

II

Regulatory Programs

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Preface

Section I provided an overview of the Arizona Department of Water Resources' (Department) statutory authority and management objectives, and described the physical, climatic, demographic, and water use characteristics of the Phoenix Active Management Area (AMA). Long-term water level declines, land subsidence, and water quality problems, coupled with current and projected groundwater over-drafting estimates, provide compelling justification for the development of progressive and responsible water management programs.

This section of the Third Management Plan, Section II, is entitled "Regulatory Programs" because the programs described are required of groundwater users or are preconditions to obtaining certain permits or financial assistance. The regulatory chapters that follow describe specific requirements for groundwater users within the AMA. Programs contained in this section include mandatory conservation requirements, a criterion for demonstrating consistency with the management plan by applicants for Certificates of Assured Water Supply, additional programs designed to encourage the use of renewable water sources, recharge program eligibility and operational criteria, criteria for obtaining financial assistance for water management assistance programs, and plan implementation activities, including the Department's compliance and enforcement program.

Chapters 4, 5, and 6 contain the agricultural, municipal, and industrial conservation programs, respectively. Chapter 7 discusses the Department's groundwater quality management program and provides an assessment of water quality within the AMA. Chapter 8 describes the Department's augmentation and recharge program, and Chapter 9 discusses the Department's water management assistance program. Finally, Chapter 10 outlines the Department's policies and procedures for implementation of the Plan.

The regulatory programs are based on a philosophy developed by the Department over the course of the last two management periods. In the first management period, the Department focused on the conservation of groundwater as its primary management goal. In the second management period, the Department continued to enhance the conservation programs, but also implemented a program for the augmentation of water supplies, which included incentives for the increased use of renewable supplies. In the third management period, the Department's focus is on both conservation of groundwater and augmentation of water supplies. The Department's regulatory philosophy is based on its overall water management goals for the management plans: the conservation of groundwater through the efficient use of all water sources and the augmentation of water supplies to ensure a long-term, secure water supply.

The safe-yield goal and the overall mission statement of the Department are guiding concepts in the agency's activities. An understanding of the basic framework of the regulatory programs requires knowledge of the components of the safe-yield goal and the Department's compliance approach. The framework is described below.

- **The AMA Management Goal: Safe-yield**

"Safe-yield" by January 1, 2025 is the management goal of the Phoenix AMA. "Safe-yield" is defined by statute to mean:

[A] groundwater management goal which attempts to achieve and thereafter maintain a long-term balance between the annual amount of groundwater withdrawn in an active management area and the annual amount of natural and artificial recharge in the active management area. A.R.S. § 45-561 (12).

The statute specifies that safe-yield is “a long-term balance.” Thus, the hydrologic conditions in the AMA cannot simply be viewed in the short-term, but rather must be viewed over a longer period of time. Further, establishing a “balance” is more complicated than comparing the total amount of groundwater withdrawals for the AMA to the amount of recharge occurring in the area in a given year.

In analyzing whether an AMA is at a safe-yield condition, the Department considers the following factors which impact groundwater levels and water in storage:

1. Net natural recharge: Net natural recharge in a given year is the volume of water that naturally recharges the groundwater supply minus the natural depletions to the groundwater supply over the course of that year. The components of net natural recharge that increase the groundwater supply are stream channel infiltration, mountain front recharge, and groundwater inflow into the AMA. The components that naturally deplete the groundwater supply are groundwater outflow out of the AMA and water loss due to evapotranspiration. Infiltration of treated effluent discharged to surface water channels is not a component of net natural recharge.
2. Incidental recharge: Incidental recharge originates as groundwater or surface water which percolates down to the water table during and after its use for human activity. In the Phoenix AMA, the volume of incidental recharge is largely dependent on the quantity of municipal effluent discharged into stream channels, and the volume and efficiency of agricultural and mining water use. It should be noted that incidental recharge that occurs during the use of the water may not be permitted as an underground storage activity under the state’s Underground Water Storage (UWS) Program. Water that is treated after its use for municipal purposes, becomes effluent, and is released into a natural streambed, however, is specifically recognized by the UWS Program as eligible to become a managed underground storage activity. *See A.R.S. §§ 45-801.01 et seq.* As is more fully explained below, storage credits that are accrued through an effluent discharge that has been permitted as a managed storage facility cannot be counted as a contribution to safe-yield.
3. Artificial recharge: Under the state’s UWS Program, A.R.S. §§ 45-801.01 *et seq.*, persons may undertake recharge projects to purposely add water to an aquifer without the right to withdraw it in the future. However, artificial recharge is commonly used as a storage mechanism to accrue credits with the expectation of future recovery. Stored water for which credits have been issued cannot be counted as a contribution to safe-yield, because it is already allocated to the water storer. Therefore, this type of water has no impact on the safe-yield volume; however, it does result in a temporary increase in groundwater in storage.

Not all water stored under the UWS Program can be recovered. The volume of recharge which is allocated permanently to the aquifer, or the “cut to the aquifer” that results from generation of certain types of recharge credits does benefit the aquifer and is a component of the safe-yield groundwater supply. In addition, any non-recoverable storage that is conducted under the UWS Program in a given year can be included in the safe-yield volume for that year. Recharge credits that are generated and then subsequently extinguished prior to use are also a component of the safe-yield supply.

4. Groundwater pumping: Annual pumpage volumes from the AMA’s aquifers are considered in the safe-yield calculation. Withdrawals in association with irrigation grandfathered rights, non-irrigation grandfathered rights, groundwater withdrawal permits, and undesignated municipal providers are calculated as debits to the groundwater system.

Also considered in the safe-yield calculation as a debit to the system is the volume of groundwater allowed through the Assured Water Supply Program for each Designation and Certificate of Assured Water Supply issued prior to 2025. The Department concluded in the development of the Assured Water Supply Rules that a limited quantity of the groundwater in storage could be allocated as a portion of the allowable water supply for each applicant. This groundwater can be used at any time in the 100 year period; however, it is expected that this allowance will be used in the early years while other supplies are being developed, or to offset groundwater pumpage during shortage years in CAP supplies.

5. **Committed demand:** Committed demand is an important component in the calculation of safe-yield. In the context of an application for a Designation of Assured Water Supply, the applicant must demonstrate the physical availability of a water supply for a 100 year period which includes sufficient water to serve current, committed, and projected demand. Committed demand is associated with platted, undeveloped lots which will be served in the future. In the assured water supply demonstration process, all demands, including the committed demand, must be determined to be physically available, or “allocated.” This demand is reflected in the safe-yield calculation. Outside of the designation process, committed demand is associated with unbuilt subdivisions for which a Certificate of Assured Water Supply already exists. These subdivisions can be developed without the requirement to replenish groundwater use with a renewable water supply, as a result of being approved prior to the 1995 Assured Water Supply Rules, which, for the first time, required a renewable water supply. In addition, lots that otherwise fall outside of the Assured Water Supply Program requirements represent a potential future demand. This committed groundwater demand must be counted as already having been “allocated” when examining safe-yield. To do otherwise would allow groundwater to be allocated multiple times to multiple developments, resulting in an underestimation of the long-term demands on the AMA’s aquifers.

The volume of groundwater that can be withdrawn while maintaining a safe-yield condition in the AMA is not a fixed amount; it will change due to annual variations in incidental, natural, and artificial recharge, as well as other factors listed above. The groundwater system is in a state of “overdraft” as long as groundwater withdrawals exceed the sum of the naturally and incidentally recharged volumes plus the portion of the artificially recharged volume that will not be withdrawn later as storage credits.

Because water level changes are direct indicators of changes in groundwater storage, they are the measured data which support the other factors of the safe-yield analysis. However, changes in water levels are expected to continue even after achievement of safe-yield, as stored credits are recovered and entities with assured water supply designations utilize their groundwater allotments. An AMA that is at safe-yield should not experience broad-ranging, significant, and continuing declines in average water levels after adjustments are made for the factors just described. Therefore, water levels are considered in making the safe-yield determination.

- **Total Water Use Conservation Requirements and “Stacking”**

With the wide array of water resources available in Arizona as an alternative to groundwater, including surface water, effluent, CAP water, and poor quality remediation water, the Department attempts to provide incentives that will promote use of these alternative supplies whenever and wherever possible. At the same time, we recognize that groundwater is often a very accessible and inexpensive source of supply, whereas the alternative sources can be expensive and difficult to access. The Department also recognizes that groundwater is our state’s “emergency” supply, and

it must be available for use whenever the other alternatives run short. Groundwater is particularly valuable as a long-term drought supply, to buffer the effect of changes in surface water availability. In order to maximize the supply of groundwater, and ensure sufficient supplies of water, all sources must be utilized efficiently.

For these reasons, the Department believes that it is both impractical and unwise to consider groundwater use as the only measure of regulatory compliance. The level of groundwater use that is reasonable is relative to the amount of water used from other sources. To ensure that groundwater users make reasonable use of groundwater, and to encourage efficiency and flexibility in the use of alternative supplies, the regulatory strategy includes evaluation of the total water use of each water user and provider, and setting conservation requirements based upon that total water use. In keeping with the Department's statutory obligations and limitations, however, the conservation requirements of the management plan only apply if groundwater is used.

The Department's regulatory program is, therefore, structured around the concept of "stacking" different types of water, by type, in a compliance hierarchy, with groundwater on top. If a total water use conservation requirement is exceeded by a user of groundwater, the amount of the violation of that requirement will be measured by the amount of groundwater used in excess of the regulatory requirements. This strategy will ensure that if groundwater is being used, it is being used as wisely and efficiently as economically possible. This system also provides the flexibility needed by most users of commingled supplies, allowing groundwater to be used as needed to supplement alternative sources

- **Flexibility in the Components of the Regulatory Plan**

The Department recognizes that water use varies by year and locality. Therefore, the Department has provided maximum flexibility when administering the regulatory provisions of the management plan. For example, most regulatory provisions include a basic program, with one or more alternative programs designed to meet special circumstances. The basic program is generally designed to place simple numerical limits on water use, leaving the means of achieving those limits wholly up to the water user or provider. The alternative programs tend to remove numerical limits in favor of specific conservation measures more suitable to the water user.

Another component of regulatory flexibility is the establishment of "flexibility accounts" for most allotment-based requirements. These accounts generally allow water users to borrow or bank water from one year to the next in order to overcome the variation in use caused by weather or other unforeseen circumstances. Flexibility accounts are mandated by statute for agricultural users, and the Department has used this example to incorporate flexibility accounting into municipal and industrial programs as well.

- **Administrative Review and Variance of Conservation Requirements**

Even with the general flexibility of the regulatory programs, the Groundwater Code (Code) recognizes that certain individual conservation requirements may pose hardship in certain circumstances. To allow relief in these situations, the Code provides for an administrative review and variance process. The emphasis in this process is on the impact of a particular conservation requirement as it is applied to an individual water user. Administrative review and variance are fact-intensive inquiries which may result in some regulatory relief and are considered on a case-by-case basis.

- **Accounting for Water Use**

Many water providers deliver a mix of water types. In order to determine compliance with conservation requirements, the Department must adopt a set of policies for commingled systems. The Department is continuing to develop policies for "volumetric" accounting.

Generally, a water provider delivering different types of water through a commingled system cannot determine which type of water a customer actually received. Therefore, the provider is generally asked to account for all deliveries to its customers on a volumetric as opposed to molecular basis. This allows the provider to compute the percentage of each type of water delivered in a given year, and apply that same percentage to the water delivered to each customer, regardless of the type of water actually received by the customer. This volumetric accounting policy works well for most providers, because of its simplicity and certainty. Individual circumstances may warrant individual consideration, however, and the Department is constantly reviewing its policies on volumetric accounting to recognize necessary exceptions. Generally speaking, however, the Department does not recognize accounting which shows a concentration of deliveries of certain types of water to certain users if the delivery system is physically commingled.

- **Enforcement**

An effective conservation plan requires effective enforcement. The Department is given wide ranging enforcement authority in the statutes to ensure that all water users are contributing their share to the overall goal of groundwater conservation and augmentation of water supplies. While the statutes allow the imposition of substantial monetary penalties for violating either water use limitations or conservation requirements, the Department is also given considerable discretion in how that enforcement program will be managed. Overall, the Department's philosophy has been that the ability to correct management deficiencies and save groundwater is more important than collecting monetary penalties. Therefore, most of the Department's regulatory efforts to date have involved voluntary "consent orders" where the water user in violation agrees to adopt conservation measures, guarantee future compliance, or otherwise mitigate the impact of the violation on the state's groundwater resources in exchange for a waiver or reduction of the civil penalties. This approach has worked well in the past, and has been particularly useful in making the transition from a state where groundwater use was essentially unregulated to a state where water regulation has become a fact of everyday life.

In the third management period, the Department will continue its policy of reviewing each suspected violation on an individual basis. The Department will also continue its policy of working with any water user in violation of the groundwater laws to make certain that all the surrounding circumstances are understood and to explore alternative means by which the problem might be solved. In some cases, however, violations are not matters of inadvertence or misunderstanding, but are repeat offenses or voluntary decisions based on economic considerations, lack of planning, or careless disregard for the resource. During the third management period, the Department will strive to identify these latter types of violations and pursue stringent civil penalties. By so doing, the Department intends to bring greater equity and fairness to the common goal of saving our groundwater supply. Alternative mechanisms to achieve compliance while encouraging achievement of local water management goals will also be explored.

The foregoing synopsis of the Department's regulatory approach is intended to assist the reader in understanding the reasons behind the mandatory conservation requirements in the following regulatory chapters. In addition, we have included a Plan Implementation Chapter which gives more definitive explanation to many of the administrative policies and procedures introduced here. Finally, it has always been the Department's policy to offer assistance to anyone seeking to better understand or comply with the conservation requirements imposed by the management plans, or the requirements of the Groundwater Code. The AMA offices, or the central office in Phoenix, can provide valuable support on most water management issues.

Agricultural Conservation Program



4.1 INTRODUCTION

The Agricultural Conservation Program for the Third Management Plan has been developed to contribute to the achievement of the water management goal of the Phoenix Active Management Area (AMA), which is to attain safe-yield by the year 2025. The agricultural sector's contribution to meet the Phoenix AMA's safe-yield goal is projected to come from a combination of improved on-farm water management practices, the utilization of renewable supplies, and the reduction of irrigated acreage due to urban development.

As discussed in Chapter 3, agriculture was responsible for approximately 59 percent of the total water use in the Phoenix AMA in 1995. In that year, approximately 425,683 acre-feet of groundwater, 463,887 acre-feet of surface water, 121,238 acre-feet of Central Arizona Project (CAP), 56,468 acre-feet of in-lieu, 34,028 acre-feet of effluent, and 7,801 acre-feet of tailwater were reported used by Irrigation Grandfathered Rights (IGFRs) in the Phoenix AMA for a combined total use of water of approximately 1,109,105 acre-feet. Indian water uses for agriculture are estimated at approximately 224,780 acre-feet. Given these water sources and amounts, agriculture contributed 46 percent of the total overdraft in the Phoenix AMA in the year 1995 (see Chapter 11).

Under the Groundwater Code (Code), land associated with a Certificate of Irrigation Grandfathered Right can be legally irrigated with groundwater within an AMA. A.R.S. § 45-465. These certificates were issued by the Arizona Department of Water Resources (Department) based on acreage planted from the years 1975 through 1979. Land not irrigated during this time period may not be irrigated with any water unless one of the exceptions stated in the Code applies. A.R.S. § 45-452. For each IGFR, the Department establishes a maximum annual groundwater allotment based on certain statutory criteria. Figure 4-1 depicts the land associated with IGFRs within the Phoenix AMA as well as the acres irrigated within Indian reservations. Figure 4-2 depicts the major irrigation districts in the Phoenix AMA.

At this time, the Department is deferring adoption of a Base Program under A.R.S. § 45-566(A)(1) as part of the Agricultural Conservation Program. This delay is based on concerns which have been raised by the agricultural community regarding the proposed adoption of an agricultural conservation program that includes water duties based upon an 85 percent irrigation efficiency.

Presently, the Department is adopting the Historic Cropping Program that was authorized by A.R.S. § 45-566.02, and conservation requirements for irrigation distribution systems. Participation in the Historic Cropping Program is voluntary, and those who do not participate will be subject to the agricultural conservation requirements established by the Second Management Plan until the Department adopts a Base Program for the Third Management Plan. Descriptions of the Historic Cropping Program and the irrigation distribution system conservation program are detailed in this chapter.

In addition to these regulatory conservation programs, the Department will continue to encourage the use of renewable water supplies by the agricultural sector through other water resource management methods. During the third management period, indirect recharge, effluent reuse, and programs supported by water management assistance funds will be options available to encourage this use.

This chapter discusses the following topics in the order listed:

- Statutory Provisions (section 4.2)
- Irrigation Water Duties and Maximum Annual Groundwater Allotments (section 4.3)
- Agricultural Conservation Program Components (section 4.4)
- Non-regulatory Water Resource Management Strategies (section 4.5)
- Future Directions (section 4.6)
- Agricultural Conservation Requirements and Monitoring and Reporting Requirements (section 4.7)

4.2 STATUTORY PROVISIONS

The Code manages the use of groundwater for irrigation purposes in AMAs in several ways. These statutory provisions are described below.

4.2.1 Third Management Plan

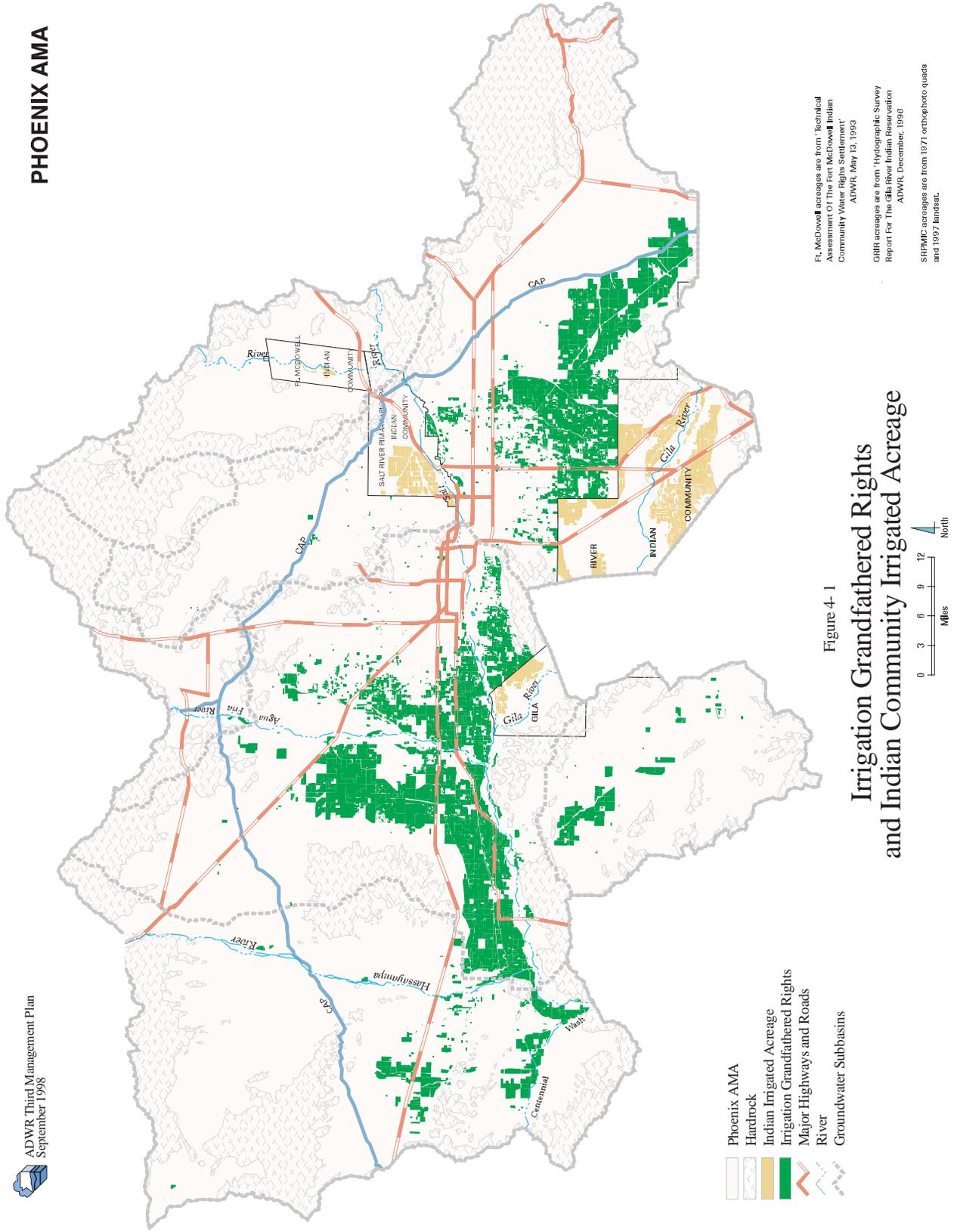
A.R.S. § 45-566 requires the director to follow established guidelines in developing management plans for the third management period (years 2000 to 2010). For the agricultural sector, in the plan for each AMA, the director:

- Shall establish an irrigation water duty for each farm unit to be reached by the end of the third management period. A.R.S. § 45-566(A)(1).
- May establish one or more intermediate water duties to be reached at specified intervals during the third management period. A.R.S. § 45-566(A)(1).
- Shall calculate the irrigation water duty or intermediate water duties as the quantity of water reasonably required to irrigate the crops historically grown in the farm unit and shall assume the maximum conservation consistent with prudent long-term farm management practices within areas of similar farming conditions, considering the time to amortize conservation investments and financing costs. A.R.S. § 45-566(A)(1).
- After computing the irrigation water duties or intermediate water duties, may adjust the highest 25 percent of the water duties within an area of similar farming conditions by reducing each water duty in an amount up to 10 percent, except that in making the adjustment, no water duty may be reduced to an amount less than the highest water duty within the lowest 75 percent of the water duties computed within an area of similar farming conditions. A.R.S. § 45-566(A)(1).
- Shall grant an exemption from the irrigation water duties at any time during the third management period if an applicant can demonstrate to the director's satisfaction that the applicant's farm unit meets specific hydrologic conditions regarding waterlogging or basin outflow. A.R.S. § 45-566(D).
- Shall establish additional economically reasonable conservation requirements for the distribution of groundwater by irrigation districts within their service areas. A.R.S. § 45-566(A)(5).

4.2.2 Prohibition on New Irrigated Acres

Under A.R.S. § 45-452, only acres of land which were legally irrigated at any time from January 1, 1975 through January 1, 1980, which are capable of being irrigated, and which have not been retired from irrigation or conveyed for a non-irrigation use, may be irrigated with any water unless one of the following exceptions apply:

- Surface water may be used pursuant to decreed or appropriative rights established before June 12, 1980. A.R.S. § 45-452(A).
- Existing acreage irrigated with surface water may be replaced with new acreage if the surface water right is severed and transferred to the new acreage. A.R.S. § 45-172.



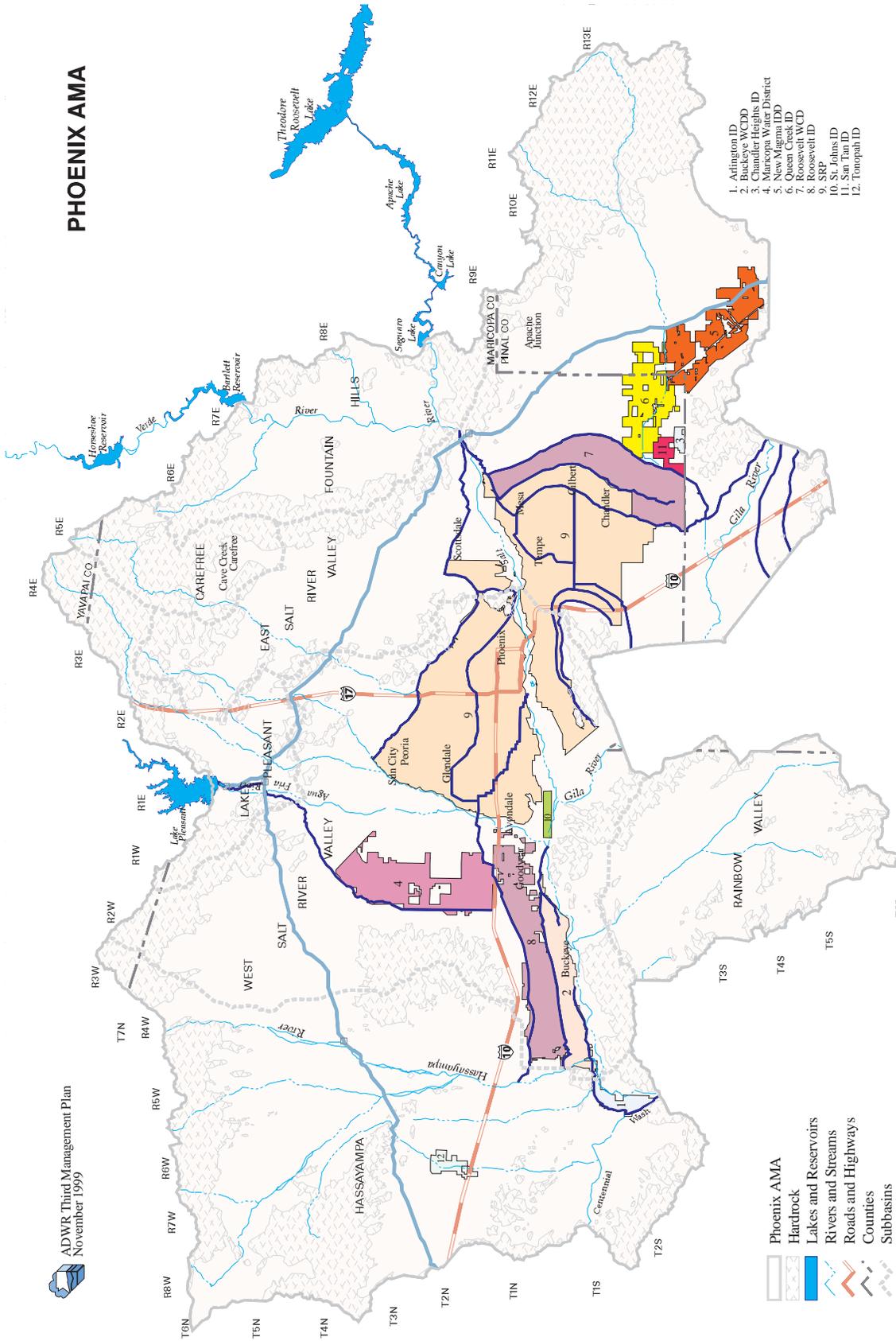
Ft. McDowell acreages are from "Technical Assessment Of The Fort McDowell Indian Community Water Rights Settlement" ADWR, May 13, 1993

GRR acreages are from "Hydrographic Survey Report For The Gila River Indian Reservation" ADWR, December, 1996

SRPME acreages are from 1971 orthophoto quads and 1997 landast.

Figure 4-1
Irrigation Grandfathered Rights
and Indian Community Irrigated Acreage

PHOENIX AMA



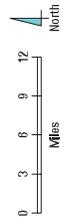
1. Arlington ID
2. Buckeye ID
3. Chandler Heights ID
4. Maricopa Water District
5. New Magma ID
6. Queen Creek ID
7. Roosevelt WCD
8. Roosevelt ID
9. SRP
10. St. Johns ID
11. Tempe ID
12. Tonopah ID

- Phoenix AMA
- Hardrock
- Lakes and Reservoirs
- Rivers and Streams
- Roads and Highways
- Counties
- Subbasins
- Canals and Laterals
- Central Arizona Project Aqueduct
- Central Arizona Project Pumping Stations

Figure 4-2

Large Irrigation Districts

ORIGINAL SOURCE
Arizona Department of Water Resources
Geographic Information System



- State universities may irrigate new acreage not to exceed a total of 320 acres of land with not more than five acre-feet of groundwater per acre per year. A.R.S. § 45-452(I).
- Correctional facilities under the jurisdiction of the Arizona Department of Corrections may irrigate new acreage not to exceed a total of 10 acres of land with not more than four and one-half acre-feet of water per acre per year for the purpose of producing plants for consumption by inmates as part of a prisoner work program. A.R.S. § 45-452(J).
- Existing acreage damaged by floodwaters may be replaced with new acreage. A.R.S. § 45-465.01.
- Existing acreage that has a condition that limits irrigation efficiency may be replaced with new acreage. A.R.S. § 45-465.02.

4.2.3 Maximum Annual Groundwater Allotments

Under A.R.S. § 45-465, the maximum annual groundwater allotment for each IGFR is determined by multiplying the irrigation water duty by the water duty acres. Water duty acres are the highest number of acres in a farm, taking land rotation into account, that were legally irrigated during any one year from 1975 through 1979. The maximum annual groundwater allotment may be used to irrigate any or all of the irrigation acres in the farm unit. Irrigation acres are the acres in the farm which were legally irrigated at any time from 1975 to 1980.

4.2.4 Flexibility Account Provisions

To provide farmers with sufficient flexibility to address varying climatic conditions and to take advantage of changing agricultural market conditions, the Code requires the director to establish a flexibility account for each farm that receives a maximum annual groundwater allotment. A.R.S. § 45-467. In 1987, the Department began implementing these provisions in the Phoenix AMA.

Under the flexibility account statute, a right holder may accumulate both flexibility account credits and debits. If a right holder uses water during a year in excess of the farm's maximum annual groundwater allotment, the flexibility account is debited. A negative balance that exceeds 50 percent of the annual allotment results in a violation of the conservation requirement. If a right holder uses less water during a year than the farm's maximum annual groundwater allotment, the flexibility account is credited. Accrued flexibility account credits are not limited, can be used at any time in future years, and may be used to offset a debit. In addition, under certain conditions right holders may transfer flexibility account credits accumulated during the preceding calendar year from one IGFR to another. A.R.S. § 45-467(O).

4.2.5 Historic Cropping Program

In 1998, the legislature adopted A.R.S. § 45-566.02 that directs the Department to include in the Third Management Plan an agricultural conservation program entitled the Historic Cropping Program. Laws 1998, Ch. 274, § 1. Under this program, the director must calculate the maximum annual groundwater allotment as provided in A.R.S. § 45-465, and must calculate the irrigation water duty using an irrigation efficiency of 75 percent. In areas deemed by the director to have limiting soils, the statute authorizes the director to use an irrigation efficiency as low as 70 percent. In addition, the director may not register credits to the flexibility account established under A.R.S. § 45-467 which cause the credit balance to exceed 75 percent of the maximum annual groundwater allotment established under the Historic Cropping Program. This program is described in more detail in section 4.4.1.

4.2.6 Small Irrigation Grandfathered Rights

In 1994, legislation was passed that deregulated small IGFRs. A small IGFR is defined as an IGFR appurtenant to a farm with ten or fewer irrigation acres, and that is not part of an integrated farming operation of more than ten acres. Under A.R.S. §§ 45-563.02 and 632(D), small IGFRs are not required to report annual water use or to comply with water duty limitations. Small IGFRs make up about one half of the IGFRs in the Phoenix AMA, but accounted for less than 4 percent of the total water use in 1992.

4.2.7 The Buckeye Waterlogged Area

Legislation was passed in 1985 authorizing a study to identify major causes of the waterlogging problems in the West Salt River and Hassayampa Subbasins. Laws 1985, Ch. 319, § 1. Upon completion of the study and subsequent review by the Department and the public, House Bill 2353 was passed. Laws 1988, Ch. 97, § 1. This legislation exempted the Arlington Canal Company (Arlington), the Buckeye Water Conservation and Drainage District (Buckeye), and the St. Johns Irrigation District (St. Johns) during the first, second, and third management periods from the conservation requirements for the distribution of groundwater. In addition, this legislation exempted persons using groundwater pursuant to an IGFR on certain waterlogged farm areas located in or near Buckeye, Arlington, and St. Johns from irrigation water duties and the payment of withdrawal fees. These exemptions became effective on January 1, 1989 and extend until the end of the third management period, December 31, 2009. A.R.S. § 45-411.01(A). However, either the entity delivering water to the exempted areas or the persons owning irrigation acres within the exempted areas must pay a water duty exemption fee, except for holders of small IGFRs (see section 4.2.6). Laws 1995, Ch. 258, § 2. Prior to December 15, 2005, the Department will review the hydrologic conditions influencing the designated waterlogged areas, consult with representatives of Buckeye, Arlington, and St. Johns, and submit a recommendation to the Governor and legislative leadership regarding an extension of the exemptions. A.R.S. § 45-411.01(F).

4.3 IRRIGATION WATER DUTIES AND MAXIMUM ANNUAL GROUNDWATER ALLOTMENTS

The irrigation water duty is the primary component of the Historic Cropping Program and is used to determine the maximum annual groundwater allotment for each IGFR. The following sections describe how the Department determines water duties and maximum annual groundwater allotments.

4.3.1 Calculation of Irrigation Water Duties

The irrigation water duty is the quantity of water reasonably required per acre to annually irrigate the crops historically grown in a farm unit from 1975 to 1980. The crops historically grown in each farm unit were verified and established during the first management period. The Department calculates the irrigation water duty for each IGFR using the following formula:

$$\text{Irrigation Water Duty} = \frac{\text{Total Irrigation Requirement Per Acre}}{\text{Assigned Irrigation Efficiency}}$$

In this formula, the irrigation water duty is calculated by dividing the total water requirements to produce the crops historically grown by an assigned irrigation efficiency. Each component of the formula is discussed below.

4.3.1.1 Assigned Irrigation Efficiency

Irrigation efficiency is a measure of the overall effectiveness of water application during a crop season. The effectiveness is a function of many variables including evaporation loss, soil intake rate, water application rate, irrigation system type, crop type, and irrigation water management practices.

The assigned irrigation efficiency establishes a benchmark value which is determined for each management period in accordance with statutory provisions. For the Historic Cropping Program, the assigned irrigation efficiency for farms with non-limiting soils is 75 percent as prescribed by A.R.S. § 45-566.02.

4.3.1.2 Total Irrigation Requirement

The total irrigation requirement for each farm unit equals the amount of water needed annually to satisfy the sum of the irrigation requirements for all of the crops historically grown. For each crop, the irrigation requirement (IR) consists of the amount of water needed to meet: the consumptive use (CU) requirement of the crop, plus any other needs (ON) that the crop may have, plus any needed leaching allowance (LA), less the amount of any effective precipitation (EP). The total irrigation requirement is calculated by the following equation:

$$IR = CU + ON + LA - EP$$

For purposes of determining the irrigation water duty in the Phoenix AMA, effective precipitation is not subtracted from the total irrigation requirement. The components of the total irrigation requirement equation are discussed below.

4.3.1.2.1 Consumptive Use

The consumptive use requirement of a crop is the amount of water used in transpiration and building of plant tissue together with the amount of water evaporated from adjacent soil during the growing season. Crop consumptive use values are based on accepted scientific methods and commonly used values for the Phoenix AMA. Appendix 4 lists the consumptive use requirement for each crop historically grown in the Phoenix AMA during the years 1975 through 1979 based on the data currently available.

4.3.1.2.2 Other Needs

Water required by certain crops for purposes other than consumptive use is referred to as “other needs” water. For example, some vegetable crops such as lettuce need additional water for germination, cooling, and quality control. The Department makes adjustments for those crops that have “other needs.” Appendix 4 lists the “other needs” requirements for crops historically grown in the Phoenix AMA.

4.3.1.2.3 Leaching Allowance

In some situations, a crop may require additional water for leaching or deep percolation. A leaching allowance may be necessary to prevent salts from accumulating in the crop root zone when high levels of total dissolved solids (TDS) are present in the irrigation water. If the accumulated salts in the soil profile are not leached below the root zone, soil salinity will increase and eventually inhibit plant growth and yields.

The procedure used to calculate the leaching allowance for a crop is shown by the following equation:

$$LA = \frac{AE}{0.85} \left[CU \left[\frac{1}{1 - \frac{EC_w}{5EC_e - EC_w}} - 1 \right] \right]$$

In this equation, LA = leaching allowance for the crop; AE = assigned irrigation efficiency for the farm unit; CU = consumptive use requirement of the crop; EC_w = electrical conductivity of the irrigation water (expressed in millimhos per centimeter); and EC_e = tolerance of the crop to soil salinity in electrical conductivity of the soil saturation extract (expressed in millimhos per centimeter).

Most irrigation water in the Phoenix AMA is of adequate quality for irrigation purposes. Consequently, the Department did not include any leaching allowances in the calculation of irrigation requirements for crops grown in the Phoenix AMA. If, however, a particular irrigation water supply has an EC_w value greater than 1.5 millimhos per centimeter (a concentration of approximately 1,000 milligrams per liter of TDS), the right holder may apply to the Department for an administrative review as discussed in Chapter 10.

4.3.1.2.4 Effective Precipitation

Effective precipitation is defined as the amount of precipitation occurring before and during the growing season that is available for plant growth. Because precipitation is minimal and varies considerably by year and location in the Phoenix AMA, effective precipitation is difficult to quantify and is not subtracted from the total irrigation requirements for the crops historically grown. However, managing the use of precipitation to offset use of other water supplies could be an irrigation water management tool available to IGFR holders.

4.3.2 Calculation of Maximum Annual Groundwater Allotments

The maximum annual groundwater allotment for each IGFR is determined by multiplying the irrigation water duty by the water duty acres. These calculations are governed by A.R.S. § 45-465 (see section 4.2.3 above).

4.4 AGRICULTURAL CONSERVATION PROGRAM COMPONENTS

The following section describes the Agricultural Conservation Program for the Third Management Plan that is being adopted at this time. This program consists of two main parts: the Historic Cropping Program, and the irrigation distribution system conservation requirements program. Each of these programs is described below.

4.4.1 Historic Cropping Program

The Historic Cropping Program was developed by the Department pursuant to A.R.S. § 45-566.02. As required by statute, for the Historic Cropping Program, the Department will calculate the water duty and maximum annual groundwater allotment by dividing the total irrigation requirement per acre by an assigned irrigation efficiency of 75 percent. In areas determined by the director to have limiting soils, the director may use an assigned irrigation efficiency as low as 70 percent for the water duty calculation. As further required by A.R.S. § 45-566.02, the use of flexibility account provisions will be limited.

To qualify for the Historic Cropping Program, the IGFR owner must satisfy the following requirements: (1) file an application with the Department, (2) reduce any debit balance in the existing flexibility account

to an amount that does not exceed 25 percent of the existing maximum annual groundwater allotment, (3) reduce any flexibility account credits in the existing flexibility account balance to an amount that does not exceed 75 percent of the existing maximum annual groundwater allotment, and (4) provide documentation showing that an actual irrigation efficiency of 75 percent has been, or will be, achieved on the farm on a seasonal basis. Once an IGFR owner has been accepted into the Historic Cropping Program, the right holder must remain in the historic Cropping Program during the entire third management period, unless there has been a change in IGFR ownership.

Participants in the Historic Cropping Program will be subject to limitations on their ability to accumulate flexibility account credits and debits. Participants will only be allowed to accrue flexibility account credits up to 75 percent, and flexibility account debits up to 25 percent, of their maximum annual groundwater allotment calculated for the Historic Cropping Program. Any IGFR owner, or any person entitled to use groundwater pursuant to that IGFR, who uses groundwater in an amount that causes the farm's flexibility account to be in arrears in excess of 25 percent of the maximum annual groundwater allotment, will be considered in violation of the conservation requirements. In addition, IGFR owners participating in the Historic Cropping Program will not be allowed to sell or purchase flexibility account credits.

In addition to these flexibility account credit provisions, participants will also be required to comply with certain reporting requirements. Participants must provide information regarding irrigation water management practices, irrigation system type, and the acreage and type of crops grown to assist the Department in determining program effectiveness.

The Historic Cropping Program requires a high level of farm management. Specific entrance and performance criteria must be satisfied, and only owners of IGFRs may apply (see section 4.7). IGFR owners interested in participating in the Historic Cropping Program may file an application beginning January 1, 2000 on forms provided by the Department

4.4.2 Irrigation Distribution System Conservation Program

For the third management period, the director is required to establish "additional economically reasonable conservation requirements for the distribution of groundwater by cities, towns, private water companies and irrigation districts within their service areas." A.R.S. § 45-566(A)(5). The same conservation requirements were part of the Second Management Plan. A.R.S. § 45-565(A)(5). These requirements do not apply to entities distributing groundwater to waterlogged areas (see section 4.2.7).

In the Second Management Plan, private water companies and irrigation districts that distributed 20 percent or more of their total water deliveries for irrigation use by January 1, 1990 were required to reduce their irrigation distribution system lost and unaccounted for water either by lining all their canals, or by operating their delivery systems so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water withdrawn, diverted, or received during a year. These requirements become effective upon the commencement of operation or by January 1, 2000, whichever is later. A Department review of the conservation practices of the largest irrigation districts has shown that the Second Management Plan distribution system conservation requirements are being achieved by most districts.

For the Third Management Plan, the irrigation distribution system conservation requirements established by the Second Management Plan will continue to apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use. These irrigation districts and private water companies will be required to reduce their irrigation distribution system lost and unaccounted for water either by lining all their canals, or by operating their delivery systems so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water withdrawn, diverted, or received during a year. These requirements become effective upon the

commencement of operation or by January 1, 2002, whichever is later. Until this time, the Second Management Plan irrigation distribution system conservation requirements will apply.

If a private water company or irrigation district has economic circumstances that prevent timely compliance with the irrigation distribution system conservation requirements, a variance of up to five years may be requested as provided by A.R.S. § 45-574. Information submitted in support of the variance request must include a complete water loss reduction plan prepared by a registered civil engineer, which contains:

- A complete construction design document that shows specifications for repairing or modifying the irrigation distribution system. The document must include material specifications, proposed design specifications, installation and construction specifications, and any other engineering information or specifications necessary to complete the proposed rehabilitation of the distribution system.
- A detailed list of engineering costs and the proposed investment options designed to pay for the system improvements.
- The final completion date for the rehabilitation.
- If applicable, a system operating guide for use by the district to reduce lost and unaccounted for water to a minimum. This guide may be modified as the rehabilitation progresses.

The procedures for obtaining a variance are described in Chapter 10, section 10.3.1.

4.4.3 Program Summary

The Department is adopting an Agricultural Conservation Program for the Third Management Plan that consists of two parts: the Historical Cropping Program and the irrigation distribution system conservation program. The Historic Cropping Program is a new program which the legislature authorized in 1998 through the enactment of A.R.S. § 45-566.02. Pursuant to this legislation, the irrigation efficiency used to calculate the maximum annual groundwater allotment for non-limiting soils is set at 75 percent, and the flexibility account provisions of A.R.S. § 45-467 are restricted. The irrigation distribution system conservation requirements are essentially a continuation of requirements that were established for the Second Management Plan. These requirements are designed to assure that the amount of lost and unaccounted for water from water distribution systems is kept to a minimum. Both the Historic Cropping Program and the irrigation distribution system conservation program provide important tools for achieving the water management goal for the Phoenix AMA. To further the attainment of this water management goal, the Department will also adopt a Base Program pursuant to A.R.S. § 45-566(A)(1) in the future.

4.5 NON-REGULATORY WATER RESOURCE MANAGEMENT STRATEGIES

In addition to the Agricultural Conservation Programs, other water resource management strategies are available to achieve the water management goal for the Phoenix AMA. These strategies focus on the use of renewable sources of water and are described below.

4.5.1 Effluent Use

In 1991, the Legislature amended A.R.S. § 45-467 to exclude effluent from consideration in determining the amount of any debit to be registered to a farm's flexibility account. Laws 1991, Ch. 112, § 3. Under this amendment, a person using groundwater on a farm pursuant to an IGFR may use an unlimited amount

of effluent on the farm without any debit being registered to the farm's flexibility account as a result of effluent use. This amendment created an incentive for the use of effluent.

During the Third Management Plan, the Department will study alternatives to increase the utilization of effluent. In the past, effluent utilization for agricultural irrigation has been limited mostly by the lack of necessary infrastructure. Other requirements, such as the wastewater reuse rules adopted by the Arizona Department of Environmental Quality, have limited the types of crops that can be irrigated solely with effluent. As effluent treatment techniques improve and more effluent becomes accessible to the agricultural sector, the Department expects that effluent use for agricultural purposes will increase.

4.5.2 Groundwater Savings Program (Indirect Recharge)

A reduction in agricultural groundwater use has occurred in the Phoenix AMA as a result of indirect recharge opportunities, which were first authorized by the Legislature in 1990 and later reauthorized in 1994 as the groundwater savings program. Laws 1994, Ch. 291, § 32; Laws 1990, Ch. 176, § 14. In the early 1990s, the agricultural sector began to utilize CAP water to a greater extent through the incentives provided by the indirect recharge program. (Effluent may also be utilized in the groundwater savings program.) This increased use of renewable water supplies has decreased groundwater use by the agricultural sector in the Phoenix AMA. However, while this program has increased the current use of renewable water supplies by the agricultural sector, it should also be noted that there is a legacy of credits that are associated with in-lieu water use that may be recovered to meet future non-agricultural demand. (See section 8.7.2.1.1.)

4.5.3 Water Management Assistance Program

Non-regulatory efforts such as the Department's Water Management Assistance Program have contributed to the reduction of agricultural water use in the Phoenix AMA during the second management period. The Water Conservation Management Program (WCMP) is a program which has been funded by the Department through the Water Management Assistance Program for a total of six years on the west side of the AMA and for four years on the east side. The west side and east side programs combined into one program, the Central Arizona WCMP, in November 1996. This cooperative program with the Agua Fria-New River, Buckeye, and East Maricopa Natural Resources Conservation Districts, the Natural Resources Conservation Service, the United States Bureau of Reclamation, and the Department provides computer-based and field-measured irrigation scheduling and application rate information to cooperating farmers in the Phoenix AMA. The efforts of the WCMP have resulted in the conservation of an estimated average of 1,300 acre-feet per year. In 1998, the WCMP was approved for funding for an additional year.

Other Conservation Assistance Program grants awarded include funding to the United States Water Conservation Lab to develop software for the design of sloping border irrigation systems; a grant to the University of Arizona Cooperative Extension to study the consumptive use requirements of medium maturity determinate upland cotton, and a grant to Duncan's Sunfresh Farms to develop and add a water conservation education component to their farm tours that would include educational materials given out to school children and their teachers.

The use of Water Management Assistance Program monies to fund programs designed to assist the agricultural sector in the conservation of groundwater resources is expected to extend into the third management period. The Department will continue to encourage programs that promote efficient agricultural water use. (See Chapter 9 for more information regarding the Water Management Assistance Program.)

4.6 FUTURE DIRECTIONS

During the third management period, the Department will continue to provide the agricultural sector with technical and financial assistance to increase its efficiency and reduce its reliance on groundwater supplies. The Department will investigate incentives for, and encourage the increased use of, effluent and groundwater savings facilities. In addition, the waterlogged area and those IGFRs deregulated pursuant to the small rights exemption will continue to be monitored by the Department. The Department will submit a report to the Legislature prior to December 15, 2005, with recommendations for whether the waterlogged area exemptions should be continued.

The Department will continue to work cooperatively with the agricultural community to determine appropriate conservation requirements un A.R.S. § 45-566(A)(1) and to develop additional alternative agricultural conservation programs in the Phoenix AMA for the third management period.

The Department will also monitor crop and water use patterns during the third management period to evaluate the impacts of Department programs on farming operations. More research on the consumptive use of newer varieties of crops grown in the AMA may occur. Urbanization impacts on agricultural water use, as well as water use trends due to agricultural market conditions, will be evaluated for future planning needs.

The Agricultural Conservation Program for the Third Management Plan is a step toward achieving the safe-yield goal for the Phoenix AMA. During the third management period, this program will continue to be evaluated for its effectiveness in achieving this goal.

AGRICULTURAL CONSERVATION REQUIREMENTS AND MONITORING AND REPORTING REQUIREMENTS**4-101. Definitions**

In addition to the definitions set forth in Chapters 1 and 2 of Title 45 of the Arizona Revised Statutes, the following words and phrases used in sections 4-101 through 4-105 of this chapter shall have the meanings set forth below, unless the context otherwise requires:

1. *“Assigned Irrigation Efficiency” is defined as the maximum economically feasible levels of conservation within areas of similar farming conditions which each right holder is expected to achieve.*
2. *“Canal” is defined as a waterway constructed for the purpose of transporting water to a point of delivery, including main canals and lateral canals.*
3. *“Farm” is defined under A.R.S. § 45-402.*
4. *“Farm Unit” is defined under A.R.S. § 45-402.*
5. *“Flexibility Account” is an account maintained under A.R.S. § 45-467.*
6. *“Irrigation Acre” is defined under A.R.S. § 45-402.*
7. *“Irrigation Distribution System” is defined as a system of canals, flumes, pipes, or other works which are owned or operated by an irrigation district or private water company and used to deliver water for irrigation use.*
8. *“Irrigation Water Duty” is defined under A.R.S. § 45-566 which, for the Third Management Plan, is the total irrigation requirement to produce the crops historically grown divided by the assigned irrigation efficiency.*
9. *“Lost Water” is defined as water from any source, including effluent, which enters an irrigation distribution system and is lost from the system during transportation or distribution due to seepage, evaporation, leaks, breaks, phreatophyte use, or other causes.*
10. *“Maximum Annual Groundwater Allotment” is defined as the maximum amount of groundwater which may be used per year for the irrigation of each irrigation acre in the farm which is calculated pursuant to A.R.S. § 45-465.*
11. *“On-farm Seasonal Irrigation Efficiency” is defined as the total water requirements to produce a crop divided by the total quantity of water actually applied to that crop during one growing season.*
12. *“Total Quantity of Lost and Unaccounted for Water” is defined as the total quantity of water from any source, including effluent, withdrawn, diverted, or received by an irrigation district or private water company during a calendar year less the total deliveries of water from any source, including effluent, made by the irrigation district or private water company during the calendar year that are measured or estimated based on a generally accepted method of estimating water use.*
13. *“Water Duty Acres” is defined under A.R.S. § 45-461.*

4-102. Base Agricultural Conservation Program Requirements

Unless the owner of a Certificate of Irrigation Grandfathered Right (IGFR) is regulated under the Historic Cropping Program described in section 4-103, the IGFR owner and any person who is entitled to use groundwater pursuant to that IGFR shall continue to comply with the agricultural conservation requirements established by the Second Management Plan until the director adopts a Base Program for the Third Management Plan.

4-103. Historic Cropping Program

A. Application for Regulation under the Historic Cropping Program

Only an owner of an IGFR may apply to be regulated under the Historic Cropping Program. Beginning January 1, 2000, an application may be filed by an IGFR owner at any time prior to the first compliance date for the agricultural conservation requirements established in the Fourth Management Plan. An application for regulation under the Historic Cropping Program shall be on a form prescribed by the director and shall include the following information:

- 1. The name, address, and phone number of the IGFR owner.*
- 2. The number of the Certificate of Irrigation Grandfathered Right.*
- 3. The name, address, and phone number of any person entitled to use groundwater under the IGFR.*
- 4. For each of the three previous years, the number of acres and types of crops planted and the amount of water used to irrigate the planted acres.*
- 5. For each of the three previous years, the type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*
- 6. For each of the three previous years, a description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

B. Criteria for Approval of Application

The director shall approve a complete and correct application for regulation under the Historic Cropping Program if the following requirements are satisfied:

- 1. Any negative flexibility account balance in the farm's flexibility account does not exceed 25 percent of the maximum annual groundwater allotment in effect at the time that the application is made.*
- 2. Any positive flexibility account balance in the farm's flexibility account does not exceed 75 percent of the maximum annual groundwater allotment in effect at the time that the application is made. In order to satisfy this requirement, the IGFR owner may sell or convey any excess credits as provided by A.R.S. § 45-467 or the IGFR owner may relinquish any excess credits.*

3. *The IGFR owner demonstrates that the average on-farm seasonal irrigation efficiency achieved on the farm's irrigation acres during the previous three years was 75 percent or greater. If the IGFR owner cannot demonstrate that an average on-farm seasonal irrigation efficiency of at least 75 percent has been achieved during the previous three years, the IGFR owner shall agree in writing to develop and implement at least one of the following:*
 - a. *Enroll in a Department-sponsored or private irrigation management services program throughout the entire third management period or until the IGFR owner can demonstrate to the Department that an average on-farm seasonal irrigation efficiency of at least 75 percent has been achieved during the previous three years.*
 - b. *Install a conservation system improvement, approved by the Department, designed to enable the IGFR owner to achieve an on-farm seasonal irrigation efficiency of at least 75 percent.*

C. *Historic Cropping Program Requirements*

An IGFR owner who has been approved for regulation under the Historic Cropping Program and any person using groundwater pursuant to that IGFR shall comply with the provisions of this section.

1. *The IGFR owner and any person entitled to use groundwater under that IGFR shall comply with the irrigation water duty and maximum annual groundwater allotment established by the director under this section, beginning with the calendar year in which the IGFR owner is accepted into the Historic Cropping Program, and continuing thereafter until the first compliance date for any substitute conservation requirement established in the Fourth Management Plan. The director shall establish the irrigation water duty and maximum annual groundwater allotment in the same manner that the director established the irrigation water duty and maximum annual groundwater allotment assigned to the IGFR in the Second Management Plan, except that the director shall use an assigned irrigation efficiency of 75 percent. In areas deemed by the director to have limiting soils, the director may use an assigned irrigation efficiency as low as 70 percent.*
2. *The IGFR owner, and any person entitled to use groundwater under that IGFR, may use the maximum annual groundwater allotment assigned to the IGFR to irrigate only the irrigation acres to which the IGFR is appurtenant.*
3. *The IGFR owner and any person entitled to use groundwater under that IGFR shall not use water for irrigation purposes during a calendar year in an amount which exceeds the maximum annual groundwater allotment assigned to the right, except as provided in the flexibility account provisions of A.R.S. § 45-467, as modified in subsection D of this section, and any rules adopted by the director.*

D. *Flexibility Account Provisions*

Under the Historic Cropping Program, the flexibility account provisions of A.R.S. § 45-467 shall apply to the IGFR owner and any person entitled to use groundwater under that IGFR with the following modifications:

1. *If the amount of water used to irrigate the farm in any year is less than the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section, the amount of any credit registered to the farm's flexibility account pursuant to A.R.S. § 45-467 shall not exceed the difference between the existing balance in the account and a positive account balance of 75 percent of the maximum annual groundwater allotment. The director shall not register a credit to the farm's flexibility account in any year in which the account has an existing positive account balance equal to or greater than 75 percent of the maximum annual groundwater allotment.*
2. *The IGFR owner and any person entitled to use groundwater under that IGFR who are regulated under the Historic Cropping Program shall not:*
 - a. *Purchase or sell flexibility account credits to another IGFR owner or any other person entitled to use groundwater under another IGFR regardless of whether they are regulated under the Historic Cropping Program.*
 - b. *Transfer credits from the flexibility account of one farm to another farm even if the farms are owned by the same IGFR owner.*
3. *The maximum excess amount of groundwater that may be used pursuant to A.R.S. § 45-467 shall not exceed 25 percent of the maximum annual groundwater allotment established for the farm pursuant to subsection C, paragraph 1 of this section. The IGFR owner and any person entitled to use groundwater under that IGFR violate this section if the flexibility account maintained for the IGFR is in arrears at any time in excess of this amount.*

E. Reporting Requirements

In addition to the information required to be submitted in the annual report required by A.R.S. § 45-632, the IGFR owner and any person entitled to use groundwater pursuant to that IGFR shall submit the following information in the report:

1. *The name, address, and phone number of any person entitled to use groundwater under the IGFR.*
2. *The number of acres and types of crops planted and the amount of water used to irrigate the planted acres.*
3. *The type of irrigation system which has been used, including percent of slope, length of runs, and method of field application.*
4. *A description of all water conservation practices used on the farm, including the name of any conservation program or irrigation water management service used on the farm.*

F. Duration of Regulation under Historic Cropping Program

1. *Except as provided in paragraph 2 of this subsection, after the director approves an application for regulation under the Historic Cropping Program, the IGFR owner and any person entitled to use groundwater pursuant to that right shall be regulated under the Historic Cropping Program until the first compliance date for any substitute agricultural conservation requirement established in the Fourth Management Plan.*

2. *After the director approves an application for regulation under the Historic Cropping Program, the IGFR owner must remain in the Historic Cropping Program during the entire third management period, except that a subsequent owner of the IGFR file a written request to leave the Historic Cropping Program with the director within 90 days after acquiring an ownership interest in the IGFR. The director shall grant the request unless the director determines that the request is being made for the purpose of circumventing the provisions of paragraph 1 of this subsection, in which case the request will be denied. In the event that an IGFR is owned by more than one person, this paragraph does not apply unless all owners have conveyed their interests in the IGFR and all subsequent owners join in filing a written request with the director to leave the Historic Cropping Program.*

4-104. Conservation Requirements for Irrigation Distribution Systems

A. Applicability

The irrigation distribution system conservation requirements set forth in subsection B below apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use.

B. Conservation Requirements

By January 1, 2002 or upon commencement of operation, whichever is later, and continuing thereafter until the first compliance date of any substitute requirement in the Fourth Management Plan, each irrigation district and private water company owning or operating an irrigation distribution system shall either:

1. *Line all canals used to deliver water for irrigation use with a material that allows no more lost water than a well-maintained concrete lining, or*
2. *Operate and maintain its distribution system so that the total quantity of lost and unaccounted for water is 10 percent or less of the total quantity of water from any source, including effluent, withdrawn, diverted, or received by the irrigation district or private water company on either a calendar year basis or a three-year average basis based on that calendar year and the two preceding calendar years.*

4-105. Monitoring and Reporting Requirements for Irrigation Districts and Private Water Companies

A. Applicability

The monitoring and reporting requirements set forth in subsection B below apply to irrigation districts and private water companies which, as of January 1, 2000, distribute 20 percent or more of their total water deliveries for irrigation use.

B. Monitoring and Reporting Requirements

For calendar year 2002 and for each calendar year thereafter until the compliance date for any substitute requirement in the Fourth Management Plan, each irrigation district and private water company owning or operating an irrigation distribution system shall submit in its annual report required by A.R.S. § 45-632, the following information as it applies to the irrigation district or private water company:

1. *A map showing the irrigation distribution system, including those portions which have lined canals and those portions which have unlined canals, unless a current map is on file with the Department.*
2. *The number of miles of lined canals and the number of miles of unlined canals in the irrigation distribution system.*
3. *The total quantity of water from any source, including effluent, which was withdrawn, diverted, or received by the irrigation district or private water company during the calendar year.*
4. *The total quantity of water from any source, including effluent, delivered by the irrigation district or private water company to all water users during the calendar year.*
5. *An estimate of the irrigation district's or private water company's total quantity of lost and unaccounted for water for the calendar year. This quantity shall be determined by a generally accepted engineering method.*

**APPENDIX 4
CONSUMPTIVE USE AND OTHER NEEDS BY CROPS¹
PHOENIX ACTIVE MANAGEMENT AREA**

Crop	Consumptive Use (acre-feet per acre)	Other Needs (acre-feet per acre)	IRRIGATION REQUIREMENT (acre-feet per acre)
Grain Crops			
Barley	2.08	0.00	2.08
Maize (Sorghum)	2.12	0.00	2.12
Millet	2.58	0.00	2.58
Oats	1.83	0.00	1.83
Rye	1.83	0.00	1.83
Sorghum Grain (Single Crop)	2.12	0.00	2.12
Sorghum Grain (Double Crop)	4.28	0.00	4.28
Wheat	2.15	0.00	2.15
Corn, Grains	2.12	0.00	2.12
Forage Crops			
Alfalfa	4.69	0.00	4.69
Alfalfa High Yield ²	6.19	0.00	6.19
Bermuda Grass	3.63	0.00	3.63
Blue Panic Grass	4.36	0.00	4.36
Clover ³	4.33	0.00	4.33
Ensilage (All Single Crop)	2.08	0.00	2.08
Ensilage, Sorghum (Double Crop)	4.52	0.00	4.52
Permanent Pasture Mix	5.67	0.00	5.67
Sudan Sudex Grass	2.58	0.00	2.58

APPENDIX 4 (continued)
CONSUMPTIVE USE AND OTHER NEEDS BY CROPS¹
PHOENIX ACTIVE MANAGEMENT AREA

Crop	Consumptive Use (acre-feet per acre)	Other Needs (acre-feet per acre)	IRRIGATION REQUIREMENT (acre-feet per acre)
Field Crops			
Castor Beans	3.70	0.00	3.70
Cotton	3.43	0.00	3.43
Cotton (Dry Plant) ⁴	3.43	0.33	3.76
Flax	2.60	0.00	2.60
Pinto Beans	1.25	0.00	1.25
Safflower	3.78	0.00	3.78
Soybeans	1.85	0.00	1.85
Sugar Beets	3.56	0.00	3.56
Plantago	1.25	0.00	1.25
Guar (for seed production)	1.93	0.00	1.93
Vegetable Crops			
Beets, Table	2.00	0.50	2.50
Broccoli	1.64	1.00	2.64
Cabbage, Early	1.43	1.00	2.43
Cabbage, Late	2.04	1.25	3.29
Carrots	1.38	0.75	2.13
Cauliflower	1.55	1.00	2.55
Chili Peppers	2.50	0.50	3.00
Corn, Sweet	1.63	0.87	2.50
Cucumbers, All	1.50	0.50	2.00
Lettuce	0.71	2.44	3.15
Okra	2.50	0.50	3.00
Onions, Dry	1.94	0.75	2.69
Onions, Green	1.46	0.75	2.21
Parsnips	2.00	0.50	2.50

APPENDIX 4 (continued)
CONSUMPTIVE USE AND OTHER NEEDS BY CROPS¹
PHOENIX ACTIVE MANAGEMENT AREA

Crop	Consumptive Use (acre-feet per acre)	Other Needs (acre-feet per acre)	IRRIGATION REQUIREMENT (acre-feet per acre)
Potatoes	2.03	0.75	2.78
Radishes	0.75	0.50	1.25
Rappini	2.75	0.50	3.25
Turnips and Rutabagas	1.50	0.50	2.00
Tomatoes, All	2.00	0.50	2.50
Miscellaneous Vegetables	2.00	0.50	2.50
Mixed Vegetables	2.00	0.50	2.50
Summer Squash and Zucchini	1.75	0.50	2.25
Green Manure Crops			
Guar	1.93	0.00	1.93
Papago Peas	1.63	0.00	1.63
Sesbania	1.09	0.00	1.09
Small Grain for Green Manure	1.00	0.00	1.00
Vine Crops			
Cantaloupe, Early	1.71	0.50	2.21
Cantaloupe, Late	1.40	0.50	1.90
Honeydew Melons	2.00	0.50	2.50
Watermelons	1.75	0.50	2.25

APPENDIX 4 (continued)
CONSUMPTIVE USE AND OTHER NEEDS BY CROPS¹
PHOENIX ACTIVE MANAGEMENT AREA

Crop	Consumptive Use (acre-feet per acre)	Other Needs (acre-feet per acre)	IRRIGATION REQUIREMENT (acre-feet per acre)
Citrus			
Grapefruit	3.99	0.00	3.99
Lemons/Limes	3.99	0.00	3.99
Oranges, All	3.26	0.00	3.26
Tangerines	3.26	0.00	3.26
Fruits			
Dates	4.92	0.00	4.92
Grapes	3.00	0.50	3.50
Apricots	4.17	0.00	4.17
Nectarines	4.17	0.00	4.17
Peaches	4.17	0.00	4.17
Plums	4.17	0.00	4.17
Olives	2.58	0.00	2.58
Nuts			
Pecans with Ground Cover	5.83	0.00	5.83
Pecans Without Ground Cover	4.50	0.00	4.50
Pistachios	4.33	0.00	4.33
Miscellaneous Crops			
Aloe Vera	1.50	0.00	1.50
Guayule	3.00	0.00	3.00
Joboba	3.00	0.00	3.00
Christmas Trees	2.50	0.00	2.50
Flowers, Cut	3.33	0.00	3.33
Double Cropped Vegetables	3.33	0.00	3.33

APPENDIX 4 (continued)
CONSUMPTIVE USE AND OTHER NEEDS BY CROPS¹
PHOENIX ACTIVE MANAGEMENT AREA

Crop	Consumptive Use (acre-feet per acre)	Other Needs (acre-feet per acre)	IRRIGATION REQUIREMENT (acre-feet per acre)
Roses	2.50	0.00	2.50
Nursery Stock	3.00	0.00	3.00
Salt Bush	1.50	0.00	1.50
Cactus (In Nursery)	1.25	0.00	1.25

¹ Based on crops that were reported from 1975 to 1980 history.

² The Department assigned an irrigation requirement of 6.19 acre-feet per acre to farms with demonstrated historic yields above the average.

³ Data are not available for the consumptive use of clover. Until FAO calculations can be made, the Department has estimated that value at 4.33 acre-feet per acre.

⁴ The Department assigned an irrigation requirement of 3.76 acre-feet per acre for Areas of Similar Farming Conditions #3 (Roosevelt Irrigation District) and #4 (Buckeye) due to historic dry plant practices.

Sources: Consumptive Use of Water by Major Crops in the Southwestern United States, Conservation Research Report #29, United States Department of Agriculture, Agricultural Research Service. (Provides consumptive use values for major crops in southwestern United States.)

FAO Irrigation and Drainage Paper #24, Food and Agriculture Organization of the United Nations (revised 1977). (Describes Blaney-Criddle method for computing consumptive use values.)

APPENDIX 4 (continued)

**ASSIGNED CONSUMPTIVE USE (CU) VALUES FOR CROPS ASSOCIATED WITH FARM
UNITS LESS THAN TEN ACRES
PHOENIX ACTIVE MANAGEMENT AREA**

HIGH CONSUMPTIVE USE CROPS

Crops with a CU value of 4.50 acre-feet per acre or more are assigned a CU value of 5.00 acre-feet per acre.

Alfalfa
Dates

Pecans (with and without ground
Permanent Pasture Mix

MEDIUM CONSUMPTIVE USE CROPS

Crops with a CU value of 3.00 to 4.49 acre-feet per acre are assigned a CU value of 3.50 acre-feet per acre.

Apricots
Bermuda Grass
Blue Panic Grass
Castor Beans
Cotton
Double Crop Vegetables
Flowers, Cut

Grapefruit
Grapes
Guayule
Jojoba
Lemons/Limes
Nectarines
Nursery Stock

Oranges, all
Peaches
Plums
Safflower
Sorghum, Grain,
Double Cropped
Sugar Beets

LOW CONSUMPTIVE USE CROPS

Crops with a CU value less than 2.99 acre-feet per acre are assigned a CU value of 2.50 acre-feet per acre.

Aloe Vera
Barley
Beet, Table
Broccoli
Cabbage, all
Cactus (Nursery)
cantaloupe, all
Carrots
Cauliflower
Chili Peppers
Christmas Trees
Corn, Sweet
Cucumbers
Ensilage, (all Single Crop)
Flax

Guar (for Seed Production)
Honeydew Melons
Lettuce
Maize (Sorghum)
Millet
Misc. Vegetables
Oats
Okra
Onions, all
Papago Peas
Parsnips
Pinto Beans
Planatago
Potatoes
Radishes

Rappini
Roses
Rye
Salt Bush
Sesbania
Small Grain for Green
Sorghum, Grain, Single and
Double Cropped
Soybeans
Sudan/Sudex Grass
Summer Squash and
Tomatoes, all
Turnips and Rutabagas
Watermelons
Wheat