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The Groundwater Management Act: Saving Water and Developing Water Policy

The Arizona Groundwater Management Act (GMA) of 1980 confronts a problem that has concerned state officials since the early 1930s—the overdraft of Arizona's groundwater resources. The GMA was not the first legislative effort in Arizona to control groundwater use. Advised that a groundwater law was a prerequisite to authorization of the Central Arizona Project (CAP), the state Legislature enacted the Critical Groundwater Code in 1948.

The Code empowered the State Land Department to designate critical groundwater areas. These would be areas with insufficient groundwater to assure a reasonably safe supply to support continued irrigation at its then current level. Also the Code prohibited drilling new wells to irrigate land not previously irrigated. The Code, however, did not limit the amount of water that could be pumped from existing irrigation wells nor did it restrict non-irrigation uses of groundwater.

State Supreme Court rulings further defined Arizona groundwater law. For example, the "rule of reasonable use" was adopted that allowed landowners to use groundwater beneath their land for reasonable, beneficial purposes on their land. Landowners could not, however, transport water pumped from their land if it affected neighboring landowners adversely.

In spite of legislative and judicial action, the groundwater overdraft problem continued. Central and southern Arizona groundwater withdrawals were exceeding recharge by approximately 2 million acre-feet per year on a long term average. Excessive withdrawals had caused groundwater levels in some areas to drop as much as 600 feet. As groundwater supplies are depleted, pumping water for some uses becomes economically infeasible. Also, land subsidence and water quality problems sometimes result.

In 1980, 32 years after the passage of the Critical Groundwater Code, the Arizona Legislature, again prompted by a threatened withdrawal of federal support for the CAP, passed the GMA. The GMA has two primary objectives. First, the GMA sets out to control the severe overdraft occurring in some parts of Arizona; and second, the act is to help allocate limited groundwater resources to assure that future water needs will be met.

Outlined in the GMA is a strategy to help achieve these objectives. Part of the strategy involved setting up four Active Management Areas (AMA) in locations where groundwater overdraft is most severe. Approximately 80 percent of Arizona's population resides within these AMAs and about 70 percent of the state's water is consumed there.

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The act also calls for five management periods to cover the years 1980 to 2025, with water conservation goals becoming more stringent in each subsequent period. The GMA strategy also includes provisions related to water supply augmentation, the identification of additional renewable water supplies, and the retirement of agricultural land.

The GMA strategy is to assure that the Phoenix, Prescott and Tucson AMAs achieve safe-yield of their groundwater resources by the year 2025. Simply stated, safe yield is achieved when long-term groundwater withdrawals do not exceed recharge of the aquifer.

A predominantly agricultural area, the Pinal AMA has a slightly different agenda. It is concerned with developing non-irrigation water uses; continuing the agricultural economy for as long as is feasible; and conserving water supplies for future non-irrigation uses.

The GMA also includes an "assured water supply" provision to help control development in the AMAs. This means that anyone offering to sell or lease certain lands within an AMA must be able to demonstrate that sufficient water of adequate quality will be continuously available to meet the needs of the proposed development for at least 100 years. Further, the projected use of this water is to be consistent with the management plan and achievement of the management goal for the AMA. This means that groundwater mining cannot be used to demonstrate an assured water supply.

Second Management Plan

The Second Management Plan (SMP), which is to cover the years from 1990 to 2000, is to be adopted by the end of 1988. The plan includes three primary components: 1) mandatory water conservation requirements for agricultural, municipal and industrial water users; 2) a groundwater quality and assessment program; and 3) a water supply augmentation and reuse program. Recently promulgated, the SMP is now open for public comment.

As the SMP is being reviewed, it is useful to place the GMA in the context of other water-related issues affecting the state and the evolution of its water policy. Such an analysis must begin by recognizing the GMA and its management plans as important aspects of Arizona's water policy. Formation of water policy, however, is a dynamic process. Water policy takes shape as laws are enacted; as court cases are decided; and as situations develop that affect the supply, use and quality of water.

As the SMP is being reviewed, it is useful to place the GMA in the context of other water-related issues affecting the state and the evolution of its water policy.

In other words, the GMA is one facet among many that together interact to form Arizona's water policy. Other issues include artificial recharge, water transfers, artificial lakes, use of treated effluent, water quality, conjunctive management of surface and groundwater, and the organization of non-AMA areas. Following is a discussion of each of these issues as they relate to the GMA and its SMP.

Artificial Recharge

Through artificial recharge water can be stored in the subsurface or aquifers, and this has implications for the implementation of the GMA and its management plans. Artificial recharge, which enables water to be added to groundwater reserves deliberately through such means as spreading ponds or injection wells, is becoming an important groundwater management tool in Arizona.

Interest in artificial recharge heightened in the early 1980s as plans were made for the arrival of CAP water. Many municipalities realized that they would not need their full CAP allocations for direct use during the early years of the project. Estimates indicated that almost 600,000 acre-feet per year of such surplus water might be available during the early years of CAP. Recharging excess CAP water into the aquifer seemed a reasonable course of action.

The GMA also stimulated interest in artificial recharge. It was seen as a water management method to help achieve safe yield in an AMA. Water recharged into an aquifer would raise the water level and result in a favorable assured water supply. Also, the GMA directed the Arizona Department of Water Resources (ADWR) to study artificial recharge as a method to augment the state's water supplies.

Several studies were undertaken to determine the feasibility of artificial recharge at various locations throughout the state, including a study at Butler Valley along the CAP route. Recharge technology was established and demonstrated to be a cost-effective method of water storage.

Many water providers, however, were reluctant to take on recharge projects because of legal ambiguities. Arizona law left undefined many issues relating to recharge. For example, if a water provider recharged water into an aquifer, the raised water level could benefit all who draw on the aquifer, and the original provider would have no way to legally claim the amount of water recharged. Legislation was needed to answer such questions as: Who has the legal right to recharged water? How will the recovery of stored water be regulated and monitored?

The Artificial Recharge and Underground Storage and Recovery Act of 1986 was passed to help clarify the situation. (A.R.S. 45-651 et seq. and A.R.S. 45-661 et seq.) The law established an accounting process that quantifies the amount of water stored and recovered. It also determined that recovered water has the same legal identity as its original source. For example, if treated effluent is recharged, it can be recovered and still be designated as effluent. This is significant since effluent use is not computed as part of a water provider's per capita potable

water use. The law also protected stored water from recovery by others. Finally the law established specific review criteria to be used to decide whether to approve a recharge project.

With the issue more clearly defined, artificial recharge has a greater potential to contribute to the groundwater management goals of the AMAs. When recharging water, a water provider can now establish a water storage account that documents the quantity of water recharged. The water can later be recovered by the provider.

Water storage accounts will be used to build assured water supplies. A CAP allocation provides an assured water supply until the year 2001. As this date approaches, additional water resources will be needed to demonstrate an assured water supply. A balance in a water storage account built up through a storage and recovery project can demonstrate the additional water resources needed to support further development.

This right to establish water storage accounts through recharged water has led to a request from the City of Tucson for in-lieu-of-recharge credits. This refers to credit that would be earned for water that was saved by not taking it from the aquifer. By retiring farmlands and terminating groundwater pumpage, Tucson feels in-lieu-of-recharge credits are justified. Legislation will be needed before such credits can be granted.

Finally, groundwater recharge encourages creative water transfer and exchange arrangements and supports conjunctive management of water resources. For example, to help meet its safe-yield goal and also as part of a drought management plan, Phoenix is considering recharging excess CAP water in the Phoenix AMA during wet years, and transporting groundwater from its McMullen Valley water farm into the Phoenix AMA for recharge during dry years. Under such an arrangement, a dependable water supply would be available at all times for recharge. Other municipalities are contemplating variations of this idea as water storage, recovery, transfers and exchanges are worked out to achieve specific goals.

The SMP incorporates the view that artificial recharge is an attractive water storage option because it can be integrated with water management objectives in such areas as flood control, contaminant management and maintenance of water levels. Before water can be recharged within AMAs, however, recharge legislation states that the ADWR director must determine that " . . . the project is not inconsistent with the active management area's augmentation program."

Other issues will need to be addressed as recharge, storage and recovery projects are implemented. For example, if an agency recharges water with the intention of recovering the same water, what water quality assurances should be established? Presently rechargers who can demonstrate that they will be recovering the same water face few water quality restrictions. Also, the development of many recharge, storage and recovery projects will be contingent upon being able to use the CAP canal to transport water to a recharge site. The use of the CAP canal for this purpose, however, is an unresolved issue.

Water Transfers

In brief, water transfer means a change in ownership of the right to use water. A controversial issue throughout the Southwest, water transfers usually involve the purchase of agricultural land by urban areas to support municipal and industrial development. Laws regarding water transfers vary among states in the West. Generally, however, most western state water rights may, with state agency and court approval, be sold and transferred to other areas in the same state.

The GMA helped boost interest in water transfer as a water management method in Arizona. With groundwater pumping restricted within the AMAs, water suppliers seek to purchase water rights outside the AMAs, often in rural agricultural areas.

Other developments also contribute to the growing interest in water transfers. The state's metropolitan areas continue to expand rapidly resulting in increased water demand. Also the construction of the CAP aqueduct system has progressed. Crossing the middle of the state and passing through major metropolitan areas, the CAP aqueduct is seen as a potential delivery system to transfer water to various areas of the state. Finally a declining agricultural economy prompts farmers to be willing and even eager to sell their lands.

These developments have sparked a controversy. As urban water suppliers negotiate for rural water resources, rural and agricultural interests feel threatened and attempt to protect their water rights.

The GMA's intent toward water transfers is debated. Some say the law did not address the issue of interbasin water transfers directly. According to this view the GMA merely meant to allow the continuation of transfers already arranged by Tucson in Avra Valley and Prescott in Chino Valley. These tranfers involved moving water from one subbasin to another for a relatively short distance, 10 to 20 miles. Transfers were within the same county so tax impacts were internalized, and both Tucson and Prescott offered to provide water to the areas of origin on the same terms as their regular customers.

Others say that the GMA implicitly recognized that groundwater transfers would be essential for meeting changing water needs and for fulfilling the terms of future groundwater management plans effectively. The requirements of safe yield and an assured water supply established by the GMA are seen by some as requiring cities to import water from outside the AMAs. Also, the agricultural land retirement provisions in the GMA reinforce this conclusion since most agricultural land is outside AMAs.

The SMP includes recognition that water transfers are an important water management tool to help reduce groundwater overdraft in the AMAs. The plan commits ADWR to conduct

further research on issues relating to water transfers. Also, statutory and regulatory mechanisms are to be reviewed to mitigate adverse consequences to third party interests from transfers to AMAs.

Included in the SMP, however, is an acknowledgement that the Arizona Legislature may pass laws regulating water transfers to protect rural interests from potential negative impacts. Although it is unlikely that a substantive water transfer bill will be passed this legislative session, the issue is certain to come up again next year, with greater likelihood of definite legislative action. Such action will determine whether limitations and restrictions on interbasin transfers will be imposed.

Artificial Lakes

Passed in 1987, the Lakes Bill (A.R.S. 45-131 et seq.) is a water conservation measure that affects surface water and groundwater use. The aim of the bill is to curb future development of artificial lakes dependent on potable water and to help the AMAs meet the goal of safe yield by 2025.

According to the First Management Plan, artificial lakes built after Jan. 1, 1987 could not be filled with groundwater supplied by municipal providers. Methods were still available, however, for developers to fill artificial lakes, even using groundwater. Type 1 water rights, which are derived from retired irrigated farmland, could be purchased and the water used in artificial lakes. Also, type 2 water rights, which are granted for industrial uses, could be purchased and used to fill decorative lakes. Finally, Salt River Project water, which was surface water, could be used in artificial lakes.

The Lakes Bill was passed to close the loopholes that allowed the continued filling of man-made lakes with potable groundwater and surface water. The bill further restricted the use of groundwater to fill artificial lakes by stating that groundwater could be used only if treated effluent is to be phased in within five years. Surcharges are imposed on the use of groundwater for this purpose, with the surcharge amount doubling each year.

Whether surface water could be used in artificial lakes was debated by the Legislature. A case was made that surface water was a renewable resource, non-AMA specific, and, as an established right, did not need to be subject to further legislative control.

Others argued that surface water is a primary source of drinking water. If great quantities of potable surface water are used to fill artificial lakes, additional groundwater will be needed for drinking. In other words, the use of surface water in artificial lakes would adversely affect the safe-yield goal of the management plans.

When it enacted the Lakes Bill, the Legislature decided that the use of surface water in decorative lakes is not a beneficial use pursuant to the doctrine of prior appropriation, under which surface water is allocated in Arizona.

Use of Treated Effluent

Seen as an underutilized resource at present, treated effluent is recognized by the SMP as the only increasing water resource within AMAs. As a result, the SMP stresses the utilization of treated effluent, with increased direct use in agricultural and turf applications. The SMP also calls for an increase in the controlled recharge of treated effluent which cannot be used directly. ADWR expects that treated effluent will provide about 10 percent of AMA water supplies by 2025. However, several legal questions will have to be resolved first.

The Arizona Supreme Court is presently considering the Arizona Public Service vs. John F. Long case. Long, a developer, proposed to build a town in the Phoenix area that would demonstrate efficient water use and be a national model for water conservation. The plans called for an on-site treatment plant that would process effluent for reuse. The City of Phoenix, however, said Long could not recycle effluent since the city owned all the effluent that was produced within its jurisdiction. In fact, Phoenix had already agreed to sell all its effluent to the Palo Verde nuclear power plant. Long sued.

The basic issue in the case involves whether effluent is to be regulated as surface or groundwater, or neither. A lower court declared that effluent is neither surface water nor groundwater and, therefore, is not subject to state regulation. If this decision is upheld by the state Supreme Court, cities could have an unregulated monopoly over how they use their effluent. ADWR would have no control over effluent use and could not require the use of treated effluent to replace nonrenewable water sources in its management plans.

Legislation is needed to clarify ADWR jurisdiction over effluent use. Without such clarification ADWR is in an awkward position. If categories of water can be created that fall outside the purview of ADWR, the agency's centralized authority over water will be reduced. As a result, the agency will be left with a diminished ability to accomplish its goals.

Despite legal uncertainties, the SMP maps out future directions for treated effluent use. ADWR is to encourage its direct use by agricultural, municipal and industrial users. Also, ADWR is to work to overcome institutional barriers to recharge of treated effluent and provide funds to support recharge projects. The department is also to provide technical assistance to help implement direct use and treated effluent recharge projects. Finally, ADWR is to facilitate the permitting of effluent projects that are consistent with AMA water management goals.

Water Quality

Although mainly concerned with assuring adequate groundwater supplies, the GMA is also involved with the quality of regulated water. The GMA views groundwater quality and quantity as interrelated and requiring coordinated attention to manage the state's water resources effectively. If water quality is managed and protected, greater

supplies of usable water will be available. The coordination of water quality and water quantity management is called integrated management.

Many water managers call for an integrated water management policy since water supply and water quality are inseparable and intimately related hydrologic phenomena. They feel that a single water management strategy is more logical and productive than having separate policies for water supply and water quality. The SMP includes a rationale justifying the need for integrated management programs that address water quality issues.

As Arizona's water policy developed, however, institutional and legal developments tended to segregate water quantity and water quality management. This situation is demonstrated by the passage of two major laws, one addressing water supply and the other water quality.

The Groundwater Management Act (A.R.S. 45-401 et seq.) was passed in 1980 to protect diminishing water supplies, and it established the ADWR. Passed in 1986, the Arizona Environmental Quality Act (A.R.S. 49-201 et seq.) established a comprehensive groundwater protection program and created the Arizona Department of Environmental Quality. As a result, water supply and water quality management strategies rely on different laws and are implemented by separate state agencies.

A groundwater quality management program, however, is part of the SMP. By managing the state's groundwater quality, the program helps assure a maximum supply of water available for beneficial use. The program is designed to identify, protect, and correct groundwater quality problems.

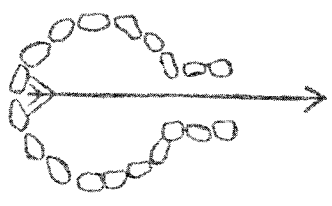
Institutional cooperation between ADWR and ADEQ will be necessary as the SMP's groundwater quality management program is implemented. The two state agencies have cooperated on the issuance of recharge permits and the enforcement of remedial action. Also ADWR and ADEQ have worked together to conduct a groundwater quality assessment that was specified by the GMA as part of its second management plans. The assessment is to assure the integration of water quality considerations into the GMA's water management plans.

Since ADWR and ADEQ have overlapping authorities, the two agencies have signed a memorandum of understanding to promote continued cooperation in water quality matters. The memorandum is to assure a regular exchange of information and a consistent policy toward water quality and quantity issues. Also a joint committee made up of members from both agencies was established to help avoid duplications or conflicts. No instititional realignment of rights and duties are expected, however.

Conjunctive Management of Surface and Groundwater

The previous section discussed how the management of water supply and water quality is legally and institutionally separate in Arizona. Arizona water law makes another important distinction between groundwater and surface water, treating each as separate, distinct and different. The GMA, which sets out to manage and regulate groundwater, is not concerned with surface water directly.

Arizona law allocates surface water according to the doctrine of prior appropriation. This means that the first to claim rights to surface water and put it to a "beneficial use" has a priority and superior claim over others who make a later claim. Or, as it is succinctly stated in an aphorism: First in time, first in right. Water flowing in "subterranean channels" is also considered to be surface water and is subject to appropriation.



Shoshone water sign: a circle of stones with arrow pointing to water.

Under the GMA subsurface water which does not flow in channels is termed groundwater and is allocated much differently and in more detail than surface supplies. AMA agricultural water rights are determined by historic use (with new agricultural uses proscribed), and a permit process allows new withdrawals for municipal and industrial water purposes. In all cases, however, water conservation requirements are mandated to encourage more efficient water use and eventual attainment of safe yield. Groundwater users outside of AMA areas confront different regulations.

Often discussed is whether the state should adopt conjunctive management principles, which would involve coordinating groundwater and surface water management. Some feel conjunctive management is inappropriate because the legal status of surface water use is quite clear, and most of Arizona's surface water, which is limited in supply compared to groundwater, has been appropriated. Whether groundwater and surface water are hydrologically connected is also questioned in this view. According to this argument, surface water, therefore, is in a different category than groundwater. Groundwater is much more difficult to regulate and, as a result, needs separate legislation such as the GMA.

Others find serious problems with the establishment of separate mechanisms to allocate and manage groundwater and surface water. They argue that the two types of water are hydrologically connected, and so they should be combined institutionally. For example, increased groundwater may be pumped to supply growing municipal needs, and this pumpage may reduce flows in nearby streams. As a result, historic irrigation uses downstream or riparian habitats may be jeopardized. This is a controversy in Sierra Vista. Some say that the city's increased groundwater pumpage has affected surface flows in the San Pedro River with serious consequences to riparian habitats.

The existence of separate Arizona laws for surface and groundwater has also created difficulties in the General Stream Adjudication process. Currently, water rights are being adjudicated to clarify all the surface water claims in the Gila and Little Colorado river systems. Some areas of these stream systems, however, are affected by groundwater pumping. Some people argue that if groundwater pumping has a physical and hydrologic impact on surface streams, groundwater should be included in the adjudication process. Now before the courts, the question is expected eventually to be addressed by the State Supreme Court. The final decision will be based upon and, in turn, will help to interpret the connection between surface and groundwater laws in Arizona.

Many observers believe that the lack of a strong management program linking surface and groundwater is due in large part to an inadequate appreciation of the hydrologic system. They say that few attempts have been made to develop a unified flow model for Arizona conditions that would account for the complexity of flow paths through the vadose zone and aquifer systems. Such a model, they believe, would demonstrate the necessity for conjunctive management of water resources.

At present, however, Arizona's water management plans do not include an explicit strategy to link surface and groundwater through conjunctive management.

Organization of Non-AMA Areas

The non-AMA parts of the state are generally rural areas with low population. They are also usually the locations for the water farms that would augment the water supplies of the AMA metropolitan centers. Perceived as both an opportunity and a threat, this situation prompts many non-AMA residents to feel that they should be allowed to develop their own goals and water management plans.

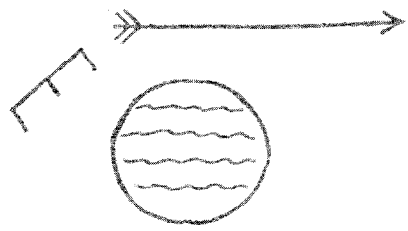
The proposed non-AMA goals and management plans are mainly defensive having been worked out to anticipate the exportation of water from the area. The various options define how non-AMAs can control or prevent the transfer of their water to AMA metropolitan centers.

One option is to give residents of non-AMAs control over the status of their own basins. Boards of supervisors or committees of water users would determine whether or not water transfers would be allowed in each area.

Other options concern regulating the amount of water to be pumped for exportation. For example, pumping water for transfer would be prohibited below a certain depth. The depth would vary depending upon the basin and its hydrologic conditions but could range between 400 and 900 feet. Below that depth the water would be reserved for future use in the area. Or, pumping could be limited to a specified percentage of the groundwater in storage.

Further options borrow provisions from the GMA and apply them to non-AMAs to manage and regulate water use. For example, one proposal calls for safe yield to apply to both AMA and to non-AMA area basins. This would severely limit the amount of water that could be pumped for exportation and transfer. Another option would require that non-AMA areas demonstrate an adequate water supply to satisfy their proposed use for the next 100 years. This would assure that non-AMA water needs are defined and covered before water is exported to other areas. A further option would require AMAs to demonstrate maximum conservation and water-use efficiency before being allowed to import water.

The above options are being explored by rural interest groups. Before any of the proposed options can be adopted and enforced, however, legislative action is required. Some rural interests, however, doubt that legislation favorable to their cause will be passed since the Arizona Legislature is now dominated by urban interests.



Prehistoric Indian symbol showing location of water.

Conclusion

Outlined in the GMA is a long-term plan that is to be worked out over 40 years and through five management plans. This ensures that the act will be a vital factor affecting and, in turn, affected by a wide range of Arizona water issues, both now and in the future.

One way the GMA and water issues interact to form policy is through legislative action. For example, the Arizona Legislature passed laws concerning artificial lakes and recharge and recovery mainly to accommodate GMA water conservation measures. Further, water transfer, an issue brought to prominence by the GMA, is expected to receive legislative attention. Such legislative action will probably also determine the organization of non-AMAs.

The GMA, in turn, may be greatly affected by a pending court decision. The A.P.S. vs. John F. Long case will determine whether ADWR can regulate the use of treated effluent. The decision could impact the implementation of the management plans.

GMA's involvement with water quality has led to institutional cooperation between ADWR and ADEQ and to a greater awareness in the state for the need to coordinate the management of water quantity and quality. Further, the implementation of the GMA has resulted in additional concern about the lack of a conjunctive management policy in Arizona. As water policy develops in Arizona, the integrated management of water quantity and quality and conjunctive management will be topics that will need to be further addressed.▼

INVITED COMMENT

The Second Management Plan: An Ambitious Program for the 1990s

Herb Dishlip
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As soon as the ink had dried on the publication of the first management plans, the Department of Water Resources embarked on the preparation of the second management plans. In the First Management Plan the department described the role of those initial plans as a guideline for a period of organization, gathering and dissemination of information and data, and the establishment of basic programs. The department's short-term goals were to implement the basic provisions of the Groundwater Code, achieve a reduction in groundwater withdrawals and lay the foundation for a comprehensive effort in the second management period. The second plan includes both new programs and revisions to existing programs. Conservation requirements are taken another step. As the Second Management Plan is promulgated, the department should be in a position to establish a management program based on the necessary steps which must be achieved by the year 2000 in order to reach the ultimate management goals for each AMA.

While the department was satisfied with the first management plans, we realized that the second series of plans were going to take a great deal of additional effort. The department's primary recognition was that the new plans had to be closely related to Arizona's special circumstances. Arizona water users definitely have their own unique characteristics. A water management program which may have worked well in another part of the country may have little or no application in our state because of the special conditions created by our climate, economy, and population expansion. It was the department's desire to create water management plans which accomplished the primary policies as established in the Groundwater Code, but did it in a manner which recognized that all water users are not the same. Therefore, acknowledgement of those differences is important to a successful plan.

One of the greatest challenges of the Second Management Plan is that the applicable compliance date for most of the conservation measures is not until the end of the management period, i.e. the year 2000. Projecting the changes in water demands and supplies which will occur over the decade places a degree of uncertainty into the achievement of overall goals. For example, one of the early conclusions reached in the municipal conservation program was that a higher degree of conservation can be achieved in new construction because of the opportunities for use of conservation designed plumbing fixtures and more water efficient landscaping and sprinkler systems. Older facilities and homes would require retrofitting programs which usually will have a more limited success rate because of the costs associated with the replacement of fixtures or landscaping. Therefore the overall reduction in per capita water use of any given municipal water utility has a direct relationship to the magnitude of the increased population which will occur over the decade. In estimating this conservation potential the department relied upon official state population projections, but we also recognize that those population projections are based on many variables and assumptions which may or may not prove to be true. As a result of these kinds of uncertainties, the management plans have included alternative approaches to the primary conservation programs wherever practical to do so.

The decade of the 1990s will also see the introduction of Central Arizona Project water on a large scale in the AMAs. CAP water of and by itself, will result in a major reduction in the reliance upon overdrafted groundwater. Departmental studies also reflect projections that as the population grows throughout the decade, there will be a significant reduction in agricultural water demand as farms are removed from production to be replaced by subdivisions, shopping centers and new industries. Even though agriculture will experience some transition during the management period, studies continue to show that water conservation potential for irrigated agriculture remains very high and is economically feasible.

The second management plans emphasize the implementation of practical water conservation practices by all water users in the AMAs. They also contain forward looking water management provisions relating to water supply augmentation and reuse of treated effluent and a program for water quality protection. These areas are very important aspects in the water management programs for the AMAs and the plans call for increased research, monitoring, and the demonstration of new technology in both quantity and quality programs. The goal for the augmentation program is to allow the state to focus attention on the most feasible new water supply sources for development after the turn of the century. The goal of the water quality program is to use all water management tools available to DWR to supplement and aid the Department of Environmental Quality in the mission to protect the quality of the state's groundwater and surface water resources.

The second management plans set forth an ambitious agenda for water management in the state's AMAs. We believe that the measures proposed are appropriate and can be accomplished

by the year 2000. That is not to say it will be easy—it will not. The challenge of achieving a policy of wise and careful water use was set forth when the Groundwater Code was adopted in 1980. The second management plans will be a major step toward meeting that challenge.▾

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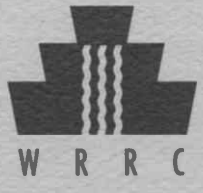

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