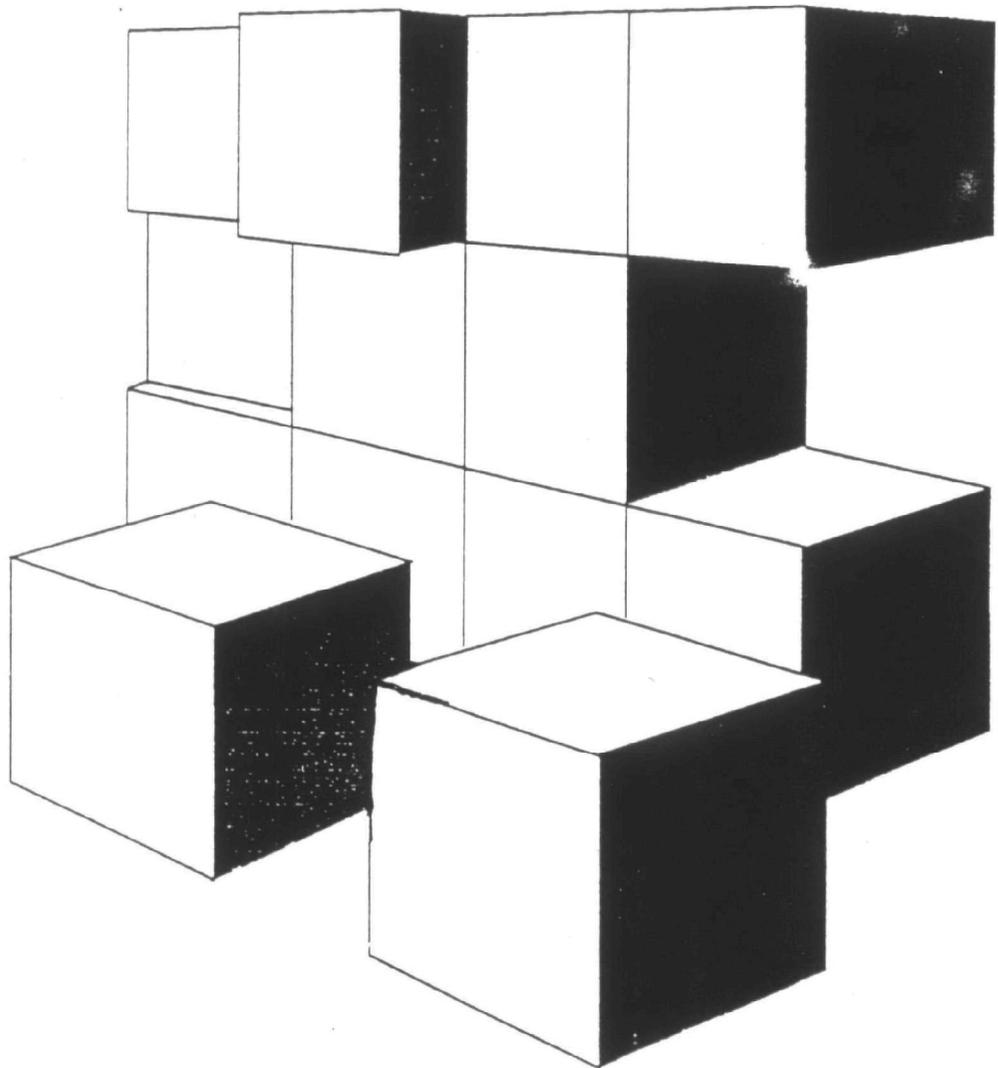


Virginia User Charge Study



Introduction

Purpose of the Survey

Part of the State's ongoing responsibility is to acquire financial and technical information about its communities. The information acquired from this user charge survey allows the State to monitor the ability of its communities to achieve financial self-sufficiency for wastewater treatment operations. There is an especially strong need for the State to look even more closely at user charges since local municipalities will be financing their future wastewater construction without the assistance of federal grants. The future success of wastewater pollution control in the State will depend on the ability of local communities to maintain financially self-sufficient wastewater treatment operations.

Do communities have healthy user charge systems that provide adequate revenues to support operations and debt repayment? To answer this question and plan for the future, State and local officials must know where communities stand in running self-sufficient wastewater systems.

To obtain information on the financial solvency of its communities, the State of Virginia undertook a survey of user charges following the procedures given in the United States Environmental Protection Agency's publication Looking at User Charges. A State Survey and Report (EPA 430/09-87-0008). The survey's 11 questions, although deceptively simple, generate a wealth of information on residential unit costs. A copy of the survey form is provided in Appendix A. The survey was mailed to statically significant municipal wastewater systems during November 1989. The response rate of 61% was sufficiently large that confidence can be placed in the results.

Responses on demographic and utility characteristics were used to calculate unit costs and flows, examine economic impact and ensure valid comparisons between communities. Costs data

provided the basis for comparing user charge systems and the costs of operation, maintenance, replacement and capitalization. Revenue questions allow the examination of whether the systems were recovering enough money to operate in the black.

Not all respondents answered all the survey questions. This resulted in different sample sizes being used for the various analyses.

Organization of Report

This report is divided into eight sections to evaluate the financial self-sufficiency of municipal wastewater treatment operations:

- I. Covering the Costs of Operation
- II. Unit Costs by Treatment Level
- III. Average Annual Total Residential Costs and Sewer Service Charges per Household
- IV. Equitability of Residential User Charges
- V. Ability of Residential Sector to Cover Residential Costs
- VI. Planning for Equipment Replacement
- VII. Debt Burden Without Grant Contribution
- VIII. Summary Findings

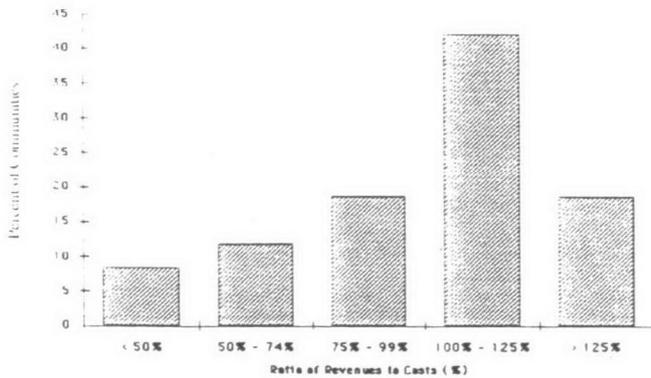
A summary table of each community's responses to the survey is presented in Appendix B.

I. Covering the Costs of Operation

The most basic question is "Are sewer service charges adequate to cover the costs of operation and to achieve clean water goals?" This analysis shows the ratio of revenues to costs. For communities where revenues are not adequate to cover costs, i.e., the ratio is below 100%, the communities should reassess their user charge systems and other sources of revenues to ensure proper funding.

In this analysis, 39% of the communities showed revenues below their costs. These communities had an average overall revenue shortfall of 36%

RATIO OF REVENUES TO COSTS



DISTRIBUTION OF TOTAL REVENUES TO TOTAL COSTS

TREATMENT LEVEL	NO. OF COMMUN.	ABOVE 100%	BELOW 100%
PRIMARY	4	50%	50%
SECONDARY	47	64%	36%
ADVANCED	8	50%	50%
OVERALL	59	61%	39%

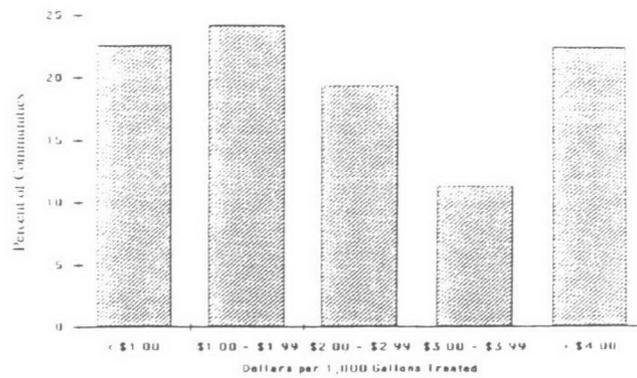
(Note: In this report, the level of analysis is the community. Some communities have more than one treatment plant, and these different plants may use different levels of treatment. In this survey, two communities reported using both primary and secondary treatment and three communities reported using both secondary and advanced treatment. For purposes of this report, the former are analyzed with communities using only secondary treatment and the latter with communities using only advanced treatment.)

II. Unit Costs by Treatment Level

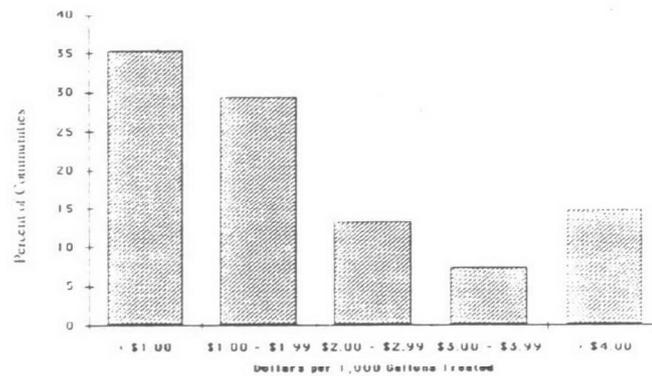
Analysis of unit costs (cost of treatment per 1000 gallons) helps identify communities where costs are usually high or low. Unit costs for individual communities vary dramatically and the analysis reflects this fact.

Communities with secondary treatment averaged \$2.64 per 1000 gallons, and advanced treatment systems averaged \$2.21 per 1000 gallons.

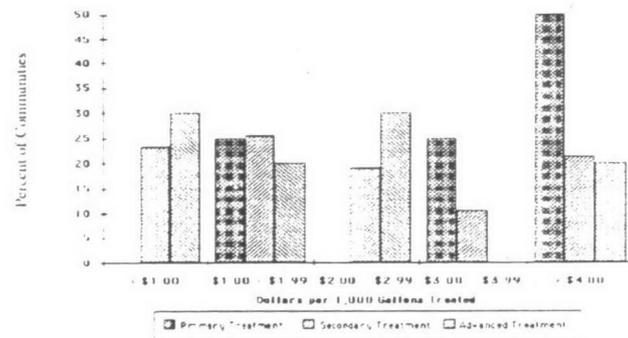
TOTAL COSTS



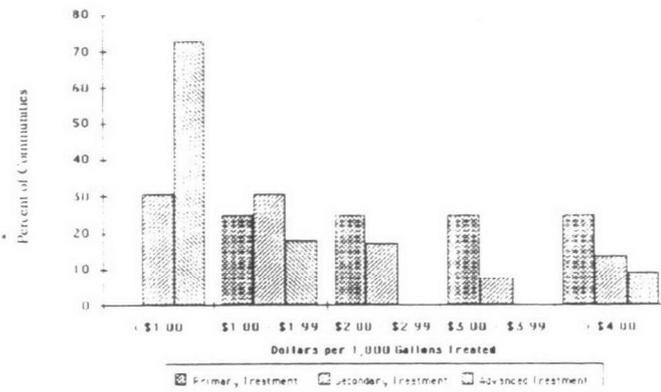
OM&R COSTS



TOTAL COSTS BY TREATMENT LEVEL



OM&R COSTS BY TREATMENT LEVEL



AVERAGE UNIT COSTS BY TREATMENT LEVEL

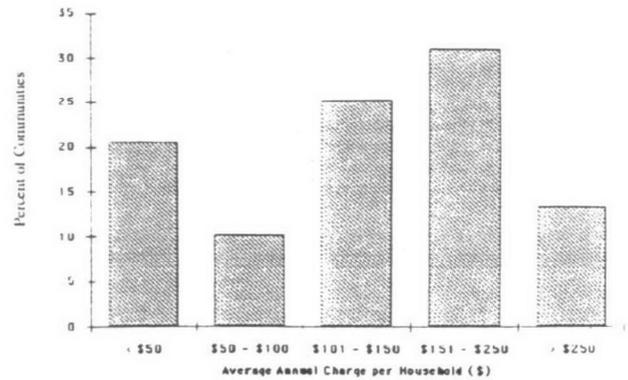
TREATMENT LEVEL	NO. OF COMMUN	AVER OM&R COSTS	AVER CAPITAL COST	TOTAL UNIT COSTS		
				AVER	MEDIAN	STD DEV
PRIMARY	4	\$3.00	\$1.26	\$4.26	\$4.66	\$2.04
SECONDARY	47	\$2.01	\$0.63	\$2.64	\$2.03	\$2.16
ADVANCED	10	\$1.32	\$0.89	\$2.21	\$1.91	\$1.77
OVERALL	61	\$1.95	\$0.73	\$2.68	\$2.09	\$2.14

III. Average Annual Total Residential Costs and Sewer Service Charges per Household

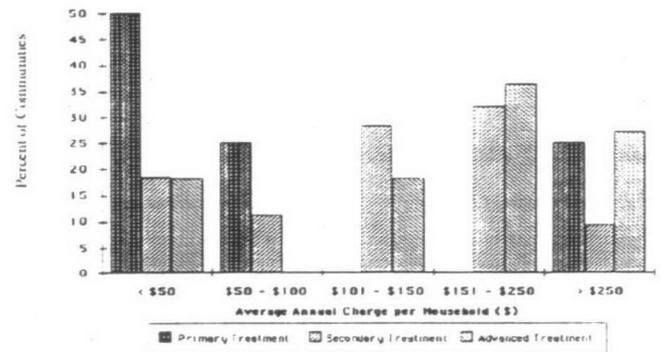
The average annual total residential treatment costs and sewer service charges per household serves as a basis for later analyses such as (1) the percentage it represents of median household income, and (2) whether costs are covering actual costs. Here, the data has been arrayed to show the distribution by treatment levels. The results of this survey showed a steady cost increase as one goes from primary to secondary to advanced treatment.

The secondary treatment residential costs were concentrated in the \$101 to \$250 range, while advanced treatment costs were in the \$101 to \$150 and greater than \$250 ranges. The user charges for secondary were concentrated in the \$101 to \$250 range, while sewer charges for advanced treatment were generally \$151 or greater.

AVERAGE ANNUAL CHARGE PER HOUSEHOLD

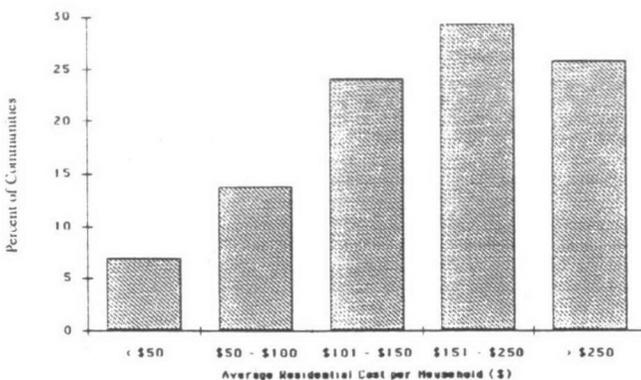


AVERAGE ANNUAL CHARGE PER HOUSEHOLD



AVERAGE RESIDENTIAL COST PER HOUSEHOLD

AVERAGE RESIDENTIAL COST PER HOUSEHOLD



DISTRIBUTION OF RESIDENTIAL COSTS AND USER CHARGES

TREATMENT LEVEL	# IN SAMPLE	AVE TOTAL RESID COST/HH	AVERAGE USER CHARGES PER HOUSEHOLD		
			AVERAGE	MEDIAN	STD DEV
PRIMARY	4	\$205.21	\$593.45	\$ 58.00	\$952.79
SECONDARY	45	\$210.99	\$135.92	\$130.00	\$ 81.42
ADVANCED	11	\$243.09	\$179.43	\$194.00	\$ 87.97
OVERALL	60	\$215.57	\$169.88	\$137.10	\$267.00

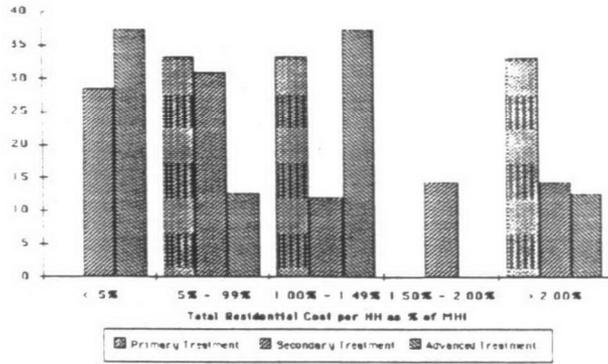
IV. Equitability of Residential User Charges

Are residential customers paying their fair share of the costs? Or is one class of users subsidizing another? Analysis of data on the portion of the flow, costs, and revenues attributable to residential users allows answers to these questions.

Based on the analysis, communities may restructure their user charge systems to distribute costs more equitably.

This analysis shows that in many communities residential users (58%) may be paying less than their share of treatment costs. For communities utilizing secondary treatment, about 57% of communities charge residential customers less than their estimated share of treatment costs; for advanced treatment, this figure is 67%.

TOT RESIDENTIAL COSTS PER HH AS % OF MHI



EQUIPMENT REPLACEMENT FUNDS

TOTAL NO OF COMMUNITIES	62
PERCENT OF COMMUNITIES WITH EQUIPMENT REPLACEMENT FUNDS	55%
AVERAGE PERCENT VALUE OF REPLACEMENT FUNDS	13%
MEDIAN VALUE	10%

VII. Debt Burden Without Grant Contribution

The effect of grant funding on capital costs was examined by making adjustments to the debt financing cost figure (as reported in the surveys) to reflect "total" costs of capital without Federal or State grant assistance. This roughly determined the impact of grant assistance on community treatment costs.

This analysis showed that the average debt financing costs for advanced treatment would have increased from \$.91 to \$1.49 per 1000 gallons, while it would have increased from \$.64 to \$2.48 for secondary treatment. In this analysis, grants reduced the average treatment costs from \$4.23 per 1000 gallons to \$2.58 or 39%.

VIII. Summary Findings

Some of the more interesting findings from this survey were:

1. Thirty-nine (39%) percent of the communities are not collecting enough wastewater revenues to meet their total expenses.
2. The average wastewater revenue shortfall for the deficient communities was 36 percent of their total treatment costs.
3. The unit wastewater treatment costs averaged 2.58 dollars per 1,000 gallons. Operation, maintenance, and equipment replacement averaged 1.95 dollars per 1,000 gallons.
4. The average residential treatment cost was 216 dollars per household per year while the average residential user fee was 170 dollars per household per year.
5. The average sewer service charge was 0.7% of the median household income (MHI), however, the total residential treatment cost was 1.1% of the MHI.
6. Fifty-eight (58%) percent of the residential users appear to be paying less than their appropriate share of the total costs.
7. Fifty-five (55%) percent of the communities have equipment replacement funds with an average value of 13% of operating funds.
8. Federal and State grants have reduced the average total cost of wastewater treatment by 39% for secondary and advanced treatment systems.

Appendix A

Model Survey Form

SAMPLE

Dear (State Name) Community Official,

The budget problems you've faced in paying for community services will probably increase in the future. This means your local residents and industry must pay more for wastewater treatment. Your challenge will be how to raise money to meet your current and future wastewater treatment needs. The information requested in the attached survey can help you meet this challenge.

STRIKING A BALANCE

As you know, every community needs to continuously examine its wastewater costs and revenues to make certain they balance. The results of this survey will help you decide if your current service charges are adequate for operating, maintaining, and improving your wastewater treatment facilities.

HOW DO YOU COMPARE?

The information you and others provide will be analyzed to show how much communities in the state pay for wastewater service. You'll be able to compare your community's costs with others. If you return this survey to us, we'll send you a copy of the survey analysis report.

DO YOU HAVE QUESTIONS?

Instructions are attached to help you answer the survey questions. To answer some of the questions, you may need to involve various people in your organization who know about the special aspects of your wastewater system. Even if you or others don't know the exact answers to all the questions, please use your best estimates and return the survey to us by (date). Please feel free to call (name of contact) at (telephone number) if you have any questions. The survey should be returned to (name of contact and address).

Thank you for your help.

Sincerely,

(Name of Official)

Attachment

Community Name _____

Wastewater Service District (if your community
does not treat its wastewater) _____

Contact Person(s) _____

Address _____

Phone No. _____

1. How many households (not population) in your community receive wastewater
treatment services? _____

2. What is the current estimated median household income in your community?

\$ _____

3. What is the current average flow treated at your facility?

_____ Gallons per day

4. What is your current estimated average wastewater flow per household per
day?

_____ Gallons per day

5. What is the level of treatment at your wastewater treatment facility?

___ primary ___ secondary ___ advanced

6. About how much of the money needed to construct your facility came from state or federal grants?

\$ _____

7. How much does it cost to operate your facilities for a year? (operation, maintenance, and equipment replacement costs -- DO NOT include the costs of wastewater loans and bonds, or depreciation)

\$ _____ Year of data _____

8. About how much money are you putting aside (as a percentage of operating costs) each year for equipment replacement?

_____ %

9. How much are you paying each year to cover wastewater loans or bonds? (principal and interest costs only)

\$ _____ Year of data _____

10. How much money (revenue) are you currently collecting to pay for wastewater collection, treatment and disposal, plus principal and interest costs on wastewater debt?

\$ _____ Year of data _____

11. What is the current average annual sewer service charge per household?

\$ _____ Year of data _____

INSTRUCTIONS FOR COMPLETING SURVEY

These instructions include information plus directions to help you complete some of the questions. If something does not fit your situation, answer as best as you can and explain the problem or call the number shown in the cover letter for more help.

QUESTIONS 1-6

There are several possible sources of information to complete Questions 1-6. Use the most current source that corresponds best to your wastewater facility's service area. Sources for data include the census, surveys conducted by a regional planning agency, etc. In all cases, provide the best information you have; give us your best estimate if actual numbers are not available.

1. **Households.** This should be the total number of households (residential customers) serviced, not the number of people or population. (Residential apartment buildings should be treated as equivalent dwelling units.)
2. **Median Household Income.** This should be the most recent census value or current estimate. Your local Bureau of Census, Data User Center, can provide this information.
3. **Current Average Flow Treated.** This value represents flow from all sources. Flow should be reported in gallons per day. If your flow is calculated in cubic feet per day, multiply the flow by 7.481 to convert it to gallons per day.

4. **Average Wastewater Flow Per Household Per Day.** Calculate as follows:

$$\frac{\text{gallons daily residential flow}}{\text{number of residential customers}} = \text{daily flow per household (gallons per day)}$$

Your figure for gallons daily residential wastewater flow might come from your water supply department or your billing office. The wastewater flow figure should include an adjustment for infiltration/inflow.

QUESTIONS 7-11

Cost and revenue information you provide in Questions 7-11 should include all parts of the wastewater system: collection (sewers, pumping stations), the treatment plant, and disposal (outfalls, sludge disposal).

7. **Annual Costs.** This number should include annual "operating costs," "maintenance costs," "replacement costs" for wastewater collection and treatment, and any charges from Regional systems. (It DOES NOT include the costs of wastewater loans and bonds, or depreciation).

Operating costs include labor, materials and supplies, utilities, and overhead (such as office rent).

Maintenance costs include preventive and corrective maintenance.

Replacement costs include costs to maintain but not to extend the useful life of the facilities (like pumps and motors).

8. **Equipment Replacement.** This question is intended to determine what percentage of the operating costs you included in Question 7 are being put aside to maintain but not extend the useful life of the facilities (like pumps and motors).
9. **Costs of Loans or Bonds.** This number should include all principal and interest payments you are making annually to pay for your wastewater treatment facilities.
10. **Money (Revenues) Collected Annually.** This should include all the money you collect for operating and financing all parts of the wastewater facilities--collection, treatment, disposal and debt service. DO NOT include grant monies.
11. **Annual Sewer Service Charge Per Household.** This should be an estimate of the typical total annual sewer service bill for a residential customer. One method of calculating this charge would be to use the wastewater treatment rate established in your sewer use ordinance and the average wastewater flow per household.

Appendix B
Formulas and Data

1. Ratio of Revenues to Costs
= Total Revenue (10) / [OM&R Costs (7) + Debt Financing Costs (9)]
2. Total Unit Costs per 1000 Gallons
= $\frac{[\text{OM\&R Costs (7) + Debt Financing Costs (9)] * 1000}{\text{Current Average Flow (3) * 365}}$
3. OM&R Cost per 1000 Gallons Processed
= $(\text{OM\&R Costs (7)} / [\text{Current Average Flow (3)} * 365]) * 1000$
4. Average Annual Charge per Household
= Current Average Annual Sewer Service Charge (11)
5. Average Residential Cost per Household
= $\frac{\text{Residential Flow Proportion} * [\text{OM\&R Costs (7)} + \text{Debt Financing Costs (9)}]}{\text{Number of Households (1)}}$

Where Residential Flow Proportion
= $\frac{\text{Flow / Household (4)} * \text{Number of Households (1)}}{\text{Current Average Flow (3)}}$

6. Ratio of Revenues to Costs: Residential
= $\frac{[\text{Number of Households (1)} * \text{Average Annual Sewer Charge (11)}]}{\text{Cost of Treating Residential Flow}}$

Where Cost of Treating Residential Flow
= $[\text{OM\&R Costs (7)} + \text{Debt Financing Costs (9)}] * \text{Residential Flow Proportion}$

7. Total Residential Cost per Household as a Percent of MHI
= Average Residential Cost per Household / Average MHI (2)
8. Sewer Service Charge as a Percent of MHI
= Current Average Annual Sewer Service Charge (11) / Average MHI (2)
9. Equipment Replacement Funding
= Equipment Replacement as a Percent of OM&R (8)
10. Annual Debt Financing Cost Adjustment
= Total Grant Dollars (6) * Capital Cost Recovery Factor

Where the Capital Cost Recovery Factor is assumed to be 0.102, representing the equivalent annual cost of borrowing the grant funding over 20 years at 8 percent interest per year.

Note that in computing these measures, any system which was missing one or more parts of the data was excluded from the calculation, thus, sample sizes vary from measure to measure.

SUMMARY CHART OF USER COSTS SURVEY INFORMATION

Community Number	Average Flow (GPD)	Level of Treatment	Operation Costs	Debt Financing Costs per Year	Total Cost \$/1000 Gal	Average Annual Service Charge per Household	Total Res Cost per Household	Total Residential Cost as % of Mill
1	1,460,000	secondary	\$250,000	\$58,000	\$0 58	\$25 00	\$128 33	0 73%
2	41,000,000	advanced	\$13,814,000	\$1,857,300	\$1 05	\$130 00	\$118 72	0 32%
3	250,000	secondary	\$135,000	\$0	\$1 48	\$13 00	\$242 81	2 29%
4	280,000	secondary	\$65,745	\$36,000	\$1 00	\$143 00	\$109 01	0 44%
5	161,150	secondary	\$178,215	\$54,000	\$3 95	\$178 00	\$148 42	0 52%
6	1,100,000	secondary	\$426,901	\$172,806	\$1 49	\$217 80	\$136 30	0 37%
7	2,860,000	secondary	\$506,400	\$298,887	\$0 77	\$139 20	\$63 35	0 26%
8	11,000	secondary	\$18,000	\$0	\$4 48	\$200 00	\$229 09	2 29%
9	613,000	secondary	\$63,000	\$96,000	\$0 71	\$11 00	\$79 37	0 51%
10	263,000	secondary	\$220,000	\$43,300	\$2 74	\$330 00	\$276 31	1 59%
11	125,000	secondary	\$75,808	\$13,750	\$1 96	\$84 00	\$103 17	0 62%
12	60,300	secondary	\$73,282	\$38,990	\$5 10	\$100 57	\$213 85	1 43%
13	20,600	secondary	\$15,000			\$108 00		
14	92,468	secondary	\$210,383	\$108,000	\$9 43	\$99 44		
15	22,000	secondary	\$13,000	\$0	\$1 62	\$192 00	\$114 04	0 39%
16	17,000,000	advanced	\$5,430,071	\$5,426,600	\$1 75	\$219 48	\$143 69	
17	1,300,000	advanced	\$460,566	\$521,550	\$2 07	\$141 89	\$226 64	2 27%
18	28,000	secondary	\$33,038			\$174 00		
19	35,000	secondary	\$58,655	\$45,552	\$8 16	\$24 12	\$274 23	
20	14,800,000	secondary	\$3,227,658	\$607,002	\$0 71	\$91 00	\$214 02	1 55%
21	130,000	secondary	\$40,000	\$23,856	\$1 35	\$192 00	\$147 36	0 94%
22	1,100,000	secondary	\$410,000	\$210,000	\$1 54	\$165 00	\$105 68	0 52%
23	800,000	secondary	\$126,889	\$0	\$0 43	\$130 00	\$88 49	0 34%
24	190,000	secondary	\$125,000	\$45,000	\$2 45	\$253 32	\$163 74	1 13%
25	130,000,000	primary, secondary	\$40,304,000	\$10,373,000	\$1 07	\$78 00	\$93 56	0 32%
26	30,000	secondary	\$80,000	\$10,126	\$8 23	\$300 00		
27	322,425	secondary	\$156,244	\$60,527	\$1 84	\$126 49	\$177 49	0 47%
28	33,000,000	secondary	\$5,713,000	\$0	\$0 47	\$108 00	\$34 62	0 15%
29	35,000	secondary	\$38,000			\$118 50		
30	65,000	secondary	\$40,000	\$14,964	\$2 32	\$120 00		
31	200,000	secondary	\$340,000	\$64,000	\$5 53	\$135 00	\$404 00	1 26%
32	15,000	secondary		\$0		\$120 00		
33	1,885,000	secondary, advanced	\$1,151,370	\$361,979	\$2 20	\$152 00	\$325 15	0 90%
34	69,000	secondary	\$39,000			\$168 00		
35	34,000,000	advanced	\$12,300,000			\$196 00		
36	12,000,000	secondary	\$1,900,000	\$1,600,000	\$0 80	\$165 00	\$131 25	0 53%
37	8,000,000	secondary	\$1,886,000	\$0	\$0 65	\$57 60	\$47 15	0 22%
38	100,000	secondary	\$48,690	\$65,458	\$3 13	\$216 00	\$205 47	1 07%
39	24,000	primary	\$22,510	\$9,814	\$3 69	\$2,242 80	\$149 50	

SUMMARY CHART OF USER COSTS SURVEY INFORMATION

Community Number	Average Flow (GPD)	Level of Treatment	Operation Costs	Debt Financing Costs per Year	Total Cost \$/1000 Gal	Average Annual Service Charge per Household	Total Res Cost per Household	Total Residential Cost as % of Mill
40	185,000	secondary	\$159,000	\$0	\$2 35	\$225 00	\$223 46	1 54%
41	140,000	primary, secondary	\$53,700	\$125,000	\$3 50	\$177 50	\$174 17	0 73%
42	93,300	advanced	\$203,317	\$0	\$5 97	\$30 00	\$329 49	1 46%
43	110,000	secondary	\$77,558	\$43,512	\$3 02	\$154 32	\$262 62	
44	14,000,000	secondary, advanced	\$5,900,000	\$19,060,000	\$4 88	\$256 80	\$595 47	1 27%
45	250,000	secondary	\$549,709	\$0	\$6 02	\$30 00	\$427 79	1 90%
46	800,000	primary	\$350,000	\$0	\$1 20	\$96 00	\$84 44	0 51%
47	27,186,247	advanced	\$5,537,384	\$437,690	\$0 60	\$47 54	\$96 70	0 40%
48	700,000	secondary	\$189,695	\$0	\$0 74	\$125 99	\$158 08	2 63%
49	85,000	secondary	\$80,500	\$23,400	\$3 35	\$17 00	\$270 57	2 16%
50	53,000	secondary	\$89,623	\$0	\$4 63	\$120 00	\$507 30	4 05%
51	18,800	secondary	\$17,000			\$168 00		
52	75,000	secondary	\$60,000	\$0	\$2 19	\$180 00	\$300 00	2 14%
53	150,000	secondary	\$45,000	\$33,000	\$1 42	\$150 00	\$93 60	0 66%
54	120,000	primary, secondary	\$75,650	\$35,000	\$2 53		\$190 78	1 91%
55	663	secondary	\$20,000	\$0		\$360 00	\$1,508 30	1 89%
56	70,000	secondary	\$62,419	\$6,963	\$2 72	\$5 02	\$212 11	1 00%
57	40,000	primary	\$50,000	\$45,000	\$6 51	\$20 00	\$263 63	1 32%
58	54,000	primary	\$95,000	\$15,888	\$5 63	\$15 00	\$323 29	2 09%
59	200,000	secondary	\$70,000	\$84,756	\$2 12	\$34 49	\$233 68	
60	600,000	secondary	\$119,162	\$0	\$0 54	\$16 00	\$67 86	0 38%
61	127,785	secondary	\$94,561	\$0	\$2 03	\$84 00	\$141 34	0 60%
62	82,000	secondary	\$91,616	\$93,114	\$6 17	\$198 00	\$225 28	0 93%
63	240,000	secondary	\$100,000	\$0	\$1 14	\$29 20	\$129 17	0 06%
64	940,000	secondary	\$404,880	\$741,595	\$3 34	\$275 00	\$243 93	0 79%
65	31,000,000	advanced	\$763,933	\$956,750	\$0 15	\$270 00	\$18 87	0 07%
66	450,000	secondary	\$207,107	\$60,000	\$1 63	\$120 00	\$178 07	0 82%
67	4,810,000	advanced	\$1,250,000	\$3,000,000	\$2 42	\$194 00	\$333 05	1 07%
68	270,500	advanced	\$60,000			\$336 00		
69	791,418	secondary	\$129,411	\$49,846	\$0 62	\$151 44	\$15 18	0 09%
				AVERAGE	\$2 68	\$169 88	\$215 57	1 10%
				MEDIAN	\$2 09	\$137 10	\$175 83	0 80%