Technical and Physical Feasibility Fact Sheet
Alternative 21: Urban Water Pricing

Acknowledgements: This fact sheet was written by Brian McDonald, Ph.D., private economic consultant, as part of the "Evaluation of Alternative Actions for Technical, Physical, Hydrological, Environmental, Economic, Social, Cultural, and Legal Feasibility and Water Quality Issues and Legal Overview" contracted to Daniel B. Stephens & Associates, Inc. The format and organization of the fact sheet and the definition of the alternative were developed by the Water Assembly.

1. Definition of Alternative

A-21: Examine a variety of water pricing mechanisms and adopt those that are most effective at conserving water. The mechanisms to be examined include: a) price water to reflect the true value; b) institute a moderately increasing block price schedule; c) institute a steeply increasing block price schedule; and d) other feasible incentives and subsidies for conserving water.

2. Summary of the Alternative Analysis

Price increases, as a strategy to conserve water can lead to revenue enhancement for public and private water systems, which is inconsistent with present utility regulatory policy. To make this alternative feasible, revenues generated through price increases must be reinvested into projects and programs. Projects could include water conservation programs and/or water supply development projects.

2.1 Understanding the True Cost of Water

In the ideal competitive world the price of a commodity such as water would be set at its true economic value, determined by the interplay of demand and supply among many competing buyers and sellers. However, in the Middle Rio Grande (MRG) planning region the true value of water is unknown and indeterminate, since the market for water is not competitive.

Irrigation water is provided to farmers by the Middle Rio Grande Conservancy District (MRGCD) on a per-acre charge basis, and the marginal price of irrigation water is zero since there is no metering. Urban water use in the City of Albuquerque is priced on a cost of service basis, where water prices are set so that the city recovers the operating and capital cost to provide water service. Private water utilities, such as New Mexico Utilities, must get New Mexico Public Regulatory Commission approval of water prices, which are generally set to recover the cost of service and a fair rate of return on invested capital. Competitive market forces do not set water prices in this region.

As further evidence of the lack of a competitive market for water in the MRG region, consider that the acquisition of new water rights today costs approximately $5,000 per consumptive acre-foot of water. This reflects the value to acquire the permanent right to consume water in the region from another water user. Assuming a discount rate of 5.25 percent,[1] a $5,000 cost to acquire a permanent water right today represents an annual $262.50 cost[2] per consumptive acre-foot cost. The City of Albuquerque and other water users in the region also have rights to San Juan-Chama Project water, the cost of which has been determined by the U.S. Bureau of Reclamation based upon the capital and operating cost of this project. It is estimated that the annual cost of the San Juan-Chama Project water to the City of Albuquerque is $45 per acre-foot. The City of Albuquerque has recently leased San Juan-Chama water back to the Bureau of Reclamation at an annual cost of $45 per acre-foot, as provided for in the San Juan-Chama Project agreement. However, at the same time the City is paying $5,000 per acre-foot to acquire permanent water rights, which is an annual $262.50 cost. In a competitive market, the marginal price of water would be the same price for all uses, but this is not true in the planning region.

Groundwater that is mined as a source of water supply represents a special case for the true value of water. Such groundwater not only provides the usual “extractive services” to municipal, industrial, commercial, and agricultural water users. In addition, it provides “in situ services” such as supporting the water table in the riparian zone, preventing the subsidence of the land surface, providing reserves in case of drought, and reducing water treatment costs.[3] The value of these in situ services are not reflected in the current price of mined groundwater, which is based upon the cost to drill, pump, and treat mined groundwater.

Other impediments to a functioning competitive water market in the MRG region include the difficulty of transferring water among users because of institutional and legal constraints. In a competitive market the transfer of water would be relatively frictionless. Water within this region is also not well-defined as a private property right because of the lack of adjudication of water rights, including the resolution of native rights for the Pueblo Indians. There are many more paper water rights in the MRG region than there are wet water rights. There are also new demands for water in this region, which have not previously existed and which have been imposed by the courts, such as instream flow for endangered species. Thus, in no sense does a true value of water exist today in the MRG region, and what this value would be under competitive economic market conditions is impossible to determine.

2.2 Correlation Between Price and Demand

Water is not exempt from the laws of economics. As an economic commodity, the demand for water is responsive to the price of water. As the price of water increases, the quantity demanded falls. The effectiveness of increasing the price of urban water as a strategy to conserve water in the MRG planning region, however, depends on exactly how responsive demand for water is to increased price. Economists refer to this relationship between the quantity demanded and the price as the "price elasticity of demand."

Urban water pricing mechanisms can result in a 10 percent decrease in water demand, if prices are increased by 100 percent, as outlined in the following discussion. Price increases result in revenues which, under current regulations, must be reinvested in water projects and programs. Because such a drastic increase in price is required, this alternative may not be the most appropriate for reducing water demand. Other non-price conservation mechanisms such as water conservation and xeriscaping may provide a more feasible, lower cost approach to reducing water demand.

Michelsen et al. (1998) provided an extensive analysis of the effectiveness of residential water conservation price and non-price programs for the American Water Works Association. This research explored the feasibility of using higher water prices to alleviate temporary water shortages, to avoid the need for increased water supply, treatment, and water system expansion, and to extend the ability of existing water supplies to meet current and growing future demand for water. Specifically, Michelsen et al. (1998) focused on the consumer response to price and non-price conservation measures in different urban areas of the southwest including Los Angeles, San Diego, Denver, Albuquerque, Las Cruces, and Santa Fe. The statistical analysis covered the 1984 to 1995 time period and examined residential water consumption, rate structure, and price and non-price conservation programs.

According to their research, non-price water conservation programs appear to be effective, if the water utility achieves a critical mass of such water conservation programs. Although they were not able to determine the effectiveness of a specific non-price water conservation program, their research did indicate that a combination of water conservation programs, implemented in unison, can be effective in reducing the demand for residential water use (Michelsen et al., 1998). The feasibility of such non-price water conservation programs is explored more completely in the economic fact sheet for Alternative A-22, Conservation Incentives.

Over time, a water price increase coupled with extensive non-price, conservation programs can lead to reduced revenues. Revenue projections as well as short- and long-term effects on water demand must be part of a study to fully evaluate the implications of this alternative on the operations of any individual public or private utility.

Typically, urban water rates are set to recover the cost of providing water service to residential and non-residential customers. Rate structures include a fixed monthly charge, which may or may not include some minimum usage of water, and a water commodity charge, which may be a constant price per unit of water or an increasing block rate structure in which the price per unit increases as water consumption increases. The increasing block rate structure is oriented toward water conservation and attempts to use the market mechanism to reduce water use, particularly among high volume water users. Michelsen et al. (1998) found that in 1986 only 8 percent of residential water providers in the U.S. used an increasing block rate structure. However, by 1994 this had increased to 22 percent.

Although Michelsen et al. concluded that a higher water price has the expected negative impact on water use, they noted that water demand is very price inelastic: "Consumers are very unresponsive to price increases under current rate structures, requiring large increases in price to achieve small reductions in demand" (Michelsen, et al., 1998). For summer water use, they found that the price elasticity of demand for water was approximately –0.20, which means that for a 100 percent increase in water prices, water demand decreases 20 percent. On an annual basis, however, they concluded that the price elasticity of demand for water was only –0.10, meaning that a 100 percent increase in water prices will reduce water demand by only 10 percent (Michelsen et al., 1998).

Urban water prices are set within a utility regulatory environment, whether it is a public utility or private water utility. In the latter case, however, the price allows recovery of the operating and capital cost of the water utility and a fair rate of return. Revenue enhancements through price increases are allowed, if the water utility can document that it has increased operating cost of service or additional capital expansion needs.

Price increases for water conservation goals alone will result in revenue enhancement for water utilities. Public water utilities must be operated on an enterprise fund basis, and excess revenue may not be shared with the general fund. Private water utilities operate on a cost of service plus a fair rate of return basis. Revenue enhancement from a water conservation pricing strategy would result in excess profits to the private water utility or excess reserve funds to the public water utility. However, if these revenues are reinvested in water projects and programs, the utility can implement the price change while complying with existing regulations.

2.3 Existing Water Rate Structures in Selected Southwestern Cities

Tucson, Arizona has the highest increasing block rate water price structure in the southwest. For a single family residential customer, Tucson charges $1.03 per unit[4] for the first 15 units, $3.50 per unit for the next 15 units, $4.92 per unit for the next 15 units, and $6.97 per unit for water usage over 45 units. In contrast, the City of Albuquerque charges $1.1934 per unit with a 50 percent surcharge ($1.7901 per unit) in summer (April through October) for water usage exceeding 200 percent of the winter average. A second tier surcharge of an additional 50 percent ($2.3868 per unit) is applied to water usage exceeding 300 percent of the winter average. In Albuquerque, the typical residential customer uses 10 units in the winter; this means that in summer only, the city charges $1.1934 per unit for the first 20 units, $1.7901 per unit for the next 10 units, and $2.3868 per unit for water usage over 30 units.

Both Albuquerque and Tucson have a fixed-base charge that does not include any minimum water usage; however, Phoenix charges a fixed base charge, varying by meter size, that does include a minimum water usage—6 units during October through May, and 10 units during June through September. Consequently, in Phoenix, the minimum water user faces a zero marginal price of water. For water usage beyond the minimum, Phoenix uses an increasing block rate structure that varies by season. In the low use months of December through March, the water commodity charge is $1.24 per unit. In the medium use months of April, May, October, and November, the water commodity charge is $1.47 per unit. Finally, in the high use months of

June, July, August, and September, the water commodity charge is $1.87 per unit. Phoenix also imposes a flat $0.08 per unit environmental charge in all months in addition to the water commodity charges above.

Colorado Springs has a water price structure similar to Albuquerque, with a fixed base charge and no minimum usage. In the winter months (November through April), there is a constant water commodity charge of $1.52 per unit. In the summer months (May through October) there is an increasing block rate structure. The water commodity charge is $1.52 per unit for the first 10 units of water, $1.91 per unit for the next 20 units of water, and $2.27 per unit for water use over 30 units.

Salt Lake City has the lowest water rates among the southwestern cities surveyed. Salt Lake City has a fixed base charge, which includes the first 5 units of water use. It also has an increasing block rate structure like Phoenix, which varies by the season than by usage. During the low use season of October through May, the water commodity charge is $0.61 per unit, while during the high use season of June through September, the water commodity charge is $0.93 per unit.

There are several small private water utilities in the MRG planning region. Residential water rates for three of these are presented in Table 21-1; however, as a condition of releasing this rate information, these private water utilities wished to remain anonymous. Water utilities A and B both charge a fixed monthly base amount, which includes a minimum usage of the first 900 gallons. For monthly water usage over 900 gallons, these two private water utilities charge a fixed commodity charge: $2.53 per 1,000 gallons and $3.08 per 1,000 gallons, respectively.

Water Utility C charges no fixed monthly base amount, and derives water revenues only from a commodity charge per 1,000 gallons. This commodity charge increases as monthly usage increases, ranging from $3.38 per 1,000 gallons on the first 1,000 gallons to $5.84 per 1,000 gallons for usage over 20,000 gallons. Thus, Water Utility C already has imposed an increasing block rate structure, while the other two have not.

Table 21-1. Water Rates for Small Private Utilities in the Middle Rio Grande Planning Region

Private Water Utility[a]	Service Charge	Rate per 1,000 Gallons		
		0 to 900 Gallons Used	901 to 20,000 Gallons Used	Over 20,000 Gallons Used
Water Utility A	None	$12.50	$2.53	$2.53
Water Utility B	$11.25	$3.08	$3.08	$3.08
Water Utility C	None	$3.38	$4.61	$5.84

[a] These small utilities have between 500 and 2,000 connections each.

It is important to note that the water commodity charge of these small private water utilities is much higher than the commodity charge of large public water utilities such as Albuquerque, Salt Lake City, Colorado Springs, and Phoenix. Increasing the water rates from present levels at these small private water utilities as a means of encouraging water conservation will impose a greater financial burden on these rate payers than on those of a large public water utility such as the City of Albuquerque.

Santa Barbara, California is an interesting case study of the urban water pricing and water conservation policy. In 1990 and 1991, Santa Barbara was faced with a severe drought and had actual physical limitations on the amount of water available for consumption. Urban water use was reduced by 50 percent during this time period. In response to the drought and water shortage, Santa Barbara embarked on a $34 million desalination water project to expand the city's water supply. To pay for this project, water rates were doubled and an increasing block rate price structure imposed.

At first glance, it may appear that Santa Barbara was able to achieve a 50 percent reduction in urban water use for a 100 percent increase in water prices. However, this would be an incorrect analysis of the price elasticity of the local demand for water. Although water usage undoubtedly fell because of higher water prices, the decrease in usage was primarily caused by the physical shortage of water—water could not be had for any price.

Santa Barbara raised water prices in response to the drought emergency, not only to discourage water demand and but also to raise revenue to pay for the $34 million desalination plant. The need for revenue enhancement to pay for expanding the city's water supply was a major driving force behind the water rate increase.

Interestingly, Santa Barbara does not currently use the desalination plant, but maintains it as a drought reserve. Due to ample rainfall in recent years and cheaper available water from the State Water Project, it is not cost effective to run this plant at this time. Between 1993 and 1999 Santa Barbara kept its water rates unchanged, while the statewide average residential water price increased 20 percent. Santa Barbara did approve a 3 percent water price increase in 1999 and 2000 to fund major water construction for the City's Sheffield Reservoir. Thus, even in Santa Barbara, water price increases appear to be tied for the need for revenue enhancement rather than water conservation.

Water consumption data from the City of Santa Barbara indicates that, prior to the drought emergency in 1990, water system production was approximately 16,000 acre-feet per year. During the drought, water system production fell to near 10,000 acre-feet per year and today, water system production has leveled off at approximately 14,500 acre-feet per year, "reflecting an estimated permanent reduction in water usage of about 10 percent as a result of measures taken during the drought" (City of Santa Barbara, 2002).

3. Alternative Evaluation

3.1 Technical Feasibility

Enabling New Technologies and Status

Urban water pricing mechanisms with increasing block rate structures already have been implemented in many U.S. cities. Thus, this alternative is technically feasible.

Infrastructure Development Requirements

For a public water utility, a water rate increase would usually be initiated by the water utility department, as needed, to fund increased operating costs or capital expenditure needs of the public water system. The new water rate structure would be designed by city staff, perhaps with the assistance of an outside consultant. Water utility department staff must document that the proposed water rates would raise enough water revenue to cover operating cost and debt service on water revenue bonds without generating excess cash reserves. The proposed new water rates would be presented to the city council for review and approval, and the mayor must sign off on the rates, after city council approval. The city council and/or the mayor can also initiate a water rate increase as part of a city water policy strategy to conserve water, with increased water revenues dedicated to fund water conservation programs or new water supplies for the city.

For a private water utility, the manager of the private water utility typically would bring a proposal for a water rate increase to the New Mexico Public Regulatory Commission (NMPRC) for approval. The proposal would first be prepared by the financial staff of the private water utility, with or without the assistance of outside consultants. In many cases the private water utility hires an outside lawyer, who is an expert in administrative proceedings before the NMPRC, to assist in this process. This proposal must document that the proposed rate structure would raise sufficient revenue to cover the operating cost of the private water utility as well as provide a fair rate of return on the utility's invested capital. The NMPRC staff would review the proposed new water rate structure and recommend approval of the commissioners. The new water rates would not go into effect until it was approved by the five-member NMPRC.

Total Time to Implement

Implementation of a new water rate structure could be completed within six months; however, it may require consultation on water rate design.

3.1.1 Physical and Hydrological Impacts

Effect on Water Demand

A 100 percent increase in water rates, on average, would decrease total urban water use by 10 percent. Total urban consumptive water use in the MRG planning region is estimated at 84,880 acre-feet in 1995 (Wilson and Lucero, 1997).

Effect on Water Supply (surface and groundwater)

None.

Water Saved/Lost (consumption and depletions)

This alternative would result in a 10 percent reduction of urban water demand for every 100 percent increase in the water rate.

Impacts to Water Quality (and mitigations)

None.

Watershed/Geologic Impacts

None.

3.1.2 Environmental Impacts

Impact to Ecosystems

Water savings, if legally available, could be transferred to other water uses that support riparian habitat.

Implications to Endangered Species

Water savings, if legally available, could be transferred to other water uses that support the endangered species such as the silvery minnow.

3.2 Financial Feasibility

3.2.1 Initial Cost to Implement

For a public water utility, the administrative costs include staff time to develop, manage, and implement a water rate increase initiative, estimated at six months of one full-time employee's time. The public water utility likely would contract out for a water rate study, which would cost approximately $50,000. City council staff would review the proposed water rate increase, estimated at one month of a full-time employee's time. Staff from the mayor's office would also review the final water rate proposal, requiring an estimated two weeks of a full-time employee's time. This alternative could cost from $100,000 to $300,000 to implement, depending on employee salaries and/or unanticipated costs. Assuming a 100 percent increase in the average price of urban water ($0.00193 per gallon including surcharges; City of Albuquerque, 2002) the cost to save 8,488 acre-feet (10 percent of total urban consumptive use in the three counties in the region) is approximately $6,300 per acre-foot.

For a private water utility the administrative costs would likely be of the same magnitude, except the total cost is more likely to be at the high end of the range. This is because an outside attorney specializing in administrative hearings before the NMPRC would likely be hired on a contract basis.

Potential Funding Source

Water users would pay for the increased rates. Public and private utilities pay salaries and the cost of outside consultants from revenues, therefore these costs would also be funded by water users.

3.2.2 Ongoing Cost for Operation and Maintenance

None.

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[1] Current interest rate on municipal bonds rated AAA.

[2] $5,000 times 5.25%.

[3] For a more complete discussion of these groundwater issues see *Valuing Ground Water: Economic Concepts and Approaches*, Commission on Valuing Ground Water, National Research Council, The National Academies Press, 1997.

[4] One unit is 748 gallons of water or 100 cubic feet of water.