Oberlin College/LBNL 2004-5 California Water Utilities Survey
DRAFT report prepared by Sylvestre Gaudin
Completed October 11, 2007

I. SURVEY DESCRIPTION

Goal of the Survey: To better understand the role of block sizes and billing practices, in particular price information, in capitalizing on the theoretically conservationist effect of increasing block pricing schedules.

Timing, Investigators, and Institutional/Financial Support:
The survey was carried out between October 2004 and December 2005. The principal investigator was Sylvestre Gaudin, Assistant Professor of Economics and Environmental Studies at Oberlin College at that time.
The design of the survey and the first "trial" round of calls were done between October and December 2004 while the principal investigator was a guest researcher at the Lawrence Berkeley Labs in California. Data from 10 utilities was gathered during that time. The Lawrence Berkeley Lab, Energy and Technology Division, is recognized as a supporting partner for this preliminary part of the research.
Most of the data gathering was done in the summer of 2005 at Oberlin College with the research assistance of James Casteleiro, undergraduate economics major at Oberlin College. The research assistantship was financed by a grant of the Mellon Foundation. Terri Pleska, administrative Assistant of the Economics Department provided invaluable logistical support. The Economics Department at Oberlin College also provided support through the Kasper and Reiss Funds.

Survey procedures and participating utilities:
A list of all water Utilities in California was obtained from the California Public Utility systems Inventory Data (July 2004). The number of public water systems was reduced to 573 utilities on the criteria that they provided residential service and served a population of 1000 or more. Once it was verified that the utilities made use of increasing block pricing for residential customers (the information was obtained either by phone or using their internet site), they were asked (by phone) if they would be willing to fill out our survey , they were informed that they could do so either electronically (through a website or by electronic file and email), by fax , or by mail. Most of the surveys were filled out by personnel in billing but some were the fruit of collaboration between departments within the utility. Although the format and wording of the survey were slightly modified over-time to improve readability and comprehension, the questions remained the same. A copy of the final version of the survey sent to most utilities in Summer 2005 is attached to this report in PDF format.

From the list of 573 utilities serving a residential population of at least 1000, 230 utilities (40 percent) were found to use increasing block pricing for residential users. After a second round of calls, surveys were mailed to the utilities that could not be contacted by

phone as well as those that requested a formal data request. Out of the 230 utilities contacted, 93 surveys were received. 50 surveys were fully completed with fully usable data (listed in Group IA). 28 surveys were complete but did not include rate information (Group IB). The other 15 utilities all listed in category II responded to our survey but the data could not be fully used. Category II included 2 groups: 12 surveys had unresolved issues on some important questions, such as revenue or quantity data (group C) and 3 surveys included severe data inconsistencies or presented special circumstances that rendered the data unusable (group D). Results from utilities in Category II are included in some statistics but not others. The most common reason for appearing in category II was missing information on revenue or quantity data or the impossibility to separate industrial or commercial customers from residential customers in terms of volume and billing. Some utilities in category II are fully included in rate-related data (see the List of Participating Utilities).

The majority of surveys was received in summer 2005 and relate to periods of one year between June 2003 and June 2005. Unfortunately the number of surveys completed was too small for statistical so our econometric investigation of the impact of billing structures and billing formats on residential water use could not be completed. We recognize that the response rate was not bad but the population too small to establish relationships of causation at any reasonable confidence level.

The statistics in this report represent between 20 and 40 percent of the utilities in California using increasing block pricing for residential billing. All statistics concerning blocks and block rates are based on 58 utilities that provided rate information either on the survey or via their internet site (25 percent of eligible utilities).

A full list of utilities that responded to our survey is given in the appendix.

Anonymity: While the records identifies the respondent and a list of participating utilities is given in the appendix, the utilities were informed that the data would be compiled without reference to their name. No name will therefore be released in conjunction with specific answers that are not already in the public domain.

II. SUMMARY STATISTICS

Statistics are different formats depending on the type of variable. The full distribution is given when the number of unique values is small. Averages and standard deviations are given for continuous variables. The number of observations (non-missing values) is given in the first column in most tables. For categorical variables, the number and percent of utilities in the category indicated is reported.

A. GENERAL CHARACTERISTICS OF UTILITIES

Although the cutoff for the size of utilities was 1000, the actual size of the utility was only known once the survey was received. One utility was included that had less than 1000 residential customers; all other has more than 1000.
Less than half of the utilities (34) responded to the question on square miles.
Half of the utilities had more than 90 percent of their residential units as single family units.

Table 1

	Obs	Min	Max	Average	St.Dev	Median
Population Served	92	638	3,800,000	108,245	426,966	19,779
Square miles	34	1	486	36	84	14
Residential Units	89	279	590,527	23,275	75,550	5,573
Proportion of Single family units	86	0.25	1	0.88	0.13	0.92

B. ANNUAL REVENUE AND QUANTITY DATA

The following data is based on water revenues from residential customers only. Utilities that could not separate residential customers in revenues or sale data were not included.

Table2.

	Obs	Min	Max	Average	St.Dev	Median
Revenue in 1000 US$	86	15.68	461,804	16,881	59,475	3,132
Quantity sold to residential customers in million gallons	84	12.3	141,242	5,894	19,418	882
Average price per 1000 gallons	79	0.58	9.67	3.27	2.08	2.66
Q/Population in 1000 gallons	81	5.54	208.44	52.91	31.38	48.53
Gallons per capita per day	81	15.30	575.8	146.2	86.70	134.05
Revenue per population in US$	84	7.03	577.0	158.6	118.8	121.9

C. CONSERVATION

All utilities in the sample were assumed to be engaged in some conservation strategy as they were chosen for their use of increasing block rates (conservation pricing). We asked the utilities the reasons for this engagements. We also asked what non-price conservation strategies they used, besides those related to billing.

1. Reasons to engage in conservation strategies (either price or non-priced based)

A list of 7 reasons was given to the utilities. All that applied were checked. We did not ask to rank these reasons. Space was allowed to indicate additional reasons or explanations. 7 utilities indicated an additional reason as being a voluntary action program participant (BMPs of CUWCC mostly), although some other utilities may have included this reason as following a state/local directive. All 93 utilities responded to the question.

Table3.

	Number of checks	Percent
1. Raw water supply limitations (including issues of salt intrusion/subsidence)	47	50.5
2. To reduce utility cost	32	34.4
3. To follow federal or state legislation or directive	26	28.0
4. To follow local legislation or directive	24	25.8
5. Production and/or distribution limitation/ pop growth	21	22.6
6. To respond to consumer preference	18	19.4
7. Wastewater treatment capacity limits	5	5.4
8. other reasons (most commonly cited: "right ecological/environmental thing to do)	5	5.4

2. Non-price related conservation strategies

15 utilities (16 percent) used non-price conservation incentives, such as rebate programs
14 utilities (15 percent) indicated they used some kind of “moralsuation” means such as information campaigns.
Only 2 utilities resorted to conservation mandates (any kind of water use restriction).

D. CARACTERISTICS OF WATER BILLS

1. Age of the water bill: (92 observations): 75 percent of the bills were more than 10 years old; Half were more than 5 years old; 25 percent were modified within the past two years.

2. Frequency of billings: Approximately half of the utilities used monthly billing and the other half bimonthly.

Table 4.

	Number of utilities	Percent	Cumul
12 bills per year (monthly)	46	49.5	49.5
6 bills per year (bimonthly)	45	48.4	97.9
4 bills per year (trimestrial)	2	2.15	100
Total	93		

3. Automatic payment option (93 observations)

56 percent of the utilities offered some sort of automatic payment. The following indicated the proportion of residential customers that used the option, conditional on the option being offered

Table 5.

	Obs	Min	Max	Average	St.Dev	Median
Proportion of customers using the automatic payment option	48	0	0.25	0.082	0.063	0.085

4. Other utilities on the bill

54 out of 93 respondents charged utilities other than water on the same bill. On average 73 percent of the total bill was from water only charges. Other utilities included sewer, refuse, electricity, and gas.

Out of the 52 utilities that charged for sewer, 40 percent made their water rate conditional on water use (some of them made it conditional on winter use only).

The following table indicates the number and proportion of for utilities other than water on the bill. All 93 utilities responded.

Table 6.

	Number of utilities	Percent
Sewer	52	56
Refuse	19	20.5
Electric	6	6.5
Gas	1	0.1
Other	10	11

5. Quantity units used on the bill

91 utilities responded. Most utilities used hundred cubic feet (CCF) or thousand gallons (KG) units. Some did not use multiples (i.e, either used CF or Gal.). The following table indicates the number of utilities that indicated quantities in cubic feet on the bill (either

CCF or CF) or gallons (either thousand gallons or gallons); those that did not use multiples, and those that used both cubic feet and gallon units on the bill.

Table 7.

	Number of utilities	Percent
Cubic Feet	79	86.8
Gallons	19	20.9
Both	7	7.7
Unitary (either CF of Gallons)	13	14.1

E. INFORMATIONAL CONTENT OF BILLS

1. Price information

92 utilities responded to questions on price information.
In prior research on US data (all rate structures), I showed that indicating the price per unit next to consumption on the bill increased the effectiveness of price increases in discouraging consumption. In the following table, the presence of price information on the bill is recorded. The first two rows indicate that price per unit consumed are indicated next to consumption on the bill. The second row indicates that marginal price information is available. i.e. consumers know what rate would apply if they were to consume in higher blocks. This is likely to make the increasing block schedule more likely to encourage conservation, although the data was not sufficient to test the hypothesis.

Table 8.

	Number of utilities	Percent
a. Price per unit in blocks consumed	31	34
b. Price per unit in all blocks (even if 0 consumption)	13	14
c. Rate schedule information (but not next to quantity consumed)	6	6.5

2. Historical data (same consumer).

While most (66 percent) utilities indicated the consumption in the same period last year, 80 percent utilities did not include historical monthly data. Note that comparisons of dollars paid last year without having direct quantity comparisons could have different effects depending of whether price increased or decreased. Since dollar paid include both quantity and price, it is simpler to interpret quantity only data. Most utilities did not use comparisons based on dollars.

Table 9.

	Number of utilities	Percent
a. Quantity used same period last year	61	66
b. dollars paid same period last year	4	4.25
c. graph of use history	13	14

Number of months included in historical data (whether in a graph or not) were the following:

Table 10.

Number of months	Number of utilities	Percent	Cumul percent
0	73	79.35	79.35
1	4	4.35	83.7
2	2	2.17	85.87
3	1	1.09	86.96
4	1	1.09	88.04
5	1	1.09	89.13
6	2	2.17	91.3
12	7	7.61	98.91
48	1	1.09	100

3. Benchmarks and daily averages

Only 3 utilities used benchmarks (comparisons related to some "average"). A few more indicated daily averages.

Table 11.

	Number of utilities	Percent
Benchmark comparisons	3	3.26
Daily averages	6	6.6

4. Conservation messages (92 responses)

71 utilities (77.2 percent) used to bill to convey conservation messages. Some included the message of all bills but on average messages were included on half of the bills (46 percent) during the year (most likely during the summer months).

F. BLOCKS AND RATES

As indicated in part 1, detailed water rate information was obtained from 58 utilities for the one year period of reference (between 2003 and 2005). All units were converted to thousand gallons and monthly billing.

1. Fixed Fee

91 percent of the utilities (53 utilities) charged a fixed fee on the bill. Out of the 53 utilities, 10 included free water allowances (so the first block rate started at a quantity greater than 0). The other 43 charged rates from he first unit consumed.

Table 12.

	Obs	Min	Max	Average	St.Dev	Median
Fixed Fee US$ (monthly)	53	3.5	45.7	13.14	7.72	11.46
Water allowance	10	1	15	4.35	3.98	3

2. Surcharge

12 utilities (21 percent) indicated they used some kind of surcharge. Common types of surcharges were:

- higher rates to consumers outside of the city limits (usually double the city rates)
- elevation charges to cover pumping costs

3. Blocks

Blocks were recorded if they were within reasonable consumption reach for residential consumers. Utilities used the following number of blocks:

Table 13.

# of blocks	# of utilities	Percent	Cumul
2	18	31.03	31.03
3	19	32.76	63.79
4	10	17.24	81.03
5	6	10.34	91.38
6	4	6.9	98.28
10	1	1.72	100

Lower limits and size of blocks (tables 14 and 15) varied greatly and overlapped from one utility to another. To calculate block sizes, final blocks were eliminated.

Table 14.

Lower limits	#of obs	Average lower limit	Min	Max
block 1	58	0.67	0	11.97
block 2	58	8.02	2.244	28.08
block 3	40	17.68	5.23	74.8
block 4	21	27.7	6.98	56.1
block 5	11	45.11	16.001	104.72
block 6	5	41.77	20.001	75.11
block 7	1	56.85	56.85	56.85
block 8	1	74.8	74.8	74.8

Table 15.

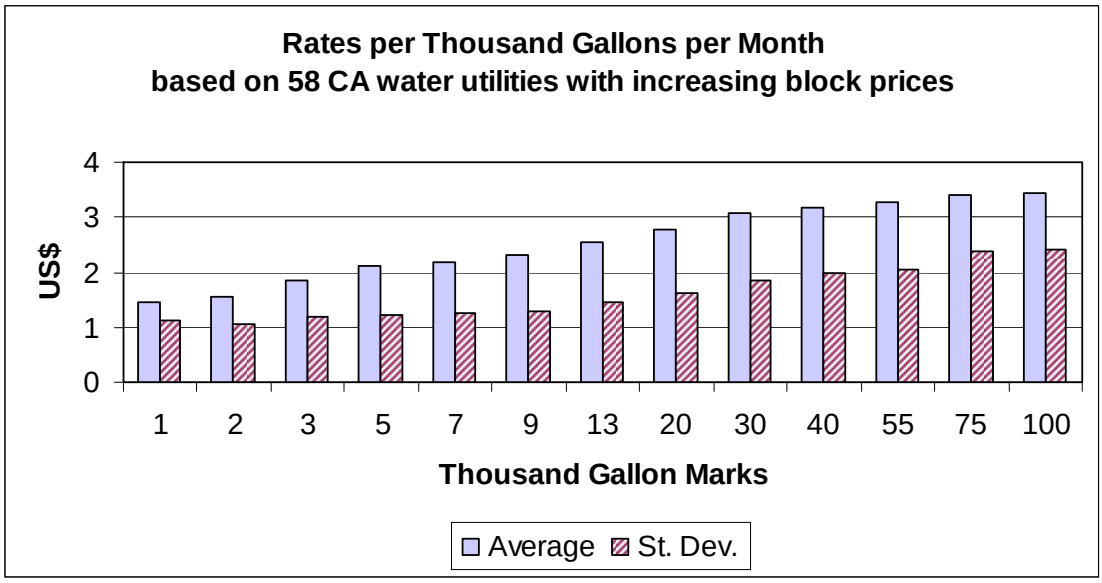
Block sizes	#of obs	Average size in KG	MinSize	MaxSize
block 1	58	7.35	1.5	28.09
block 2	40	11.32	1.5	52.36
block 3	21	13.65	1.75	34.03
block 4	11	17.87	4	66.57
block 5	5	15.76	4	37.4
block 6	1	14.96	14.96	14.96
block 7	1	17.95	17.95	17.95

4. Rates

Given the overlapping of blocks, it was meaningless to report average prices in each block. Instead, we took a few values well matched to represent all the blocks and reported the price charged for that value. Values ranged from one thousand to 100,000 gallons (monthly use). Since blocks were tighter at lower consumption, closer values were used to represent the lower blocks.

1000 Gal.	Obs	Mean	Std. Dev.	Coef Var	Min	Max
1	58	1.47	1.14	0.78	0.00	5.01
2	58	1.56	1.07	0.69	0.00	5.01
3	58	1.86	1.19	0.64	0.00	5.01
5	58	2.12	1.22	0.58	0.00	5.01
7	58	2.19	1.25	0.57	0.00	5.01
9	56	2.33	1.31	0.56	0.00	6.26
13	58	2.54	1.46	0.57	0.41	7.53
20	58	2.79	1.61	0.58	0.41	7.95
30	58	3.07	1.84	0.60	0.41	8.33
40	58	3.18	1.98	0.62	0.41	9.56
55	58	3.29	2.05	0.62	0.41	9.60
75	58	3.40	2.37	0.70	0.41	14.33
100	58	3.43	2.41	0.70	0.41	14.33

Figure 1.


Rates per Thousand Gallons per Month
based on 58 CA water utilities with increasing block prices
US$
0
1
2
3
4
1
2
3
5
7
9
13
20
30
40
55
75
100
Thousand Gallon Marks
Average
St. Dev.

Appendix I: List of Participating Utilities (Alphabetical)

Category IA (50)
Adam Springs/Cobb Area Water District
Aromas Water District
Baldy Mesa Water District
Bear Valley Community Services District
Bodega Bay Public Utility District
Bolinas Community PUD
Cabazon Water District
calaveras pud
Calistoga
Castroville Water District
City of Hayward
City of Livermore
City of Mountain View
City of Palo Alto
City of Pleasanton
City of San Luis Obispo
City of St Helena
City of Tehachapi
Colton Public Utilities
Crestline Village Water District
East Bay MUD
Elsinore Water District
Fort Jones Water
Helix Water District
Hillsborough
Indian Wells Valley Water District
Irvine Ranch Water District
Lake Arrowhead Community Services District
Lake County Service Area #21 North Lakeport
Las Virgenes
Mammoth Community Services District
McKinleyville Community Services District
Mid-Peninsula Water District
Mission Hills Community Services District
Mission Springs Water District
Moulton Miguel Water District
Nipomo Community Services District
Oceano Community Services District
Olivenhain Municipal Water District
Pine Grove Community Services District
Pismo Beach
Rio Linda/Elverta CWD
San Diego Water Department

San Juan Water District
San Lorenzo Valley Water District
Santa Margarita Water District
Soquel Creek Water District
Vallecitos WD
Vandenberg Village Community Services District
Ventura River County Water District

Category I B (28) (All but rate information)
Citrus Heights Water District
City of Arcata
City of Banning
City of Benecia
City of Brisbane
City of Escalon
City of Morro Bay
City of Santa Barbara Public Works
City of Santa Cruz Municipal Utilities
City of Santa Monica
City of Signal Hill
City of Tustin
Coastside County Water District
Groveland Community Services District
Home gardens County WD
Joshua Basin Water District
Jurupa Community Services District
Lakeside Water District
Los Angeles Department of Water and Power
Lower Lake County Waterworks District #1
Murrieta County Water District
Padre Dam Municipal Water District
Palmdale Water District
Pasadena Water and Power
Pico Rivera City Water Department
Purissima Hills Water District
Sweetwater Authority
Victor Valley Water District

Category II – (15)
*indicates that the utility was fully included in rate-related data
Bella Vista Water District
City of Daly City*
City of Elmonte
City of Gilroy
City of Orange*
City of Roseville

City of Santa Maria
City of Seal Beach Utility*
City of Sonoma
City of Yountville*
Hi Desert water district*
Otay Water District*
Rubidoux Community Services District
Tuolumne Utilities District*
Twain Harte Community Services District*

We thank all participating utilities for the efforts they put into filling out the survey and answering our phone calls.

Appendix II

Sample Survey: Faxed Version, June 2005 (2 pages)

Utility Name:	**ZIP CODE:**

The information you provide will be used to quantify the effect of billing information on residential water demand. This is NOT FOR PROFIT research and results will be submitted for publication to professional journals.

If you prefer, you may fill this survey electronically. GO TO http://www.oberlin.edu/faculty/sgaudin/CASurvey.html. Any questions? Please send e-mail to Jim Casteleiro jcastele@oberlin.edu or call 440/775-5052.

If you wish to access **summary statistics** on the data obtained from all participating utilities, check here: If you wish to see a draft of the **research paper** before it is sent for publication, check here: If interested, please make sure you provide an **email address** below so we can inform you when results are available.		
Who should we contact if we need clarifications?	**Name:**	
Title (optional):	**Email:**	**Tel:**

A01	Twelve month period for which you have annual data on residential water sales between Jan 2003 and Dec 2004. **(all questions below refer to this period!)**	From / To /

A02	Best estimate of residential population served if known	

B01	How often was water normally billed to residential customers?	Every___ month(s)

B02	How often were meters normally read?	Every___ month(s)

B03	How long have you been using the current bill format?	___ Year(s) or ___ month(s) or ☐ Unknown

B04	Did you provide an automatic bill payment option?	☐ YES ☐ NO If yes, % of residents using it (best estimate) _____ %

B05	Did you charge for other utilities such as sewer, electric, etc. on the SAME bill? If your answer to B5 is NO, skip to question B8	☐ YES ☐ NO
B06	What other utilities were included on the same bill? CHECK **ALL** THAT APPLY ☐ Sewer. If checked, are there sewer charges related to water consumption? ☐ YES ☐ NO $ per unit:_____ ☐ Refuse ☐ Electric ☐ Gas Other _____	
B07	If you charged other utilities on the bill, what is your **best estimate** of the water-only charge as a percentage of the total amount due on the bill for a typical consumer?	_____ %

B08	If your utility is considering ways to promote water conservation, what are the main reasons? CHECK **ALL** THAT APPLY ☐ Raw water supply limitation ☐ Production and/or distribution limitations ☐ Wastewater treatment capacity limits ☐ Reduce utility costs ☐ Consumers' preference ☐ State legislation or directives ☐ Local legislation or directives Other _____

B09	Dis you use the water bill to convey conservation messages (e.g. drought warnings, tips)?	☐YES ☐NO
B10	How often were conservation-related messages used during the 12-month reporting period? (# of months in which you included a message, whether the message was changed or not)	# _____ times ☐ unknown

B11	The layout of your residential water bill **typically** included (CHECK **ALL** THAT APPLY): ☐ Water consumption in ☐100 Cubic Feet (ccf) ☐1000 Gallons ☐Other: _____ ☐ Water consumption in each rate block (or price tier) ☐ Price per unit in each rate block NEXT to consumption in that block ☐ Price per unit in rate blocks beyond total water consumed (for ex: 200 cf @ $2.50; 0 cf@$3.50) ☐ Rate information ELSEWHERE on the bill ☐ Own water consumption for same month last year ☐ Own Consumption history for the ____ previous billing cycles (please fill in the number of billing cycles) ☐ Dollar amount paid for water, same billing cycle last year ☐ Dollar amount paid for water for the ____ previous billing cycles (please fill in the number of billing cycles) ☐ Graphical representation of consumption history ☐ Benchmark comparisons (for ex. whether the consumer is above or below "normal" usage) Please describe any other information or words that could affect consumption:

B12	If the layout of the bill changed during the 12-month reporting period or within a year before, describe the change(s) below. If possible, indicate approximate dates of changes.

B13	If during the reporting period you had in place programs directed toward residential consumers to encourage/mandate conservation, please briefly list/describe below:

C02	Please indicate the approximate size of your service area if known (in square miles): _____ Below list the ZIP codes OR towns/townships names you serve (residential only)- you may skip areas that are small relative to the total. If you serve many small areas,just give the one most representative in terms of average income)

C03	Number of residential units served (number of active metered connections)	
	Of which number or percent of single family units (best estimate):	

C04	Total **revenue** from residential water sales during the 12-month period (water only)	US$

C05	Total **volume** of water billed to residential customers (12-months). Choose your preferred units, we will do the math		☐ 1000 Gal. ☐ 100 CF ☐ AF

C06	Please provide below the water rates for **SINGLE FAMILY RESIDENTIAL USERS** during the 12-month reporting period. If your rates are on the web and have not changed since then, just indicate the URL http://www. **Fixed charge per billing cycle:** **Consumption units included in fixed charge if any:** **Consumption charges (Tiers and $ per unit in each tier):**

Please FAX back the completed survey and any attachements to 440-775- 6978 OR
Mail to Jim Casteleiro, Dept. of Economics, Oberlin College, Oberlin, Ohio, 44074

Please write comments below, if any. Thank you for your cooperation!