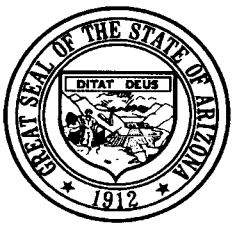
CHAPTER

6

Industrial Conservation Program



6.1 INTRODUCTION

This chapter contains the Arizona Department of Water Resources' (Department) conservation program for industrial water users within the Prescott Active Management Area (AMA). The purpose of the Industrial Conservation Program is to move industrial water users within the AMA to the greatest level of efficiency economically attainable given use of the latest available water conservation technology. In addition to conservation, the replacement of groundwater sources with renewable water supplies during the third management period will ensure that industrial users make effective strides toward contributing to the AMA's statutorily mandated goal of safe-yield by the year 2025.

The Groundwater Code (Code) defines industrial use of water as "a non-irrigation use of water not supplied by a city, town or private water company, including animal industry use and expanded animal industry use." A.R.S. § 45-561(5). An industrial user is a person who uses groundwater for an industrial use. In most cases industrial users withdraw groundwater from their own wells pursuant to Type 1 or Type 2 non-irrigation grandfathered rights or a groundwater withdrawal permit. These rights and permits (collectively referred to in this chapter as "industrial rights") have annual volumetric groundwater allotments. The total volume of Type 2 rights in the AMA was set at the time the Code was enacted. The total volume of water associated with Type 1 rights can increase over time as agricultural land with irrigation grandfathered rights is retired from production and the rights are converted to Type 1 non-irrigation grandfathered rights. General Industrial Use (GIU) permits are issued by the Department if water service cannot be secured from a municipal provider and if the use of surface water or effluent, or the purchase or lease of a grandfathered groundwater right is not economically feasible. Permits expire after a specified period of years.

An industrial user may also receive groundwater from an irrigation district. However, an industrial user may not receive groundwater from an irrigation district in excess of the amount it was entitled to receive on June 12, 1980 unless it has obtained a grandfathered right or a GIU permit. A.R.S. § 45-497(B).

There are also types of groundwater users that, although served by a municipal water provider, are subject to industrial program conservation requirements through the Municipal Conservation Program. These users include turf-related facilities and large-scale cooling facilities, and are referred to in the Municipal Conservation Program as "individual users."

Conservation is an important tool for reaching the AMA's safe-yield goal. Industrial facilities generally use water efficiently due to pumping costs and industrial discharge limitations that require them to recycle water and contain water on site. The allotment-based conservation requirements for the turf industry have required turf-related facilities to comply with declining application rates per acre since the First Management Plan became effective. This program has resulted in significant conservation savings through efficient use of water.

Industrial users have the legal authority to withdraw groundwater up to the annual allotment of their rights or permits subject to management plan conservation requirements. Because the cost of pumping groundwater is relatively low compared to the cost of other sources of water, there is no economic incentive for industrial users to switch to renewable water supplies. Because the Department does not have the authority to require holders of industrial rights to use renewable supplies in place of groundwater, it has tried to develop meaningful incentives to encourage the use of renewable supplies.

Some industrial users use surface water, effluent, or industrial wastewater. However, the majority of industrial water use is groundwater. The only industrial facilities that use effluent are turf-related facilities. However, almost all of this use is by individual users.

Users in several industrial categories have indicated that they may be interested in using renewable water supplies if such supplies were available and comparable in cost to groundwater. There are many factors that impede the ability of industrial users to use renewable water supplies, including lack of proximity to renewable supplies, reliability of supply, cost, supply ownership, and water quality issues. There are no significant water quality problems associated with using effluent on turf-related facilities. However, use of this source by other industrial users could require additional treatment to remove salts and other constituents.

In all the AMAs, a significant portion of the water rights allocated to industrial uses are unused. These unused allocations represent a potential increase in groundwater pumpage allowable under statute and provide a means for the industrial sector to expand over time.

For the third management period, there are general conservation requirements that apply to all industrial users. In addition to these requirements, there are specific conservation requirements that apply to the following current or potential industrial users in the Prescott AMA for the third management period:

- Turf-Related Facilities (≥ 10 acres)
- Sand and Gravel Facilities (>100 acre-feet/year)
- Large-Scale Cooling Facilities (>1,000 tons)
- New Large Landscape Users (>10,000 square feet of water intensive landscape)
- New Large Industrial Users (>100 acre-feet/year)

Industrial users in the Prescott AMA use groundwater primarily for golf course and landscape watering. Industrial water users with water rights or permits accounted for 3 percent of the AMA water use in 1997, or approximately 626 acre-feet. Water use was primarily related to industrial processes, sanitary and kitchen uses, turfgrass watering, cooling, construction, institutional facilities, landscaping, and stock watering. One golf course and two schools used the bulk of industrial water.

This chapter is organized as shown below. Following the Introduction, each Industrial Conservation Program is discussed under a separate subsection. In general, each of the subsections contains all or some of the following: (1) an introduction, (2) water use by the subsector, (3) First and Second Management Plan program development, (4) issues and Third Management Plan development, (5) program description, (6) non-regulatory efforts, (7) future directions, and (8) subsector conservation requirements.

- Introduction
    - Statutory Provisions
    - Industrial Program Development
    - Industrial Program Issues
    - Non-Regulatory Efforts
    - Future Directions
- All Industrial Users
- Turf-Related Facilities
- Sand and Gravel Facilities
- Large-Scale Cooling Facilities
- New Large Landscape Users
- New Large Industrial Users

6.1.1 Statutory Provisions

6.1.1.1 Conservation Requirements

The Code requires that the management plan contain a conservation program for industrial users. For the third management period the director is required to establish for each plan:

> additional conservation requirements for all non-irrigation uses of groundwater to be achieved by the end of the third management period and may establish intermediate conservation requirements to be achieved at specified intervals during the third management period . . . For industrial uses including industrial uses within the exterior boundaries of the service area of a city, town, private water company or irrigation district, the program in each plan shall require the use of or establish conservation requirements based on the use of the latest commercially available conservation technology consistent with reasonable economic return. A.R.S. § 45-566(A)(2).

6.1.1.2 Individual User Requirements

The Code also requires the establishment of additional conservation requirements for municipal uses in the Third Management Plan including "use of such other conservation measures as may be appropriate for individual users." A.R.S. § 45-566(A)(2). (See Chapter 5.) In the First Management Plan, only turf-related facilities receiving water from municipal providers were regulated as individual users. These facilities were subject to the requirements of the Industrial Conservation Program as if they were industrial users. Thus, regardless of the source of water, whether from a municipal provider or from the facility's own wells, all turf-related facilities were subject to the turf-related facility conservation requirements in the Industrial Conservation Program chapter of the First Management Plan.

Similarly, in the Second Management Plan, turf-related facilities receiving water from a municipal provider were regulated as individual users and were subject to the Second Management Plan industrial program conservation requirements for turf-related facilities. In addition, new large-scale cooling users, which are typically served by water providers, were also regulated as individual users in the Second Management Plan. These facilities were required to comply with the conservation requirements established for new large-scale cooling users in the Industrial Program chapter.

6.1.2 Industrial Program Development

The Industrial Conservation Program has evolved into a more technically sophisticated program since the First Management Plan. This has been the result of considerable input and cooperation by the regulated community as well as investigative efforts by the Department.

The First Management Plan requirements stressed water use efficiency and contained other general requirements. There were specific conservation programs only for metal mines, turf-related facilities, electric power plants, sand and gravel facilities, and other industrial users. As a result of consultant studies done for the Second Management Plan, additional conservation requirements were added for new large-scale cooling users, dairies, cattle feedlots, new large industrial users, and new large landscape users. In addition, there was a more specific effluent incentive provision for turf-related facilities.

Development of the Third Management Plan conservation requirements included extensive participation by a wide cross-section of industry representatives, including facility managers, consultants, municipal representatives, vendors, land developers, and academic research specialists. The following Technical Advisory Committees (TACs) were formed for the development of specific conservation requirements found in the Industrial Conservation Program:

- Turf-related facilities (separate committees for the Tucson and Phoenix AMAs);
- Dairies/feedlots (a joint committee for the Tucson, Phoenix, and Pinal AMAs);
- Large-scale power plants and cooling facilities (a joint committee for the Tucson and Phoenix AMAs);
- Sand and gravel facilities (a joint committee for the Tucson, Phoenix, and Pinal AMAs); and
- Metal mining facilities (Tucson AMA only).

Collectively, over thirty meetings were held with the committees over an eighteen month period. Committee members had an opportunity to help formulate and suggest conservation requirement alternatives, provide industry expertise, and review final programs.

In the Third Management Plan, separate industrial program categories have been created for large-scale cooling facilities, new large landscape users and new large industrial user subsectors. These three industrial water use groups were included in the "all industrial users" category in the Second Management Plan, but have been separated out to more clearly present the water use characteristics and specific conservation requirements for the third management period. This results in a total of five industrial program subsectors in the Third Management Plan for the Prescott AMA: (1) turf-related facilities, (2) sand and gravel facilities, (3) large-scale cooling facilities, (4) new large landscape users and (5) new large industrial users.

Industrial subsector requirements vary from allotment-based requirements to the implementation of specific conservation measures. In all cases, the requirements have been developed consistent with the statutory requirement to establish conservation requirements that require the use of, or are based on the use of "the latest commercially available conservation technology consistent with reasonable economic return." A.R.S. § 45-566(A)(2).

For the Third Management Plan, the Department reviewed the existing subsector programs and tried to address any existing problems or deficiencies. In most instances, specific conservation requirements for the third management period are not significantly different from those in the Second Management Plan. Conservation requirements in the First and Second Management Plans have been effective in improving water use efficiency for certain industrial subsectors. In the Third Management Plan, a number of technical corrections have been made, requirements have been added, additional program alternatives have been included, and renewable supply use incentives have been added or adjusted to be more effective. The specific changes, issues, and renewable supply incentives that were considered in subsector program development are discussed in the subsector sections of this chapter.

6.1.3 Industrial Program Issues

The Department considered a number of issues associated with the industrial program as it developed the Third Management Plan. Several issues emerged that have long-term implications for industrial water use. Some issues can be addressed using existing statutory and regulatory mechanisms while others may require a statutory amendment. The Department will continue to pursue opportunities to address these issues.

6.1.3.1 Use of Renewable Supplies by Industrial Users

Use of renewable supplies by industrial users in the Prescott AMA is limited by physical, economic, and legal barriers. Physical access to renewable supplies is frequently limited because potential users are often far removed from surface water and effluent conveyance facilities. The cost of constructing delivery systems to the industrial users may be prohibitive. Because industrial users have legal authority to withdraw groundwater from their own wells at a cost consisting primarily of relatively low energy costs, there is no economic incentive to incur the additional expenses associated with the purchase, delivery, and possible treatment of an alternative supply. In addition, water quality regulations, such as wastewater reuse

rules or aquifer protection permit rules, may also provide impediments to the use of surface water or effluent by industrial users.

6.1.3.2 Matching Water Quality and Uses

Each industrial user category has its own water chemistry requirements related to the particular product or process involved. Although some users may require high quality water, others do not. For example, turf facilities are able to use effluent without any significant adverse impact and sand and gravel facilities can use effluent for aggregate washing. Remediated groundwater may be acceptable for certain industrial uses. Use of industrial wastewater may also be a potential water supply and needs to be investigated. Obvious constraints on use include location of the supply in relation to the facility, cost, and pre-treatment needs.

In 1997, the Legislature enacted legislation significantly revising the Water Quality Assurance Revolving Fund (WQARF) program to provide incentives for the use of remediated groundwater to facilitate the treatment of contaminated groundwater. Among other things, the WQARF legislation provides that when determining compliance with management plan conservation requirements, the Department shall account for groundwater withdrawn pursuant to approved remedial action projects under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, consistent with the accounting for surface water. Laws 1997, Ch. 287, § 51(B). See Chapter 7, section 7.4.4.6.3. Groundwater withdrawn pursuant to an approved remedial action project retains its legal character as groundwater for all other purposes under Title 45, Arizona Revised Statutes, including all other laws regulating groundwater withdrawal and use such as the assessment of withdrawal fees pursuant to A.R.S. § 45-611 *et seq.*, as well as laws regulating water exchanges as set forth in A.R.S. § 45-1001 *et seq.*, the transportation of groundwater as set forth in A.R.S. § 45-541 *et seq.*, withdrawals of groundwater for transportation to active management areas as set forth in A.R.S. § 45-551 *et seq.*, and underground water storage, savings, and replenishment as set forth in Title 45, Chapter 3.1, Arizona Revised Statutes.

For each approved remedial action project, the annual amount of groundwater that is eligible for the remediated groundwater accounting incentive is the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in the consent decree or other document approved by the EPA or ADEQ. However, if the project was approved prior to June 15, 1999 and the maximum annual volume of groundwater that may be withdrawn pursuant to the project is not specified in a consent decree or other document approved by the EPA or ADEQ, the annual amount of groundwater that is eligible for the remediated groundwater accounting incentive is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999. The director may modify the annual amount of groundwater that is eligible for the accounting incentive if an increase in withdrawals is necessary to further the purpose of the project or if a change is made to the consent decree or other document approved by the EPA or ADEQ.

In order to qualify for the remediated groundwater accounting incentive, a person must notify the director in writing of the anticipated withdrawal of the groundwater prior to its withdrawal. The notification must include a copy of a document approved by ADEQ or the EPA such as the Remedial Action Plan (RAP), Record of Decision (ROD), or consent decree. Unless specified in the document, the notification must include the volume of groundwater that will be pumped annually pursuant to the project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project. The notification must also include the purpose for which the remediated groundwater will be used and the name and telephone number of a contact person. Additionally, at the time the notice is given, the person must be using remediated groundwater pursuant to the approved remedial action or must have agreed to do so through a consent decree or other document approved by ADEQ or the EPA. Remediated groundwater which qualifies for the accounting must be metered and reported separately from groundwater that does not qualify for the accounting. (See section 6-204 of the Conservation Requirements for All Industrial Users).

6.1.3.3 Unused Allotment

There are about 4,541 acre-feet of unused groundwater rights and permit allocations associated with the industrial sector in the Prescott AMA. Approximately 3,170 acre-feet of the unused allotment is a Type 2 non-irrigation grandfathered right owned by the City of Prescott. Some of the unused allotment may never actually be put to use and predictions are difficult. However, total industrial water use is projected as 1,144 acre-feet in 2010 and as 1,532 acre-feet in 2025. If the entire unused allotment volume were pumped, it would be a serious hindrance to reaching safe-yield unless it were offset through replenishment with imported renewable supplies. Type 1 grandfathered rights and some Type 2 grandfathered rights may be extinguished for assured water supply credits (mineral extraction and electric power Type 2 rights may not be extinguished for this purpose). This mechanism provides an opportunity to permanently extinguish existing industrial rights.

6.1.3.4 General Industrial Use and Mineral Extraction Permits

GIU permits are issued under A.R.S. § 45-515 for industrial uses located outside of service area boundaries pursuant to certain conditions and are valid for a specified period of time. Permits may also be issued for mineral extraction and metallurgical processing under A.R.S. § 45-514. These permits allow groundwater pumping in addition to withdrawals pursuant to existing industrial rights. The total permitted GIU volume in the Prescott AMA in 1995 was 68 acre-feet. The number of permit applications may increase in the future as the availability of Type 2 rights to serve industrial uses becomes more limited.

6.1.4 Non-Regulatory Efforts

The Department began a program for conservation assistance and augmentation of water supplies in the AMAs in 1991. Funding for the program is obtained from an annual withdrawal fee levied and collected from all large groundwater users in the AMAs. Each AMA can initiate programs that concentrate on the areas of greatest water conservation potential in each water use sector (municipal, industrial, and agricultural) that are based on total water use, current water use practices, and potential for implementation of new conservation technologies. In the Prescott AMA, the Conservation Assistance/Augmentation (CAA) program has enabled funds to be set-aside for use for future data collection efforts and for future water monitoring.

6.1.5 Future Directions

Maintaining water use efficiency, providing conservation and technical assistance, and developing opportunities for renewable resource use are the most likely future directions for the industrial sector. The future of industrial users in relation to the safe-yield goal is largely shaped by the potential for growth in groundwater use and existing constraints on replacing groundwater use with renewable supplies.

It is likely that future development in the Prescott AMA will impact the goal of safe-yield if unused Type 1 and Type 2 non-irrigation grandfathered rights are used to meet water needs. New golf courses using these rights could have the greatest impact on industrial sector water use. However, golf courses also present one of the best areas in which effluent or other renewable supplies could be used. Presently, two 18-hole golf courses are supplied with effluent by the City of Prescott. Future golf course development in the city will likely also depend on effluent for its turf watering needs.

The development of "critical area" programs within the AMAs will be a major focus of the Department's activities during the third management period. This may involve the development of water management strategies to address localized water conditions, promoting withdrawals in areas experiencing groundwater recharge, and restricting withdrawals from areas experiencing severe declines. For industrial uses this could mean limiting new General Industrial Use permits and industrial users in critical areas, limiting Type

1 non-irrigation grandfathered right conversions or buying out or providing incentives for extinguishing existing grandfathered rights in specified areas.

Also during the third management period, the Department will increase its efforts to gather and analyze timely data regarding turf water use. Studies performed at the Antelope Hills Golf Course will provide new information on evapotranspiration and water application rates for turfgrass grown at the specific altitude and under the specific growing conditions that exist in the Prescott AMA.

There are presently no large industrial water users such as cooling facilities, power plants, or golf courses on the Yavapai-Prescott Indian Reservation. It is hoped that water conservation measures will be employed for any future use by these types of facilities on the reservation. The Department will be able to provide information concerning these water conservation measures as needed.

6.2 ALL INDUSTRIAL USERS

6.2.1 Introduction

The conservation requirements in this section apply to all industrial water users. In addition to these requirements, certain industrial users are also required to comply with conservation requirements specific to their type of water use under other sections of this chapter. For example, a sand and gravel facility must comply with the requirement in this section to use low-flow plumbing devices at the facility to the maximum extent possible and, in addition, must comply with the conservation requirements in section 6.4.6 of this chapter.

The following industrial users are required to comply with the conservation requirements for all industrial users in this section, as well as conservation requirements for their specific type of water use in other sections of this chapter: turf-related facilities, sand and gravel facilities, large-scale cooling facilities, new large landscape users, and new large industrial users. All remaining industrial users are referred to in this section as "other industrial users" and are required to comply only with the conservation requirements for all industrial users in this section.

6.2.2 Water Use by "Other Industrial Users"

Many different types of commercial and manufacturing uses are included in the "other industrial user" category. "Other industrial users" include health care facilities, resorts, restaurants, office buildings, shopping malls, and laundries. Water uses associated with this category commonly include cooling, landscaping, sanitary, kitchen, and industrial process use.

The water use of some user groups within this category is expected to grow in the future. It is anticipated that most future industrial development will be served by municipal providers because commercial and industrial development generally occurs within their service areas.

6.2.3 Program Development and Issues

In the First Management Plan, "other industrial users" were required to avoid waste and make efforts to recycle water. In addition, they were prohibited from using single-pass cooling or heating. These requirements and others were also included in the Second Management Plan for all industrial users.

Consultant studies done in preparation of the Second Management Plan investigated water use associated with landscaping, heating and cooling, and sanitary and kitchen water use practices. These studies identified areas of water conservation potential and appropriate water conservation techniques. The Department has determined that the findings from these studies still apply to current industrial use and practices.

The following techniques are recommended for achieving water conservation in the industrial sector:

- reusing or recycling water
- avoiding single pass cooling unless the water is reused
- use of low flow plumbing fixtures
- use of low water use landscaping with efficient irrigation systems
- developing site specific water conservation plans for large facilities

Most of these techniques are included in the conservation requirements for all industrial users detailed in section 6.2.5 and apply to "other industrial users" as well as industrial users subject to conservation

requirements for their specific type of water use. The Third Management Plan requirements are intended to send a strong conservation message to all industrial users to use water efficiently.

The Department also inventoried the "other industrial user" category during the planning process for the Third Management Plan to determine if there were any user groups with sufficient usage and conservation potential to warrant specific conservation requirements. The diverse nature of water uses within this category makes it difficult to formulate volumetric conservation requirements that address the various types of industries. There are, however, some opportunities for water conservation.

The greatest conservation potential within the "other industrial users" category is in landscape watering which is a use common to most facilities. For instance, commercial landscapes are usually maintained by contractors whose priority is a lush appearance and who may not adjust automatic irrigation controller clocks to match weather conditions. Smaller cooling towers may not be managed with water conservation as a priority.

6.2.4 All Industrial Users Conservation Program

The Third Management Plan conservation program for all industrial users is similar to the Second Management Plan program. All industrial users are required to avoid waste and make diligent efforts to recycle water. Single-pass cooling or heating is not allowed unless the water is reused and low-flow plumbing fixtures must be used as required by the state or local plumbing code. Since January 1, 1994 the Arizona Statewide Plumbing Code has required use of low-flow fixtures in new construction throughout the state and some local plumbing ordinances have even more stringent standards.

There are two new landscaping requirements in the Third Management Plan. Industrial users that are not regulated as turf-related facilities or new large landscape users are required to use low water use landscape plants for landscaping where feasible and water with efficient irrigation systems. Improving irrigation efficiency can be a source of major water savings whether the plants have high or low water needs. The Department encourages all facilities to irrigate efficiently regardless of the type of vegetation planted. In addition, industrial users are prohibited from serving groundwater to vegetation planted in a public right-of-way after January 1, 2002 unless the plants are on the low water use plant list for the AMA, and are prohibited from serving groundwater to a water feature in the right-of-way if installed after January 1, 2002.

6.2.5 Industrial Conservation Requirements and Monitoring and Reporting Requirements for All Industrial Users

6-201. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases used in sections 6-202 and 6-203 of this chapter shall have the following meanings:

1. *"Industrial process purposes" means water which is used by an industrial user directly in the creation or manufacture of a product.*

2. *"Industrial use" means a non-irrigation use of water not supplied by a city, town or private water company, including animal industry use and expanded animal industry use.*

3. *"Industrial user" means a person who uses water for industrial uses.*

4. *"Low-flow plumbing fixture" means a lavatory faucet, lavatory faucet replacement aerator, kitchen faucet, kitchen faucet replacement aerator, shower head, urinal, water closet or evaporative cooler designed to meet the use rates specified in A.R.S. § 45-312 and 313 or the applicable county or city code, whichever is more restrictive.*

5. *"Single pass cooling and heating" means the use of water without recirculation to increase or decrease the temperature of equipment, a stored liquid or a confined air space.*

6. *"Wastewater" means water that is discharged after an industrial or municipal use, excluding effluent.*

6-202. Conservation Requirements

Beginning on January 1, 2002, or upon commencement of water use, whichever is later, and continuing thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, an industrial user shall comply with the following requirements:

1. *Avoid waste; use only the amount of water from any source, including effluent, reasonably required for each industrial use; and make diligent efforts to recycle water.*

2. *Do not use water for non-residential single-pass cooling or heating purposes unless the water is reused for other purposes.*

3. *Use low-flow plumbing fixtures as required by Title 45, Chapter 1, Article 12, Arizona Revised Statutes, or any applicable county or city code, whichever is more restrictive.*

4. *Use plants listed in Appendix 5F, Low Water Use Plant List or any modifications to the list, for landscaping to the maximum extent feasible, and water with a water efficient irrigation system. An industrial user regulated as a turf-related facility under sections 6-301, et seq., or as a new large landscape user under section 6-901, et seq., is exempt from this requirement.*

5. *Do not serve or use groundwater for the purpose of watering landscaping plants planted on or after January 1, 2002 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel, unless the plants are listed in Appendix 5F, Low Water Use Plant List or any modifications to the list. The director may waive this requirement upon request from the industrial user if a waiver is in the public interest. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

6. *Do not serve or use groundwater for the purpose of maintaining water features, including fountains, waterfalls, ponds, watercourses, and other artificial water structures, installed after January 1, 2002 within any publicly owned right-of-way of a highway, street, road, sidewalk, curb or shoulder which is used for travel in any ordinary mode, including pedestrian travel. The director may waive this requirement upon request from the industrial user if a waiver is in the public interest. This requirement does not apply to any portion of a residential lot that extends into a publicly owned right-of-way.*

6-203. Monitoring and Reporting Requirements

A. Requirements

For calendar year 2002, or the calendar year in which the facility first begins to use water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the Fourth Management Plan, an industrial user shall, except as provided for in subsection B below, include the following information in its annual report required by A.R.S. § 45-632:

1. *The total quantity of water by source, including effluent, withdrawn, diverted or received during the reporting year for industrial process purposes, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The total quantity of water by source, including effluent, withdrawn, diverted or received during the reporting year for purposes other than the industrial process purposes, listed in paragraph 1 of this subsection, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *An estimate of the quantity of wastewater generated during the reporting year.*

4. *An estimate of the quantity of wastewater recycled during the reporting year.*

5. *A description of the primary purposes for which water from any source, including effluent, is used.*

6. *The number of acres of land that were planted with low water use plants during the calendar year as a result of removal of plants not on the low water use plant list for the Prescott AMA. An industrial user regulated as a turf-related facility under sections 6-301, et seq., or as a new large landscape user under sections 6-601, et seq., is exempt from this requirement.*

B. Exemption

An industrial user who holds a Type 1 or Type 2 non-irrigation grandfathered right or a groundwater withdrawal permit in the amount of 10 or fewer acre-feet per year, is exempt from the requirements set forth in subsection A of this section, unless the industrial user holds more than one such right or permit in the aggregate amount of more than 10 acre-feet per year and withdraws more than 10 acre-feet of water during the calendar year pursuant to those rights or permits.

6-204. Remediated Groundwater Accounting for Conservation Requirements

A. Accounting

Groundwater withdrawn pursuant to an approved remedial action project under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Title 49, Arizona Revised Statutes, and used by a person subject to a conservation requirement established under this chapter, shall be accounted for consistent with the accounting for surface water for purposes of determining the person's compliance with the conservation requirement, subject to the provisions of subsections B through D of this section.

B. Amount of Groundwater Eligible for Accounting

For each approved remedial action project, the annual amount of groundwater that is eligible for the remediated groundwater accounting provided in subsection A of this section is the project's annual authorized volume. The annual authorized volume for a remedial action project approved on or after June 15, 1999 is the maximum annual volume of groundwater that may be withdrawn pursuant to the project, as specified in a consent decree or other document approved by the United States Environmental Protection Agency (EPA) or the Arizona Department of Environmental Quality (ADEQ). The annual authorized volume for a project approved prior to June 15,1999 is the highest annual use of groundwater withdrawn pursuant to the project prior to January 1, 1999, except that if a consent decree or other document approved by the EPA or ADEQ specifies the maximum annual volume of groundwater that may be withdrawn pursuant to the project, the project's annual authorized volume is the maximum annual volume of groundwater specified in that document. The director may modify the annual authorized volume for a remedial action project as follows:

1. *For an approved remedial action project associated with a treatment plant that was in operation prior to June 15, 1999, a person may request an increase in the annual authorized volume at the same time the notice is submitted pursuant to subsection C of this section. The director shall increase the annual authorized volume up to the maximum treatment capacity of the treatment plant if adequate documentation is submitted to the director demonstrating that an increase is necessary to further the purpose of the remedial action project and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

2. *A person may request an increase in the annual authorized volume of an approved remedial action project at any time if it is necessary to withdraw groundwater in excess of the annual authorized volume to further the purpose of the project. The director shall increase the annual authorized volume up to the maximum volume needed to further the purpose of the project if adequate documentation justifying the increase is submitted to the director and the increase is not in violation of the consent decree or other document approved by the EPA or ADEQ.*

3. *The director shall modify the annual authorized volume of an approved remedial action project to conform to any change in the consent decree or other document approved by the EPA or ADEQ if the person desiring the modification gives the director written notice of the change within thirty days after the change. The notice shall include a copy of the legally binding agreement changing the consent decree or other document approved by the EPA or ADEQ.*

C. Notification

To qualify for the remediated groundwater accounting provided in subsection A of this section, the person desiring the accounting must notify the director in writing of the anticipated withdrawal of groundwater pursuant to an approved remedial action project under CERCLA or Title 49, Arizona Revised Statutes, prior to the withdrawal. At the time the notice is given, the person desiring the accounting must be using remediated groundwater pursuant to the approved remedial action project or must have agreed to do so through a consent decree or other document approved by the EPA or ADEQ. The notice required by this subsection shall include all of the following:

1. *A copy of a document approved by ADEQ or the EPA, such as the Remedial Action Plan (RAP), Record of Decision (ROD) or consent decree, authorizing the remediated groundwater project. Unless expressly specified in the document, the person shall include in the notice the volume of groundwater that will be pumped annually pursuant to the project, the time period to which the document applies, and the annual authorized volume of groundwater that may be withdrawn pursuant to the project.*

2. *The purpose for which the remediated groundwater will be used.*

3. *The name and telephone number of a contact person.*

4. *Any other information required by the director.*

D. Monitoring and Reporting Requirements

To qualify for the remediated groundwater accounting for conservation requirements as provided in subsection A of this section, groundwater withdrawn pursuant to the approved remedial action project must be metered separately from groundwater withdrawn in association with another groundwater withdrawal authority for the same or other end use. A person desiring the remediated groundwater accounting for conservation requirements shall indicate in its annual report under A.R.S. § 45-632 the volume of water withdrawn and used during the previous calendar year that qualifies for the accounting.

6.3 TURF-RELATED FACILITIES

6.3.1 Introduction

A turf-related facility is a facility with 10 or more acres of water-intensive landscaped area. Golf courses, parks, schools, cemeteries, and common areas within residential developments are examples of facilities that often qualify as turf-related facilities. Because "irrigation" is defined in the Code as water applied for the purpose of growing crops for sale or consumption, turf-related watering for recreational and aesthetic purposes is considered a non-irrigation water use rather than an irrigation use.

Turf-related facilities regulated under the Industrial Conservation Program obtain groundwater pursuant to Type 1 or Type 2 non-irrigation grandfathered rights or groundwater withdrawal permits. In addition, a large number of turf-related facilities are served groundwater by municipal water providers and are also subject to the conservation requirements set forth in this section through provisions of the Municipal Conservation Program (see Chapter 5). These municipally-served facilities are called individual users.

Second Management Plan conservation requirements and other factors have led to changes in turf-related facilities. New facilities are typically designed with less water-intensive acreage, both existing and new facilities employ technology that applies water more efficiently, and facility management has become more cognizant of the need for water conservation.

6.3.2 Water Use by Turf-Related Facilities

Turf-related facilities apply water for growing turfgrass and other landscaping plants and for filling and maintaining water levels in bodies of water. Water application efficiency is determined by the type of water application system that is utilized, maintenance of the system, water application scheduling, site topography, soil type, weather conditions, and water quality. In 1997 there were four turf-related facilities subject to conservation requirements in the Prescott AMA, two golf courses and two schools. Another recently developed 18-hole golf course, Quailwood Greens, is supplied with water by a municipal water company. Parks, cemeteries, and residential common areas with 10 or more acres of water-intensive landscaping are also subject to regulation as turf-related facilities, but none have been identified within the Prescott AMA.

The water use rate for maintaining bodies of water is higher than for turf and low water use landscaping because evaporation from the water surface (approximately 5.8 feet per year) is higher than the consumptive use and evaporation rates for plants. Unlined or inadequately sealed water holding basins can lose significant volumes of water through seepage. The bodies of water associated with turf-related facilities are most often constructed on golf courses, although sometimes parks feature recreational bodies of water.

"Water use efficiency" refers to the relationship between the physiological needs of the plants being watered and the amount of water actually applied. Turf-related watering is normally expressed in terms of acre-feet per acre per year. Average turf application rates at turf-related facilities may be estimated by subtracting the estimated water use for low water use landscaping acres and lake acres (calculated by multiplying the number of acres of low water use landscaping and water surface area by the application rates) from total water use.

6.3.2.1 Golf Courses

In the Prescott AMA, golf courses include driving ranges and 18-hole courses. Golf courses are composed of tees, greens, fairways, and roughs. The most frequently used type of grass is Kentucky bluegrass.

Golf course water application systems are often more sophisticated than those at other turf-related facilities. Most have a system with a control panel and field satellites that can override the central controller. Computer controlled watering systems and pump stations with flexibility in operating sprinkler heads are commonplace; newer systems provide much greater savings in energy and water costs than water delivery systems of 10 years ago. Most of the newer systems can incorporate weather stations which assist in scheduling water application to more accurately replace the amount of water lost through evaporation and transpiration. Most courses apply water to greens and tees with spray heads; larger turf areas are watered with large radius heads. Water is typically pumped into the watering system from a reservoir or a storage tank.

Turf managers who are knowledgeable of water conservation technologies and practices are critical to program effectiveness. Taking advantage of a computerized system's ability for field-adjusting water distribution uniformity or the percentage of points within the area being watered which receive equivalent amounts of water, routine leveling of heads, and frequent verification of proper operation of all controllers and heads are examples of prudent management.

In 1997 two golf courses used only groundwater to meet their water needs and were therefore subject to conservation requirements. Two golf courses in the Prescott AMA met their water needs exclusively with effluent and subsequently were not subject to Department requirements.

6.3.2.2 Schools

The main function of turf in school yards is to provide an appropriate surface for active play. School managers have determined that using low water application rates can save money without adversely impacting turf use. Although athletic fields tend to be maintained at a higher turf quality than the balance of school yards, more relaxed appearance standards allow much lower application rates than those achieved by golf courses.

Water application systems at schools are usually relatively inflexible. In older schools, outdated equipment, including quick coupler systems, is common. Newer facilities have in-place sprinkler heads with manual or electromechanical control. Some schools have converted non-play areas to drip irrigation. Due to budget constraints, it is difficult for schools to install computerized controllers and systems are frequently manually operated. There are two schools with ten or more acres of turf in the Prescott AMA.

6.3.3 First and Second Management Plan Program Development

The First Management Plan established a maximum annual water allotment for each turf-related facility and stressed water use efficiency. This was the first time golf course water use was regulated, and water management practices such as evapotranspiration-based water application scheduling were uncommon. The First Management Plan provided for adjustment of turf application rates if effluent was used. The allotment approach permitted turf managers to consider characteristics of the facility, evaluate conservation alternatives, and decide how to most effectively apply the allotment to meet the facility's needs.

Development of the Second Management Plan conservation requirements involved extensive data collection regarding water use patterns in Arizona and the conservation options available to turf-related facility managers. The Department relied heavily on input from the Turf Advisory Committees in the Tucson and Phoenix AMAs which consisted of golf course, park, cemetery, and school turf managers, turf irrigation specialists, extension agents, and golf course designers.

The Department used consulting services to analyze the water conservation practices in use in the turf industry and the potential for future water conservation. The study evaluated technologies including management practices and design alternatives associated with water conservation. A primary finding of

the study was that management of the water application system, rather than the use of specific water application systems, is the most important factor in efficient landscape watering. The consultant and advisory committees concluded that a combination of good management and use of the latest water application systems was very effective in reducing water use.

Conservation requirements in the Prescott area differ from southern desert areas due to climatic conditions and the adaptability of the grass species used. Studies of turf water use conducted at Colorado State University in Fort Collins, Colorado were examined to determine turf watering needs for the Prescott AMA. The Colorado location has climatic and geographic features similar to the Prescott AMA.

For the Second Management Plan, the Department chose not to require specific conservation techniques wherever possible due to the widely varied nature of turf-related facilities. Instead, turf-related facilities continued to receive a maximum annual water allotment based on the use of conservation techniques. The allotment approaches of the First and Second Management Plans permitted turf managers to consider characteristics of the facility, evaluate conservation alternatives, and decide how to most effectively apply the allotment to meet each facility's needs.

Based on these factors, the Department established final annual application rates in the Prescott AMA of 4.9 acre-feet per acre per year for turf acres, 5.5 acre-feet per acre for bodies of water, and 1.5 acre-feet per acre for low water use landscaping. Adjustments to the application rate were provided for establishing new turf, using high salinity water, filling or refilling bodies of water, and revegetation of acreage disturbed during construction.

The Department continued to encourage the use of effluent in the Second Management Plan. As an incentive, effluent use, if 50 percent or more of total water use, was discounted by 15 percent to 20 percent when determining a facility's compliance with its maximum annual water allotment.

A review of short term weather data in the 1980s indicated that a three-year averaging method would adequately compensate for weather fluctuations when determining a facility's compliance with its allotment. A provision for finding a facility in compliance on either an annual or a three-year average basis was included in the Second Management Plan.

The Second Management Plan has proven most successful in changing the design of new facilities by reducing turf acres without sacrificing functionality. Water use by turf-related facilities is highly correlated to the number of turfed acres within the facilities. Recent school and park designs usually eliminate turf except where essential for recreational purposes, reducing water use for turf. Golf course designers have been able to design lower acreage courses without affecting appearance and playability. Generally, improvements in water management and irrigation technology have allowed turf-related facilities to increase the percent of acreage that is overseeded, while maintaining efficient water application rates.

6.3.4 Issues and Third Management Plan Development

The Code provides that the conservation program for industrial users shall require the use of or establish conservation requirements based on the use of the latest commercially available and economically feasible water conservation technologies. For turf-related facilities, such technologies include: (1) the use of weather-based water application scheduling and water budgeting; (2) accurate, well-designed water application systems and computerized control mechanisms; (3) golf course design which concentrates water-intensive landscaping in areas which come into play; and (4) PVC liners for bodies of water. Using new low water use and drought tolerant turfgrasses, improving conservation knowledge and awareness by facility management, and converting industrial users to renewable supplies are ways turf-related facilities could further contribute to safe-yield.

Technical Advisory Committees in the Phoenix and Tucson AMAs, consisting of golf course, park, school, and cemetery turf managers, golf course directors, golf course architects, industry association representatives, and land developers contributed to the development of the Third Management Plan conservation program for turf-related facilities. The committees aided the Department in identifying second management period water use efficiency, water supply and conservation program effectiveness issues, provided and reviewed data and information relevant to the issues, and participated in developing program alternatives for the third management period. The committees worked with the Department to review the merits of all alternatives and to strive for consensus on the program for the third management period. In some cases, subcommittees were formed to address a specific issue and to make a program recommendation to the committee as a whole. These committees and the Department identified the following issues of relevance:

- the allotment methodology
- application rates for turf
- weather adjustment
- renewable supply incentives

6.3.4.1 Allotment Methodology and Application Rates

The Second Management Plan application rate of 4.9 acre-feet per acre per year applies to all turf-related facilities. For golf courses, the application rate is limited to five acres of turf for a maximum water use cap of 24.5 acre-feet per hole. In the Third Management Plan, the annual application rate for all turf-related facilities is 4.9 acre-feet per acre for turf acres, 5.5 acre-feet per acre for water surface acres, and 1.5 acre-feet per acre for low water use landscaped area.

Because regional variation in rainfall, wind speed during watering times, soil type, root zone depth, and course topography can all have potential negative impacts on turf water demand, application rates deemed sufficient for the majority of facilities may not be appropriate for all facilities. Individual facilities with special circumstances which could render these application rates unreasonable may seek relief through administrative review. A.R.S. § 45-575.

While the maximum annual water allotment provisions do not directly limit water-intensive acreage of new golf courses, acreage limitations are incorporated into the derivation of the 24.5 acre-feet per hole allotment cap. Among the conservation technologies currently available to golf course developers, minimizing water-intensive acreage is one of the most effective means of reducing water demand. Both the turf-related facility study conducted by the Department during development of the Second Management Plan and numerous articles in golf industry trade journals during the past 15 years point to smaller turfed areas as an effective means for golf courses to save water and reduce operating costs. Eighteen-hole golf courses with about 90 acres of turf were found to be more manageable while still being about 7,200 yards in length. Bodies of water with 2 to 3 acres of surface area allow for sufficient storage capacity to hold three to five days worth of peak facility water demand. The allotment cap is based on these acreage guidelines for an 18-hole course multiplied by the application rates for turfed and water surface area, expressed on a per hole basis.

6.3.4.2 Renewable Supply Incentives

The Second Management Plan's incentive for effluent use counted each acre-foot of effluent as .85 acre-foot if effluent constituted 50 percent to 89 percent of total water use and .80 acre-foot if it constituted 90 percent or greater of total water use. The Second Management Plan exempts effluent filled lakes from a limitation on golf course water surface acreage for which an allotment is given.

The cost and availability of effluent delivery and the policies of individual municipal providers primarily determine effluent use for turf-related watering in the Prescott AMA. Having effluent excluded from a municipal provider's gallons per capita per day conservation requirement (see Chapter 5), averting the lengthy permitting process and costs to discharge effluent into navigable waterways, and preventing groundwater pumping in areas where it is adverse to residential water supplies are factors that influence municipal providers to deliver effluent to turf-related facilities.

The City of Prescott has developed a policy which requires any new turf-related facility with water demand in excess of 100 acre-feet per year to use exclusively effluent to meet its turf and landscape watering needs. The new facilities are required to construct infrastructure needed to deliver effluent to the facility.

The Department and the Third Management Plan turf TACs discussed several incentives that would further encourage effluent use by both municipally provided facilities and industrial users during the third management period. Because effluent is an underutilized supply, the Department chose to discount all direct effluent use 40 percent. The incentive will provide a significant discount to encourage effluent use where supplies are expensive and to encourage and reward the construction of wastewater package plants to produce effluent in new developments, where supplies may be limited until residential development nears completion. The incentive acknowledges the need for efficient use of all water supplies, while providing a higher potential application rate to facilities using higher percentages of effluent. Agronomic research has shown that high quality turfgrass can be maintained through application of approximately 75 percent of the measured evapotranspiration rate. As effluent use approaches 100 percent of a facility's total water use, the 40 percent effluent discount will allow a typical golf course to apply the full amount of water lost by turfgrass through evaporation and transpiration.

6.3.5 Turf-Related Facilities Program

6.3.5.1 Maximum Annual Water Allotment

6.3.5.1.1 Base Allotment

The core of the conservation program for turf-related facilities is the maximum annual water allotment. The allotment is calculated differently for different types of facilities, but in most cases there is a direct relationship between the number of acres to which water is applied and the volume of the allotment. The total acreage of turf and lakes is multiplied by an acre-foot per acre rate to determine the allotment.

The allotment for all turf-related facilities in the Prescott AMA is calculated by determining the actual acreage within the facility in each of the three landscaping categories, and then multiplying the number of acres by the appropriate application rate (see Table 6-1). The approach used for these facilities allows expansion of landscaped area. Beginning with the First Management Plan, the Department recognized that the latest conservation technology for golf courses includes course design which concentrates water-intensive landscaping into areas which come into play and water management practices which adjust water application schedules for weather conditions and seasons of highest play. The allotment for golf course acreage which came into existence after December 31, 1984 is therefore capped to encourage efficient design, construction, water application, and overseeding practices. These caps are described below.

Pre-1985 golf courses. Several limitations apply to the maximum annual water allotment for pre-1985 golf courses. In determining the number of water surface acres in existence within a facility, the total surface area of any bodies of water added to the facility after December 31, 1984 and not filled and refilled entirely with direct use effluent or effluent recovered within the area of impact of a storage project is limited to an area calculated by multiplying the number of holes present within the turf acres that came into existence within the facility after December 31, 1984 by 0.14 acre per hole. Also, the allotment for any turf acres and low water use landscaped area that were added to the facility after December 31, 1984 cannot exceed

TABLE 6-1
ANNUAL APPLICATION RATES FOR TURF-RELATED FACILITIES
PRESCOTT ACTIVE MANAGEMENT AREA

Type of Use	Applicable Rate (acre-feet per acre)
Turf	4.9
Water Surface Acres	5.5
Low Water Use Landscaping	1.5

an amount calculated by multiplying the number of holes present within those acres by 24.5 acre-feet of water per hole, plus any allotment additions.

Post-1984 golf courses. Several limitations also apply to the maximum annual water allotment for post-1984 golf courses. In determining the number of water surface acres in existence within a facility, the total surface area of all bodies of water not filled and refilled entirely with direct use effluent and effluent recovered within the area of impact is limited to an area calculated by multiplying the number of holes present within the facility during the year by 0.14 acre per hole. Also, the allotment for turf acres and low water use landscaped area within a post-1984 golf course cannot exceed an amount calculated by multiplying the number of holes present within the facility by 24.5 acre-feet of water per hole, plus any allotment additions.

Golf courses may expand or develop any number of water-intensive landscaped acres and low water use landscaped area. However, water use must not exceed the maximum annual water allotment, which assumes acreage restrictions. Although the allotment is calculated on a per acre basis, the facility manager has discretion on how to apply the allotment within the facility.

6.3.5.1.2 Allotment Additions

Under certain circumstances, a turf-related facility is entitled to an addition to its base allotment. In some cases, the allotment addition is effective only for one year; in other cases, the allotment addition is effective for a longer period. The following are the allotment additions allowed in the Third Management Plan:

Allotment Addition for Establishment of Newly Turfed Area

An allotment addition is given to turf-related facilities for the establishment of newly planted turf. The allotment addition is equal to 1.0 acre-feet of water per acre of newly turfed area, and is limited to the year in which the turf is planted. For golf courses, the allotment addition is limited to an amount calculated by multiplying the number of holes present within the newly turfed area by 5 acre-feet of water.

Allotment Addition for Revegetation

A revegetation allotment addition is available to facilities that want to establish low water use or other site-adapted landscaping plants which will need only temporary supplemental water application after construction of a new or renovated facility. This allotment addition of up to 1.5 acre-feet per acre for up to a maximum of three calendar years is quantified and granted on an individual basis through an application process. The quantity and duration of the allotment adjustment is determined through the Department's evaluation of each application. This adjustment is separate from the low water use landscaping component included in the maximum annual water allotment calculation, and is not included in the allotment cap for new landscaped areas within golf courses.

Allotment Addition for Filling Bodies of Water

New turf-related facilities receive a one-time allotment addition to fill bodies of water used within the facility. The allotment addition is equal to the volume used for initial filling of the body of water and is given only for the year in which the body of water is filled. Any facility may also apply for an allotment addition to refill a body of water which has been emptied for maintenance work to eliminate or reduce seepage losses. The allotment addition may be given only for the year in which the body of water is refilled.

Removed Acreage Addition

Conservation requirements for the third management period also provide an incentive to remove turfed acreage. The annual water allotment for existing facilities is based on the maximum area of turf and lakes developed at each facility during the first management period. If historic turfed acreage, low water use landscaped area, or total water surface area is removed, the allotment does not decrease. Schools, parks, cemeteries, and common areas of housing developments are encouraged to minimize areas landscaped with water-intensive plants.

Allotment Addition for Leaching

When high levels of total dissolved solids are present in the water supply, a turf-related facility may need an additional amount of water for leaching, or deep percolation, to prevent salts from accumulating in the root zone. If salts are allowed to accumulate in the soil, salinity may eventually reach levels toxic to turfgrass. If a facility's water supply has a concentration of 1,000 milligrams per liter of total dissolved solids (approximately 1.5 millimhos per centimeter of electrical conductivity) or greater, the turf-related facility may apply to the Department for an allotment addition for leaching.

6.3.5.2 Additional Conservation Requirements

All turf-related facilities are required to prepare and maintain a water conservation plan. The plan must outline the water management practices and technologies the facility will utilize to maximize water use efficiency. All turf-related facilities that are not golf courses are required to design, construct, and maintain grounds in a manner which will minimize water-intensive landscaped areas consistent with reasonable use and enjoyment of the facility. Golf courses have a capped maximum annual allotment which assumes water-efficient design and management.

6.3.5.3 Effluent Use Adjustment

Currently in the Prescott AMA, a greater percentage of turf-related facilities use effluent to meet their water needs than in other AMAs. In 1995, 61 percent of turf-related facilities in the AMA used effluent for watering turf, while in the Tucson AMA, 52 percent of the facilities used effluent and, in the Phoenix AMA, 7 percent used effluent for turf watering. Effluent's high nutrient content makes it an excellent supply for turf-related watering, as long as the nutrient load is carefully matched to plant needs and over-application of potential groundwater pollutants is avoided.

To encourage the maximum use of effluent on turf-related facilities during the third management period, the Department has modified the effluent incentive offered in the Second Management Plan. While the maximum annual water allotment will not change, each acre-foot of effluent will be counted as 0.6 acre-foot of water when compliance with the maximum annual water allotment is determined. This adjustment does not apply to effluent stored in a storage facility pursuant to a water storage permit and recovered outside the area of impact of the stored water. In addition to the effluent adjustment, facilities using

effluent may apply to the Department for an allotment addition to allow for leaching of salts below the root zone.

6.3.5.4 Monitoring and Reporting Requirements

The Third Management Plan includes monitoring and reporting requirements for all turf-related facilities. All turf-related facility water use will be assumed to be for landscape watering purposes unless other water uses are metered separately. For example, if water for domestic uses at a park is not metered, it will count against the facility's allotment. This provision encourages facilities to install enough meters to ensure that turf-related watering is accurately measured and reported.

6.3.6 Non-Regulatory Efforts

In 1991, the Department initiated a grants program for conservation assistance and augmentation of water supplies in the AMAs. Individual AMA programs focus on the areas of highest water conservation potential in each water use sector (municipal, industrial, and agricultural) based on total water usage, current water use practices, and potential for implementation of new conservation technologies. Funding for the grants program comes from an annual withdrawal fee levied and collected from all regulated groundwater users in the AMAs. See Chapter 9 for a description of the Conservation Assistance Program for the third management period.

During the second management period, over $70,000 was awarded under the Conservation Assistance Grants Program to assist turf-related facilities through evaluation and implementation of conservation strategies. Funded projects include water application scheduling workshops for facility managers, a public school water application system audit and repair program, development of an electronic over watering controller, and a water application field study which compared turf water demand under high- and low-traffic conditions. The Department is committed to continuing its efforts to assist turf-related facilities in meeting their conservation requirements through direct staff assistance and through the grants program.

6.3.7 Industrial Conservation Requirements and Monitoring and Reporting Requirements for Turf-Related Facilities

6-301. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, and 6-201 of this chapter, the following words and phrases used in sections 6-301 through 6-305 of this chapter, unless the context otherwise requires, shall have the following meanings:

1. *"Body of water" means a constructed body of water or interconnected bodies of water, including a lake, pond, lagoon, or swimming pool, that has a surface area greater than 12,320 square feet when full, and that is filled or refilled primarily for landscape, scenic, recreational purposes or regulatory storage.*

2. *"Common area" means an area or areas which is owned and operated as a single integrated facility and which is used for recreational or open space purposes. A common area is maintained for the benefit of the residents of a housing development.*

3. *"Contiguous" means in contact at any point along a boundary, or part of the same master planned community. Two parcels of land are contiguous even if they are separated by one or more of the following: a road, easement or right-of-way.*

4. *"Direct use effluent" means effluent transported directly from a facility regulated pursuant to Title 49, Chapter 2, Arizona Revised Statutes, to an end user. Direct use effluent does not include effluent that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes.*

5. *"Effluent recovered within the area of impact" means effluent that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes and recovered within the stored effluent's area of impact. For purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.*

6. *"Golf course" means a turf-related facility used for playing golf with a minimum of nine holes and including any practice areas.*

7. *"Hole" means a component of a golf course consisting at a minimum of a tee and a green. A practice area or driving range is not a hole.*

8. *"Landscape watering" means the application of water from any source, including effluent, to a water-intensive landscaped area, a low water use landscaped area or revegetation acres within a turf-related facility.*

9. *"Low water use landscaped area" means an area of land of at least one acre in aggregate, which is an integral part of a turf-related facility, watered by a permanent water application system and planted primarily with plants listed in Appendix 5F, Low Water Use Plant List, Prescott AMA, or any modifications to the list. Mature vegetation planted in a low water use landscaped area must cover at least 50 percent of the area.*

10. *"Newly turfed area" means, for a calendar year, an area of land planted with a turfgrass species which was not planted with any turfgrass species during the preceding calendar year.*

11. *"Post-1984 turf-related facility" means a turf-related facility that was neither in operation as of December 31, 1984 nor substantially commenced as of December 31, 1984.*

12. *"Pre-1985 turf-related facility" means a turf-related facility that was either in operation as of December 31, 1984, or substantially commenced as of December 31, 1984, and includes any expanded or modified portion of such a facility.*

13. *"Revegetation acres" means acreage contiguous to a turf-related facility that has been approved by the director as qualifying for a revegetation allotment addition.*

14. *"Substantially commenced as of December 31, 1984" means, with regard to the construction of a turf-related facility, that the owner or operator of the facility had obtained all pre-construction permits and approvals required by federal, state or local governments for the facility by December 31, 1984, or had made a substantial capital investment in the physical on-site construction of the facility by December 31, 1984.*

15. *"Total cemetery area" means an area of land being used for cemetery-related purposes, including any area of land covered by grave markers or by cemetery-related buildings, walks, pathways, and landscaping, but not including roads, parking lots, and any areas of land being held for future expansion of the cemetery.*

16. *"Turf acres" means an area of land that is watered with a permanent water application system and planted primarily with plants not listed in Appendix 5F, Low Water Use Plant List, Prescott AMA, or any modifications to the list.*

17. *"Turf-related facility" means any facility, including a school, park, cemetery, golf course or common area of a housing development, with a water-intensive landscaped area of ten or more acres.*

18. *"Water-intensive landscaped area" means, for a calendar year, the turf acres and water surface acres within a turf-related facility.*

19. *"Water surface acres" means the total surface area of all bodies of water that are an integral part of the water-intensive landscaped area of a turf-related facility. Bodies of water used primarily for swimming purposes are not an integral part of the water-intensive landscaped area of a turf-related facility.*

6-302. Conservation Requirements for Turf-Related Facilities

A. Maximum Annual Water Allotment

Beginning with calendar year 2002, or the calendar year in which landscape watering commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, an industrial user who uses water at a turf-related facility shall not withdraw, divert or receive water for landscape watering purposes at the facility during a calendar year in an amount which exceeds the turf-related facility's maximum annual water allotment for the year as calculated in section 6-303.

B. Conservation Plan for Post-1984 Turf-Related Facilities

No later than January 1, 2002, or 180 days after receiving official notice of these conservation requirements, whichever occurs later, an industrial user who uses water at a post-1984 turf-related facility shall have prepared a conservation plan for the facility which contains an accurate and detailed description of the conservation technologies, including management practices, that are applied at the facility when water is used for landscape watering purposes. The industrial user shall maintain the plan until the first compliance date for any substitute conservation requirement in the Fourth Management Plan.

C. Limiting Water-Intensive Landscaped Area Within Post-1984 Turf-Related Facilities that are Schools or Common Areas of Housing Developments

1. *Beginning on January 1, 2002, or upon commencement of landscape watering, whichever occurs later, and continuing until the first compliance date for any substitute requirement in the Fourth Management Plan, an industrial user who uses water at a turf-related facility that is not a golf course shall design, construct, and maintain the grounds of the facility in a manner that minimizes the water-intensive landscaped area of the facility consistent with the use of the facility. All of the facility's water-intensive landscaping shall be planted in those areas directly associated with the turf-related facility's primary purpose.*

2. *Beginning on January 1, 2002 or upon commencement of landscape watering, whichever is later, and continuing until the effective date of any substitute conservation requirement in the Fourth Management Plan, an industrial user who uses water at a turf-related facility that is a cemetery shall limit the water-intensive landscaped area within any portion of the facility that was neither in operation as of December 31, 1984 nor substantially commenced as of December 31, 1984 so that no more than 75 percent of the total cemetery area within that portion of the cemetery is planted with plants not listed in Appendix 5F, Low Water Use Plant List, or any modifications to the list. This requirement shall not apply to any expanded portion of a cemetery in operation as of December 31, 1984 or substantially commenced as of December 31, 1984 if the expanded portion of the cemetery was under the same ownership as the cemetery as of December 31, 1984.*

6-303. Calculation of Maximum Annual Water Allotment for Turf-Related Facilities

A. Turf-Related Facilities that are Not Golf Courses

For each calendar year, the maximum annual water allotment for a turf-related facility that is not a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-2, by the applicable application rate listed in Table 6-2 and then adding together the products plus any allotment additions as determined under subsection D of this section.

B. Pre-1985 Turf-Related Facilities that are Golf Courses

For each calendar year, the maximum annual water allotment for a pre-1985 turf-related facility that is a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-2 by the applicable application rate listed in Table 6-2 and then adding together the

products plus any allotment additions as determined under subsection D of this section. The maximum annual water allotment is subject to the following limitations:

1. *In determining the number of water surface acres in existence within the facility during the calendar year, the total surface area of any bodies of water added to the facility after December 31, 1984 and not filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact shall be limited to an area calculated by multiplying the number of holes added to the facility after December 31, 1984 by 0.14 acre per hole. For purposes of this paragraph, a body of water filled and refilled pursuant to an interim water use permit issued under A.R.S. § 45-133 shall be deemed to be filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact if the body of water will be filled and refilled exclusively with one of those types of effluent after the permit expires.*

2. *The total allotment for any turf acres and low water use landscaped area added to the facility after December 31, 1984 shall not exceed an amount calculated by multiplying the number of holes added to the facility after December 31, 1984 by 24.5 acre-feet of water per hole, plus any allotment additions allowed under subsection D of this section.*

C. Post-1984 Turf-Related Facilities that are Golf Courses

The maximum annual water allotment for a post-1984 turf-related facility that is a golf course shall be calculated by multiplying the number of acres in existence within the facility during the calendar year in each of the categories listed in Table 6-2 by the applicable application rate listed in Table 6-2 and then adding together the products, plus any allotment additions as determined under subsection D of this section. The maximum annual water allotment is subject to the following limitations:

1. *In determining the number of water surface acres in existence within the facility during the year, the total surface area of all bodies of water not filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact shall be limited to an area calculated by multiplying the number of holes present within the facility during the year by 0.14 acre per hole. For purposes of this paragraph, a body of water filled and refilled pursuant to an interim water use permit issued under A.R.S. § 45-133 shall be deemed to be filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact if the body of water will be filled and refilled exclusively with one of those types of effluent after the permit expires.*

2. *The total allotment for turf acres and low water use landscaped area within the facility during the year shall not exceed an amount calculated by multiplying the number of holes present within the facility during the year by 24.5 acre-feet of water per hole, plus any allotment additions allowed under subsection D of this section.*

D. Allotment Additions

1. *Newly Turfed Area Establishment Addition*

   For any year in which a turfgrass species is planted at a turf-related facility, the facility shall receive an allotment addition of 0.8 acre-foot of water per acre of newly turfed area. For golf courses, the newly turfed area establishment addition shall not exceed an amount calculated by multiplying the number of holes present within the newly turfed area by 4 acre-feet of water.

2. *Revegetation Addition*

The owner or operator of a turf-related facility may apply to the director for an allotment addition to revegetate areas within and around the facility after initial construction or renovation of new acres. The director may allow up to an additional 1.5 acre-feet of water per acre for up to three years if the following conditions apply to the acres for which the revegetation addition is sought:

a. *The plants which are planted within the revegetation area are listed in Appendix 5F, Low Water Use Plant List, Prescott AMA, or any modifications to the list, or were adapted to the site conditions prior to construction;*

b. *The aggregate area to be watered exceeds one acre and has at least 50 percent vegetative cover at maturity;*

c. *An allotment is not provided for the revegetation area under subsection A, B or C of this section; and*

d. *All of the water applied to the revegetation acres is measured and reported as part of the total water use of the facility.*

3. *Body of Water Fill and Refill Addition*

a. *A turf-related facility shall receive a one-time body of water fill allotment addition equal to the volume of water used for the initial filling of any new body of water added after January 1, 2002 within the facility. The facility shall receive the allotment addition only for the calendar year in which the body of water is filled.*

b. *If a body of water at a turf-related facility is drained or partially drained to allow for repairs to reduce water losses, the owner or operator of the facility may apply to the director for an addition to the facility's maximum annual water allotment in the amount of water necessary to refill the body of water. The director shall grant the allotment addition if the director determines that draining the body of water was necessary to allow for repairs to reduce water losses. The facility shall receive the allotment addition only for the calendar year in which the body of water is filled.*

4. *Removed Acreage Addition*

A pre-1985 turf-related facility that removes acres of water-intensive landscaped area that were in existence within the facility on or before December 31, 1984, shall receive an allotment addition equal to the allotment the acres would have received pursuant to the Third Management Plan if they had not been removed, provided that the acres were given a water allotment in the First Management Plan, the Second Management Plan, or the Third Management Plan.

5. *Leaching Allotment Addition*

The owner or operator of a turf-related facility may apply to the director for an allotment addition for leaching purposes. The director shall approve the application if the water supply used for landscape watering at the facility contains at least 1,000 milligrams per liter of total dissolved solids. If the director approves an allotment addition for leaching purposes, the director shall calculate the additional allotment as follows:

$$\textit{Leaching Allotment Addition} = \left(\frac{1}{1 - \left(\frac{EC_w}{5EC_e - EC_w} \right)} - 1 \right) \times \frac{CU}{0.75}$$

Where:

Ec_w = *Electrical conductivity of water used*

Ec_e = *Tolerance of the grass species grown to the soil salinity in electrical conductivity of the soil saturation extract*

CU = *Consumptive use requirement for the grass species*

Any allotment addition granted under this paragraph shall remain in effect until the water supply used for landscape watering at the facility contains less than 1,000 milligrams per liter of total dissolved solids, or until the first compliance date for the facility's conservation requirements in the Fourth Management Plan, whichever occurs first.

E. Combined Allotments for Contiguous Facilities

The maximum annual water allotments for contiguous turf-related facilities under one ownership or operation may be combined. All or a portion of the combined maximum water allotment may be applied to any part of the contiguous facilities.

F. *Nothing in this section shall be construed as authorizing the use of more groundwater or surface water than may be used pursuant to any groundwater or appropriable water rights or permits associated with the use. Nor shall this section be construed as authorizing the use of groundwater or surface water in any manner that violates Chapter 1 or Chapter 2 of Title 45, Arizona Revised Statutes.*

6-304. Compliance with Maximum Annual Water Allotment

A. Effluent Use Adjustment

For purposes of determining compliance with the maximum annual water allotment requirement, the director shall count each acre-foot of direct use effluent or effluent recovered within the area of impact used at the facility for landscape watering purposes during the calendar year as 0.6 acre-foot of water.

B. *A turf-related facility is in compliance with its maximum annual water allotment for a given calendar year if the director determines that either of the following apply:*

1. *The amount of water from any source, including effluent, used by the facility for landscape watering purposes during that calendar year does not exceed the facility's maximum annual water allotment for that year, or*

2. *The aggregate amount of water from any source, including effluent, used by the facility for landscape watering purposes during that calendar year and the preceding two*

calendar years divided by three does not exceed the sum of the maximum annual water allotments for those three years divided by three.

6-305. Monitoring and Reporting Requirements

A. *An industrial user who uses water at a turf-related facility that commences landscape watering within any new turfed acres, low water use landscaped area or water surface acres after January 1, 2002 shall submit to the director documentation of the new acres no later than 90 days after commencing landscape watering to the new acres or receiving notice of these conservation requirements, whichever is later. The scale of the submitted documents, extent of turf acres, water surface acres, and low water use landscaped area must clearly be shown. Documentation may consist of one or more of the following:*

1. *As-built plans certified by a registered professional such as a civil engineer, golf course designer or landscape architect.*

2. *Aerial photography at a scale no smaller than 1"=200'.*

3. *A survey of the facility certified by a registered professional such a civil engineer or land surveyor.*

4. *Any other documentation upon approval by the director.*

B. *For calendar year 2002, or the calendar year in which landscape watering commences, whichever occurs later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the Fourth Management Plan, an industrial user who uses water at a turf-related facility shall include in the annual report required by A.R.S. § 45-632 the following information:*

1. *The total quantity of water by source, disaggregated by source, withdrawn, diverted, or received during the calendar year for landscape watering purposes at the facility, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The total amount of effluent, disaggregated by source, direct use effluent, effluent recovered within the area of impact, and effluent recovered outside the area of impact that was withdrawn or received during the calendar year for landscape watering purposes at the facility as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *The number of turf acres within the facility during the calendar year, not including newly turfed area.*

4. *The number of acres of total water surface area within the facility during the calendar year.*

5. *The number of acres of low water use landscaped area within the facility during the calendar year.*

6. *The number of acres of newly turfed area within the facility during the calendar year.*

7. *The number of turf acres removed within the facility during the calendar year.*

8. *The number of acres of total water surface area added or removed within the facility during the calendar year.*

9. *The number of acres of low water use landscaped area added or removed within the facility during the calendar year.*

10. *If the facility is a golf course, the length of the course as measured from the back of each tee ground furthest from the associated green, then down the center line of the hole to the center of the green.*

11. *The number of acres approved by the director for a revegetation addition pursuant to section 6-303, subsection D, paragraph 2 within the facility during the calendar year.*

12. *The quantity of water used to fill or refill a body of water within the facility during the calendar year for which an allotment addition is sought pursuant to section 6-303, subsection D, paragraph 3.*

13. *If the facility is a golf course, the number of holes within the facility during the calendar year.*

14. *If the facility is a golf course, the number of holes added during the calendar year.*

15. *If the facility is a golf course that qualifies as a pre-1985 turf-related facility, the number of acres of turf acres, low water use landscaped area and water surface acres added to the facility after December 31, 1984, and the number of holes added to the facility after December 31, 1984.*

16. *An estimate of the quantity of water from any source, including effluent, used for each purpose other than landscape watering purposes at the facility during the reporting year. Any water used at the facility that is not measured separately from the water used for landscape watering shall be counted by the director as water used by the facility for landscape watering for purposes of calculating the compliance with the maximum annual water allotment.*

C. *A single annual report may be filed for contiguous turf-related facilities if the maximum annual water allotments of the facilities are combined pursuant to section 6-303, subsection E. The annual report shall report water use and landscaped areas of the contiguous facilities as required in subsection B of this section.*

TABLE 6-2
APPLICATION RATES FOR TURF-RELATED FACILITIES
PRESCOTT ACTIVE MANAGEMENT AREA

From 2002 until the first compliance date for any substitute requirement in the Fourth Management Plan

(Acre-feet per acre per calendar year)

Application Rate - Turf Acres

	2002 - Fourth Management Plan
All Facilities	4.9

Application Rate - Total Water Surface Area

	2002 - Fourth Management Plan
All Facilities	5.5

Application Rate - Low Water Use Landscaped Area

	2002 - Fourth Management Plan
All Facilities	1.5

6.4 SAND AND GRAVEL FACILITIES

6.4.1 Introduction

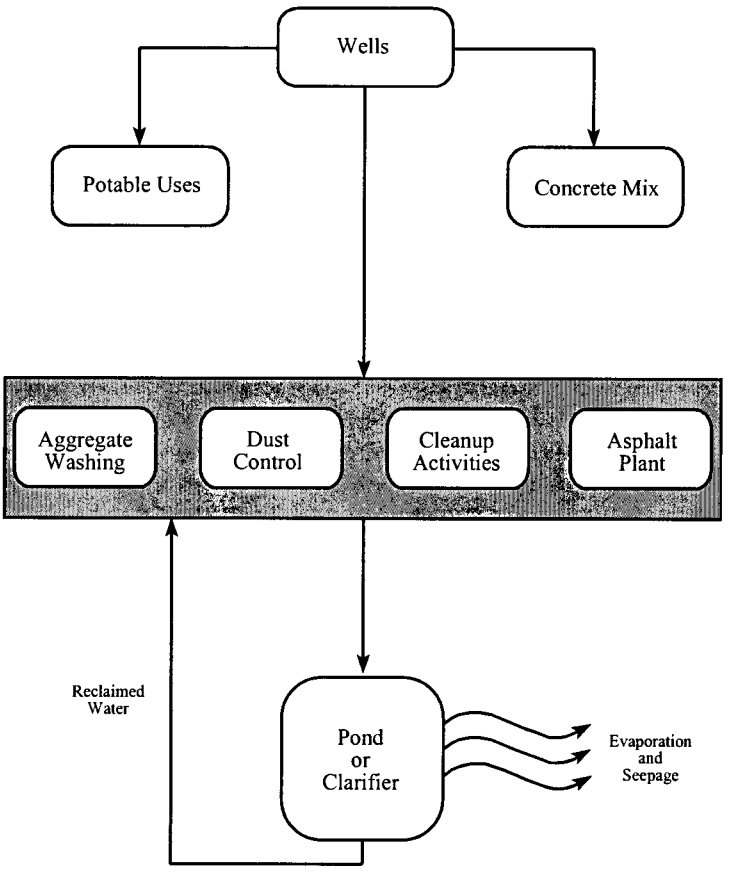
Sand and gravel facilities regulated under the Third Management Plan are facilities that produce sand and gravel and use more than 100 acre-feet of water from any source in a calendar year. Sand and gravel facility activities include mining aggregate, mixing concrete, and producing asphaltic concrete.

6.4.2 Water Use by Sand and Gravel Facilities

Sand and gravel facilities mine unconsolidated stream deposits to produce construction materials. The aggregate must be sorted according to grain size and washed to remove fine-grained particles. Aggregate washing accounts for the bulk of water use by sand and gravel producers. In addition to using water for washing, water is used for the following purposes: (1) to produce ready-mix concrete, bricks, blocks, and asphaltic concrete; (2) to control dust; (3) to wash the outside of vehicles; (4) to wash the inside of mixer drums; (5) to wash other equipment; (6) to cool equipment; (7) to cool material; and (8) for domestic purposes. Figure 6-1 illustrates how water is cycled in a typical sand and gravel facility.

Most sand and gravel facilities recycle wash water using excavated pits called disposal ponds. Sediment-laden wash water is pumped or diverted into a pit or series of pits where sediment is allowed to settle out. After this sediment settles out, the water is recycled to the plant and used to wash more material. Water can also be pumped from the pond for dust control, truck washing, or other clean-up activities. Geologic and hydrologic conditions at many facilities may result in a large amount of seepage loss incidentally returning to the aquifer from disposal ponds. Because most facilities are located along major riverbeds, depth to groundwater is usually relatively shallow. Some facilities even require dewatering to lower the water table to allow excavation to occur. A large portion of seepage loss may become a component of the groundwater pumped by sand and gravel facilities.

FIGURE 6-1
DIAGRAM OF WATER FLOW IN A TYPICAL SAND AND GRAVEL FACILITY



An alternative method of recycling wash water is the use of clarifiers. A clarifier is a device which accelerates the settling of sediment without creating the need for a large disposal pond. Chemical flocculants are usually used in conjunction with clarifiers to further enhance the removal of solid particles from the wash water.

Recycled water is not used for mixing concrete because the use of recycled water in the mixture may result in a product of inferior strength and

quality. However, aggregate used in the concrete can be washed with recycled water without affecting concrete strength.

The ability of sand and gravel facilities to save water varies because of differences in geology, availability and cost of land and water, product demand and price, and other factors. It may therefore be economically feasible to use the latest commercially available conservation technology at some facilities but not at others.

Because recycled water can be used for most purposes at a sand and gravel facility, the maximum savings of water can occur in the recycling of wash water from aggregate washing and, to a lesser extent, the recycling of water used for wet scrubbers at asphalt plants.

A number of conservation techniques may be employed to reduce the amount of water used to control dust raised by trucks traveling on haul roads. Binding agents, pavement, or other surface treatments may be used. Water uses for cleanup activities may be made more efficient by metering truck washing and by using alternative methods to clean truck mixer drums. Alternative methods can include the "rock out" method, which involves agitating rock inside the mixer drums for the purpose of cleaning excess concrete, or the use of chemical set-arresting agents, which prevent excess concrete from adhering to the mixer drums.

Sand and gravel facilities that have asphalt plants may have air emissions from the plant cleaned by either baghouses or wet scrubbers. Of these two methods, baghouses do not require water.

Presently, there are no sand and gravel facilities in the Prescott AMA with water use from any source in excess of 100 acre-feet of water per year. Should an existing or new sand and gravel facility use more than 100 acre-feet of water per year during the third management period, the facility must comply with the conservation requirements presented in this chapter.

6.4.3 Program Development and Issues

The First Management Plan required sand and gravel facilities to recycle wash water using disposal ponds or clarifiers. This requirement ensures that sand and gravel facilities reduce their water use. The First Management Plan requirements were carried over into the second management period.

To identify the most economical conservation methods for each facility, sand and gravel facility operators were required during the second management period to evaluate specific water-saving methods and submit a conservation plan to the Department.

In addition to the conservation requirements identified in the First and Second Management Plans, there are a number of economically feasible ways water use for dust control and cleanup activities can be reduced. However, because conditions and characteristics at each facility vary, flexibility is needed to allow facility operators to select the requirements most appropriate for their facility.

6.4.4 Sand and Gravel Conservation Program

The First and Second Management Plan requirements for recycling wash water are included for the third management period because implementation of recycling improves water use efficiency. All sand and gravel operations can apply these techniques.

In addition to recycling wash water, sand and gravel facility operators must implement two additional conservation measures, one related to water used for dust control and the other related to cleanup activities. The facility operator must choose the conservation measure to be implemented in each category from a list

of approved measures. The measures chosen must be the most appropriate for the facility for the third management period.

Similar to the Second Management Plan, sand and gravel operators will be required to evaluate specific water-saving methods and submit a conservation plan to the Department during the third management period. The conservation plan must be submitted to the director by January 1, 2002 or within 180 days after notification of the conservation requirements, whichever is later.

Implementation of water conservation practices or technologies can result in increased profits. Sand and gravel facility operators will analyze conservation methods to identify those which will result in a positive economic return. Operators will be required to perform an economic feasibility analysis of three potential conservation practices; disposal pond surface area reduction, use of clarifiers and the use of an alternative water supply to groundwater. The following potential costs and savings must be analyzed in the economic feasibility analysis:

- Labor (including planning, construction, operation, maintenance, and management time);
- Equipment (values amortized over the projected life of the equipment);
- Land value (including value of mineral reserves);
- Water costs (including pumping costs, well maintenance, and withdrawal taxes);
- Costs for chemicals and raw materials;
- Fuel or energy costs;
- Industrial wastewater disposal costs;
- Sewage disposal costs;
- Changes in revenue caused by changing production rate, minimizing "down-time," or increasing the size of reserves;
- Regulatory permitting costs.

6.4.5 Industrial Conservation Requirements and Monitoring and Reporting Requirements for Sand and Gravel Facilities

6-401. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases used in sections 6-402 through 6-404 of this chapter shall have the following meanings:

1. *"Alternative water supply" means a water source other than groundwater of drinking water quality.*

2. *"Sand and gravel facility" means a facility that produces sand and gravel and that uses more than 100 acre-feet of water from any source per calendar year. For purposes of this definition, the annual water use shall include all water used by the facility regardless of the nature of the use.*

3. *"Rock out method" means agitating rock inside concrete truck mixer drums for the purpose of cleaning excess concrete from the drums.*

4. *"Wash water" means water used for washing or sorting sand, gravel, or other aggregates.*

6-402. Conservation Requirements

A. Standard Conservation Requirements

Beginning on January 1, 2002, or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation requirements in the Fourth Management Plan, an industrial user who uses water at a sand and gravel facility shall comply with the following conservation requirements:

1. *If sufficient land area for construction and operation of disposal ponds is available at a reasonable price, the industrial user shall construct disposal ponds at the sand and gravel facility. All wash water, all water used for wet scrubbers at asphalt plants, all runoff from cleanup operations and all drainage from sand and gravel piles shall be discharged or diverted into the disposal ponds unless prohibited by state or federal environmental regulations. The disposal ponds shall contain a barge pump or sump pump of sufficient capacity, together with any necessary additional equipment, to assure the maximum reclamation of the water. The water shall be reclaimed and reused at the sand and gravel facility unless prohibited by state or federal regulations.*

2. *If sufficient land area for the construction and operation of disposal ponds is not available at a reasonable price, clarifiers shall be used at the sand and gravel facility for reclaiming wash water, all water used for wet scrubbers at asphalt plants, runoff from cleanup operations and all drainage from sand and gravel piles. The clarifiers shall be designed and operated to assure the maximum reclamation of water. The water shall be reclaimed and reused at the sand and gravel facility unless prohibited by state or federal regulations.*

3. *At least one of the following techniques or technologies designed to reduce water use for dust control shall be implemented at the sand and gravel facility:*

   a. *The placement of binding agents on all haul roads;*

   b. *The paving of all haul roads;*

   c. *The placement of recycled asphalt on all haul roads;*

   d. *The placement of medium sized aggregate or "pea gravel" on all haul roads; or*

   e. *A technology or technique designed to reduce water use for dust control not included in subparagraphs a through d of this paragraph that demonstrates water savings equivalent to any of the technologies or techniques listed in subparagraphs a through d, and that has been approved by the director.*

   The industrial user shall have sole discretion in determining whether to implement more than one of the above technologies.

4. *At least one of the following techniques or technologies designed to reduce water use for cleaning shall be implemented at the sand and gravel facility:*

   a. *Use of metered timers for truck washing and other cleanup activities;*

   b. *Use of the "rock out method" of cleaning concrete from truck mixer drums;*

   c. *Use of concrete set-arresting agent chemical applications to clean concrete from truck mixer drums; or*

   d. *A technology or technique designed to reduce water use for cleaning that is not included in subparagraphs a through c of this paragraph that demonstrates water savings equivalent to any of the measures listed in subparagraphs a through c and that has been approved by the director.*

   The industrial user shall have sole discretion in determining whether to implement more than one of the above technologies.

B. Substitute Conservation Requirements

1. *An industrial user who uses water at a sand and gravel facility may apply to the director to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section. The director may approve the use of substitute conservation technologies if both of the following apply:*

   a. *The industrial user has submitted a detailed description of the proposed substitute technologies and the water savings that can be achieved by the use of those technologies, and;*

   b. *The director determines that the proposed substitute conservation technologies will result in a water savings equal to or greater than the savings that would be achieved by the standard conservation requirements prescribed in section 6-402.*

2. *If the director approves an industrial user's request to use conservation technologies other than the standard conservation requirements prescribed in subsection A of this section, the industrial user shall comply with the substitute conservation technologies approved by the director beginning on the date determined by the director and continuing until the first compliance date for any substitute conservation requirement in the Fourth Management Plan.*

C. Conservation Plan

Not later than January 1, 2002, or within 180 days after receiving notice of these conservation requirements, whichever is later, an industrial user who uses water at a sand and gravel facility, including an industrial user who acquires ownership of an existing sand and gravel facility after January 1, 2002, shall submit to the director a plan to improve the efficiency of water use at the facility on a form provided by the director. The plan shall analyze the economic feasibility of implementing all of the following at the facility:

1. *Disposal pond surface area reduction;*

2. *The use of clarifiers for recycling water;*

3. *Use of an alternative water supply if such a supply is available within a one mile radius of the facility.*

6-403. Monitoring and Reporting Requirements

For calendar year 2002, or the calendar year in which the sand and gravel facility first commences using water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the Fourth Management Plan, an industrial user who uses water at a sand and gravel facility shall include the following information in its annual report required by A.R.S. § 45-632.

1. *The quantity of water reclaimed from disposal ponds or clarifiers during the calendar year, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The quantity of water from any source, including effluent, supplied to the wash plant during the calendar year, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

3. *The quantity of water from any source, including effluent, supplied to the asphalt plant during the calendar year, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

4. *The aggregate surface area of any disposal ponds.*

5. *The average depth of any disposal ponds.*

6. *The estimated quantity of water from any source, including effluent, used during the calendar year for:*

a. *Industrial process purposes. Water used for industrial process purposes includes water used for sanitary waste disposal but does not include water for cooling and cleaning purposes.*

b. *Non-domestic cooling purposes.*

c. *Non-domestic cleaning purposes. Water use for non-domestic purposes includes truck washing, truck mixer drum washing, or other non-domestic cleaning purposes.*

d. *Road dust control.*

e. *Landscape watering.*

f. *Other purposes.*

7. *The tonnage of material washed during the calendar year.*

6.5 LARGE-SCALE COOLING FACILITIES

6.5.1 Introduction

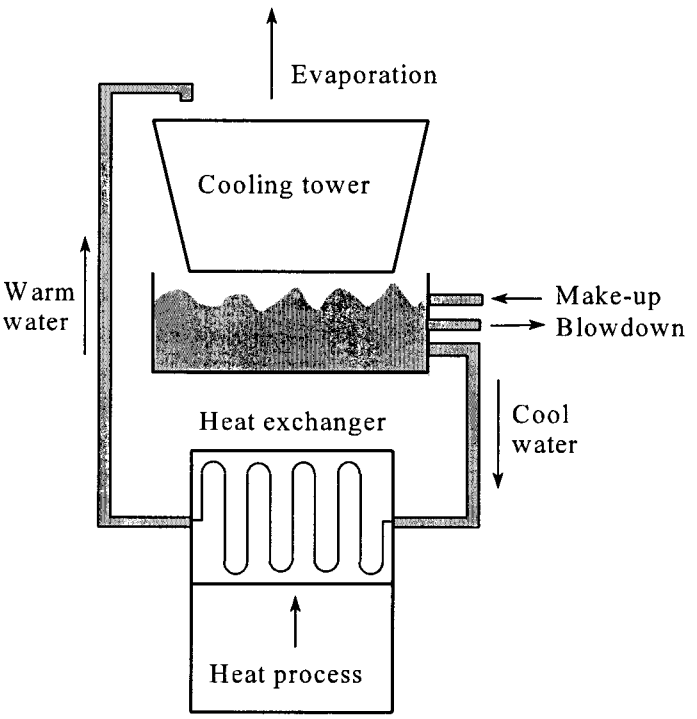
The purpose of cooling tower operation is to cool water that has absorbed the heat load of a heat-generating process. Cooling towers are present at a variety of commercial, industrial, and institutional facilities. Large-scale cooling facilities are defined as facilities with an aggregate cooling capacity of a minimum of 1,000 tons. The minimum cooling unit that is added to create the aggregate total of 1,000 tons is 250 tons in size. Most large-scale cooling facilities are served by municipal water providers. These facilities are termed individual users. Water providers are responsible for the Individual Users' compliance with industrial conservation requirements unless they have notified the Department of the existence of the individual user as provided in section 5-112 of the Municipal Conservation Requirements (Chapter 5), in which case the individual user is responsible for compliance. Large-scale cooling facilities served by their own wells are regulated directly by the Department and are responsible for complying with industrial conservation requirements.

Currently, there are no large-scale cooling facilities subject to conservation requirements in the Prescott AMA. However, the Department anticipates that some large-scale cooling facilities may be constructed during the third management period.

6.5.2 Water Use by Large-Scale Cooling Facilities

The main function of water in a cooling tower is to absorb heat from a heat-generating process and dissipate this heat through evaporation, as shown in Figure 6-2. Because a portion of the recirculating water is lost through evaporation, this is considered an "open" recirculating cooling loop.

FIGURE 6-2
AN OPEN RECIRCULATING COOLING LOOP



The equipment served by a cooling tower varies from industry to industry. The most common is equipment used to reject heat from a large Heating, Ventilation, and Air Conditioning system (known as an HVAC system). Various equipment configurations are used to transfer heat from its source to the cooled water stream coming from the cooling tower. This transfer typically occurs inside a heat exchanger (Figure 6-2).

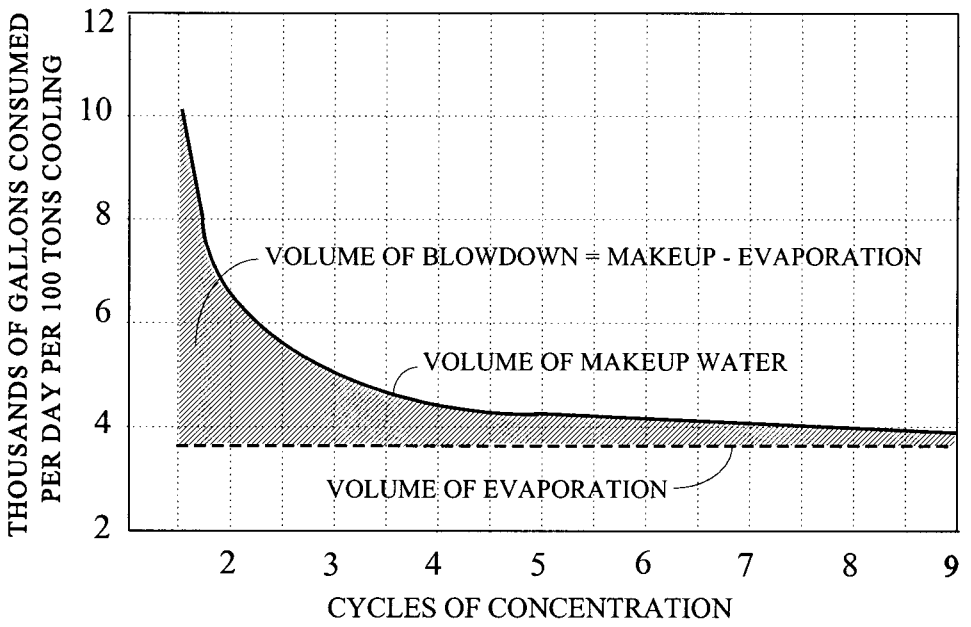
As a portion of cooling tower water evaporates, dissolved minerals become concentrated in the remaining water. Problems such as corrosion, mineral deposition, and biological fouling can result. These conditions reduce cooling efficiency and damage equipment. Chemical treatments including biocides, scale inhibitors, corrosion inhibitors, and addition of sulfuric acid can prolong the time mineral-laden water can safely be recirculated in towers. Mineral-laden water must be periodically discharged to

prevent the excessive buildup of minerals and the possible precipitation of these minerals onto equipment surfaces. This discharge is known as "blowdown." Replacement water, known as "make-up water," is added back to the tower's recirculating water stream to replace the water lost to evaporation and blowdown.

The "cycles of concentration" or "concentration ratio" achieved in a tower indicate how efficiently water is being used in the tower. Cycles of concentration can be determined by dividing the concentration of a constituent in the blowdown water by the concentration of this same constituent in the make-up water. The concentration of total dissolved solids, a measure of the overall dissolved mineral content in water, is one commonly used constituent for calculating the cycles of concentration. For example, if the total dissolved solids concentration in blowdown water is 1,500 milligrams per liter (mg/L), and the total dissolved solids content of make-up water is 300 mg/L, the tower is operating at 5 cycles of concentration. Cycles of concentration can also be calculated using electrical conductivity measurements, water volumes, and other conservative constituents (mineral constituents whose concentrations are not altered by precipitation, loss to the atmosphere, or the addition of treatment chemicals).

Figure 6-3 illustrates the relationship between the cycles of concentration achieved in a tower and the volume of water lost through evaporation and blowdown and replaced by make-up water. At lower concentration cycles, the tower loses water through both evaporation and blowdown. At higher cycles of concentration, the rate of water consumption levels off until almost all water loss is due to evaporation. Evaporation cannot be reduced since that mechanism provides the cooling function of the tower. However, blowdown can be minimized by operating the tower at optimal efficiency. The larger the tower is, the more water will be saved as the cycles of concentration increase.

FIGURE 6-3
RELATIONSHIP BETWEEN THE CYCLES OF CONCENTRATION AND THE AMOUNT OF WATER CONSUMED BY COOLING TOWER



Cooling tower water use cannot be determined directly from water supply records because water supplies to large facilities serve a number of water needs besides cooling towers. In the absence of direct records,

water use at cooling towers could be based on an estimation of the number, size, and efficiency of towers in the Prescott AMA. Lists of large water customers served by municipal water providers in the Prescott AMA could be reviewed to locate hospitals, manufacturing plants, commercial buildings, department stores, grocery stores, schools, and other facilities with large cooling demands. Questionnaires could be sent to these facilities to determine tower size and water use efficiency.

The size or cooling capacity of a tower is often described in units of tons. Cooling capacity tonnage indicates the rate at which the cooling tower can reject heat. Cooling tower capacities can range from as little as 50 tons to over 1,000 tons or more. Large industrial or commercial facilities may have several large towers. As discussed in the next section, third management period conservation requirements apply to facilities with a total cooling capacity of 1,000 tons or more.

6.5.3 Program Development and Issues

The First Management Plan had no conservation requirements for cooling towers other than for towers serving the electric power industry (section 6.5 of this chapter). Beginning in the Second Management Plan, regulations went into effect for "new large cooling users," defined as facilities with an aggregate tower capacity in excess of 250 tons that went into operation after January 1, 1990. Cooling towers at facilities in this category were required to achieve a concentration of 2,000 mg/L of total dissolved solids in recirculating water before blowing it down. The cutoff date of January 1, 1990 was intended to focus on new facilities with cooling towers, which could be identified as they established hook-ups with water providers. This identification process proved to be difficult.

Conservation requirements for the Third Management Plan include several changes intended to increase the effectiveness of requirements for cooling towers. The facilities subject to regulation have been expanded from "new" facilities to facilities of all ages, because cooling technology has not changed significantly over time and age alone does not preclude towers at facilities from achieving water use efficiency. At the same time, the size of regulated facilities has been shifted upwards to include facilities with an aggregate cooling capacity of 1,000 tons or more. In determining the aggregate cooling capacity of a facility, only cooling towers that are 250 tons or more in size are considered and only towers of this size or larger have specific blowdown requirements. This size cutoff excludes small capacity towers at which it may not be cost effective to conduct monitoring and install chemical feed equipment. Eliminating the January 1, 1990 cutoff date increases the number of facilities subject to regulation and increases the potential water savings. Identifying facilities subject to the conservation requirements for the third management period should be facilitated by the shift to larger scale industries, commercial buildings, and institutions that need 1,000 tons or more of cooling capacity.

In the Second Management Plan, facilities were required to achieve a recirculating water concentration of 2,000 mg/L of total dissolved solids in cooling towers before blowing down. Blowdown standards for the third management period have been shifted from total dissolved solids to silica- and hardness-based standards. While the concentration of total dissolved solids is relatively easy to estimate using electrical conductivity as a surrogate, and the 2,000 mg/L cutoff level addresses to some extent the water quality variations in make-up water supplies, silica and total hardness are more useful as indicators of the maximum concentration cycles that can safely be achieved in a tower. Silica can build up in recirculating water and damage equipment by precipitating a layer of "glass" inside piping. This reduces heat transfer and requires expensive repairs. The total hardness of water is a measure of the presence of calcium and magnesium salts, which can precipitate to form scale inside cooling towers and associated piping.

The purpose of Third Management Plan regulations is to effectively move large-scale cooling facilities toward more water conserving management practices while operating within a range that safely avoids mineral precipitation in cooling towers and associated piping. As required in the Code, conservation requirements for industrial users must be based on the use of the latest commercially available

conservation technology consistent with reasonable economic return. Conservation requirements for the Third Management Plan focus on standards that can be achieved using conventional chemical treatment to extend cycles of concentration in cooling towers. This is the most efficient proven conservation technology currently available without major capital outlays. Several new commercially available technologies for tower operation and maintenance are available but have drawbacks because they are unproven technologies, have high initial capital costs, or do not work efficiently at high desert temperatures.

For the Third Management Plan, large-scale cooling facilities must achieve concentrations of either 120 mg/L of silica or 1,200 mg/L of total hardness, whichever is reached first, before blowing down the recirculating water from towers with 250 tons or more of cooling capacity. The solubility limit of silica in water is around 150 mg/L. Allowing facilities to discharge water when silica reaches 120 mg/L provides a margin of safety against costly equipment damage. The solubility limit of total hardness is a function of the chemical treatment used in a tower. Large cooling towers can generally operate safely at concentrations about 1,200 mg/L total hardness in the recirculating water, so this was selected as the third management period requirements total hardness standard. Total hardness is typically expressed as an equivalent concentration of calcium carbonate ("hardness as calcium carbonate"), though both calcium and magnesium salts are included in this expression.

Third Management Plan cooling tower blowdown requirements apply only when towers are functioning to dissipate heat. Some towers are operated periodically based on seasonal or workload patterns, rather than being operated continuously. During periods when they are not dissipating heat, water may still need to be recirculated through towers to keep surfaces wetted, but evaporation fans may be turned off to reduce electricity use. This reduces the normal rate of evaporation. When the recirculating water becomes stagnant, it needs to be blown down whether or not blowdown standards have been met.

Use of effluent in cooling towers is encouraged as an alternative to groundwater use. The feasibility of this use depends on a number of factors including the availability of effluent, the volume and timing of water demand at the towers, water quality considerations, cost, any constraints on groundwater supplies, and site-specific factors such as other on-site uses for the effluent. The chemical composition of this renewable water source can vary seasonally and even daily depending on the quality, volume, and source of wastewater flowing into wastewater treatment facilities. For the third management period, a cooling tower at a large-scale cooling facility is exempt from cooling tower blowdown requirements for the first 12 months in which effluent constitutes 50 percent or more of the water supply to that tower. During this period, the facility operator will collect data on the concentration and variability of constituents in make-up water that may limit the cycles of concentration that can safely be reached and maintained. After the 12-month exemption period, the facility must either comply with the silica/total hardness blowdown standards for the tower or propose an alternative blowdown standard based on the data collected during that year.

For all facilities subject to Third Management Plan requirements, in cases where the build up of constituents other than silica or total hardness in cooling tower recirculating water is likely to result in damage to cooling towers or is likely to result in exceeding environmental discharge standards, facilities may apply to use an alternative blowdown standard.

6.5.4 Large-Scale Cooling Facility Conservation Program

Large-scale cooling facilities are facilities with a total cooling capacity of 1,000 tons or more. The following Third Management Plan conservation requirements apply to cooling towers that are located at large-scale cooling facilities and that have 250 tons or more of cooling capacity:

- Fully operational cooling towers with 250 tons or more of cooling capacity must achieve either 120 mg/L of silica or 1,200 mg/L of total hardness in recirculating water, whichever is reached first, before blowing down;
- If needed, a facility may apply for an alternative blowdown standard for any towers using effluent. During the initial 12-month period during which 50 percent or more of the water used by a tower is effluent, the tower is exempt from blowdown standards;
- If needed, a facility may apply for an alternative blowdown standard for any tower if compliance with blowdown requirements would likely result in damage or exceedence of environmental discharge standards because of the accumulation of limiting constituent other than silica or total hardness.
- Facilities must record monthly and report annually the volumes of tower make-up water and blowdown water and the concentrations of silica, total hardness, or approved alternative constituent, in both make-up water and blowdown water.

6.5.5 Future Directions

During the third management period, new cooling tower maintenance technologies will continue to be investigated and can be incorporated into future conservation requirements. Experiences gained by facilities converting to effluent use in the third management period can be used to direct research and regulatory directions in the fourth management period. Reuse of industrial wastewater in cooling towers and the use of cooling tower blowdown water for landscape watering should continue to be examined to determine the advantages and constraints of these approaches.

6.5.6 Industrial Conservation Requirements and Monitoring and Reporting Requirements for Large-Scale Cooling Facilities

6-501. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases shall have the following meanings:

1. *"Blowdown water" means water discharged from a cooling tower recirculating water stream to control the buildup of minerals or other impurities in the recirculating water.*

2. *"Conservative mineral constituent" means a component of recirculating water in a cooling tower, the concentration of which is not significantly modified by the addition of treatment chemicals.*

3. *"Cycles of concentration" means the ratio of the concentration of a conservative mineral constituent or electrical conductivity in the blowdown water to the concentration of this same constituent or electrical conductivity in the make-up water.*

4. *"Effluent-served cooling tower" means a cooling tower served by a make-up water supply which on an annual average basis consists of 50 percent or more effluent.*

5. *"Fully operational cooling tower" means a cooling tower that is functioning to dissipate heat.*

6. *"Large-scale cooling facility" means a facility that has control over cooling operations with a total combined cooling capacity greater than or equal to 1,000 tons. For the purposes of this definition, the minimum cooling tower size which shall be used to determine total facility cooling capacity is 250 tons. A large-scale cooling facility does not include a large-scale power plant that utilizes cooling towers to dissipate heat.*

7. *"Large-scale power plant" means an industrial facility that produces or is designed to produce more than 25 megawatts of electricity.*

8. *"Limiting constituent" means a chemical, physical, or biological constituent present in recirculating cooling tower water, which, due to potential physical or biological factors or due to potential exceedence of any federal, state, or local environmental standards upon discharge as blowdown, should not be allowed to accumulate in recirculating cooling tower water above a certain concentration.*

9. *"Make-up water" means the water added back into the cooling tower recirculating water stream to replace water lost to evaporation, blowdown, or other mechanisms of water loss.*

6-502. Conservation Requirements

A. Conservation Requirements for Large-Scale Cooling Facilities

Beginning on January 1, 2002 or upon commencement of water use, whichever occurs later, and continuing thereafter until the first compliance date for any substitute conservation

requirement in the Fourth Management Plan, an industrial user who uses water at a large-scale cooling facility shall comply with the following requirements:

Each fully operational cooling tower with greater than or equal to 250 tons of cooling capacity at the facility shall achieve a cycles of concentration level that results in blowdown water being discharged at an average annual minimum of either 120 milligrams per liter (mg/L) silica or 1,200 mg/L total hardness, whichever is reached first.

B. Exemptions and Alternative Blowdown Standards

1. *The requirement set forth in subsection A of this section does not apply to a large-scale cooling facility in any year in which 100 percent of facility blowdown water is beneficially reused.*

2. *The requirement set forth in subsection A of this section does not apply to any effluent-served cooling tower at a large-scale cooling facility during the first 12 consecutive months in which more than 50 percent of the water supplied to the cooling tower is effluent. After the 12-month period expires, the person using water at the effluent-served cooling tower may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would not be possible due to the presence of a limiting constituent other than silica or total hardness in the effluent supplying the cooling tower. To apply for an alternative blowdown level to address such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:*

   a. *The limiting constituent other than silica or total hardness that is present in the effluent supplying the cooling tower which results in the need to blow down a greater annual volume of water than that required under subsection A of this section.*

   b. *Documentation describing the concentration at which this limiting constituent should be blown down and the reason for the alternative blowdown level.*

   The director shall grant the request if the director determines that the presence of a limiting constituent other than silica or total hardness in the effluent supplying the cooling tower results in the need to blow down a greater annual volume of water than that required under subsection A of this section. Any alternative blowdown level granted pursuant to this paragraph shall apply only while the cooling tower qualifies as an effluent-served cooling tower.

3. *An industrial user may apply to the director to use an alternative blowdown level from that required in subsection A of this section if compliance with the blowdown requirement would likely result in damage to cooling towers or associated equipment or exceedence of federal, state or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water. To apply for an alternative blowdown level for such a limiting constituent, an industrial user shall submit a request in writing to the director which includes the following information:*

   a. *Historic, current and projected water quality data for the relevant limiting constituent(s).*

b. Documentation describing the potential damage to cooling towers or associated equipment, or documentation of environmental standards that are likely to be exceeded, whichever applies.

The director shall grant the request if the director determines that compliance with the blowdown level set forth in subsection A of this section would likely result in damage to cooling towers or associated equipment or exceedence of federal, state, or local environmental discharge standards because of the accumulation of a limiting constituent other than silica or total hardness in recirculating water.

6-503. Monitoring and Reporting Requirements

For calendar year 2002 or the calendar year in which water use first commences, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the Fourth Management Plan, an industrial user who uses water at a large-scale cooling facility shall include in its annual report required by A.R.S. § 45-632 the following information for all cooling towers with 250 tons or more of cooling capacity at the facility:

1. Capacity in tons of each cooling tower.

2. Number of days per month that each cooling tower was fully operational.

3. For each cooling tower at the facility that is exempt from cycles of concentration requirements or for which an alternative blowdown level has been granted, pursuant to section 6-502, subsection B, paragraph 2, the percentage of water served to the cooling tower during the year that was effluent.

4. The quantity of water from any source, specified by source, that was used for make-up water on a monthly basis during the calendar year as measured with a measuring device in accordance with the Department's measuring device rules. A.A.C. R12-15-901, et seq.

5. The quantity of water that was blown down on a monthly basis during the calendar year as measured with a measuring device in accordance with the Department's measuring device rules. A.A.C. R12-15-901, et seq.

6. The average monthly concentrations of silica, total hardness or other approved limiting constituent established under section 6-502, subsection B, paragraph 2 or 3, in make-up and blowdown water for those portions of each month when cooling towers were fully operational during the calendar year, reported in mg/L or other measurement units established under section 6-502, subsection B, paragraph 2 or 3, and either:

a. Determined by direct analysis; or

b. Calculated based on average monthly electrical conductivity readings for those portions of each month when cooling towers were fully operational if the following conditions have been met: (a) correlations between electrical conductivity and silica, between electrical conductivity and total hardness or between electrical conductivity and another approved limiting constituent established pursuant to section 6-502 subsection B, paragraph 2 or 3, have been established over a period of one year or more in make-up and blowdown water; and (b) documentation of these correlations has been provided to the director.

6.6 NEW LARGE LANDSCAPE USERS

6.6.1 Introduction

New large landscape users are industrial users with a substantial water-intensive landscaped area that was planted after January 1, 1990. The conservation program differentiates between two types of new large landscape users: non-residential facilities that are hotels or motels, and non-residential facilities that are not hotels or motels. If the facility is not a hotel or motel, conservation requirements apply to landscapable areas in excess of 10,000 square feet. If the facility is a hotel or motel, requirements apply to areas in excess of 20,000 square feet. If a facility has ten or more acres of water-intensive landscaped area it is defined as a turf-related facility and is subject to specific conservation requirements discussed in Section 6.3 of this chapter.

6.6.2 Water Use by New Large Landscape Users

Water use associated with landscaping is directly related to the size of the landscaped area, the types of vegetation, and the efficiency of the irrigation method used. Although low water use residential landscaping is common in the Prescott AMA, significant water use may be associated with the landscaping of industrial parks, large commercial and institutional facilities, and resorts. No new large landscape users served by their own wells, rather than a municipal water provider, were identified during the second management period.

A 9-acre hotel landscape could use more than 40 acre-feet of water per year if it were planted entirely with water-intensive plants. This is enough water to supply about 130 households per year. By restricting lush plantings and water features to those areas that may be used for recreation or near areas that receive the most visitation, considerable water savings may be realized. Under the Third Management Plan requirements, this same facility would use about 10 acre-feet per year to meet its landscaping needs while still maintaining an aesthetically pleasing and lush landscape. While many large resorts and commercial facilities are constructed within water provider service areas, the potential exists for new facilities to be served by their own wells, particularly those that are associated with development on retired farmland in outlying areas of the AMA. It is difficult to predict the extent of growth possible in this subsector but the potential for future facility construction and for corresponding significant water use does exist as the Prescott area grows and becomes a tourist and retirement destination.

6.6.3 Program Development and Issues

Consultant studies done for the Second Management Plan indicated that significant reductions in landscape water use can be achieved using the following techniques:

- Improving water application efficiency through proper irrigation scheduling, use of more sophisticated control systems, conversion to drip irrigation, and grouping plants with similar water needs.
- Reducing the size and perimeter of turfed areas and limiting the placement of turfed areas to functional use areas and areas of high visual impact.
- Using drought-resistant plant species adapted to the desert.
- Using proper planting, fertilization, and maintenance techniques.
- Grading sites to direct rainfall into planted areas.
- Avoiding the use of water-intensive plants within rights-of-way thus emphasizing the community's commitment to low water use designs.

The findings from these studies still apply for the third management period. Attractive landscapes can be maintained solely with rainfall. However, a lush, colorful, low water use landscape, watered by a

permanent drip irrigation system, is considered more desirable for commercial and industrial landscape applications. This type of landscape results in water savings of 50 to 75 percent of the amount used by a well-maintained turf (water-intensive) landscape.

The distinction in the program between hotel or motel landscapes and landscapes that are associated with facilities that are not hotels or motels is intended to address the contention by the lodging industry that for certain hotel and motel developments there is an economic benefit derived from planting high water using landscape plant material, thus economically justifying a larger water-intensive area.

6.6.4 New Large Landscape User Conservation Program

The new large landscape user program for the Third Management Plan is similar to that in the Second Management Plan. In addition to the requirements that apply to all industrial users, new large landscape users must limit the percentage of water-intensive landscaped area above a specified square footage. The facility must limit its water intensive landscaped area to the greater of the following: 1) 10,000 square feet (20,000 square feet for hotels and motels) plus twenty percent of the area in excess of 10,000 square feet (20,000 square feet for hotels and motels); and 2) the total surface area of all bodies of water within the facility that qualify as water intensive landscaped area.

Water-intensive landscaping includes not only high water using plants such as turf but also bodies of water such as ponds. However, it does not include any area of land watered exclusively with direct use effluent or effluent recovered within the area of impact, bodies of water used primarily for swimming, bodies of water filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact and bodies of water allowed under an interim water use permit pursuant to the Lakes Bill if the body of water will be filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact after the permit expires. If 100 percent wastewater is used to water the landscape, the requirements do not apply. For example, if there is sufficient cooling tower blowdown water and grey water available from the operations of a hotel, this wastewater could be used to water any amount of water-intensive landscaped area up to 10 acres. Once a water-intensive landscaped area equals or exceeds 10 acres in size, it is defined as a turf-related facility and is subject to regulation under that program.

6.6.5 Industrial Conservation Requirements and Monitoring and Reporting Requirements for New Large Landscape Users

6-601. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, unless the context otherwise requires, the following words and phrases used in sections 6-502 and 6-503 of this chapter shall have the following meanings:

1. *"Direct use effluent" means effluent transported from a facility regulated pursuant to Title 49, Chapter 2, Arizona Revised Statutes, to an end user. Direct use effluent does not include effluent that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes.*

2. *"Effluent recovered within the area of impact" means effluent that has been stored pursuant to Title 45, Chapter 3.1, Arizona Revised Statutes, and recovered within the stored effluent's area of impact. For the purposes of this definition, "area of impact" has the same meaning as prescribed by A.R.S. § 45-802.01.*

3. *"Landscapable area" means the entire area of a lot less any areas covered by structures, parking lots, roads or any other area not physically capable of being landscaped.*

4. *"New large landscape user" means a non-residential facility that has a water-intensive landscaped area in excess of 10,000 square feet and that has landscaping planted and maintained after January 1, 1990, or bodies of water, other than bodies of water used primarily for swimming purposes, filled and maintained after January 1, 1990, or both. Turf-related facilities as defined in section 6-301 of this chapter are excluded from this definition.*

5. *"Water-intensive landscaped area" means, for the calendar year in question, all of the following areas within a non-residential facility:*

    a. *Any area of land that is planted primarily with plants not listed in Appendix 5F, Low Water Use Plant List, or any modifications to the list, and watered with a permanent water application system, except any area of land that is watered exclusively with direct use effluent or effluent recovered within the area of impact.*

    b. *The total water surface area of all bodies of water within the facility, except bodies of water used primarily for swimming purposes, bodies of water filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact, and bodies of water allowed under an interim water use permit pursuant to A.R.S. § 45-133 if the bodies of water will be filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact after the permit expires.*

6-602. Conservation Requirements

A. Conservation Requirements for New Large Landscape Users that are not Hotels or Motels

Beginning on January 1, 2002, and continuing thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, the water-intensive landscaped area within a new large landscape user that is not a hotel or motel shall not exceed the greater of the following: 1) an area calculated by adding 10,000 square feet plus

20 percent of the facility's landscapable area in excess of 10,000 square feet; and 2) the total water surface area of all bodies of water within the facility that are allowed under A.R.S. § 45-131, et seq., and that qualify as water-intensive landscaped area.

B. Conservation Requirements for New Large Landscape Users that are Hotels or Motels

Beginning on January 1, 2002, and continuing thereafter until the first compliance date for any substitute conservation requirement in the Fourth Management Plan, the water-intensive landscaped area within a new large landscape user that is a hotel or motel shall not exceed the greater of the following: 1) an area calculated by adding 20,000 square feet plus 20 percent of the facility's landscapable area in excess of 20,000 square feet; and 2) the total water surface area of all bodies of water within the facility that are allowed under A.R.S. § 45-131, et seq, and that qualify as water-intensive landscaped area.

C. Waiver of Conservation Requirements for the Use of 100 Percent Wastewater

The conservation requirements set forth in subsections A and B of this section shall not apply to a new large landscape user in any year in which all of the water used for landscaping purposes within the facility is wastewater.

6-603. Monitoring and Reporting Requirements

For calendar year 2002, or the calendar year in which the facility first begins to use water, whichever is later, and for each calendar year thereafter until the first compliance date for any substitute monitoring and reporting requirement in the Fourth Management Plan, an industrial user that applies water to a new large landscape user shall include the following information in its annual report required by A.R.S. § 45-632:

1. *The total quantity of water from any source, including effluent, withdrawn, diverted or received for use on the facility during the calendar year for landscape watering purposes, including bodies of water filled or refilled during the calendar year, as measured with a measuring device in accordance with the Department's measuring device rules, A.A.C. R12-15-901, et seq.*

2. *The total amount of landscapable area within the facility.*

3. *The total amount of water-intensive landscaped area at the facility broken down into the area planted primarily with plants not listed in Appendix 5F, Low Water Use Plant List (except any area watered exclusively with direct use effluent or effluent recovered within the area of impact) and the surface area of all bodies of water (except bodies of water used primarily for swimming purposes, bodies of water filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact, and bodies of water allowed under an interim water use permit if the bodies of water will be filled and refilled exclusively with direct use effluent or effluent recovered within the area of impact after the permit expires).*

6.7 NEW LARGE INDUSTRIAL USERS

6.7.1 Introduction

New large industrial users are industrial users that use in excess of 100 acre-feet of water per year and commence use after January 1, 2000. In the Second Management Plan, new large industrial users were defined as industrial users that use in excess of 100 acre-feet per year and commenced use after January 1, 1990. As of June, 1999, there were no new large industrial users identified in the Prescott AMA.

6.7.2 Water Use by New Large Industrial Users

Growth potential in this sector is difficult to predict. New large commercial or manufacturing facilities are often constructed within water company service areas and are customers of the water provider.

6.7.3 Program Development and Issues

There were no requirements for new industrial users in the First Management Plan. In addition to the conservation requirements for all industrial users, the Second Management Plan contains a specific conservation requirement for new industrial users that use over 100 acre-feet per year. In the Second Management Plan, new industrial users were required to prepare and submit a water conservation plan addressing the water conservation opportunities at the facility. The user was required to develop a plan which:

- describes the level of water conservation that can be achieved
- identifies the water uses and conservation opportunities within the facility
- describes an ongoing water conservation education program for employees, and
- includes an implementation schedule.

The Department has determined that submitting a conservation plan is a reasonable requirement to continue for the Third Management Plan considering the large volume of unused allotments that could be used for new large industrial uses and the corresponding opportunity to design water conservation into new or expanding facilities. When facilities expand, even after operation has commenced, there are additional water conservation opportunities associated with being able to "build in" water conserving designs. This is typically more economical and more feasible than retrofitting a facility that is not expanding.

6.7.4 New Large Industrial User Conservation Program

The new large industrial user program for the Third Management Plan is identical to that of the Second Management Plan. In addition to the requirements that apply to all industrial users, new large industrial users must prepare and submit a water conservation plan to the director. However, if the user is required to submit a conservation plan under another section of this chapter, it can combine and submit one plan.

The water conservation plan must show how much water conservation can be achieved at the facility. It must identify how water is used at the facility and what can be done to conserve it in major water use areas. The plan must also detail an employee water conservation education program at the facility and describe when conservation measures will be implemented.

6.7.5 Industrial Conservation Requirements and Monitoring and Reporting Requirements for New Large Industrial Users

6-701. Definitions

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes and section 6-201 of this chapter, "new large industrial user" means an industrial user that begins using more than 100 acre-feet of water per year for industrial purposes after January 1, 2000.

6-702. Conservation Requirements

A. *Not later than January 1, 2002, or within 180 days after the end of the first calendar year in which the facility first uses more than 100 acre-feet of water for industrial purposes, whichever is later, a new large industrial user shall submit to the director a plan to improve the efficiency of water use by the facility. The plan shall:*

1. *Specify the level of water conservation that can be achieved assuming the use of the latest commercially available technology consistent with reasonable economic return;*

2. *Identify water uses and conservation opportunities within the facility, addressing water used for the following categories as appropriate: landscaping; space cooling; process-related water use, including recycling; and sanitary and kitchen uses;*

3. *Describe an ongoing water conservation education program for employees; and*

4. *Include an implementation schedule.*

B. *If a person required to submit a plan under subsection A of this section is required to submit a conservation plan under another section of this chapter, the person may combine the plans into a single conservation plan.*