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Western State Ground Water Management

Prepared by the Staff of the
Western States Water Council

ABSTRACT

Ground water is often a critical natural resource in many western states. Because of its general high quality, it is an important source of drinking water. Further, it is widely used by western agriculture and industry. However, some ground water reserves upon which western states rely for social and economic stability are rapidly being depleted. Further, numerous incidents of ground water contamination have surfaced nationwide, which has raised concerns over the protection of ground water drinking supplies in particular.

In order to better evaluate the nature and extent of ground water problems among western states, as well as assess the status of current state management programs, in February of 1982 the Western States Water Council circulated a survey memorandum among its member states. The body of this report is comprised of a narrative summary of the results of the survey. A brief description is provided of each states' ground water allocation and ground water quality programs. Further, various specific management topics are discussed.

Although it is evident that state programs vary widely, and are sometimes fragmented, in general they adequately address current problems. Further, many western states are evaluating and revising their programs in view of evolving needs. It also appears that conflicting ground water allocation and quality goals are satisfactorily addressed using various formal and informal mechanisms. No specific management approach can be determined to be right or wrong in all cases. Rather, each should be evaluated as to its utility in meeting specific state ground water management objectives. State programs could be improved, particularly with greater technical and financial support.

Hopefully, the description of individual states' programs contained in this report will provide useful information in addressing growing ground water management problems.

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GROUND WATER AND THE WEST

Ground water is the Nation's principle reserve of fresh water. According to the U.S. Geological Survey, by 1975 the nation was using about 415 billion gallons of water per day for municipal, industrial and agricultural uses -- 20% was supplied from ground water reserves. However, ground water has a strategic importance, particularly in the West. Often, in arid areas it may be the only source of supply, or it may be necessary to supplement surface water supplies which are inadequate to meet demands. Further, due to its general high quality, ground water serves as an important source of drinking water.

The importance of ground water in the West may be illustrated by a few observations. First, western states depend on ground water to supply 50% or more of their municipal water needs (up to 80% or 90% in some states). Because of its good quality, municipal treatment costs are also relatively low. Further, ground water is the primary source of domestic supply for nearly all rural areas. Second, irrigated agriculture by far accounts for most western ground water use. It is the principle source of supply in such important agricultural areas as the High Plains of Texas (and other states overlying the Ogallala aquifer), the San Joaquin portion of the Central Valley in California, and much of Arizona. Over 30 million acre feet annually are withdrawn from ground water reserves in these three states alone to irrigate areas which support a significant part of the Nation's agricultural production. Third, ground water is a very important source of industrial process and cooling water. For example, ground water reserves have supported much of the economic development of southern Arizona. Further, it is a potentially important resource in such energy rich areas as the Piceance Creek Basin of Colorado (oil shale). Clearly, ground water is a critical western resource.

Given present population and development trends in the West, dependence upon ground water is likely to increase in the future.

However, while demands are increasing, supplies in some areas are threatened with depeletion and/or contamination.

Some ground water aquifers could be depleted (i.e., drawn down to the point water would not be economically recoverable) within the foreseeable future. In many areas, increasing ground water demand and use has led to overdraft or mining of the resource. Though defined differently, mining is generally viewed as withdrawals from a ground water aquifer which exceed the natural recharge from precipitation over the long run. Often where mining occurs, the ground water may be viewed as a nonrenewable resource, and western states have employed several mechanisms to allocate and control subsequent use.

Mining is not intrinsically bad. Rather, under some circumstances it may be the most economically efficient solution to water supply problems. However, conflicts among users occur when water levels begin to decline, and due to the potential for social and economic disruption accompanying the loss of a water supply, ground water depletions require careful planning and management. Ground water overdraft is a significant problem in the States of California, Texas, Arizona, Idaho and Colorado. In addition to the threat to social and economic stability, ground water overdraft can cause other, more immediate, problems -- including land subsidence, salt water intrusion into fresh water aquifers (particularly in coastal areas), reduced surface water flows, and increased pumping lifts and subsequently higher energy costs.

Ground water contamination is also a problem with potentially serious consequences. Numerous incidents of ground water contamination have been discovered nationwide over the past few years, but water quality in the West is relatively good. Generally, ground water pollution incidents have been minor, there are serious problems in some states. Ground water drinking supplies have not usually been affected, but such incidents serve to illustrate the fragility of our ground water resources and the subsequent need for protection.

Ground water contamination may be caused by various human activities, including mining, agriculture, petroleum and natural gas production, waste disposal by underground injection, land disposal of wastewater, septic tanks, municipal landfills, various leaks and spills, and disposal of industrial wastes using landfills or surface impoundments. With respect to the latter, future growth and development is expected to increase the need for more solid and hazardous waste disposal facilities, and subsequently increase related threats of ground water contamination. Often, contamination renders ground water unsuitable for continued use due to the fact that (unlike surface waters) natural restorative processes may take generations. Further, treatment or artificial restoration programs are difficult and expensive at best, and often are technically or economically impractical.

In order to better evaluate the nature and extent of ground water problems among western states, as well as assess the status of current state management programs, the Western States Water Council circulated a survey among its member states which addressed various ground water issues (see Appendix A). A narrative summary of the results of the survey comprise the body of this report, which includes a brief description of each states' ground water allocation and quality programs. Various specific management topics are also considered.

Western states have employed a variety of approaches in managing ground water use and protecting ground water quality. They have also developed formal and informal mechanisms for managing problems related to conflicting ground water allocation and ground water quality goals. In general, existing authorities and programs, though sometimes fragmented, seem to be adequate. Further, many western states are presently reviewing and revising their programs in view of evolving needs. In some instances state ground water management and protection efforts have been hampered due to a lack of technical and financial resources.

A list of state agencies primarily responsible for ground water allocation and the protection of ground water quality is found in Appendix B.

With respect to ground water allocation, different states' water codes contain various requirements which regulate users of ground water in accordance with established legal doctrines (please refer to Appendix C). All use some type of permit system (particularly in designated ground water basins where specific concerns exist), and they generally license water well drillers and have specific well construction standards. There are exceptions. For example, small wells for domestic and stockwatering purposes are often categorically exempted from many administrative and legal requirements.

In addition to a brief description of each states' allocation programs and related legal doctrines, the summaries also discuss the following management topics (1) the protection of ground water users' means of diversion, (2) artificial aquifer recharge, (3) conjunctive use, and (4) mining. The latter has already been mentioned, but ground water mining also leads to conflicts among users, which raises the problem of appropriate protection of users in their means of diversion (i.e., works such as wells, pumps, etc.). There are different legal and administrative means of resolving such problems. For example, subsequent users may be enjoined from lowering the water table to a point that prior users are adversely affected, or they may be required to compensate prior users for any additional costs which they incur in order to use their ground water right. Also of interest among state management programs is the manner and extent to which surface and ground water use is interrelated. For example, ground water supplies may be augmented by artificially recharging aquifers (using surface water which may be imported and spread, percolating downward, or directly injected). Such action may be taken either as a remedial step to resolve overdraft problems or as part of a more efficient storage and distribution system. Ground water

aquifers, like surface reservoirs, may be used to conserve water when supplies are plentiful for use when they are not. Local water districts in southern California actively promote the conjunctive use of ground and surface waters in this manner. However, conjunctive use may also be viewed as the administrative recognition of the physical interrelatedness of ground and surface water supplies.

With respect to ground water quality management, various state programs address this responsibility differently. In general they focus on preventative measures which can be catagorized as: (1) regulating the construction and operation of water wells; (2) controlling the collection, treatment and disposal of wastes; and (3) land use planning. Specific preventative measures include effluent limitations, monitoring requirements, ground water standards, protection of recharge zones, and mandated mandatory management practices. State programs differ with regard to the classificiation of aquifers, the types of standards used, the specific requirements made of potential dischargers, and how issues such as acceptable risk and economic practicality are handled.

All states have general police powers which may be used to control ground water pollution in order to protect the public health and welfare in general. Most states also have some type of emergency power. Many states have established policies and procedures which provide for the indirect protection of ground water by regulating surface water quality and various waste disposal practices. In addition, an increasing number of states have or are developing legislative authority and administrative regulations which directly address ground water management issues on a comprehensive basis. In general, land use planning authority and related ground water protection measures have been delegated by the states to local governments.

The states also have authority available under various federal laws which can be used to protect ground water resources. The Clean Water Act, Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act, and "Superfund," are probably the most noteworthy. This report specifically identifies states which have assumed responsibility for administering the SDWA's underground injection control (UIC) program.

The following summaries provide an outline of ground water management programs in each of the member states of the Western States Water Council. No single management approach should be viewed as right or wrong, but rather evaluated as to its utility in meeting specific ground water management objectives. Hopefully, this description of individual state's programs will serve to provide other states with information which will be helpful in addressing their own ground water management problems.

STATE GROUND WATER MANAGEMENT PROGRAM SUMMARIES

ARIZONA

Ground water is a very important resource in the State of Arizona, and serious quantity and quality problems exist. Ground water withdrawals total five million acre feet annually, of which 2 to 2½ million acre feet is mined. Such overdrafting is causing land subsidence, earth fissures, increased pumping costs, and water quality changes (some good, some bad). With respect to water quality, the discovery of organic contaminants and heavy metals has resulted in the closure of some municipal water supply wells in the major metropolitan areas of Phoenix, Tucson, and domestic wells near Yuma. This has forced the cities to retire the wells and obtain water supplies of acceptable quality from other sources.

The Arizona Department of Water Resources is responsible for ground water management, while the Department of Health Services regulates water quality. The two Departments are required by statute to cooperate in the development of the water quality aspects of mandated ground water management plans, and quantity and quality goals are carefully coordinated at a staff level.

Department of Water Resources programs are financed through state general funds and user fees. Department of Health Services programs are almost entirely financed by EPA grants (75% of the staff).

Ground Water Allocation

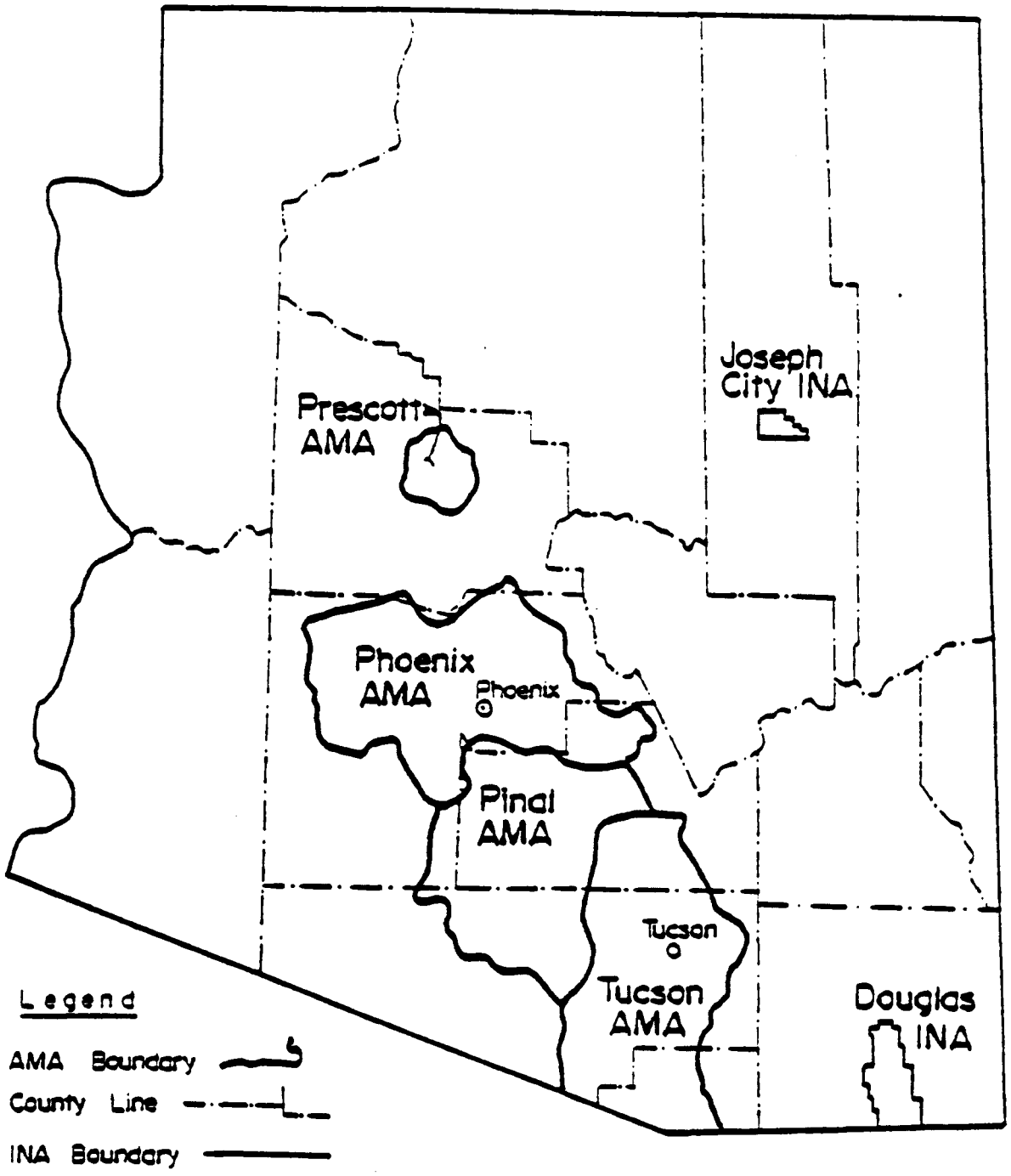
Arizona water law presumes that all ground water is percolating and is not public water subject to the appropriation doctrine. A recent Supreme Court decision reaffirmed that the overlying

landowner has the right to use ground water subject to the rule of reasonable use. Arizona ground water law also provides special consideration for municipal water uses, and in a recent decision an Arizona court held the City of Tucson may import ground water for municipal use if the City obtains title to the overlying land.

In June of 1980, Arizona enacted new ground water legislation establishing a system of ground water rights and providing for their management. The Department of Water Resources was created, and the Director was given authority to prepare conservation plans in four active management areas (AMAs). (see figure on next page) The law grandfathered rights for all existing water users within the AMAs, provided for the establishment of new rights for specified uses and established mechanisms to convey and transfer ground water rights. Further, under the new law, the State licenses well drillers and has uniform well construction standards.

In accordance with the new statute a safe yield goal, defined as a basin-wide balance of recharge and withdrawals, is to be achieved by the year 2025 in the metropolitan active management areas of Tucson, Phoenix and Prescott. The Director is authorized to establish and enforce per capita water consumption levels and industrial water use duties. Further, in Penal County, the other active management area, a program of planned depletion is to be established with irrigation water duties set for each farm and then reduced over time to meet conservation objectives (to preserve the existing agricultural economy for as long as feasible, while preserving future water supplies for other uses). New irrigated agriculture is prohibited in the AMAs. In addition, under the law, two irrigation non-expansion areas (INAs) have been established in the Joseph City and Douglas areas.

Outside the AMAs and INAs there are no legal restrictions on the irrigation of desert lands or the development of ground water for municipal and industrial uses. Further, small users with wells capable of pumping less than 35 gpm are exempt from the requirements of the law.



ACTIVE MANAGEMENT AREAS
IRRIGATION NON-EXPANSION AREAS

Figure 4

In addition to the ground water rights system and mandatory conservation requirements, the new law also allows the Director to purchase and retire irrigated lands -- sometimes the most direct and effective means of reducing ground water use. However, in light of the fact that much of Arizona's irrigated agriculture will be lost by the turn of the century anyway due to urbanization and increasing pumping costs, the legislature precluded the exercise of this option until after the year 2006.

Water deliveries from the Central Arizona Project will reduce dependence on ground water. However, the law provides for further augmentation of all water supplies and specifically calls for artificial ground water recharge programs, though none are now underway. Augmentation opportunities include flood water utilization, waste water reuse, water shed management and weather modification. With respect to conjunctive use, the State's only role is in the issuance of surface or ground water rights.

As to the protection of works, the State has limited direct authority to prevent "unreasonably increasing damage" through requiring well spacing. Further, the achievement of overall mangement goals in the active management areas will tend to stabilize water levels for all users.

The Department of Water Resources' management programs are now financed from the general fund. However, while realizing the benefits to the State of improved ground water management, the legislature recognized that existing problems had been created by the water users themselves. Therefore, the legislature provided for a pump tax of up to $5 per acre foot to pay 50% of the costs of management programs. Ground water users (except for exempt wells) are required to install measuring devices, annually report pumpage and pay the tax. Fifty cents to a dollar is allocated for the Department's administrative costs. Up to an additional two dollars may be collected for water supply augmentation programs, as part of the mangement plan of an AMA, which the Director may levy in the first year of program implementation.

The remaining two dollars is to be used for the purchase and retirement of agricultural lands (after 2006).

Ground Water Quality

The Arizona Department of Health Services (DHS), Bureau of Water Quality Control, is authorized and obligated under state statutes to adopt standards to protect the waters of the State from contamination. In addition, the law authorizes the Department of Health Services to review and approve facility plans and specifications; and establish permit conditions and criteria for the construction, operation, and monitoring of facilities which may pollute waters of the State.

The Department of Health Services released draft regulations for a new ground water quality protection program in May and the regulations are scheduled to be in place by January 1983. There are no ground water standards now in effect.

The new program will establish a system for permitting discharges to ground waters, as well as surface waters. Further, ground water quality standards will be adopted by the Arizona Water Quality Control Council. The future standards are not expected to be numeric, and consequently, the issue of acceptable risk will not be addressed. However, the standards will be subjected to a cost-benefit type of analysis before adoption. Dischargers will be required to monitor activities which would affect ground water, with DHS conducting compliance monitoring as necessary. In addition, existing regulations will be reorganized, as part of the preliminary draft, to integrate all state water quality standards. The end product will be a comprehensive reassessment of standards and permitting requirements with ground water protection built in.

The major new requirement, under the proposed system, will be submittal of a waste discharge plan for all facilities or activities (regulated by DHS) which may potentially discharge

waste to waters of the State. The plan shall describe how facility operation will comply with the goals, policies, and standards of the Water Quality Control Council. The waste discharge plan must also address abandonment of the facilities and assure that no further discharge will occur, or that measures will be taken to ensure that any subsequent discharge will not contaminate ground water, taking into account existing uses. This abandonment plan may require amendment in accordance with state-of-the-art improvements.

The new regulations provide for general permits to be issued (1) to groups of facilities or activities that have minimal individual and cumulative impacts on ground water quality, or (2) for a defined geographic area. Such facilities or activities will not be required to file a waste discharge plan.

The first step in the new permit process is submission of an application for permit by the discharger. If the discharge is not covered by a general permit, the permittee must file a waste discharge plan for review and approval by DHS. All discharge plans are subject to public notice before a permit is issued, and public hearings will be scheduled if the Director determines that significant issues are involved. If all the issues have been adequately addressed, a final permit is issued. A permittee may appeal the decision within 30 days. The Director must hold a hearing on the appeal within 60 days, and make a final decision within 30 days of the hearing. Any further appeals follow procedures set out for judicial review of administrative decisions.

The Department of Health Services has authority to respond to emergencies though funding and staff are limited.

Arizona has not adopted an aquifer classification procedure, but under the proposed system it will be possible for aquifers to be designated for waste disposal. The State will also be able to prohibit the disposal of waste through injection wells, but this is unlikely, except for hazardous and radioactive waste.

Arizona is applying for primacy under the Safe Drinking Water Act to administer the underground injection control (UIC) program. Class V wells used for urban runoff control and septic disposal are the most common, but solution mining wells (Class III) are expected to become more prevalent in the future. The actual scope of the use of injection wells, and any related drinking water supply contamination problems, is unknown.

Currently, established regulations and policies for sanitary landfills and hazardous waste disposal provide some ground water protection. With respect to hazardous wastes, a land disposal site has been selected under site specific legislation, but the State has not developed general siting standards for the protection protection of ground water quality. The State has no other authority to impose land use controls to protect ground water.

CALIFORNIA

Ground water management is a major issue in California. A recent report (DWR Bulletin 118-80) identified nearly 400 ground water basins in the State. Eleven were determined to be "subject to critical conditions of overdraft." (see figure on next page) Further, public hearings pointed out that ground water overdraft is widespread in other basins. Most of the critical basins are located in the San Joaquin Valley portion of the Central Valley. Ground water pumped in the Central Valley totals about 19B gpd, which is equivalent to almost 25% of that pumped daily in the entire nation. The annual overdraft is estimated at two million acre feet, and declining water levels are causing increased pumping lifts and, consequently, higher energy costs. Ground water management in some basins has been determined to warrant special attention. Water quality problems include sea water intrusion, increased salinity due to agricultural uses and some localized contamination from chemicals, pesticides and waste disposal sites. In 1981, ground water degradation was identified as a major water resource management priority.

The California State Water Resources Control Board is responsible for both water rights administration and water quality management. Regional water quality control boards have also been established. The State Board is assisted by the Department of Water Resources and the Department of Health Services. The latter and the counties together have jurisdiction over drinking water.

Financing of state and regional board water quality programs comes from the State of California General Fund, waste discharge filing fees, and federal sources. Additionally, state bond funds, which have been approved by the voters, may be used

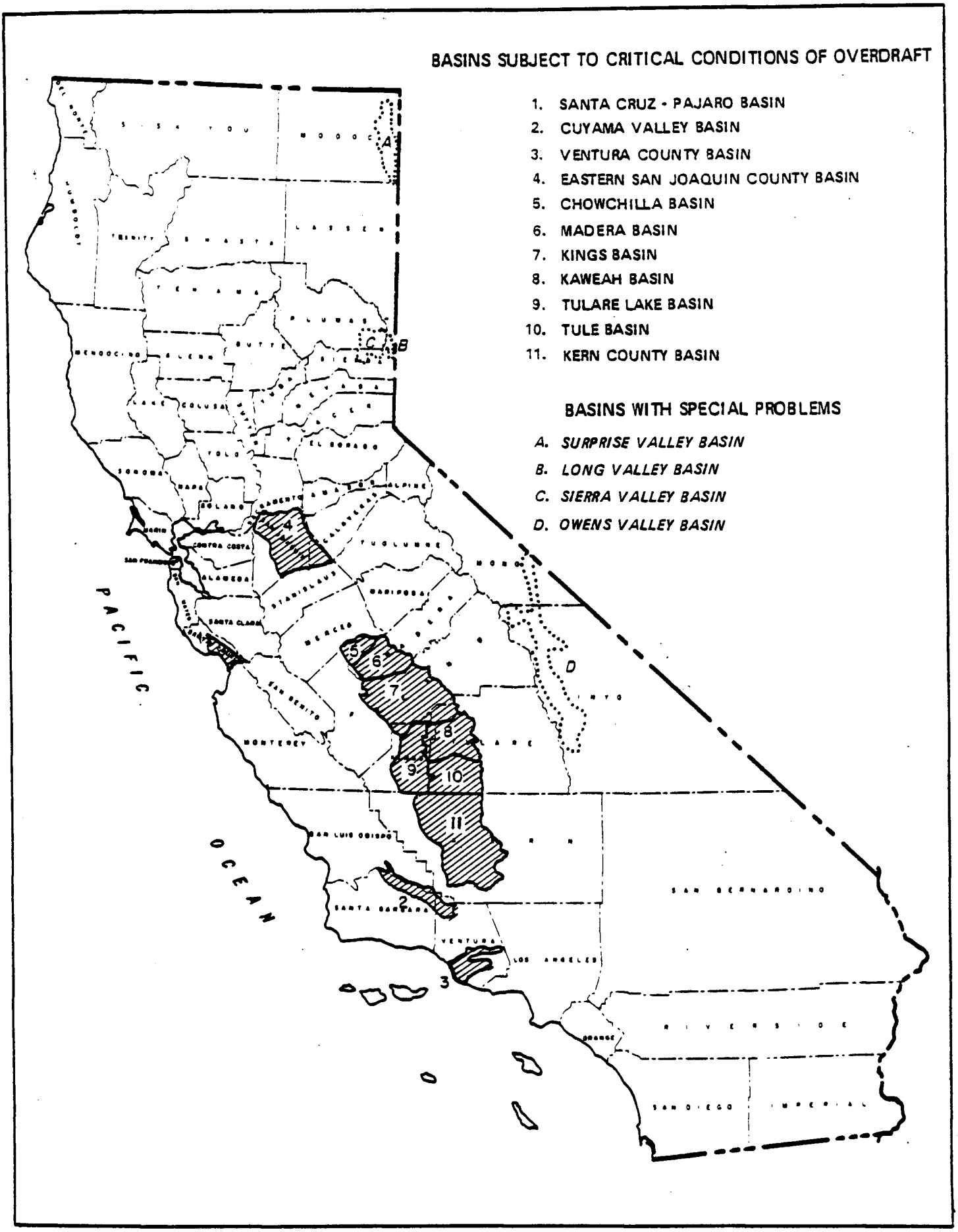


Figure 2. BASINS SUBJECT TO CRITICAL CONDITIONS OF OVERDRAFT OR WITH SPECIAL PROBLEMS

for water quality planning. Ground water investigation and planning is carried out by the Department of Water Resources with general funds, and when work is for the State Water Project, with project funds. Much of the ground water investigation activity is cooperatively funded with local water agencies, counties, and other state and federal agencies. Further, many local agencies also carry out studies on their own. Department of Health Services programs are supported with general funds and EPA safe drinking water grants.

Ground Water Allocation

California has no ground water appropriation codes. All underground water is presumed to be percolating and absent proof to the contrary is generally subject to the correlative use doctrine. In Katz v. Walkinshaw, the California supreme court abandoned the common law doctrine of absolute ownership and adopted the rule of correlative use, which gives overlying owners common rights to percolating waters beneath their lands. Each owner is limited to the reasonable use of water to meet his beneficial needs, subject to similar rights for all other overlying landowners.

The correlative right is an appertenance to the land and is not dependent on use. Neither does an overlying user obtain any priority over adjacent overlying users solely by pumping first from the common supply. It is a private right, not a public right, but it is subject to limitations on reasonable, beneficial use and reasonable means of diversion to prevent waste. Of course, when supplies are sufficient, each owner's withdrawals are unrestricted. Further, underground water in excess of the needs of all overlying landowners may be appropriated and exported outside the basin of origin (without a permit from the State).

In overdrafted basins, withdrawals in excess of recharge are intrusions upon the rights of overlying owners, but the courts have held them to ripen into prescriptive rights if continued for the requisite period of time (5 years), even though there is no present damage to water uses. The overdraft has been held to be mutually prescriptive to all overlying rights, but while past adjudications have relied on this doctrine of mutual prescription, it may not be used in the future since a recent state supreme court decision rejected its use as improper. (see Los Angeles v. San Fernando 14 Cal 3d 199 (1975))

California courts have also held that an overlying owner has the right to protect his prospective use against an established appropriation, except insofar as the appropriative claims ripen into prescriptive rights. Overlying users may protect their rights against loss by prescription before a basin is overdrafted by obtaining a dclaratory judgement establishing their paramount right against nonsurplus appropriations. Subsequently, the overlying user could obtain injunctive relief when overdraft begins. In addition, an overlying user can retain his right to the proportionate share of the safe yeild by exercising it by pumping at any time during the prescriptive period. Case law is not clear as to whether or not overlying rights which have never been exercised can be lost by prescription, though there are some indications this may be possible if an overlying landowner has not acted to protect or exercise his right.

Mining is not defined by state stature, nor may the State prohibit the mining of ground water, except that the Water Resources Control Board may exercise its authority to enjoin withdrawals to prevent destruction or irreparable injury to ground water quality. The Board is authorized by statute to initiate a court adjudication of ground water rights to protect water quality. Acting upon the recommendations of the Department of Water Resources, or investigations by any governmental agency, the Board may hold a public hearing on the necessity of

restricting ground water pumping to protect water quality from irreparable injury. Subsequently, it may file an action in the superior court to restrict pumping and/or impose other physical solutions to the extent necessary. A recent California appellate court decision held that where all parties in a ground water basin adjudication are overlying owners using the water for overlying uses, the mutual prescription doctrine does not apply. Rather, the rights of overlying users must be calculated based on the correlative rights doctrine, where "if the quantity is insufficient each is limited to his proportionate fair share of the total amount available based on his reasonable need." (see Tehachapi-Cummings County Water District v. Armstrong, 49 Cal. App. 3d 992, 1000, 122 Cal. Rptr. 9/18, 9/24 (1975))

With respect to non-overlying uses, the courts have indicated that prior appropriation principles should be applied (i.e., first in time is first in right), and appropriative rights can be lost by prescription.

There do not appear to be any court decisions which directly involve the question of whether an overlying user can protect his means of diverting or extracting ground water against the actions of other overlying users. No protection has been provided against the lowering of ground water tables except through adjudication of rights in the entire basin. Even then, though the rights may be defined, damages will not necessarily be assessed. The State Water Resources Control Board has the responsibility of recording all underground water extractions in four counties in southern California for the possible future definition of ground water rights by adjudication. Presumably, where rights have been adjudicated, the accumulated overdraft will not be allowed to increase, and therefore, existing means of extraction will be protected indirectly. The courts have affirmed the overlying users right to protect his reasonable

means of diversion against pumping by an appropriator whose pumping lowers the ground water levels in the overlying users wells to the extent that he is "unable to obtain by his pump sufficient water therefrom for use upon his lands...." (see Burr v. Maclay Rancho Water Co., 154 Cal. 428, 438, 98 p. 260, 264 (1980))

Well drillers are licensed by the State, as are all other contractors. Suggested standards have been published by the State and have been adopted by many of the 54 counties of the State.

Ground water basins are often managed by local water districts. Selected basin strategies are shown in the figure on the next page.

Artificial ground water recharge programs, and the conjunctive use of ground and surface waters are not new in California. The flood waters of San Antonio Creek, in Los Angeles County, have been impounded and spread since 1895. Local water agencies artificially recharge nearly two million acre feet per year in their own areas. Further, conjunctive operation of the State Water Project has been envisioned since 1957 by the state water plan. However, the State is not directly involved in either artificial recharge or conjunctive use activities. The State has supported local ground water management activities, including conjunctive use, and the State has negotiated with local water agencies to store State Water Project water in local ground water basins in order to increase project yield. Demonstration projects exist in two basins in Southern California.

The State has not appropriated artificially stored ground water. In Los Angeles v. San Fernando, the court held an importer's right to recapture imported ground water was held to be of the highest priority, equal to the priority accorded Pueblo ground water rights. Further, the case was used as a

precedent for utilizing ground water basins instead of surface reservoirs whenever practical, while implying that the storage of water underground must not interfere with a basin's ground water supply. A priority system has not been established for the use of ground basin storage space.

Ground Water Quality

The Porter-Cologne Water Quality Control Act of 1969 established nine separate regional water quality control boards with broad authority to deal with water quality problems. Each is composed of nine members, which meet regularly, and each has a full-time staff. A regional board has authority to initiate enforcement actions against specific dischargers, levy monetary fines and require remedial action. In certain situations, a board may perform needed remedial work itself. The boards also prescribe waste discharge requirements for anyone proposing to discharge waste where it may affect the quality of the waters of the State, which includes ground water. In addition, the regional boards and the State Board adopt water quality control plans ("basin plans") which can help to prevent any contamination problems from worsening.

Basin plans have been adopted for the entire state. These plans establish water quality objectives for receiving waters, and regional boards prescribe waste discharge requirements implementing the plan. In adopting water quality control (basin) plans, the State and regional boards are required by statute to consider the following factors: beneficial uses, environmental characteristics and quality of water supply of the particular hydrographic unit, reasonably achievable water quality conditions, economic considerations, and the need for housing development in the region.

CA. DEPT. WATER RESOURCES
N.J. PETERS
JULY 1982

THE VARIETY OF GROUND WATER MANAGEMENT STRATEGIES IN CALIFORNIA

GROUND WATER BASINS	PROBLEMS			LEGAL POWERS				FINANCING				GROUND WATER MANAGEMENT STRATEGIES				
	SEA WATER INTRUSION	LAND SUBSIDENCE	CRITICAL CONDITIONS OF OVERDRAFT	ADJUDICATION	COUNTY ORDINANCE	SPECIAL POWERS	GROUND WATER MGT. DISTRICT	BENEFIT EQUITY TAX	ZONE OF BENEFIT TAX	WATER PUMPED TAX	PROPERTY VALUE TAX	CONJUNCTIVE USE AND ARTIFICIAL RECHARGE	ARTIFICIAL RECHARGE	PLANNED STORAGE	SPECIAL FEATURES	GROUND WATER BASIN MGMT. STATUS
North Coastal Area																
Scott Valley				x							x			x	With surface water	Ongoing
San Francisco Bay Area																
Santa Clara County Basin	x	x				x				x			x	x	5 sources of water	Fully managed
Niles Cone Basin	x					x				x			x		Repel seawater	Quality management
Central Coastal Area																
Santa Cruz-Pajaro Basin	x		x													Incipient
Salinas Basin	x					x							x		Seawater stable	Partial
Cuyama Valley Basin			x												Mining	Uncoordinated
South Coastal Area																
Ventura Central Basin	x		x			(x)							x		Will mine offshore water	Being formed
West Coast & Central Basin	x			xx						x	x		x		Seawater Barriers	Safe Yield Mgmt.
San Fernando Valley Basin(s)				x									x	x	Regulates Import	Fully managed
Chino Basin				x						x	x		x	x	May "rent" storage	Fully managed
Bunker Hill-San Timoteo Basin						x					x		x		May "sell" water	Partial Mgmt.
Raymond Basin				x						x	x		x		First Adjudication	Safe Yield Mgt.
San Gabriel Basin				x						x			x	x	Advisory Board	Fully managed
Cucamonga Basin				x						x						Safe Yield
Orange County Basin	x					x		x					x	x	Uses Ecoomic Incentives and Seawater barriers	Fully
Central Valley Area																
Sacramento Valley		x			xx										No-export law	None
Eastern San Joaquin County Basin	x	x	x										x		Planning Ongoing	Start soon
Chowchilla Basin			x									x			No control on pumping	No planned management at basin level
Madera Basin		x	x									x				
Kings Basin		x	x									x				
Kaweah Basin		x	x									x				
Tulare Lake Basin		x	x									x				
Tule Basin		x	x									x				
Kern County Basin		x	x						x			x				
Lahontan & Colorado Desert Areas																
Sierra Valley		x								x					Keep water levels up	Incipient
Owens Valley					x					x					Environmental Prot.	Incipient
Imperial County					x										No-export law	None

The State Water Resources Control Board formulates and adopts state policy for water quality control. As previously described, the Board also has authority to adjudicate ground water rights to protect ground water quality. The California constitution also speaks to the prevention of waste or unreasonable use of water, and this is generally construed as authority for the State Board to act to protect the quality of waters of the State, including ground water. The State Board has adopted a non-degradation policy to maintain to the maximum extent possible the existing quality of water which is better than established water quality standards. A certain degree of degradation may be permissible, under this policy, in certain areas when viewed from a statewide perspective of maximum benefit. The concept of acceptable risk is implied in this basic policy.

The State Board and regional boards have also been given the authority to implement the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act, as amended, including specific authorization to prescribe waste discharge requirements for the disposal of pollutants from a point source to navigable (surface) water, or into wells.

The Department of Health Services has emergency authority under the general provisions of the State Health and Safety Code to shut down any well that is contaminated, i.e., water exceeds the adopted standards for drinking water, or exceeds the accepted action level for constituents for which standards do not exist. If closing the well is impractical, boiling of water or bottled water may be ordered. The Department of Health also restricts the recharge of reclaimed waste water.

California has not yet been delegated responsibility for the federal underground injection control (UIC) program. The

State Water Resources Control Board is preparing an application for primacy for all classes of injection wells except Class II (those used for oil and gas production). The State's Department of Conservation, Division of Oil and Gas, has applied for primacy in regulating Class II wells. EPA will not delegate its authority to regulate injection wells unless state and federal authorities and programs are substantially equivalent.

The federal program prohibits construction of an injection well until a permit has been issued containing construction requirements. While the Division of Oil and Gas requires construction permits for Class II wells, neither the State Water Resources Control Board nor regional boards issue construction permits or directly prohibit construction of wells without a permit. However, injection of waste to any wells would not be allowed without waste discharge requirements, and because of the risk and costs involved in drilling a well, dischargers usually wait for waste discharge requirements prior to construction in order to assure that the well may be used.

Another problem with delegation is what California perceives to be a slackening of federal UIC regulations to make it easier to obtain approval to exempt an aquifer from water quality restrictions. The State is debating whether or not any aquifer should be exempted, and if so, what criteria should be used.

There are seven Class I wells in California which are used for disposing of industrial waste below usable aquifers. These are regulated through permits issued by the regional boards. There is no evidence indicating that drinking water supplies are being contaminated through injection well practices. However, the State is concerned with protecting future beneficial uses, including industrial and agricultural uses, as well as drinking water supplies.

Oil and gas recovery wells constitute the major type of underground injection wells in the State with over 6,000 in operation. There are also a limited number of solution mining injection wells (Class III).

It is unknown how many, if any, Class IV wells may exist. This classification includes wells injecting waste into "drinking water sources," which EPA generally considers as aquifers having concentrations under 10,000 mg/l of total dissolved solids. Through recent efforts of the regional boards and the Department of Health Services, up to 60 possible sites with Class IV wells have been identified, which includes hazardous waste sites. All of these sites are still under investigation.

Under the residual classification (Class V), there are roughly 25 geothermal wells which inject water to create steam. In addition, there are approximately fifteen salt water intrusion barrier wells where fresh water is injected. Other wells in this class include a few recharge wells using reclaimed water to replenish underground supplies, and approximately 100 wells used for the storage of hydrocarbons.

Under the Porter-Cologne Act, the regional boards may prohibit or regulate the discharge of wastes into deep injection wells. The boards may also review the effect of any discharge on an aquifer, in accordance with the basin plan, and adopt appropriate waste discharge requirements for injection wells.

The State has not adopted any land use controls to protect ground water, but areawide management plans, adopted under Section 208 of the Clean Water Act, can provide some authority to protect ground water.

Under statutory authority, the State Board has adopted regulations dealing with the land disposal of wastes. Basically,

three different classes of disposal sites are established. Class I sites require complete protection for ground water from all wastes. Class II sites may overlie usable ground water, but must have geologic and hydrologic barriers to prevent continuity with so-called group 2 and group 3 wastes (which do not include toxic substances). Class III sites must protect water quality from group 3 wastes (non-water soluble, non-decomposable inert solids.

COLORADO

Various ground water problems are becoming of increasing interest in Colorado. With respect to quality, most problems involve disposal methods related to mining tailings, which have been found to introduce high levels of heavy metals into certain aquifers. Further, a recent study of surface impoundments indicates that one out of three municipal, agricultural, industrial, mining, and oil and gas related impoundments have caused some ground water contamination. Ground water quantity problems are also an important concern, particularly overdraft of the Ogallala Aquifer located in eastern Colorado and adjoining states. These ground water management issues are expected to be of even greater concern in the future due to the pressures of growth on the resource.

In Colorado, ground water allocation is the responsibility of the State Engineer (Department of Natural Resources). Ground water quality is primarily the responsibility of the Colorado Department of Health's Water Quality Control Division. Any ground water quality regulation and ground water quantity allocation conflicts are resolved on a case-by-case basis, but in no case can quality considerations supercede vested water rights. Ground water programs are financed mainly with state general funds.

Ground Water Allocation

Ground water in Colorado is defined as either tributary, non-tributary or designated ground water. Tributary ground water includes seepage or percolating ground water which would eventually become part of a natural stream. Generally, all ground water is presumed to be tributary unless proven otherwise.

The 1965 Ground Water Management Act allowed for the appropriation of designated ground water and the creation

of designated ground water basins, which by definition include all ground water not tributary to any natural stream. Following notice and hearing procedures, the State Ground Water Commission may determine the boundaries of a designated ground water basin, as well as the estimated quantity of water stored in an aquifer, the estimated annual recharge rate, the estimated ground water use in the area, and the number of users.

Following designation of a basin, ground water can only be appropriated through a permit issued by the Commission, which protects against waste and the impairment of existing water rights. The Commission may impose reasonable permit conditions, such as well spacing, and limit extraction. Although the priority of claims is determined by the "first-in-time first-in-right" principle, the procedures differ from those for surface water rights (or rights to tributary ground water). Priorities are determined, after hearings, by the Ground Water Commission. The date of priority is effective either from the date of actual taking and beneficial use of ground water, or following enactment of the 1965 law, from the filing of an application with the Commission. The Act also gives certain regulatory and administrative powers to the State Engineer and local management districts.

Tributary ground water is subject to the prior appropriation doctrine under the Colorado Constitution and the 1969 Water Right Determination and Administration Act, which recognized the need to more fully develop and use the underground waters of the State. The 1969 Act addressed the potential interference with surface stream flows of an increasing number of wells. With some exceptions, it required the adjudication of water rights for wells before priority would be established as of the actual dates of initiation. It also provided certain protections to surface appropriators. Further, it declared as the policy of the State the integrated appropriation, use and administration of ground waters and surface waters in order to maximize the beneficial use of all waters of the

State. Ground and surface waters are therefore administered as one and the same source.

An amendment to the law in 1971 authorized the State Engineer to promulgate separate rules and regulations covering wells in different stream basins, and different aquifers with separate and distinct hydraulic features. Such rules and regulations have been promulgated for wells diverting water tributary to both the Arkansas and South Platte Rivers. With respect to the Arkansas, such action has been upheld by the Colorado Supreme Court.

Prior to construction, all ground water wells must be permitted by the State Engineer. Further, the Board of Examiners of Water Well Contractors licenses well drillers and has rules and regulations which provide minimum standards for the location, construction, modification or abandonment of water wells and the installation, modification or repair of pumping equipment.

Ground water mining is not strictly defined in Colorado but the State Engineer may allow mining based on a reasonable use policy. In the Northern High Plains designated ground water basin, he permits a 40% decline over 25 years, and in non-tributary ground water basins permits are based on a 100-year aquifer life.

No specific administrative protection is provided prior ground water users in their means of diversion. To the extent that the ground water is allowed to be appropriated, a user must deepen his well or take other suitable action to divert his water right. Legal action between prior and subsequent users over well interference questions must be initiated by civil suit through regular judicial channels.

The State of Colorado has completed an artificial recharge demonstration project in the South Platte area, which was

turned over to local users. Other projects are planned for the High Plains area. No specific permit is required for individual operators to practice artificial recharge, but usually a court decreed priority is sought by rechargers. The State does appropriate recharged water, generally under augmentation plans allowing rechargers to withdraw water by permit at a later date.

Ground Water Quality

Presently, the State's ability to address ground water contamination problems is limited, primarily because of staff and budget constraints. The Colorado Department of Health and the Attorney General's Office are conducting a legislative review of all state ground water related authority as a step towards determining the need for additional legislation in developing a comprehensive ground water management program. Existing legislation appears adequate in most areas to protect ground water, but the implementing regulations may not be.

In addition to the review of legislative and regulatory authority, a ground water task force was formed within the Department with representatives from industry and various governmental agencies. Some numeric standards for ground water have been suggested which have yet to be acted upon. Numeric parameters have been established by the Department for organics and inorganics, but these limitations have not been applied towards ground water. The Department has also adopted an antidegredation standard, which applies to waters of the State that have an active discharge permit program. However, specific antidegredation standards do not apply to ground water due to the lack of a specific discharge program.

Under the Water Quality Control Act, the State does have emergency response authority and any spillage of materials which may pollute the waters of the State must be reported to the Water Quality Control Division. Remedial action may also be taken if ground water contamination can be shown to be an imminent public health hazard.

The State of Colorado does not use a ground water classification procedure. However, on a case-by-case basis aquifers may be designated for waste disposal, or disposal of waste by injection may be prohibited if it would degrade ground water or threaten public health.

The State has not yet received primacy under the federal underground injection control (UIC) program, but the current comprehensive review of ground water authorities and responsibilities is expected to lead to proposed legislation which might include necessary authority for state delegation.

The most widely used type of wells in Colorado are for oil and gas recovery operations as well as related subsurface brine disposal. While these and other wells for the disposal of industrial and municipal waste have been used in the past, none are currently being utilized. Various disposal wells for oil shale operations, air conditioning/cooling water, sand backfill, drainage, low level radioactive waste and ground water recharge have been used, but the exact number has yet to be determined. At present, the Department of Health is not aware of any significant ground water problems caused by the injection of wastes.

Various statutes and regulations address ground water contamination from different sources such as feedlots, landfills and sewage systems. Mining and oil and gas related activities are also regulated to protect ground water. Further, the State Assembly is considering legislation regarding the disposal of solid, hazardous, nuclear and radioactive wastes, which would also provide ground water protection. Specific land use controls on certain hydrologic systems, such as recharge areas, do not exist.

IDAHO

Ground water pollution problems in the State of Idaho do not appear to be numerous, although there are site specific concerns. The State does have a number of areas where ground water overdraft is a problem. Seven areas have been declared to be critical (some as early as 1962). Although permits for new appropriations are not being issued in these areas, water levels continue to fall.

The Department of Water Resources is responsible for controlling discharges below a depth of 18 feet, and for ground water quantity management. The Division of Environment, Department of Health & Welfare, has responsibility for ground water quality and discharges to a depth of 18 feet. Both Departments are required by statute to reconcile water management conflicts. To date, conflicts between ground water quality and quantity administration have not arisen.

The Department of Water Resources is financed through state general funds and fees on water appropriation permits. Some federal funds are also used for ground water monitoring through a cooperative program with the U.S. Geological Survey. Water quality programs are financed primarily with state general funds, although federal grants available under the UIC program have been used.

Ground Water Allocation

Idaho has ground water appropriation statutes and established permit procedures which, along with judicial precedence, provide the mechanism for managing ground water use. In 1931, the Idaho Supreme Court rejected the concept of absolute ownership of ground water, and in effect said that all ground water was percolating ground water subject to appropriation. In 1963, the Idaho legislature provided that the right to use ground water could only be acquired through statutory appropriation, except

in the case of domestic wells or wells drilled solely for draining lands.

Water well drillers are licensed by the State, and minimum well construction standards have been adopted.

Idaho ground water law indirectly provides some protection for appropriators in their means of diversion. The rights of prior ground water appropriators are protected through the maintainance of reasonable ground water pumping levels, which are established by the Director of the Department of Water Resources. However, to the extent that the ground water resource is allowed to be appropriated, a prior appropriator must deepen his well and/or alter his system as needed to divert his water right. In cases of demonstrated direct and significant interference between individual wells, or wells and springs, the court has awarded damage costs to prior appropriators or enjoined pumping by junior appropriators.

The State prohibits the mining of ground water. Though there is no precise statutory definition, the Idaho Supreme Court has defined mining to be pumping in excess of the "average rate of future natural recharge."

With respect to conjunctive use, the law provides for the joint administration of surface and ground water. Permits for new ground water appropriations can be issued with provisions to protect surface water rights. Further, water districts are authorized to administer ground water rights if a direct inter-relationship exists between the surface and ground water resources. The statutes do not appear to require conjunctive use in order to optimize use of overall water resources.

Idaho law also allows for the creation of ground water recharge districts. The only such district currently in existence will recharge a portion of the Snake plain aquifer with surface water diverted out of the Snake River and/or Wood River systems. Benefits from the recharge program are assumed to accrue to all existing users of ground water within the district.

Ground Water Quality

The Idaho Department of Water Resources administers existing statutes regulating waste disposal and injection wells, the Idaho Geothermal Resources Act and statutes regulating well drillers.

With respect to emergency powers, state and federal agencies have developed a comprehensive memorandum of understanding to insure that spills of hazardous materials receive an immediate response. The combined authority of the State Departments of Health & Welfare and Water Resources and the general police powers of the State, along with the authority of EPA, appear to be adequate to handle any emergencies.

The State has adopted standards for waste disposal injection wells, which in essence require any effluent discharged to the subsurface to comply with adopted standards for drinking water as the effluent enters the ground water. The issue of acceptable risk is inherently, but indirectly, considered by the statutes enacted by the legislature, and the regulations and standards adopted by the Department of Water Resources. The standards for waste disposal and injection wells provide for the evaluation of economic and practical alternatives to subsurface disposal.

Currently, all identified aquifers are designated as drinking water sources or potential sources, and therefore the quality of any discharge to waste wells must meet drinking water standards. Aquifers could be designated in the future for waste disposal. The State can and has prohibited the disposal of waste through injection wells. The U.S. Department of Energy has questioned the State's authority to do so on federal reservations, but this legal question will be avoided if the State is delegated primary responsibility for the federal UIC program.

Most underground injection wells in Idaho are used for the disposal of excess irrigation water and surface runoff waters. Some local incidents of contamination of drinking water wells

have been experienced, and several irrigation waste water disposal wells have been abandoned or reallocated to resolve these problems.

The Department of Water Resources can designate critical ground water recharge areas, but local land use regulations are the responsibility of the counties. Zoning ordinances are used to control the location and density of urban and suburban development, as well as the use of septic tanks, in order to protect ground water. EPA has also designated a "sole source" aquifer in northern Idaho. Subsequently, no federal financial assistance may be given to any project which may contaminate the aquifer through its recharge zone.

The State has developed siting standards for the land disposal of hazardous wastes, which also provide ground water protection.

MONTANA

Numerous, relatively minor incidents of pollution of shallow ground water aquifers have been documented in Montana. No major ground water drinking supplies have been affected, and potential conflicts have in part been avoided due to the sparse population of the State. Generally, where pollution instances have been identified, there is currently no use of the impaired ground water. Still, these incidents have been taken seriously as representing the fragility of the resource, demonstrating the potential threat to drinking water sources and illustrating the need to protect ground water.

Ground water quality management is primarily the responsibility of the Water Quality Bureau of the Department of Health and Environmental Sciences (DHES). Financing for the Bureau's ground water programs comes from state general funds (25%) and EPA 106 grants (75%).

Ground water quantity management is primarily the responsibility of the Water Rights Bureau of the Department of Natural Resources and Conservation (DNRC), and such programs are supported with state general funds.

Ground water allocation and ground water quality conflicts are resolved through informal and formal contact between DHES and DNRC. Water appropriation permit applications are sent by DNRC to DHES, and DHES may submit objections prior to a final decision. Although the criteria listed for issuance of a water use permit does not specifically mention water quality, such affects are considered. The criteria address the withdrawal of ground water, and not discharges to ground water.

Ground Water Allocation

Water use in Montana is generally guided by the principles of prior appropriation and beneficial use. The State has had an administrative statute governing the appropriation and regulation of ground water since January 1, 1962.

Up until 1962 for ground water, and 1973 for surface waters, Montana law recognized water rights obtained in three ways. First, appropriated rights could be obtained by filing a public notice of intended use with the county clerk, diverting the water and putting it to beneficial use. Second, use rights were established simply by putting the water to beneficial use, even though they may not have been legally recorded. Use rights are valid if the water user can prove the date when the beneficial use began and the amount of water used. Third, decreed rights (which originate as appropriated rights or use rights) have been established by Courts.

The Montana Water Use Act of July 1, 1973, established a centralized record system, as well as a "permit system" for any new or additional water developments. It generally superceded the ground water code of 1962, though some parts were retained. All water rights existing prior to the passage of the Act were "confirmed" by the Montana Constitution. These rights, many of them unrecorded, have or are being determined through an adjudication process in state courts. In 1979, the legislature passed Senate Bill 76, which created state water courts to preside over four water divisions for the purpose of court identification and quantification of "confirmed" rights.

On June 6, 1979, the Montana Supreme Court issued a water rights order requiring every person claiming ownership of an existing right to file a statement of claim for that right with the Department of Natural Resources and Conservation (DNRC) no later than January 1, 1982. Stock water and domestic claims on ground water, or instream flows were exempted from this process, though such claims could be voluntarily made. Following preparation of a preliminary decree, as well as an opportunity for hearings and objections, the judges will issue a final decree, and on that basis DNRC will issue a "certificate of water right" to each person decreed an existing right.

New or additional development of surface water and ground water made after July 1, 1973, must receive either a "certificate of water right" or a "permit to appropriate water" from DNRC. Permits to appropriate water issued by DNRC are conditional, in that they are added by priority date after the adjudication and final decree of all existing water rights. They are then reviewed and recorded and a "certificate of water right" is issued. When anticipated use is 100 gallons per minute or more, a "permit to appropriate water" must be applied for and received before development begins. Applications to appropriate more than 3,000 acre feet of ground water per year must be approved by the legislature, but this requirement does not apply to appropriations for municipal use, public water supplies, or the irrigation of cropland owned and operated by the applicant.

A permit is not necessary to develop wells or springs with an anticipated use of less than 100 gallons per minute. In such cases, a "well log report" is completed by the driller and sent to DNRC with a copy to the well owner. When work is completed the owner submits a "notice of completion of ground water development," along with a filing fee. The priority date of the water right is the date DNRC receives the completed form.

The 1962 code provided for the establishment of controlled ground water areas, and this section was strengthened in 1979. Surface boundaries are set to indicate the location and extent of the underground aquifer , and ground water withdrawals within these boundaries are regulated. A petition for designation can be submitted by ground water users in an area (at least 20, or one-fourth of the users in an area, whichever is less, must sign the petition); or proposed by DNRC. The petition or proposal must show that (1) ground water overdraft is occurring; or (2) excessive withdrawals are likely to occur soon; or (3) there are significant disputes over the priority dates of water rights, amounts of ground water in use, or priority of type of water use in the area; or (4) ground water levels or water pressure levels in the area have declined or are declining excessively.

In such designated areas a permit is required in all cases to appropriate ground water in any amount. Areas are designated by the Board of Natural Resources and Conservation following public hearings on a petition or proposal. Depending on the particular situation, the Board's order may include any of the following provisions: (1) closure of the area to future ground water development; (2) limiting withdrawals over a given period and dividing the amount among users by the priority date of water rights; (3) establishing a preference for livestock and domestic use regardless of priority dates and assigning preferences among remaining uses; (4) establishing water duties for users in the area; (5) limiting the use of more than one well by the same user; (6) requiring a system of rotation of ground water use; and (7) other requirements.

Presently, only one area in the State, known as the South Pine Controlled Ground Water Area (in southeastern Montana) has been designated. It was created on November 1, 1967 and covers an area of approximately six townships. Controls have been effective, and ground water levels have steadily recovered over the past four to five years. Hearings on other potential controlled ground water areas have been held.

The above provisions allow the State to prohibit the mining of ground water, though mining is not specifically defined by statute.

The Montana Department of Commerce, through its Professional and Occupational Licensing Bureau, licenses all Montana well drillers. The State has specific statutes, rules and regulations which provide some construction standards. More detailed well construction standards could be required through legislative action or by rule of the Board of Professional and Occupational Licensing. The Montana Well Drillers Association has prepared, adopted and published recommended standards.

With respect to protection of means of diversion, the basic purpose of Montana's water use permit system is to protect prior water rights. Existing users are notified of permit

applications near them and may object to the new water use. If the objections are valid and an agreement can not be reached among all parties involved, the case is brought before a hearing officer for administrative determination. A proposed order is issued, and following comment and review, a final order is issued and signed by the Administrator of DNRC's Water Resources Division. Any aggrieved persons may file an appeal with the district court.

If after a permit is issued, prior water right users are adversely affected, DNRC investigates the matter and may revoke permits with cause. Prior water right users may also file civil court action. The district court generally has jurisdiction in cases involving compensation or injunctive measures. The Department has not yet administratively required compensation for any additional costs which may have been incurred by prior users. However, on occasion, water levels, pumping depth, or other restricted conditions have been placed on permits administratively.

Montana's permit system applies to both surface and ground water uses. Ground water is often used in conjunction with surface water, either as a primary, secondary or supplemental source (or vice versa). There are no statutes or programs in Montana related to artificial recharge or ground water aquifer storage.

Ground Water Quality

Montana's Water Quality Act prohibits pollution of state waters, which are defined to include underground waters. The statute requires the State Board of Health and Environmental Sciences to adopt rules governing permits to discharge waste into state waters, and to establish classifications and water quality standards for all state waters.

The Water Quality Bureau prepared draft ground water permit regulations and quality standards which the Board adopted this September. The ground water quality standards included in

the regulations will enhance the enforceability of the Montana Water Quality Act as it applies to ground water. The regulations and standards are geared to control ground water degredation, and require permitting of "point-type sources," treatment works, and disposal systems or ponds which might potentially discharge pollutants to ground water. If the source requires a permit under other regulations which address ground water protection, a duplicate permit is not required and only the ground water standards will apply. The regulations and standards are based on the concept of protecting beneficial uses rather than prohibiting all constituent-by-constituent changes.

Ground waters of the State are classified into four categories based on their existing quality and suitability for various purposes. General and numeric standards have been proposed, and point sources will not be allowed to violate these standards in ground water. Where existing ground water quality is better than the standards, degredation will not be allowed if it will adversely affect the existing or reasonably expected beneficial uses of the water. Non-point sources are not allowed to change the quality of usable ground water unless all reasonable best management or conservation practices have been applied.

Class I ground waters are defined as generally suitable for public and private water supplies, culinary and food processing purposes, irrigation, livestock and wildlife watering, and for commercial and industrial purposes with little or no treatment. Concentrations of various dissolved substances may not exceed Montana's maximum containment levels (MCL's) as set forth in drinking water regulations. Concentrations of other toxic, hazardous or deleterious substances shall not exceed levels (set forth in separate guidelines) which would render the ground water unsuitable, or for practical purposes untreatable, for its designated beneficial uses. Further, Class I ground waters have a specific conductance of less than 1,000 micromhos per centimeter at 25 degrees centigrade (in lieu of mg/l total dissolved solids measures).

Class II ground waters are defined as generally marginally suitable for public and private water supplies, culinary and food processing uses, and are suitable for irrigation of some agricultural crops, for drinking water for most livestock and wildlife, and for commercial and industrial purposes. Class II ground waters may be used for domestic and municipal water supplies in an area where better quality water is not readily available, and such drinking water supplies must meet applicable MCL's for various substances. Again, concentrations of other substances may not exceed levels (as established by guidelines) which would render the ground water unsuitable for its designated beneficial uses. Class II ground waters have specific conductance ranging from 1,000 to 2,500 micromhos.

Class III ground waters are suitable for some industrial and commercial uses, as drinking water for some wildlife and livestock, and for irrigation of some salt tolerant crops using special water management practices. In some cases, Class III ground waters are the only economically feasible source for municipal or domestic water supplies and appropriate MCL's apply. Guidelines for other substances are applicable as described above. Class III ground waters have specific conductance ranging from 2,500 to 15,000 micromhos.

Class IV ground waters may be suitable for some industrial, commercial and other uses, but are unsuitable or for practical purposes untreatable for higher class beneficial uses. These ground waters have specific conductance greater than 15,000 micromhos, and where they have a beneficial use, are to be protected to continue that beneficial use.

The proposed regulations state that the ground water quality standards shall be applied at the outer limits of a mixing zone, to utilize the benefits of dilution and pollutant attenuation. The boundaries of the mixing zone will be set on a case-by-case basis and will generally extend to the point where some other beneficial use of the ground water occurs,

or is reasonably expected to occur, in keeping with the idea of protecting beneficial use rather than simply prohibiting any constituent change in the immediate area where a seepage encounters ground water.

Permitting under the regulations is set up so that administrative procedures parallel those of the Montana Pollutant Discharge Elimination System (MPDES), the state's surface discharge permit program. Permit conditions are flexible, but virtually all sources with significant pollution potential will be required to monitor ground water quality at the mixing zone boundaries at a minimum. Early warning monitoring wells may also be required, as well as contingency action plans.

The issue of acceptable risk is apparently indirectly addressed through the idea of beneficial use, and the regulations have been justified economically.

In the Department's opinion, the regulations and standards represent a manageable program to prevent unchecked degredation of the State's ground water without devastating economic impacts from prohibiting all development. Further, the concepts of protecting reasonable beneficial uses and utilization of reasonable conservation practices will allow the imposition of reasonable (economically feasible) technology as permit conditions.

With respect to emergency authority and capability, various state statutes form the basis for the Montana Disaster and Emergency Plan which was established in 1978. The plan covers the effects of natural or man-caused disasters, including those related to ground water resources.

The State has not, and is not, seeking primacy for the federal underground injection control (UIC) program. The State has authority as previously described to prohibit underground injection waste disposal practices without a permit, with the exception of oil related injection wells. Currently, there are no subsurface disposal wells which are not oil related.

Domestic well problems associated with these disposal practices have sometimes been alleged, but seldom, if ever, proven.

The State has siting standards for the land disposal of hazardous waste. The Solid Waste Bureau has adopted the federal Resource Conservation and Recovery Act (RCRA) program. The State has also developed a hazardous materials response plan to meet emergencies.

NEVADA

Currently, the State of Nevada does not have significant ground water problems. This can best be attributed to the existence of a strong ground water law enacted in 1939. With respect to ground water allocation, the State Engineer's office has designated several hydrographic areas within the State as critical ground water areas due to full commitment of the resource.

The Department of Conservation and Natural Resources (DCNR) is the entity responsible for the protection and utilization of Nevada's natural resources. Within DCNR, ground water quality is the responsibility of the Division of Environmental Protection, while ground water quantity is managed by the Division of Water Resources (State Engineer). The Director of the Department, the appointing authority, oversees the administration of both Divisions. Programs of both Divisions are financed with state general funds, and some federal financial participation.

Ground Water Allocation

The Nevada legislature has declared all water within the State to belong to the public. Vested ground water rights are defined as those acquired and continuously used prior to March 22, 1913 for artesian or definable aquifers, and those prior to March 25, 1939 for percolating waters. Presently, the right to use ground water can only be acquired by permit through statutory appropriation procedures, with the exception of domestic wells.

Nevada law provides that upon petition of at least 40% of the well owners in a basin, or upon the initiative of the State Engineer, a desginated basin or portion thereof can be established and the Engineer may exercise additional administration over all wells. Provision is made for the appointment of county ground water boards, and when created such boards assist the Engineer in administration of the resource within the designated ground water basins. In all such basins, or portions thereof,

no development can be initiated without obtaining a permit through the State Engineer. In non-designated basins, wells may be drilled before a permit is applied for, but at the applicant's own risk. However, in either case the Engineer must determine (1) that unappropriated water is available, (2) what the probable effect will be on existing rights, and (3) that approval would be in the public interest and welfare.

All well drillers must obtain a license through the State Engineer before drilling. They are required to keep a log of their wells and comply with all rules and regulations adopted by the Engineer, which includes well construction standards.

With regard to protecting the appropriator's means of diversion, Nevada law recognizes an appropriator's right only to a specific quantity of water, which may be subject to a reasonable lowering of the water table. The State Engineer determines what is reasonable, taking into consideration (but not limited to) the economics of pumping and the general type of crops grown in the area. He may also consider the effect of water use on the economy of the area in general.

Ground water mining is not defined by statute, but the State Engineer has the authority to restrict use in order of priority of right where he finds the average annual recharge is not adequate to satisfy all rights. He may also restrict drilling where he determines additional wells would cause undue interference with existing wells. Further, in any designated area which is being depleted, the Engineer is empowered to take such actions as are deemed essential to protect the public welfare. In acting on applications to appropriate ground water in such areas, he may designate certain preferred uses, issue temporary permits, and where possible require an applicant to obtain water from a public entity. The law also provides for the adjudication of ground water rights, which are expressly made subject to statutory forfeiture and loss by abandonment.

The appropriation doctrine applies to the use of ground water and surface waters conjunctively, with limited discretionary authority provided to the State Engineer under the law. Waste from artesian wells is declared to be unlawful and is a misdemeanor. Nevada has no artificial recharge program for aquifer storage.

Ground Water Quality

The Division of Environmental Protection (DEP) is responsible for implementation and enforcement of the Nevada Water Pollution Control Law, while the State Environmental Commission (within the Department) has exclusive power to promulgate rules and regulations necessary to implement the law. Such regulations provide authority to control the disposal of pollutants into wells in order to protect the public health and welfare, as well as prevent pollution of underground and surface water resources. The Commission is specifically charged with evaluating the economic impact of such regulations.

In addition, the Division of Mineral Resources (DMR) administers the Nevada Oil and Gas Conservation Law, and also has regulations protecting surface and subsurface fresh water from pollution related to oil and gas development.

Unless specifically authorized, the Nevada Water Pollution Control Law makes it illegal for anyone to discharge waste into any waters of the State without first obtaining a permit. High quality waters are to be protected to the greatest degree available given present technology.

To obtain a permit, discharger must submit an application to DEP, which reviews the application and prepares a draft permit. Following public review and comment a final permit is issued or denied. Permits may be issued for a term not to exceed 5 years. Application fees are charged and credited to a water pollution control permit fund, which is used to administer the program.

All permits are renewable if limitations are complied with restricting the quantity, rate and concentration of pollutants discharged. Such limitations are based on the effect on the receiving waters and its current beneficial use. Any permit may be revoked if its terms are violated or if it is obtained under false pretenses. Further, legislative changes may lead to the revocation or modification of a permit. Changes in discharges must be reported by submitting a new permit application.

The law specifically prohibits the discharge of any nuclear, biological, or chemical warfare agent or any high-level radioactive waste, as well as any proposed disposal which contradicts 208 area-wide waste treatement management plans, or rules and regulations of the Commission.

Any person aggrieved by the actions of the Director (DEP) on a permit decision may appeal to the Commission, which holds a public hearing prior to making the final determination. Most of the costs incurred by such an appeal are charged against the requesting party.

Under a memorandum of understanding with various State departments, the State Civil Defense has the authority and capability for emergency response.

A ground water classification system has not been adopted, nor have ground water standards been developed. Rather, all ground water is protected from contamination as described above.

The State has not applied for primacy under the tentative federal underground injection control (UIC) program. Rather it has been determined that State programs provide adequate protection, and the amount of federal funding available is not worth the effort. The State Engineer can prohibit the disposal of wastes through injection wells based upon possible contamination of fresh water aquifers. The primary types of such wells are oil and gas related, and geothermal. There are a limited number

of cooling water injection wells, but these are located in areas not affecting drinking water supplies.

The State has not adopted any land use controls to protect ground water. However, with respect to the land disposal of hazardous wastes, standards are being developed which will be equivalent to federal Resource Conservation and Recovery Act (RCRA) regulations.

NEW MEXICO

Ground water quality and quantity problems in New Mexico are significant, but they are adequately addressed by the State.

The New Mexico Water Quality Control Commission is primarily responsible for water quality, while specific quality problems are addressed by the Department of Health & Environment's Environment Improvement Division and by the Natural Resources Department's Oil Conservation Division (OCD) and Mining and Minerals Division (MM).

The State Engineers Office, Water Resources Division, Department of Natural Resources, is responsible for water quality management. However, under authority independent that delegated the Water Quality Control Commission, the State Engineer may limit changes in water well location (from areas of poor water quality), as well as the amount appropriated, as necessary to prevent or retard encroachment of poor quality water on sources of good quality water.

All the above state agencies are financed by appropriations through state general funds, except for OCD and MM which operated from a conservation tax which is imposed upon oil, gas and mineral production. In addition, EID, OCD and MM receive some federal grant monies.

With respect to potential management conflicts, the State Engineer is a member (ex officio) of the Water Quality Control Commission; thus water quality and quantity management are effectively coordinated.

Ground Water Allocation

In New Mexico, legislation was enacted in 1927 to control ground water use. It was amended in 1931, and it has subsequently formed the basis for New Mexico's current ground water law. In 1953 the law was amended to declare that all underground waters of the State belong to the public and are subject to appropriation

for beneficial use. However, no permit or license is required to appropriate water, except where the State Engineer has designated basins which have reasonably assertainable boundaries. At the present time 31 basins have been declared encompassing approximately 82,000 square miles or 67% of the State's area.

Anyone intending to appropriate ground water in a declared basin must apply for a permit from the State Engineer, who must find that there is unappropriated water, and that the proposed appropriation would not impair existing rights, before approving the proposed application. The burden is on the applicant to prove the latter, and provisions are made for hearing protests.

A landowner lawfully initiating a ground water right and completing development with reasonable diligence acquires a water right with a priority dating from initiation of the work, even though his land may be incorporated into a declared basin prior to completion. The State Engineer has regulatory authority in such areas, but certain domestic and stock watering uses are exempted from general administrative requirements under the law.

New Mexico regulates water well drilling, and has construction standards for wells which encounter artesian aquifers. In designated basins, a well drillers license must be obtained from the State Engineer to drill for water.

The State Engineer is also empowered to approve permit applications subject to appropriate conditions. This procedure provides some protection for prior ground water users in their means of diversion. However, the New Mexico Supreme Court has ruled that the lowering of a water table in any particular amount does not necessarily constitute an impairment of the water rights of adjoining appropriators. Further, in 1980, a right of replacement was created under the Mine Dewatering Act, which allows anyone whose appropriation or mine dewatering activities would otherwise impair existing water rights to provide such prior users with a

substitute water supply of adequate quality and sufficient quantity to prevent impairment. The State Engineer must approve the plan of replacement.

Among the State Engineer's other regulatory responsibilities are approval of any change in the location of any wells or change in the use of the water. In addition, ground water use rights may also be forfeited for failure to apply the water to beneficial use for a four-year period, if not applied to beneficial use within one year after notice. However, the Engineer may grant consecutive extensions on a showing of reasonable cause for non-use. Further, subject to certain conditions, a water right owner may drill a replacement or supplemental well.

Administratively, ground water mining is simply considered to be withdrawals from an aquifer in excess of recharge, and the State can and does prohibit mining in some situations. Further, the New Mexico Supreme Court has upheld the authority of the State Engineer to approve an application to appropriate water from an unrechargable ground water basin in a case where the Engineer determined the amount of water which could be withdrawn from the basin annually over a 40-year period and still leave one-third in storage. In effect, this puts a termination date on the right. With regard to the adjudication of ground water rights, the application of surface water adjudication procedures to ground water basins has been upheld in court.

The State does not have an artificial recharge program, but conjunctive use is addressed. In stream systems where surface and ground waters are interrelated, new appropriations may be approved upon the condition that any effects on the stream are offset by the retirement of existing surface water rights.

Ground Water Quality

The New Mexico Water Quality Act created the Water Quality Control Commission, which consists of representatives from the Environmental Improvement Division, the Department of Fish & Game,

the State Engineer, the Oil Conservation Commission, the State Park & Recreation Division, the Department of Agriculture, the Soil and Water Conservation Commission, the Bureau of Mines and Mineral Resources, and one public representative. The Commission is administratively attached to the Health and Environment Department.

The Commission is the state water pollution control agency responsible for all purposes of the Federal Water Pollution Control Act, the Water Quality Act of 1965 and the Clean Waters Restoration Act of 1966 (all federal laws). It is responsible for the development of a comprehensive water quality program and a continuing planning process, as well as water quality standards and the promulgation of regulations to prevent or abate water pollution in the State for all waters. The Commission is required in promulgating regulations to consider the risk to public health and welfare, economic reasonableness, technical practicality, property rights and accustomed uses. Responsibility for administering the Commission's regulations are assigned to constituent agencies, and to this end the Commission may make such classification of waters and sources of water contaminants as is necessary. Variances from the regulations due to hardship are allowed under established procedures.

Current regulations require that a notice of intent to discharge to surface and/or ground waters be filed with the Water Pollution Control Bureau of the Environmental Improvement Division, or in the case of facilities related to (1) the transportation or refining of crude oil or natural gas, or (2) geothermal operations, with the Oil Conservation Commission. Except for discharges in compliance with federal NPDES permits, state regulations prohibit the discharge of effluent which does not conform to established standards. Other discharges onto or below the surface of the groumd are controlled to protect all ground water with 10,000 mg/l or less total dissolved solids (TDS) for present and potential future use.

Any discharge which may threaten human health or welfare must immediately be reported to the Bureau, which includes spills,

leaks, or dumping regulated substances which have a reasonable possibility of reaching surface or subsurface water.

In general, the regulations allow degradation up to numerical standards set for human health and domestic water supply. In adopting numerical standards, acceptable risk is addressed by developing a reasonable safety factor based on medical testimony. Where these standards are already exceeded, no further degradation is allowed. Numeric standards for irrigation use have also been established.

The regulations state that no person shall cause or allow effluent or leachate to discharge directly or indirectly into ground water without an approved discharge plan. Subsequent discharges must be consistent with the terms and conditions of the plan. Exemptions from this requirement include discharge of (1) effluent or leachate conforming to the listed numerical standards and which does not contain any toxic pollutant; (2) small sewerage systems (less than 2,000 gallons per day) which are controlled by another Bureau of the Environmental Improvement Division; (3) irrigation water generally (except land application of sewerage, etc.); and (4) constituents subject to the NPDES permit program, flood control systems, natural leachate, leachate regulated under solid waste management regulations, or effluent or leachate regulated by the New Mexico Coal Surface Mining Commission or the Oil Conservation Division.

A proposed ground water discharge plan must set forth in detail the methods or techniques the discharger proposes to use, or processes expected to naturally occur, which will insure compliance with the regulations. Discharge plans must also provide for monitoring (including monitoring in the vadose zone and monitoring after cessation of operationns if required). Specific sampling and analytic techniques are specified. There are also various reporting requirements. In addition, the plan must include contingency plans, as well as measures to prevent ground

water contamination after the cessation of operations. There are also various other requirements.

Public notification and participation procedures must be complied with before a determination is made on a proposed discharge plan, and the Director (EID) has authority to approve, disapprove, modify or terminate discharge plans. Plans are approved for a period of no longer than 5 years. Decisions of the Director may be appealed to the Commission. Specifically, if a discharge plan is disapproved because it would not meet established numerical standards, the discharger may seek the Commission's consideration if he believes that the plan demonstrates the maximum use of technology within his economic capability, or that there is no reasonable relationship between the economic and social costs and benefits to be obtained, and that discharge under the plan would not create a hazard to public health or undue risk to property. Commission decisions may be appealed to the courts.

A ground water classification procedure has been established using total dissolved solids (TDS) as a measure of quality. The State has authority to prohibit disposal of waste where the affected ground water contains less than 10,000 mg/l (TDS). However, different categories have been created for ground water quality ranging from 5,000 to 10,000 mg/l and some aquifers may be designated for waste disposal by injection by the Water Quality Control Commission after public hearings.

Underground injection in the State mainly involves oil and gas wells, as well as in situ leaching of uranium and salt extraction processes. The OCD regulates the disposition of water produced or used in connection with oil and gas production and geothermal resources, under the Oil and Gas Act and the Geothermal Resources Conservation Act, respectively. OCD is also responsible to afford reasonable protection against contamination of fresh water supplies, designated by the State Engineer.

The Oil Conservation Division has received primacy from EPA under the Safe Drinking Water Act's underground injection control (UIC) program for Class II wells. The EID is preparing to submit an application for primacy to EPA. Related amendments to the Water Quality Control Commission's regulations were adopted in July and became effective this September.

With respect to land use controls, the State's Subdivision Act requires developers to insure that an adequate supply of water is available of appropriate quality for any new tracts. Further, the developer is required to adequately provide for the disposal of sewage.

In addition to ground water protection under the Water Quality Act, EID has regulated hazardous waste generation, transportation, disposal, storage and spills since 1978. Additional legislation was passed in 1981 to facilitate the State's application to administer the federal Resource Conservation and Recovery Act (RCRA) program.

OREGON

At the present time, the State of Oregon does not have a comprehensive state wide assessment of ground water problems due to a lack of funding. However, several area-wide problems have been identified under the Section 208 program. Individual aquifer protection plans have been developed in these areas to protect present and future ground water use. In addition, several site specific problems, which usually are the result of a single source, are being addressed as they arise.

Water quality mangement is the responsibility of the Oregon Department of Environmental Quality, Water Quality Division (WQD), under the Environmental Quality Commission (EQC). Water quantity issues are addressed by the Water Resources Department (WRD). Drinking water matters fall within the jurisdiction of the Department of Human Resources' Health Division. State programs are financed with general funds and federal grants.

Ground water quantity and quality conflicts are generally resolved informally on a case-by-case basis. EQC's ground water policy recognizes the authority and responsibilities of the Water Resources Department and Water Policy Review Board and is intended to compliment their efforts in the management and protection of ground water.

Ground Water Allocation

In Oregon, ground water use is governed by the Ground Water Act of 1955, which generally defines ground water to include any water beneath the land. Ground water use is regulated by the Water Resources Department through a permit system. However, stock watering, domestic purposes, small industrial and commercial uses (not exceeding 15,000 gallons per day) are exempted. Water rights prior to enactment of the Ground Water Act are recognized and confirmed, to the extent of prior maximum beneficial use. Water rights commenced prior to enactment and completed within a reasonable period of time thereafter are also recognized. Any user claiming a prior vested right was required under the Act

to register with the Director of the Water Resources Department and obtain a certificate evidencing his right. Failure to register within a set time period (which was extended to 1962) constituted abandonment. A certificate is not deemed to be a final determination of the extent of the right, because the right is still subject to adjudicatory determination proceeding.

With respect to new rights, an applicant must file for a permit with the Director. Protests against issuance of a permit may also be filed, and the Director may approve the application if he concludes there is unappropriated water available which can be put to beneficial use without impairing prior rights. Applications may be approved subject to conditions to prevent impairment of prior rights, wasteful use, and protect the public welfare. If approved, ground water use applications have a priority dating from their filing with the Director. The applicant must proceed with reasonable diligence to put the water to beneficial use, but upon showing of good cause the Director may extend the time limitations. Upon proof of completion of work, the Director issues a certificate evidencing the perfected right. Certificates and permits may be assigned, but are not binding except on the parties thereto unless recorded in the Director's Office.

The Director is responsible for identifying and defining the location, extent and characteristics of ground water reservoirs in the State, but before finalizing boundaries he is to make a final determination on the rights to the use of the water. Such a determination can be made upon his own initiative or upon petition of users from the reservoir. Subsequently, conflicting claims are adjudicated in the same manner as surface streams. In the end, the nature and extent of individual rights, the boundary of the reservoirs, the lowest permissable water level, acceptable methods of diversion, and rules for controlling water use are established by order of the Director, whose findings and order are filed with the court having jurisdiction over the matter. Following adjudication, the Director issues each user a ground water certificate evidencing his right.

Upon his own initiative or petition of basin water users, the Director may initiate proceedings to determine critical ground water areas where (1) water levels are declining excessively; (2) there is substantial interference between users; (3) ground water supplies are overdrawn; (4) water quality is deteriorating; or (5) he has evidence that there is no unappropriated water in the ground water reservoir. Following notice and hearing procedures, the Director may define the boundaries of the critical ground water area and may take corrective measures such as (1) denying future appropriation permits; (2) determining the amount of permissable total withdrawal under existing rights; (3) establishing preferences among uses without regard to priority of rights; (4) reducing withdrawals by individual users; (5) requiring pollution abatement; or (6) requiring rotation of ground water usage among users.

The above procedures control mining and provide some protection for prior ground water users in their means of diversion.

The State has established rules and regulations prescribing general standards for the construction and maintenance of water wells, and requires the licensing of water well constructors. A well constructor must notify the Director prior to commencing work and must submit a well constructor's log within 30 days after completion.

The State has no active arificial recharge program, but recharges are discussed in the law and the permit required to carry out such activities is described. There is no specific conjunctive use program.

Ground Water Quality

A number of Oregon statutes exist which define measurable environmental standards and clear limits to legal authority for the protection of surface water, including control of point source discharges. With ground water protection, the case is not comparably clear. There are no measurable standards, nor a uniform statewide

program. Accordingly, state and local officials have had difficulty in applying the available statutes as they relate to ground water protection.

Two legislative policy statements which relate to pollution control and the appropriation of water generally provide that the impairment of ground water by pollution be prevented or controlled within practicable limits. Specifically, the legislature has declared that it is the policy of the State to protect, maintain and improve the quality of the waters of the State for beneficial uses; to provide that no waste be discharged into any waters without first receiving the necessary treatment or other corrective action to protect beneficial uses, and to provide for the prevention, abatement and control of new or existing water pollution.

The Environmental Quality Commission (EQC) adopted a general ground water quality protection policy on August 28, 1981, which states that under its responsibilities, EQC will minimize the impairment of natural ground water quality within practicable limits to protect present and future beneficial uses. The Department of Environmental Quality (DEQ) with the assistance of the Department of Water Resources, is to design an ambient monitoring program adequate to determine long-term quality trends for significant ground water flow systems.

Consistent with general EQC policies for the protection of surface water, the highest and best practical treatment and control of sewage, industrial waste and landfill lechates is required so the potential for ground water pollutant loading will be minimized. In arriving at a case-by-case determination of highest and best practicable treatment and control, energy, economics, public health protection, potential present and future value of the ground water resource, the time required for recovery from ground water degradation and other factors are considered. More stringent controls may be required in specific areas, including critical areas designated by the Water Resource Director for reasons

of quality and EPA designated sole source aquifers under the Safe Drinking Water Act. Less stringent controls may be approved by EQC upon a showing that lesser controls will adequately protect beneficial uses.

Existing subsurface, solid waste, and hazardous waste guidelines also address ground water protection. Disposal of wastes onto or into the ground in a manner which allows potential movement to ground water is regulated under the existing rules of DEQ for water pollution control permits, which specifically include ground water quality protection, monitoring and reporting requirements, as do solid waste disposal facility permits issued for landfills and sludge disposal. Further, amendments are proposed to correct deficiencies as they arise where on-site sewage disposal system construction permits do not adequately protect ground water quality.

Where ground water quality is being degraded by waste disposal practices, DEQ requires the necessary approved waste treatment and disposal practices. Where an area-wide approach is necessary, the Department cooperates with local governments to develop and implement a ground water quality protection plan, and will resort to formal abatement orders and civil penalties only if voluntary compliance efforts are not successful.

Under the Oregon State Land Use Act, local communities and counties must develop comprehensive land use plans which are to address identified ground water problems. These aquifer-protection plans often utilize density requirements to protect the aquifer. While in most instances these authorities are adequate, in certain areas special control measures are necessary to insure protection of ground water quality for beneficial use.

EQC is responsible for reviewing local ground water quality protection plans, and limited degradation is allowed providing: (1) beneficial use will not be significantly impaired, (2) public health risks are not significantly increased; (3) irreparable damage to the ground water resource does not occur; (4) the ground

water protection plan is duly adopted by the responsible local government and an agreement has been reached as to a timetable for implementation with EQC; and (5) a financing plan has been developed and adopted to insure implementation. Where an extensive areawide problem is being addressed, local agencies are required to include aquifer protection plans developed under Section 208 grant projects.

In order to minimize ground water quality degradation from non-point sources, it is EQC policy that appropriate state-of-the-art management practices be used with activities associated with land management, chemical application and handling, and spill prevention.

Currently, aquifer protection is handled on a case-by-case basis. The State does not have an adopted aquifer classification system, but a statewide map of sensitive aquifers is utilized in managing waste disposal. No aquifers have been individually designated for waste disposal. In cases where ground water suspected of contamination is being used as a domestic source, federal drinking water standards have been applied.

The Department of Environmental Quality has emergency authority and capability to respond to ground water problems primarily through its ability to affect activities under state permit, whether these activities relate to solid waste facilities, water pollution control facilities or subsurface sewerage. With respect to the latter, EQC can place an immediate moritorium on the issuance of septic permits, thus halting construction of any new units in an area. Further, under the point source permit program immediate action can be taken against permittees.

The State has not yet been delegated primacy for EPA's underground injection control program, but delegation will probably be received this year. Injection wells for subsurface disposal are not generally utilized in Oregon. However, in eastern Oregon it was an acceptable practice for some time to drill a "dry hole" for the disposal of urban runoff, sewage waste, etc.

DEQ policy now prevents such practices and existing wells are being phased out. In some geothermal areas, reinjection wells are used for spent fluids, and another major underground injection disposal practice involves air conditioning cooling water. Other than for these purposes, the Department does not allow pressurized injection of waste into the ground.

TEXAS

In Texas, ground water quality problems due to the activities of man are not significant, although localized areas have been polluted or impacted by nonregulated or noncompliant activites in years past. This has caused pockets of pollution immediately around the source, but there are no statewide or aquiferwide quality problems. Most of the unregulated activities of the past have been brought under regulatory control, and non compliant activities are being corrected through administrative and enforcement remedies available under state and federal law.

Ground water quantity problems in Texas are significant. Wide spread aquifers underlie 50 percent of the State's land surface. There are seven major aquifers and seventeen minor aquifers from which ground water withdrawals have increased in the last 40 years from 700,000 acre-feet annually to over 12 million acre-feet at present. Water quality has remained acceptable for existing uses. Existing utilization in several major aquifers has resulted in significant depletion of existing supplies of ground water. Depletion of some aquifers has been projected for the foreseeable future. Locally, problems with salt water intrusion and land subsidence have increased.

The State has very limited authority and responsibility for ground water quantity management. However, the State water code does provide for the creation of underground water conservation districts with broad powers to regulate well spacing and pumpage. Several conservation districts have been formed, but a significant part of the ground water resources of the State are not within the jurisdiction of the currently active underground water districts.

The Texas Department of Water Resources has primary responsibility for ground water quality protection, with some responsibilities designated and shared by the Texas Railroad Commission and the Department of Health. Underground water

management is one of several issues being addressed in the revision of the Texas Water Plan. All state programs are financed by legislative appropriations, which in some instances are supplemented with federal funds.

Ground Water Allocation

The State does not have ground water appropriation codes or regulations. In Texas, all ground water is presumed to be percolating and is owned by the surface owner. A landowner may take all the ground water he can capture. The water may be used on or off the land from which it is withdrawn and may be sold to others. Further, a law passed by the Texas Legislature in 1965, to prohibit the interstate transfer of ground water supplies purchased by an Oklahoma municipality from Texas landowners, was struck down as unconstitutional on the grounds that the water was personal property and that such a prohibition on transfer was an undue burden on interstate commerce. The federal court decision was upheld by the Supreme Court.

The State cannot currently prohibit the mining of ground water, although underground water districts may regulate well spacing and pumping rates. The State does license well drillers and has general well construction and plugging requirements.

The State is not directly involved in artificial recharge programs.

Ground Water Quality

As described above, the State has a very limited role in ground water quantity management, but extensive efforts have been devoted to protecting ground water quality through monitoring, planning, technical assistance and control of pollution through administration of state and federal legislation. Primary state legislative authority dealing with ground water quality comes from the Water Quality Act, Injection Well Control Act, and other legislative authority contained in the Texas Water Code and the Solid Waste Act. Under the State's Natural Resources Code, water

quality is further protected by control of ground water used for oil and gas production. Underground storage of hydrocarbon products is also regulated.

The State has emergency response authority under the Texas Water Code, the Federal Clean Water Act, the Resource Conservation and Recovery Act (RCRA) and "Superfund." Further, the State has developed an oil and hazardous spill response plan.

It is the policy of the State to maintain the quality of water (including ground water) consistent with public health and welfare, economic, and environmental goals. The Texas Water Commission is authorized to issue permits establishing treatment requirements for waste discharged into or adjacent to any water, as well as to specify the conditions under which the discharge may be made. The Executive Director of the Department of Water Resources is required to prepare and develop a general, comprehensive plan for the control of water quality in the State, and the plan is to be approved by the Texas Water Development Board. The Board is statutorily required to set water quality standards, and has exclusive jurisdiction to do so.

Waste discharge permit applications are submitted to the Department, but are formally approved or denied by the Commission. No permit may be issued authorizing the discharge of any radiological, chemical, or biological warfare agent of high-level radioactive waste. The Commission may also refuse to issue any type of permit violating the provisions of any state or federal law, rule or regulation. Construction of waste treatment facilities may not be commenced prior to the issuance of a permit to discharge waste from a facility, except with the approval of the Commission. The Board may prescribe reasonable requirements to monitor and report waste collection, treatment and disposal activities. The Executive Director may initiate a civil suit to enjoin violations of the law, and subsequently seek civil penalties.

The Commission is specifically prohibited from requiring any permit for the placing of dredge or fill materials, although this does not limit the Commission's authority with respect to the control of water quality in connection with dredging or filling operations. Rules and regulations governing the discharge of dredged and fill materials may be adopted by the Water Development Board.

Texas has not adopted a ground water aquifer classification procedure, although ground water quality is classified on the basis of concentration of total dissolved solids. Aquifers can be designated for waste disposal, but not to the exclusion of all other uses. No aquifers or portions of aquifers had been so designated. Rather, control is exercised through the permit program, and requests for disposal of wastes into an aquifer are considered on a case-by-case basis.

The State has been delegated responsibility for the federal underground injection control (UIC) program, and the disposal of waste by deep well injection is prohibited, except when authorized by permit. Permits are site-specific with conditions determined on a case-by-case basis. Class I industrial waste disposal wells are extensively used, but the main type of underground injection wells used in the State are Class II wells for the disposal of salt water produced from the exploration, development and/or production of oil and gas. Class III wells involving solution mining of uranium, sodium sulphate, sulphur, etc., are also numerous. Of all injection wells being used today, salt water disposal wells total about 40,000, solution mining wells 9,000 and 130 permitted industrial waste wells.

Ground water quality is also protected through other policies and procedures authorized under the Texas Water Code and Solid Waste Act. Pursuant to this legislation, the Department has developed design standards for waste treatment and storage facilities, manages waste disposal practices through terms and conditions placed in permits, and has adopted rules, regulations and guidelines as necessary to protect ground water quality.

The State has issued orders to protect ground water quality in critical aquifer recharge zones which contain restrictions or controls that affect land use. Further, the State has developed siting guidelines for the land disposal of hazardous waste, which is regulated by permit.

UTAH

Ground water problems in Utah are primarily of a localized nature. There is some contamination of shallow ground water aquifers, especially in areas of dense housing where septic tanks are used for waste water disposal. However, these ground water sources have not been used for drinking water. There are a few problems with contamination of drinking water supplies in the State, though the sources of contamination are probably natural.

The Bureaus of Water Pollution Control and Public Water Supplies, within the State Health Department, have primary responsibility for ground water quality. The State Engineer (Department of Natural Resources) has authority to administer water rights in the State for both surface and ground waters. Ground water quantity and quality issues are coordinated on an informal basis among the concerned agencies of the Department of Health (DOH) and the Department of Natural Resources (DNR). No significant conflicts have been apparent in the past.

State programs are financed primarily through state appropriations with some assistance in the form of EPA program grants.

Ground Water Allocation

Utah's Water Code covers the appropriation and administration of ground water. In 1935, the water law was amended to make all ground water within the State (with one minor exception) subject to the appropriation doctrine and provide that rights to ground water could only be acquired by filing an application with the Office of the State Engineer. The only exception is diffused percolating underground water near the surface, which sustains beneficial plant life on an owner's land (without artificial diversion) and follows no identifiable route into a water course or onto lands of others. Such water is considered to be part of the soil. Practically, this is only soil moisture which is

not a realistic source of water supply, and therefore represents no signficant problem in water rights administration.

Prior to 1935, ground water was subject to appropriation simply by diversion and beneficial use. These early "diligence" rights to ground water have subsequently been defined by the court as limited to the amount which actually had been placed in beneficial use prior to the water code amendments in 1935. Currently, the procedure for initiating and perfecting a right to ground water is the same as that for surface water.

A well driller in Utah must obtain an annual permit from the State Engineer and upon completion of drilling, a report is required which includes a log of the well. Failure to meet these requirements is a misdemeanor. The State Engineer has also adopted rules and regulations concerning the construction and maintenance of water wells.

With respect to the mining of ground water, the State Engineer has authority to determine if existing supplies are adequate to meet existing claims. If not, he is to allocate the supply according to the priority of the rights. The State Engineer is also authorized to control artesian wells to prohibit waste. Utah water law does not define nor prohibit the mining of ground water, but it has been the policy of the State Engineer to attempt to avoid serious overdrafts. The State Engineer can allow mining in certain areas if it is determined to be in the best interest of the State.

Historically, under Utah law, an appropriator was entitled to the maintenance of the hydrostatic pressure of artesian flow as part of the water right. Thus, subsequent appropriators who impaired or interfered with this means of diversion were required to replace the water. However, the Utah Supreme Court has modified this rule (at least as it applied to changes of existing rights) concluding that ground water users do not have an absolute guarantee to hydrostatic pressure, but must suffer some reasonable reduction

so as to maximize the beneficial development and use of the underground basin. Therefore, each user is required to maintain a reasonably efficient means of diversion. Individual well interference problems are generally evaluated on their merits, and if substantial, the new appropriator may be required to compensate the prior user or users.

The State has no formal articifial recharge program, though several potential areas of the State have been studied. Neither does the State have a formal conjunctive use program, but the State Engineer recognizes the interrelationship between surface and ground water supplies and encourages conjunctive use wherever possible.

Ground Water Quality

The Utah Water Pollution Control Act regulates pollution of waters of the State, which includes both surface and ground waters. However, little has been done in the past to specifically study ground water problems due to a lack of resources. There have been some studies of specific localized problems completed under the federal 208 water quality management planning program. Ground water problems may also be addressed under authority of the federal hazardous waste control program, and assistance relative to site specific questions has been provided on occasion by the Utah Geological and Mineral Survey.

The Utah Water Pollution Control Committee, staffed by the Bureau of Water Pollution Control, has adopted water quality standards, including designations of Class 1A and Class 1B waters, which are ground waters used for culinary water supply. The State's water quality standards are not numeric, and do not address acceptable risk. Economic factors are considered in development of the standards, though protection of the environment is of high priority.

With respect to emergency response authority, state statutes require the reporting of spills of oil or hazardous substances to waters of the State. Some resources are available for subsequent cleanup efforts (generally through the Governor's emergency fund and the federal "superfund" program administered by EPA).

The State has not adopted any ground water aquifer classification procedure, and there is no intention of designating certain aquifers for waste disposal. The Committee has regulations for subsurface disposal of domestic wastes, underground injection control and surface disposal of brines produced from oil and gas wells. The Division of Oil, Gas and Mining (DNR) has legislative authority to control underground injection and reinjection of brines associated with oil and gas production. The State can and does now prohibit the disposal of waste through deep injection wells.

The State has not yet received primacy under EPA's underground injection control (UIC) program, though applications have been made by both the Bureau of Water Pollution Control and the Division of Oil, Gas and Mining (for Class II wells). Approval is expected soon.

By far the most common types of injection wells are for the reinjection of brine in oil and gas production, both for disposal and for secondary recovery. There are also injection wells for solution mining, geothermal water reinjections, heat pump reinjection, etc. No injection wells have been approved for the disposal of "wastes" and there are no known drinking supply contamination problems related to injection wells.

The Bureau of Hazardous Waste Management (DOH) operates a program to control the disposal of hazardous waste and prevent contamination of ground water. Siting guidelines for hazardous waste facilities have also been developed, and the basic criteria address ground water protection, as well as other environmental goals. Currently, a state hazardous waste siting plan is being

written which will include candidate sites that the Solid and Hazardous Waste Committee has determined satisfy the established criteria. Facility standards and state regulations will be equivalent to finalized EPA land disposal regulations under the Resource Conservation and Recovery Act (RCRA).

WASHINGTON

A primary problem facing the State of Washington is the lack of adequate data regarding ground water quality. A state wide review has found that of 21 principal aquifers, representative data is lacking in all but four: Puget Sound, Yakima, Spokane, and Columbia Basin regions. In the other aquifers, generalizations about ground water quality, except on a local basis, cannot be made due to a lack of data. From what is available, it appears that ground water quality is generally good, but some areas have high concentrations of dissolved solids, fluoride or nitrates due to natural causes. Some isolated instances of man-caused pollution are also known, including the Lakewood (Pierce County) and Meade (Spokane County) areas. However, on a statewide basis, ground water quality is not a major problem.

Some ground water quantity problems could also be labeled as significant because of a declining water table. A major factor in Washington hydrology is the variability and complexity of the many aquifer systems, particularly the basalt systems in eastcentral Washington. These systems hold large quantities of water in storage, but are often very sensitive to large agriculture withdrawals, which sometimes adversely affect spring and stream flows as well as shallow domestic wells. With respect to deep wells, water levels could (without careful management) be drawn down to a point where it would no longer be economically feasible to pump. These conditions are becoming significant in some areas of the State.

The Washington Department of Ecology is responsible for both water quality and water quantity management. Program planning and management activities are carried out by the Office of Water Programs. Implementation activities are carried out by the Office of Field Operations. These activities are financed primarily with state general funds. However, additional sources of revenue include State Referendum 39 bond funds, state coastal protection funds, and federal funds under Section 106 of the Clean Water Act and Section 1443 of the Safe Drinking Water Act (UIC funds).

The Department of Ecology has four regional offices which are staffed with water allocation and water quality professionals. Any site specific water resource management conflicts are normally handled at the regional office level. Policy conflicts, either within the Department or with other entities, are resolved through the Office of Water Programs, after consultation with the various regional offices and other involved entities.

Ground Water Allocation

Since 1945, the State has regulated ground water use. The ground water code is supplemental to the surface water code, and is subject to the same statutes governing appropriation and beneficial use. Ground water is defined as all waters beneath the land surface or beneath stream beds or other surface water bodies. The law is based on the premise of "first in time is first in right" and is also applicable to interrelated surface and ground waters.

Once an appropriation application is approved, the works are constructed, and the water is put to beneficial use, a certificate evidencing the perfected right is issued. The 1945 Act also provided for the recording of ground water rights which vested prior to that time, and the issuance of a certificate with a priority as of the date of the earliest beneficial use of the water. The permit or certificate may also be amended to change the location of withdrawal without a loss of priority, provided that the new well taps the same ground water supply, will not enlarge the right and other existing rights will not be impaired. The Act prohibits the waste or pollution of ground water, and all artesian wells must be equipped with flow regulating devises. The State licenses well drillers, and minimum well construction standards have been established.

Within a ground water basin, the prior appropriator has the superior right over subsequent users from the same source to the

extent of his beneficial use. Aquifers are generally administered so as to maintain a safe sustained yield, and the Director may designate areas and sub-areas which are independently administered to prevent overdraft. Withdrawals can then be adjusted to reflect the current supply and needs of all users. Conflicts between users may be resolved through statutory adjudication proceedings. Further, the Director may appoint water supervisors to properly administer and distribute the water. Ground water rights are subject to forfeiture through non-use.

Ground water appropriation is generally limited to the capacity of the aquifer system, taking into account reasonable pumping lifts and/or reductions of artesian pressure. However, mining as such is not expressly prohibited. Administratively, state policy allows for planned depletions in some ground water management areas (i.e., withdrawals exceed net natural recharge from all sources and long term water levels decline in the aquifer).

Washington statutes do not directly address protection of an appropriator's works (or means of diversion) as part of a water right. Some protection of works is provided through the above described policy for managing aquifers. The State does protect prior appropriators who are fully utilizing the aquifer, but not those with pump settings close to the top of the aquifer. The object is to fully utilize aquifer reservoir capacity. Therefore, in granting a permit for the withdrawal of ground water, the Director of the Department of Ecology must take into account the capacity of the aquifer system, as well as the impact on prior existing rights.

The State encourages the conjunctive use of surface and ground waters to the fullest extent possible, subject to the preservation of other existing rights. However, there is no active conjunctive use program. Some recommendations have been made in the Walla Walla River Basin Management Program, which conclude that conjunctive use is feasible and necessary for the full development of that basin's water resources.

With respect to artificial recharge, the State has no specific water storage program, but a process is provided by law for claiming ownership and use of artificially stored ground water in a designated ground water area, sub-area, or zone. Owners of artificially stored waters use this process in lieu of the normal water right appropriation process.

Ground Water Quality

Primary authority for addressing ground water contamination comes from the Washington Water Pollution Control Act, and to a lesser degree solid and hazardous waste laws and regulations. Resources available to address specific ground water contamination problems are very limited. To better insure an effective allocation of these limited resources, the State is developing a ground water quality management strategy that will better coordinate the various ground water quality related efforts. These include monitoring, assessing the impacts of storm water disposal on ground water quality, regulating on-site sewage disposal systems, responding to spill emergencies, and a variety of ground water related activities pursuant to the Federal Reserve Conservation and Recovery Act (RCRA).

The State has not adopted a ground water classification procedure to designate the degree of environmental protection to be afforded an aquifer. Rather, the law requires all dischargers to waters of the State to employ all known, available and reasonable treatment to prevent and control pollution, economic factors influence the definition of reasonable. The State does not have numeric ground water standards. Therefore, the issue of acceptable risk has not been addressed.

The State of Washington is in the process of seeking primacy for the federal underground injection control (UIC) program, but prior to delegation the administrative regulations establishing a permit program for discharges to ground water must be revised. The State does not now prohibit the disposal of waste through deep injection wells, but this practice is severely restricted.

The main type of underground injection wells found in Washington are for storm water disposal (Class V). There are thousands of such dry injection wells in Washington, but only one well that falls in Classes I through IV. An assessment of Class V well activities is just being initiated, but based on the limited amount of ground water quality data available, there do not appear to be wide spread drinking water supply contamination problems.

The State has not adopted any land use controls to protect ground water as this is viewed as a responsibility of local government. Spokane County has exercised some land use controls over a designated sole source aquifer (under the Safe Drinking Water Act) through adoption and implementation of a 208 plan.

The State has established one hazardous waste disposal site for which siting criteria include protection of ground water quality.

WYOMING

Ground water quality problems in Wyoming may be viewed as significant in view of the potential impact of industrial and mineral development, as well as population pressures. So far, most impacts have not exceeded established quality criteria/standards, but in some instances corrective action has been required.

Several state agencies are authorized to address specific ground water problems. Water quality is primarily the responsibility of the Department of Environmental Quality, which includes the Water Quality Division (WQD), Land Quality Division (LQD), and Solid Waste Administration (SWA). Each addresses specific problems related to ground water protection. The State Engineer's Office is responsible for ground water allocation. In addition, the Oil and Gas Conservation Commission is also directly involved in some matters concerning ground water utilization. To date, the State has not experienced serious conflicts between ground water quality regulation and allocation.

Ground water related activities are generally financed through legislative appropriations from the general fund, with some funding from federal grants.

Ground Water Allocation

Wyoming's basic ground water law was enacted in 1947, and has been amended several times. Ground water rights acquired prior to enactment are considered vested if the owner had completed development and put the water to beneficial use, provided a statement to that effect was filed with the State Engineer by 1957. The priority of ground water appropriations completed prior to April 1, 1947 dates from the filing of the registration. Rights were acquired after April 1, 1947 by completing development and registering the well with the State Engineer. Beginning in 1969, the law was amended to prohibit construction of any well without first obtaining a permit from

the State Engineer. Stock and domestic wells, which had previously been exempted, were provided an opportunity to register and retain the date of completion as a priority date. Ground water rights are subject to the same preferences as provided for surface water, except that stock and domestic use have a preferred right regardless of their priority dates.

Currently, applications to appropriate ground water will be granted provided (1) it is a beneficial use, (2) it is not in a control area, (3) the means of diversion are adequate, and (4) the filing is in the public interest as determined by the State Engineer. In areas which have been designated as control areas, notice must be published, objections may be filed, and a hearing is held. The State Engineer may approve an application if he finds that there is unappropriated water, the means of diversion are adequate, the well is properly spaced, and the proposed use will not be detrimental to the public interest. The State Engineer may condition any permit to insure the latter.

Permits to appropriate ground water include time limits for the commencement and completion of construction, and the application to put the water to beneficial use. Upon completion of a project, proof of appropriation is submitted, the facility is field inspected, and a certificate is issued if the terms of the permit have been satisfied. It is a misdemeanor to drill a well without obtaining a ground water permit, and permits may be cancelled (after notice and hearing) for violations of any provisions of the permit, of the Act, or of any order issued by the State Engineer pursuant to the Act. The State does not license well drillers, but there are minimum water well construction standards. Further, a report is required on abandonment of works.

The State Engineer is authorized, under the oversight of the Board of Control, to (1) prescribe rules and regulations necessary to administer the Ground Water Act, (2) require reports from well drillers and water users, (3) establish standards for well construction, (4) prevent waste or pollution of ground

water, (5) initiate action to secure compliance with provisions of the law, and (6) in control areas, make well spacing regulations and determine the boundaries of districts overlying the various aquifers.

A ground water control area may be designated where (1) withdrawals are approaching recharge, (2) water levels have declined excessively, (3) there are actual or potential conflicts between users, (4) waste is occurring or may occur, or (5) specific conditions require regulation in the public interest. The State Engineer reports such conditions to the Board of Control, which after hearing and upon sufficient evidence may designate a control area. Subsequently, a district advisory board is elected to assist in administration of the basin. Once boundaries of the area are determined, the Board of Control adjudicates the various rights and issues certificates defining individual rights.

Upon petition of the users, or the State Engineers own initiative, and after hearings, a basin's supply may be determined to be inadequate for existing needs and may be closed to further appropriation. The State Engineer may also determine the total permissable withdrawal and apportion the water according to the priority of rights. He may also require rotation of use in a control area if he determines that the cessation of use by junior appropriators will not result in proportionate benefits to senior appropriators. The law also allows appropriators from a control area to agree on a method of withdrawal. In accordance with the above procedures, ground water mining can be prohibited.

Also, as described above, the State provides protection to prior ground water users if their means of diversion (well) is "adequate." Wyoming law provides as an express condition of each permit that an appropriators right does not include the maintenance of a specific water level or artesian pressure greater than that required for maximum beneficial use of the source of supply. However, if adequacy can be determined, subsequent users can be required to cease withdrawals or compensate prior appropriators

Specific numeric standards have been established for Classes I, II, III, and Special A. A discharge into aquifers in these classifications shall not result in the violation of of the standards (see tables on following pages) at any place or places of withdrawal or natural discharge to the surface generally. The quality requirements for industrial water supplies (IV) cover a wide range depending upon industrial application. Discharges into any of the heretofore described classifications may not impair the quality of ambient ground waters of the same classificiation or contribute to, cause, allow, or permit any toxic, hazardous or deleterious affect on natural biota.

With respect to Class V ground waters, discharges shall not result in degredation or pollution or waste of other water resources. Class V mineral ground water must at a minimum be returned to a condition and quality consistent with the pre-discharge classification of the water. With respect to Class VI unsuitable or unusable ground water, such classifications are made (1) due to excessive concentrations of TDS (greater than 10,000 mg/l), or (2) where the water is already so contaminated that it would be economically or technologically impractical to make use of the water, or (3) where it is located in such a way, including depth, so as to make use impractical.

No category classification may contain biological, hazardous, toxic or potentially toxic materials or substances in concentrations or amounts which exceed those allowable under EPA water program regulations for primary drinking water and hazardous substances.

The classification of ground waters are based upon the established standards and its suitability for actual and intended uses. Acceptable risk is not addressed by statute. Economics is one of several factors which the Administrator is to consider in recommending any water quality standards, rules, regulations, or permits.

for deepening wells, additional pumping costs, etc. With respect to wells used solely for domestic and stock watering purposes, upon complaint the State Engineer may order an interfering well to cease or reduce withdrawals unless the water is replaced, whether or not the wells are in a control area.

An appropriator may change the location of a well without a loss in priority. If the right has been adjudicated, approval must be secured from the Board of Control, otherwise the change must be approved by the State Engineer. Ground water rights may be adjudicated under the same procedures applicable to surface waters. Further, they may similarly be declared abandoned and forfeit.

The State does not have a specific conjunctive use program, but the law recognizes that often surface and ground water supplies are interconnected and provides for their unified administration. The State does not have an artificial recharge program, nor does it appropriate artificially stored ground waters.

Ground Water Quality

The Wyoming Environmental Quality Act gives the Department of Environmental Quality broad authority to prevent, reduce and eliminate pollution, and preserve and enhance the air, water (including ground water) and land resources of Wyoming. Specifically, the Department has developed ground water rules and regulations and quality standards. Protection is provided from direct subsurface of waste or migrating pollution, well or exploration hole drilling, potential polluting surface facilities, and mining operations.

Ground waters of the State are classified by regulation as domestic (I); agriculture (II); livestock (III); fish and aquatic life (Special A); industry (IV A) less than 10,000 mg/l total dissolved solids (TDS), and (IV B) TDS greater than 10,000 mg/l; hydrocarbon, mineral or geothermal (V); and unusable or unsuitable ground water (VI).

Wyoming has assumed primary responsibility for administering the federal underground injection control (UIC) program. The main type of underground injection wells used in the State are those associated with secondary petroleum recovery operations (Class II). Others include in situ mining projects (Class III) and one industrial waste disposal project (Class I). The State can prohibit waste disposal by injection if it would endanger fresh water supplies.

The State has delegated authority for land use planning to the counties, and counties have developed individual land use plans of a general nature. Ground water quality is directly and indirectly protected by Department of Environmental Quality rules and

The State has delegated authority for land use planning to the counties, and counties have developed individual land use plans of a general nature. The State has not adopted specific land use controls to directly protect ground water. Ground water quality is directly and indirectly protected by Department of Environmental Quality rules and regulations (as previously described) and other state statutes and regulations.

The State has not yet assumed primacy for EPA's Resource Conservation and Recovery Act (RCRA) program, therefore the disposal of hazardous waste is regulated by the EPA.

TABLE I

UNDERGROUND WATER CLASS Use Suitability Constituent or Parameter	I Domestic Concentration*	II Agriculture Concent.*	III Livestock Concent.*
Aluminum (Al)	---	5.0	5.0
Ammonia (NH_3)	0.5[8]	---	---
Arsenic (As)	0.05	0.1	0.2
Barium (Ba)	1.0	---	---
Beryllium (Be)	---	0.1	---
Boron (B)	0.75	0.75	5.0
Cadmium (Cd)	0.01	0.01	0.05
Chloride (Cl)	250.0	100.0	2000.0
Chromium (Cr)	0.05	0.1	0.05
Cobalt (Co)	---	0.05	1.0
Copper (Cu)	1.0	0.2	0.5
Cyanide (CN)	0.2	---	---
Fluoride (F)	1.4-2.4[7]	---	---
Hydrogen Sulfide (H_2S)	0.05	---	---
Iron (Fe)	0.3	5.0	---
Lead (Pb)	0.05	5.0	0.1
Lithium (Li)	---	2.5	---
Manganese (Mn)	0.05	0.2	---
Mercury (Hg)	0.002	---	0.00005
Nickel (Ni)	---	0.2	---
Nitrate (NO_3-N)	10.0	---	---
Nitrite (NO_2-N)	1.0	---	10.0
(NO_3+NO_2)-N	---	---	100.0
Oil & Grease	Virtually Free	10.0	10.0
Phenol	0.001	---	---
Selenium (Se)	0.01	0.02	0.05
Silver (Ag)	0.05	---	---
Sulfate (SO_4)	250.0	200.0	3000.0
Total Dissolved Solids (TDS)	500.0	2000.0	5000.0
Uranium (U)	5.0	5.0	5.0
Vanadium (V)	---	0.1	0.1
Zinc (Zn)	5.0	2.0	25.0
pH	6.5-9.0s.u.	4.5-9.0s.u.	6.5-8.5s.u.
SAR	---	8	---
RSC	---	1.25 meq/l	---
Combined Total Radium 226 and Radium 228[9]	5pCi/l	5pCi/l	5pCi/l
Total Strontium 90	8pCi/l	8pCi/l	8pCi/l
Gross alpha particle radioactivity (including Radium 226 but excluding Radon and Uranium)[3]	15pCi/l	15pCi/l	15pCi/l

*mg/l, unless otherwise indicated

TABLE I

UNDERGROUND WATER CLASS Use Suitability Constituent or Parameter	Special (A) Fish/Aquatic Life Concentration *
Aluminum (Al)	0.1
Ammonia (NH_3)	0.02[1]
Arsenic (As)	0.05
Barium (Ba)	5.0
Beryllium (Be)	0.011-1.1[3]
Boron (B)	---
Cadmium (Cd)	0.0004-0.015[3]
Chloride (Cl)	---
Chromium (Cr)	0.05
Cobalt (Co)	---
Copper (Cu)	0.01-0.04[3]
Cyanide (CN)	0.005
Fluoride (F)	---
Hydrogen Sulfide (H_2S)	0.002[2]
Iron (Fe)	0.5
Lead (Pb)	0.004-0.15[3]
Lithium (Li)	---
Manganese (Mn)	1.0
Mercury (Hg)	0.00005
Nickel (Ni)	0.05-0.4[3]
Nitrate (NO_3-N)	---
Nitrite (NO_2-N)	---
(NO_3+NO_2)-N	---
Oil & Grease	Virtually free
Phenol	0.001
Selenium (Se)	0.05
Silver (Ag)	0.0001-0.00025[3]
Sulfate (SO_4)	---
Total Dissolved Solids (TDS)	500.0[4]-1000.0[5]-2000.0[6]
Uranium (U)	0.03-1.4[3]
Vanadium (V)	---
Zinc (Zn)	0.05-0.6[3]
pH	6.5s.u.-9.0s.u.
Combined Total Radium 226 and Radium 228[9]	5pCi/l
Total Strontium 90	8pCi/l
Gross alpha particle radioactivity (including Radium 226 but excluding Radon and Uranium)[9]	15pCi/l

*mg/l, unless otherwise indicated

CONCLUSION

In general, ground water management problems in the West are adequately addressed by western states using existing legislative authority and administrative programs. Some state programs have suffered due to a lack of technical and financial support. Authority to address specific ground water problems can also be delegated to the states under various federal laws. No single management strategy can be identified as right or wrong, rather different approaches should be evaluated as to their utility in achieving various state ground water management goals. Some serious ground water problems do exist and evolving needs may call for different approaches. Hopefully the information in this report will help identify various management alternatives. In view of the states responsibility for the allocation of water resources, land use planning and the regulation of a wide range of human activities which could potentially lead to ground water contamination, state governments should be primarily responsible for ground water management.

Appendix A

WESTERN STATES WATER COUNCIL

220 South 2nd East Suite 200 Salt Lake City, Utah 84111 Phone (801) 521-2809

MEMORANDUM

TO: Water Quality Committee

FROM: Tony Willardson

DATE: February 11, 1982

As directed by the Committee and Ground Water Subcommittee, the attached questionnaire is being distributed in order to examine the status of western state ground water programs. The list of questions is not exhaustive, but is designed to provide some basic information from which to evaluate the extent of western ground water problems and potential management needs. In addition to answering these questions, any additional, perhaps more specific, information which you might supply would be helpful. In order to be able to compile a summary document for consideration by the Committee at the Council's April meetings, I would appreciate it if you could respond by March 19. Please let me know if you have any questions or problems in compiling this information. Thanks for your help.

STATE GROUND WATER MANAGEMENT

QUESTIONNAIRE

III. Under Ground Injection Control

1. What are the main types of underground injection wells used in the state?

2. What is the scope of the use of injection wells for subsurface waste disposal, and what is the scope of related drinking water supply contamination problems?

3. Has the state been delegated the responsibility for the federal underground injection control program under the safe drinking water act? If not, what progress has been made toward attaining primacy and what problems have been encountered?

4. Does (or can) the state prohibit the disposal of waste through deep injection wells?

IV. State Ground Water Allocation Systems

1. Does the state have ground water appropriation codes or other regulations?

2. Does (or can) the state prohibit the mining of ground water, and how is mining defined?

3. How does the state address ground water quality regulation and ground water allocation conflicts?

4. How does the state address the conjunctive use of ground and surface waters? Does the state have an active conjunctive use program?

5. Does the state have an artificial recharge program for aquifer storage? If so, how does the state appropriate artificially stored ground waters?

6. Does the state license well drillers, and does the state have uniform well construction standards?

7. Does the state provide protection to prior ground water users in their means of diversion against subsequent users? How and to what extent? (For example, can subsequent users be enjoined from lowering the water table or be required to compensate early users for any additional costs which they may thereby be caused to incur?)

STATE GROUND WATER MANAGEMENT

QUESTIONNAIRE

I. State Ground Water Programs

1. How significant are ground water problems in your state?

2. What authorities and resources are available to the state to address specific ground water contamination problems? (Please supply any statutes, regulations, orders, recent studies, etc., or relevant parts thereof, which would be useful.)

3. What emergency response authority and capability does the state have?

4. Which state agencies, divisions, or offices are responsible for ground water quality and quantity management? (Please provide the names, titles, addresses and phone numbers of those individuals primarily responsible for ground water quality and quantity management in the state.) What initiatives are being undertaken to better address ground water management in the state?

5. How are state programs financed?

6. Has the state adopted a ground water classification procedure, and have (or can) aquifers be designated for waste disposal?

7. Has the state adopted any land use controls to protect ground water (critical recharge zones, etc.).

II. State Ground Water Standards

1. What existing standards and policies does the state use for ground water protection?

2. What has been the role of the state legislature and of the executive agencies in establishing such standards and policies? (Any relevant statutes, regulations or policy statements which might be provided would be useful.)

3. To what extent do state standards address the issue of acceptable risk?

4. What role do economic factors play in establishing standards?

5. Has the state developed siting standards for the land disposal of hazardous wastes in order to protect ground water quality?

State Agencies Primarily Responsible for Ground Water Allocation and Quality Management

STATE	ALLOCATION	QUALITY
Arizona	Dept. of Water Resources Mr. Wesley E. Steiner, Director 99 E. Virginia Phoenix, AZ 85004 (602) 255-1550	Dept. of Health Services Bureau of Water Quality Control Ronald L. Miller, Ph.D., Chief 1740 West Adams St. Phoenix, AZ 85007 (602) 255-1180
California	State Water Resources Control Board Carla M. Bard, Chairwoman 1416 9th Street Sacramento, CA 95814 (916) 445-3993	Dept. of Health Services Beverlee A. Myres, Director 714/744 P. Street Sacramento, CA 95814 (916) 445-1248
Colorado	Dept. of Natural Resources Jeris Danielson, State Engineer 1525 Serman St., Rm 818 Denver, CO 80203 (303) 866-3581	Department of Health Water Quality Control Division Gary Broetzman, Director 4210 East 11th Ave., Rm 320 Denver, CO 80220 (303) 320-8333
Idaho	Dept. of Water Resources A. Kenneth Dunn, Director Statehouse Boise, Idaho 83720 (208) 334-4437	Dept. of Health & Welfare Division of Environment Lee Stokes, Administrator Statehouse Boise, Idaho 83720 (208) 334-4059
Montana	Dept. of Natural Resources & Conservation Water Rights Bureau Laurence Siroky, Chief 32 South Ewing Helena, MT 59620 (406) 449-3962	Dept. of Health & Environmental Sciences Water Quality Bureau Steven L. Pilcher, Chief Capitol Station Helena, MT 59601 (406) 449-2406
Nevada	Dept. of Conservation & Natural Resources Div. of Water Resources Pete Morros, State Engineer 201 South Fall Street Capitol Complex Carson City, Nevada 89710 (702) 885-4380	Dept. of Conservation & Natural Resources Div. of Environmental Protection Wendell McCurry, Water Quality Officer 201 South Fall Street Capitol Complex Carson City, Nevada 89710 (702) 885-4670

STATE	ALLOCATION	QUALITY
New Mexico	Dept. of Natural Resources S. E. Reynolds, State Engineer Bataan Memorial Building State Capitol Complex Santa Fe, NM 87503 (505) 827-2127	Dept. of Health & Environment Water Pollution Control Bureau Ground Water Section Maxine Good, Program Manager P.O. Box 968 Santa Fe, NM 87501 (505) 984-0020
Oregon	Water Resources Dept. James E. Sexson, Director 555 13th Street, N.E. Salem, Oregon 97310 (503) 378-2982	Dept. of Environmental Quality Water Quality Division Harold L. Sawyer, Admin. P.O. Box 1760 Portland, Oregon 97207 (503) 378-2982
Texas	Dept. of Water Resources Harvey Davis, Exec. Dir. P.O. Box 13087 Capitol Station Austin, Texas 78711 (512) 475-3187	Dept. of Health Division of Water Hygiene Thomas D. Tiner, Director 1100 W. 49th Street Austin, TX 78512 (512) 458-7533
Utah	Dept. of Natural Resources Division of Water Rights Dee Hansen, State Engineer 1636 West North Temple Salt Lake City, Utah 84116 (801) 533-6071	Dept. of Health Division of Environmental Health Bureau of Water Pollution Contro Calvin Sudweeks, Director P.O. Box 2500 Salt Lake City, Utah 84110 (801) 533-6146
Washington	Dept. of Ecology Glen Fiedler, Asst. Director Office of Water Programs Mail Stop PV-11 Olympia, WA 98504 (206) 459-6055	Same as allocation
	Dept. of Ecology Bruce Cameron, Asst. Director Office of Field Operations Mail Stop PV-11 Olympia, WA 98504 (206) 459-6053	Same as allocation
Wyoming	State Engineers Office George Christopulos, State Engineer Barrett Building Cheyenne, WY 82002 (307) 777-7354	Dept. of Environmental Quality (DEQ) Robert E. Sundin, Director 401 W. 19th Cheyenne, WY 82002 (307) 777-7937

WESTERN WATER LAW-OWNERSHIP AND USE DOCTRINES

Some background in western water law and different ownership and use doctrines is important in understanding western ground water management. The development of western ground water law has been influenced by the legal doctrines applied to surface water and early misconceptions as to the physical occurance of water underground. Water was once thought to move through underground streams and reservoirs which could be diverted, much like surface water. A distinction subsequently developed between such ground water and that which accumulated by percolating down through the cracks, crevices and pores of sand, gravel and rock aquifers. Underground streams and lakes are a rare phenomenon, and ground water is now almost exclusively categorized as percolating ground water. However, it should be recognized that often ground water is tributary to, or serves as a source for, surface water flows. This distinction between tributary and non-tributary ground water sometimes serves as a basis for defining ground and surface water rights to a common water source.

Generally, ground water allocation has been subject to one of four legal doctrines (though sometimes modified). First, the doctrine of absolute ownership, which is derived from English common law, provides that all water beneath the land is considered to be appertenant thereto and is therefore the property of the land's owner. Absent any evidence of malice, the landowner can withdraw and use as much water as he can extract without any liability for subsequent damage to neighboring property owners.

Second, the reasonable use doctrine or American rule, is a qualification of English common law. It provides that while the landowner owns water under his lands, he may be required to only use such water as can be reasonably applied to benefit the lands from which they were taken. Still, a landowner may sell or transfer water for use elsewhere unless a neighboring landowner can show he has subsequently suffered harm. Under this doctrine, the

definition of "reasonable" is left to be interpreted by the courts.

Third, the correlative rights doctrine is a further modification of English common law. Again, the landowner possesses a vested proprietary right to the use of ground water, which is limited to the beneficial use of the water on the lands from which it was taken. Legal remedies are available where the common supply is harmed by the sale or diversion of ground water to other lands. Unlike the reasonable use doctrine, when a shortage occurs, landowners are entitled only to an amount proportionate to the land area they own over the common water supply.

Fourth, the doctrine of prior appropriation, unlike the others, is not founded upon a proprietary interest in land. Rather a chronological hierachy among appropriators is established using a "first in time first in right" approach. Anyone who puts ground water to beneficial use receives a priority right over subsequent appropriators. In case of shortages, junior appropriators are required to terminate their use or adequately compensate senior appropriators. An appropriators previous beneficial use determines the amount to which he is entitled, and such water may be transferred to any location where it can be beneficially used.

These variations of the legal doctrines from which different western state water laws have evolved serve to fix the parameters within which related ground water allocation and quality problems are addressed.

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Water Quality Control Council, Resolution to Adopt a Groundwater Quality Goal for the State of Arizona, April 14, 1982.

CALIFORNIA

Attwater, William R., Chief Counsel, State Water Resources Control Board Internal Memo to David Cohen, Special Projects, Subject: Evaluation of State Water Resources Control Board Authority in Comparison to the Federal Injection Control (UIC) Program Administered by EPA, June 4, 1981.

California Administrative Code, §2200 Waste Discharge Reports and Requirements.

Ibid, §2500 Waste Disposal to Land.

California Constitution, Article X. Water (New).

California Water Code, §275 Prevention of Unreasonable Use of Water.

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