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AND ECONOMIC ANALYSIS

By

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"NATIVE AMERICAN" WATER RIGHT CLAIMS AND ECONOMIC ANALYSIS

by

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INTRODUCTION

The rights associated with the use of water in the semi-arid regions of the world are critical for agricultural, industrial, and municipal existence, development, and expansion. Such is certainly the case in the western United States.

Miners, not farmers, were the first major group to claim a right to water use in the American West. These miners often built diversionary structures and established a "use" for water for hydrolic mining. It appears that farmers "first in time, first in right" use of water was viewed in the same manner as were "first in time, first in right" mining claims (Western States Water Council, 1984). The doctrine of prior appropriation resulted from this tradition, to a great extent, and has continued to receive the support of federal and state governments since that time as evidenced by the Mining Act of 1866, Ch. 262, 14 Stat. 251 (1866), the Desert Land Act of 1877, Ch. 107, 19 Stat. 377 (1877), and many subsequent land settlement acts.

As a general rule, the property rights associated with the use of water are similar to property rights consistent with those of other real property. Water rights can, in general, be bought and sold. Title to such rights are registered and protected by law. This allows water to transfer to higher valued uses over time. The physical location of actual water use may change, within some limits. Still, there are differences in these property rights which significantly influence water use and exchange.

First, the right to use water is not automatically granted into perpetuity. Technically, most states require that the water must be continued to be put to beneficial use in order for the right to be acquired and maintained. Thus far, as a practical matter, as long as the property right holder is able to show any use, rights will likely be held by that

individual until a decision is made to sell.

Second, water rights are not associated with any specific water but, instead, with the right to use a certain quantity of water from a particular source. This is obviously necessary because of the fluid or transitory characteristics of water.

Third, while water rights are transferable, movement of rights between drainage areas is generally not allowed. That is, a property right associated with water use cannot generally be transferred into another drainage area without a simultaneous transfer of actual water.

"NATIVE AMERICAN" WATER RIGHTS

Special classification has been given to two types of "Native American" (Indian) water rights: "aboriginal" and "reserved." Aboriginal water rights are those rights which follow a "first in time, first in right" philosophy. An aboriginal right is assumed to exist for those Indians for whom the use of water in farming or domestic activities can be historically documented and tied to a specific geographic location. While many of the American Indian tribes were nomadic, some did practice farming on a regular basis and maintained those activities in a specific geographic area. Since those activities pre-dated most, if not all other current uses, there is some justification of a "first in time, first in right" or aboriginal award. While there is often some difficulty involved in establishing the exact nature and extent of water use by such tribes or groups, the perfection of these rights generally does not require any extensive economic analysis. Historical documents are most often relied on in making a determination of aboriginal rights.

"Reserved" rights are also also related to a "first in time, first in right" philosophy, but the quantification is much more complex. A reserved

right is said to apply to those Indians who, though not historically a stationary people, were placed on a reservation or area of land, specifically set aside for their long-term use. The claim has been made that there was an implicit awarding of water rights on the reservation at the time of its creation. In general, the dates of the reservation establishment determine the priority date for water rights perfection if the Indians can qualify for a reserved right.

In response to many of the early land development and settlement acts passed in the United States during the 19th century and early part of the 20th century, lands were settled throughout the water-short West. Early claims to land (and water) were generally established in those areas which adjoined "flowing" streams, according to states or territorial water law. Little groundwater was appropriated during the period. These settled lands were either brought into agricultural production or existing production was modified through the extensive use of irrigation techniques.

The development of lands which Indians had formerly intermittently used coincided with, and contributed to, the establishment of Indian reservations. These reservations were established by treaty. Later modifications in or abandonment of these treaties caused that Indian lands were enlarged, reduced, eliminated or otherwise changed. The acquisition of public lands (and water) continued unabated until the early part of the 20th century. As lands and water were acquired by non-Indians, the potential for conflict increased.

In 1906, the U.S. Government brought suit against private landowners living below the Fort Belknap Indian Reservation in Montana on behalf of the Indians claiming that all of the water in the Milk River was appropriately the property of the Indians and was necessary for meeting

reservation purposes. While the resolution of the issue might have been very simple had Congress simply granted certain water rights when the various reservations were established, such was not the case.

The defendants (non-Indian landholders) claimed that they held valid water rights under Montana State law and were beneficially using a considerable amount of water for farming and ranching purposes. The defendants alleged that the states had, after all, been given the right to regulate or control the use of in-state water by the Federal Government.

The issue of Indian water rights was, consequently, left to the courts to be resolved. In 1908, the U.S. Supreme Court ruled that all reservations had a "reserved" right to water because Congress had certainly intended to reserve water for an Indian reservation at the time of its creation (*Winters v. United States*, 1908). Such a position was taken by the Court because water was considered a prerequisite to the development of virtually all Western lands, Indian lands included. While the Supreme Court appeared to settle the issue of "reserved" right, they failed to suggest or select a method by which that water right could be quantified. Hence, the question of quantity accompanying such reserved rights was left open for future debate.

In subsequent court decisions (*Arizona v. California* (1963); *Tuttle* (1982); and *Roncolio* (1982)), a quantification process and standard has emerged. The overall standard is "practicably irrigable acreage" or PIA. In essence, the standard suggests that the quantity of reserved rights to be acquired by a tribe depends on the amount of practicably irrigable acreage that can be shown to exist on the reservation. Traditionally, PIA has been demonstrated through the extensive use of economic analyses.

Included in the process of rights perfection under a PIA standard are numerous non-economic issues. First, the date of reservation establishment

is critical in determining the award since individuals perfecting water rights prior to the date of reservation establishment have priority over reservation uses. Second, the claim cannot technically exceed the water available so the physical volume and associated hydrology of the water basin must be determined. Third, the right is apparently tied to the purpose(s) for which the reservation was originally established. For instance, if the primary purpose of the reservation was farming, then farming would be considered the activity on which to base the quantification process. On the other hand, if grazing were the primary purpose of reservation establishment, then presumably the quantification would be based on grazing uses. Because of the many changes in reservation boundaries through time, these issues must be resolved for each addition and/or change in the boundary. A portion of the reservation may have been established for farming purposes; a later portion added for grazing. Under a strict interpretation of purpose and time standards, each area would have to individually be quantified on the basis of purpose and time. It is presumed that if the primary purpose of the reservation were recreation, then recreation activities would provide the basis for the evaluation. However, it does not appear that recreation or industrial developments were ever considered as the primary purposes for which the reservations were established (Arizona v. California, 1963).

Assuming that farming was the primary purpose for which the reservation was established, additional criteria must then be met. First, it must be shown that it is technically possible to irrigate the lands in question using current practices. Second, agronomic feasibility or the physical ability to produce various crops must be demonstrated. Agronomic feasibility is contingent upon the application of today's engineering and

agronomic technologies. The irrigation system must be designed, crops selected, agronomic practices specified, and yields determined. Once these issues are settled, only then a determination must be made as to the economic feasibility or viability of the farming operation.

Each of these steps can result in complex and extended litigation. Yet, when all is said and done, an award of reserved water right based on the concept of practicably irrigable acreage depends, to a significant degree, on the outcome of an economic analysis. As noted in past cases, the concept of PIA requires that the Indians demonstrate that the water can be put to a beneficial use in purposes for which the reservation was established. In essence, beneficial use has generally been interpreted by the courts to mean that benefits must exceed costs. To the extent that crop production can pay for the necessary water development (assuming all other conditions are met), the Indians are granted the right to that amount of water.

A very simple example might serve to more clearly illustrate the application of this standard of measurement. Assume that a reservation contained 25,000 acres of irrigable land which, if irrigated properly and completely, would require 75,000 acre feet of water. Furthermore, assume that it is technically possible to irrigate all those lands. It has been demonstrated that production is possible on that acreage for a large number of crops. Finally, assume that the Indians can pay for the associated development costs including, but not limited to, land leveling, dams, ditches, fences, roads, buildings and equipment. The Indians have demonstrated, under the standard of PIA, that the land is capable of being farmed in an economical or cost-effective manner. Revenues earned from the production of the crops exceed the costs associated with crop production. Therefore, the necessary rights are granted.

Once granted, these reserved rights are not totally consistent with water rights perfected by others, however. First, while the quantification process is loosely based on the notion of beneficial use, there is no requirement that beneficial use actually be made of the water once acquired. In fact, there does not appear to be any restriction on what the final use may be on the reservation once the size of the award has been determined. Furthermore, these rights may not be terminated by abandonment or forfeiture. There is no way, short of action by Congress, that a reserved water right can be withdrawn for application to a non-beneficial use, illegal use, or even a total lack of use. Once awarded, the right remains with the tribe into perpetuity. Third, it does not appear that the property right can be transferred off the reservation. Thus far, it appears that water is awarded on the same basis as reservation land. It is to be held in "reserve" for present and future generations of Indians and cannot be sold. Fourth, the Courts have not required that any form of compensation be granted to those parties having to forfeit their rights to water use. The transfer is made without incurring any explicit costs.

In recent court cases, (*Arizona v. California*, 1963; *Tuttle*, 1982; and *Roncolio*, 1982) a fifth condition, a "sensitivity doctrine," has emerged. The doctrine states, in its most simplistic form, that the Court must consider losses elsewhere in making its decision regarding the amount to be awarded to Indians under the reserved doctrine. While not universally accepted as a point of law, it does appear that the sensitivity doctrine plays some role in the final determination of water rights.

THE NATURE AND MAGNITUDE OF THE PROBLEM

The major problem with "reserved" and "aboriginal" water rights as outlined above is simply that most of the streams are fully appropriated at

the present time. Many, such as the Gila River in Arizona, are overappropriated. There is simply not enough water in the various streams and rivers to accommodate existing appropriated rights, much less newly determined and granted rights. Consequently, if an award is made to the Indians on the basis of aboriginal use or a reserved right, present users will be denied use. In many cases, there will be a gallon-for-gallon reduction to others.

A summary of potential claims for reserved rights only is shown in Table 1 (Western States Water Council, 1984). The summary included here is not intended as a precise estimate of claims that will be made nor a suggestion that they should. The summary is intended only as an overview of the quantity of potential Indian water claims. Application of the PIA standard to the potentially irrigable acres list for some of the states would probably result in a smaller award of water rights than the potential claim suggests. However, because of the lack of available data, no irrigable acreage or potential claim is made for many reservations, some with very large gross acreages. Also, few Indian claims for fisheries, natural resource or industrial developments, recreation, or aboriginal rights are included.

Total claims equal nearly 45.9 million acre-feet per year. This is equal to 3.5 times the average annual flow of the Klamath or Colorado rivers and more than five times the flow of the Flathead or Salmon Rivers. It is nearly twenty-five times the annual flow of the San Juan or Yuba Rivers and equal to roughly 1.5 times the storage capacity of Lake Powell or Lake Mead.

Table 1. State by State Summary of Potential Indian Reserved Water Claims

BIA Area, BIA Agency Jurisdiction	Gross Area in Acres	Presently Irrigated Acres	Potentially Irrigable Acres	Other Estimate of Water Needs	Potential Claim AcFt/Yr
Alaska (7)	386,142.19	0	0	0	0
Arizona (20)	19,808,056.88	188,410	6,516,208	18,034,825	31,273,343
California (80)	583,235.34	14,741	58,665	0	269,282
Colorado (2)	755,399.71	0	93,000	0	0
Idaho (5)	826,863.26	102,229	227,417	0	762,721
Montana (7)	5,224,864.06	102,338	450,000	3,993,872	6,632,902
Nebraska (4)	64,475.70	0	14,482	0	26,481
Nevada (24)	1,154,109.89	34,442.34	24,670	0	210,556.06
New Mexico (26)	7,408,225.35	13,846	74,297	17,309	328,332.6
N. Dakota (6)	851,925.99	0	66,626.51	0	190,045.03
Oregon (3)	757,362.54	1,800	100,000	0	450,000
S. Dakota (9)	5,091,218.73	0	439,797.49	0	1,269,306.37
Utah (5)	2,283,986.00	3,175	172,520	481,078	630,007
Washington (23)	2,496,422.89	165,000	435,000	0	3,371,805
Wyoming (1)	1,888,031.81	0	103,000	0	477,292

SOURCE: Western States Water Council. 1984. "Indian Water Rights in the West." Study prepared for the Western Governors' Association. May.

The state with the largest potential claim is Arizona. As Figure 1 illustrates, Arizona's dependable water supply pales in comparison. In the other states, the proportions reflected in the figure would be reversed somewhat in that potential Indian claims would be a fraction of the dependable water supply in most other states. However, the real issue even in states for which a smaller share of water is to be affected is that there is little, if any, water available to new users. The water has been appropriated. In light of the possible consequences associated with water

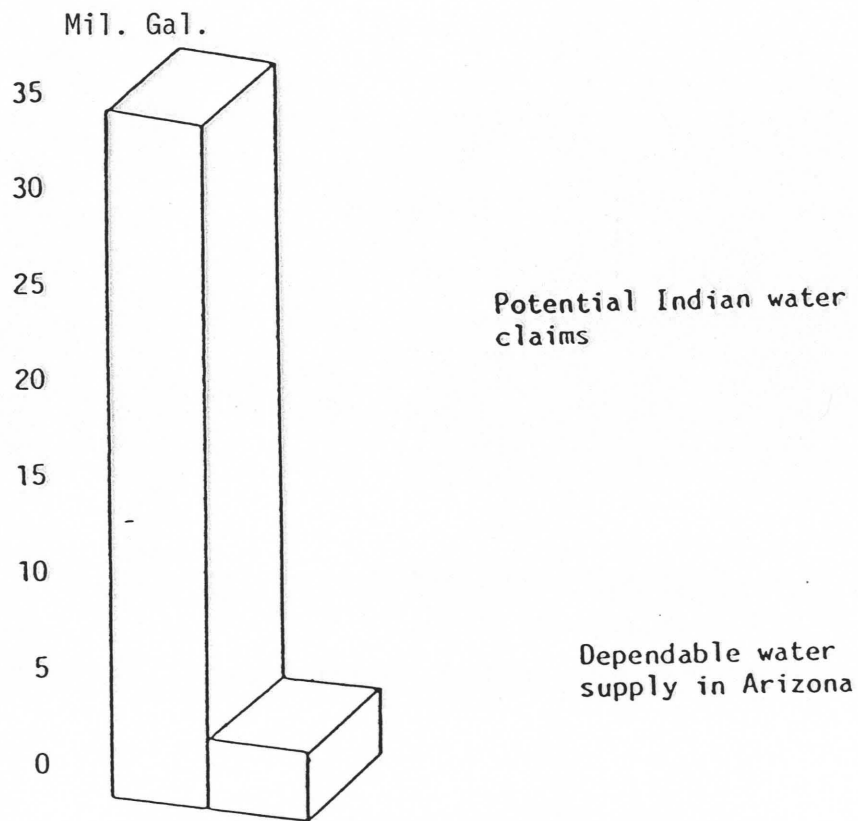


Figure 1. Comparison of potential Indian water claims and dependable water supply in Arizona.

right transfers, it is amazing that little specific legal guidance has been given regarding the techniques to be employed in the quantification process. The major unresolved issues with respect to a determination of reserved water rights under a PIA standard is the methodology with which the claimed reserved rights will be determined and perfected and the impact on society as a whole of such transfers.

It may be argued that, in the case of reserved water rights, the law is being applied in an attempt to protect or recapture a lost property right. While it is true that the courts would protect the rights of any water user presently abused, Indian rights included, it should also be noted that in the case of any other water right holder, that the non-Indian holder (or predecessor) took an active role in the acquisition and development of the property right. Such cannot be said for the Indians. While some Indian tribes have acquired water rights on the same basis as any other water right holder (by making application through the appropriate state agency), the majority of Indian tribes have not taken any action, nor has the Federal Government as trustee for the tribes, except for the limited number of lawsuits thus far conducted by the U.S. on behalf of the tribes. The difference between the court protecting the right of a private citizen who developed (or purchased the right to use water) may be conceptually different from that of the Indians wherein no effort was made to acquire the necessary water rights. Neither the Federal Government, in its trust responsibility, nor the Indians themselves have attempted to mitigate the situation they suddenly find themselves in, with few exceptions. While a question may be raised regarding the responsibility of the Indians or Federal government to mitigate adverse impacts of off-reservation water development, that is primarily a legal question and one that cannot be answered here.

ECONOMIC ANALYSIS AND RESERVED WATER RIGHTS

While economic analysis may have a limited role in the determination of aboriginal water rights, it appears that such rights are more of a historical and legal matter rather than an economic one. Hence, this discussion will be limited to that dealing with reserved water rights.

With the Court's decisions regarding reserved water rights, it might be concluded that the perfection of reserved rights would proceed very rapidly with a minimum effort and cost. Such has, however, not been the case. Litigation on a specific case may extend over several years and cost millions of dollars.

We would suggest that there are three realms wherein problems may lie with respect to extended and costly litigation. First, a major function, it appears, of litigation is to attempt to instigate a change in the rules to make the standard or precedent more favorable to one side or the other. Once again, this is a legal matter or, at the very least, part of the legal system. As such, it lies outside the breadth of this paper. The other two problems with respect to the economic issues, (conceptual matters and empirical applications), are within the scope of this paper. First, at the conceptual level, we have identified eight areas where economic theory or concepts may impact the outcome of an "economic" analysis. Second, at the empirical level, seven areas have been identified. Some topics are common to both the conceptual and empirical levels and are discussed accordingly.

Conceptual Issues

The first conceptual issue is that of society's welfare. In the most basic sense, society's welfare is improved as long as some action results in at least one member of society being made better off without any other

member being made worse off. As soon as no other transfer can be made which improves someone's position without adversely impacting anyone else', then the system is said to be "Pareto" efficient. Compensation may or may not actually be required but the full impacts are identified. Free markets or an omniscient government might bring Pareto efficiency about. In a free market, where property rights were completely transferable and goods were scarce, a resource would shift to its highest valued use(s). A determination of gains and losses is difficult, at best. Yet, at a conceptual level, any mandated shifts in resource use without a consideration of net gains/losses to all parties involved will not insure that society remains even as well off as they were prior to any changes in distribution.

It may be argued that the market for water rights is a reasonably well-functioning market and, as such, would allow water to move to its highest valued use(s). In this regard, it should be noted that nothing has prevented the Indians from making a claim for water rights through the usual process outlined by the various states over time. Some tribes have, in fact, made application for and received water rights under the appropriate state jurisdiction. In general, we would suggest that the water has historically been employed in its most productive use(s). If such water rights (and the accompanying water) is suddenly transferred without an accompanying demonstration that the water will be put to beneficial use, then society is clearly worse off. That the Indians have not perfected rights to water would suggest that higher valued uses already exist and are being used.

The second conceptual issue is that of risk. The removal of a valuable resource without accompanying strict assurances that the resource will be put to a similarly valued (or higher valued) use would suggest a

reduction is society's welfare. This implies an increased risk to society should the transfer take place. This point is particularly relevant since even though the present quantification standard is based on beneficial use, no requirement is imposed that such use actually has to occur nor that beneficial use on the reservation be as high or higher than existing off-reservation uses.

Furthermore, there is the distinct possibility that water, once assigned through a reserved right proceeding, will never be allowed to re-enter the market regardless of the gain or loss to society (Roncolio, 1982). A transfer in water outside of any workable market would suggest that water would not be available for other purposes at a later point in time. If the water is to be held in reserve in the same sense as reservation land in a sense that it cannot be bought and sold, society's risk would increase. Given the increased risk associated with such a transfer, strict evaluation procedures would need to be used to insure that such transfers are cost effective.

The third conceptual issue involves the very nature of the analysis. Calculation of benefits and costs may follow two distinct approaches: financial or economic. The courts have recognized the differences between these two conceptual approaches. The Special master in California vs. Arizona (Tuttle, 1982) stated the following: "For present purposes, a finding that annual benefits exceed costs will suffice for a finding of practicable irrigability." In response to that statement, Burness, et al., 1983, indicate that this conclusion on the part of the Master was consistent with economic analysis as opposed to financial analysis. They suggested that,

"Thus, economic feasibility is established as the means for demonstrating practicably irrigable acreage which, in turn, serves to quantify water reserved to the tribes."

Economic analysis is based on the concept of opportunity cost. In using an economic analysis, it is imperative that the true opportunity cost of resources be determined and used. The true opportunity cost of a resource is simply the value that must be foregone if that resource is used in another process. For instance, the true opportunity cost of using water in agriculture is the value that the water in alternative uses. This concept is so basic to economic analysis that it is taught in virtually every introductory economics textbook. The use of economic analysis requires the adoption and correct application of opportunity cost to each and every resource being considered in a production process.

The fourth conceptual problem, related to the first three, is that of an uncompensated transfer of water (and wealth). The argument is sometimes advanced that if water was subsidized during early development, then there may not be any significant impact to society should that water be simply transferred without compensation. However, this ignores any change in the value of that water that may have occurred over time because of changes in technologies.

Assume that a current water right owner purchased that right in recent times. The price paid for that water would represent its current value in production, assuming a reasonably, well-functioning market. It would most clearly represent a higher value than the price (if any) originally paid for the water given historical changes in related technologies. To make a transfer without due compensation brings about a redistribution of wealth. The party who originally gained through water development will likely not be the one to suffer the consequences of the water transfer. However, even if they were, there is some loss that will be incurred because other

investments have been made by the impacted party in order to enhance water productivity. But this issue is not simply an issue of whether compensation should or should not be granted.

In assessing whether a transfer should take place, even if a legal or political decision were made that compensation would not be required, the true opportunity cost of that water must be measured or evaluated in conducting an economic feasibility analysis. There is a real cost associated with the transfer of that water, even should compensation never be made. That cost must be identified and accounted for. Water is not a free good. Consequently, in making a determination of economic feasibility, it is imperative that the true opportunity cost of that water be included in the analysis if economic analysis is to be the basis from which all the calculations are made.

The fifth issue is that of time. Reservations were established in the past, as were appropriated water rights. Water rights are, however, being evaluated for transfer in the present based on some present and future needs. A reallocation will impact present and future generations of both sides. Admittedly, there is an opportunity cost to those impacted by the reassignment -- today and tomorrow. That must include the increase in welfare experienced by the Indians as well as the decrease in welfare experienced by those who must give that water up.

It may be argued that those living in the past were adversely impacted by past and present water rights assignments. It is, however, unlikely that a change in today's assignment will make those who lived previously any better off! Therefore, we would suggest that the analysis must focus on those impacted in the present time period and, possibly, those which may be impacted in a future time period, though such determinations are nearly

impossible to make since future generations are not here to make their wishes known. A determination of benefits and costs can be done in today's terms, with some consideration of the benefits and costs to future generations.

The sixth conceptual issue is that of an appropriate discount rate to use in the discounting/compounding process. In "reserved" water right cases, a benefit-cost analysis has been used to determine whether benefits exceed costs for the project/development in question. Benefits and costs occurring in different time periods are brought to a comparable basis through the process of discounting. This is a well-recognized practice in project evaluation. The difficult issue is to determine the appropriate rate to be used or employed in the discounting process. In order that this portion of the analysis be consistent with the others, the opportunity cost of capital is the correct conceptual approach to adopt.

What must be given up in order for a transfer of financial capital to take place? Certainly, current production, consumption, and government spending must be foregone if a transfer takes place. Note that the correct opportunity cost cannot be limited just to the lost opportunities in business and government. Today's consumption is also foregone and its opportunity cost must be included in the calculation. In addition, future generations are impacted. As a conceptual matter, it should be noted that both present and future generations of those who gain and those who lose must be considered. Consequently, an appropriate discount rate to use would be one that reflected opportunities foregone today, as well as opportunities foregone tomorrow. Therefore, present and future opportunities foregone becomes that standard -- not just the future, nor just the present; not just to those who gain, but also those who lose; not just business or government, but businesses, government, and consumers.

It seems appropriate to also suggest that opportunities foregone in the past are not relevant to the analysis since such opportunities would presumably have been undertaken had the benefits actually exceeded the costs. Once again, the fact that such acquisitions did not take place, as a general rule, would suggest that few opportunities were foregone in the past.

A seventh conceptual point has to do with the incidence of both primary and secondary benefits and costs. As is the case with most development projects, the benefits and costs (both primary and secondary) are not always realized by the same group of people or even in the same geographic area. Consequently, some area or group may receive the benefits yet have none of the costs imposed. Alternatively, another group may incur virtually all of the costs, yet receive few if any of the benefits. If a transfer of wealth is to take place, then the losses and gains to all parties involved must be accounted for. Unless all benefits and costs are accounted for (primary or secondary), any potential development project could be shown to be viable by excluding some or all of the costs.

It would appear that a consideration of all benefits and costs is even more critical in this situation where it can be said that those who lose their water right did nothing of themselves to deny the Indians their water rights. That the Indians did not receive some water would suggest that they, or the U.S. acting as their trustee, were negligent in their responsibilities. The current approach places the entire financial blame those who were doing exactly what that same Federal Government was encouraging them to do -- settle the Western lands through an appropriation of water.

Economic analysis is conducted so that all benefits and costs can be

enumerated and the resulting calculations made. Those calculations may be expressed in a benefit-cost ratio as in the case of reserved water rights. Other noneconomic forms of evaluation may not require as explicit accounting of all costs and benefits. However, if economic (benefit-cost) analysis is to be the yardstick by which reserved water rights are to be made, then it must be recognized that there is a potential for three possible outcomes. First, all benefits may exceed all costs ($B/C > 1$) and the transfer would be efficient. Second, all benefits may equal all costs ($B/C = 1$) and the transfer may or may not be appropriate. Third, and the most critical in understanding the implications of an economic analysis, all benefits may be exceeded by all costs ($B/C < 1$) and the transfer could not be justified on economic terms. If the courts (and other parties involved) are not willing to recognize and submit to the possibility of these three outcomes, then economic analysis is an inappropriate analysis to follow in determining the quantity of reserved water rights.

An eighth conceptual issue focuses on the term "equity." The claim has been made that, from a conceptual point, equity requires that the Indians be given considerations above those given to others involved or impacted by the transfer. First, it must be recognized that economics deals with questions of efficiency not equity. Efficiency is the realm in which economics can provide objective, meaningful analysis. Economists can provide information concerning the impacts of various transfers to all parties involved. Whether such transfers are equitable, however, is another matter. Still, equity implies certain criterion that can be used in evaluating such transfers. "Equity" is defined as 'freedom from bias or favoritism' (Merriam-Webster, 1983). Some authors (Burness, et al., 1983) have argued that certain rules of evaluation need to be changed in order to insure that the Indians are treated equitably. To adjust the rules by

which the rest of society is evaluated or to view gains to the Indians without also considering losses occurring elsewhere hardly seems consistent with the concept of equity as expressed above. Is it appropriate to argue 'equity' from a single position?

Empirical Issues.

There are a host of areas where changes in empirical approaches can modify the results of a benefit-cost analysis. Interestingly enough, one of the most basic divergences has been a failure to understand the difference between economic and financial analysis. In its most basic form, economic analysis requires an examination of all explicit and implicit benefits and costs associated with a particular project or activity. Financial analysis, on the other hand, requires only that out-of-pocket or explicit costs be accounted for. Financial analysis, for the most part, ignores the full concept of opportunity cost. If, as suggested above, economic analysis is the appropriate analysis to use (and that view appears to be one accepted by the courts) then it must be used consistently throughout the analysis. a national perspective may not be required in an economic analysis -- but a perspective broad enough to consider all costs and benefits is necessary.

The second empirical issue is the use of standardized and generally accepted project evaluation practices. Project feasibility analysis actually began in the U.S. in the late 1800's. From the beginning, projects have been analyzed following what was determined to be the state-of-the-art in economic theory and application at a point in time. These standards have changed through time as more conceptually sound and empirically accurate measurement methods and technologies were found. In fact, current and past project evaluation standards have evolved from only

the most basic principles into a set of reasonable and manageable instructions/procedures. It would, therefore, appear reasonable to value proposed projects or developments involving reserved water rights with present evaluation standards, such as reflected in the 1983 Principles and Guidelines (U.S. Water Resources Council, 1983). In fact, the federal government has mandated the use of these standards in project evaluation for Indian projects (U.S. Department of Interior, 1980) as well as others. However, even had no such standards been mandated for the Indians, they would be the most appropriate ones to use for several reasons. First, they represent the latest consensus in appropriate evaluation techniques. Second, they reflect economic theory as nearly as is possible with today's technology. Third, all other engineering and agronomic standards are measured in today's or the current period terms.

Burness, et al., 1980, have suggested that changes in the standards since they first were applied to project analysis preclude their use in current project analysis, particularly with respect to Indian Reserved Water Rights litigation. Of course, all currently approved projects must also abide by these same standards. Furthermore, it is interesting to note that all other technologies and standards (engineering, agronomic, legal, soils, hydrologic, etc.) are considered in the present time period. That is, only current technologies are considered in making a determination of reserved water rights. Past irrigation technologies are not utilized, nor are past agronomic practices. If such were to be used, the number of acres that could potentially irrigated and the quantity of yields under older varieties and agronomic practices would likely make economic feasibility even more difficult to achieve. As an empirical, as well as conceptual matter, if current technologies are to be used to evaluate project

feasibility, then current economic practices should also be used.

The third empirical issue is the treatment of labor costs in project analysis. From a conceptual basis, labor cost should be included consistent with the opportunity cost of that labor. It has been suggested that because Indians generally live in areas and cultures with high rates of unemployment, there should not be any labor cost assessed against the project. The use of zero labor costs is not very compelling from either and conceptual or an empirical basis.

Due to differences in job requirements, labor mobility, and job duration, there are really two labor issues involved in any project -- its construction and operation. Because these two activities have differing labor demands (in a skill as well as a temporal sense) it is clear that there is justification for treating them differently. Construction labor is generally short-term. On-the-job training does not really provide the laborers with permanent, transferable job skills. Only if the labor is perfectly mobile, which seems unlikely on a Indian reservation, could that labor take advantage of continuing employment possibilities. Hence, it would seem appropriate that the opportunity cost of some labor during construction be valued at less than some current market wage rate.

However, it is also obvious that the opportunity cost of that labor is not zero. Indians have alternative uses of their time. Hunting, fishing, religious ceremonies, and numerous other similar activities constitute a significant portion of Indian society. Those activities involve labor and because they choose to participate in some non-work activities, the opportunity cost of that labor cannot be said to equal zero.

The opportunity cost of that labor should be valued at the wage rate at which the Indians would agree to work in the type of employment resulting from a construction activity. If they were to go to work for

\$4/hour, then that become the opportunity cost of their labor. to this in a slightly different way, if Indians are not willing to work for \$0.25/hour but are willing to work only when the wage rate reaches \$4/hour, then \$4/hour represents the opportunity cost of the next best alternative. This concept may be referred to as a "withholding price" threshold.

Note, however, that valuing labor cost at \$4/hour ignores the loss to other workers, who previously had been working on similar projects, would now become unemployed because of that Indian's work. The actual benefit attributable to a project would be that portion of the wages/income above that lost elsewhere. Only in instances of significant national unemployment could such benefits be credited outright during the construction of a project.

The present version of the principles and guidelines, (U.S. Water Resources Council, 1983) does allow for the inclusion of labor benefits during a project's construction phase. Even in these standards, however, the benefits are limited to those workers who would have been previously unemployed. This implies that some matching of jobs and skills levels be done. Were the proper investigation made, it is conceivable that some labor benefits could be counted during project construction in conformance with present evaluation guidelines, although it is obvious that the opportunity cost of previously employed workers is not equal to zero.

A second type of employment issue is labor used during project operation. It can be treated differently for several reasons. First, skills learned during project operation are assumed to have a more lasting benefit because project operation is expected to continue for several years. Second, such skills are more easily transferred since those same type of jobs are generally available in other parts of most regional/local

economies. Third, there may be other employment opportunities on the project over time and if personnel are promoted or reassigned, then there is a cost involved in finding and training their replacement. Finally, there is a problem of valuing "leisure" time (time engaged in activities other than "work"). The current standards for project evaluation do not allow for the inclusion of labor benefits during project operation. This exclusion of labor benefits during project operation also applies to Indian projects (U.S. Department of Interior, 1980).

In addition to the problems associated with an empirical estimate of the value of non-work time, there is a substantial empirical problem associated with the treatment of underemployed labor vs. unemployed labor. In the process of P&G development, it was noted that some decisions relative to the treatment of labor values were arbitrary in the sense that empirical measurement was nearly impossible to make. The standard included in the Principles and Guidelines likely underestimate some of the benefits derived from employing underemployed or unemployed labor and overestimate other labor benefits. It is, in a sense, a compromise given the uncertainties associated with empirical measurement. Until such time as empirical techniques allows for a more accurate quantification of labor benefits, the generally accepted evaluation techniques such as reflected in the 1983 Principles and Guidelines (U.S. Water Resources Council, 1983) remain the best available.

To assume that the cost of Indian labor is zero for the entire 50 or 100 year life of project operation implicitly assumes that the Indians never will gain any transferable skills during their lifetimes (or the lifetimes of their children and children's children). If the purpose of the granting of a reserved water right is to meet the tribes need and to provide an improvement in their social well-being, then the use of a zero

wage cost during operation would appear to add insult to injury. What is being suggested is either that the Indians will never gain and useful skills or that they will never be able to compete with others in society for available jobs. It may also suggest, that they will always be a people without employment opportunities either on or off the reservations. That is, to say the least, not a particularly cheerful outlook.

A fourth empirical issue is the level and type of activities often included in the analysis. For instance, it may be unreasonable to include the production of strawberries, raspberries, or asparagus in an area where there has not been any commercial production of those commodities unless a definitive analysis can show or illustrate that there is some basis for the existence of a comparative advantage in that area. This may include a comparative advantage in production, processing, and/or marketing. Unless it can be demonstrated that a particular area has some real advantage in production, processing, or marketing, it cannot be reasonably assumed that production will leave any existing production area. Furthermore, such an analysis effectively ignores the impact that demand has on the production and consumption of many commodities. Second, if such a strong comparative advantage exists, why is production not already occurring in an area? Food (or recreation or minerals or virtually anything else) production occurs in a particular location because, in the long run, there is some profit to be made. The absence of production in an area may be the strongest evidence that no comparative advantage exists. Even in the event that similar products are grown and sold within the project area, does this justify that crop's automatic inclusion in the crop mix? Not necessarily. Unless it can be demonstrated that there is a shortage of land from which that increase in "incremental" production might come from, market forces would

suggest that supply equals demand and any increased production would reduce price. Furthermore, even if it could be demonstrated that a shortage of appropriate land existed, an inordinate amount of increase could also effectively reduce the price received by the producers of that commodity. Hence, comparative advantage and analysis of existing demand play a very large role in the determination of appropriate new crops. Any increase would be felt in decreased prices on and off the proposed project.

As a result of these considerations and past abuses, limits are placed on the amount of "non-basic" crops that can be included in a project under the 1983 Principles and Guidelines (U.S. Water Resources Council, 1983). (Basic crops are the 10 most widely grown crops in the country.) This rule is not as arbitrary as it may seem for the reasons cited above. Because there is rarely an evidence of a shortage of available lands on which to produce such commodities, it must be assumed that the limiting factor is demand not supply. Consequently, unless it can be demonstrated that land is a limiting or constraining factor, net returns or benefits from only the 10 basic crops can be considered in project analysis. Certain benefits from other crops can also be included. However, the benefit which can be claimed from the production of these other crops is limited to that which would be in excess of that which could be earned elsewhere. This, in effect, does make an allowance for whatever aspect of comparative advantage is relevant. This discussion assumes that inputs are valued at their full opportunity cost. Admittedly, if costs on a new project are subsidized sufficiently and a financial analysis is used (only explicit costs are accounted for), then a comparative advantage may be suggested where none, in fact, exists. A complete economic analysis would insure that comparative advantage (or disadvantage) would be clearly shown.

Related to the discussion of the type of activities to be included is

the level of their inclusion. For example, while apple production has historically been practiced in a given area, if additional production were to increase area or state or regional production by two or three times, some price effect would almost certainly be felt. The exact impact would be difficult to quantify. In response to this problem the P&G's limit additional agricultural production to the same proportion of various crops as presently exists in an area. While not allowing an exact quantification of the price and quantity effect, the standards do provide a technique that is easy to apply and that would be expected to limit the error of estimation/calculation and provide a less costly means by which an answer can be arrived at.

The fifth empirical issue is the geographic extent to which benefits and costs apply. Project feasibility viewed from a single position or geographic area cannot be presumed to capture the full economic costs of an action. Furthermore, it is not obvious that an economic analysis is appropriate were the analysis is isolated to a specific area. As noted above, it is not unusual for project costs to be realized by different individuals and/or areas than those enjoying project benefits. One could virtually guarantee that the localized benefits would exceed localized costs in any event by simply adjusting the boundaries (geographic or population) associated with the development. Hence, there is no need for an economic analysis if one can insure that the benefits will exceed the costs by simply adjusting the population or geographic boundaries. Interestingly enough, current evaluation standards recognize this problem. They require that national benefits and costs be calculated and then they allow for the calculation of regional impacts. That way, national vs. regional impacts are clearly distinguished and the resulting impacts to

individuals are readily identified.

An issue closely related to that of the geographic dispersion of benefits and costs is that of the inclusion of secondary benefits and costs. Conceptually, it would make no difference if secondary benefits were included in the analysis as long as secondary costs, where ever they occurred, were also identified. Estimates of secondary impacts are generally derived through the use of some sort of an income or output multipliers. It may be appropriate to display those impacts, costs, as well as benefits. However, these values certainly have no place in a benefit-cost ratio.

A sixth empirical issue is that of the appropriate discount rate to use in economic analyses. Suggestions for an appropriate discount rate to be used in such analysis include the present opportunity cost of capital, a zero opportunity cost of capital, or some range of rates. While a specific number may be difficult to determine, it should be based on the following facts. First, any project that is approved will require funds from present as well as future generations. There is no doubt but there is an intergenerational impact associated with such proposed developments and/or the transfer of water rights. Second, use of funds to justify a project implies that today's and tomorrow's government spending, business spending, and consumer spending must be foregone if the project is to be undertaken. This includes those projects wherein no development actually takes place but a transfer of water rights does. Whether development or transfer actually takes place or not, there is a current opportunity cost to those who must give something up in order for others to gain and the full impacts must be identified.

The exclusive application of a long-term real rate is inappropriate because people will be impacted today should a change be made. As noted

previously, past rates are irrelevant to the calculus except to the extent that past rates can be used to predict future rates. Furthermore, both today's and tomorrow's rates should include consumption or investment foregone in all three impacted sectors -- government, business, and consumers. The fact that neither governments nor most business actually would have to forego anything unless the project were actually built would perhaps suggest a stronger weighting toward the opportunity cost of foregone consumer spending.

In much of the work that has been done in the past, there has been a suggestion that an appropriate rate would be one that is comparable to the long term real rate of return on public investments (bonds, notes, etc.) This rate ranges from 2-4% (Fraumeni and Jorgensen, 1980). However, there are several things wrong with this suggestion. First, there is absolutely no indication that the projects undertaken through such analyses are going to be less risky than those undertaken by the private sector. In fact, given that the final use of the water is unknown at the time of the award and the fact that the projects are generally new undertakings to the tribes involved, there may be a valid argument that the project payoffs are even more risky than other public and private projects. Second, in the final analysis consumers must forego consumption and businesses must forego investments if such projects (or transfers) are actually realized. Third, the long-term rates cited above include rates derived over periods of time when many such rates were essentially controlled or regulated. Hence, they may not be an accurate reflection of the true opportunity cost of businesses, governments or consumers. Reliance on a long-term real rate of return to business or governments ignores the private sector to a significant degree and would understate the true opportunity cost of

capital. It might be argued that today's rate is high by historic standards. While that may be true, it should also be noted that a transfer of water rights and/or approval of project development impacts today's consumer as well as tomorrow's. Hence, a present evaluation of current and expected opportunity cost must be accounted for.

While the interest rate dilemma may seem insurmountable, federal policy makers have provided an answer that presumably represents some consensus of public opinion. Since the 1960's, the federal government has required the use of a discount rate consistent with the return on federal borrowings, except that upward and downward adjustments in that rate cannot exceed 1/4 of one percent for any year. Consequently, during periods of high inflation, the rate will not be that actually reflected in the market but some additive amount of the preceding year's rate. This tends to ameliorate the impact of inflation while still allowing for today's opportunity cost of capital to be reflected in the calculation.

Note that the suggestion was made that this approach reflects some consensus of public opinion. In support of that statement, it should suffice to suggest that the current standards have been subjected to years of review and, yet, remained in place for nearly two decades. Until this consensus was developed, the method by which the rate was determined and changed was subject to numerous changes. In fact, the same conceptual and empirical issues raised in an evaluation of reserved water rights have been discussed each time the general principles and standards have been opened for review over the past two decades. The rules remain virtually the same.

Yet, pressure for a low discount rate continues. In most, if not all development projects, the costs are incurred early in the project life while the stream of benefits do not occur until later in the life of the project. Consequently, the ratio of benefits to costs could be enhanced

(increased) if a lower discount rate were used. However, increasing the value of the benefit stream through the introduction of a lower discount rate is not consistent with the notion and use of the true opportunity cost of financial capital nor will that lower rate provide for a conservation of resources.

A final empirical issue rests with the actual methodology employed in the discounting and compounding process. In traditional project analysis, the flow of benefits and costs from all aspects of the proposed project or development are brought to a common point in time for comparison purposes. For instance, if recreation and agriculture depend on the completion of a water storage facility, then the costs to construct the facility are compounded until such time as the facility has been completed and the benefits (and any other costs) are discounted back to this same time period. To compare costs at a specific point in time with benefits at another point in time as has been done in some reserved right cases is totally inconsistent with the logic of compounding/discounting. A common point of time comparison must be used because costs and benefits received in different periods of time do not have the same value to us today. Note that this problem is particularly troublesome for multiple feature projects such as dams which include cost and benefit components for irrigated agriculture, recreation, flood prevention, and municipal and/or industrial use. Unless such costs and benefits are brought to a common point in time, the resulting benefit-cost ratio is meaningless.

ECONOMIC ANALYSIS AND RESERVED WATER RIGHTS

It would seem appropriate to now summarize the application of economic analysis to reserved water rights. First, there may be some basis for using practically irrigable acreage as defined by appropriate economic

analysis in determining a reserved water right because a similar process would certainly have to be used were the Indians to compete for the water. Historically, other members of our society had to demonstrate that the water could be put to beneficial use before those rights could be captured. Today, the standard of beneficial use is the primary criterion used to establish or perfect water rights. Hence, there is certainly some historical basis for its use in the case of establishing reserved water rights. More specifically, irrigated agriculture constituted the primary use of water in those early days of development and would most likely have been the basis for water rights quantification. Second, the use of a measure of economic feasibility establishes some limit to the claim for reserved water rights. Third, the use of economic feasibility establishes a rule for quantification that can be applied to all concerned, providing the specific analytical analyses are performed in an appropriate manner. Finally, the use of a PIA standard using today's technologies almost guarantees that the Tribe will receive more water than they would have had rights been perfected during the time at which the reservation was established.

Are there any reasons to suggest that PIA may not be the standard to use as a measure of quantification? First, under the current evaluation procedures and practices (establish the right based on the purpose for which the reservation was established), there is no guarantee that the water will be put to the best use by society or the Indian tribe. Second, the use of a PIA standard may not provide water to meet the "needs" of the tribe in question. For all of us, there is usually some divergence between wants and needs and the PIA standard may either provide too much water for meeting the tribe's needs or too little water to meet those needs. The

PIA standard would, in all likelihood, never provide enough water to satisfy wants. Third, there is the potential that an award of water made on the basis of economic feasibility to the tribes may exceed that which is practicably even in the water shed. Fourth, a claim based on PIA may preclude every other non-Indian use, something which may be legally, politically, and economically unpalatable. Furthermore, the use of a PIA standard which would result in no award would likely be as unpalatable. This last possibility, in our opinion, has not been given the serious consideration that it merits. If project infeasibility and a resulting non-award is not acceptable to the parties involved in these matters, then PIA and economic feasibility are not useful measures. In summary, there are problems associated with the application of a PIA standard to the issue of reserved water rights.

SUMMARY AND CONCLUSIONS

The issue of reserved water rights is extremely complex. From the litigation that has occurred thus far, there does appear to be a major role for economic analysis in bringing about a resolution of the reserved water rights issue. There is little doubt but that the extent of the problem is significant enough to warrant its examination. For some states, the potential reserved water right claims exceed available supplies. For other states, even though the total claims are a small portion of the state's water supplies, those supplies are fully appropriated. Reserved water rights can be granted only if someone else is denied their rights.

We have identified several conceptual and empirical issues which have yet to be resolved in the resolution of the reserved rights question. Of importance in the conceptual area are issues relating to economic and financial analysis, questions of Pareto efficiency, impact on society's

wealth when transfers are made, the issue of time, the role of beneficial use in rights determination, the geographic distribution of benefits/costs, the discount rate, the inclusion of secondary benefits/costs, and questions of equity. Empirical issues needing further discussion by economists and clarification by the courts are the role and use of current, federally mandated feasibility rules in actual rights determination, economic vs. financial feasibility approaches, method of treating labor cost during construction/operation, the type of activities that are appropriate to include and the level that such activities can be introduced, the geographic extent or distribution of benefits and costs; the discount rate, the discounting approach, the use of secondary benefits and costs, and the "time" dimension of application of benefits and costs.

We would suggest the use of economic analysis can be an appropriate tool in resolving this conflict. We would also suggest that until some rules are established which must be followed in determining "needs" or "wants", conflicts associated with the litigation process will expand. Even where a determination based on needs, we would expect the rules to be challenged simply because the stakes are so high.

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