Appendix A

PAST ARIZONA TOWN HALL RECOMMENDATIONS AND CONCLUSIONS

FOURTH ARIZONA TOWN HALL
ARIZONA'S WATER SUPPLY
April 6-8, 1964

The policy of the state should be to conserve water. All farmers, industries, and municipal and private water entities should continue sound conservation practices, and all organizations and agencies should alert their customers, members and employees to the need for preventing the waste of water.

We strongly urge the resolution of sectional differences and expediting hydrological, legal, engineering and other studies bearing on this issue, both on federal and state levels. Specific studies are particularly needed on such systems as the Bill Williams River, Diamond Creek, The Virgin River, and the Little Colorado River.

No solution should be adopted which could in any manner be interpreted as an acceptance by the United States of any obligation to deliver to Mexico water of any particular quality. No solution should be suggested or implemented which would result in any water in the Colorado River entering Mexico which is not chargeable to Mexico's treaty allocation.

The situation with respect to groundwater shortage and depletion is critical and growing worse in most sections of Arizona; exceptions exist, such as in the Yuma area, which are created by strictly local conditions. As a general rule the present supply in inadequate to meet existing demand, resulting in severe overdrafts against the underground reservoirs.

[W]here a retreat of groundwater in any part of Arizona threatens to make the cost of pumping too high for agricultural use, thereby threatening the existence of any community, every proper resource of the community and state, intellectual and material, should be mustered to analyze and overcome the threat by whatever means may be devised, whether this be the introduction of light industry, the creation and application of new techniques in agriculture, provisions for additional water from other sources, or any feasible combination of such practices.

In view of the fact that existing projects and proposals, including the Central Arizona Project, will leave Arizona still showing a water deficit, and assuming effective community and state conservation practices, both before and after these projects are realized, the ultimate needs for full development will require negotiation of additional water supplies on a regional basis. Research should be continued into the possibility of the processing of saline water as a future solution to the regional water problem.

It is the widely held belief among Arizonans within the Central Arizona Project area that this project must and will serve the people of the entire state through exchanges, direct diversions and whatever other means may be devised. It is the firm purpose of the people of the state to work out such details on a basis of equity for all parts of the geographic, economic, and political entity which is Arizonan.

Proven means of watershed management can improve the yield of water, improve grazing, increase timber production, and maintain the recreational use of land. This multiple use concept of the watershed should be continued and emphasized. Profitable areas for expanded study in management are: vegetation modification on watersheds, control of transportation losses in streambeds and canals, control of seepage in canals and reservoirs, and control measures against evaporation on lakes, reservoirs and elsewhere.

The control of uneconomical water-consuming plants, such as salt cedars (phreatophytes), offers a great opportunity to increase water yields. Additional research is necessary to achieve economic methods for elimination of these plants. Full scale action programs toward this end should now be implemented.

In addition to canal and ditch lining, on-farm practices recommended for more attention include: proper timing of irrigation, short-row irrigation, pump-back practices for reuse where feasible, stricter control of tail water from irrigated fields, and better land leveling. We recommend for special attention:

1. Canal, lateral and ditch lining;
2. Use of crop species requiring less water;
3. More and better information on costs and savings to farmers of various conservation methods in farming;
4. More research into the economics of crops yields relative to water requirements.

Although in the experimental stage, sprinkler irrigation offers the opportunity of much more efficient use of water on the farm and substantial water savings in some areas.

[W]e urge each community to establish its conservation practices. To accomplish this, it is suggested that the local governing body create a permanent committee of persons competent to consider water programs and plan accordingly.

Sewage effluent offers a tremendous source of reusable water in Arizona. Since approximately half of the water used in Arizona communities goes out as sewage, this source must receive additional attention.

Water catchment or "harvesting" systems are known to be the most efficient of all systems for gathering rainfall. We strongly recommend a large-scale pilot program in a suitable location to determine the benefits that can be expected from such a program in Arizona.

[W]e recommend the creation by an appropriate state authority of a state-wide committee to make a thorough study and analysis of the efforts in Arizona and in other states and areas, and of any other applicable factors, with the goal of recommending the most efficient organization or centralization of water functions.

THIRTY-FIRST ARIZONA TOWN HALL

ARIZONA WATER –THE MANAGEMENT OF SCARCITY

October 9-12, 1977

There was general agreement that, for some parts of the state, existing sources of water in Arizona can be further developed to increase accessibility. Methods which can be further developed include:

a) Drainage control and catchment;
b) Evaporation suppression;
c) Seepage control;
d) Watershed management;
e) Regional weather modification;
f) Desalination;
g) Effluent recycling for non-domestic and some agricultural uses;
h) Improved agricultural irrigation techniques;
i) Education promoting water conservation;
j) Exploration for new water sources.

Proper watershed management, a proven economic technology, should be further utilized; Effluents should be used as efficiently as possible; conservation should be encouraged with water rate structures and

allocations that do not promote high use and inefficiency. Desalination also represents a potential source of water for Arizona. A greater investment should be made by the state in research and development of technologies designed to reduce water quantity and quality problems. Especially important will be new methods for using and conserving agricultural water, since the agricultural sector has such a significant impact on total water use in Arizona. Conservation measures should be encouraged primarily through the use of economic incentives and education rather than mandatory controls.

All agree that the present law is not adequate, and that it does not address the problems of groundwater overdrafts.

Theoretically, there should be no difference between the law relating to groundwater and the law relating to surface water. These two types of water are, in fact, inextricably tied together. As a practical matter, however, it is not feasible at the present time to begin treating these types of water identically.

Most participants believe that the State Legislature should have primary responsibility for the formulation of water policy in Arizona and urge that the Legislature act to discharge this responsibility by enacting legislation which will provide an adequate groundwater law.

A great need exists to coordinate the activities of the numerous agencies responsible for the implementation of the state's water policy. The number of such agencies should be sharply reduced, and the functions of the remaining agencies should be clearly delineated. The consolidation of responsibility should result in more effective implementation of the established policy, and should avoid some of the inaction and inefficiency which has led to the present disjointed water policy.

Compensation for the settlement of valid Indian claims arising from federal actions should be made by the federal government without adversely affecting Arizona interests. These issues are of national rather than simply statewide concern.

A majority of the panelists supports a system of water priorities favoring domestic and urban users. Concern was expressed that a reasonable balance of priorities be maintained so that no segment of the state's economy would be seriously damaged. Any future system of water management in Arizona must accommodate the allocations of water to which it is determined our Indian populations are entitled. Many panelists feel that aesthetic and recreational factors should also be given some degree of priority.

Arizona's groundwater should be managed so as to avoid exhaustion of major water basins. While groundwater overdrafts are currently a necessary part of our water system, they should be minimized to the extent possible with a view toward preserving the major groundwater supplies forever.

Future planning and management must deal with the problem of groundwater transfers within basins, as well as trans-basin diversions.

Future planning for surface waters should emphasize watershed management, reduction of transmission loss, evaporation control, flood control, and construct effective storage facilities (both above and below ground) on all lands within the state, both public and private.

Water transfer projects like the CAP are indeed justified, and represent a significant component of the state's long-term water strategy.

Most panelists believe that no direct limitations should be placed on Arizona's population, agriculture or industrial growth by means of water management, although a comprehensive water management plan will undoubtedly affect such growth. Incentives to conserve water should be further encouraged, with consideration given to imposing penalties for misuse of water.

The economic forces of supply and demand should also be given full opportunity to influence the

allocation of water to high-value uses. Market factors alone, however, may not be sufficient to achieve the desired allocations, in which case regulatory constraints such as extraction taxes may be necessary. If implemented, such constraints must recognize existing property rights.

Although our entire water allocation system cannot be revamped, widespread support does exist for vesting some statewide regulatory agency with authority to regulate the use of groundwater.

Regulatory alternatives which might be considered in the future include the following:

a) Taxation;
b) Improved definition of "reasonable use";
c) Limitations on decorative water uses;
d) Penalties for water misuse.

Water rights, where they exist, are a form of private property. Consequently, the owner of such rights may legally be entitled to compensation if they are taken from him, and most panelists concluded that such compensation is mandatory.

It is essential for the development of a comprehensive water plan for the state of Arizona that the reserved water rights of the Indians and the Federal Government be finally defined and quantified. The Federal Government should accept financial responsibility for resolving on an equitable basis Indian claims, taking into consideration the legitimate water needs of all the interested parties.

FORTY-SEVENTH ARIZONA TOWN HALL
MANAGING WATER QUALITY IN A WATER SCARCE STATE
October 27-30, 1985

[T]he state must accommodate development and growth, on the one hand, with protection of the environment and public health, on the other. To achieve that balance, the issues of water quantity and quality must be viewed as inextricably interrelated. In short, no longer can we afford to consider these two issues in isolation.

Arizona's success in developing a public philosophy for water quantity – as manifested by its enactment of the Groundwater Management Act – demonstrates this state's ability to develop a successful philosophy toward water quantity. The time for focusing on water quality is now at hand.

A review of the statutes governing the transfer of water should be undertaken to facilitate matching the quality of available water with its anticipated uses.

Water augmentation should be expanded by all means including storing floodwaters and other surplus waters. Groundwater recharge should be further encouraged with attention to appropriate precaution to minimize degradation of the aquifer. The protection and management of the state's watersheds remain important. It is also imperative to recognize the importance of effluent as a valuable resource.

In examining sources and activities for possible regulation, Town Hall recommended that sources and activities with a reasonable probability of impairing the state's water quality should be regulated.

The participants reiterated their recognition that water quality and quantity issues are interrelated and that a comprehensive approach to overall management of the resource must be implemented. All panels recognized that the present system is ineffective and that environmental issues – particularly water quality – do not receive sufficient attention at the state level. Nevertheless, participants could not agree on the single best approach to coordinating an appropriate, statewide response.

The Town Hall panels reviewed and recommended specific proposals to enhance the management of water quality and quantity in Arizona. Among the specific proposals suggested are the following: Location and sealing of abandoned wells to prevent pollution; Implementation of a water pricing system that encourages conservation; Improvement of water yield and quality through improved watershed management; Encouragement of water allocation to a use consistent with its quality, to the extent economically feasible (and, conversely, establishment of quality standards based on nature of use); Augmentation of the water supply by constructing catchment dams, recapturing and storing CAP water by recharge and other means devised to capture or conserve water

SEVENTY-FIRST ARIZONA TOWN HALL
ENSURING ARIZONA'S WATER QUANTITY AND QUALITY INTO THE 21ST CENTURY
October 26-29, 1997

The issues of water quantity, quality and allocations are tied together, but often difficult to reconcile. Despite the overriding concern about water quantity, attention also must be given to quality.

Town Hall believes that Arizona's water supply can support current and predicted populations if water resources are properly managed. How efficiently water is used will determine its availability. While in theory the available supply is substantial, the economic feasibility of securing sufficient useable and deliverable water where needed is in question.

Delivery of Colorado River water, for example, could be reduced or interrupted in times of drought or by system failure. To prepare for future shortages, Arizona should expand the implementation of water banking procedures and groundwater recharge and should develop a long-term strategy for ensuring supply.

Town Hall believes greater emphasis should be placed on developing the technology and systems necessary to make more efficient use of reclaimed water. If the costs and reliability of this and other alternative sources, such as desalination and cloud seeding, could be controlled, our available water supply could be modestly augmented.

Town Hall believes the federal government's role in managing Arizona water resources should be reduced because decisions at the federal level do not adequately address the diversity and complexity of local needs. More local input is needed. Local communities within hydrological boundaries should work as partners with state and federal governments and less as regulated entities.

Current water law and planning tend to address issues from the top down, where it may be appropriate to look at laws more comprehensively, regulating and managing water rights first at the local level, moving from the bottom up.

Town Hall is dissatisfied with the current status of the adjudication of water rights process, with some even calling the process a failure. The costs of the lengthy proceedings have been significant. Until the adjudication of water rights is resolved, there is a cloud over the rights of water users that creates uncertainty and undermines effective planning and management.

The goals set for the next 50 to 100 years should address the needs of sustainable development and preservation of water supplies for future generations of Arizonans. They should include achieving safe-yield in certain areas and looking beyond domestic, industrial and agricultural uses to the effect water use and allocation have on riparian areas, the environment and our overall quality of life.

Many felt groundwater data should be expanded beyond the AMAs to assist planners in determining what level of development can be supported by existing supplies.

Water conservation programs should play a significant role in increasing the efficient use of water, even in times of plentiful supply.

Recognizing that effluent is a valuable resource in an arid environment, suggestions offered by Town Hall include using tax and rate-paying structures to encourage and increase efficient use of effluent for open turf, industrial, agricultural and commercial applications, and for building treatment plants and dual distribution systems.

[T]he GMA has not been entirely effective nor entirely fair as applied and has been unable to achieve many of its stated goals. It does not apply to much of rural Arizona. It has a number of exemptions for agriculture, mining and certain urban demands that create challenges in its implementation.

The adequacy program must be strengthened in appropriate areas outside of AMAs to ensure a higher level of consumer protection. City and county planning authorities should be encouraged to consider lack of adequate water resources in approving subdivision plats.

While the safe-yield goal is appropriate for some AMAs, it should not be a statewide goal. Arizona is too diverse for one goal to meet all needs.

Where safe-yield is a goal, but is not being achieved, the groundwater use limitation across user groups should be reexamined. Responsibility for reaching safe-yield should be allocated among all users within the AMA.

Although the state can establish the regulations to be applied to address critical water supply issues in non-AMA areas, preparation and implementation of the individual plans should occur at the local level.

Sub-basin strategies should be considered, particularly in those areas that request them. Current AMA management mechanisms were tailored to address general AMA water balance. They do not necessarily deal with specific areas of localized water level decline, subsidence and water quality decline. We need to monitor subsidence, while recognizing the related development implications.

Through laws such as the Endangered Species Act and federal application for state instream flow rights, federal law currently plays an inappropriately significant role in developing water policy for Arizona. Many federal laws regulate from the top down and do not take local concerns into account. Ideally, the federal role should be minimized.

Current water management in Arizona is too fragmented.

Town Hall strongly recommends that consideration be give to merging some of the ADEQ's water quality programs into ADWR to ensure continuity in water management.

Additional financial resources will be required to perform geological, hydrological and other technical water studies, particularly in rural areas, to provide ADWR or other state agency technical assistance in non-AMA areas, to fund the activities of a consolidated agency, to assist in accelerated completion of the general stream adjudications and American Indian water rights settlements, and to increase public education and participation on water issues.

Current water pricing does not include total costs such as the external cost of replenishment, environmental regulations and American Indian water rights settlements. Most Arizona water users do not pay the true economic cost of water.

Appendix B

HISTORY OF GROUNDWATER MANAGEMENT IN ARIZONA

(Adapted from Governor Hull's Water Management Commission Briefing Book)

TIMELINE

1863 Arizona Territory Established
President Lincoln declares Arizona a U.S. territory on February 24th, making it separate from the New Mexico Territory.

1864 Howell's Code
The first Arizona Territorial Legislature adopts Howell's Code, which establishes appropriative rights to surface water.

1877 Desert Land Act
Passed by Congress on March 3 to encourage and promote the economic development of the arid and semiarid public lands of the Western United States. Through the Act, individuals may apply for a desert-land entry to reclaim, irrigate, and cultivate arid and semiarid public lands.

1902 National Reclamation Act
This act by President Theodore Roosevelt recognizes that a key component to Western growth and development is constructing a system of irrigation works for the storage, diversion and development of water. This act, which also created the U.S. Reclamation Service (later the Bureau of Reclamation), provides that " . . . the right to the use of water acquired under the provision of this act shall be appurtenant to the land irrigated and beneficial use shall be the basis, the measure and the limit of the right."

1904 Howard v. Perrin
The Arizona Territorial Supreme Court ruling in this case (upheld in 1906 by the U.S. Supreme Court) established a definite distinction, in character and ownership, between surface water and groundwater. This decision adopted the idea that percolating water was the property of the overlying landowner and not subject to appropriation as surface water.

1908 Winters v. United States
Recognizes Indian water rights are established when a reservation is created, regardless of whether or not a tribe has previously used water.

1911 Theodore Roosevelt Dam completed
This structure was the first multipurpose project built by the Bureau of Reclamation. The dam is located 76 miles northeast of Phoenix at the confluence of the Salt River and Tonto Creek where it is operated and maintained by the Salt River Project.

1912 Arizona Statehood
Arizona is accepted for statehood by President Taft and becomes the 48th state on February 14, 1912.

1918 McKenzie v. Moore
This decision reinforced the concept of subsurface spring water as non-appropriable groundwater.

1919 Public Water Code
Legislation is enacted on June 12, 1919 to establish procedures for developing a right to use appropriable water. These procedures go beyond the prior practice of merely putting the water to beneficial use or posting a notice and recording a water right claim.

1922 Colorado River Compact
The Compact divides the Colorado River Basin into an Upper and Lower River Basin and apportions 7.5 million acre-feet of Colorado River water per year to each basin. Arizona refuses to ratify the Compact (but signs it in 1944) because of concerns over how its tributary waters from the Salt and Gila Rivers will be counted in the apportionment. Article VII, inserted at the insistence of Herbert Hoover, the commission's federal chairman, states "Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian Tribes."

1926 Pima Farms Company v. Proctor
In deciding this case (appealed from the Pima County Superior Court) the U.S. Supreme Court upheld the distinction between surface water and percolating water. They found that water flowing underground within well-defined channels was not percolating water and was subject to prior appropriation.

1928 Boulder Canyon Project Act
Authorizes construction of the Hoover Dam on the condition that the Colorado River Compact is ratified. This act provides a mechanism for approval of the Colorado River Compact that does not require Arizona's approval.

1931 Maricopa Co. Municipal Water Conservation District v. Southwest Cotton Co.
The Arizona Supreme Court reverses the judgment of the Superior Court, identifying subflow as another source of appropriable water. Subflow is considered water seeping through the streambed or from lands under or immediately adjacent to the stream and is itself part of the surface stream.

1932 Maricopa Co. Municipal Water Conservation District v. Southwest Cotton Co.
This decision includes a test for subflow waters, stating that if the drawing off of subsurface water directly and appreciably diminishes the flow of the subsurface stream, then it is subflow.

1938 First Groundwater Study Group
Governor Stanfield appoints a group to study groundwater in response to growing concern over increased groundwater pumping. The efforts of this group lead to the legislature appropriating monies to the U.S. Geological Survey to study and report on state groundwater conditions.

1944 Arizona approves the Colorado River Compact
Arizona approves the Colorado River Compact in hopes of getting approval for a reclamation project to deliver Colorado River water to central and southern Arizona. Arizona then enters into negotiations concerning the Central Arizona Project.

1945 Arizona's first Groundwater Code is adopted
The Bureau of Reclamation warns that the CAP will not be approved without restrictions on groundwater use. The federal government holds Arizona to its claim that construction of the CAP would reduce groundwater use instead of allowing for more groundwater use by agricultural users. Legislation is passed, but only requires the registration of wells throughout the state.

1948 Critical Groundwater Code is adopted
The Federal Government again warns that the funding for the CAP will not be approved without a more meaningful Groundwater Code. The 1948 Code limits development of new wells drilled for groundwater-irrigated agriculture in 10 designated critical groundwater areas, but did nothing to apportion use among landowners in those areas and allowed groundwater pumping to continue at historic levels.

1951 Arizona's second Groundwater Study Commission is formed

In response to the widely criticized provision in the 1948 Groundwater Code that allowed groundwater pumping to continue at historic levels within critical areas, the second Groundwater Study Commission is formed to draft a new groundwater bill. The legislature failed to pass any of the Commission's recommendations and the Commission was ultimately abolished.

1952 Congress passes the McCarran Amendment

This amendment allowed the federal government to be brought into state general stream adjudications, thereby waiving its sovereign immunity and allowing the extent of federal reserved water rights to be determined in state court proceedings.

Bristor v. Cheatham I

Controversial decision by the Arizona Supreme Court that stated percolating waters **were** subject to prior appropriation and that appropriation of water for domestic purposes constituted the highest beneficial use. This ruling reverses nearly 50 years of common law that had stated that percolating water was not subject to prior appropriation.

1953 Bristor v. Cheatham II

This decision identified the American common law principle of reasonable use pertaining to groundwater. Specifically in this case, the water in question was not put to beneficial use on the land from which it was pumped, but rather used to irrigate non-adjacent property three miles from the well site.

1955 Southwest Engineering Co. v. Ernst

The plaintiff seeks legal recourse, claiming that the restrictions applying to the critical groundwater areas designated by the 1948 Groundwater Code are unconstitutional. The decision upheld the general concept that certain areas may be managed differently, and specifically that the additional restrictions placed on agricultural groundwater users within areas designated by the 1948 Code as critical were not in and of itself unconstitutional.

1963 Arizona v. California

Following 11 years of costly litigation, the decision in *Arizona v. California* results in major power shifts between the states and the federal government. Colorado River water was apportioned, with California receiving 4.4 million acre-feet, Arizona 2.8 million acre-feet, and Nevada 300,000 acre-feet, with each state also awarded all the water in their tributaries. *Arizona v. California* opened the door for federal participation in Colorado River affairs, which many state delegates had hoped to avoid through the Colorado River Compact. The decision interpreted the Boulder Canyon Act as empowering the Secretary of Interior to act as water master of the Lower Colorado River, to apportion future surpluses and shortages among the states and even among users within the states.

1968 Colorado River Basin Project Act

The construction of the Central Arizona Project is authorized through the Colorado River Basin Project Act. The Act contains a provision that safeguards California's 4.4 million acre-feet entitlement, stating that in times of shortage this full amount will be delivered before any water is provided for the CAP. The stated legislative purpose of the Act calls for ". . . furnishing irrigation water and municipal water supplies to the water deficient areas of Arizona and western New Mexico…"

1969 Jarvis v. State Land Department I

The decision resulted in an injunction against the City of Tucson, prohibiting them from transporting groundwater from city-owned wellfields in the Avra and Altar Valleys. The 1948 Groundwater Code designated both areas as critical. The court held that the property right to use the water was limited by the reasonable use doctrine on overlying land, not ownership.

1970 Jarvis v. State Land Department II

This decision uses surface water statute to modify the injunction placed against the City of Tucson in 1969. The determination of appropriative rights (based on A.R.S. 45-147) gives preference to domestic and municipal uses over agricultural uses. However, Tucson was allowed to pump and transport the "annual historic maximum use" following the purchase and retirement of irrigated farmland.

1973 Construction of the CAP Canal begins at Lake Havasu City

1974 Water Rights Registration Act

Allowed individuals alleging a water right claim that existed before June 12, 1919 to file a claim with the state.

1976 Jarvis v. State Land Department III

The decision of Jarvis v. State Land Department II is modified, allowing the City of Tucson to pump only 50 percent of the "annual historic maximum use."

Farmer's Investment Company v. Bettwy

This case involved water transportation issues within a critical groundwater area, beginning with a mining company's transportation of water for use miles from where it was pumped, and eventually including the City of Tucson. In granting an injunction in favor of the plaintiff, the court found that under the reasonable use doctrine, water could not be pumped from one area for use in another area if other wells suffered injury or damage as a result, although the two areas overlie a common source. The injunction was never acted upon, leaving it up to the legislature to establish a system of preference for rights based on economic interests, and opposing the findings of Jarvis v. State Land Department, limited the City of Tucson withdrawals to pre-1972 levels.

1977 Stockpond Water Rights Registration Act

Granted statutory recognition of stockponds.

Amendments to the 1948 Groundwater Code

As a result of the FICO decision, the 1977 Amendments to the 1948 Code established a permit system for the transportation of groundwater. A 25-member Groundwater Study Commission was also established, charged with developing a new Groundwater Code that would address groundwater transportation and reduce groundwater overdraft occurring in parts of the State.

Federal Budget Cuts

President Carter announces that the CAP is among several Federal projects whose funding will be cut but later removes the CAP from this "hit list".

1978 Ak Chin Indian Settlement approved by Congress

1979 Groundwater Study Commission releases its Draft Report of Tentative Recommendations

Secretary of the Interior Cecil Andrus warns that funding for the CAP will not be allocated unless the State passes a Groundwater Code.

1980 Groundwater Management Code is passed and adopted

The Arizona Department of Water Resources is created to administer Code provisions.

Southern Arizona Water Rights Settlement Act approved by Congress

The SAWRSA settlement was intended to resolve the water rights of the Tohono O'odham, but it was never fully implemented. (The final resolution of outstanding issues is currently before Congress in the Arizona Water Rights Settlement Act).

1984/ First Management Plans are adopted
1985 The first of the five Management Plans called for by the Groundwater Management Act are adopted by the Arizona Department of Water Resources for the Phoenix, Pinal, Prescott and Tucson Active Management Areas.

1986 The Lakes Bill
Generally restricts the construction of bodies of water larger than 12,320 square feet, with most kinds of groundwater and CAP water if it is to be used for landscape or scenic purposes.

1986 First Recharge Bill authorizing underground storage and recovery programs

1988 Salt River Pima-Maricopa Settlement approved by Congress

1989 Second Management Plans are adopted
The Arizona Department of Water Resources for the Phoenix, Pinal, Prescott and Tucson Active Management Areas adopts the second of the five Management Plans called for by the Groundwater Management Act.

1990 Fort McDowell Indian Community Settlement approved by Congress

Indirect Recharge
The Groundwater Code is amended to promote indirect recharge of excess CAP water.

1991 Groundwater Transportation Act
Severely restricted the ability of a municipal provider to transport groundwater from rural sub-basins to the Phoenix, Pinal, Prescott and Tucson Active Management Areas, except those operating under a previous agreement.

1992 San Carlos Apache Tribe (Gila River drainage) Settlement Approved by Congress

1993 Central Arizona Groundwater Replenishment District
CAGRD is established to serve as a groundwater replenishment entity for member lands and member service areas under the Central Arizona Water Conservation District. CAGRD must replenish excess groundwater use by lands enrolled in the replenishment district, and therefore assist in meeting requirements of the assured water supply program.

1994 Underground Water Storage, Savings and Replenishment Act
The legislature repeals previous enactments and consolidates all storage programs into a unified program.

Yavapai-Prescott Tribe Settlement approved by Congress

Water Protection Fund
Administered by a commission which issues grants from the fund to water users for implementing projects to protect Arizona rivers and streams, including the use of excess CAP water for riparian enhancement.

1995 Assured Water Supply Rules
The Assured Water Supply Rules call for Certificates and designation of Assured Water Supply to be demonstrated primarily through the use of renewable water supplies.

1996 Arizona Water Banking Authority
Created as a mechanism for Arizona to fully utilize its CAP allotment. The Water Bank may annually purchase all or part of the state's unused allotment and store it through recharge. The legislation also allowed the Water Bank to store water for other jurisdictions beside the state of Arizona.

1999 Arizona Supreme Court held that federal reserved rights extend to groundwater

To the extent groundwater is necessary to accomplish the purpose of a reservation, federal reserved rights may include groundwater.

Third Management Plans are adopted

The Arizona Department of Water Resources for the Phoenix, Pinal, Prescott, Santa Cruz and Tucson Active Management Areas adopts the third of the five Management Plans called for by the Groundwater Management Act.

2000 Governor's Water Management Commission

Governor Jane Dee Hull announces the formation of the Governor's Water Management Commission.

2003 Pueblo of Zuni (Zuni Heaven) Settlement approved by Congress

RELEVANT ARTICLES

1. Connall, Desmond D., Jr. (1982). "A History of the Arizona Groundwater Management Act." *Arizona State Law Journal* 1982: Pp. 313-344.

This Law Review articles gives the political and legal background leading up to the creation of the Arizona Groundwater Management Act, including the 1976 FICO case and the work of the original Arizona Water Commission.

2. Ferris, Kathy. (2000). "A Twenty-Year Retrospective."

This speech was given by Kathy Ferris at the May 2nd, 2000 Conference on the 20th Anniversary of the Groundwater Management Act in Tempe, AZ. The speech outlines the politics and work behind the creation of the Arizona Groundwater Management Act.

3. Goldberg, Barbara. (2000). "Major Issues in the 1980 Groundwater Management Act."

This speech was given by Barbara Goldberg at the June 9th, 2000 Technical Advisory Committee meeting. The speech outlines the water management issues facing the original Arizona Water Commission and the rationale behind different components within the Arizona Groundwater Management Act.

Appendix C

ASSURED WATER SUPPLY PROGRAM

Source: Governor's Water Management Commission Briefing Notebook, August 2000

CHAPTER IV

OVERVIEW
ASSURED WATER SUPPLY FOR NEW SUBDIVISIONS

Arizona's Assured Water Supply Program is designed to sustain the State's economic health by preserving groundwater resources and promoting long-term water supply planning. This is accomplished through regulations that mandate the demonstration of renewable water supplies for new subdivisions. The program is an integral component of Arizona's 1980 Groundwater Code, which was designed to address severe groundwater level decline rates in major urban and agricultural areas.

History

In 1973, the Arizona Legislature enacted a statewide water adequacy statute as a consumer protection measure (A.R.S. § 45-108). The law was passed in response to incidences of land fraud involving the sale of subdivision lots that were later found to have insufficient water supplies. This law required developers to obtain a determination from the State regarding the availability of water supplies prior to marketing new subdivision lots. Developers were then required to disclose any "inadequacy" of the supply to potential lot buyers.

The 1980 Groundwater Code contains more rigorous provisions for new subdivisions in the Active Management Areas (AMAs). The 1980 Code prohibits the sale or lease of subdivided land in an AMA without demonstration of an assured water supply. An assured water supply determination is required to gain approval of a subdivision plat by local governments, and to obtain authorization to sell lots by the Department of Real Estate. A subdivision is defined as land divided into six or more parcels where at least one parcel is less than 36 acres. Land divisions resulting in parcels larger than 36 acres are classified as "unsubdivided" lands and do not require an assured water supply determination.

1995 Assured Water Supply Rules

In 1991, the Arizona Department of Water Resources (ADWR) began developing formal administrative rules for meeting the statutory criteria. The effort, which involved considerable public input, culminated in the adoption of the Assured Water Supply (AWS) Rules in February 1995.

The two most common types of documentation for an AWS are a Certificate of Assured Water Supply (Certificate of AWS) and a Designation of Assured Water Supply (Designation of AWS). New subdivisions are required by the 1980 Groundwater Code to have a Certificate of AWS, unless a water provider designated as having an assured water supply serves them. The Certificate of AWS states that the developer has proven that sufficient water supplies exist for the subdivision for 100 years. If the new subdivision or development is within the service area of a Designated Water Provider, then a Certificate of AWS is not required; provided that the developer has obtained a written commitment of service from a water provider designated as having an assured water supply. As an example, if a subdivision is being built in the Tucson AMA within the City of Tucson's service area, the developer only needs to provide written proof to ADWR of the City of Tucson's commitment of service to meet the AWS requirements, since the City of Tucson has already met the AWS criteria and obtained a Designation of AWS.

For municipal private water providers, a Designation of AWS is issued. This Designation of AWS states that the municipality or private water provider has proven sufficient water supplies to service their current, committed and future demand for 100 years. Municipalities and private water providers are not required to apply for a Designa-

tion of AWS, but there are incentives to do so. A Designated Water Provider can deliver water to new developments within their service area without the new subdivision having to apply for their own Certificate of AWS. The most populous cities within AMAs have obtained a Designation of AWS, and thus a majority of new subdivisions qualify through this process.

Assured Water Supply Criteria

To obtain an assured water supply determination, the statute requires a demonstration of:

1. Physical, legal and continuous water availability for 100 years;
2. Water quality standards attainment;
3. Financial capability to construct the delivery system and related features;
4. Consistency with the AMA's management plan; and
5. Consistency with the AMA's management goal.

Meeting the Assured Water Supply Criteria

Developers seeking a Certificate of AWS must demonstrate that sufficient qualifying water supplies are available to meet subdivision demands for at least 100 years. Water providers seeking a Designation of AWS must demonstrate that sufficient qualifying supplies are available to meet current demand, committed demand (i.e. that which is associated with recorded, undeveloped lots) and at least two years of projected growth for a 100 year period.

Accounting, Reporting and Monitoring

A credit account is maintained by ADWR for each Certificate and Designation of AWS. The account is updated annually based on reports filed by water providers. ADWR will review the AWS status of designated water providers periodically to determine whether the designation remains valid. Additionally, ADWR monitors the allowable groundwater account, which is based on:

1. Basic groundwater allocations: designation applications for existing water providers are allocated the 1994 water usage multiplied by 7.5 in the Phoenix AMA, 15 in the Tucson AMA. In the Pinal AMA, the basic allowance is determined by multiplying the population of the subdivision by 125 gallons per person per day. In the Prescott AMA, the groundwater allowance is their 15 year demand of the development, multiplied by the number of years until 2025, divided by two. For example, if an existing water provider's 1994 water usage was 1000 acre-feet in the Phoenix AMA, then 1000 X 7.5 = 7500 acre-feet would equal their basic groundwater allocation.
2. Incidental Recharge Factor: Designated water providers, under the AWS Rules, annually receive an incidental recharge allocation of 4% of the demand of the previous year and may apply for a higher incidental recharge factor if they can demonstrate a higher incidental recharge in their service area.
3. Extinguishment credits: the extinguishment of grandfathered groundwater rights creates a credit based on a calculation prescribed in the AWS rules (R12-15-803 MP), which varies depending on the AMA, the type of right and the year of extinguishment.

A. Assured Water Supply Regulations for Subdivisions

Two avenues exist for obtaining an AWS determination for a proposed subdivision. The method used will depend upon the access to a Designated Water Provider. If the water provider has acquired a Designation of AWS, then the developer may obtain a written commitment of service from that water provider. If the water provider has not acquired a Designation of AWS, the developer must independently obtain a Certificate of AWS by submitting an application to ADWR.

Commitment of Service by a Designated Water Provider

Designated water providers may include cities, towns and private water companies that have previously satisfied the AWS criteria for current, committed and projected customers. If a developer intends to take advantage of a provider's designated status, the developer need only obtain a written commitment from the provider to serve the proposed subdivision. The written commitment is presented to the platting entity, and must be noted on the subdivision plat. An application to ADWR is not required.

Certificate of Assured Water Supply

To acquire a Certificate of AWS for a proposed subdivision, the property owner must file an application with

ADWR. If the application is found to meet the AWS criteria, public notification is posted in a local newspaper. If no protests are received, a Certificate of AWS is issued. A typical application is processed in about three months. The Certificate of AWS is issued in the name of the property owner, and is valid only for that owner. A Certificate of AWS may be reissued in the name of a new owner if ADWR is notified within 90 days of the transaction.

Certificates of AWS are issued only for subdivision plats. For "master planned" areas that are not yet platted, the developer may obtain a pre-qualification for an AWS determination by applying to ADWR for an Analysis of AWS.

Assured Water Supply Statutory Requirements

While these basic criteria have been required since 1980, the 1995 AWS Rules strengthen the management goal component significantly and establish standards for many sources of water, including Central Arizona Project water, other surface water and effluent. The 1995 AWS Rules also raise the depth-to-water standard, and simplify the financial capability requirements. The most important provisions of the five program criteria are discussed in the following sections.

1. Physical, Legal and Continuous Availability; R12-15-703

The applicant must describe the sources of water to be served to the subdivision. This involves demonstrating the actual water availability and the existence of a delivery system.

Water must be physically and continuously available to the subdivision to meet its demand for at least 100 years. This is typically demonstrated through a hydrologic study which must be submitted with the application, unless the entity providing water has previously submitted a valid study to ADWR. To show that supplies will be continuously available, adequate delivery, storage, and treatment works must also exist or be financed. Evidence of a legal right to the water supply or supplies is also required.

A legally recognized water provider must be committed to supply service. If a system does not presently serve the area, two options exist: a) a new water company or co-op may be established in accordance with the applicable Arizona Corporation Commission, ADEQ and ADWR requirements; or b) the subdivision may be developed as a "dry lot subdivision" where individual domestic wells will be drilled on each lot by purchasers. If the subdivision is to be served by a private water company, the proposed subdivision must be within the area prescribed in the company's Certificate of Convenience and Necessity.

2. Water Quality; R12-15-704

The applicant's proposed source(s) of water must satisfy existing state water quality standards as well as other water quality standards applicable to the proposed use after treatment. ADWR will consider the possible migration of poor quality water that may impact the applicant's source. Designated providers must continue to satisfy all applicable state water quality requirements in order to maintain their designation.

3. Consistency with Management Goal; R12-15-705

All five AMAs have water management goals related to reduction in groundwater use. The AWS Rules require that municipal users in growing areas limit the use of mined groundwater through the use of alternative supplies and conservation practices. Mined groundwater is groundwater that is used in excess of the goal of the AMA. A certain amount of mined groundwater is allocated to Certificate and Designation of AWS applicants to allow for the "phasing in" of renewable supplies. Renewable supplies must meet any demand over the groundwater allocations. Each AMA, except the Santa Cruz AMA, has its own formula to calculate the amount of mined groundwater that can be used when demonstrating an AWS, which is discussed in Part Three, Chapter IV, Section C. Although the applicant may meet the goal criterion through recharging a renewable supply outside of the service area and pump groundwater, the groundwater must still be physically available.

The following sections are general ideas for maintaining consistency with the management goal. It is important to keep in mind that dry lot subdivisions of 20 lots or less are exempt from the consistency with management goal requirement in all AMAs. For subdivisions that will be receiving groundwater in an AMA, the Certificate of AWS

applicant may demonstrate consistency with the management goal through any or all of the following methods: membership in the Groundwater Replenishment District (GRD), extinguishment credits, use of poor quality water or use of water from a waterlogged area.

4. Consistency with Management Plan; R12-15-706
The applicant will need to estimate the amount of water use per lot and for any additional subdivision features such as golf courses, parks or lakes. A build-out schedule must be supplied for all subdivisions. Demand estimates are evaluated in the context of water conservation guidelines.

If the subdivision is for more than 50 lots, a description of any proposed conservation measures will need to be provided. If the development is designed so that it conforms to water conservation practices, it will be easier for the serving provider to meet its conservation requirements as prescribed in the management plan for the AMA. While ADWR cannot deny a certificate application if the demand will make it more difficult for the provider to comply with its conservation requirements, the provider will be notified of the potential impact of the new subdivision. A certificate application will not be denied if the water provider is out of compliance with its conservation requirements.

5. Financial Capability; R12-15-707
The developer's financial capability to construct the water delivery system is typically considered through the platting entity's process of approving a plat. The developer's capacity to finance any features that are not included in the plat approval process, such as storage and treatment facilities, generally requires the posting of a performance bond.

B. Assured Water Supply Regulations for Water Providers

If a water company is designated as having an assured water supply then individual subdivisions to be served by the water company are relieved of having to independently demonstrate an AWS. The same basic criteria, which apply to Certificates of AWS, also apply to water providers seeking a Designation of AWS. Important items that are unique to the Designation of AWS are addressed in the following sections.

Physical, Legal, Continuous Availability; R12-15-703
Demand and supply information must be provided for the entire service area. The water must be physically and continuously available to the water provider in amounts sufficient to meet current demand, committed demand and a minimum of two years of projected demands for at least 100 years. The water provider must have a legal right to all water to be served. If the provider is not a city or town, applicable Arizona Corporation Commission approvals must exist for private water company regulations.

Consistency with Management Goal; R12-15-705
"Consistency with the management goal" can be demonstrated through utilization of a CAP allocation, other surface water, recharge credits, extinguished grandfathered water rights, water exchange agreements or membership in the GRD. If the water provider meets the consistency with the management goal requirement through membership in the GRD, the service area must be enrolled as a member service area. The provider will pay an annual assessment to the GRD based on the amount of mined groundwater pumped for the entire service area.

Consistency with Management Plan; R12-15-706
Existing water providers can show consistency with the management plan if they are in compliance with their conservation requirements. If the provider is out of compliance, the violation must be remedied by entering into a stipulated agreement with ADWR. New water providers must describe the measures that will be implemented to meet ADWR's conservation requirements. If the water provider is out of compliance, the Designation could be lost.

Financial Capabilities; R12-15-707
To demonstrate financial capability for storage and treatment facilities, private water companies can show Arizona Corporation Commission approval of financing as evidence. Cities and towns can present evidence that

financing is available for a five-year capital improvement plan containing these facilities.

SERVICE AREAS DESIGNATED AS HAVING AN ASSURED WATER SUPPLY
Within Active Management Areas (AMAs)
As of July 1, 2000

Phoenix AMA
City of Avondale
City of Chandler
City of El Mirage
Town of Gilbert
City of Glendale
City of Goodyear
City of Mesa
City of Peoria
City of Phoenix
City of Scottsdale
City of Surprise
City of Tempe
Chaparral City Water Company, Fountain Hills
Apache Junction Community Facility District

Prescott AMA
City of Prescott

Tucson AMA
Rancho Sahuarita Water Company
City of Tucson
Town of Oro Valley
Metropolitan Domestic Water Improvement District, Oro Valley
Town of Marana
Spanish Trail Water Company
Vail Water Company

Pinal AMA
Town of Florence
City of Eloy

Santa Cruz AMA
City of Nogales (Expected to be issued by August 31, 2000)

C. Groundwater Allocation and Management Goal Accounting

Assured Water Supply applicants are allowed to utilize a certain volume of groundwater to allow for the "phasing in" of renewable supplies. This volume is calculated differently depending on the type of applicant and the AMA. Each AMA's groundwater allocation and goal were discussed in Part Three, Chapter IV, Section A- Consistency with Management Goal.

The methods for calculating the allocation, how the groundwater allocation may be used, and the accounting mechanism to determine compliance with the consistency with management goal criterion are explained below.

Calculating the Groundwater Allocation

The groundwater allocation is comprised of three components: the basic allocation, the incidental recharge factor and extinguishment credits. Each of the following sections describes how to calculate these parts of the ground-

water allocation. Groundwater used above the total of the mined groundwater allocation, the incidental recharge allocation and the extinguishment credits must be replenished unless it is exempt.

Basic Allocation

Designation applications for existing water providers can pledge the 1994 demand (water usage) multiplied by 7.5% in the Phoenix AMA and by 15% in the Tucson AMA. For example in the Phoenix AMA, if an existing water provider's 1994 water usage was 1000 af, then 1000 af X 7.5% would equal their basic groundwater allocation. 75 af/yr would be the amount of groundwater that would not have to be replenished. New water companies formed after February 7, 1995 that apply for a Designation of AWS do not receive a basic allocation.

For Certificates of AWS in the Tucson and Phoenix AMAs, the 15-year demand of the development (which may be the build-out demand) is multiplied by the appropriate factor shown in the table below. This amount is the basic 100-year allocation and not an annual amount. For the Pinal AMA, the basic allowance is determined by multiplying the population of the subdivision by 125 gallons per person per day. For certificates in the Prescott AMA, the groundwater allowance is their 15 year demand of the development, multiplied by the number of years until 2025, divided by two. The rules do not establish a groundwater allowance for the Santa Cruz AMA.

Calculating the Basic Groundwater Allocation for Certificates

Location of Proposed Development	Management Period in Effect on Date of Application	Allocation Factor
Tucson	Third (2000-2010)	8
	Fourth (2010-2020)	5
	Fifth (2020-2025)	2
	After 2025	0
Phoenix	Third (2000-2010)	4
	Fourth (2010-2020)	2
	Fifth (2020-2025)	1
	After 2025	0

Incidental Recharge Factor

Holders of designations under the new rules (except those in the Pinal, Prescott and Santa Cruz AMAs) annually receive an incidental recharge allocation based on 4 percent of the demand in the previous year. Designation applicants may also apply for a higher incidental recharge allocation factor if they can demonstrate that incidental recharge is higher than 4 percent in their service area.

Extinguishment Credits

Groundwater credits can be accumulated through the extinguishment of grandfathered groundwater rights. The credit is based on a calculation prescribed in the rules, which varies depending on the AMA in which the right is extinguished, the type of right, and the year that the right is extinguished. Extinguishment credits may be conveyed so long as they have not already been used as the basis of a Certificate of AWS.

Use of the Mined Groundwater Allocation

The mined groundwater allocation can be used at any time during the 100-year period. It may be spread out over a period of years or the use may occur during a specific time period.

Private water companies that applied for a Designation of AWS by August 7, 1995 were given three years before they needed to show consistency with the management goal of the AMA. This means that for 1996, 1997, and 1998 they may use groundwater and not have it subtracted from their groundwater account. Similarly, if deemed providers (cities or towns with CAP allocations) applied for a Designation of AWS by January 1, 1997, they do not have to comply with the goal consistency provision until 2001.

Consistency with Management Goal Accounting

To determine compliance with the consistency with management goal requirements, ADWR establishes an account for each holder of a Certificate or Designation of AWS which includes the water supply and demand status of the holder. The account is updated annually and includes the volume of the mined groundwater allocation, including any extinguishment credits and the incidental recharge allocation as applicable. As mined groundwater is used, it will be subtracted from the account unless it is exempt.

Wet Water v. Paper Water

The process of calculating the basic allocation, the incidental recharge factor and extinguishment credits produces an amount of "paper water." It may be the case that an existing water provider is entitled to an amount of groundwater on paper that does not exist in the aquifer. It is important to remember that physical availability of the water must still be proven, even if the applicant is entitled to a groundwater allocation.

Appendix D

UNDERGROUND WATER STORAGE AND RECOVERY PROGRAM

Source: Governor's Water Management Commission Briefing Notebook, August 2000

CHAPTER III
OVERVIEW
CONVERSION TO RENEWABLE SUPPLIES

Current groundwater withdrawal authorities established in the Code, such as IGFRs, Type 1 and Type 2 Non-Irrigation Grandfathered Rights, withdrawal permits, and service area rights, plus groundwater allocations under the Assured Water Supply (AWS) Rules, play a major role in groundwater overdraft. To address this problem, water management efforts focus on ways to encourage water users to convert to renewable supplies. In the AMAs, these efforts include an Augmentation and Recharge Program, the Underground Storage and Recovery Programs, and renewable supply utilization requirements under the AWS Rules. Additional entities that assist in conversions to renewable supplies are the Central Arizona Groundwater Replenishment District (CAGRD) and the Arizona Water Banking Authority (AWBA).

Augmentation and Recharge Program

The Augmentation and Recharge Program, in combination with conservation program efforts, is intended to support achievement of the management goal for each AMA by encouraging the acquisition, delivery, use and storage of renewable water supplies now and in the future. Increasing the use of renewable supplies, particularly Central Arizona Project water and effluent, to replace groundwater mining is a key component of achieving the management goals for the Phoenix, Pinal and Tucson AMAs. For the Prescott and Santa Cruz AMAs, effluent, limited volumes of surface water and potential imported supplies will be depended upon to offset groundwater pumping.

One of the most important factors that will shape the Augmentation Program is the unique opportunity to bring excess CAP water into the AMAs (only Phoenix, Pinal and Tucson) and store it underground for future use. A substantial supply of CAP water has been physically available to augment the Phoenix, Pinal and Tucson AMA's water supplies, but will not be fully utilized until some point in the future. Therefore, taking advantage of this supply and storing it now while it is currently available is an opportunity that must be encouraged. The Arizona Water Banking Authority (AWBA) provides the means to purchase and store CAP water that is not currently used directly, and that would otherwise remain in the Colorado River. Furthermore, the AWBA statutes specify that some of this water may be used "to fulfill the water management objectives" of the Groundwater Code.

Incentives to facilitate the utilization of renewable supplies have been incorporated into the Management Plans, providing "breaks" in the conservation requirements for the use of effluent and CAP water, under certain circumstances. Financial assistance is provided through the augmentation assistance program for entities implementing augmentation projects or studies that contribute to achieving the AMA management goal or resolving regional water management issues.

Underground Storage and Recovery Programs

Several underground storage and recovery programs enacted under legislation during the late 1980s and early 1990s were unified under the 1994 Underground Water Storage, Savings and Replenishment Act (UWS). The UWS program allows individuals and entities to recharge water into aquifers, and later recover that water, once the individual has received either a storage facility permit, water storage permit or a recovery well permit. Recovery of stored water can occur either annually or long-term, which allows for flexibility in meeting fluctuating water demands and drought conditions.

Assured Water Supply Rules

Municipal providers serving new municipal uses are required to utilize renewable supplies through acquisition of an Assured Water Supply designation (Designation of AWS) or Certificate of Assured Water Supply (Certificate of AWS). Because all new subdivisions must demonstrate the use of renewable supplies (through direct use or storage and recovery) or join the Central Arizona Groundwater Replenishment District (CAGRD) so that their groundwater pumping will be replenished, most municipal water use will gradually transition to renewable supplies. This transition is an important strategy in reducing the long-term reliance on groundwater. However, some amount of groundwater will be allowed to be pumped under the AWS Rules, which will further affect groundwater levels and the rates of decline in each AMA.

Central Arizona Groundwater Replenishment District

The establishment of a replenishment entity in the AMAs is closely tied to the Assured Water Supply Program (AWS Program). In 1993, the Legislature authorized CAWCD to undertake replenishment activities that allow municipal providers and new subdivisions seeking an assured water supply (either designation or Certificate of AWS) to become members of the CAGRD. The CAGRD provides a mechanism for demonstrating consistency with the management goal, required under the AWS Rules, in the Phoenix, Pinal and Tucson AMAs. Members can continue to pump groundwater and the CAGRD will replenish that groundwater using a renewable supply somewhere in the same AMA.

Arizona Water Banking Authority

In 1996, the Arizona Water Banking Authority (AWBA) was created to assist Arizona in utilizing its 2.8 million acre-feet annual apportionment of Colorado River water and to store unused Colorado River water for future needs, including for use in times of drought. Additionally, the AWBA can participate in interstate water banking with California and Nevada by entering into Storage and Interstate Release Agreements that allow Arizona to store unused Colorado River water for California and Nevada.

A. Incentive Programs

Pricing incentives are one of the most effective tools in encouraging the conversion to the use of renewable supplies. In 1992 the Central Arizona Water Conservation District (CAWCD) established an indirect, or in-lieu recharge program that priced a certain portion of CAP water well below the price of agricultural CAP water. The figures denoting deliveries of in-lieu water and agricultural groundwater pumping indicate that this pricing structure had a dramatic effect on water use patterns, and was very effective in reducing groundwater pumping.

Agricultural CAP use was relatively small in the early 1990s. Therefore, the CAWCD, the managing entity of the CAP canal, established an incentive pricing program for non-Indian agricultural CAP water, beginning in 1994 and ending in 2011, to encourage greater direct use of these supplies. This restructuring program was established primarily to deal with the inability of the irrigation districts in the Pinal and Phoenix AMAs to meet their obligations to CAWCD under their CAP subcontracts. In exchange for waiving their entitlement to CAP water under their subcontracts, the irrigation districts would receive excess and surplus CAP water. The program, called "target pricing," created three pools of agricultural supplies to be available to the Phoenix, Pinal and Tucson AMAs. Pools 1 and 2 each contain a total of 200,000 acre-feet, whereas the amount in Pool 3 is not capped. Pool 1 was made available to each district that executed a CAP subcontract prior to October 1, 1993. Pool 2 water was made available to non-Indian irrigation subcontractors who relinquished part or all of their original entitlement between October 7, 1993 and January 1, 1994. Pool 3 water consists of agricultural water remaining after sales of Pools 1 and 2 and is available to agricultural entities otherwise eligible to receive CAP water service at a price equal to pumping energy costs plus a capital charge.

The benefits of target pricing are twofold. First, CAWCD and ADWR require the irrigation districts to use the low cost pool water prior to taking any in-lieu water if the district is a groundwater savings facility (GSF). This benefits water management efforts by ensuring that a portion of the agricultural water demand is met with CAP water and not with groundwater–groundwater that is either pumped today or the future pumping of long-term storage credits. Second, no interest is due on the total federal repayment obligation of the CAP canal for water supplied to

agricultural lands. Therefore, the more CAP water, including Pool water, used on agricultural lands, the less the overall repayment debt becomes. For 1998, costs of Pools 1, 2 and 3 were set at $31, $21 and $43 per acre-foot, respectively. The price of Pools 1 and 2 increases $1.00 per acre-foot annually and the price of Pool 3 will be determined annually.

Provisions established under the agricultural, municipal and industrial conservation programs in the second and third management plans provide regulatory incentives for the use of renewable water supplies. These incentives have focused primarily on the use of effluent but are extended to CAP and other renewable supplies.

RENEWABLE WATER SUPPLY UTILIZATION INCENTIVES
PHOENIX ACTIVE MANAGEMENT AREA

Municipal

Delivery of effluent by a municipal water provider does not count against the gallons per capita per day (GPCD) requirement, unless effluent is recharged in one location and recovered outside the area of impact. This is an incentive for municipal providers to invest in reclaimed water systems (Chapter 5, section 5.8).

CAP water delivered by a municipal provider to a non-residential water user is excluded from the provider's total GPCD requirements for up to ten years if it is shown that the delivery will expedite the development of infrastructure to deliver reclaimed effluent to the user in the future (Chapter 5, section 5.8).

The Alternative Conservation Program removes the non-residential portion of the GPCD requirement for providers who limit their groundwater use to the highest annual use between 1980-1989, utilize renewable supplies for their remaining demand, and implement specific conservation measures for non-residential customers. This program also includes an incentive to extinguish existing grandfathered rights to groundwater (Chapter 5, section 5.7.1.3.1).

The Non-Per-Capita Program removes the GPCD rate as a regulatory tool entirely in exchange for implementation of specified conservation programs. A "best management practices" approach is designed to achieve the same level of efficiency as the GPCD, but the point of compliance is implementation of the programs, not the level of water use. To qualify, water providers must phase out groundwater use, or have a Designation of AWS (Chapter 5, section 5.7.1.2.3).

Industrial

Turf

Effluent use is discounted when calculating compliance with the annual allotment for each facility. For the Third Management Plan, the incentive has been increased to a 40 percent discount (the Second Management Plan discount was a maximum of 20 percent) (Chapter 6, section 6.3.5.3).

If 100 percent of the water used at a facility in a year is from a non-groundwater source, no compliance is required with the annual allotment for that year.

Cooling Towers

Cooling towers that beneficially reuse 100 percent of their blowdown water are exempt from meeting the blowdown concentration requirements (Chapter 6, section 6-602.B.1). Cooling towers that convert to at least 50 percent effluent are exempt from the blowdown concentration requirements for one full year. If it is shown that they cannot meet the requirements, amended blowdown concentration levels may be applied (new incentive in the Third Management Plan) (Chapter 6, section 6-602.B.3).

Electric Power

Electric power generating facilities are given a full year with no blowdown concentration requirements if they convert to at least 50 percent effluent. If it is shown that they cannot meet the requirements, amended blowdown concentration levels may be applied (new incentive in the Third Management Plan) (Chapter 6, section 6-505).

Dairies

The reuse of dairy wastewater by a grandfathered groundwater right holder is not counted toward compliance with the dairy's maximum annual water allotment (Chapter 6, section 6-703).

Agricultural

Pursuant to A.R.S. § 45-467, effluent use cannot contribute to a farm exceeding its allotment in any year. In determining whether a farm exceeds its maximum annual groundwater allotment for a year, total water use, including groundwater, effluent, and surface water, is counted. Any effluent used that year is subtracted from the amount of groundwater that otherwise would have exceeded the farm's allotment.
Source: Third Management Plan

B. Underground Storage & Recovery Programs

In 1986, the Arizona legislature established the Underground Water Storage and Recovery Program to allow storage of renewable water underground and to recover it at a later time for the storer's use. Between 1986 and 1993, the legislature added several other programs related to underground water storage. In 1994, the Arizona legislature consolidated these various underground water storage programs into a unified program by enacting the Underground Water Storage, Savings, and Replenishment Act (UWS). The UWS program is administered by the Arizona Department of Water Resources (ADWR).

The UWS program has two sets of goals. The first set of goals is to encourage the use of renewable water supplies to satisfy existing needs, to allow for effective and flexible storage of renewable water supplies not currently needed, and to preserve non-renewable groundwater supplies. The second set of goals for the UWS program is to allow for the efficient and cost-effective management of water supplies by allowing the use of underground storage facilities for filtration and distribution of surface water rather than constructing surface water treatment plants and distribution systems. This UWS program goal allows storage of water in one location and recovery in a different location. Therefore, water may be stored near its source and recovered where it is needed. Although the UWS program contains some restrictions to this "transportation," the program may be used to deliver water to where it is needed without the expense of constructing canals and pipelines.

Recharge Methods

There are various methods to recharge water. The UWS program recognizes two general categories of recharge facilities. These are Groundwater Savings Facilities (GSF) and Underground Storage Facilities (USF). At GSFs, also called "in-lieu" recharge projects, an entity with an excess supply of renewable water (such as a municipal water provider) delivers this water to a facility that would otherwise have pumped groundwater (such as a farm). The recipient then uses the renewable water in lieu of pumping groundwater. The supplier of the renewable water then earns credits to "recover" this renewable water at a later date from anywhere within the Active Management Area (AMA) that meet the requirements set forth in the ADWR Management Plans. The potential for increasing the number of GSF projects is limited by the loss of agricultural land in the AMAs. As agricultural land is taken out of production due to urbanization or other factors, the acreage available for this type of project will decrease.

At USF projects water is physically added to an aquifer by a number of different means. The most commonly used methods are identified below (modified from Table 4 of Regional Recharge Committee Technical Report).

- Off-Channel Constructed Shallow Spreading Basins: Designed to be operated in a wet-dry cyclic mode to maintain high infiltration rates. The dry cycle is used to control the development of a biological film at the surface that impedes the movement of water. The water depth during the wet cycle is not more than five feet.
- In-Channel Constructed Facilities: Facility functions within the active floodplain of a watercourse. May include use of inflatable dams, gated structures, levees and basins, compound channels, etc.
- Managed In-channel Recharge: Facility involves no construction (other than monitoring devices). The natural stream channel is used for "passive" recharge.
- Injection Wells: Wells used to inject water directly into the water-bearing unit of the aquifer. Generally requires source water that meets drinking water quality standards. Best and most direct method of limiting subsidence since the water is recharged directly to the aquifer.

• Induced Recharge: Use of extraction wells alongside a river channel to draw down groundwater levels, thereby preventing the water table from intercepting the land surface and sustaining favorable infiltration rates. This method is only applicable in areas where the permeability and transmissivity of subsurface soils are favorable.
• Vadose Zone Recharge Wells: Wells introduce water into permeable, unsaturated strata above the water table. Wells differ in design and construction from stormwater drywells, which are commonly used to drain urban runoff into the vadose zone to comply with local detention/retention ordinances. (Note: the vadose zone is the layer of unsaturated soils that usually extends from the land surface to the top of the uppermost aquifer.)
• Deep Basins or Pits: Recharge pits differ from drywells in size and shape; unlike wells, they are typically much wider than they are deep. Pits are constructed to expose coarse-grained sediments of the vadose zone when fine grained overburden precludes the use of shallow spreading basins.

Recharge Permits In Arizona

The following table summarizes the currently active permits that have been issued in the corresponding locations. Expired permits, abandoned facilities, permits issued in 2000 and applications currently under review are not included.

	Phoenix AMA	**Tucson AMA**	**Pinal AMA**	**Prescott AMA**	**Santa Cruz AMA**	**Outside of an AMA**
USF Permits	20	6	1	2	0	2
GSF 11 **Permits**	5	3	0	0	0	
Water Storage Permits	72	28	11	4	0	2
Recovery Well Permits	36	6	3	3	0	0

Permitted recharge capacity as of December 31, 1999 and the total volume of long-term storage credits earned at USFs and GSFs and held in long-term storage accounts as of December 31, 1998 are summarized below. In addition the table shows the number of entities participating in water storage. This is the number of cities, towns, private water companies and other businesses that have long-term storage accounts in each AMA.

	Permitted USF Capacity as of 12/31/99 (AF/Year)	**USF Storage as of 12/31/98 (AF)**	**Permitted GSF Capacity as of 12/31/99 (AF/Year)**	**GSF Storage as of 12/31/98 (AF)**	**Number of Entities Participating in Water Storage**
Phoenix AMA	378,730	707,109	446,450	313,296	43
Tucson AMA	51,807	36,688	60,986	75,748	12
Pinal AMA	456	888	285,000	690,163	5
Prescott AMA	7,521	9,659	0	0	3
Santa Cruz AMA	0	0	0	0	0
Outside of an AMA	35,000	0	0	0	2

The holders of long term storage credits, either the entities that stored the water or the purchasers of the resulting credits, may recover (i.e. pump) a volume of groundwater equal to the accrued credits[1]. This pumped water legally retains the character of the stored water. That is, if CAP water is stored at a facility and long term storage credits are

[1] Recharge facilities are required to leave a specified amount of their stored water in the ground. This is referred to as a "cut-to-the-aquifer". Managed recharge facilities require a 50% cut-to-the-aquifer. All other types of recharge facilities require a 5% cut-to-the-aquifer (no cut-to-the-aquifer is required for stored effluent at these facilities).

earned for that CAP water storage, then a volume of groundwater equal to that volume of credits may be pumped. However, this groundwater is considered to be CAP water for the purposes of the conservation requirements of the Groundwater Code.

The Arizona Water Banking Authority (AWBA) also functions as a storage and recovery program by storing unused Colorado River water to assist Arizona in times of drought, assist water users and providers in meeting conservation requirements, and assist Indian water rights claims settlements.

C. Central Arizona Groundwater Replenishment District

In 1993, the legislature created a groundwater replenishment authority to be operated by the Central Arizona Water Conservation District (CAWCD) throughout its three-county service area. This replenishment authority of CAWCD is commonly referred to as the Central Arizona Groundwater Replenishment District (CAGRD). In 1999, the legislature expanded CAWCD's replenishment authorities and responsibilities by passing HB2262.

The purpose of the CAGRD is to provide a mechanism for landowners and water providers to demonstrate an assured water supply under the new Assured Water Supply Rules (AWS Rules) which became effective in 1995.

Relationship to AWS Rules

The benefits provided by the CAGRD cannot be fully understood without a basic understanding of the AWS Rules. The AWS Rules are designed to protect groundwater supplies within each Active Management Area (AMA) and to ensure that people purchasing or leasing subdivided land within an AMA have a water supply of adequate quality and quantity. Thus, in each AMA, new subdivisions must demonstrate to the Arizona Department of Water Resources (ADWR) that a 100-year assured water supply is available to serve the subdivision before sales can begin. An assured water supply (AWS) can be demonstrated in two ways. First, the owner of the subdivision can prove an AWS and receive a Certificate of AWS from ADWR. Or, the owner of a subdivision can receive service from a city, town or private water company which has been designated by ADWR as having an AWS.

There are five basic criteria for proving an AWS. An applicant for an AWS must prove that:

1. a sufficient quantity of water is continuously available to satisfy the water demands of the development for 100 years;
2. the water source meets water quality standards;
3. the proposed use of water is consistent with ADWR's conservation standards;
4. the proposed use is consistent with water management goals; and
5. the applicant is financially capable of installing the necessary water distribution and treatment facilities.

Under the 1993 CAGRD enabling legislation, membership in the CAGRD provides a means by which an AWS applicant can satisfy criterion number 4 above, which requires that the proposed water use be consistent with the water management goals of the particular AMA. The consistency with management goals section of the AWS Rules limits the quantity of mined groundwater that an applicant may use to demonstrate an AWS. The effect of this groundwater pumping limitation is to prevent new development from relying solely on mined groundwater to serve its water demands.

Development, however, is not stymied for those landowners and water providers who have no direct access to CAP water or other renewable supplies. If a water provider or a landowner has access to groundwater and desires to rely exclusively on groundwater to demonstrate a 100 year water supply, it may do so, provided it joins the CAGRD. As a member of the CAGRD, the landowner or provider must pay the CAGRD to replenish any groundwater pumped by the member which exceeds the pumping limitations imposed by the AWS Rules.

Replenishment Obligation of the CAGRD

The CAGRD must replenish (or recharge) in each AMA the amount of groundwater pumped by or delivered to its members which exceeds the pumping limitations imposed by the AWS Rules. This category of water is referred to as "excess groundwater."

Recharge may be accomplished through the operation of underground storage facilities or groundwater savings facilities. CAWCD may sell its indirect storage and recovery credits to the CAGRD at fair value.

Water used for replenishment may be CAP water or water from any other lawfully available source, except groundwater withdrawn from within an AMA. For the foreseeable future, the water that the CAGRD will use for replenishment will likely be excess CAP water.

Membership

Membership is voluntary. Any city, town, water company, subdivision or homeowner's association located in Pima, Pinal or Maricopa counties may join the CAGRD.

There are two types of members:

a. Member Service Areas: The service area of a city, town or private water company, including any additions to or extensions of the service area.
b. Member Lands: An individual subdivision with a defined legal description.

Physical Access to Groundwater

Under the provisions of the 1993 CAGRD enabling legislation, membership in the CAGRD does not waive the requirement under the AWS Rules that an applicant must demonstrate the physical and legal availability of groundwater. Providers or subdivisions which rely on the CAGRD to meet the AWS requirements must still meet the depth to groundwater criteria established in the AWS Rules and have the legal right to withdraw groundwater from the point of withdrawal. The new authorities provided to the CAGRD in 1999 modify this requirement to some extent for Member Service Areas, as described later in this section.

Replenishment Taxes/Assessments

Costs of the CAGRD will be covered by a replenishment tax or replenishment assessment levied on CAGRD members. Water providers serving Member Service Areas will pay a replenishment tax directly to the CAGRD according to the number of acre-feet of excess groundwater they deliver within their service areas during a year. For Member Lands, a replenishment assessment will be collected by the county assessor from each tax parcel according to the number of acre-feet of excess groundwater delivered to that parcel.

Amount of the Replenishment Tax/Assessment

The amount of the replenishment tax/assessment will be the CAGRD's total cost per acre-foot of recharging groundwater, including: the capital costs of constructing recharge facilities, water acquisition costs, operation and maintenance costs and administrative costs. By statute, the replenishment tax/assessment must be calculated separately for each AMA.

Additional Authorities Provided by the Legislature in 1999

In 1999, the legislature expanded CAWCD's replenishment authorities and responsibilities by passing HB 2262. Under this legislation, CAGRD's role in helping members prove an AWS is extended beyond the consistency with management goal criterion described above. Now the CAGRD may assist a Member Service Area in satisfying criterion number 1, (i.e., proof that a sufficient quantity of water is continuously available to satisfy the water demands within the service area for 100 years).

The new legislation allows ADWR to grant a designation of AWS to a water provider whose service area has been enrolled as a Member Service Area of the CAGRD and has been granted "Water Availability Status" by the CAWCD Board. If the CAGRD decides to grant "Water Availability Status" to a Member Service Area, it must formally adopt a resolution and prepare and file a detailed "Capability Plan" with ADWR. The plan must include a description of the replenishment facilities, transportation facilities, and water supplies that will be used to provide a physically available supply of water to the Member Service Area. It must be a 100-year plan, which is subject to public review and a public hearing. The plan is to be updated every ten years. The bill also allows the CAGRD to make direct deliveries, under certain conditions, to Member Service Areas that have been granted Water Availability Status.

D. Arizona Water Banking Authority

Arizona does not currently use its full 2.8 million acre-foot per year share of Colorado River water established under Arizona vs. California, 373 U.S. 546 (1963). Any of Arizona's apportionment not diverted from the mainstream by Arizona is available for use in California or Nevada. The Arizona Water Banking Authority (AWBA) was established in 1996 as a means to increase the utilization of Arizona's Colorado River apportionment and to store unused Colorado River water to meet Arizona's future water supply needs. As Arizona directly uses more of its Colorado River apportionment, the amount of excess CAP water available to the AWBA for storage is expected to decrease.

The objectives of the AWBA include: (1) protecting municipal and industrial (M&I) users of CAP water from shortages or disruptions of the CAP system; (2) assisting in meeting the management objectives of the state's Groundwater Code (Code); (3) assisting in the settlement of Indian water rights claims; (4) exchanging water to assist Arizona's Colorado River communities; and (5) exploring opportunities for interstate water banking with Nevada and California. Although the AWBA has been working closely with the AMAs to identify storage opportunities that would also help support water management objectives of each AMA, some recharge projects ideally located to meet some of these AWBA objectives may not optimally assist the AMAs in meeting their specific water management goals, for example, hydrologically feasible sites located outside of the AMA.

Annual funding for the AWBA comes from four sources: (1) an ad valorem property tax of four cents per $100 assessed valuation in the three-county CAP service area; (2) a groundwater withdrawal fee of $2.50 per acre-foot in the Tucson, Phoenix and Pinal AMAs; (3) general fund appropriations; and (4) the proceeds of interstate banking activities. The ad valorem tax collected for the AWBA in Maricopa County is estimated to be $6.1 million in 1998. The 1997 groundwater withdrawal fee (collected in 1998) should generate $2.2 million. General fund money projected to be used for storage in the Phoenix AMA in 1998 is $235,000. Based on the $8.5 million that is currently available, the total recharge capacity that could be utilized by the AWBA in the Phoenix AMA is estimated at 121,000 to 170,000 acre-feet per year, based on water costs of $70 to $50 per acre-foot, respectively, which may be optimistic for the long-term.
In 1998, the AWBA actually stored over 117,000 acre-feet of water.

The AWBA is authorized to enter into Storage and Interstate Agreements with entities in Nevada and California under certain conditions. Under these agreements, the out-of-state entity, known as the Consuming State, requests Arizona, known as the Storing State, to divert and store a set amount of Arizona's unused apportionment of Colorado River water, which is financed by the Consuming State. Arizona must first verify that no in-state Colorado River right holders could utilize the unused apportionment requested by the Consuming State to be stored. Later, when the Consuming State needs additional water supplies beyond its Colorado River apportionment, the Consuming State requests Arizona to develop an Intentionally Created Unused Apportionment (ICUA) that matches the amount originally stored by Arizona for the Consuming State. The ICUA is developed by decreasing Arizona consumptive use of Colorado River water and allowing the Consuming state to utilize the water remaining on the mainstream. To the extent interstate water is stored within an AMA, the AMA would receive a short-term benefit of additional water supplies imported into the AMA in advance, perhaps by decades, of when those supplies would be needed for direct use by the out-of-state entity.

E. Augmentation Assistance Program

The Arizona Department of Water Resources' (ADWR) Water Management Assistance Program (WMAP) is intended to provide financial and technical resources and to assist in the development and implementation of conservation programs, augmentation programs, and programs designed to monitor hydrologic conditions and assess water availability in the Active Management Area (AMA). This program is funded through a portion of the groundwater withdrawal fee paid annually by those who withdraw groundwater in the AMA.

Augmentation assistance may take the form of financial assistance to water users, providing them the means to study, design, and construct renewable resource facilities. Assistance may also take the form of planning and technical assistance designed to develop AMA-wide and local area management strategies, as well as monitoring

activities. Current monitoring activities include providing staff assistance and funds for water availability and subsidence monitoring studies.

ADWR administers this program through the awarding of contracts to water users, universities, consultants and other eligible persons. ADWR also provides legal, financial, and administrative support to the contracts program. Each AMA has a five-member Groundwater Users Advisory Council (GUAC) appointed by the governor to represent various sectors of the regulated water community. A competitive application review process is conducted after which program staff and the GUAC formulate a set of funding recommendations for submittal to the director for final decision.

The goal of the Augmentation Assistance Program is to assist water users or other eligible persons within each AMA in developing augmentation and recharge projects to maximize the use of renewable sources of water such as Central Arizona Project, other surface water and effluent. ADWR will meet this goal by working toward the following program objectives:

- Identify high priority funding areas, in consultation with the GUAC and the waterusing community, and administer priority programs.
- Provide funds for the planning, design and construction of such augmentation and recharge projects.
- Act as a central source for information on augmentation and recharge.
- Increase public awareness of the importance of augmenting the AMA's groundwater supplies.

In an effort to apply available funding and technical assistance to the most important projects, the AMA identifies annual program priorities. With assistance from members of the water-using community and the GUAC, high priority project categories are identified. Any applications for funding in these categories receive preference during the application review and selection process.

Statutory authorization making monitoring and water availability assessments fundable under this program was given in 1996. Projects that may be funded in this new category include water measurement, aquifer and geohydrologic studies, land subsidence monitoring and aquifer compaction studies.