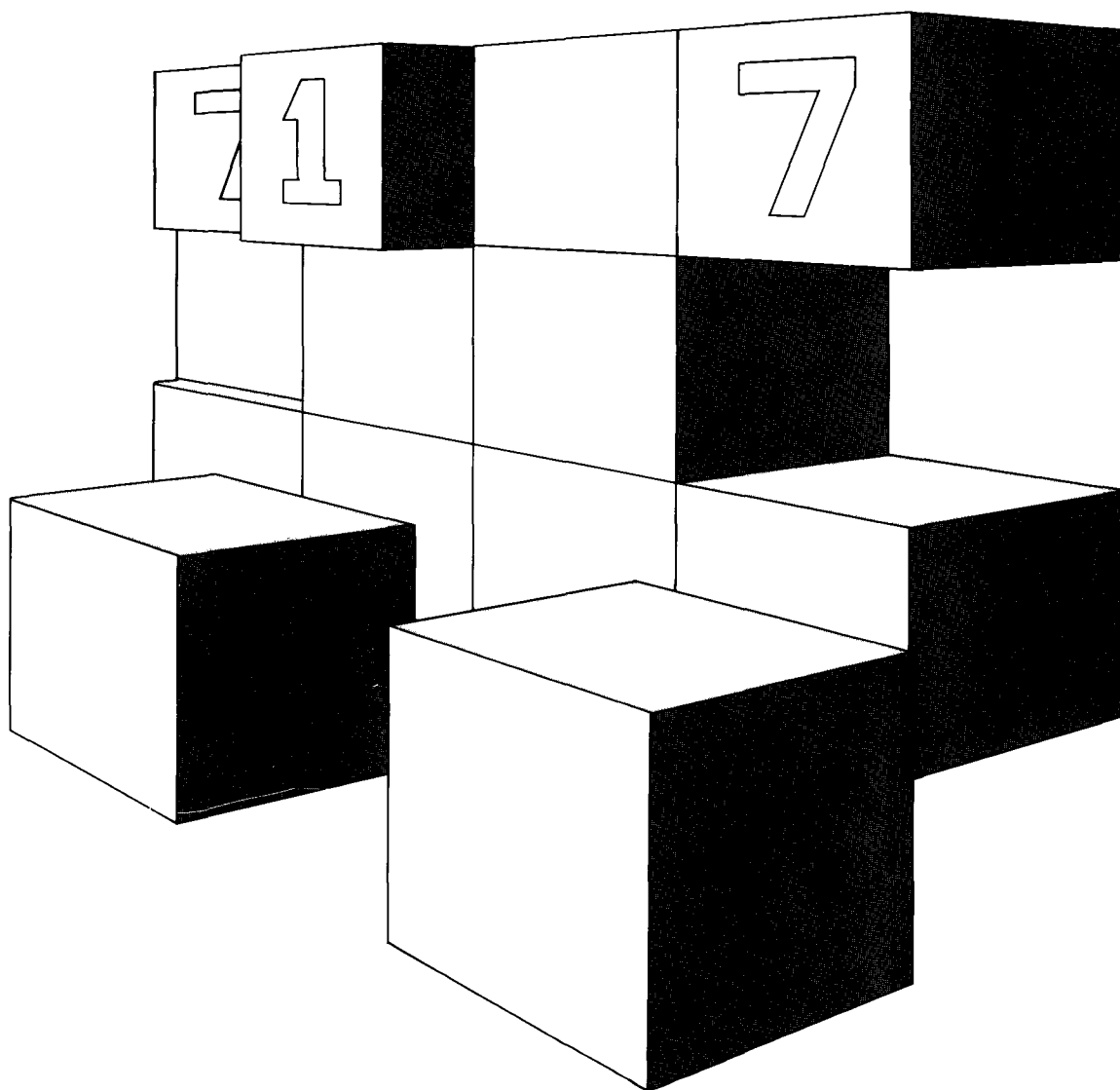




# Looking at User Charges

## A State Survey and Report



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# LOOKING AT USER CHARGES

## A State Survey And Report

U.S. Environmental Protection Agency  
Region 5, Library (PL-12J)  
77 West Jackson Boulevard, 12th Floor  
Chicago, IL 60604-3590

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### WHY A USER CHARGE SURVEY AND REPORT

It has always been a part of your role as a State regulator to provide financial and technical information through community outreach programs and ensure that EPA-funded localities comply with Clean Water Act requirements for user charge systems. Indeed, communities have always looked to you for such guidance.

But now there is a new pressure to look even more closely at user charges. State revolving funds, not federal grants, will finance wastewater construction in the future. Your State will soon be lending large sums of money to localities--and expecting timely repayments to fund the other projects. The success of this financing approach depends upon system solvency. Will your communities have healthy user charge systems that support operation, maintenance, replacement, and repayment?

It is more important than ever that you have the information you need to evaluate these issues. Few communities have the "big picture" on sewer service charges that will help them make educated decisions. To plan for the future, both you and your local

partners must know where each community stands in running self-sufficient wastewater systems. This survey package will help you collect the data you need.

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### EASY STEPS ARE LAID OUT

This package contains all the materials you will need to conduct a thorough survey and effective analysis. You will find information on:

- How the Survey Was Designed.
- Specific Purpose for Each Question.
- Suggestions on Conducting the Survey.
- Ensuring a Good Response.
- Packaging the Survey Analysis Report.
- Presenting the Survey Data.

The Appendices provide you with:

- A Cover Letter, Survey Form, and Instructions.
- Data Analysis Worksheets.

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## WHAT THE USER CHARGE SURVEY CAN TELL YOU

The questions on the survey form have been carefully designed to collect data that will reveal:

### 1. Whether existing sewer service charges across your State are adequate. In other words, are they:

- Self-sufficient? (Do revenues cover OM&R and debt service?)
- Equitable? (Do users pay in proportion to the cost of the service they use?)
- Affordable? (Can the community independently bear the cost of self-sufficient operation?)

### 2. How costs compare across communities.

- This information will help you identify high-cost systems and flag potential financial problems.
- It may help communities to understand that they can afford system improvements or that they need to raise their charges.

### 3. Directions for future planning. You will be able to:

- Analyze the unit costs of treatment and thus project future capital requirements.
- Identify the types of communities that will need financial assistance in the future.
- Plan the kind of technical assistance you should deliver in the area of financial management.

One final word on what the survey will not provide you--data on your commercial and industrial users. To keep the survey results manageable and clearly focused, this survey targets residential users only: the State's primary concern is about the cost of wastewater services for its individual residents.

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## HOW THE SURVEY WAS DESIGNED

This survey package is not just another EPA document to put on your shelf. Survey designers were experienced with State concerns and spent considerable time putting together the kinds of questions that would meet your data needs. Their goal was to create an informational package that you can use as is. The State staff in California field tested the survey. They got very good results. In fact, the data presentations in this package used information gathered from the California pilot test.

While no one is forcing you to use this survey package, it does offer you a step-by-step approach. Likewise, response from your communities should be voluntary. The suggested cover letter included in Appendix A points out the advantages of participating in the survey. All you need to do is copy it on State letterhead and address it.

We designed the user charge survey with this voluntary approach in mind. Thus, the survey form is:

- Short--Only 11 questions appear.
- Simple--Answers are fill-in-the-blank or checklist format.

- 
- Clearly Organized--Questions follow logically and are easy to read.
  - Relevant--No information is asked unless it is needed for data analysis.
- 

#### EACH QUESTION HAS A SPECIFIC PURPOSE

The survey's 11 questions, although deceptively simple, generate a wealth of information on residential user costs. Part of the design process included making the collected data easy to analyze on a microcomputer with a spreadsheet program, such as LOTUS 1-2-3®. Questions 1-5 ask for demographic and utility information. Questions 6-11 gather data on costs and revenues.

#### Survey Questions

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?
4. What is the current estimated average wastewater flow per household per day?
5. What is the level of treatment at your wastewater treatment facility?
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?

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

9. How much money are you paying each year to cover wastewater loans or bonds?

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?

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

Responses on demographic and utility characteristics are used to calculate unit costs and flows, examine economic impact and ensure valid comparisons between communities. Costs data provide the basis for comparing user charge systems and carefully segregate the costs of operations, maintenance, replacement and capitalization. Revenue questions test whether the system is recovering enough money to operate in the black. Are charges fair? Do subsidies exist?

The survey form and instructions appear in the Appendix A. Just copy and package them with the cover letter.

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## SUGGESTIONS ON CONDUCTING THE SURVEY

Although we have done a lot to simplify the administration of this survey, you will still have to plan on some time and energy to make it a success. The suggested steps are straightforward:

1. Prepare the cover letter using State letterhead, and package the survey using a self-addressed, stamped envelop or self-mailer.
2. Decide who will receive the survey and prepare the mailing list. Target the list carefully so that the survey form gets right to the person who can complete it.
3. Assign staff to the project to answer questions, tabulate results, and analyze data.
4. Publicize the survey through such means as operators' newsletters and press releases.
5. Set up a system for tracking responses that triggers follow-up.
6. Send out the forms, respond to any questions, and follow-up with calls or letters to increase the response rate.
7. Analyze the data by following the steps laid out in the data analysis sheets in Appendix B.
8. Package the results as shown in this document and send it to communities so they can see how they compare.
9. Use the results to aid communities: for example, conduct workshops on setting sewer service charges, provide on-site assistance in cost reduction.

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## ENSURING A GOOD RESPONSE

### Stimulate Interest

The cover letter and instructions accompanying the survey form were carefully designed to attract and inform community participants. The cover letter sells participation by pointing out what's in it for respondents. It conveys a sensitivity to the respondent's busy schedule and stresses the ease and brevity built into the survey. The instructions are clear and brief. They steer the participant to sources of information and--where necessary--describe step-by-step calculations.

Community interest can be sustained by setting a deadline for returning the survey within two weeks. This sets a tone of importance and makes it less likely that the community will postpone completing the survey until a "later time" that never comes.

### Offer and Provide Assistance

Choose a contact person inside your office and make sure his or her name and phone number appear on the cover letter. Make sure the contact is available during the hours when calls are expected. This person should be qualified to answer typical questions or find the answers quickly, preferably by the next day. Responsive, reliable help will boost both the response rate and the accuracy of responses.

Respondents are especially likely to ask how they should define (1) the costs of operating the plant, (2) the cost of paying off loans or bonds, and (3) equipment replacement funds.

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Think about the characteristics of communities in your State, and be prepared for the types of questions you think they may have.

### Track Questionnaires

Establish a follow-up system for non-respondents. A periodic review of the file should be made; a log or a simple database can be used for tracking. Whatever method is chosen, it must be used. Send reminder note (a phone call would be better) a few days before the due date. Such a reminder lets the community know you are committed to getting results and may stimulate a response, especially if the State contact displays enthusiasm for the effort.

### Simplify Response

Use a self-addressed, stamped envelope or self-mailer. If the State shows it cares about the survey enough to pay for its return, communities are likely to take it equally seriously.

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## PACKAGING THE SURVEY ANALYSIS REPORT

Putting the report together for your communities is straightforward:

(1) Start with a thank-you letter to communities for their participation. Say again how you will be using the information (see the survey cover letter in Appendix A).

(2) Attach the survey form and instructions as a reference to the survey data.

(3) Use the worksheets included in Appendix B to guide your analysis.

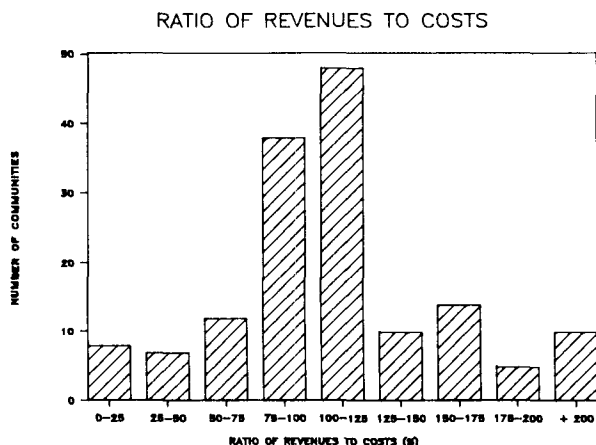
(4) Present the data as shown below.

We have presented the pilot survey data and described the results below to guide you in discussing your findings and targeting state assistance.

## PRESENTING THE SURVEY DATA

### Covering Costs of Operation

The most basic question that you will want to ask is "Are sewer service charges adequate to cover the costs of operation and 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%, you may want to suggest that the community reassess its user charge system and other sources of revenues to ensure proper funding. Special technical assistance might be targeted to communities far below 100%.



In this analysis, 47% of the communities showed revenues below their costs. They had an average overall revenue shortfall of 37%.

### DISTRIBUTION OF TOTAL REVENUES TO TOTAL COSTS

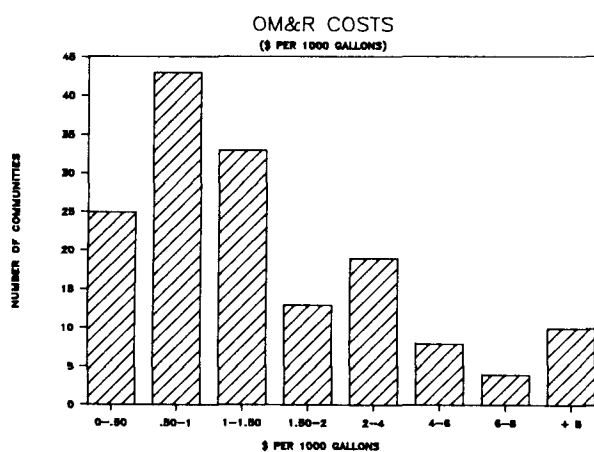
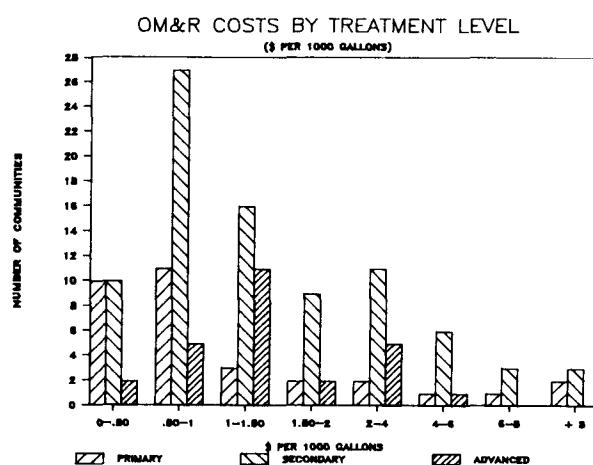
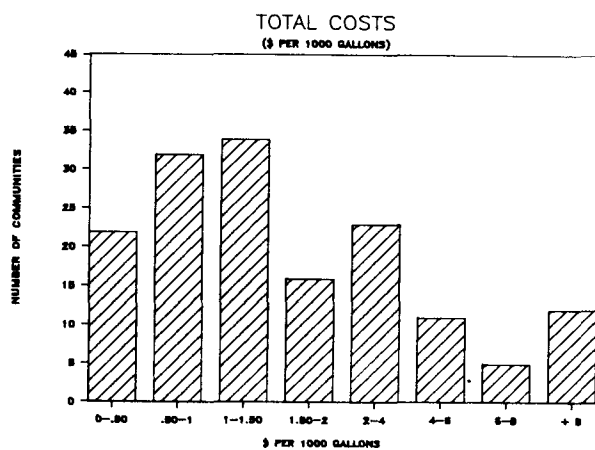
TREATMENT LEVEL	NO. OF COMMUN	> 100%	< 100%
PRIMARY	30	70	30
SECONDARY	81	51	49
ADVANCED	22	36	64
TOTAL	133	53	47

### Unit Cost by Treatment Level

Analysis of typical unit costs (cost of treatment per 1000 gallons) can help you identify communities where costs are unusually high or low and thus may need financial or technical assistance. Unit costs for individual communities vary dramatically and the analysis reflects this fact.

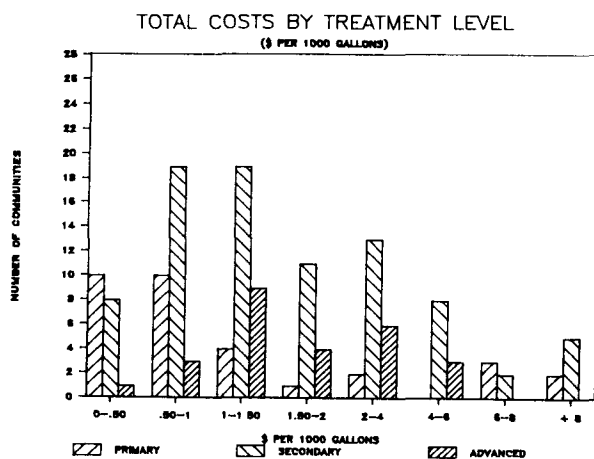
Communities with secondary treatment averaged \$2.61 per 1000 gallons, and advanced treatment systems averaged \$2.10 per 1000 gallons.

This analysis can be used in reviewing proposed user charge systems as well as for determining whether current treatment costs are reasonable. You can also help communities estimate the change in user costs that may result from increasing their level of treatment.



AVERAGE UNIT COSTS BY TREATMENT LEVEL

TREATMENT LEVEL	NO. OF COMMUN	AVER OM&R COSTS	AVER CAPITAL COSTS	---TOTAL UNIT COSTS---		
				AVER	MEDIAN	STD DEV
PRIMARY	32	\$1.82	\$0.28	\$2.11	\$0.80	\$3.19
SECONDARY	83	\$2.16	\$0.41	\$2.61	\$1.40	\$3.77
ADVANCED	25	\$1.60	\$0.48	\$2.10	\$1.60	\$1.35
OVERALL	140	\$1.96	\$0.39	\$2.38	\$1.34	\$3.32

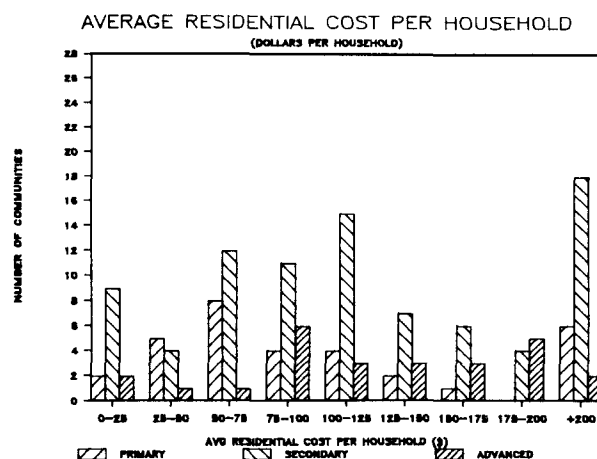
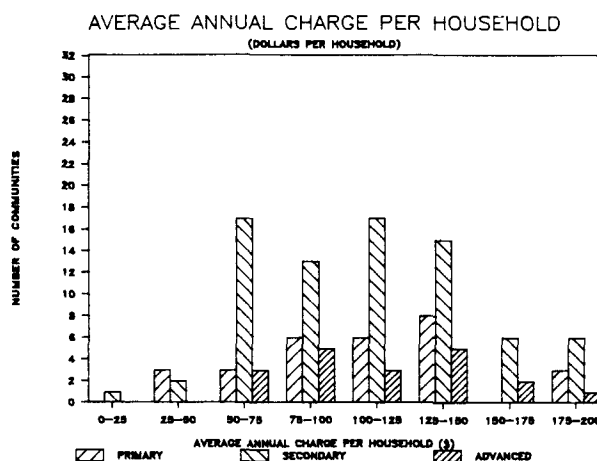
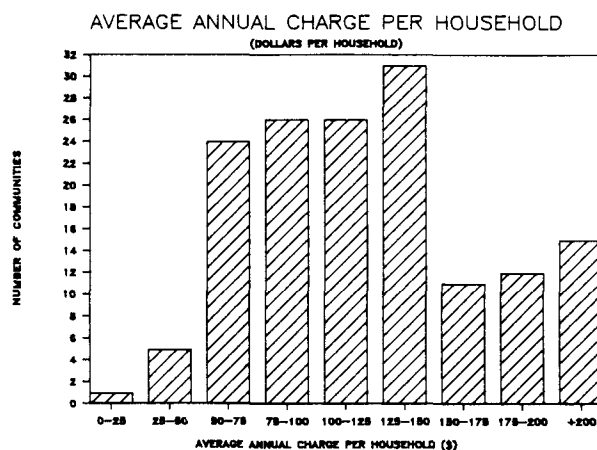
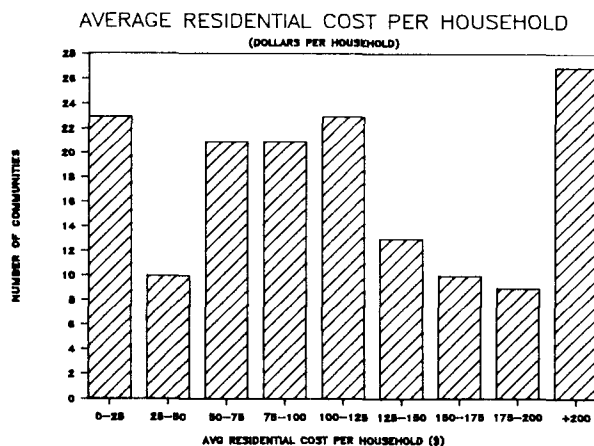




## Average Annual Total Residential Costs and Sewer Service Charges per Household

The average annual total residential costs and sewer service charge per household serves as a basis for later analyses such as the percentage it represents of median household income. 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. This increase was not supported by the unit costs data.

The secondary treatment residential costs were concentrated in the \$50 to \$125 range, while the advanced treatment costs were in the \$75 to \$200 range. The sewer charges for secondary and advanced treatment were both concentrated in the \$50 to \$150 range.



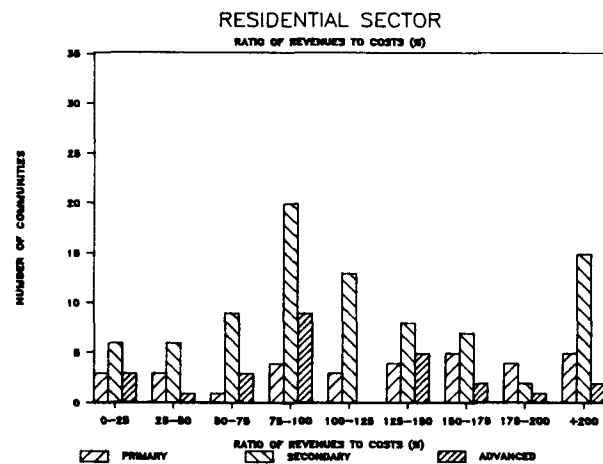
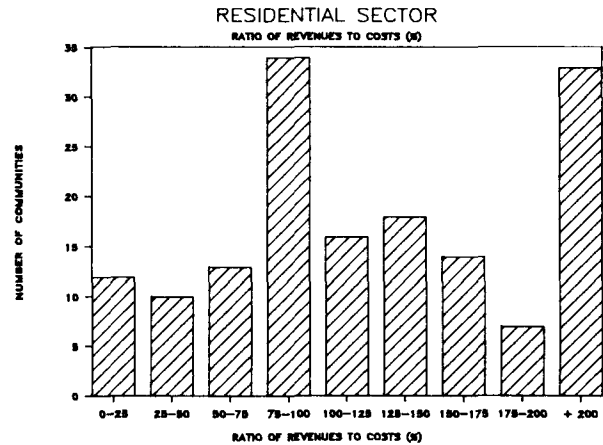
# DISTRIBUTION OF RESIDENTIAL COSTS AND USER CHARGES

TREATMENT LEVEL	# IN SAMPLE	AVG TOTAL RESID COST/HH	---AVERAGE USER CHARGES---		
			AVERAGE	MEDIAN	STD DEV
PRIMARY	31	\$121.83	\$120.49	\$120.00	\$59.56
SECONDARY	80	\$143.43	\$121.50	\$114.12	\$59.13
ADVANCED	24	\$151.80	\$134.27	\$129.00	\$56.63
TOTAL	135	\$139.25	\$123.42	\$120.00	\$59.08

## Equitability of Residential User Charges

Are residential customers paying for their 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 will allow you to answer these questions. Based on the analysis, you can advise communities on restructuring their user charge systems to distribute costs more equitably.

This analysis shows that in many communities residential users may be paying more than their share of treatment costs. This is especially true for primary and secondary treatment, where about two-thirds of the communities in each class appear to be charging their residential customers more than their "share." About one-half of advanced treatment communities charge residential customers more than their estimated share of treatment costs.

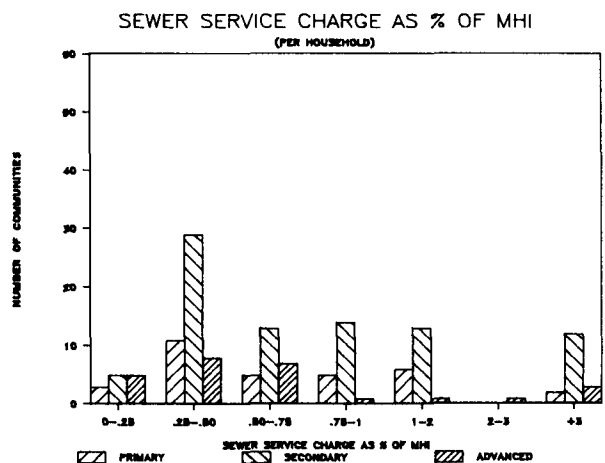
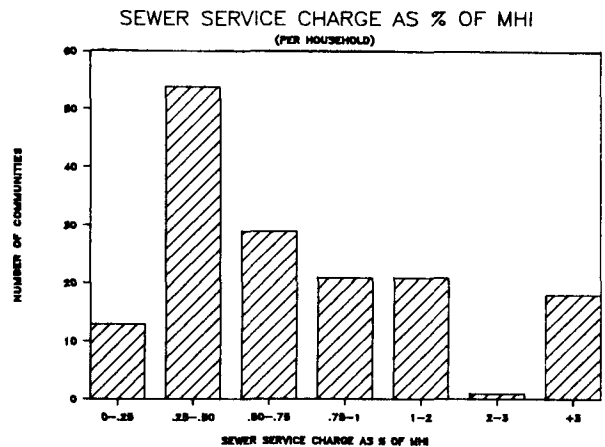
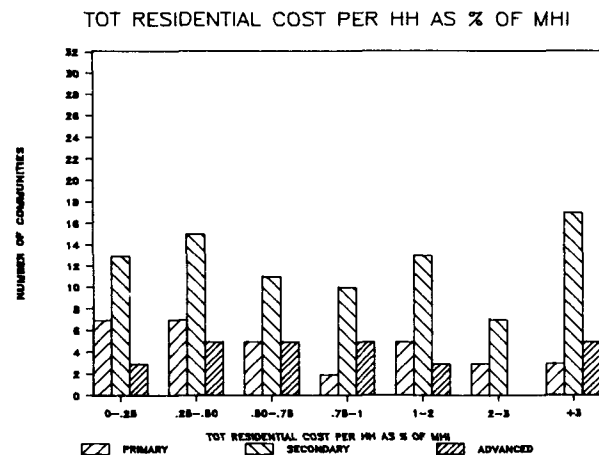
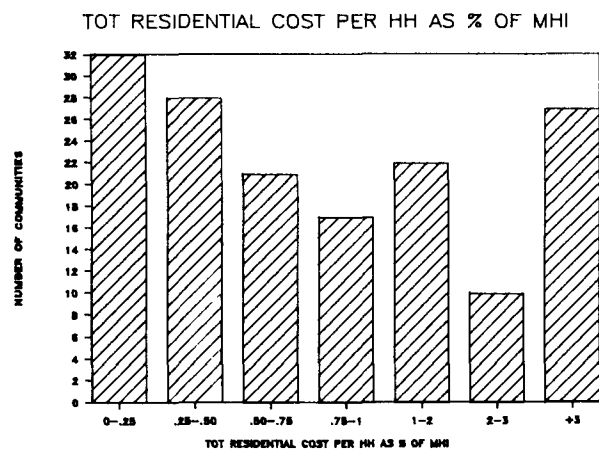


## DISTRIBUTION OF TOTAL REVENUE VS. TOTAL COST FOR RESIDENTIAL SECTOR

TREATMENT LEVEL	NO. OF COMMUN	>100%	<100%
PRIMARY	32	66	34
SECONDARY	83	69	31
ADVANCED	25	48	52
TOTAL	140	64	36

## Ability of Residential Sector to Cover Residential Costs

Average cost per household as a percentage of median household income can be used to indicate whether the cost of wastewater treatment is becoming burdensome for community residents. You can also use this data to predict the ability of the community to generate more revenue by increasing its sewer service charges.



In this analysis, communities had an average total residential cost which was 1.3% of the MHI, but their average sewer service charge was only half that value. High median household incomes in many of the surveyed communities caused the low percentages for wastewater services.

ABILITY OF RESIDENTIAL SECTOR  
TO COVER RESIDENTIAL COSTS

TREATMENT LEVEL	NO. OF COMMUN	--COST PER HOUSEHOLD-- AS % OF MHI		STD DEV
		AVER	MEDIAN	
PRIMARY	32	2.0	0.5	5.7
SECONDARY	86	1.2	0.8	1.9
ADVANCED	26	0.8	0.8	0.6
TOTAL	144	1.4	0.7	3.2

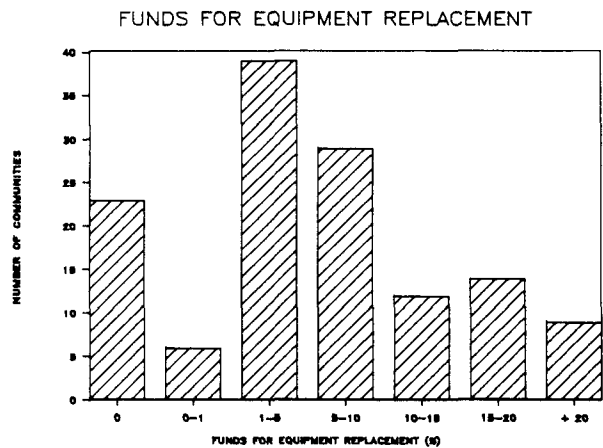
ABILITY OF RESIDENTIAL SECTOR  
TO COVER RESIDENTIAL COSTS

TREATMENT LEVEL	NO. OF COMMUN	--SEWER SERVICE CHARGE-- AS % OF MHI		STD DEV
		AVER	MEDIAN	
PRIMARY	32	0.7	0.6	0.4
SECONDARY	86	0.7	0.5	0.4
ADVANCED	26	0.6	0.5	0.5
TOTAL	144	0.7	0.5	0.4

Planning For Equipment Replacement

You will want to examine how communities are planning for future equipment replacement to identify those communities that may need to reassess their user charge systems. This analysis can also identify communities that may be shortening the life expectancy of their facilities and possibly be causing future compliance problems by not providing adequate funds for equipment replacement.

You can use this information to target assistance such as workshops to educate communities about the need for setting aside the replacement dollars.



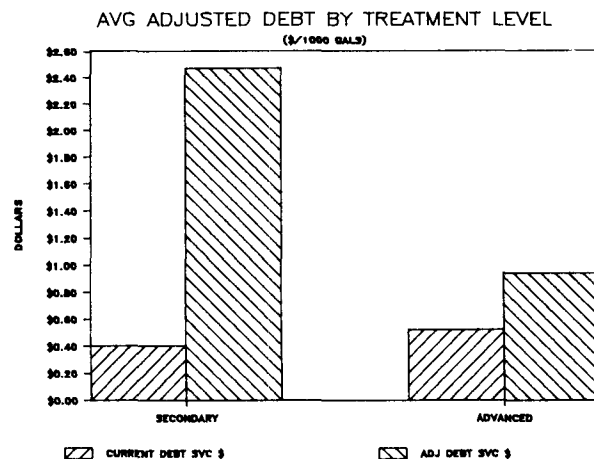
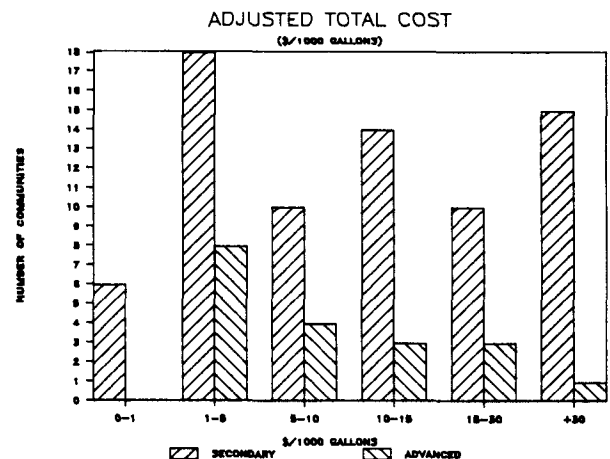
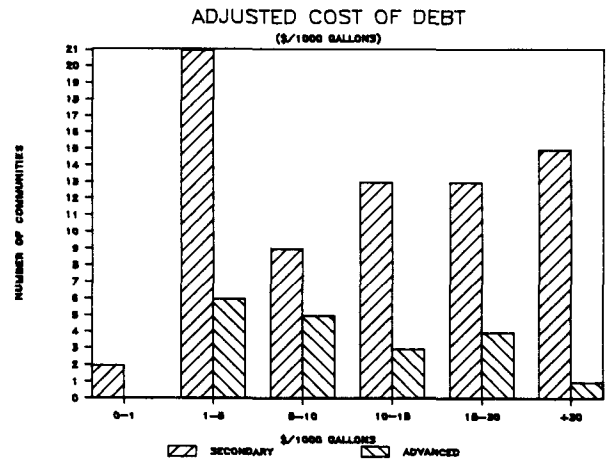
EQUIPMENT REPLACEMENT FUNDS

TOTAL NO. OF COMMUNITIES	130
PERCENT OF COMMUNITIES WITH EQUIPMENT REPLACEMENT FUNDS	82%
AVERAGE PERCENT VALUE OF REPLACEMENT FUNDS	10%
MEDIAN VALUE	5%

## Debt Burden Without Grant Contribution

You will want to examine the effect of grant funding on capital costs 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 will allow you to roughly determine 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 \$.48 to \$.95 per thousand gallons, while it would have increased from \$.41 to \$2.48 for secondary treatment. Why the lower debt service increase for advanced treatment? These numbers appear to suggest that secondary treatment communities received 75% Federal and 12½% State grants and advanced treatment communities received 55% Federal and 12½% State grants with substantial reductions in grant eligible costs. In this analysis, grants reduced the average treatment costs from \$3.87 per 1000 gallons to \$2.38 or 39%.



AVERAGE ADJUSTED COSTS FOR GRANT CONTRIBUTION BY TREATMENT LEVEL						
TREATMENT LEVEL	NO. OF COMMUN	AVG OM&R COSTS PER 1000 GALLONS	AVG ADJ DBT COST PER 1000 GALLONS	AVG ADJ TOT COST PER 1000 GALLONS	MEDIAN	STD DEV
SECONDARY	73	\$1.76	\$2.48	\$4.24	\$1.63	\$6.05
ADVANCED	19	\$1.52	\$0.95	\$2.47	\$2.09	\$1.98
OVERALL	92	\$1.71	\$2.16	\$3.87	\$4.15	\$5.09

### Summarize User Survey Information

Communities will want to see how they compare with others in the state. You can show this by presenting the following information on each community in a summary table:

- Community name or number
- Average flow
- Level of treatment
- Operation costs
- Debt financing costs per year
- Total costs per 1,000 gallons
- Average annual service charge per household
- Total residential cost per household
- Total residential cost as % of medium household income
- Appropriate average values

### Summary Findings

Finally, you will want to summarize the major findings revealed by the survey. Some of the more interesting findings from the pilot survey were:

1. About half of the communities are not collecting enough revenues to meet their expenses.
2. The average unit costs to provide advanced wastewater treatment were 20% lower than secondary treatment.
3. The average residential user charges for advanced treatment were 10% more than the secondary treatment charges.
4. A significant portion of residential users (64%) appear to be paying more than their fair share for wastewater treatment.
5. Most communities (82%) have equipment replacement funds.
6. The average sewer service charge was only 0.65% of the median household income.
7. Federal and state grants have reduced the average total cost of wastewater treatment by 39%.

You want to keep in mind that the data presentations were for California communities. A survey in your state will provide you with comparable data.

# **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 or 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:

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

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**

### **Data Analysis Worksheets**

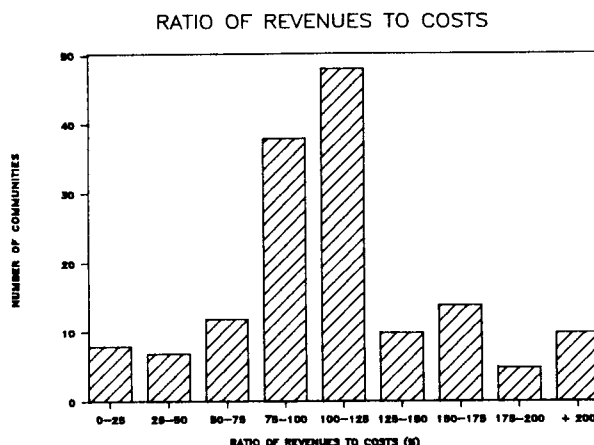
## WORKSHEET #1 – COVERING THE COSTS OF OPERATIONS

### Analysis:

The most basic question that you will want to ask is "Are user charges adequate to cover the costs of operation and achieve compliance with the NPDES permit?" For communities where revenues are not adequate to cover costs (i.e., the ratio is below 100%), the state may want to suggest that the community reassess its user charge system and other sources of revenues to ensure proper funding.

### Presentation:

#### Frequency Distribution (Ratio of Revenues to Costs)



#### Summary Table (Distribution of Total Revenues to Total Costs)

DISTRIBUTION OF TOTAL REVENUES TO TOTAL COSTS			
TREATMENT LEVEL	NO. OF COMMUN	> 100%	< 100%
PRIMARY	30	70	30
SECONDARY	81	51	49
ADVANCED	22	36	64
TOTAL	133	53	47

Questions needed: 7, 9, 10

Calculations:

- Ratio of Revenue to Cost =  $\frac{\text{Total Revenue (10)}}{\text{OM\&R Costs (7) + Debt Financing Cost (9)}}$

- Distribution of Total Revenues to Total Costs

Count number of communities with ratios of revenues to costs of 100% or greater and less than 100%.

$$\text{Average Amount of Revenue Shortfall} = \frac{\text{Total Revenue (10) of Communities with \% < 100} - \left[ \text{OM\&R Costs (7) + Debt Financing Costs (9) of Communities with \% < 100} \right]}{\text{Number of Communities with \% < 100}}$$

## WORKSHEET #2 - UNIT COSTS

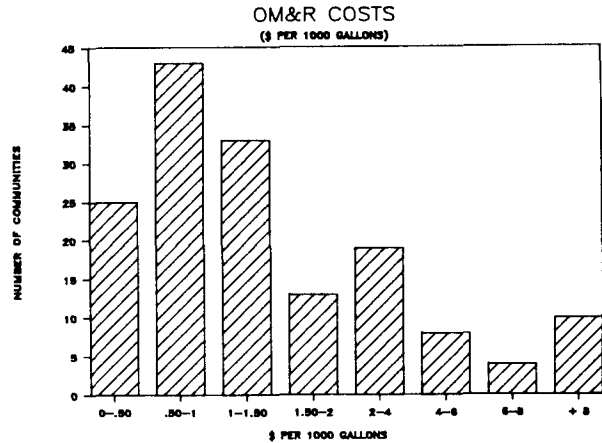
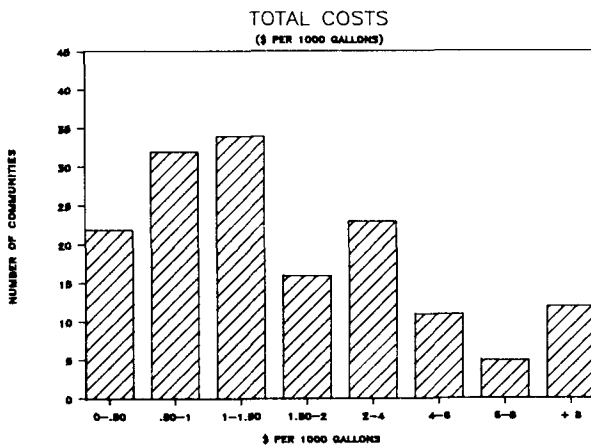
### Analysis:

#### Unit Cost Per Gallon and Treatment Level

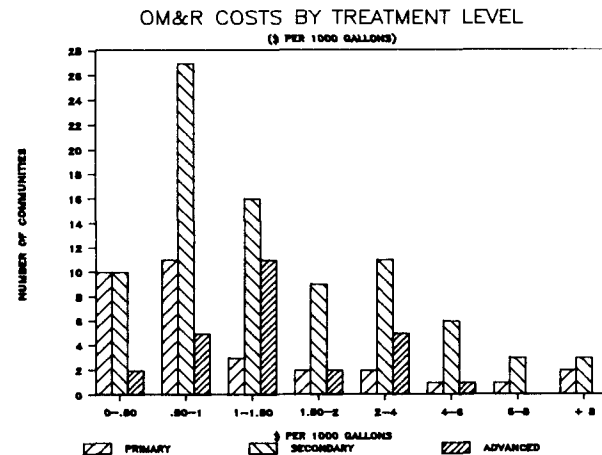
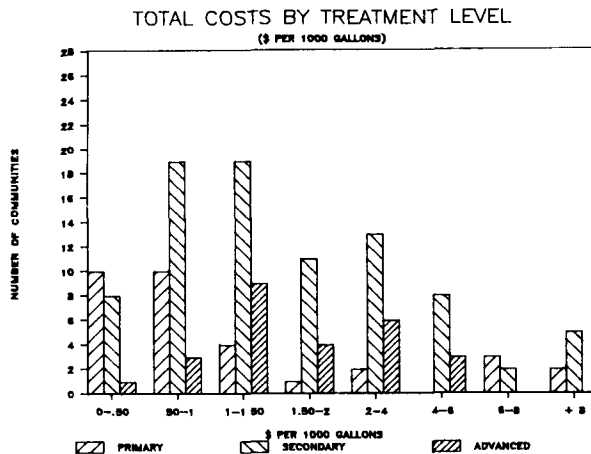
You can use data from the survey to determine the typical unit costs in order to identify communities that have unusually high or low unit costs. This will help the state to identify those communities that may need financial assistance and/or technical assistance. You may also want to evaluate unit costs by treatment level, since unit costs vary dramatically between different levels of treatment.

### Presentation:

#### Frequency Distributions (Unit Costs)



#### Frequency Distributions (Total Unit Costs and OM&R Costs by Treatment Level)





## Summary Table (Average Unit Costs by Treatment Level)

AVERAGE UNIT COSTS BY TREATMENT LEVEL						
TREATMENT LEVEL	NO. OF COMMUN	AVER OM&R COSTS	AVER CAPITAL COSTS	---TOTAL UNIT COSTS---		
				AVER	MEDIAN	STD DEV
PRIMARY	32	\$1.82	\$0.28	\$2.11	\$0.80	\$3.19
SECONDARY	83	\$2.16	\$0.41	\$2.61	\$1.40	\$3.77
ADVANCED	25	\$1.60	\$0.48	\$2.10	\$1.60	\$1.35
OVERALL	140	\$1.96	\$0.39	\$2.38	\$1.34	\$3.32

Questions needed: 3, 5, 7, 8, 9

### Calculations:

- Total Unit Costs =  $\frac{\text{OM\&R Costs (7)} + \text{Debt Financing Costs (9)}}{\text{Current Average Flow (3)} \times 365} \times 1000$   
Per 1000 Gallons
- OM&R Unit Costs =  $\frac{\text{OM\&R Costs (7)}}{\text{Current Average Flow (3)} \times 365} \times 1000$   
Per 1000 Gallons
- Unit costs are sorted by treatment level.
- Average and median cost calculations are performed to determine typical unit costs for each treatment level. Standard deviations from the mean would be calculated and, depending on the specific data available in a given state, one or two standard deviations from the mean could be chosen as control values for communities on the high and low end of costs.

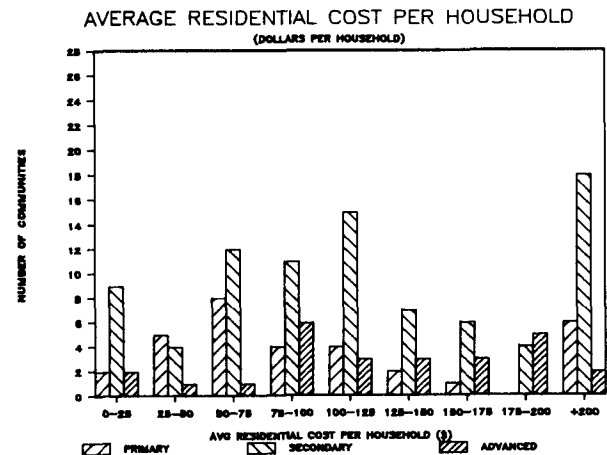
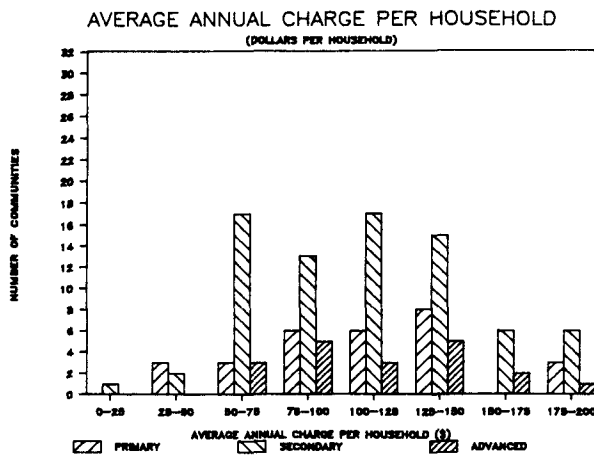
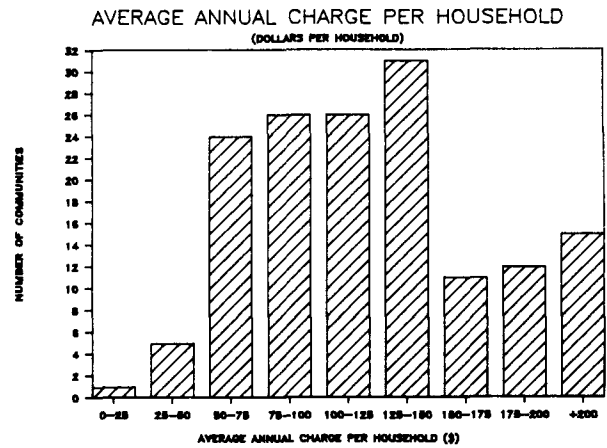
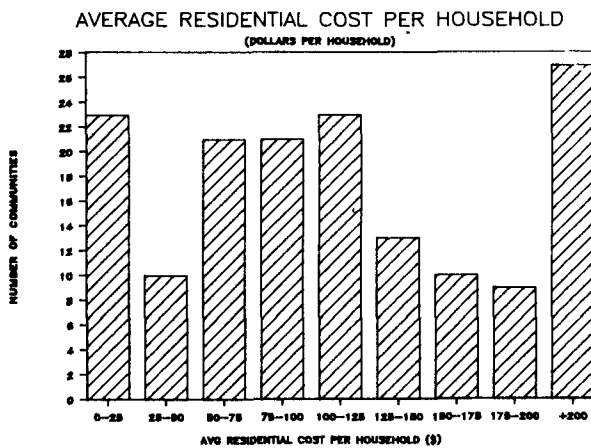
## WORKSHEET #3 – DISTRIBUTION OF RESIDENTIAL COSTS

### Analysis:

You may also want to use the survey data to present the average total residential cost and average annual sewer service charge per household. This information will show the range of fees paid by residents in various communities.

### Presentation:

#### Frequency Distributions (Average Total Residential Costs and Annual Sewer Service Charge Per Household):



## Summary Table (Distribution of Residential Costs and User Charges)

DISTRIBUTION OF RESIDENTIAL COSTS AND USER CHARGES					
TREATMENT LEVEL	# IN SAMPLE	AVG TOTAL RESID COST/HH	---AVERAGE USER CHARGES---		
			AVERAGE	MEDIAN	STD DEV
PRIMARY	31	\$121.83	\$120.49	\$120.00	\$59.56
SECONDARY	80	\$143.43	\$121.50	\$114.12	\$59.13
ADVANCED	24	\$151.80	\$134.27	\$129.00	\$56.63
TOTAL	135	\$139.25	\$123.42	\$120.00	\$59.08

Questions needed: 1, 3, 4, 7, 9, 11

### Calculations:

- Residential Flow (%) =  $\frac{\text{Flow/Household (4)} \times \text{No. of Households (1)}}{\text{Current Average Flow (3)}} \times 100$
- Residential Cost = Residential Flow (%)  $\times \frac{[(\text{OM\&R Costs (7)} + \text{Debt Financing Costs (9)})]}{\text{No. of Households (1)}}$   
Per Household
- Do a frequency distribution analysis of the current average total residential cost and annual user charge per household.
- Unit costs are sorted by treatment level.
- Average and median cost calculations are performed to determine typical unit costs for each treatment level. Standard deviations from the mean would be calculated and, depending on the specific data available in a given state, one or two standard deviations from the mean could be chosen as control values for communities on the high and low end of costs.

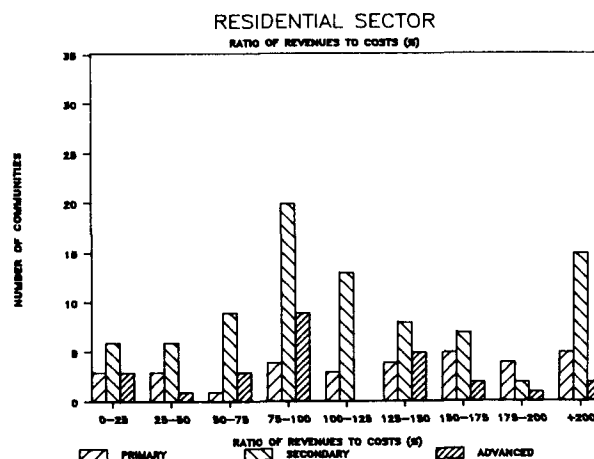
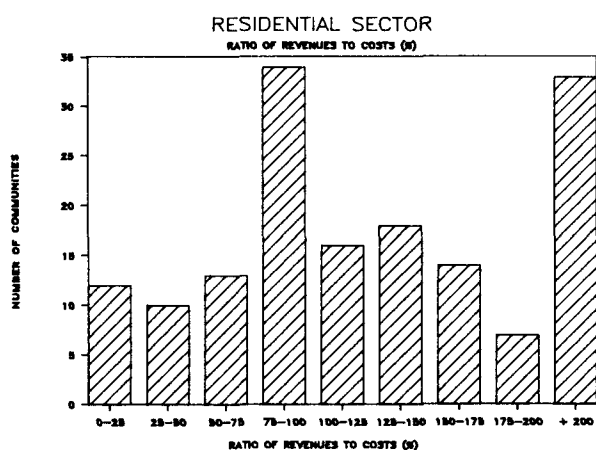
## WORKSHEET #4 – EQUITABILITY OF RESIDENTIAL USER CHARGES

### Analysis:

You can use the data to determine whether user charge systems are equitable for residential customers, i.e., are residential customers paying for their share of the costs, or are these expenses being subsidized by other categories of users (or vice versa). This will allow the state to advise communities as to the need to reassess/restructure user charge systems to provide for a more equitable distribution of cost. Calculating this ratio for the residential sector will also provide information on other customer classes.

### Presentation:

#### Frequency Distributions (Ratio of Revenues to Cost as a Percent):



### Summary Table (Distribution of Total Residential Revenues to Total Residential Costs)

DISTRIBUTION OF TOTAL REVENUE VS. TOTAL COST FOR RESIDENTIAL SECTOR			
TREATMENT LEVEL	NO. OF COMMUN	>100%	<100%
PRIMARY	32	66	34
SECONDARY	83	69	31
ADVANCED	25	48	52
TOTAL	140	64	36

Questions needed: 1, 3, 4, 7, 11

Calculations:

Residential Revenue = Avg. Charge/Household (11) x No. of Households (1)

Cost of Treating Residential Flow =  $\left[ \begin{array}{l} \text{OM\&R Costs} + \text{Debt} \\ \text{Cost (7)} \quad \quad \text{Costs (9)} \end{array} \right] \times \left[ \frac{\text{No. of Households (1)} \times \text{Flow/Household (4)}}{\text{Current Average Flow (3)}} \right]$

Ratio of Residential Sector Revenues to Costs =  $\frac{\text{Residential Revenues}}{\text{Cost of Treating Residential Flow}}$

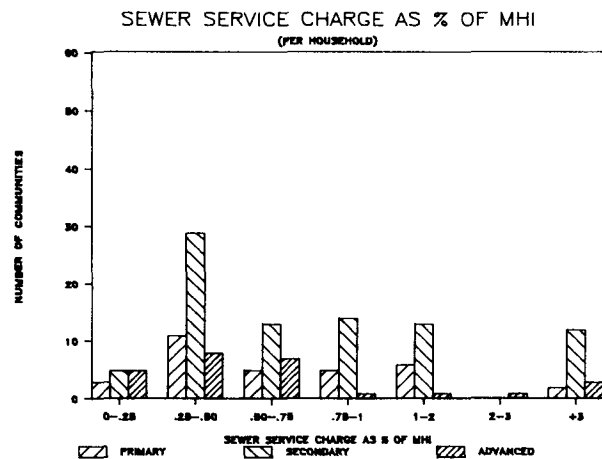
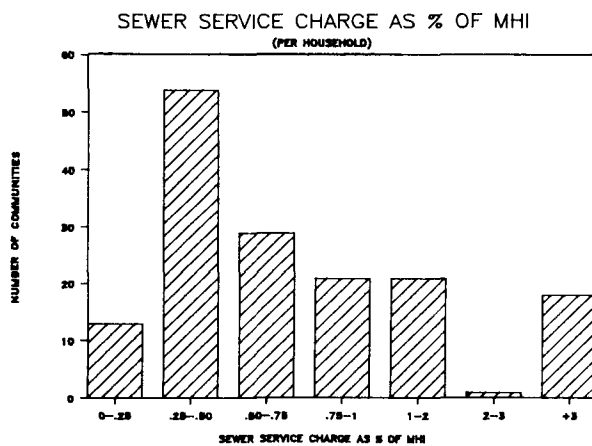
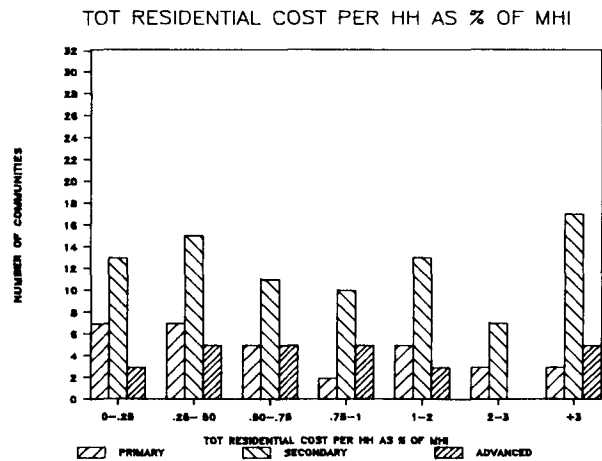
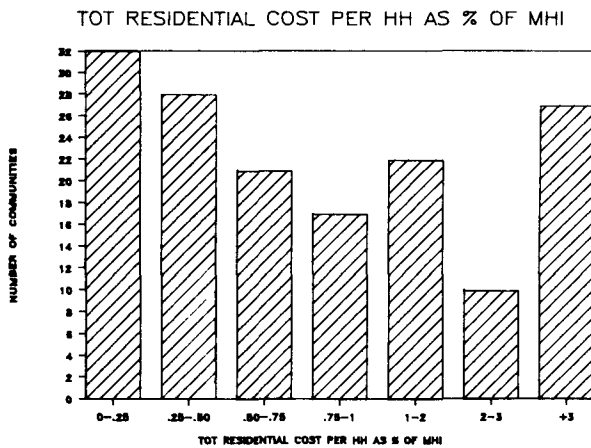
## WORKSHEET #5 - ABILITY OF RESIDENTIAL SECTOR TO COVER RESIDENTIAL COSTS

### Analysis:

The data will allow you to examine average costs per household as a percent of median household income and evaluate how burdensome sewer service charges are on individual households. The state can use this data to interpret the ability of residential sewer service charges to generate additional revenue without over-burdening residential users.

### Presentation:

Frequency Distributions (Total Residential Cost per Household and Sewer Service Charges as a Percent of MHI):



## Summary Table (Ability of Residential Sector to Cover Residential Costs)

ABILITY OF RESIDENTIAL SECTOR TO COVER RESIDENTIAL COSTS					ABILITY OF RESIDENTIAL SECTOR TO COVER RESIDENTIAL COSTS				
TREATMENT LEVEL	NO. OF COMMUN	--COST PER HOUSEHOLD-- AS % OF MHI			TREATMENT LEVEL	NO. OF COMMUN	--SEWER SERVICE CHARGE-- AS % OF MHI		
		AVER	MEDIAN	STD DEV			AVER	MEDIAN	STD DEV
PRIMARY	32	2.0	0.5	5.7	PRIMARY	32	0.7	0.6	0.4
SECONDARY	86	1.2	0.8	1.9	SECONDARY	86	0.7	0.5	0.4
ADVANCED	26	0.8	0.8	0.6	ADVANCED	26	0.6	0.5	0.5
TOTAL	144	1.4	0.7	3.2	TOTAL	144	0.7	0.5	0.4

Questions needed: 1, 2, 3, 4, 5, 7, 9

### Calculations:

- Residential Flow (%) =  $\frac{\text{Flow/Household (4)} \times \text{No. of Households (1)}}{\text{Current Avg. Flow (3)}} \times 100$
- Average Total Residential Cost Per Household (%) =  $\frac{\text{Residential Flow} \times [\text{OM\&R Costs (7)} + \text{Debt Financing Costs (9)}]}{\text{No. of Households (1)}}$
- Average Total Residential Cost Per Household As % of Median Household Income (MHI) =  $\frac{\text{Residential Cost Per Household}}{\text{Median Household Income (2)}}$
- Sewer Service Charge as a Percent of Median Household Income (MHI) =  $\frac{\text{Annual Sewer Service Charge Per Household (11)}}{\text{Median Household Income (2)}} \times 100$
- Average and median cost calculations are performed to determine typical values for each treatment level. Standard deviations from the mean would be calculated and, depending on the specific data available in a given state, one or two standard deviations from the mean could be chosen as control values for communities on the high and low end of costs.

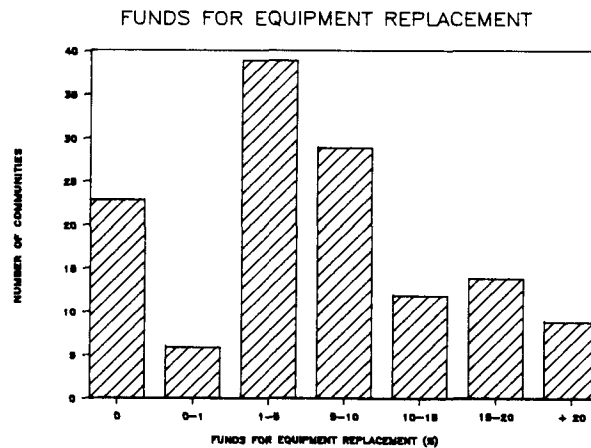
## WORKSHEET #6 – PLANNING FOR EQUIPMENT REPLACEMENT

### Analysis:

You can use the survey to examine how communities are planning for future equipment replacement. This would assist the state in identifying those communities that may need to reassess their user charge systems to adequately address replacement costs. It would also assist in identifying communities which could be shortening the life expectancy of their facilities and possibly cause future compliance problems.

### Presentation:

#### Frequency Distributions (Funds for Equipment Replacement):



#### Summary Table (Equipment Replacement Funds)

EQUIPMENT REPLACEMENT FUNDS	
TOTAL NO. OF COMMUNITIES	130
PERCENT OF COMMUNITIES WITH EQUIPMENT REPLACEMENT FUNDS	82%
AVERAGE PERCENT VALUE OF REPLACEMENT FUNDS	10%
MEDIAN VALUE	5%

Questions needed: 8

### Calculations:

- Do a frequency distribution analysis of the percent of OM&R costs being set aside for replacement needs.
- Average and median calculations are performed to determine typical values.



## WORKSHEET #7 – ADJUSTED CAPITAL COSTS WITHOUT GRANT FUNDS

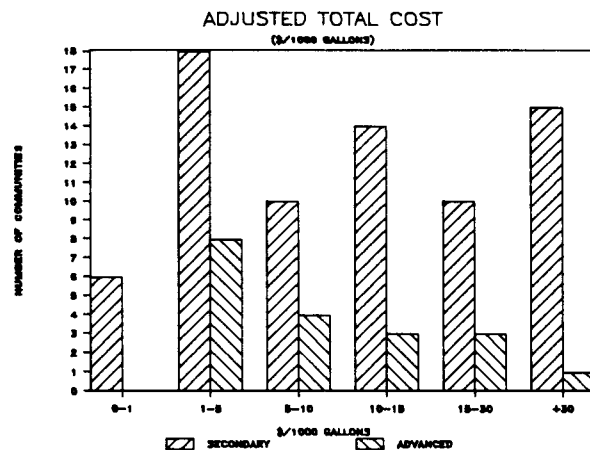
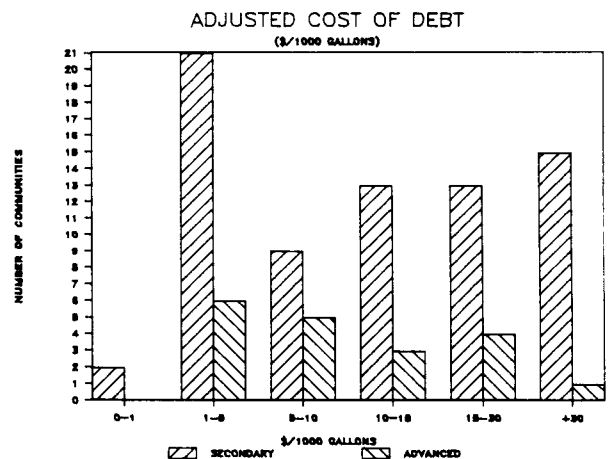
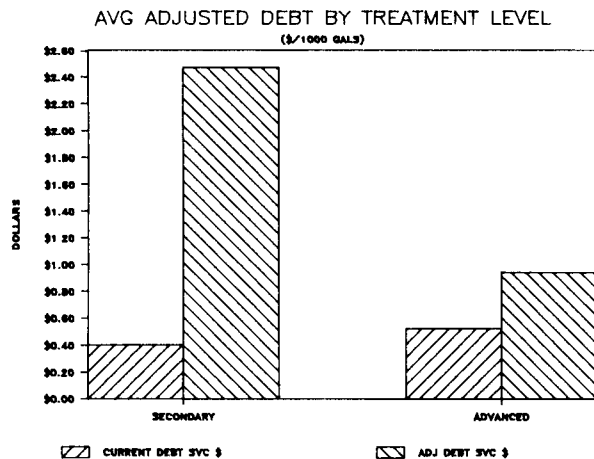
### (Supplemental Analysis)

#### Analysis:

You may want to examine the effect of grant funding on costs of capital by making adjustments to the debt financing cost figure (as reported in the surveys) to reflect the "total" costs of capital without Federal or State grant assistance. This will allow the State to roughly determine the impact of grant assistance on community treatment costs.

#### Presentation:

#### Frequency Distributions (Adjusted Debt Financing Costs Without Grant Funds)



## Summary Table (Adjusted Average Capital Costs by Treatment Level)

AVERAGE ADJUSTED COSTS FOR GRANT CONTRIBUTION BY TREATMENT LEVEL						
TREATMENT LEVEL	NO. OF COMMUN	AVG OM&R COSTS PER 1000 GALLONS	AVG ADJ DBT COST PER 1000 GALLONS	AVG ADJ TOT COST PER 1000 GALLONS	MEDIAN	STD DEV
SECONDARY	73	\$1.76	\$2.48	\$4.24	\$1.63	\$6.05
ADVANCED	19	\$1.52	\$0.95	\$2.47	\$2.09	\$1.98
OVERALL	92	\$1.71	\$2.16	\$3.87	\$4.15	\$5.09

Questions Needed: 3, 6, 9

### Calculations:

- Annual Debt  
Financing Cost Adjustment = Total Grant Dollars (6) x Capital Cost Recovery Factor

The Capital Cost Recovery Factor is calculated to convert grant dollars into annual debt financing costs. For purposes of this calculation, it was assumed that money was borrowed for 20 years at an 8% interest rate (cost recovery factor = .102). For your use, a Capital Cost Recovery Table is shown below.

**CAPITAL COST RECOVERY TABLE**

Length of Maturity	Rate of Interest				
	7%	8%	10%	12%	15%
10	.142	.149	.163	.177	.199
15	.110	.117	.131	.141	.171
20	.094	.102	.117	.134	.160
25	.086	.094	.110	.128	.155
30	.081	.089	.106	.124	.152
35	.077	.086	.103	.122	.151
40	.075	.084	.102	.121	.151

- Adjusted Annual Debt Financing Cost per 1000 Gallons
 
$$= \frac{\text{Debt Financing Cost Adjustment} + \text{Debt Financing Costs (9)}}{\text{Current Average Flow (3)} \times 365} \times 1000$$
- OM&R Cost per 1000 Gallons
 
$$= (\text{see Worksheet \#2, OM\&R Unit Costs per 1000 gallons})$$
- Adjusted Total Cost per 1000 Gallons
 
$$= \text{Adjusted Annual Debt Financing Cost per 1000 Gallons} + \text{OM\&R Costs per 1000 Gallons}$$

## WORKSHEET #8 - SUMMARY OF USER RATE SURVEY INFORMATION

### Analysis:

You can summarize key data points in a table to show communities how they compare with others in the state. This will provide them with a basis for comparison among communities with similar average flows and levels of treatment. It will also provide the state with a quick reference guide that will help them target needed assistance to specific communities.

### Presentation:

#### Summary of User Costs Survey Information:

SUMMARY CHART OF USER COSTS SURVEY INFORMATION

COMMUNITY NAME	AVERAGE FLO (GPD)	LEVEL OF TREATMENT	OPERATION COSTS	DEBT FINANCING COSTS/YEAR	TOTAL COST \$/1000 GAL	AVERAGE ANNUAL SERVICE CHARGE/ HOUSEHOLD	TOTAL RES COST PER HOUSEHOLD	TOTAL RESIDENTIAL COST AS % OF MHI
COMMUNITY 1	30,000	P	\$56,000.00	\$22,700.00	\$7.19	\$348.00	\$491.88	2.81%
COMMUNITY 2	1,300,000	S	\$596,171.00	\$74,885.00	\$1.41	\$148.00	\$429.48	2.86%
COMMUNITY 3	4,240,000	S	\$1,698,000.00	\$443,000.00	\$1.38	\$63.00	\$73.22	0.29%
COMMUNITY 4	1,500,000	S	\$964,000.00	\$0.00	\$1.76	\$96.00	\$112.47	0.39%
COMMUNITY 5	250,000	S	\$175,968.00	\$52,956.52	\$2.51	\$120.00	\$102.56	0.89%
COMMUNITY 6	1,000,000	P	\$127,890.00	\$17,134.00	\$0.40	\$58.80	\$48.44	0.14%
COMMUNITY 7	4,650,000	P	\$145,529.00	\$497,856.00	\$0.38	\$140.00	\$39.99	0.08%
COMMUNITY 8	319,267	-	\$154,612.00	\$12,512.00	\$1.43	\$184.32	\$147.50	1.40%
COMMUNITY 9	2,900,000	A	\$1,440,000.00	\$211,270.00	\$1.56	\$228.00	\$148.04	0.74%
COMMUNITY 10	880,000	P	\$122,000.00	\$27,055.00	\$0.46	\$96.60	\$94.68	0.86%
COMMUNITY 11	5,000,000	P	\$1,015,000.00	\$0.00	\$0.56	\$10.00	\$65.37	0.22%
COMMUNITY 12	380,000	P	\$55,000.00	\$0.00	\$0.40	\$86.40	\$54.28	0.42%
COMMUNITY 13	200,000	S	\$56,000.00	\$5,747.50	\$0.85	\$155.00	\$123.50	1.00%
COMMUNITY 14	333,500	P	\$95,670.00	\$0.00	\$0.79	\$84.00	\$100.12	0.72%
COMMUNITY 15	350,000	A	\$269,863.00	\$81,500.00	\$2.75	\$150.00	\$250.97	1.05%
COMMUNITY 16	160,000	S	\$197,936.00	\$4,560.00	\$3.47	\$84.00	\$463.21	4.63%
COMMUNITY 17	650,000	S	\$1,331,613.00	\$132,950.00	\$6.17	\$10.50	\$457.39	-
COMMUNITY 18	100,000	S	\$30,000.00	\$27,000.00	\$1.56	\$10.00	\$129.39	1.18%
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COMMUNITY 155	109,000	S	\$167,750.00	\$35,000.00	\$5.10	\$167.72	\$465.02	2.93%
COMMUNITY 156	60,000	S	\$162,500.00	\$32,500.00	\$8.90	\$226.00	\$812.50	5.50%
COMMUNITY 157	12,000,000	S	\$4,620,000.00	\$490,000.00	\$1.17	\$92.04	\$95.39	0.26%
COMMUNITY 158	270,000	P	\$53,500.00	\$0.00	\$0.54	\$60.00	\$39.63	0.28%
COMMUNITY 159	5,900,000	S	\$1,400,000.00	\$0.00	\$0.65	\$96.00	\$69.76	0.24%
COMMUNITY 160	860,000	S	\$364,393.00	\$133,500.00	\$1.59	\$55.00	\$124.47	0.69%
COMMUNITY 161	260,000	S	\$200,000.00	\$40,000.00	\$2.53	\$138.00	\$240.00	1.09%
COMMUNITY 162		S	\$65,000.00	\$115,750.00	-	\$108.00	-	-
AVERAGE					\$2.38	\$123.42	\$139.25	1.40%
MEDIAN					\$1.34	\$120.00	\$124.47	0.70%

Questions needed: 1, 2, 3, 4, 5, 7, 9, 11

### Calculations:

- Average Flow = (3)
- Level of Treatment = (5)
- Operation Costs = (7)
- Debt Financing Costs/Year = (9)

- Total Cost =  $\frac{\text{OM\&R Costs (7) + Debt Financing Costs (9)}}{\text{Current Average Flow (3) x 365}} \times 1000$   
\$ / 1,000 Gallons
- Average Annual  
Sewer Service  
Charge/Household = (11)
- Total Residential Cost Per Household = (See Worksheet #5, Average Total  
Residential Costs Per House-  
hold)
- Total Residential  
Costs as a Percent  
of MHI = Average Total Cost Per Household as % of MHI  
(See Worksheet #5)

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