

Water Rate Structures in Utah: **How Utah Cities Compare Using This Important Water Use** **Efficiency Tool**



January 2005

This report was prepared by Western Resource Advocates with cooperation from the Utah Rivers Council. Please contact either of these organizations for hardcopy or electronic versions of the report.

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Water Rate Structures in Utah:

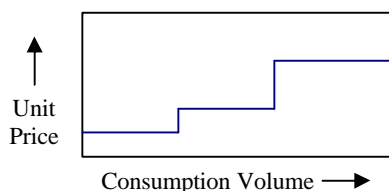
How Utah Cities Compare Using This Important Water Use Efficiency Tool

Executive Summary

In semi-arid Utah, precious rivers, streams, and aquifers sustain cities and towns by feeding urban water supply systems. With a finite supply, Utah citizens, policymakers, and water utility managers must fulfill the dual role of ensuring water in customer taps and in Utah's rivers, as Utahns place a high value on both.

Water rate structures play an essential role in communicating the value of water to water customers, thus promoting long-term efficient use. The value of water includes: (1) the utility's operation and maintenance costs; (2) costs to procure and develop additional water supplies to meet growing demands; and (3) social and environmental "opportunity costs" of losing other benefits of the water and natural waterways.

Increasing block rate structures most effectively communicate this value and encourage efficient use when compared to other types of rate structures. Through an increasing block rate design, the unit price for water increases as the volume consumed increases, with prices being set for each "block" of water use. Customers who use low or average volumes of water are charged a modest unit price and rewarded for conservation; those using significantly higher volumes pay higher unit prices.



In a broader regional study, we found a close correlation between cities with dramatically increasing block rates and those with the lowest per capita consumption levels.¹ Along with other conservation and efficiency programs, effective rate structures can help stretch existing water supplies farther and avoid much of the cost, delay, and controversy that result from large, new water development projects. If designed appropriately, increasing block rates:

- Provide water at low prices for basic and essential needs, so *all* customers can afford it;
- Reward conserving customers with lower unit rates for water;
- Encourage efficient use by sending a strong conservation price signal;
- Assign water supply and development costs proportionately to the customers who place the highest burden on the supply system and the natural supply sources; and
- Do all of the above while still maintaining a stable flow of revenue to the utility.

Utah communities use a wide variety of water rate structures, ranging from efficiency-based designs to rate structures that promote little or no efficient water use. Some have incorporated increasing block rate designs, but have set the block prices and volumes in ways that do not effectively promote efficient water use. Although some Utah cities and towns have made progress in developing and instituting efficiency-based rate structures, the results from this analysis indicate that most still have a lot of room for improvement.

This report discusses the various types of water rate structures and their effect on promoting efficient water use (pages 3 to 8). It then offers a comparison of the rate structures used in 12 Utah municipalities to see how these cities and towns stack up in using rate structures as a water efficiency tool (pages 9 to 16).

¹ Western Resource Advocates, *Smart Water: A Comparative Study of Urban Water Use Efficiency Across the Southwest*, December 2003, at 74-86.

Introduction

Water rate structures are becoming an important tool for encouraging the most efficient use of our precious water in the arid West. Many cities with water rate structures that accurately reflect the value of water and the costs of obtaining new water supplies have lower per capita water use and can stretch existing water supplies farther. These cities are able to avoid much of the cost, delay, and controversy that accompany large new water development projects. As a result, they're able to preserve the natural river systems that support habitat and the quality of life associated with outdoor experiences here in the West.

This paper offers a guide to the various pricing options that urban water managers and policymakers can use. It explains which options generate the strongest incentive for efficient water use and yield the fairest billing for consumers who place different levels of demand on water supply systems. It then compares a large sampling of current water rate structures in communities throughout Utah.

What Is a Water Rate Structure?

Like retailers of commodities such as electricity, municipal water utilities sell their product (treated water) to their customers, and charge the customers to cover the cost of the product plus the operation and maintenance of its supply and delivery system. Municipal water utilities set the prices for their retail water sales through their *water rate structures*. If well designed, water rate structures communicate the true cost of water to the consumer. They also play an important role in setting price incentives that promote indoor and outdoor water conservation. Unfortunately, many water rate structures in Utah cities and towns do not yet effectively accomplish either of these objectives (see pages 9 to 16 for details).

Water rate structures are extremely important in promoting efficient water use, since water consumption levels are directly related to the price signals sent by rate structures. Many people assume that establishing a conservation price signal in a water rate structure translates to higher water bills for most customers. However, this is not necessarily the case. In fact, under well-designed structures, conserving households can actually save money. Innovative rate structures can promote efficient water use while maintaining an equitable and reasonable charge to customers. At the same time, well-designed rate structures can also provide the utility with a reliable revenue flow that covers its operation and maintenance costs.

What Are the Different Types of Water Rate Structures?

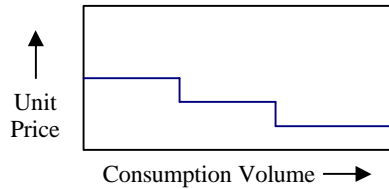
Most water rate structures are made up of two charges. Both charges play a role in determining how effectively a water rate structure communicates an efficiency message to the customer.

- *Service charge* = the fixed service fee per billing period, regardless of consumption level
- *Consumption charge* = the price for each unit of water consumed

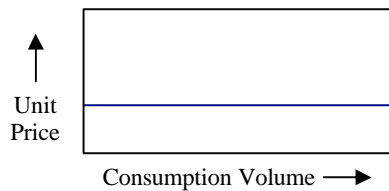
With these two charges as a basis, the water supply industry uses four general types of water rate structures. However, many variations exist within these types. In addition, some cities and utilities apply hybrid rate structures that combine different components of the four basic types. The unit prices discussed here refer to the consumption charges for water sold to each customer, and do not reflect the service

charges. These consumption charges, or *marginal prices*, reflect the price for using the next measured amount of water, often set as dollars per 1,000 gallons or dollars per 100 cubic feet of water.²

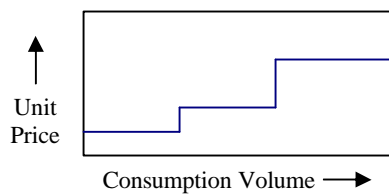
Decreasing block rates: The unit price for water decreases as the volume consumed increases. The structure consists of a series of “price blocks,” which are set quantities of water sold at a given unit price. The unit prices for each block decrease as the price block quantity increases.



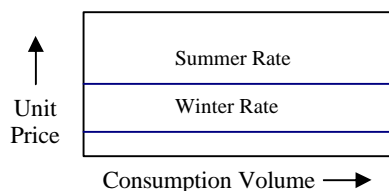
Uniform rates: The unit price for water is constant, or flat, regardless of the amount of water consumed.



Increasing block rates: The unit price for water increases as the volume consumed increases. This structure consists of a series of price blocks, where the unit prices for each block increase as the block volumes increase. Those who use low or average volumes of water will be charged a modest unit price; those using excessive volumes will pay higher unit prices. A variety of approaches can be applied to setting each block volume.



Seasonal rates: The unit price for water is set to vary from season to season. Summer water rates are typically higher than winter rates in order to reflect the fact that water is more valuable, and costs more to provide, in the summer.



² Some smaller communities still use a flat consumption charge for all customers (i.e., not metered per unit of individual consumption), since individual metering systems are not adequate or in place.

How Do Water Rate Structures Relate to Efficient Water Use and Conservation?

To promote efficiency, water rate structures must communicate the true cost of water. Only if the price of water reflects the economic value of water will customers know whether it is “worth it” to conserve water. The true economic value of water includes: (1) the utility’s operation and maintenance costs; (2) the costs to procure and develop additional water supplies to meet growing demands; and (3) the social and environmental “opportunity costs” of losing other benefits of the water in order to develop and consume the water (e.g., ecological and recreation values of river basins, local/community economies, values of river flows for diluting pollutants, etc.). Failing to integrate all of these social and environmental costs into a water rate structure is equivalent to subsidizing the cost of water. Furthermore, if the retail price of water is lower than its value, customers have an incentive to use too much of it.

Often a utility’s “marginal” costs—the costs of meeting an increase in water demand with additional supplies—serve as a useful proxy for the value of water. If efficiency is a priority—and under conditions of limited water supply and increasing population, it should be—it is imperative that water rate structures send accurate signals about water’s value. If a utility’s rate structure accurately reflects its marginal costs, it should encourage efficiency. In other words, water use efficiency means saving water when doing so costs less than the value of the water saved. Although there are costs associated with saving or conserving water, these conservation costs are often lower than the total economic costs associated with developing and using water. Such factors usually include the cost of acquiring new water supplies, environmental costs, and socioeconomic costs, among others.

Innovative rate designs can promote efficient water use and still assure revenue stability for the utility. Water utilities are confronted with the challenge of recovering supply costs with revenues from water sales. System maintenance, facility operation, and procuring and developing future supplies all contribute to the utility’s costs. With the exception of tax-based subsidies in some districts, most of these costs are recovered via the water rate structure, tap fees, and other surcharges. Given this arrangement, utilities have an inherent disincentive to promote conservation, since utility revenues are driven by higher water sales. However, water rate structures can be designed in ways that yield relatively stable and sufficient revenue flows, while still promoting efficient water use. Examples of this “win-win” scenario exist throughout the Southwest.

Which Types of Rate Structures Promote the Most Efficient Water Use?

The increasing block rate structure most effectively encourages efficient water use. An increasing block rate structure is set up to charge higher unit prices to customers who use more water and charge lower unit prices to customers who use less. In other words, the unit prices reflect the strain or demand a customer places on the water supply system. This design is fundamentally fair; customers are charged on the basis of the costs they impose on the utility. Because high-volume users expedite the need for infrastructure upgrades and new supply procurement, these high-volume customers are more expensive for the utility to maintain. It would be unfair to pass the costs generated by these relatively few customers on to those who use more moderate amounts. Thus, if designed correctly, increasing block rate structures reward customers for conservation.

Increasing block rate structures can maximize efficiency if the block volumes are individually customized to the specific water needs of each customer—this is called a **water budget rate structure**. Under this design, each customer is assigned a monthly allotment of water based on the customer’s lot size, irrigable area, climate conditions, and household/building occupancy. In most cases, the monthly allotment, or

budget, provides enough water for each customer to sustain normal indoor uses as well as actual landscape irrigation needs based on local evapotranspiration rates. If the customer exceeds the monthly water budget, the excess water use is charged at notably higher unit prices (as with the standard increasing block rate structure). In essence, each account has its own water rate structure attached to it. As a result, efficient customers pay a lower unit rate, while inefficient customers pay a higher unit rate.

Maximum water budget allotment limits can be set to avoid excessive water allotments to large lot owners. One way to do this is to incrementally decrease the water allotment per square foot as the irrigable area of the lot increases. This helps minimize the inequity of allocating water based on wealth (measured via lot size ownership). It also encourages large lot owners to apply a more water-efficient design to a portion of their landscaped yard.

The *seasonal rate structure* also provides a conservation price signal when moving from winter to summer. This design charges a higher unit rate in summer, when outdoor and other discretionary water uses are the highest. Most often, this design applies a uniform rate structure that varies in price from season to season. Thus, on a day-to-day basis within a particular season, the seasonal rate structure does not provide a price incentive for conservation because the unit price is constant regardless of the amount of water consumption each month. An exception to this rule occurs when the seasonal rate changes incorporate increasing block rates (e.g., uniform winter rate and increasing block summer rates).

The *uniform rate structure* and the *decreasing block rate structure* provide no price incentive for water conservation. Although a customer's overall bill will increase as water consumption increases in both of these rate structures, the unit price for water remains constant or decreases, respectively. Thus, the consumer has little or no price incentive to conserve and, in the case of the decreasing block rate structure, the consumer actually has a price incentive to use more water. This can encourage waste.

What Other Factors Affect a Water Rate Structure Design?

Equity for the Customers

Rate structures need to charge customers equitably. This is a challenge, given the wide variety of customers. To meet this challenge, utilities must provide fairly and reasonably priced water to all customer types (i.e., from small volume users to large volume users) and across all customer sectors (i.e., residential, commercial, industrial, etc.). Increasing block rate structures meet the criteria for fairness: they charge customers on the basis of the amount of water they consume and also ensure that all customers can afford to pay for water to meet basic needs. This design is inherently fair and reasonable because customers are charged according to the strain they impose on the utility's water supply, which can eliminate the subsidy to the high-volume users.

Revenue Stability for the Utility

Rate structures must be designed to ensure that the utility recovers its costs. A rate structure that will not allow a utility to recover its operation and maintenance costs will require a subsidy to the utility, typically at the taxpayers' expense. This often occurs when the utility prices the water at or below its average cost of collecting, storing, treating, and delivering the water. Conversely, a utility generally is only allowed to raise revenues that do not exceed and are reasonably related to its *cost of service*. Therefore, setting fixed service charges and consumption charges must be coordinated with customer demand projections to generate a revenue flow consistent with utility costs, which include operation, maintenance, as well as conservation program costs.

What Factors Can Weaken the Effectiveness of a Water Rate Structure?

High Fixed Service Charges

High fixed service charges can weaken the intended conservation effect of an increasing block rate structure. Setting appropriate fixed service charges is as important as setting consumption charges. When compared to consumption charges, fixed service charges offer a much more consistent revenue stream for a utility to cover its operation and maintenance costs. As a result, water utilities often prefer to set higher fixed service charges. However, a high fixed service charge coupled with relatively low consumption charges can encourage wasteful consumption—much like a “pay by the plate” dinner buffet.

In combination, both the service charge and consumption charge directly affect the *average price* for the water. The average price, which is what consumers see reflected in their bills, is defined as the monthly service charge plus the total consumption charges, divided by the total consumption volume. The average price directly affects consumption patterns, because consumers typically respond to the bottom line on their bills. When fixed service charges are factored into an increasing block rate structure, a conflicting message can result. According to studies by the American Water Works Association Research Foundation, “fixed service charges can offset the conservation incentives of increasing marginal rates.”³ This phenomenon occurs often when high fixed service charges are applied along with small block price increases.

If the block price increases are too small and/or the fixed monthly service charges are too high, the average price curve often declines and eventually becomes uniform, or flat. From the perspective of the customer’s pocketbook in this scenario, each additional unit of water purchased will more or less have a constant price attached to it, even if the block prices (marginal prices) are increasing. When this occurs, the consumer will not experience any noticeable conservation price incentive.⁴

“Price Insensitivity” as a Result of Minimal Consumption Charge Increases

Increasing block rate structures can also be ineffective in promoting efficient water use if the block price increases are small. This is especially true in districts with an abundance of low-density, residential or commercial development, particularly areas with large, irrigated lawns. An important economic concept known as *price insensitivity* explains this phenomenon. In this case, price insensitivity refers to situations where block price increases are too small or negligible relative to a customer’s overall water bill and/or disposable income. As a result, the increasing block rates are hardly enough to encourage conservation or demand reduction for high-volume customers with large disposable incomes. For example, a \$0.20 block increase (per 1,000 gallons) does not create the incentive for a high-volume residential user to be efficient with lawn irrigation practices. This hypothetical consumer would only pay an additional \$2.00 for using 10,000 more gallons in this block.⁵ Addressing this problem is very

³ Ari Michelsen, J. Thomas McGuckin, and Donna M. Stumpf, *Effectiveness of Residential Water Conservation Price and Nonprice Programs*, American Water Works Association Research Foundation (AWWARF), 1998, at 13.

⁴ “A rate structure with increasing marginal prices while the average price is declining sends mixed signals to consumers about their economic incentives to conserve water. Rate structures with any service charges, and in particular relatively large service charges in relation to the per unit cost and total water bill, are apt to create these mixed price signal conditions.” AWWARF at 13-14.

⁵ The challenge that many water utilities face is setting block prices that will have a significant effect on customers that use large volumes and have high disposable incomes without creating an inequity, or regressive tax, on lower income brackets. An aggressive increasing block rate structure appears to be the most ideal tool for this socioeconomic conundrum. This design would charge substantially higher unit prices for high-volume use, while the low-volume use for basic needs would be charged at a much lower, more affordable rate.

important since a small number of high-volume users can easily use more water, and place more strain on the supply system, than a large number of low-volume users.

Billing Frequency and Communication to Customer

Customers' response to water rates is also influenced by the billing cycle and the ability to track their use. For example, bi-monthly billing cycles can be counter-productive to water conservation efforts. Customers interested in conservation or saving money adjust their home water use on an incremental basis, in response to the consumption reported in each billing statement. This practice is particularly common during the summer irrigation months, when urban water use peaks. With a bi-monthly billing cycle, the summer can be half over by the time customers are notified of their recent consumption quantities. This may preclude many customers from making more efficient water use decisions earlier in the summer during the high water-use months.

Customers are more likely to practice water conservation if they have easy access to their account information. Although billing statements typically summarize each household's water use during the previous month period, other opportunities could be made available on a more frequent basis. For example, as computerized utility accounting systems become more streamlined and modernized, it will be possible to provide real-time account access via the utility website. In-home, remote meter-monitoring technology is also becoming available. With these types of tools, customers will have the opportunity to monitor daily or weekly water use trends and adjust their use accordingly.

How Can I Evaluate My City's Water Rate Structure?

When analyzing water rate structures and billing policies, ask the following questions:

- Do the consumption charges, or marginal prices, send a conservation price signal that clearly demonstrates that water conservation yields lower water bills?
- Does a high monthly service charge decrease the customer's incentive to conserve?
- Are the consumption charge increases in an increasing block rate structure noticeable to all customers, or are high-volume water users unaffected by the modest block price increases?
- Do the water rates reflect the true value of water, incorporating system operation costs, social costs, environmental costs, as well as the costs for acquiring future supply sources?
- Does the billing frequency and statement summary enable the customer to effectively monitor water use and adjust conservation efforts accordingly?

As with most public affairs, local socioeconomic trends and variables must be considered when assessing appropriate water policy implementation. For example, an effective price structure in one community may be ineffective or regressive in another community, depending on the socioeconomic status and demographic makeup.

How Do the Water Rate Structures Compare Across Utah?

In October 2004, we gathered water rate data from twelve municipal water utilities in Utah. This sampling provides a good cross-section of Utah water providers, both in terms of geographic distribution and community size. Although the variation in rate structures used across Utah can be seen as a rough indication of how each city prioritizes water conservation, each utility has a different water supply situation and different costs associated with these supplies. Therefore, rate structures can be expected to vary somewhat regardless of each city's commitment to conservation. Table 1 lists the components of each rate structure that was implemented by these water providers as of October 2004.

As shown in Table 1, the majority of the water providers in the analysis sample applied some form of an increasing block rate structure (Draper City, Logan, Ogden, Park City, St. George, Salt Lake City, South Jordan City, and West Jordan City). This widespread use was not the case just a few years ago when uniform rate structures were more common. We can be encouraged by the fact that many Utah cities are taking steps towards promoting efficient water use through their rate structures. In these cases, water is charged at a higher unit rate as consumption volumes increase. Conceptually, the customers that place a higher strain on the supply system pay a higher unit rate for their water. Therefore, if the rate structure is designed effectively, customers receive a conservation price signal ... use less, and pay less per unit.⁶

However, this 12-city sampling reveals that most Utah cities have a lot of room for improvement in promoting efficient water use via their water rate structures. In this sampling, we do see significant variations in the design and aggressiveness of the increasing block rate structures. Most of these increasing block rate structures include three or four separate blocks. In this sampling, the number of blocks ranges from two to nine, in Logan and St. George, respectively. All of these design characteristics directly affect how the rate structure promotes efficient water use.

Although eight of the rate structures utilize increasing blocks, by definition, most do not effectively send a conservation price signal to most customers due to the way the block volumes and block prices are set. In some cases, the block price increases in consumption charges are too minimal to send a distinct price signal to most customers. In other cases, the block volumes (i.e., the consumption volumes for each block) are set in a way that allows for large amounts of wasteful use. As a result, most of the increasing block rate structures in this sampling are designed in a way that considerably limits their effectiveness in promoting efficient water use. These characteristics will be more evident when the marginal prices and average prices are discussed in the next two sections of this report.

Also, given the issues raised in the previous section regarding marginal prices and average prices, take note of *both* the fixed service charge and the consumption charge for each municipal utility, and consider the potential effect of both of these charges on water consumption trends. Once again, high fixed service charges combined with minimal block price increases, can yield an ineffective increasing block rate structure (also see discussion of average price comparisons later in this section).

Interestingly, Salt Lake City and Park City use a seasonal rate structure and an increasing block rate structure in combination, with the increasing block rates only being applied during the irrigation season (i.e., summer months). The use of this combined rate structure adjusts to the changing cost or value of water throughout the year while still providing a price signal *within* the high demand months.

⁶ Using South Jordan City as an example of an increasing block rate structure, a customer pays \$24.19 for the monthly service charge, in addition to paying \$1.08 per 1,000 gallons for the first 10,000 gallons used, \$1.22 per 1,000 gal. for the next 18,000 gal. used (between 10,000 and 28,000 gal. total), \$1.36 per 1,000 gal. for the next 20,000 gal. used (between 28,000 and 48,000 gal. total), and \$1.50 per 1,000 gal. for any water use that exceeds 48,000 total gal.

Table 1
Water Rates for Residential Accounts
in Utah Municipalities (3/4" Services), as of October 2004

Municipality [Water Provider]	Rate Structure Type	Fixed Monthly Service Charge	Consumption Rate: Unit Rate per 1,000 Gallons of Water Consumed
Draper City [WaterPro, Inc.]	Increasing block rate	\$24.40 *(a) (incl. 5,000 gal.)	\$1.29 – from 5,000 to 18,000 gal. \$1.88 – from 18,000 to 57,000 gal. \$2.48 – over 57,000 gal.
Eagle Mountain City [Eagle Mountain City Utilities Dept.]	Uniform	\$20.00	\$0.80
Logan [City of Logan Water & Wastewater Dept.]	Increasing block rate	\$14.00	\$0.75 – up to 10,000 gal. \$1.10 – over 10,000 gal.
Ogden [City of Ogden Public Works Dept.]	Increasing block rate	\$6.77	\$0.25 – up to 3,000 gal. \$1.03 – from 3,000 to 10,000 gal. \$1.13 – from 10,000 to 25,000 gal. \$1.23 – from 25,000 to 50,000 gal. \$1.49 – from 50,000 to 200,000 gal. \$1.65 – over 200,000 gal.
Orem [City of Orem Public Works Dept.]	Uniform	\$7.16	\$0.50
Park City [Park City Water Dept.]	Seasonal and increasing block rate	\$12.96	<u>Nov. - May:</u> \$2.27 <u>June - Oct.:</u> \$1.62 – up to 5,000 gal. \$2.59 – from 5,000 to 30,000 gal. \$4.21 – from 30,000 to 80,000 gal. \$6.48 – over 80,000 gal.
St. George [City of St. George Water Dept.]	Increasing block rate	\$13.43 (incl. 5,000 gal.)	\$0.71 – from 5,000 to 10,000 gal. \$0.81 – from 10,000 to 15,000 gal. \$0.89 – from 15,000 to 20,000 gal. \$0.98 – from 20,000 to 25,000 gal. \$1.06 – from 25,000 to 30,000 gal. \$1.15 – from 30,000 to 35,000 gal. \$1.25 – from 35,000 to 40,000 gal. \$1.35 – from 40,000 to 45,000 gal. \$1.41 – over 45,000 gal.
Salt Lake City [Salt Lake City Public Utilities]	Seasonal and increasing block rate	\$5.62	<u>Nov. - March:</u> \$0.96 <u>April - Oct.:</u> *(b) \$0.96 – up to 7,480 gal. \$1.47 – from 7,480 to 22,440 gal. \$2.04 – over 22,440 gal.
Sandy City [Sandy City Public Utilities Dept.]	Seasonal	\$16.33 (incl. 8,000 gal.)	<u>Oct. - April:</u> \$0.99 <u>May - Sept.:</u> \$1.79
South Jordan City [South Jordan City Water Dept.]	Increasing block rate	\$24.19	\$1.08 – up to 10,000 gal. \$1.22 – from 10,000 to 28,000 gal. \$1.36 – from 28,000 to 48,000 gal. \$1.50 – over 48,000 gal.
West Jordan City [West Jordan City Utilities Dept.]	Increasing block rate	\$13.90	\$0.83 – up to 40,000 gal. \$1.00 – from 40,000 to 60,000 gal. \$1.20 – from 60,000 to 100,000 gal. \$1.44 – over 100,000 gal.
West Valley City [Granger-Hunter Improvement Dist.]	Uniform	\$13.00 *(c) (incl. 10,000 gal.)	\$1.30 – over 10,000 gal.

- Notes: (a) The WaterPro, Inc. rates shown in this table apply to the "South Mountain" portion of the WaterPro service area.
(b) SLCPU measures water use in 100 cubic feet increments, or CCF. 1 CCF = 748 gallons. To maintain consistency with the other listed cities, SLCPU consumption charges and volumes have been converted to "per 1,000 gallons" and "gallons," respectively.
(c) The Granger-Hunter Improvement District bills bi-monthly. To maintain consistency with the other cities, the GHID bi-monthly service charge of \$26.00, which includes 20,000 gallons in two months, is listed as \$13.00 per month with 10,000 gallons included.

Sandy City also uses a seasonal rate structure that can help promote efficiency from season to season. However, unlike Salt Lake and Park City, Sandy's seasonal rate structure applies uniform rates in *both* winter and summer. Therefore, Sandy's rate structure does not necessarily promote efficiency within a particular summer season.

Three water providers (Eagle Mountain City, Orem, and West Valley City) apply uniform rate structures that do not convey any conservation message to the customer, since all customers pay the same unit price for water, regardless of how much they use.

Four of the water providers in the sample include an initial volume of water with the fixed monthly service charge (Draper City/WaterPro, St. George, Sandy City, and West Valley City/GHID). These initial volumes range from 5,000 gallons to 10,000 gallons per month. This strategy does not promote efficient water use within these initial volumes. Instead, it provides an "automatic" water delivery for essential indoor uses for all customers. In most cases where this approach is used in other cities of the Southwest, the initial volume of water included with the service charge typically equates to the average monthly indoor water use per household (roughly 5,000 gallons).

In all eight increasing block rate structures in the sample, the price blocks are set according to fixed consumption volumes that apply to all customers, regardless of a customer's lot size, household size, or previous water use patterns. None of the eight water providers with increasing block rates apply a "**water budget**" allotment design. With a water budget rate structure, individual block volumes would be established for each customer depending on that customer's particular use patterns or needs (which relates to lot size, vegetation evapotranspiration rates, household occupancy, and other factors). If designed appropriately, Utah cities could attain a higher level of efficiency and equitability if they applied water budget concept to their rate structures. This rate structure design is more common in Colorado (e.g., Aurora, Centennial Water & Sanitation District, Inverness, Castle Pines, and Cottonwood). The cities of Greeley and Boulder, Colorado are also considering the adoption of this type of rate structure.

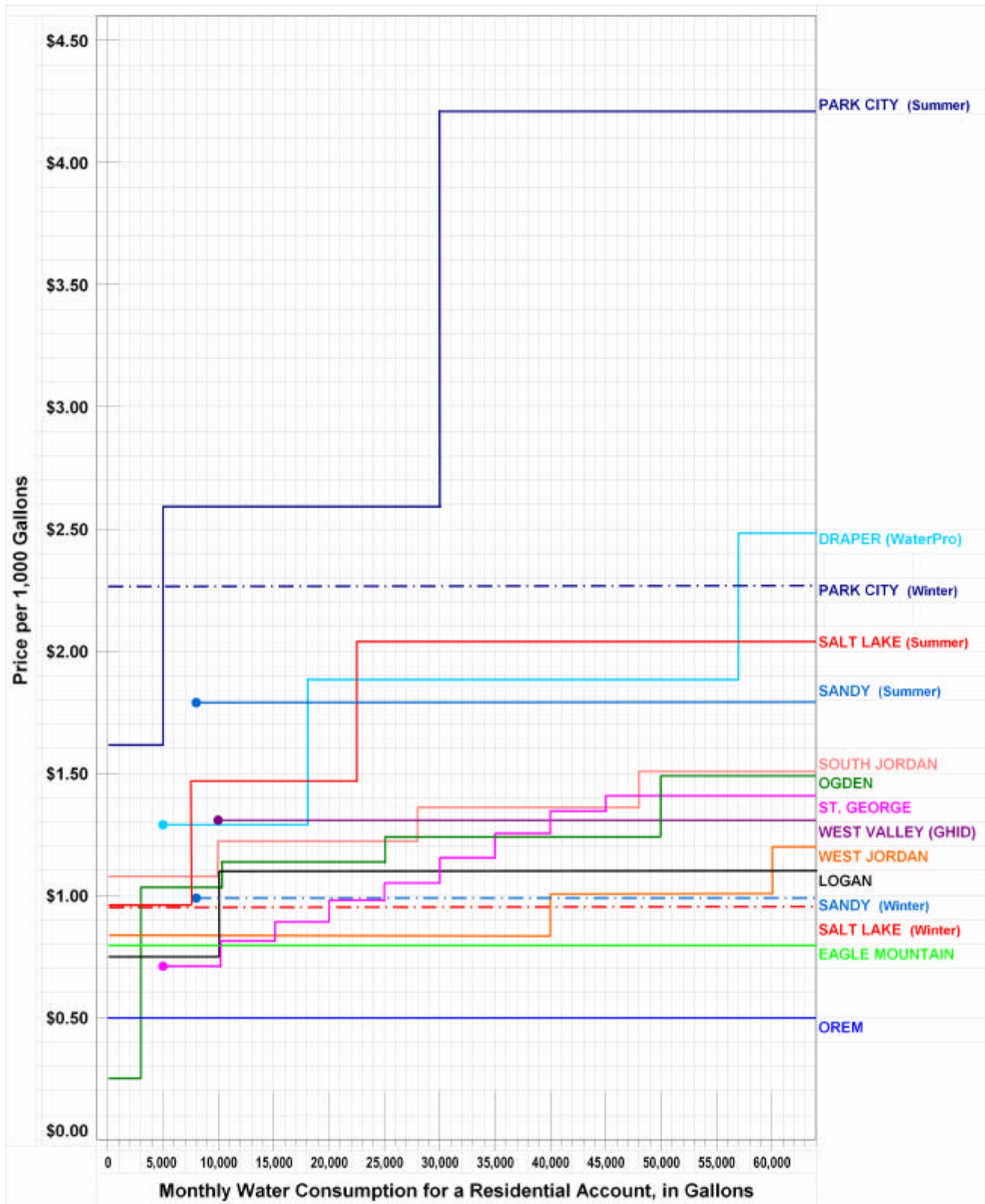
How Do the Marginal Prices for Water Compare? (Consumption Charges)

The consumption charges billed by a water utility relay the **marginal price** of the water, or the price for the next unit of water consumed. The analysis of the marginal price curves for the various water rate structures distinctly reveals the differences in efficiency incentives. The water providers in this analysis used several different types of rate structures as of the autumn of 2004, ranging from uniform rate structures to a variety of increasing block rate structures. Each of these pricing designs has a unique marginal price curve. Plotting all of these marginal price curves on one graph exposes the significant distinction in economic effect of each price structure. Figure 1 illustrates this effect. The following two marginal price curve characteristics are especially important to consider when viewing Figure 1:

- Differences in curves between the uniform and increasing block rate marginal price curves; and
- Significant variations in block prices and block volumes amongst the water providers that use increasing block rate structures.

Figure 1 reveals the wide range of marginal price curves (or consumption charges) being used in cities across Utah. In some cities, such as Eagle Mountain and Orem, water is sold at low unit prices with no conservation price signals. On the other end of the spectrum, Draper City (WaterPro), Park City (summer only), and Salt Lake City (summer only) have built in consumption charges that increase somewhat aggressively with use, resulting in conservation price signals. Other cities apply increasing block rates that send much less noticeable price signal to customers.

Figure 1
Marginal Price Curves (Consumption Charges) of Water Rate Structures in Utah,
as of October 2004



- Notes: (1) Unlike in other cities in the sample, customers in West Valley City are billed on a bi-monthly basis by GHID. However, this does not affect GHID's marginal price curve.
(2) Price curves beginning with a solid dot indicate the initial volume of water that is included with the fixed monthly service charge.
(3) The price graph does not extend beyond 60,000 gallons per month since the vast majority of customers use less than this amount.

Eagle Mountain, Orem, and West Valley City/GHID

Water customers in these three cities pay for their water via uniform rate structures. As shown in Figure 1, the marginal price lines for the rate structures in these cities are flat. No matter how much water customers use, they pay a constant unit rate for the water. As a result, high-volume use customers in these cities have no price incentive to conserve water.

Logan and West Jordan City

Although only three of the twelve water providers in the sample apply uniform rate structures, the increasing block rate structures in Logan and West Jordan City, in effect, function as uniform rate structures to most customers and, therefore, do not effectively send a conservation message.

Logan's increasing block rate structure has only two blocks, with the second block taking effect at 10,000 gallons of use. Thus, Logan's rate structure functions as a uniform rate structure, charging at \$1.10 per 1,000 gallons for any use over 10,000 gallons. During the high irrigation months of summer, a significant portion of Logan's customers use water volumes well beyond the 10,000-gallon threshold and, therefore, do not experience any price incentive to be efficient.

West Jordan's four blocks do not begin to send pricing incentives until a customer uses over 40,000 gallons per month. All water use below this 40,000-gallon threshold is charged at a uniform rate of \$0.83 per 1,000 gallons. Since a large portion of customers use water at volumes that fall within this 40,000-gallon range, most customers do not experience an effective price signal for efficient use.

Draper City, Park City, and Salt Lake City

Figure 1 graphically reveals the noticeable price increases (or signals) that customers in Draper City, Park City, and Salt Lake City experience as their water use increases. The block prices increase by much higher percentages in these three cities when compared to other increasing block rate structures in the sample. The increasing unit prices also tend to be at much higher levels. For example, Park City's unit rate jumps to \$4.21 per 1,000 gallons when consumption exceeds 30,000 gallons per month, and eventually hits \$6.48 per 1,000 gallons if consumption exceeds 80,000 gallons (off the graph of Figure 1).

The amount and percentage increases of Park City's rates send a strong efficiency message to customers. These rates are substantially higher than the rates of all other rate structures in the sampling. The rate structures in Draper City, Park City, and Salt Lake City also send a price signal at relatively low monthly volume levels when compared to most other rate structures. This strategy encourages efficient water use by most customers, even those at lower consumption levels.

Ogden and South Jordan City

Ogden and South Jordan City apply increasing block rate structures that fall somewhere between those of Park City and Salt Lake City and the less effective structures of Logan and West Jordan. Ogden and South Jordan apply five blocks and four blocks, respectively. Although the block prices do not increase very rapidly (i.e., at a high percentage increase), the blocks are designed in a way to promote conservation at most levels of use, from low-volume use to high-volume use.

St. George

In comparison to the other cities in the sample, St. George applies a very unique increasing block rate structure. St. George uses nine separate price blocks set at every 5,000 gallons of use (from 5,000 gallons of use to over 45,000 gallons of use). The block price increases from block to block are relatively small, averaging an increase of roughly \$0.09 per 1,000 gallons across all blocks. The benefit of this strategy is that all customers, both low-water users and high-water users, are faced with similar and equitable price incentives to conserve (at least up to 45,000 gallons). However, it is unclear whether the small block price

increases have enough “teeth” to send a noticeable conservation message. In addition, high-water users who consume over 45,000 gallons per month no longer have a price incentive to be efficient for their excessive use.

Sandy City

Sandy City uses a seasonal rate structure, with a winter uniform rate of \$0.99 per 1,000 gallons and a summer uniform rate of \$1.79 per 1,000 gallons. Although the winter-to-summer price increase sends a seasonal message for efficient water use, Sandy customers do not experience conservation price signals from their rate structure during the summer months. From week to week in summer, Sandy’s rate structure functions as a uniform rate structure, yielding little or no price incentive to conserve.

How Do the Average Prices for Water Compare? (Consumption Charges + Fixed Service Charges)

Generally, water customers respond to the overall water bill, which is reflected in the *average price*. The average price of water is the fixed service charge (fixed price) plus the consumption charge (marginal price(s) multiplied by consumption volume), divided by the total consumption volume. Therefore, both the fixed service charge and the consumption charges combine to determine the resulting conservation price signal sent to customers.

$$\text{Average Price} = \frac{\text{Fixed Service Charge} + (\text{Consumption Volume} \times \text{Marginal Price(s)})}{\text{Consumption Volume}}$$

To maintain a noticeable price signal for the consumer, the average price needs to rise as consumption volume increases. If the average price curve is relatively flat or declines as the consumption volume increases, there is little price incentive to conserve water, as the unit price for water remains relatively constant no matter how much water the customer uses.

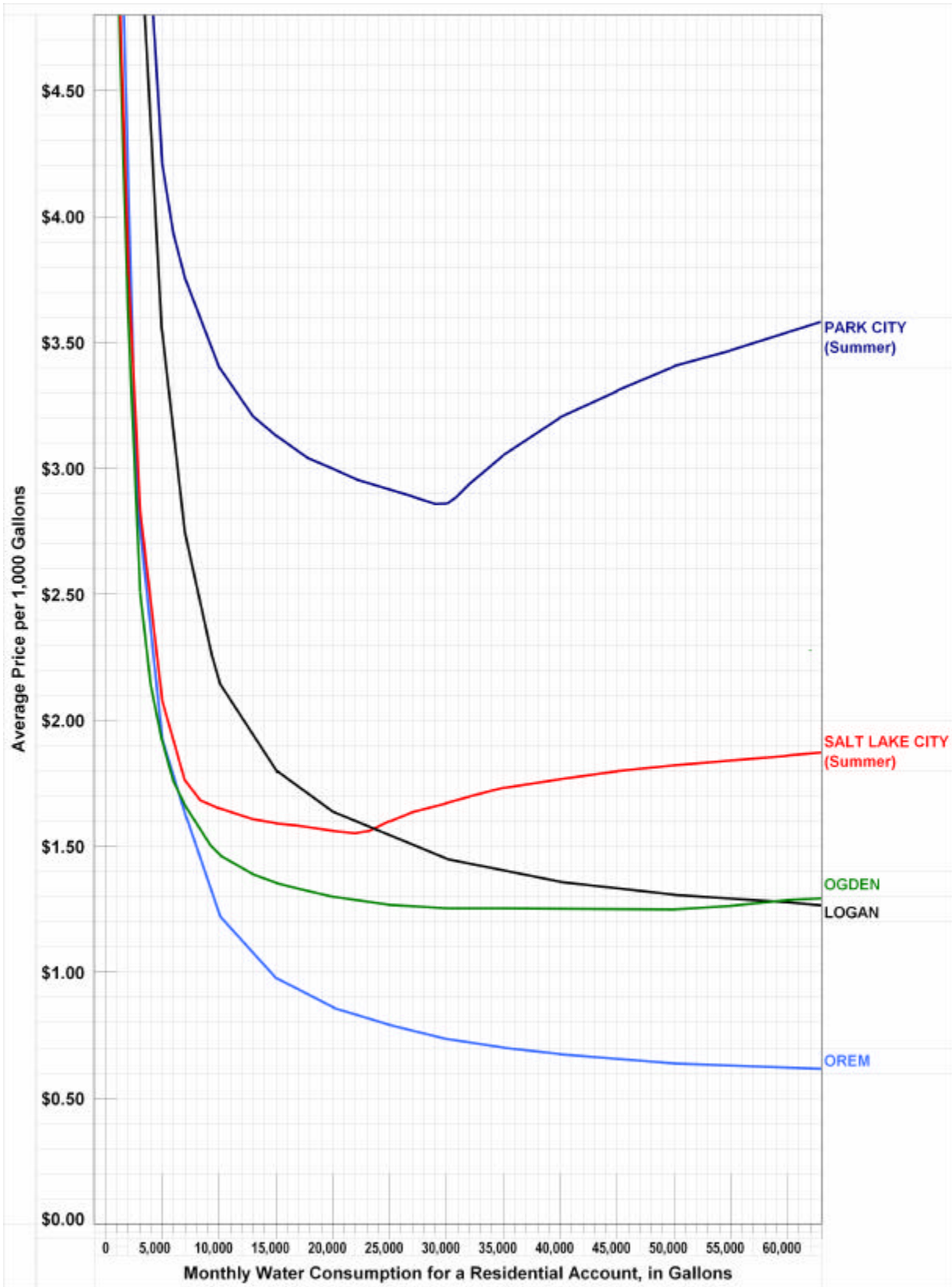
Figure 2 illustrates a small sampling of average price curves in four cities with rather different rate structures and displays how the average price for water can be significantly affected by an overall rate structure. The distinct differences in these five average price curves should be noted, with the general trends applied to rate structures in other cities.

As shown in Figure 2, Park City’s average price curve ascends relatively quickly when a customer uses more than 30,000 gallons. Customers that exceed this use level receive a strong price signal as their consumption increases—the more they use, the higher the average price per unit. The steepness of Park City’s increasing block rate structure (as shown in Fig.1) is responsible for this trend. To send a stronger conservation price signal to more customers, Park City could drop the volume threshold of the third block to lower than 30,000 gallons.

Salt Lake City’s increasing block rate structure yields a similar effect during summer months. Once a Salt Lake customer uses over 22,000 gallons, the average price for the water begins to increase. However, since the consumption charges in Salt Lake City do not jump up as quickly or as high as in Park City, the resulting effect on the average price curve is much less significant than in Park City. Nonetheless, a modest conservation price signal is sent to Salt Lake customers who use excessive amounts of water.

Ogden’s increasing block rate structure sends a weaker price signal than that of Salt Lake City and Park City. Ogden’s price block increases are not large enough with respect to the overall bill to provide a

Figure 2
Average Price Curves (Fixed Service Fees plus Consumption Charges)
of Water Rate Structures in Utah, as of October 2004



Note: (1) The price graph does not extend beyond 60,000 gallons per month since the vast majority of customers use less than this amount.

notable efficiency price incentive to customers. The end result is a relatively flat average price curve. As consumption increases, the average price for Ogden water remains relatively constant. If water consumption exceeds 50,000 gallons, the average price will increase slightly for a short period due to the effect of the second highest block price. However, this high-volume price signal is too weak and at too high of a volume to effectively encourage most customers to conserve.

Although Logan technically applies an increasing block rate structure and Orem applies a uniform rate structure, the average price curves for both of these cities are very similar. The only noticeable difference results from Orem's uniform consumption charge being lower than Logan's rates. Orem's uniform rate structure and its flat marginal price, result in an average price curve that sends no conservation price signal. As consumption increases, the average price for the water decreases. Similarly, Logan's average price curve indicates that Logan's rate structure offers very little incentive for efficiency.

Conclusion

Although most of Utah's municipal water comes from a common source (Utah's natural aquifers and river basins), this water is sold to customers under a wide variety of rate structures from city to city. Because water rate structures communicate the value of water to the customers, they can provide a great incentive to improve efficiency of water use.

A Current Snapshot of Rate Structures in Utah Cities

This 12-city comparative analysis reveals the disparity in the way Utah water utilities charge for the water they sell and, thus, how they communicate the value of water to their customers. Although some Utah cities have taken steps in recent years to promote efficiency via water rate structures, many more still have a lot of room for improvement. In many cities, customers who use excessive amounts of water pay disproportionately low unit prices for their water. Large-volume customers place the highest strain on the water supply and on Utah's rivers and aquifers, and are thereby accelerating the need for additional water supply and storage. Most of these water development needs come with large price tags and impacts, which, in the end, are paid for by *all* Utahns.

Rate structure inequity and inefficiency are most evident in the cities that apply uniform rate structures (all year or seasonally). Uniform rate structures do not send a conservation message and do not encourage efficient use.

In addition, although some Utah cities already apply increasing block rates—a conservation-based concept—the block price increases in most of these cities are too minimal to persuade most high-volume customers to use water more efficiently and/or reduce their demand. In other cities with increasing block rates, the volumes of each block are set in ways that allow significant levels of inefficient use before price incentives are triggered.

Steps for the Future

Our analysis and research indicates that a more effective approach to maximizing efficiency via Utah's municipal water rate structures is to: (1) impose increasing block rates with sharp increases in rates for excessive amounts of water use, while not increasing rates for lower levels of use; and (2) setting block volume thresholds at consumption levels that capture inefficient use by more customers. This approach will give Utah cities more effective increasing block rate structures, since the "staircase effect" of rates would be notably steeper and more evident. As a result, water utilities in Utah cities and towns would be encouraging their customers to use water more efficiently.

A large number of water utilities in Utah and throughout the West have already moved towards increasing block rate structures in recent years. Many cities that have turned to more aggressive increasing block rates are benefiting from noted decreases in per capita consumption. As a result, these cities may be able to avoid or delay much of the cost and controversy that accompany new water development and diversion projects. In turn, these communities are helping preserve the natural river systems and aquifers that support our quality of life here in the West.

Droughts may come and go, but Utah will always be situated in a semi-arid desert, with its water “lifeline” being a finite resource. With population growth compounding the demand, Utahns have no choice but to face the challenge and become more efficient in the ways they use water. More effective increasing block rate structures are an important step in the right direction.

**For reports and information on water use efficiency and our
important water resources, please contact:**

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