. A regularly scheduled program of leak detection and repair can provide considerable savings in water and energy costs for a small increase in maintenance effort, particularly at larger and older facilities.

Leak detection and repair efforts should include examination of both water using fixtures and the water distribution system.

☐ Check all pipes, connections, and faucets for leaks.
In many cases water pipes are embedded in the walls and floors, therefore, leaks are often not spotted until there is visible damage such as discoloration on walls, ceilings, or carpet.

☐ Dye-test all tank toilets to check for leaks.
About 20 percent of toilets leak from between 20 gallons to several hundred gallons of water per day.

☐ Check your water meter(s) during non-business hours.
If the dial is moving when no equipment is running, you may have a leak. If you are unfamiliar with how to read your meter refer to Reading Your Water Meter (pdf).

☐ Monitor your water bill.
If your bill is higher than normal and there are no known increases in consumption, such as seasonal variations, there may be a leak.

☐ Develop a program for leak detection and repair of irrigation systems.
Instruct staff to visually inspect systems regularly by running each station to look for leaks, damage or efficiency issues, especially if irrigation occurs during non-business hours. This should be done monthly if possible, or twice a year at minimum. Have staff report and repair leaks immediately. For irrigation systems the Volume Based Irrigation System Audit Worksheet (pdf) and Instructions may be useful for finding leaks and determining water use.

☐ Check all water meters and backflow devices annually.
These should be checked for leaks and accuracy by a certified backflow tester, a legal requirement. Contact the Arizona Department of Environmental Quality for regulatory requirements, and your local water provider for local ordinances and a list of approved testers.

For more information on backflow prevention contact the Arizona Chapter of the American Backflow Prevention Association (ABPA).

☐ Establish a system that insures that employees promptly report plumbing leaks or other water-use issues.

☐ Develop and implement a plumbing fixture repair/replacement program.
Immediately repair all leaking plumbing fixtures or water using appliances. Or, when replacement is needed, purchase water efficient models. Look for the EPA Water Sense labeling on products.

☐ Utilize leak detection equipment to identify water system leaks.
There are various methods for detecting water distribution system leaks. These methods usually involve sonic leak-detection equipment that identifies the sound of water escaping a pipe.

☐ Consider installing a commercially available active water leak detection system.
Refer to the ADWR Conservation website - Technologies Section for more detailed information on cooling towers and irrigation.

WATER THEFT

☐ Install flow detection meters on fire hydrants to reveal water theft if hydrants are owned and maintained by the facility rather than a water provider.

DOMESTIC PLUMBING

There are several different approaches that can be taken to make plumbing fixtures effective and water-efficient:

☐ Retrofit older faucets and showerheads with aerators. The use of the most highly efficient aerator available (currently 0.5-gallon-per-minute) is encouraged.

☐ Consider purchasing an alternative faucet type.
Examples of available alternatives are: self-closing faucets (close as soon as the user releases the knob); and automatic sensor-controlled faucets.

☐ Consider replacing toilets with a water-efficient alternative.
When replacing toilets, consider ultra-low volume toilets (ULV) and high efficiency toilets and urinals (HET). Versions with improved bowl designs and flushing procedures or no flush options, such as waterless urinals, are available. Units with field-adjustable valves must be kept properly adjusted to prevent unnecessary water usage.

☐ Inspect all flush valve toilets.
Look for misuse such as broken flush valve handles and whether there are a number of fixtures in which un-flushed waste is a problem. Low-consumption infrared light-controlled automatic flushing systems are available for toilets and urinals.

☐ Install showerheads with temperature sensitive stop valves, that will stop the hot water from flowing once the water reaches a certain temperature.

WATER REUSE and RECIRCULATION.

Water used for heat transfer is typically a good water source for reuse because it is relatively clean, so it can be used with little or no pre-treatment.

☐ Consider installing re-circulating hot water systems for large buildings to reduce the amount of water going down the drain while waiting for water to heat up at sinks and showers. If water circulation is continual, consider a push button or timer system that circulates water on demand. This will reduce water and energy use for both heating and re-circulation.

☐ Recover and reuse reverse-osmosis reject water, air conditioner condensate, rainwater, foundation drain water and any other source generated on site for reuse (based on water quality) for irrigation; scrubber and cooling tower make-up water.

WATER TREATMENT

Water Conditioning- *Water Softeners*

☐ Evaluate use of softened water and eliminate where possible (e.g. for domestic cold water).

☐ Eliminate use of timers for softener-recharge systems.
This may result in more frequent than necessary backwashing.

☐ For all ion-exchange and softening processes, set recharge cycles by the volume of water treated or use conductivity controllers.

☐ For all filtration processes, install pressure gauges to determine when to backwash or change cartridges. Backwash based upon pressure differential.

☐ Test the quality of softened water daily.
This should be done to determine the required regeneration frequency. Kits are available that automatically monitor water quality and initiate the regeneration sequence when the softener resin is near exhaustion.

☐ Inspect the resin beads every three to five years and replace if necessary.

FACILITY HEATING and COOLING

Boiler and Steam Generator Heating Systems

Overall, *w*ater consumption by boiler heating systems varies depending on the size of the system, the volume of steam generated, and the volume of condensate return. The most energy and water-efficient systems return steam condensate to the boiler.

☐ Evaluate the efficiency of existing boiler systems.
If the facility uses a steam boiler, consider replacement with a hot water boiler or condensing boiler which have larger and more efficient heat exchangers.

☐ Recover steam condensate for reuse as make-up water.
A condensate return (closed loop) system saves water, boiler feed-water pretreatment costs and reduces energy consumption.

☐ Discharge boiler blow-down via an expansion tank.

This method of discharge allows boiler blow-down to condense and cool. Avoid using cold water mixing valves for blow-down cooling. If your facility utilizes this type of valves, check them to insure water does not flow continuously and consider replacing them with an expansion tank.

☐ Use make-up meters on feed-water lines to steam boilers and water boilers of more than 100,000 BTU's per hour and closed loop hot-water systems for facility heating.

Cooling Towers

In many areas of the Southwest, especially the desert areas, it is likely that more energy and water are used for cooling a facility than heating one. Additional information on the efficient operating practices for cooling towers is available in at ADWR Conservation website - Technologies section.

☐ Evaluate all buildings and processes to determine energy efficiency. More efficient buildings result in decreased cooling tower use.

☐ Equip all cooling towers with conductivity controllers, make-up and blow-down meters, and overflow alarms.

☐ Read conductivity and flow meters regularly to quickly identify problems. Keep a log of make-up and blow-down quantities, conductivity, and cycles of concentration. Monitor trends to spot deterioration in performance.

☐ Consider changing operation of your cooling tower to increase your cycles of concentration, which decreases the volume of bleed-off water. If incoming water has a high level of total dissolved solids (TDS), the number of cycles of concentration will be lower. The tower operator must reach a balance between water savings and fouling (build up of salts and scale) because fouling lowers the efficiency of the tower and increases electric costs.

☐ Determine your minimum level of water-efficiency and require adherence to it.

Base this level on performance-based specifications and obtain vendor proposals for your facility's cooling tower water treatment that meet or exceed this level. Have vendors provide figures showing projected annual water, chemical consumption and costs.

☐ Understand the chemicals being used in your cooling tower.

Ask the chemical vendor to explain the purpose and action of each chemical. Consider incorporating sulfuric acid in your treatment program to achieve significantly higher cycles of concentration. Sulfuric acid typically does not result in significant water savings if your cooling tower has less than a 1000 ton capacity. If sulfuric acid treatment is not feasible or practical, there are other products that work on the pH of the system. *If you use sulfuric acid, be sure to observe the appropriate safety precautions*.

☐ Obtain written reports of each service call. The vendor should explain the meaning of each analysis performed, as well as the test results.

☐ Use reclaimed water as a source of cooling tower make-up water.

Phosphorus levels in reclaimed municipal water may be higher in the summer. If so, softeners can be used on the water service or makeup water. *Be sure to verify that the water is sufficiently clean for use in your system*.

☐ Re-use blow-down water for lower-grade, non-potable uses.

Determine if you are eligible for sewer bill credits. A credit on your sewage bill for evaporation may be available if you properly meter your cooling tower's water losses. Check with your local water provider and/or wastewater treatment department to find out if a credit is available.

Evaporative Coolers

☐ Eliminate all uses of water for once-through or "single-pass" cooling, unless you reuse the water elsewhere for a beneficial purpose.

This is required by state law within Active Management Areas (AMAs). Once-through cooling is inefficient and also illegal in some Arizona communities outside AMAs.

☐ Instruct staff to turn off evaporative coolers when the building is unoccupied.

☐ Re-use bleed-off water from evaporative coolers.
Pipe bleed-off water to locations where it can be utilized for non-potable uses such as washing vehicles and watering landscapes.

☐ Install re-circulating pumps on water-cooled units or connect to a re-circulating cooling water loop (such as the plant chilled water system).

☐ Consider replacing water-cooled units with air-cooled units.

Mist Cooling Systems

These systems may offer a quick fix for outdoor cooling but will result in higher water use and are not a good option from a water efficiency standpoint. However, if you choose to install a system, or operate an existing one, make sure the system is operated as efficiently as possible.

☐ Operate the system only when people are using the area.
Consider installing an on/off switch or sensors that turn off misters when no one is present and turns them on when needed.

☐ Consider installing patio fans instead.

LAUNDRY FACILITIES

Equipment and processes in an industrial laundry setting may serve institutions, commercial facilities for hotels, prisons, hospitals, nursing homes, and athletic programs. For additional information refer to Clothes Washers: Water & Energy-Saving Tips and Technologies for Single and Multi-Family Residences and the Laundry section of the Alliance for Water Efficiency website.

☐ Advise staff to launder full loads only.

☐ Re-use rinse water (gray water) from washers whenever possible.

☐ Use water-efficient washers preset to meet the water factor of 8.0 or better for water and energy efficiency.

☐ Utilize high efficiency continuous tunnel batch washers when feasible.
These washers have numerous control settings and load capacities up to hundreds of pounds. Consider their use for new construction or for major expansions of existing laundry operations.

☐ Consider front load washer-extraction technology.
These washers use less water than top loaders and the extractors have the capability to remove 2-4 gallons of water per pound of laundry.

☐ Investigate the applicability of laundry water reclamation systems.
For large resort-type facilities, consider the installation of a laundry wastewater reclamation system to save water, soap, energy for heating, and sewer fees. Several different systems have been developed to reclaim wastewater from commercial laundries. These systems can be cost-effective due to savings in water, soap, energy for heating, and sewerage fees. Some systems provide 75 percent reuse and are available as a packaged unit.

KITCHEN EQUIPMENT - Kitchens and Cafeterias

Many facilities have kitchens and cafeterias and that can use large volumes of water for preparing meals and washing dishes. Many are equipped with commercial dishwashing machines, garbage disposers, and icemakers; these are typically the major water-using items in kitchens. High water use models can be replaced with water-efficient cooking equipment such as connectionless (boiler-less) steamers, combi-ovens and waterless woks. When replacing with water-efficient models, always check for rebates from your utility company to help reduce the cost. When replacing or purchasing new equipment, always look for the Water Sense and ENERGY STAR labels.

Dishwashers

☐ Maintain equipment for maximum efficiency. Advise employees to wash full loads only.

☐ Utilize the manufacturer's water flow and pressure recommendations to insure maximum efficiency.

☐ Utilize water of the appropriate temperature
Don't use hotter water than necessary. Contact gas and electric utilities for more energy conservation tips.

☐ Reduce or eliminate water used for pre-washing dishes
If your current pre-rinse spray valve is inefficient it can be retrofitted with a new, low volume, high-pressure nozzle (1.6 gallons per minute maximum).

☐ Re-use wastewater if feasible.
Use water from your dishwasher for a low-grade purpose such as pre-washing or in garbage disposers and trash trough flushing.

☐ Equip conveyor-type machines with "electric eyes" to insure efficiency.
In these machines, water should be allowed to flow only when dishes are actually passing through the dishwasher. "Electric eye" systems can be installed to detect the presence of dishes moving along the conveyor.

☐ Insure that the dishwasher is only using the volume of water needed.
If you don't have a high-efficiency dishwasher, experiment with a modest reduction (about 10 percent) in flow rate to your dishwasher to see if any problems result. If no problems occur, continue to operate at the reduced flow rate. Consult with the equipment manufacturer or your service contractor before making major changes.

Garbage Disposers

☐ Use a solenoid valve to control the flow of water to the disposer. Inspect the valve regularly.

☐ Consider eliminating garbage disposers or replacing them with garbage strainers. Garbage strainers use less water than garbage disposers.

Refrigeration Equipment

Water is often used to cool compressors on walk-in freezers. Older units may be using water in a single-pass fashion, wasting thousands of gallons per day. Refrigerators, walk-in coolers and freezers, ice machines, and ice cream and yogurt machines should be air-cooled or should receive water from a closed cooling water loop (using heat exchangers). This eliminates single-pass cooling and reduces water waste.

☐ Establish a regular maintenance schedule to keep your equipment performing efficiently with the least amount of energy.

☐ Select refrigerators with adequate space for thawing food.

Ice Machines

☐ Look for the Water Sense and ENERGY STAR® labels. Commercial ice machines that have earned the ENERGY STAR are approximately 15% more energy-efficient and 10% more water-efficient than their conventional counterparts.

☐ Use ice flake instead of ice cube machines where possible.
Flake machines bleed off less water and use less water than cubed.

☐ Consider built-in, digital programmable controls to manage ice production.
Shift production to off-peak hours such as during the evenings, to potentially get better rates from your local energy company.

☐ Install bin level sensors so your machine produces ice based on need.

☐ Place ice machines in a cool location.

Avoid placing ice machines near heat generating appliances such as ovens and ranges. Keep commercial ice machines in well-ventilated areas with an air temperature of 90º F or less or and an incoming water temperature below 70ºF.

☐ Eliminate the use of once-through ("single-pass") cooling of ice-making machines.

☐ Consider replacing water-cooled units with air-cooled models.
These machines work just as well and are usually priced the same as water cooled versions.

☐ Determine if your ice machine’s condensers can be "remote cooled" by your building's chilled water loop. If so, use remote heads to expel warm air outside the work space and customer areas.

☐ Identify ways to re-use ice machine cooling water.
If using a water softener or reverse osmosis (RO) unit on the ice machine feed line, a portion of the feed water is rejected as a water/salt solution (brine) to the sewer. Look for ways to reuse the cooling water for some other purpose, such as landscape watering.

☐ Insure that mineral deposits are removed regularly.
Commercial ice machines that do not have an automatic cleaning system, should be emptied and cleaned with sanitizing agents every six months to remove mineral deposits by de-liming your commercial ice machine with acetic and phosphoric acid cleaners. If water flow becomes restricted due to mineral deposit build up it will take longer to run through its cycles. Some models offer automatic cleaning units you can install.

☐ Insure that the ice machine is clean.
If your ice machine does not already have built-in antimicrobial features, consider purchasing antimicrobial sticks or pouches to put inside. The cleaner the ice machine, the more efficient it will be.

☐ Install a "harvest assist" feature.
This feature helps ice overpower scale and gets the cubes off the racks and into the bin more quickly. As a result, the cycles are shorter and less energy is consumed.

Ice Cream and Frozen Yogurt Machines

Some ice cream or frozen yogurt machines use water instead of air to cool the refrigeration condenser. In addition, some operators use a constant flow water bath or “dipper well” to clean and warm serving scoops.

☐ Consider installing in-line restrictors that reduce “dipper well” flow to under 0.3 gallons per minute or wash utensils only as needed.

Food Preparation

☐ Thaw food in the refrigerator, not under running water.
To increase efficiency, plan ahead and thaw food in a refrigerator. If water thawing is necessary, a slow running stream of water should be used for health reasons.

☐ Turn off steam tables and continuous-flow drain devices when not in use.

Cooking and Serving Systems

☐ Insulate condensate-return lines.

☐ Return and re-use condensate for all boiler-type steam kettles.

☐ Size steam traps for proper operation to avoid loss of condensate.

☐ Select combination (combi) ovens that use no more than 15 gallons of water per hour.

☐ Use dry heating tables instead of steam tables.

☐ Use pasta cookers with a simmer mode and automatic flow-control valves. Restrict the flow to 0.5 gallon per minute.

☐ Use connectionless or boiler-less steamers that use no more than 3 gallons per hour.

IRRIGATION EFFECIENCY AND NEW TECHNOLOGIES
Check the ADWR Conservation website – Technologies or Landscape Professionals sections or with your local irrigation supplier regarding the availability of new water conserving technologies.

☐ Stay current!
New water conserving technologies are always coming on the market. Call a local irrigation supplier to find out what's new!

☐ Install a pressure regulator if water-supply pressure exceeds 80 psi.

Landscaping

☐ Stress the importance of water conservation in all landscape maintenance contracts.

☐ Instruct staff to develop a schedule for monthly irrigation applications based on the facility's landscape water budget. At the end of the year, compare the landscape water budget to actual landscape water use. Many facilities find that they have been watering their landscapes more than needed.

Design Considerations

☐ Install a programmable controller and/or moisture sensors to increase efficiency.

☐ Evapotranspiration (ETo) based controllers, or "Smart Controllers", use an advanced technology that can save significant amounts of water.

☐ When purchasing a new irrigation controller or water saving device, look for the Water Sense label.

☐ If you are using a digital controller, develop and implement written monthly irrigation schedules that correspond to seasonal plant water demand. If changing controllers monthly is too onerous, adjust irrigation schedules at least once per season.

☐ Install an electronic flow sensor along with a system master valve to override the controller station if it detects a leak.

☐ Plant low-water use, native and drought-tolerant plants.
Appropriate plant selection and placement reduces water usage. For more information refer to the online version of Xeriscape Landscaping with Style.

☐ Check with your local Cooperative Extension office, Native Plant Society, water provider or the Arizona Department of Water Resources to determine if low-water-use plant lists are available for your area.

☐ Zone plants by water use frequency to avoid unnecessary watering of the low water use plants. Low and high water use plants should not be mixed and should be watered separately (separate valves).

☐ Replace the spray irrigation system with a drip irrigation system for plants other than turf.

☐ Install multi-outlet emission devices (allows different gallons per hour application rate for each emitter port) to match plant water use requirements by type and size, giving you the ability to increase water application rates as the plants grow.

☐ Install a layer of organic (wood chips) or inorganic (decomposed granite or crushed rock) mulches to help retain water in planting beds.

☐ Remove grass from non-functional (unnecessary) areas and in shady spots where it does not grow well. Replace grass with low-water-use plants, paving, or ground covers.

☐ Incorporate rainwater harvesting techniques to direct water from roofs and hardscape (paved areas). Use land contouring to create swales to direct rainwater to plants to decrease the need for supplemental watering. The City of Tucson, Water Harvesting Guidance Manual for Commercial Development is a good resource. Or, also link to ADWR Conservation website – Landscaping.

☐ Use drip irrigation systems in non-turf areas. They are generally very efficient because they apply a slow application of water to the base of each plant, watering only the root zone. Install pressure compensating emitters to maintain even distribution of water at each emitter on the lateral line. Refer to Guidelines for Landscape Drip Irrigation Systems for more information.

☐ For high-water-using turf areas use a well-designed irrigation system with head-to-head coverage and low and matched precipitation rates to provide the most uniform irrigation coverage. Irrigation systems for turf grass should be designed to avoid unnecessary sprinklers and blockage of the spray stream by obstacles. Curved or narrow turf areas are very difficult, if not impossible, to irrigate efficiently.

POOLS, SPAS and WATER FEATURES

☐ Install a recirculating system on all decorative ponds, fountains and water features.

☐ Collect and use rainwater for ponds and water features.

☐ Regularly check water levels in pools, spas and water features unless a dedicated water line and float system is in place.

☐ Avoid unnecessary back-flushing, install a timer to Standardize the backwash cycle duration and frequency to meet actual needs.

☐ Cover pools and spas when not in use to reduce evaporation and help keep debris out of the backwash filter.

LABORATORIES and MEDICAL FACILITIES

Laboratories

☐ Avoid the use of once-through cooling water for instruments and analyzers.

Medical Clinics

☐ Eliminate single-pass water-cooling of instrumentation or analyzers.

☐ If feasible, obtain water for cooling from the facility chilled water system.

☐ Insure that water is not used in continuously running streams for aspiration of liquids or other purposes.

☐ Choose dry-vacuum systems rather than liquid-ring pumps. For vacuum and compressor systems, use air-cooled, radiator-cooled, or chilled-loop or cooling-tower systems.

Equipment for special purposes:

☐ Equip all stand-alone steam sterilizers with condensate-tempering systems.

☐ Equip all vacuum sterilizers with mechanical vacuum systems.

X-ray / film processors
When purchasing or replacing X-ray, MRI, CT scans and other imaging equipment, it is best to select digital models that use no water. Digital technologies display images on electronic video screens and store them on computer files. However, if more water-intensive X-ray processing equipment must be used, follow these suggestions to increase water-efficiency:

If X-ray film processors are still in use at your facility:

☐ Insure they are equipped with shut-off valves to stop the flow of fresh water when processing is not taking place.

☐ Reduce the flow rate of water through the processors to the minimum needed to be consistent with quality performance.

Often a flow rate of 2 gallons per minute or less is sufficient. Refer to the manufacturer's recommendations for proper flow rates. To measure rates, install a flow meter in the supply piping.

☐ Install recycling technology on large X-ray processing systems (e.g. Water Saver/Plus™).

☐ Flow rates for rinse tanks should be metered and adjusted to use the minimum amount necessary.

☐ Replace rinse baths with spray rinses if product quality can be maintained. Use timers and conductivity controllers to control quality of water in rinses.

☐ Check to see if your machines can be fitted with squeegees. This device physically removes the liquid from the product surface as it travels from one tank to the next.

☐ Reduce carryover. The degree of reduction that can be achieved depends on squeegee type (typically ranges up to 95 percent), product area, and the speed with which the product travels through the machine.

- ☐ Reclamation and recovery methods allow for recovery of raw materials including silver and organic couplers, and regeneration and recycling of processing solutions such as fix and bleach. Silver is recovered from the fix or bleach-fix process overflow or the post-fix wash water. Electrolytic methods, in which the silver is plated out on electrodes, and ion-exchange methods in which iron is exchanged for silver in the waste stream, are both common.

- ☐ Convert smaller conventional processing systems to mini-lab image developing units that require no plumbing or washing to develop the film.