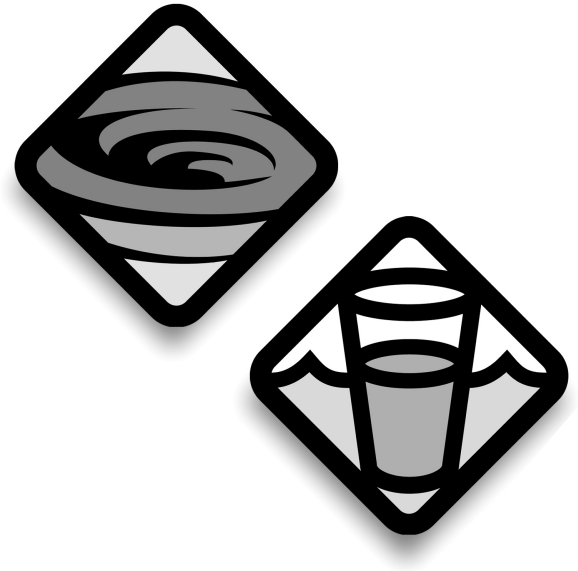
Multi-discipline



Water and Sewer Rates: Full Cost Recovery

This document is the third in a series of multidisciplinary best practices which has been developed with the combined efforts of various Technical Committees. For titles of other best practices in this and other series, please refer to <*www.infraguide.ca*>.

National Guide to Sustainable Municipal Infrastructure

NRC · CNRC FCM Federation of Canadian Municipalities Fédération canadienne des municipalités Canada

Water and Sewer Rates: Full Cost Recovery

Version 1.0

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Users are specifically advised that certain recommended measures or actions presented in this publication may not be appropriate for use in Canada's northern communities. Factors such as extreme cold temperatures, permafrost, and the special difficulties encountered when bringing infrastructure to isolated communities may adversely affect the technical solutions or the application of the proposed best practices. Specific professional technical advice is required in all such cases.

InfraGuide® — Innovations and Best Practices

Why Canada Needs InfraGuide

Canadian municipalities spend $12 to $15 billion annually on infrastructure but it never seems to be enough. Existing infrastructure is ageing while demand grows for more and better roads, and improved water and sewer systems responding both to higher standards of safety, health and environmental protection as well as population growth. The solution is to change the way we plan, design and manage infrastructure. Only by doing so can municipalities meet new demands within a fiscally responsible and environmentally sustainable framework, while preserving our quality of life.

This is what the *National Guide to Sustainable Municipal Infrastructure: Innovations and Best Practices (InfraGuide)* seeks to accomplish.

In 2001, the federal government, through its Infrastructure Canada Program (IC) and the National Research Council (NRC), joined forces with the Federation of Canadian Municipalities (FCM) to create the National Guide to Sustainable Municipal Infrastructure (InfraGuide). InfraGuide is both a new, national network of people and a growing collection of published best practice documents for use by decision makers and technical personnel in the public and private sectors. Based on Canadian experience and research, the reports set out the best practices to support sustainable municipal infrastructure decisions and actions in six key areas: municipal roads and sidewalks, potable water, storm and wastewater, decision making and investment planning, environmental protocols, and transit. The best practices are available on-line and in hard copy.

A Knowledge Network of Excellence

InfraGuide´s creation is made possible through $12.5 million from Infrastructure Canada, in-kind contributions from various facets of the industry, technical resources, the collaborative effort of municipal practitioners, researchers and other experts, and a host of volunteers throughout the country. By gathering and synthesizing the best Canadian experience and knowledge, InfraGuide helps municipalities get the maximum return on every dollar they spend on infrastructure—while being mindful of the social and environmental implications of their decisions.

Volunteer technical committees and working groups—with the assistance of consultants and other stakeholders—are responsible for the research and publication of the best practices. This is a system of shared knowledge, shared responsibility and shared benefits. We urge you to become a part of the InfraGuide Network of Excellence. Whether you are a municipal plant operator, a planner or a municipal councillor, your input is critical to the quality of our work.

Please join us.

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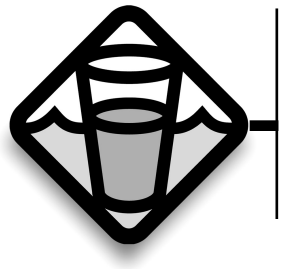
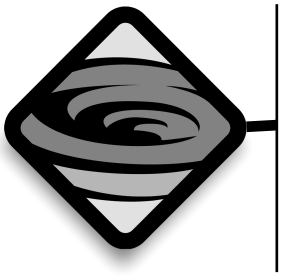
The InfraGuide Best Practices Focus

Multidisciplinary best practices are relevant to two or more Infrastructure sectors. The current best practice combines Potable Water and Storm and Wastewater.



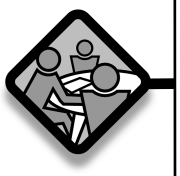
Potable Water

Potable water best practices address various approaches to enhance a municipality's or water utility's ability to manage drinking water delivery in a way that ensures public health and safety at best value and on a sustainable basis. Issues such as water accountability, water use and loss, deterioration and inspection of distribution systems, renewal planning and technologies for rehabilitation of potable water systems and water quality in the distribution systems are examined.



Storm and Wastewater

Ageing buried infrastructure, diminishing financial resources, stricter legislation for effluents, increasing public awareness of environmental impacts due to wastewater and contaminated stormwater are challenges that municipalities have to deal with. Storm and wastewater best practices deal with buried linear infrastructure as well as end of pipe treatment and management issues. Examples include ways to control and reduce inflow and infiltration; how to secure relevant and consistent data sets; how to inspect and assess condition and performance of collections systems; treatment plant optimization; and management of biosolids.

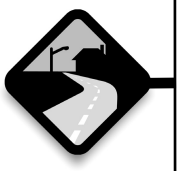


Decision Making and Investment Planning

Elected officials and senior municipal administrators need a framework for articulating the value of infrastructure planning and maintenance, while balancing social, environmental and economic factors. Decision-making and investment planning best practices transform complex and technical material into non-technical principles and guidelines for decision making, and facilitate the realization of adequate funding over the life cycle of the infrastructure. Examples include protocols for determining costs and benefits associated with desired levels of service; and strategic benchmarks, indicators or reference points for investment policy and planning decisions.

Environmental Protocols

Environmental protocols focus on the interaction of natural systems and their effects on human quality of life in relation to municipal infrastructure delivery. Environmental elements and systems include land (including flora), water, air (including noise and light) and soil. Example practices include how to factor in environmental considerations in establishing the desired level of municipal infrastructure service; and definition of local environmental conditions, challenges and opportunities with respect to municipal infrastructure.



Municipal Roads and Sidewalks

Sound decision making and preventive maintenance are essential to managing municipal pavement infrastructure cost effectively. Municipal roads and sidewalks best practices address two priorities: front-end planning and decision making to identify and manage pavement infrastructures as a component of the infrastructure system; and a preventive approach to slow the deterioration of existing roadways. Example topics include timely preventative maintenance of municipal roads; construction and rehabilitation of utility boxes; and progressive improvement of asphalt and concrete pavement repair practices.

Transit

Urbanization places pressure on an eroding, ageing infrastructure, and raises concerns about declining air and water quality. Transit systems contribute to reducing traffic gridlock and improving road safety. Transit best practices address the need to improve supply, influence demand and make operational improvements with the least environmental impact, while meeting social and business needs.

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

This document explains the importance of full cost recovery for municipal water and sewage services and provides guidance on planning and implementing full cost recovery. Key topics covered include the identification and quantification of full costs and the setting of adequate and equitable rates to recover full costs.

In the past, budgets for water and sewage systems were typically based on historical trends with inflationary and/or service level adjustments and in some cases, refinements in regulations on drinking water quality and wastewater discharge quality. Now, as water and sewage systems deteriorate and maintenance costs increase, and managers incorporate approaches and tools such as business planning, level of service pricing and performance benchmarking, historical costs no longer serve as a reliable guide for budgeting. As a result, the gap between what should be spent and what is being spent continues to widen for many. This is not sustainable in light of ever more stringent regulations and increasing accountability of decision makers and operators.

Planning to recover the full costs for these services can help ensure that funding for water and sewage systems is sufficient to sustain them indefinitely and that funds are appropriately spent. A full cost recovery plan can also be developed to promote more efficient use of water, allowing municipalities to defer capacity expansions and reduce costs. Without planning for full cost recovery, the level of service would gradually decline.

In many cases, municipalities[1] have a growing backlog of renewal works (i.e., deferred capital). A full cost recovery plan must ensure that water and sewage rates are increased sufficiently over the short term to prevent the backlog from growing.

Australia, New Zealand and the United States have already legislated the need for full cost recovery at the municipal level. In 2002, the Ontario government passed the Sustainable Water and Sewage Systems Act (Bill 175), which calls for municipalities to quantify the full costs for their water and sewage systems and then prepare a cost recovery plan.

This best practice outlines nine steps to establish a full cost recovery plan:

1. Set goals and objectives
2. Identify components of full costs
3. Estimate full costs
4. Conduct gap analysis
5. Identify revenue sources and prioritize
6. Review financing methods
7. Develop a financial plan
8. Set the rates and charges
9. Review the full cost assessment and cost recovery plan annually

Goals and objectives should at the very least include full cost recovery, water use efficiency, equity, service level, and sustainability.

A full cost recovery plan is required for all components of water and sewage services (including source water protection, production, distribution, collection and treatment). Full costs include operations, maintenance and administration (OM&A), research and development, financial (including depreciation, interest and equity return), capital works (for expansion, upgrade, rehabilitation and renewal including planning, pilot testing, pre-design, design and land acquisition), decommissioning of disused works and source protection.

1. Municipality (or municipalities) mentioned in InfraGuide best practices is intended to include all purveyors of public services as well as utilities.

Municipalities should develop an asset management plan in order to project the costs for renewal of their systems over both the short term and the long term. An asset management plan requires an inventory of assets, condition assessments and an evaluation of alternatives that is based on life cycle costs.

Once the full costs for the water and sewage systems have been determined, the municipality should establish a realistic timeframe to close the gap between the investment needs and the spending. It is particularly important for municipalities with old systems to quantify the backlog of renewal needs since this could require significant increases in rates over the short term in order to prevent a reduction in the level of service.

There are several potential sources for revenue, the principal ones being user rates, user fees, capital charges, property taxes, various other charges and grants. Municipalities should develop a cost recovery plan using sources that are appropriate from a technical and legal perspective, provide sufficient scope for revenue generation, and are consistent with local objectives. Municipalities should not rely on grants from senior levels of government to subsidize their water and sewage systems since this is not sustainable.

Municipalities should also review the various financing methods, including reserve funds, capital from current funds, debt, capital charges and private sector financing. Once the financing method(s) has been selected, the municipality should develop a financial plan that reflects the full costs and describes how the costs are financed and how the costs are to be recovered.

User rates are the cornerstone of most cost recovery plans. A variety of alternative rate structures can be used. Manuals published by the AWWA and the CWWA describe methods for developing and setting these rates. The rate structure selected by a municipality should achieve cost recovery objectives and an equitable allocation of costs among customers. Other local objectives should also be considered in rate structure design, for example water conservation or customer comprehension of the rates. Rates can be used to pursue objectives, but usually in combination with other tools such as customer education and promotion.

The full cost recovery plan should be reviewed each year during the annual budgeting process. An annual review is required since the budget and customer assumptions that went into the prior projections can change over time and new programs can affect expenditures and usage patterns. Small systems with very limited or no capital investment may review their rates and charges every two or three years at a minimum if resources are limited. The levels of rates and charges should be evaluated and adjusted as needed to assure full cost recovery.

An example is provided in Appendix E to illustrate how to set water and sewer rates to achieve full cost recovery.

1. General

1.1 Introduction

This is one of a number of best practices (BP) being developed under the auspices of the *National Guide to Sustainable Municipal Infrastructure (InfraGuide)*.

InfraGuide BPs are intended to be decision-making and investment planning tools, as well as a compendium of technical best practices and innovations. They provide road maps to the best available solutions for addressing infrastructure issues.

This document is based on the results of a survey of 15 progressive Canadian municipalities, a literature review and input from experts on financial management of water and sewage systems.

This document focuses on the development of a full cost recovery plan for municipal water and sewage services. The concept of full cost recovery is not new. In 1993, the Federation of Canadian Municipalities stated that they will: "*...promote water rates that reflect the full cost of purification, storage, distribution and sewage treatment...*"[2]. With ageing infrastructure, more stringent legislation, public demand for a higher level of service (e.g., increased levels of water and wastewater treatment) and accountability and increased concern about the environment, full cost recovery is gaining greater attention.

Full cost recovery includes concepts of both costs and cost recovery which are defined in this report as follows:

Costs include all water and sewage system costs that must be incurred to provide services at sustainable service delivery levels and reflect customer, industry and government mandated service standards. Costs include operating, maintenance and administration (OM&A) expenditures, land, financial and capital investments to repair, rehabilitate, replace, expand and upgrade facilities; and, in some cases, decommissioning and disposing of infrastructure. These costs must be recognized and reported.

Cost recovery means the generation of sufficient revenues to pay the cost of water and sewage services. It includes user fees and charges for services that allocate costs to users in an equitable manner and are affordable. Full cost recovery supports a business plan and funding approach that suits local conditions, sustains water and sewage systems in perpetuity and maintains acceptable service levels for the users of the systems.

1.2 Purpose and Scope

As water and sewage systems age, as quality and service level standards increase and as funding sources change, water and sewage utilities are challenged to develop cost recovery strategies that assure financial sustainability. Full cost recovery is an important strategy for sustainability.

This document has been prepared for water and sewage utility staff, decision makers and regulatory authorities. It provides information to help the reader understand, develop and implement full cost recovery, including:

- A simple, understandable definition of the concept;
- A description of sustainable service delivery and how to achieve it;
- Procedures to quantify full costs and establish a cost recovery strategy;
- A discussion of data and information needs;
- A discussion of risk management issues; and
- References to other literature on pricing and related BPs.

Full cost recovery supports a business plan and funding approach that suits local conditions, sustains water and sewage systems in perpetuity and maintains acceptable service levels for the users of the systems.

2. M. Fortin and M. Loudon, 1996. *Using Real Costs For Setting Water Rates*, OWWA/OMWA Joint Annual Conference, April 23.

This document is not intended to be a detailed manual that can be used to calculate water and sewer rates.

This document sets out why it is important to establish rates that reflect the full cost of service, how to identify and quantify full costs and how to establish adequate and equitable rates and what needs to be done. It is a primer and reference tool on full cost recovery, providing a framework to build a financing strategy tailored to local needs.

This document is not intended to be a detailed manual that can be used to calculate water and sewer rates. It references several excellent manuals that provide a more detailed description of the process that should be used to set rates and in most cases, this should be directed by an experienced professional.

1.3 How to Use This Document

Steps outlined here constitute a specific approach to achieve best practice. Other approaches may equally achieve full cost recovery and may be more suitable for given systems. However, the approach presented here is more readily suited to the small to medium sized operation and, when applied correctly, can be used to achieve best practice.

Section 1 — General introduces and defines the subject, describes issues surrounding full cost recovery and provides an overview of key concepts. Reference is made to related BPs and definitions of key terms are provided.

Section 2 — Rationale provides justification for full cost recovery and describes its benefits. Full cost recovery is needed to ensure sustainable services.

Section 3 — Work Description describes WHAT needs to be done and HOW to do it. It presents a framework for quantifying full costs for water and sewage systems as well as an approach for establishing water and sewage rates.

Section 4 — Applications and Limitations presents some considerations for implementation of water and sewage rates to achieve full cost recovery.

Section 5 — Evaluation describes several measures that can be used to assess the adequacy of the investment plan and cost recovery strategy. References are provided throughout this document for additional information on specific issues.

Section 6 — Areas for Future Research describes several issues that are related to full cost recovery of water and sewage services where future research is required.

Readers should be aware that prior to release of this document, InfraGuide has already published several other best practice reports on topics related to full cost recovery.

Appendix A includes a brief description of related BPs. Those BPs can provide more extensive information on various topics, such as asset management, that are referred to in this best practice.

Appendix B provides a summary of a survey conducted by Environment Canada in 2001 on water use and pricing in Canadian municipalities.

Appendix C includes some discussion on financing and accounting issues that are relevant to full cost recovery for water and sewer systems.

Appendix D summarizes the policy statements issued by the Canadian Water and Wastewater Association and the American Water Works Association on full cost recovery.

Appendix E presents an example to illustrate how to set water and sewer rates to achieve full cost recovery.

1.4 Glossary

This section defines several terms that are relevant to full cost recovery for water and sewage services. There are several other financing and accounting terms that are also relevant and these are defined in Appendix C.

Asset Management — The combination of management, financial, economic, environmental, engineering, operational and other practices applied to assets with the objective of providing the required level of service in the most cost-effective manner.

Capital Charges — Water or sewage system levies by municipalities against new customers as a condition of development approval. They are contributions toward the cost of construction of capital facilities by the municipality to provide the capacity needed to service the customer.

Economic Efficiency — Implies using productive resources in a manner that achieves the greatest possible level of service at the least cost. In this context, "economic efficiency" refers to the efficient use of all productive resources including labour, capital investments, management, water and other resources. "Water efficiency" is a narrower term that places greater emphasis on the efficient use of the water resource.

Equity return — This is the amount that a utility is allowed to budget in order to compensate for its investment in providing capital facilities. It is calculated by multiplying an approved interest rate times a rate base. The rate base is the amount of capital invested by the utility in order to provide utility services and typically includes plant in service, less accumulated depreciation, less contributions in aid of construction plus working capital allowance.

Full Cost Pricing — Full cost pricing achieves full cost recovery primarily through the effective use of user rates and charges, without reliance on grants and/or general tax revenues.

Full Cost Recovery — Full cost recovery requires the generation of sufficient revenues through appropriate pricing of the services to cover the full cost of water and sewage services. These include operating, maintenance, administration (OM&A), research and development (R&D) expenditures, financial costs and capital investments in facilities (including depreciation, interest and equity return at a level sufficient to sustain the systems in perpetuity and achieve the mandated level of service as a minimum).

Life Cycle Costing — A process to determine the sum of all the costs associated with an asset or part thereof over its life cycle, including acquisition, installation, operation, maintenance, rehabilitation, replacement and eventual disposal costs. Life Cycle Costing is pivotal to the asset management process.

Marginal Cost (MC) — The cost incurred to expand system capacity in response to population growth, extending services into unserviced areas or increasing customer demands. Marginal cost is the incremental cost associated with the expansion. It can be measured either per unit of production (e.g., per cubic meter) or per customer depending upon the type of expansion under consideration. The incremental cost per unit of production is relevant when costing a general growth in average or maximum day demand associated with new or existing customers. This marginal cost is sometimes used in setting user rates. The incremental cost per customer is relevant when costing the extension of a distribution system (or collection system) to service new customers. Marginal cost includes both operating and maintenance costs as well as costs that must be incurred to meet growing demands for service. Depending on local circumstances, MC can be greater than or less than average cost.

Marginal Cost Pricing — A method of pricing for water and sewage services and setting the volumetric charge equal to the MC per unit of production, is called Marginal Cost Pricing.

In practice, MC pricing is usually used when the rate structure has a complex volumetric charge with a component of the volumetric charge designed to give high water users a greater incentive to conserve water, examples being seasonal and excess use volumetric rates.

Municipal Overhead Costs — Municipal overhead costs are indirect costs incurred to support water and sewer operations. These costs include, but are not limited to, a portion of total costs incurred for human resources, information technology, engineering, legal, accounting/finance, customer service, corporate services, regulatory compliance, executive compensation and governance.

Sustainable Services Delivery — Sustainable services delivery is the provision of water and sewage services to customers at a standard or level that meets customer needs, regulatory requirements and accepted industry standards and requires the generation and expenditure of sufficient funds to achieve this on an ongoing basis. Sustainability is defined as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs",* (World Commission on the Environment).

User Pay — Costs are recovered through user rates and charges that allocate costs to customers in proportion to the volume of water used (either measured or estimated) or the cost of the service provided. Sewage charges commonly use water consumption as a proxy for sewage volume in an effort to approach user pay. The cost of service accounts for volume used as well as other costs such as the cost of providing access to the service (i.e., the connection).

User Rate, Fee or Charge — *User rates* are regular charges to serviced customers to recover a utility's ongoing operational and capital costs. They are used to set the monthly bill. *Fees* are preset fixed charges for specific services to customers. *Charges* can also be levied for specific services based on the actual cost (time and material) of the work carried out by the utility.

Volumetric Rate — A user rate for water or sewage services that is based on the volume of water that the customer uses. The volumetric rate is the unit charge (e.g., cost per cubic meter).

2. Rationale

2.1 Background

2.1.1 The Aim of Full Cost Recovery

In the past, budgets were typically based on historical costs with inflationary and/or service level adjustments, and in some cases, refinements in regulations on drinking water quality and wastewater discharge quality. User rate decisions reflected a desire to keep rates low or in line with other municipalities. However, as systems age rising renewal costs are leading to inadequate reinvestment in capital renewal and inadequate cost recovery. The problem is worse where deferred maintenance has widened the gap between what should be spent and what is being spent. Rate increases can no longer be based on inflation if full costs are to be adequately financed.

The need to finance the replacement of water and wastewater infrastructure in the coming decades may challenge many utilities financially, particularly those that currently do not include an infrastructure renewal allowance in their rates. In some municipalities, the concurrent need to finance pipe replacement along with treatment plant upgrades will significantly increase the challenge.

More aggressive rate increases are also called for in light of increased competition for other funding sources, diminishing grants, increasing accountability and more stringent regulations (e.g., increased levels of water and wastewater treatment).

The aim of this best practice is therefore to provide the utility manager with an approach that can be used to determine full costs, develop an effective cost recovery strategy and demonstrate to decision makers the need to approve that strategy.

Several organizations conduct surveys of water and sewer rates periodically, including Environment Canada, National Water and Wastewater Benchmarking Initiative[3] and American Water Works Association (AWWA).

Appendix B includes a summary of the most recent survey conducted by Environment Canada on water use and pricing.

Both the Canadian Water and Wastewater Association (CWWA) and the American Water Works Association (AWWA) have issued policy statements providing strong support for full cost recovery. Appendix D includes a summary of their policy statements.

In a recent report to the Ontario Ministry of Public Infrastructure Renewal, the Water Strategy Expert Panel (Swain, H. et al., 2005), outlined the need for several reforms to the water sector to meet the challenges ahead, including:

"Systems must look to their customers for financial sustainability. Consumers should pay the full cost of the services they consume, which will require full metering. This will help to ensure that systems are not overbuilt, conservation is encouraged and nature is respected. With full cost recovery and improved economies of scale, most water systems in Ontario will be able to rely on the customer base to maintain and operate their assets over the long term. Only where systems are shown to be unsustainable should the Province provide subsidies, and in those cases it should act as a trustee of the assets until the system can be made sustainable."

The aim of this report is therefore to provide the utility manager with an approach that can be used to determine full costs, develop an effective cost recovery strategy and demonstrate to decision makers the need to approve that strategy.

3 A partnership of more than 35 Canadian cities and regional organizations developed and led by Earth Tech (Canada) Inc. with funding provided by the partner municipalities.

2.1.2 Legislative Requirements

In Canada, the Public Sector Accounting Board of the Canadian Institute of Chartered Accountants (CICA) establishes government accounting standards.[4] CICA promotes full accrual accounting for local governments on the basis that it provides better information on infrastructure costs.[5] Despite the efforts by CICA, the modified accrual system is still the norm for local government in Canada.[6]

Legislative requirements for full accrual accounting are slowly emerging in Canada, and lag advancements made in Australia and New Zealand in the early 1990's followed by the United States in 1999. The United States Governmental Accounting Standards Board (GASB) introduced Statement No. 34, referred to as GASB 34, in that year. Under GASB 34, government entities are required to use full accrual accounting. Capital assets must be recorded at their original cost and depreciated or, alternatively, governments must establish and account for asset maintenance and replacement requirements. The traditional depreciation approach is a financial calculation. The alternative approach under GASB 34 introduces asset management and requires more information since it uses condition assessments to project expenditure needs.

The accounting system alone does not guarantee financial sustainability. Rather, financial sustainability, along with consumer protection, is an objective of regulatory bodies that oversee water and sewage rates. In Canada, direct or indirect regulation of rates is practiced in Alberta, Manitoba, Nova Scotia[7], Prince Edward Island and Saskatchewan. Under direct regulation, municipalities apply for a rate adjustment. Following public hearings, the regulatory board makes a final decision on the rate adjustment. With indirect regulation, rates and financial performance are reviewed annually and financial sustainability is promoted. None of these provinces currently address asset management in the regulatory process but in some cases there is approval of borrowing (Saskatchewan) and capital budgets (Prince Edward Island).

In 2002, Ontario passed the Sustainable Water and Sewage Systems Act (Bill 175) which requires assessments of full costs including an asset management plan for water and sewage systems and the development of a cost recovery plan. Regulations under this act are pending at the time of production of this document.

There are a number of accounting and financial issues which are not directly part of full cost recovery, but can have a significant impact on its presentation and planning of cost recovery. Appendix C includes a brief discussion of some of these issues.

2.2 Benefits

The primary purpose of a full cost recovery plan is that it will ensure that water and sewage systems are adequately financed for sustainability over the long term.

The following list summarizes some of the main benefits of identifying full costs and implementing a full cost recovery plan for water and sewage systems:

- Represents a sound business practice;
- Ensures sustainability of the water and sewage services;
- Improves knowledge of the urgency of investments and allows budget components to be effectively prioritized and financed;

4. *<http://www.cica.ca/index.cfm/ci_id/225/la_id/1.htm>*. Accessed May 12, 2005.
5. Canadian Institute of Chartered Accountants, 2002. *Accounting for Infrastructure in the Public Sector*, Toronto.
6. Full accrual accounting system versus modified accrual (cash needs) approach: these are different methods of recording capital costs in the statement of income and expenses. The full accrual system reports depreciation, interest costs and a return on equity as costs. The modified accrual approach reports capital expenditures in the year financed using current revenues, current revenues set aside for future capital costs, interest costs and debt principal repayments. If consistent principles for approving revenue requirements are used, the results of the two methods may be similar.
7. Nova Scotia does not regulate sewage rates.

- Provides a technically defensible financing plan (i.e., the municipality can demonstrate accountability to its customers);
- Helps municipal councils, utility commissions or utility regulators evaluate budget and rate requests in a more informed manner and to develop long term financial plans;
- Can be used to promote water efficiency;
- Facilitates rate stability by reducing the risk of sudden large increases or decreases in water and sewage rates;
- Facilitates "buy-in" from customers for proposed rate increases;
- Provides notice to high use customers of future rate increases, thus supporting economic stability for the community;
- Enables more accurate comparisons (e.g., benchmarking) between municipalities;
- Extends the life of assets since managers can better balance maintenance costs against capital replacement;
- Reduces the risk of non-compliance with regulations (i.e., the municipality can demonstrate due-diligence); and
- Helps to maintain (or improve) service levels (e.g., public health and safety) and demonstrate sound fiscal management, well-planned systems and a vision for the future.

2.3 Risks

The following list summarizes some of the risks of not using the best practices outlined herein:

- A steady degradation of system infrastructure resulting in a gradual reduction in service levels;
- Reduced ability to attract new industry due to declining service levels;
- An increase in emergency repairs;
- Increased risk of environmental damage;
- An increase in exposure to liabilities (e.g., fire, health, safety, water quality);
- Increased risk to public health;
- A widening gap between full costs and current expenditures leading to "rate shock" in order to address deficiencies and reach required investment levels;
- Difficulty maintaining compliance with regulations;
- Potentially higher insurance costs;
- The identification of system needs and establishing a long term rate plan, reduces the risk of water and sewer revenues being diverted to subsidize other municipal programs;
- Difficulty obtaining approvals and funding for upgrades or expansions if the municipality cannot demonstrate that its financial plan includes full cost recovery;
- Loss of a "desirable livable" community image and resulting impact on economic growth;
- Potential for subsidization from the general tax revenue stream;
- A lower credit rating and higher lending costs; and
- Compromised management of the water and sewage services leading to low staff moral and difficulty in recruiting and retaining qualified staff.

3. Work Description

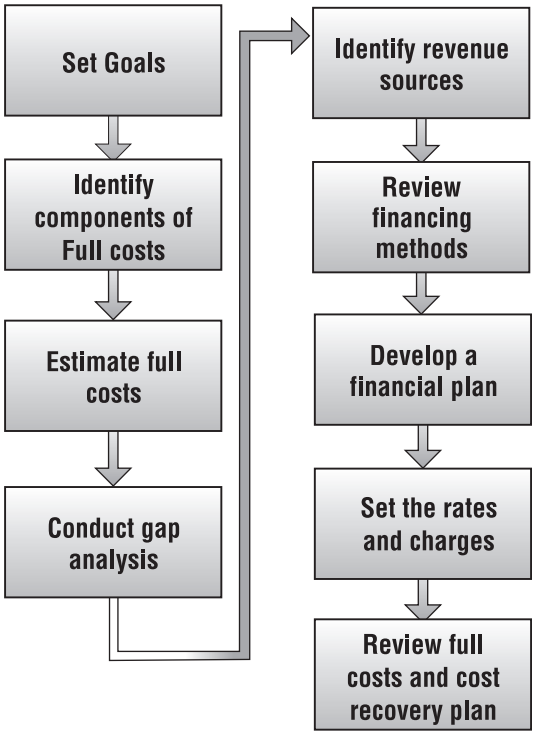
This section is divided into a brief listing of what should be done followed by a more detailed description of how to do the work.

3.1 What Should be Done

The following steps represent best practice in full cost recovery:

1. Set goals for what you want to include in a rate setting plan for achieving full cost recovery.
2. Identify components of full costs.
3. Estimate full costs (i.e., over the life of the assets to quantify long-term needs).
4. Conduct gap analysis (i.e., the financial gap between what is being spent and what should be spent).
5. Identify revenue sources and prioritize.
6. Review financing methods and prioritize sources of revenue.
7. Develop a financial plan.
8. Set the rates and charges.
9. Review full costs and the cost recovery plan annually.

Figure 3–1: Best practice steps to full cost recovery



3.2 How to Do the Work

3.2.1 Set Goals

Goals are set at a fairly high level and are basically a list of what is important to your municipality. Some will be widely accepted, while others may reflect the wishes of special interest groups and be more contentious. Some will be deemed more important (such as full cost recovery) while others are considered less so. Certain goals, such as "sustainable development", are widely acknowledged by most communities. The following is a list of commonly used goals:

Full cost recovery — Since full cost recovery may require a significant change in budget planning and investment levels for many systems, the implications of a decision to adopt or not adopt this goal needs to be fully understood. Municipalities should adopt the principles of full cost recovery.

Sustainable development — Accounting for environmental, social and economic sustainability consequences in decision making.

Water efficiency — Programs that promote efficient water usage may reduce operating costs and capital investment needs over time. Metering could be a high priority if this goal was selected.

Economic Efficiency — Investment Planning — Life Cycle Costing is a comprehensive approach to identifying the most economic combination of maintenance, rehabilitation and replacement strategies. Although detailed life cycle analysis can be data-intensive and technical, strategic level analysis can be done using simple techniques.

Equity — Equity is usually interpreted in terms of the user pay principle and requires customer charges to be proportionate to the cost burden associated with servicing each customer. Equity or fairness is an objective that is very important when customers are being asked to pay. It is strategically easier to defend increased charges if the costs are allocated based on equity. Equity can be achieved through the use of a "cost of service" study and the implementation of its results in rate setting.

Service Level — Consultation with customers on the range of services and service levels that can be achieved and the associated costs is an important step to include in a rate setting exercise. Customer service levels should be defined for such items as water pressure levels, fire protection, outage frequency (main breaks, etc.), and basement flooding, etc. In most cases, regulations and industry standards dictate the minimum level of service.

Timing — This relates to the time it will take to reach full-cost funding levels. The timing will be a function of available resources relative to the need. It also depends on the time required to complete steps that must be taken to achieve the goal, such as preparation of strategic plans, an asset inventory, condition assessments, etc. It will also be impacted by the magnitude of the infrastructure deficit (i.e., deferred capital).

Priorities — There may be specific issues that have reached the top of the priority list that has been established in an asset management plan. For example, cast iron main relining or replacement may be a high priority now for various reasons. A list of specific needs like this has a more direct bearing on investment needs and is often easier to comprehend. Legislative needs rank high as a priority.

The goals for each utility will reflect the local situation. For example other goals might be encouragement of economic development, affordability, risk management and fiscal responsibility by minimizing debt.

The goals can be refined as the program unfolds in a municipality. In light of high costs, limited time and resources, and competing interests and goals, compromises must invariably be made in the achievement of identified goals. For this reason, it is important to establish the priority of each goal so that the inevitable tradeoffs impose a minimum cost and risk on the community. Senior government often mandates key goals, such as those relating to health and safety, so that their adoption and achievement is required regardless of cost and effort. Municipalities should develop a public education program to provide a better understanding of the full costs for water and sewage services and their financial management.

Best Practice

Municipalities should adopt the principles of full cost recovery and user pay.

3.2.2 Identify Components of Full Costs

Costs should be grouped into consistent categories to facilitate the development of cohesive and defensible budgets that are readily explained on technical grounds. Broad cost categories include:

- Capital works — Capital costs can be divided into three sub-categories, each with different drivers:
  - Expansion — Provides infrastructure for new customers or increased demand by existing customers. These costs can be divided into major works of general benefit, such as treatment and trunk mains, and local works benefiting local or individual customers, such as local mains and services. Works built by the utility need to be planned and budgeted. Works built by a developer need to be identified and paid for by the developer. Capital charges are often used to finance growth related capital works. These can be project specific charges such as a local improvement charge in the case of smaller works or more widely applied charges such as the development charge for larger works. The scope for capital charges may be constrained by provincial and territorial

legislation such as the Development Charges Act, 1997 in Ontario.

- Upgrades — These are improvements to meet regulatory requirements or to improve the standard of service. The provinces and territories mandate potable water and sewage effluent quality requirements. Investments to achieve mandated quality standards may be difficult to anticipate and plan for in a full cost recovery plan. A best-in-class utility would generally be monitoring regulatory trends in both Canada and the United States and providing service that is better than minimum standards. Costs for upgrades are normally financed with the user rates.
- Rehabilitation and replacement —This relates to work done on existing facilities. Rehabilitation is a major repair, which improves the condition and value of an asset and sustains the service life of the asset. Replacement is a complete rebuild to new condition. Rehabilitation and replacement are the subject of InfraGuide's Decision Making and Investment Planning best practice: *Managing Infrastructure Assets*.

■ Operations, Maintenance and Administration (OM&A) — OM&A is a general heading that covers a number of diverse recurrent costs related to operating, maintaining and administering utilities including related costs such as for source protection and research. Generally, this expenditure includes the staffing, annual operational contracts, material and equipment costs (including vehicle costs) for the day-to-day operation of the system as well as the cost of consumables to operate the system such as energy and chemical costs. The cost of managing biosolids and disposal of residuals from water treatment plants is significant. Training and certification costs are also important and are often mandated to meet regulatory requirements.

Maintenance costs include the labour, materials and equipment needed to undertake small repairs and minor capital improvements needed to sustain the system, achieve the quality standards determined through legislative requirements and to meet service levels expected by customers.

In some cases, OM&A costs can include an allowance for research and development (R&D)[8]. R&D costs can be defined as any project or activity to resolve scientific or technological uncertainty aimed at achieving an advance in science or technology. Advances include improved treatment processes, enhanced economic assessments of rehabilitation versus replacement, improved workflow processes, improved data regarding site-specific water source quality impacts, etc. R&D costs could also include memberships in associations such as American Water Works Association Research Foundation (AwwaRF) and Water Environment Research Foundation (WERF).

OM&A costs may also include municipal overhead where utilities are under the jurisdiction of a larger organization, typically a municipality. An appropriate and fair share of the administrative costs of the municipality should be passed on to the utility as they support the operation of the water and sewage systems.

It may also include charges levied on a municipality by senior government in conjunction with the use of a water resource (e.g., one-time administrative fees related to permitting and approval procedures).

■ Financial — These are expenditures related to the acquisition of short-term and long-term debt and carrying charges such as interest expense. Acquisition fees may include legal fees, brokerage fees and premium costs depending upon the type of debt instrument selected. The municipality may also pay interest expenses on such items as security deposits and developer

8. In some municipalities, R&D projects are funded from the capital budget.

Rehabilitation is a major repair, which improves the condition and value of an asset and sustains the service life of the asset. Replacement is a complete rebuild to new condition. Rehabilitation and replacement are the subject of InfraGuide's Decision Making and Investment Planning best practice: Managing Infrastructure Assets.

deposits. The municipality must also consider the cost of debt repayment and ensure that the rates are designed to allow sufficient cash flow to service both the interest and debt repayment obligations.

Best Practice

Municipalities should identify full costs for water and sewage services over the life cycle including: operating, maintenance and administration costs; municipal overhead costs allocated to water and sewage systems; direct source protection costs; capital costs to upgrade, expand, rehabilitate and replace infrastructure; and the financing costs. Large municipalities should employ activity based costing as an excellent technique to achieve full cost identification and measurement.

It is important to recognize that OM&A costs will grow as systems age and expand to service future growth. The impact on future OM&A costs should be included in the analyses of options and costed for every major capital works project.

3.2.3 Estimate Full Costs

Capital works

This step is at the heart of full cost recovery. The cost of capital works can represent well over half of total system costs. Historically, municipalities have not adequately accounted for the costing of capital works and this has given rise to many of the problems now facing the industry.

The capital works-costing task that requires the most effort is the development of an asset management plan for infrastructure maintenance, rehabilitation and replacement. This plan is then used to develop annual and/or other timing of costs.

There are two distinct categories of cost having different life spans and approaches:

- Facilities — Treatment plants, pumping stations, and storage facilities — These are visible and tend to have mechanical, electrical and architectural components with a short lifespan (i.e., typically less than 50 years). The structures themselves can have longer life spans if properly maintained.
- Linear Infrastructure — Mains, valves, hydrants, service connections, sewers and manholes that tend to be buried, have a relatively long service life (i.e., at least 50 years). Typically, these linear assets represent more than half of the total value of water and sewage assets.

Major investments in facilities are generally required only when they are upgraded or expanded and therefore, they can be accounted for individually. Linear assets generally require annual and ongoing investment needs.

The components of a detailed "bottom up" asset management plan include:

- An inventory of assets
- Asset valuation including replacement values
- Condition assessment
- Remaining service life
- Capacity analysis (e.g., hydraulic capacity)
- Delineation of level of service expectations
- Identification of current and projected needs
- Life cycle costing
- Risk assessment
- Financial assessment

An asset management plan requires the initial acquisition of data followed by ongoing asset monitoring and assessment, data management and analysis. Depending upon the adequacy of historical spending, the asset management plan will potentially identify a backlog of work referred to as "deferred capital" which may require prioritizing over the initial years of the asset management plan. A significant increase in investment may be needed in the early years of a plan to address the deferred capital needs. Funding levels to sustain the systems in a state of good repair may be somewhat lower than the initial investment needed to correct the work backlog. The asset management plan should be reviewed periodically in order to monitor the work backlog and refine the estimates of projected costs.

The costing of capital works for upgrades and growth usually entails a master plan study.[9]

9. The discussion of master and capital planning is based on *Strategic Alternatives*, M. Fortin, Enid Slack Consulting Inc., and Mike Loudon, 2002. *Financing Water Infrastructure*, Commissioned Paper 16, The Walkerton Inquiry, Toronto.

The scheduling of such studies will depend on the rate of growth of demands for service (including community growth as well the expansion of services into unserviced areas). These studies establish municipal infrastructure development objectives over a period of 20 years or longer and determine capital needs for growth or upgrades based on an evaluation of alternative investment options. Options are evaluated using criteria such as total or life cycle cost[10], impact on user fees, risk, environmental impacts, and affordability.

On the other hand, a full cost recovery plan is also important for those municipalities, which are projected to experience a decline in population since the revenue base will decrease.

Recommendations for capital works emanating from asset management plans and master plans are refined in annual capital plans. These identify specific capital works over a five to ten year planning period and provide the basis for annual budgets and financing plans. Since the capital plan governs tendering, contracting and construction activity over the coming year, the first year of the capital plan must be very detailed. Later years may only identify larger projects individually with lump sum expenditure amounts to cover smaller investments.

Capital plans should be revised annually. Master plans should be revised every 5–10 years depending on local circumstances.

OM&A

Traditionally, existing OM&A expenditures are forecast ahead for the coming budget year based on average costs experienced over the past few years. Systems that have activity based costing provide a more detailed costing breakdown that can be used to forecast future OM&A costs. Adjustments are made for expected inflation and for known changes such as negotiated wage and salary increases. In addition, provision is normally made for contingencies such as emergency repairs and there may also be a provision for a surplus to be transferred to reserves.

It is important to recognize that OM&A costs will grow as systems age and expand to service future growth. The impact on future OM&A costs should be included in the analyses of options and costed for every major capital works project.

It should also be noted that annual OM&A costs for both water and wastewater systems can be influenced by weather. Therefore, it is important for municipalities to project the OM&A costs for both a "wet year" and a "dry year" in order to account for the potential range of costs in the plan for full cost recovery.

Where the objective is full cost recovery, existing OM&A expenditures may need further adjustment using best management practices to achieve a sustainable and efficient system. For example, life cycle costing may affect decisions regarding the best level of asset maintenance or the optimal expenditure on a water efficiency program or the commissioning of a new water treatment plant.

OM&A costs cover a number of different activities including system operations and maintenance, planning, monitoring, employee training, customer billing and collecting, public relations, water efficiency programming, and so on. For planning and forecasting purposes, it is sometimes desirable to further categorize these costs by function. For example, OM&A costs for water efficiency programs need to be itemized separately in a water efficiency planning exercise.

Best Practice

Municipalities should:

- Use an asset management system including a complete infrastructure inventory and valuation; detailed condition assessments; and repair, replacement, and refurbishment plans.

Municipalities should use an asset management system including a complete infrastructure inventory and valuation; detailed condition assessments; and repair, replacement, and refurbishment plans.

10. Measured as the net present value of life-cycle costs.

- Develop a 20 to 50 year master plan for major infrastructure. Review and update the plan every 5–10 years.
- Maintain a five to ten year capital plan identifying the cost and schedule of all projects within the first 5 years and all major projects over the full period. Update this plan every year.
- Minimize life cycle costs of capital investments through full cost accounting.
- Develop an annual OM&A budget based on detailed planning and analysis of projected costs for the next fiscal year.

3.2.4 Gap Analysis

A gap analysis quantifies the difference between expenditure targets and projected expenditure levels. It is usually done on an annual basis and can be completed separately for capital and OM&A. Estimated full costs are the target expenditure level. The comparison can be made with existing expenditure levels or escalated expenditure levels, in which case the number of years required to reach sustainable levels can be determined. Alternatively, a municipality could identify a desired timeframe to achieve sustainability and then determine the required annual expenditure increase to reach a full cost recovery level over time. For those municipalities that are projected to experience a decline in population, the gap analysis should account for the potential decrease in the revenue base.

Best Practice
Municipalities should conduct a gap analysis to quantify the difference between expenditure targets and existing expenditure levels.

3.2.5 Identify Revenue Sources and Prioritize

There are several possible revenue sources. Table 3–1 lists the most common revenue sources.

Table 3–1: Common Revenue Sources

Method	Description	Costs Recovered	Comment
User rates	Used to calculate regular charges to customers for the water and sewage services	Most OM&A plus capital costs for upgrades, replacements and refurbishment and growth costs not recovered by capital charges. Normally used to recover the shortfall in revenue after all other revenue sources have been applied.	User pay
Bulk rates (same as wholesale rates for two-tier systems)	Used to charge individual customers for drawing water from a bulk water depot or discharging bulk septic waste at a disposal site	Similar to user rates with adjustments made for special bulk service costs and cost savings. A mark-up may be charged to users outside the municipality who have not paid for past investments to establish the system. Bulk rates are sometimes related to the utility retail rates, but are more commonly based on a separate calculation.	Bulk rates are normally associated with service provided to unserviced individuals or to smaller rural communities by an adjacent municipality.
Capital charges	Development charges, frontage and connection, local improvement	System and/or site specific capital costs of providing works for growth or to service previously unserviced areas	User pay related to system expansion built by utility
Provision by subdivider	Construction and provision of works for growth by sub-divider	Cost paid by subdivider and works or assets contributed to the utility	User pay by new customers for local works
Property taxes	Charges in proportion to property assessment	A common source of revenue to cover water system fire protection costs as well as storm and sewage system costs.	Based on property value—not user pay. When used as a flat rate water charge, it does not promote conservation, full cost recovery, equity or economic efficiency.

The selection of revenue sources in a cost recovery plan will depend on the appropriateness of each type of charge, the scope for generating revenues with each, and provincial and territorial legislation.

The appropriateness of each type of charge is based on the intended function of the charge with respect to cost recovery as well as the local full cost recovery goals discussed in Section 3.2.1. For example, user rates are normally used to recover the bulk of OM&A and capital costs except perhaps those for growth.

The choice of local objectives is an important factor in choosing and structuring the cost recovery plan. In addition to objectives identified in Section 3.2.1, objectives applied specifically to the evaluation of revenue sources include:

- Fairness and equity (over space and time).
- Legality of the charge
- Simplicity, customer comprehension of the charge
- Ease of implementation

Provincial and territorial legislation is a crucial factor. Not all methods are allowed in every province and territory. For example, a full range of capital charges is not enabled in all provinces.

Fire Protection Costs

An area of disagreement concerns the best method of recovering water system fire protection costs. Most urban water systems are designed to provide fire protection and this makes them more expensive to build, operate and maintain. Those who support the use of the property tax to recover the costs cite the relationship between property value and fire protection benefit. Better fire protection lowers insurance costs, and the savings on insurance premiums outweigh the costs of fire protection.

Table 3–1: Common Revenue Sources (cont'd)

Method	Description	Costs Recovered	Comment
Miscellaneous fees and charges	Many variations, e.g., service on/off fees and meter re-read fees	These recover the costs of specific occasional services	Minor revenue source based on user pay
Interest revenue	Interest earned on investments	Recovers the financial opportunity cost of accumulated surpluses	Not related to user pay
Fire protection charge	Sometimes a separate rate or charge, but more commonly included in user rates or property taxes	Sometimes used by municipalities to contribute towards water system costs related to fire protection.	Fire protection charges based on property assessment comes closest to a user pay charge.
Wholesale rate	A bulk rate for water piped to (or sewage received from) a lower tier municipal customer in a two tier organization.	Covers the costs for the wholesale service provider including: water—source of supply, treatment, transmission; sewer—transmission, treatment, effluent disposal, sludge management	In a two-tier system, the terms bulk rates and wholesale rates are used interchangeably to describe sales to municipal customers within the upper tier service area.
Miscellaneous	Sale of biosolids, energy from waste or other assets	Depends on local circumstances.	Minor revenue source
Extra-strength sewer use charge	Formula-based charge for extra strength sewage	Recovers the added cost of treating extra strength sewage	User pay—usually only for treatable contaminants (e.g., biological oxygen demand, solids)
Grants and subsidies	From senior levels of government	Varies: to assist in achieving servicing standards, job creation, affordability	Not user pay, an inconsistent source and should not be relied upon. In the past, grants have reduced the incentive for good planning and asset management.

Others feel that some sort of fixed charge on the water bill is better since it keeps all water costs on the same bill, and does not burden property taxes. Generally, the charge is a recovery of costs for the supply and installation of hydrants and capacity in other works as well as a charge to recover the estimated cost of water use for fire protection. It would not be practical to charge by the amount of water that is actually used for fire protection. Ideally, fire protection costs should be included in the water bill in order to reduce the possibility of diverting revenues for other purposes.

User rates provide the greatest scope for generating revenues. Capital charges and contributions by developers can also be very important revenue sources for growing systems.

Many municipalities do not separate out fire protection costs, but simply recover them through the user rates. Fire protection costs are both indirect and direct. The indirect costs can be calculated by multiplying the total OM&A and financial costs by a percentage derived from taking the extra capacity designed in the water infrastructure for fire fighting purposes divided by the total system capacity. This analysis should be done separately for distribution, storage and treatment. Direct costs are those such as the operation and maintenance of hydrants.

In all municipalities, individual metering for all water services is recommended. Even if this is not possible in smaller municipalities, at a minimum all non-residential customers should be metered.

Best Practice
Municipalities should identify revenue sources with due consideration of the appropriateness of each type of charge, the scope for generating revenues with each, and provincial or territorial legislation.

Fire protection costs should be based on property value and be reported to customers as an information item on the water bill.

In all municipalities, individual metering for all water services is recommended. Even if this is not possible in smaller municipalities, at a minimum all non-residential customers should be metered. It is important to have a regular meter calibration in place. For meters larger than 50 mm regular calibration checks should be carried out approximately annually, but will vary with meter size, revenue implications and local conditions. Metering is a *best practice* and the subject of the InfraGuide best practice entitled: *Establishing a Metering Plan to Account for Water Use and Loss*.

3.2.6 Review Financing Methods

Basically there are four approaches to capital financing:

- Reserve — A *reserve* is a fund established by setting aside current revenues from user rates or other charges. Reserves serve two general purposes: they are used for rate stabilization to cushion against annual revenue fluctuations and they are used for capital finance (e.g., the repayment of a debenture due in the future or the financing of a future capital investment). A completely separate, or "dedicated" reserve is usual when contributions to the reserve come from capital charges.[11]

  Funds from *dedicated reserves* can only be used to finance the capital costs for which the charges are levied. In the case of reserves established using other revenue sources, primarily user rates, a municipality may set up separate rate stabilization reserves and capital reserve or it may use a single multi-purpose reserve. Current renewal needs should be addressed first to achieve a sustainable level of investment. Then based on multi-year capital planning, annual reserve funding contribution levels should be set and re-evaluated annually to address future needs. Excessive reserve fund accumulation may not be fair to current users and may be a tempting target when the financial resources of other municipal departments are under pressure.
- Capital from current funds — Current revenues used to finance current year capital expenditures. This method is popular with municipalities because it minimizes debt load. The advantages include reduced interest costs, greater accountability of those making the financing decision, and preservation of debt capacity for other projects with less funding available. This approach is generally not feasible for major capital projects. It also

11. A dedicated reserve is called a "reserve fund" in Ontario.

puts the burden of cost on the present generation when the benefits may end up serving future generations.

- Debt — This method is popular with municipalities since it spreads the cost over a period of several years so that costs are not borne entirely by the current users. It is particularly useful for large projects such as treatment plants where capital from current funds would be insufficient. Some provinces have provincial funding authorities, which facilitate borrowing at competitive rates.
- Private sector financing (Public Private Partnerships) — A private sector partner provides up-front financing usually in conjunction with the provision of capital works construction services and at times contractual operating services. The financing component of such partnerships may take the form of a lease, which is a type of debt, or it can be a financial contribution as equity in exchange for an ownership stake in the utility. This is a special case, which has only been used to a limited degree in Canada.
- Other — For some municipalities, development charges and fees for service can be significant sources of revenue.

There is no one preferred choice of financing instrument. Experience indicates that most municipalities prefer to minimize debt, whereas independently operated utilities are more accepting of debt financing. Reasons for this include regulatory requirements and a better match of cash requirements with cash flows under the full accrual accounting system that utilities often use and which is recommended by CICA to be used as noted in Section 2.1.2.

Best Practice

Municipalities should review financing methods with due consideration for short-term and long-term needs.

3.2.7 Develop a Financial Plan

A financial plan should be developed. The purpose of this plan is to show full costs, how the costs are financed and how they are to be recovered. There is a logical sequence of establishing target sustainable service levels, comparing with revenue generation scenarios, assessing financing options and looking at customer impact. A financial spreadsheet model allows analysis of various options at which time any of the elements might be revisited. The final step usually combines actual detailed rates for the upcoming period along with detailed capital and current budgets for the same period as well as five-year capital forecasts for planning purposes.

Annual operating budgets include OM&A costs as well as capital costs recovered in that year (i.e., capital from current). There are usually separate capital budgets which show each capital project and its funding. The way in which the capital budget is reflected in the annual operating budget varies depending on accounting and financing methods.

Cost should be presented in sufficient detail to indicate their purpose and their link to full cost recovery. For example, if cast iron mains are a problem, and special programs are needed for their accelerated replacement or rehabilitation, then those costs should be reported separately.

In certain circumstances, there may be a need to create a special charge to finance a specific large or needed project. This can happen when new treatment plants or pumping stations are needed or when a large amount of pipes need to be replaced over a short period of time.

The costs need to be reported in a manner allowing their matching against financing and cost recovery methods. For example, costs related to growth should be identified separately when they are recovered using capital charges.

Best Practice

The best practice for development of a financial plan includes:

- Develop financing plans for infrastructure investment using capital reserves, capital funding from current revenues and debt in a combination that assures adequate funding while achieving a reasonable degree of rate stability and an equitable allocation of costs to current and future users.
- Develop a cost recovery plan giving primary emphasis to the user rates. Use capital

Municipalities should review financing methods with due consideration for short-term and long-term needs.

charges and various other fees and charges as appropriate given local conditions and regulations. The cost of implementing and maintaining a fee or charge should be commensurate with revenues obtained.

- Establish segregated operating funds to ensure that water and sewage revenues are spent only on the water and sewage systems.
- Establish dedicated reserve funds to ensure that water and sewage revenues set aside to finance capital investments are spent only as intended.

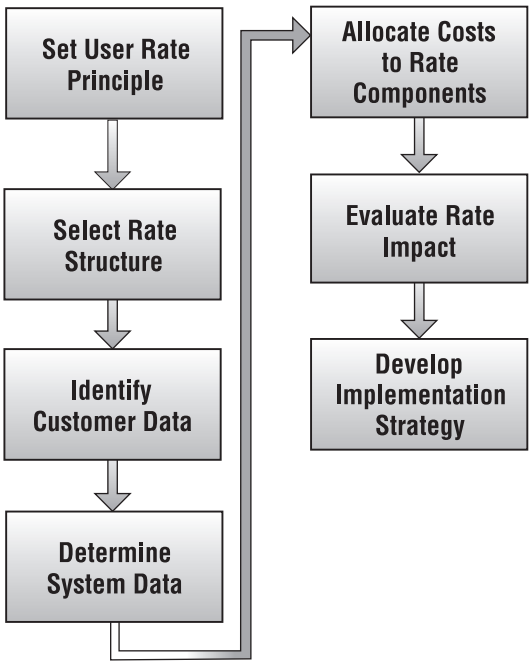
3.2.8 Set the Rates and Charges

A full rate study is conducted when a municipality wishes to review and evaluate its current practice with respect to its user rates. The rate study normally includes an evaluation of the structure of the user rate, recommendations for changes to the structure, a detailed assessment of costs and a calculation of charge levels with the new rate structure. At times, the rate study also considers various other charges or these may be the subject of special purpose studies.

A number of manuals have been published to provide guidance in rate studies, including:

- *Principles of Water Rates, Fees and Charges*, AWWA M1, 5th edition, 2000.
- *Water Utility Capital Financing*, AWWA Manual M29, second edition, 1998.
- *Developing Rates for Small Systems*, AWWA Manual M54, first edition, 2004.
- *Avoiding Rate Shock: Making the Case for Water Rates*, American Water Works Association (Water Utility Council), April 2004.
- Canadian Water and Wastewater Association (CWWA), October 1994. *Municipal Water and Wastewater Rate Manual—A New Approach to Rate Setting*, Rawson Academy of Aquatic Science (2nd Edition).
- AWWA, first edition, 2005. *Water Conservation/Oriented Rates—Strategies to Extend Supply, Promote Equity and Meet Minimum Fire Flow Levels*.

Figure 3–2: Steps for conducting a typical rate study



Conduct a Rate Study

A typical rate study involves the following steps:

1) Set User Rate Principles — It is important that the user rate principles are set in advance since they are the basis on which the rates are formulated. In addition, it is easier to gain acceptance of new rates from regulators and the public if the principles are defensible and supportable. Possible principles include:

- Fairness and Equity — Rates should be structured so that customer charges based on the rates match the cost of service as closely as possible.
- User pay — Charges are based on metered usage for individual customers or estimated usage for a class of unmetered customers.
- Conservation — This is generally considered to be a worthy objective since it promotes economic efficiency. The structure of the rates may focus on particular demand management issues, such as seasonal rates (reduce summer peaks) and increasing block rates (target high users).

Table 3–2: Customer Rates and Formats

Rate Type	Description	Comment
Unmetered Customer Rates		
Flat Rate	For unmetered customers, different approaches include charges based on ratios related to standard residential units, or charges based on metrics such as lot area, number of rooms or number of water fixtures. In partially metered communities, charges can be based on the usage of metered customers of the same class.	There are several different approaches, but their fairness is questionable since the basis of the rates may not correspond to actual usage by individual customers. Unmetered customers should pay 10–15% more than the average charge for metered customers in the same class to account for their typically higher water use.
On tax bill	Costs are incorporated into the general tax levy and applied as a percentage increase to the property tax levy.	Not best practice because customer has no sense of the cost of a service, which would be better charged on a user pay basis. Based on the assumption that properties paying higher taxes can afford to pay a higher percentage of the cost for water and sewage services.
Metered Customer Rates		
One-part rates	Includes only a volumetric charge.	Typically used for wholesale water supply.
Two-part rates	For metered customers—includes fixed charge and a volumetric charge.	Recommended as best practice by the CWWA (1994).
Fixed charge formats		
Fixed charges	A charge per customer in each billing period, usually increasing by meter size.	Usually recovers billing and metering related costs. Sometimes also fire protection costs.
Unmetered fire line charge	A charge in each billing period to customers with fire lines, standpipe connections and sprinklers.	Recovers a portion of water system fire protection costs.
Volumetric Charge Formats		
Single block rate	One rate for all consumption	Simple calculation. Particularly suitable for medium to small systems.
Decreasing block rate	Rates decrease in steps as consumption increases	Charges low volume usage the highest rate. Applicable where large industry has a lower cost of service.
Increasing block rate	Rates increase in steps as consumption increases	Targets high volume users. Can be effective in reducing excess use.
Humpback rate	Rates first increase, then decrease in steps as consumption increases	Targets high volume users and then provides lower cost for high volume users.
Seasonal rate	Water rates increase in the peak demand season	A simple way of recovering the high cost of meeting peak demands and encouraging summer conservation
Excess use rate	Consumption in the peak demand season exceeding a threshold (e.g., a customer's winter use) is charged at a higher rate	The billing process requires complete, relatively frequent (at least bimonthly) meter readings. Effective way to charge for excess summer use costs.
Time of use rate	Usage during specific periods is charged at higher rates	Requires time-of-use meters. Useful for electricity because (with very limited exceptions) generation capacity must meet demand at all times, electricity cannot be stored, as can water. Some types of electricity production are suitable for continuous/non-variable loads, while other types are better suited to varying and peak demands. However, for both electricity and water supply, production capacity as well as distribution conduits must be sized to anticipate peak demand. This concept is only emerging.

Table 3–2: Customer Rates and Formats (cont'd)

Rate Type	Description	Comment
Volumetric Charge Formats (cont'd)		
Minimum bill	Charge may include a minimum volume provided at no additional cost. The volumetric charge only kicks in when that volume is exceeded.	Meant to protect utility revenues and contribute towards fixed costs. The minimum bill volume should not be too high since it works against the benefits of metering.
Sewage and Storm System Charges		
Sewage rate	Either a separate rate structure using water consumption as a proxy for sewage discharge or a percentage surcharge on the water bill. Sometimes the sewage charge is fully integrated with the water charge as a single charge.	This is the closest practical method of achieving user pay for sewage. A separate sewage rate is considered best practice since it can better reflect sewage costs and can be related to the sewage system by customers. Sewage metering or process water metering may be installed where the process uses result in significant non-sanitary flows (e.g., cooling water losses) or high strength sewage charges are billed under sewer use by-laws.
Storm sewer rate	A separate charge included on the water bill for storm sewer costs. This charge may also be established based on the impervious area or based on the land use designation for the property (e.g., commercial, industrial, residential).	Not yet common and not connected to water or sewage charge parameters. Often based on lot-area.[13] A flat rate could be applied to cover the cost for storm drainage on public lands. Considerable knowledge is needed concerning the surface conditions to establish a rate based on impervious area. Furthermore, site conditions change with time and consequently, this method of calculation for a storm charge requires frequent updating to keep the database current.

- Legal / Defensible — The user rates must be legal and defensible. Legal restrictions are not normally imposed on the structure of user rates.
- Simple, understandable, transparent — These are worthwhile principles when it comes to customer understanding of bills.
- Stability — The development of a long-range financial plan will improve rate stability by allowing a planned, progressive, transition from current rates to full-cost rates.
- Affordability — This is actually more of a political and social issue and can affect funding choice. Trying to keep rates low is likely to conflict with full cost recovery. However, the choice of metered rate format can enhance affordability for some customers[12].

2) Select Rate Structure — The selection of a rate structure will depend on local preferences and principles. Table 3–2 lists most of the options currently in use.

3) Identify Customer Data — Customer data is needed for the rate calculations. The data requirements depend on the chosen rate format. Typical data requirements include:

- Number of customers by category including number of flat rate customers by class or category (e.g., single family residential dwelling, apartment units, banks, restaurants, etc.) or metered customers by meter size.
- Historical consumption by customer class or by component of the volumetric rate (i.e., by block in a block rate structure).

Sampling techniques may be used effectively to obtain this data and they save time and cost. But further analysis of billing records may be needed to get enough reliable information when data issues arise including incomplete billing records and undetected meter reading errors. If the block volumes are changing over time, then an evaluation of detailed customer records may be needed.

12. Refer to "Social Issues in the Provision and Pricing of Water Services" published by the Organization for Economic Cooperation and Development (DECD).

13. See *User-Fee-Funded Stormwater Utilities,* Task Force on User-Fee-Funded Stormwater Utilities, Water Environment Federation, 1994.

Customer data must be projected for the rate "test year" (i.e., the year for which rates are being calculated). Since rates are being projected normally for one year, recent historical trends should be sufficient for the number of customers. For consumption, adjustments for seasonality may be needed. Often projections are made assuming the worst financial case (e.g., a wet summer or reduced usage by industry). This has the advantage of reducing revenue risk, and generating surpluses that can go into reserves.

It is advantageous to have billing programs generate customer data summaries at the time of billing with data broken down into categories suitable for billing calculations, such as by rate block. This facilitates the analysis of consumption patterns.

4) Determine System Data — Some rate calculation methods that breakdown costs in terms of costs to supply average demands (i.e., base costs) and costs to supply peak demands (i.e., extra costs) require system design criteria as part of the cost allocation process. This information is needed prior to the allocation of costs to rate components.

5) Allocate Costs to Rate Components — Several methods of rate calculation have been developed by the water industry. All of these methods calculate two-part rates. Best practice does not require any particular method or an established method. The details of the method are somewhat technical and not necessarily of interest to the layperson. The methods include:

- Base-Extra Capacity — Costs of service are subdivided into four categories, namely: base costs, extra capacity costs, customer costs, and fire protection costs. Base costs are those related to average usage conditions. Extra capacity costs relate to providing for peak demands such as maximum day and maximum hour. Customer costs relate to billing, collecting, metering and customer service. Fire protection costs are those related to providing extra capacity in the water system on standby to fight fires. This method needs detailed water system design criteria.
- Commodity-Demand Method — Costs of service are subdivided into commodity costs, demand costs, customer costs, and fire protection costs. Commodity costs are those that vary with quantity produced such as power and chemicals. Demand costs represent the other system costs allocated in relation to peak use criteria. Customer and fire protection costs are the same as the base-extra capacity method.
- CWWA Method[14] — This method uses "test year" costs for setting rate revenue requirement, but considers future capital program needs to provide some measure of marginal costs in the setting of volumetric rates. This often results in low volumetric rates, so the rate model allows manual intervention to artificially increase the volumetric rate and decrease the fixed charge.
- Small Utility Rates and Finances (SURF) — The AWWA recently published a spreadsheet application that is designed to assist small drinking water systems in developing budgets, setting user rates and tracking expenses. The model calculates a two-part rate with a fixed monthly meter charge and a single block volumetric charge. Costs include budgeted operating and maintenance costs and contributions to reserves for capital replacements. Worksheets in the model are provided for budget tracking.
- Customized — Most of the structured rate calculation approaches are not set up to cover all of the alternative rate approaches. Therefore, the majority of rate calculations will have to be partly or totally carried out using a custom approach.

  What is required is a solid set of principles and a logical approach that can be defended. Small systems in particular, need only adopt a simple approach to rates, likely a single volumetric rate with fixed charges variable by meter size.

  Revenue certainty is always a concern. As mentioned previously, a fixed charge or minimum bill approach provides some revenue certainty. But if too large a

14. *Municipal Waterand Wastewater Rate Manual,* CWWA, January 1993.

Public and employee education is a very important component of the overall strategy. This can be accomplished through Town Hall meetings, newspaper advertisements, bill inserts, press releases, notification of individual customers and training for customer service and field staff.

proportion of the total bill is fixed, the advantages of the volumetric portion in encouraging careful water use is diminished and efficient water users are penalized with a higher average cost per unit of water. It would be better to have a rate stabilization reserve fund built up to accommodate annual revenue fluctuations than to increase the fixed revenue component.

Detailed analysis of rate format is only needed intermittently, perhaps every 5 to 10 years. However, the unit rate should be reviewed more frequently. Many do it annually, although some stretch it to the term of council, which could be 2 to 3 years, with rate increases approved for that period.

6) Rate Impact — Several types of impacts of rate proposals can be useful:

- Customer Impact — Impacts compared to existing charges are typically calculated for typical residential customers as well as selected non-residential customers. This is important because customers may ask what the new rates mean to them. If the rates for any customers are significantly increased, they should be identified. Industrial customers prefer to know in advance the impact on their rates so that the costs can be factored into their annual budget preparation.
- Compare With Other Municipalities — This type of comparison is not desirable if it is used to show how much lower rates are in your community. But it often is useful in showing trends, or to prompt the preparation of explanations as to why the charges are different.
- Compare With Commercially Available Product — The amount of water used by customers for drinking and cooking is typically less than three percent of total water consumption per household. Comparing the price of bottled water to potable water delivered by the municipality provides a stark contrast in the affordability and reasonableness of tap water prices.
- Compare With Other Utilities — Traditionally, this has been advantageous since total water and sewage charges often are lower than any other utility (e.g., electricity, telephone, natural gas, cable television).
- Affordability for Low Income Customers — This has not often been done in the past, but may become a factor if water and sewage rates increase more rapidly than inflation.

7) Develop Implementation Strategy — An implementation strategy is especially needed when dramatic changes to water rates and charges are required. In some cases, significant increases in rates can result in a short-term reduction in water usage that, in turn, can result in a revenue shortfall. This could include phasing in of rate changes to mitigate customer impact. The implementation strategy should include a communication plan that addresses why rates are increasing and how the funds will be used to upgrade, rehabilitate and replace aging infrastructure; to improve service levels; to increase the reliability of systems; to sustain/promote economic growth; and to maintain or enhance health and safety. Public and employee education is a very important component of the overall strategy. This can be accomplished through Town Hall meetings, newspaper advertisements, bill inserts, press releases, notification of individual customers and training for customer service and field staff. Ideally, water and sewage rate schedules should be available on the municipality's web site together with some background on the basis for the rates.

A by-law must be passed each year to set the annual rates or in some cases, the by-law can set the rates for a prescribed period (e.g., over the term of Council). In the case of utilities, the Board of Directors must approve rates. In some provinces, approval is required from a Provincial Board.

Best Practice

In larger municipalities, a two-part tariff with a fixed meter charge and a volumetric charge should normally be applied. Volumetric rate can vary from a single block volumetric charge (often all that is needed) to more complex rate structures which can be selected as appropriate to help achieve local objectives concerning, for instance, the equitable allocation of costs among customers or demand management.

In smaller municipalities, a simple two-part tariff with a fixed meter charge and a single block volumetric charge is appropriate. More complex rate structures should not be needed unless there are difficult issues concerning, for instance, conservation priorities, a complex mix of customers or difficult planning problems.

If a flat rate is used for un-metered customers in a partially metered system, the flat rate charge should reflect the higher demand that is typical of un-metered customers. Flat rate customers typically use 20–30% more water than a metered customer and should be charged accordingly (typically 10–15% more).

The fixed portion of the user rate should be used to recover customer related costs such as for metering, billing and collecting as well as water system fire protection costs. Other fixed costs can also be recovered from the fixed charge but total cost recovery with this charge should be modest relative to the volumetric charge. If water efficiency is a high priority for the municipality, fixed charges should not exceed 15% of user rate revenues. However, if water sales are highly variable due to varying weather conditions or if a municipality faces high fixed costs for debt servicing, a fixed charge greater than 15% will reduce financial risk.

Revenues should be projected for average usage (e.g., average trend over the past five years) and have a rate stabilization reserve fund that can absorb a "bad" year (i.e., wet year) deficit.

For larger municipalities, the sewage charge should be based on a specific rate structure for sewage customers based on water consumption. Adjustments for non-sanitary water usage can be considered for qualifying non-residential customers.

For smaller municipalities, the sewage charge based on a straight percentage surcharge on the water charge is often sufficient as an alternative to a specific sewage rate structure. A separate charge is recommended—it may be tied to the volume of water consumed, but it should not be related to the amount of dollars charged.

3.2.9 Review Full Costs and Cost Recovery Plan Annually

Although a full cost recovery plan should cover multiple years in order to reach sustainable investment levels, it also forms part of the annual budgeting process. Thus it should be updated annually so that the annual budget can be on track to achieve full cost recovery. Some provinces require that the rate and calculation be published annually as part of the municipality's five-year financial plan.

Best Practice

The user rate and other fees and charges should be reviewed annually and adjusted as needed so that they will generate enough revenue to maintain sustainable investment levels.

Special studies should be conducted periodically to design rates and charges, determine costs to be recovered by these and establish procedures to set their levels. Customers should be consulted in such studies and fully informed in advance of any change introduced as a result of such studies.

4. Applications and Limitations

4.1 Applications

Section 3 provided a general overview of procedures and practices relating to full cost recovery. These best practices should be tailored to suit local conditions. For instance, the following list summarizes some of the factors that will influence the application of these best practices:

- Municipalities that are fully metered have more opportunity to implement equitable rates and promote water efficiency than municipalities that are not fully metered.
- Municipalities with a relatively old system and/or a limited raw water supply and/or delivery capabilities should implement these best practices as quickly as possible.
- Municipalities with a declining revenue base should implement these best practices as quickly as possible since the rates will have to be increased to cover both the decreasing water consumption and the increasing maintenance and renewal costs as the systems age.
- The operating authorities in two tier water and sewage systems should work together to ensure that wholesale and retail rates both reflect the full cost of the water and sewage systems.
- Municipalities with a significant percentage of seasonal dwellings should utilize these best practices to ensure that all customers pay a fair share of the fixed costs and peaking costs even if no water is used.

Appendix E presents a simple example to illustrate how to set water and sewer rates to achieve full cost recovery.

4.2 Limitations

It should be noted that this best practice should not be construed as a "license" to increase water and sewer rates. Municipalities should have a "system" in place to ensure that revenues are sufficient and spent efficiently.

Fundamental to the success of a long-term plan is a record of accurate, up to date information on the physical assets of each individual water system. Extra resources may be required to compile an inventory, implement an inspection and testing program and optimize the maintenance and replacement programs. Small municipalities in particular may be challenged to develop a full cost recovery plan due to lack of data, tools, resources and a standard approach. For smaller municipalities, or those challenged by detailed inventory and condition assessment, a method for planning based on asset class and overall condition (top-down approach) may be a means to initiate replacement and reserve funding. Although a qualitative method it could be an interim step to a full planning mechanism.

Full cost recovery may result in high rates for some small municipalities since small municipalities typically do not have the same economies of scale as larger municipalities.

Further, the full cost accounting approach prompts the municipality to consider the complete life cycle of the asset when setting rates. Most rate setting has not accounted for the full cost analysis. In doing so, rates may increase to reflect the full cost analysis.

In the past, many small municipalities were dependent upon funding from senior levels of government to construct major components of their water and sewage systems. In some cases, small municipalities are still dependent upon senior levels of government to provide funding for renewal of these systems particularly if a cost recovery plan was not put in place before the municipality incurs these renewal costs.

Full cost analysis will ensure all water use is accounted for. Municipal departments and special interest groups who might in the past have received water free of charge will be reported on as part of the full cost for

Further, the full cost accounting approach prompts the municipality to consider the complete life cycle of the asset when setting rates. Most rate setting has not accounted for the full cost analysis. In doing so, rates may increase to reflect the full cost analysis.

operating the water and sewage systems. A management decision can be made on how to account for such non-revenue customers (i.e., flooding rinks, cleaning sewers).

This document is not intended to be a detailed manual that can be used to calculate water and sewer rates. It references several excellent manuals that provide a more detailed description of the process that should be used to set rates and in most cases, this should be directed by an experienced professional.

5. Evaluation

Each year, a municipality should compare its progress against its goals in terms of closing the gap between what should be spent and what is actually being spent. The needs (and priorities) should be reviewed periodically as more information is collected on the condition of the systems. The adequacy of the investment in renewal can be evaluated in terms of several performance measures such as: the number of water main breaks, sewer blockages, customer complaints, adverse water quality events, regulatory inspection deficiencies, as well as the volume of non-revenue water, and the volume or frequency of sewer overflows.

In addition, the municipality should monitor their capital budget on an annual basis to ensure that it is sufficient and that adequate resources are available to administer the spending.

6. Areas for Future Research

6.1 Research Needs

Currently, there are various agencies that conduct water and sewage rate surveys in Canada (e.g., CWWA, AWWA, Environment Canada). Ideally, one comprehensive database should be developed and maintained for water and sewage rates across Canada. This database should be kept current.

Further research is required to update the best practice for deriving fire protection charges. The cost for fire protection includes the cost related to fire hydrants and larger water supply and distribution systems. The design of new systems and expansion of existing systems should account for state-of-the-art fire fighting equipment and techniques as well as new building construction standards.

Further research is also required to determine the most equitable means to cover the costs for separation of combined sewers.

Source water protection is part of a multiple barrier approach to ensure that the water supply is clean and safe. This approach can include both operating and capital costs. Although some municipalities have already developed source water protection plans, the source of revenues to implement these plans is not consistent. Further research is required on appropriate approaches to allocate associated costs.

The recovery of costs related to damage to the right of way due to emergency or other excavation activities is an emerging issue. These costs typically include a cut permit fee plus a degradation fee based on area and age of the surface.

The best practice for establishing storm sewer charges should be developed. The Water Environment Federation has published a manual entitled: *User-Fee-Funded Stormwater Utilities* (1994) that outlines the advantages of a self-financing stormwater utility.

The need for standard accounting practices should be assessed in order to facilitate benchmarking of operations.

Although AWWA has carried out research on the social costs associated with water main breaks, further research is needed on the societal costs associated with overall water and sewerage system reliability. This would allow managers to quantify and assess all costs associated with providing a reliable service when making infrastructure decisions.

Appendix A: Relevant InfraGuide Best practices

The following paragraphs provide an overview of several other best practice reports prepared by InfraGuide that are relevant to this best practice: *Water and Sewer Rates: Full Cost Recovery*.

Developing a Water Distribution System Renewal Plan, 2003 — This document outlines two complementary approaches for the development of a water distribution system renewal plan. The top-down approach is used for strategic planning of policies and programs whereas the bottom-up approach is used for short-term capital planning of projects. Both approaches utilize a common framework although they differ in terms of the level of detail. Examples are provided to illustrate the application of both approaches. A renewal plan is a key component of an asset management plan.

Investment Parameters for Municipal Infrastructure, 2003 — This document describes four practices that can be used to achieve adequate levels of investment in municipal infrastructure. These methods include: infrastructure asset report model; high-level parameters; detailed level parameters; and improved communication.

Planning and Defining Municipal Infrastructure Needs, 2003 — This document presents five practices to assist with planning and defining municipal infrastructure needs, namely: strategic planning; information management; building public support and acceptance; exploring new and innovative methods for continuous improvement; and prioritization models.

An Integrated Approach to Assessment and Evaluation of Municipal Road, Sewer and Water Networks, 2003 — This document outlines the need for integrated renewal planning of municipal road, sewer, and water systems at a network level. This report describes a five-step procedure for assessment and evaluation of municipal infrastructure, including: inventory, investigation, condition assessment, performance evaluation and renewal planning.

Establishing a Metering Plan to Account for Water Use and Loss, 2003 — This document provides a roadmap for water utilities in planning, implementing, operating, and managing a metering plan to account for use and loss in the water distribution system.

Demand Management, 2004 — This document provides senior municipal officials with guidance on the concepts behind demand management, current best practices, and information needs and tools for initiating and implementing demand management programs.

Alternative Funding Mechanisms, 2003 — This document describes eight methods for developing funding sources to meet infrastructure needs, including: special levies; development fees; utility models; sponsorships; innovative transportation revenues and incentives; government service partnerships; funding partnerships; and strategic budget allocations.

Dedicated Funding, 2004 — This document provides basic information about the various funding mechanisms for potable water, sewage, and storm water and road infrastructure. In particular, it describes the following funding mechanisms for potable water, sewage and storm water systems: utility or full-cost recovery models; property tax models; fee-for-service models; and other models such as local improvement charges, development charges and public-private partnerships.

Municipal Infrastructure Assets, 2004 — This document describes the key principles of asset management, including: asset value, life cycle management, long-term-affordability, risk management, performance measurement,

A. Relevant InfraGuide best practices

and integration of technical and financial plans. This document also describes a framework for an asset management plan as well as the implementation needs.

Wastewater Source Control, 2003 — This document describes several methods for controlling wastewater at its source, including sewage rates. Sewage rates can ensure full (or partial) cost recovery, promote a user-pay approach, ensure the fair allocation of treatment costs, reduce hydraulic and pollutant loadings, and encourage water efficiency.

Assessment and Evaluation of Storm and Wastewater Collection Systems, 2004 — This document presents a systematic and proactive approach for assessment and evaluation of storm and wastewater collection systems. The approach is based on five tasks, including: inventory, investigation, condition assessment, performance evaluation and rehabilitation/ replacement plan.

Best Practice for Utility-Based Data, 2003 — This document presents a foundation and guide for Canadian municipalities that wish to begin the process of identifying, storing and managing utility-based information and data.

Additional best practice reports related to this subject may also be available from the InfraGuide's Web site <*www.infraguide.ca*>.

Appendix B: Survey of water use and pricing in Canadian municipalities

This appendix summarizes the water pricing findings of a survey conducted by Environment Canada on 2001 water use and pricing in Canadian municipalities. The *Municipal Water Use and Pricing Survey* has been conducted once every two or three years by Environment Canada since 1983. The 2004 survey was in process during the development of this guide. It's the only national survey of its kind in Canada that collects information about water use, pricing, metering and water and wastewater systems by Canadian municipalities. For more information about the survey, please visit the Environment Canada web site at *<http://www.ec.gc.ca/water/mwws>*. Survey reports can be downloaded from *<http://www.ec.gc.ca/water/en/info/pubs/e_pubs.htm>.*

B.1 Water Demand

In 2001, average per capita residential water use fell to 335 litres per day (compare to 343 in 1999). Canadians still use twice as much water per capita as most other industrialized countries and in fact are the second highest users of water in the world (second to the Americans). According to the latest study, only 61% (from 56% in 1999) of Canadian residences that are served by municipal water systems are metered. This study notes that on average over the past decade, water use has been over 70% higher when consumers are billed a flat rate rather than a volume-based rate. Recent case studies in Canada have shown that metering alone could reduce water consumption by 10–38%[15].

This excessive use of water has resulted in the need to build larger water and wastewater systems than would otherwise be required. Consequently, the costs to construct, operate and maintain this infrastructure is high. On the other hand, only 50% of the cost to operate and maintain these systems is actually being met through user charges. Municipalities will not be able to sustain their water and wastewater systems without full-cost pricing and conservation-oriented pricing structures.

B.2 Water Meters

It was noted above that only 61% of Canadian residences are metered. It is also interesting to note that some provinces and territories are almost fully metered whereas others (e.g., British Columbia, Quebec, New Brunswick, Prince Edward Island and Newfoundland) have a small percentage of residences that are metered.

B.3 Water Rate Structures

Based on the 2001 survey, the percent of Canadian residents served by the various water rate structures is as follows:

Table B–1: Percent of Canadian residents served by type of water rate

Rate Structure	Percent of Residents
Flat rate	31.9%
Constant-unit	40.3%
Increasing block rate	19.5%
Declining block rate	7.5%
Complex	0.7%
Total	100.0%

Most of the residents in Newfoundland and Prince Edward Island are billed a flat rate whereas most of the residents in the Northwest Territories are billed a constant unit

15. Reynaud, A. and S. Renzetti, 2004. "Micro-economic Analysis of the Impact of Pricing Structures on Residential Water Demand in Canada," report commissioned by Environment Canada, Sustainable Water Use Branch.

charge. Most of the residents in Nova Scotia and Manitoba are billed using a declining block rate whereas; increasing block rates are mostly found in Ontario. The rest of the provinces and territories do not favour a particular rate structure. As expected, smaller municipalities tend to favour a flat rate structure.

B.4 Sewer Charges

In 2001, 87.4% (up from 78.5% in 1999) of Canadian residents that are served by municipal sewer systems are billed a sewer charge. For over one-third of the residents that are billed, the sewer charge is based on a flat rate and the sewer charge for the other two-thirds is based on a percentage of the water bill. The sewer charge averages approximately 38.0% of the water bill but exceeds 100% in some municipalities.

B.5 Average Residential Water and Sewer Prices in 2001

The following table summarizes the mean monthly residential water and sewer prices based on a water demand of 25 m^3. The following observations can be made:

—The 2001 survey results shows that average monthly price for water and sewer service was $33.18/month with water service accounting for 62% of the total bill and sewer service accounting for the other 38%;

—The total price for water and sewer service in Newfoundland and Quebec is significantly less than that for the other provinces and territories and this is primarily attributed to the low price for sewer service in these two provinces;

—The mean monthly price for water service in the Prairie Provinces and the territories is higher than the average;

—The mean monthly price for water service tends to decrease as the size of the municipality increases until the population reaches 500,000 and then the price increases. Conversely, the mean monthly price for sewer service tends to increase as the size of the municipality increases until the population reaches 500,000 and then the price decreases. The mean total price for water and sewer service does not vary significantly with the size of the municipality.

Table B–2: Average Residential Water and Sewer Prices ($/month) in 2001

Province	Mean Price for 25 m^3 Water Service	Mean Price for 25 m^3 Sewer Service	Total Price for 25 m^3
Newfoundland	$14.49	$4.69	$19.29
P.E.I.	$11.05	$15.93	$25.83
Nova Scotia	$19.03	$2.88	$23.73
New Brunswick	$23.13	$17.44	$41.02
Quebec	$10.34	$4.55	$17.84
Ontario	$21.98	$11.85	$34.52
Manitoba	$27.31	$21.50	$48.86
Saskatchewan	$19.68	$16.20	$35.83
Alberta	$25.95	$20.84	$46.71
British Columbia	$16.14	$10.60	$26.62
Yukon Territory	$30.85	$15.10	$45.67
Northwest Territories	$59.85	$16.16	$75.98
Nunavut	$106.51	$5.60	$106.46
Population Size Group (000's)			
Below 2	$21.47	$10.29	$31.58
2 to 5	$17.95	$10.03	$29.03
5 to 50	$17.68	$11.69	$29.31
50 to 500	$16.84	$12.93	$32.54
500+	$23.92	$12.24	$36.13
All municipalities	**$20.04**	**$12.26**	**$33.18**

Source: Values derived from the 2001 Municipal Water Pricing Database, Sustainable Water Use Branch, Environment Canada

Note: Total is not necessarily the sum of the mean price for water service and the mean price for sewer service since not all municipalities have sewer service.

Appendix C: Financing and Accounting Issues

This appendix describes several water rate terms and accounting terms as well as several financing and accounting issues which are relevant to full cost recovery.

C.1 Water Rates Terms

Capital Charge — A charge to new customers for their share of the cost of constructing capital works to service new developments or expansions into unserviced areas. Examples include development, frontage, connection, local improvement, and lot levy charges

Decreasing Block Rate —Volumetric rate structure with multiple rate levels that decrease in steps as a customer's usage within the billing period increases. The customer's bill always increases with more use but it increases at a diminishing rate as does the incentive to conserve.

Excess Use Rate — A volumetric rate which charges a high volumetric charge for usage in excess of a defined volumetric threshold within the billing period, for example summer usage in excess of the average winter use.

Fire Protection Charge — Charges levied to recover the capital and operating costs of providing excess distribution and storage capacity and hydrants in water systems for fire protection. Charges may be part of the property tax bill, separate charges on the water bill or the tax bill or imbedded in the normal user rates.

Fixed Charge — A regular fixed amount charged to a metered customer in each billing period. The fixed charge is one part of a *Two-Part Rate*. It often varies by meter size. Also referred to as a *Service Charge* or *Base Charge*.

Flat Rate — A regular fixed amount charged in each billing period to an unmetered customer, the flat charge being the total charge for the service.

Humpback Rate — A volumetric rate structure with a volumetric charge that initially increases like an increasing block rate as usage increases, but then decreases beyond a certain volume as in a decreasing block rate. There must be at least three blocks in this rate structure and the final block rate may be higher than, the same as or less than the initial block rate.

Increasing Block Rate — A volumetric rate structure with multiple rate levels that increase in steps as a customer's usage within the billing period increases. The customer's bill increases at an increasing rate with more use and can be used as an incentive to conserve.

Minimum Bill — The minimum amount a customer is required to pay in a billing period. It includes a specified minimum consumption allowance.

Seasonal Rate — A volumetric rate that is higher during the peak water demand season (same as excess use rate). This rate structure can be used to promote water efficiency.

Sewage Surcharge — A charge for sewage services (sanitary or combined sewer system) added to the water bill and tied to the metered volume of water used. The rate could be a straight percentage surcharge on the water bill, or based on a separate sewage rate schedule.

Single Block Rate — A volumetric rate structure with a single volumetric charge for all usage. Also known as a *Uniform Volumetric Charge*.

Storm System Charge — A user charge to recover costs for the storm sewer system. This charge is levied on property within the service area of a storm sewer system and can be a fixed charge, or a charge based on property size or its runoff generation characteristics (e.g., its impervious area).

Two-part Rate — Rate structure which uses a combination of a fixed charge and a volumetric charge.

Uniform Rate — The same rate structure is charged to a defined group of customers, for instance, a uniform rate is often imposed when systems with different rates are amalgamated.

C.2 Accounting Terms

Activity Based Cost Accounting — An approach to cost accounting that allocates costs to the products and services produced by the utility, examples of those products being connection to the water supply or sewer service, wastewater removal, and water supply during peak and off-peak demand seasons. The cost allocation is based on the way in which resources are consumed in the process of providing the product or service and reflects volume as well as other factors that cause costs to be incurred. Activity based cost accounting requires detailed cost reporting by both object and function. It is used for budgeting and cost control.

Modified Accrual Accounting — This approach to accounting is the same as a full accrual accounting system in all respects except the treatment of capital investments. Capital investment costs are reported in the financial statement of income and expenses as the repayment of principal on debt incurred to finance investments plus contributions made from current revenues to finance the cost of current year capital expenditures, and contributions made from current revenues to reserve funds set aside for future investments. The balance sheet does not report the value of capital investments. This system of accounting does not recognize depreciation as a cost. This method is commonly used by government and is also referred to as the *Cash Needs Approach* (see Full Accrual Accounting below).

Chart of Accounts — A list of ledger account names and associated numbers arranged in the order in which they normally appear in the financial statements.

Cost Classification by Object — Cost classification in the *Chart of Accounts* based on the type of good or service being purchased, for example labour, supplies, materials, fuel, utilities, etc. Often used to provide detail to costs summarized by Function.

Cost Classification by Function — Cost classification in the *Chart of Accounts* based on the purpose of the expenditure, for example treatment, transmission, distribution, storage, customer services, etc.

Depreciation — The cost associated with the use of an asset over its useful life due to wear and tear and obsolescence. Annual depreciation cost represents the cost associated with use of the assets over the year. In Canada, depreciation cost is based on the historic or original purchase cost of the asset. In certain other jurisdictions, the cost is adjusted for inflation. Depreciation cost is normally calculated using a simple rule such as straight-line depreciation (e.g., 1/20th per year over 20 years).

Fixed Assets — Assets of a long-term and permanent nature, which are required for the normal conduct of business and which are not expected to be converted into cash during the ensuing financial period. Examples are buildings, furniture, fixtures and land.

Full Accrual Accounting — A method of accounting that measures all transactions on an accrual basis, meaning that each transaction is recorded when it takes place and not when associated cash transfer occurs (for example, a cash payment may be made several months after a sale). Accrual accounting uses an annual depreciation charge to record the cost of capital investments in the financial statement of income and expenses. The balance sheet reports the original cost of investments, the total or accumulated depreciation and the net or depreciated value of the investments. This accounting method is used in the private sector and is being adopted for government use in many jurisdictions. The AWWA refers to this as the “simple accrual” or “utility method”.

Fund Accounting — A method of accounting and presenting financial information whereby assets, liabilities expenditures and revenues are grouped according to the purpose for which they are to be used such as water fund or sewage fund. Fund accounting is commonly used in government. This generally is supported by a by-law to provide a basis for the revenues collected in each fund.

Return on Rate Base — This is the cost of investments in fixed assets and includes the interest cost on debt plus a return on equity. The rate base is the portion of total assets that is used in the calculation of the return.

There are a number of technical and financial issues which are not directly part of full cost recovery, but can have an impact on its presentation and planning of cost recovery, including;

- Full accrual accounting system versus modified accrual (cash needs) approach — These are different methods of recording capital costs in the statement of income and expenses. The full accrual system reports depreciation, interest costs and a return on equity as costs. The modified accrual approach reports capital expenditures in the year financed using current revenues, current revenues set aside for future capital costs, interest costs and debt principal repayments. If consistent principles for approving revenue requirements are used, the results of the two methods may be similar.
- Fixed asset accounting — Fixed asset accounting provides a database of financial information on the cost and value of facilities. It is a component of full accrual accounting, but also useful in its own right since it provides valuable information that can be used in the management of fixed assets. Fixed asset inventory and valuation are important parts of asset management.
- Fund accounting — An accounting system commonly used by governments whereby all assets, liabilities, expenditures and revenues corresponding to distinct functions or activities of the government, such as water and sewage, are reported in individual segregated funds. Fund accounting is the best practice for water and sewage systems operated by departments within local governments. A key feature of this best practice is that revenues raised for water and sewage services should not be used for any other purpose. This type of accounting requires a rate by-law to be passed each year and ideally, the by-law should outline the types of work that will be financed by the revenue. In some provinces, law requires fund accounting, and it is unlawful to use statutory funds for purposes other than that for which they are intended.
- Depreciation and return on rate base — Depreciation is the cost of using assets in a full accrual accounting system. But the depreciation charge is not a cash cost like, for instance, OM&A costs. Revenue generated by the recovery of depreciation charges therefore, provides funds for payment of debt or investment in capital facilities. A depreciation charge is not allowed in a modified accrual accounting system, and it may therefore be more difficult to generate investment with this system of accounting.
- Financing (capital from current, debenturing, reserve funds) — Financing refers to the manner in which funds are generated to pay for capital investments. Financing is used to smooth out high annual variations in revenue requirements and is especially useful when there is a mismatch in timing of revenues to pay for investments and the investment expenditures.

  Debt is used to finance an investment when revenues are received after payment is made, the revenues being then used to service the debt. Debt spreads the investment cost out over a period of years following the investment and is considered by some to be the fairest way of allocating costs to those who benefit.

  Reserves are investment funds that are accumulated in advance of the investment expenditure. Financial prudence has motivated many to attempt to pay for capital costs from current revenues and to use reserves to build up funds in advance of need. This is best used for major investments, to lessen borrowing needs. Reserve funds should not be used to excess

since finances that could be used for current user needs are being set aside for future users. If a municipality already has an infrastructure deficit, it would not be practical to accumulate reserves and let the deficit grow. Furthermore, the wording used to establish the reserve fund must be carefully selected because it could constrain applying funds for future legitimate but unanticipated needs.

- Depreciation versus reserve funds for future capital — The term depreciation is incorrectly applied when it is used to quantify how much funding should be put aside for future capital replacement expenditures (see 'sinking fund'). In fact, depreciation is a charge against current revenues to recover the cost of assets that were created in the past. It spreads the cost of an asset over its expected service life. But the timing of the expenditures on those assets does not necessarily match the timing of the depreciation charge. For example, if the investment in an asset is financed entirely out of accumulated reserves, then the future depreciation charges for that asset will generate funds that can be applied to other expenditures. In particular, these funds, and other surplus revenues, can be accumulated in reserves to finance future investments. It is best practice to use the funds generated from depreciation charges on infrastructure investments to finance past, current or future infrastructure investments.
- Object code versus functional code — Accounting systems use numerical codes to classify expenditures. Costs are normally budgeted and recorded using object codes which classify them by type (e.g., labour, materials, supplies, equipment, etc.). The object code represents what is being purchased. Functional codes track expenditures by type of activity (e.g., source of supply, treatment, transmission, distribution, customer services in a water system). The so-called "functionalized" costs are useful in evaluations of system performance and also in setting user rates and charges. Asset management systems can go to the level of activity-based costing that managers should consider.
- Capital versus maintenance cost — A capital expenditure is any significant expenditure to acquire or improve land, buildings, engineering structures, machinery and equipment. It normally confers a benefit lasting beyond one year. An expenditure on an existing asset is a capital expenditure if it extends the life or increases the production capacity of that asset. An expenditure on an asset designed to maintain an asset in its intended state is a maintenance cost.
- Fixed versus variable costs — Fixed costs are costs that do not vary with volume of water used or sewage treated. They are associated with the management of fixed assets as well as administration and other overhead costs and must be paid regardless of the output. Variable costs change with output or volume. In the short run, less than a year, the main costs that are variable in water and sewage systems are energy costs for pumping and treatment process and the costs of treatment chemicals. These costs are often less than 10% of total costs. The cost of labour, materials and supplies, overheads, and so on are variable over a medium term of say one to five years.
- Economic efficiency — Economic efficiency can be achieved in both production and consumption. An efficient production process minimizes the overall costs of production including OM&A and capital costs. Best practices used to minimize cost include life cycle cost analysis and strategic infrastructure planning. Life cycle costing screens operations, maintenance and capital investment alternatives in order to achieve the least cost over the life of an asset. Economic efficiency in consumption occurs when customers are encouraged not to use high cost water in uses that yield little benefit. This calls for prices that reflect marginal cost and also requires customer education and promotion of water efficiency. The two types of efficiency are closely linked. In particular, promoting efficient water use can be a more economically efficient alternative than capacity expansion to service growth.

- Marginal costing — Marginal cost (MC) pricing is promoted by economists as a means of achieving more efficient water and sewage system operations. MC pricing sends pricing signals to users that promote demand management or pollution control. MC pricing can be used when customers are metered and pay a volumetric charge. In these cases, some components of the volumetric rate can be based on MC concepts. But marginal cost analysis is complex and is usually beyond the capacity of all but the most sophisticated utilities. Marginal cost pricing used alone does not guarantee full cost recovery. Moreover, MC pricing must usually be combined with other measures, such as education and promotion, to achieve demand management or pollution control objectives.
- Sinking fund — The cash set aside plus accumulated interest earned on that cash to meet a future obligation such as the scheduled payment of a debenture.

Appendix D: CWWA and AWWA Policy Statements

Both the Canadian Water and Wastewater Association (CWWA) and the American Water Works Association (AWWA) have issued policy statements providing strong support for full cost pricing.

D.1 CWWA

The CWWA asserts that *"adequate recovery of revenue requirements based on full cost pricing*" is a fundamental operating principle for water and sewage systems.

"This means that all water and wastewater system costs for operations and capital finance are fully recovered from user rates and charges. Full cost recovery requires that:

- *Funds of the operating authority are reported and managed separately from general municipal funds; surpluses remain with the authority and deficits are recovered from the authority's own revenue sources.*
- *A break-even operation prevails; a surplus or deficit in one year is offset in subsequent years.*
- *Reported water and wastewater costs include an allocated portion of general municipal costs for shared services such as administration, finance and engineering.*
- *All capital costs, including the initial investment outlay, the cost of financing that investment, and the costs of ongoing repairs and replacements, are recognised and recovered."*[16]

The CWWA supports:[17]

- Recovery of full costs through properly structured user charges;
- Inclusion of source water protection costs in recoverable costs;
- Rate setting based on long term planning and realistic capital costs;
- Achievement of the desired degree of water servicing at least cost;
- Cost recovery from customers in proportion to system usage; and
- Universal metering and volumetric user charges to control demand.

D.2 AWWA

The AWWA policy[18] relating to financing, accounting and rates states:

The American Water Works Association (AWWA) believes that the public can best be provided water service by self-sustained enterprises adequately financed with rates and charges based on sound accounting, engineering, financial, and economic principles.

To this end, AWWA recognizes the following principles that water utilities should establish. Implementation of these principles can be balanced against other policy objectives; however, no policies should be adopted that compromise the long-term financial integrity of water utilities or their ability to provide service to customers. Basic financing and rate principles include:

1. *Water utilities' revenues from water service charges, user rates, and capital charges (e.g., impact fees and system development charges) should be sufficient to enable utilities to provide for:*

- *annual operation and maintenance expenses;*

16. Policy Item 2.09, *Rate Setting for Water and Wastewater Services*, January 2000, CWWA Members' Briefing Book

17. Policy Item 1.30, *Rates and Full Cost Pricing*, March 2001, CWWA Members' Briefing Book.

18. <*http://www.awwa.org/about/oandc/officialdocs/AWWASTAT.cfm*>. Accessed April 7, 2005. *Statement of Policy On Public Water Supply Matters–Financing, Accounting and Rates*. Adopted by the Board of Directors Jan. 25, 1965, revised Jan. 31, 1982, reaffirmed Jan. 25, 1987, revised Jan. 26, 1992, and June 21, 1998, revised January 16, 2005.

D. CWWA and AWWA Policy Statements

- *capital costs (e.g., debt service and other capital outlays); and adequate working capital and required reserves.*

2. Wate*r utilities should account for and maintain their funds in separate accounts from other governmental or owning entity operations. Water utility funds should not be diverted to uses unrelated to water utility services. Reasonable taxes, payments in lieu of taxes, and/or payments for services rendered to the water utility by a local government or other divisions of the owning entity may be included in the water utility's revenue requirements after taking into account the contribution for fire protection and other services furnished by the utility to the local government or to other divisions of the owning entity.*

3. Water utilities should adopt a uniform system of accounts based on generally accepted accounting principles. Utility practices should generally follow the accounting procedures outlined in the water utility accounting textbook published by AWWA. Modifications may be made to satisfy the financial and management control reporting needs of the utility and to meet the requirements of legislative, judicial, or regulatory bodies.

4. Water rate schedules should be designed to distribute the cost of water service equitably among each type and class of service. Non-cost of service rate-setting practices may be appropriate in some situations, subject to legal review and approval, provided they reflect market conditions, the benefits received by the users of the service, and an appropriate balance of the goals and objectives essential to the public good. Any non-cost of service rate-setting practice implemented by a utility should be fully disclosed to its customers, regulators, and the financial community. Such disclosure should identify each non-cost of service rate-setting practice, its expected benefit, and its impact on the utility's customers.

5. Water utilities should maintain asset records that detail sufficient information to provide for the monitoring and management of the physical condition of infrastructure. These asset records should also support planned and preventive maintenance programs and budgets adequate to maintain the utility's assets at a level of service consistent with good utility practice. Utilities should annually provide comparative information to customers, the financial community, and the general public about the utility's sustained capability to provide water service and generate revenue levels necessary to protect the financial investment of others in the utility. Such information could include historical expenditures for renewal and replacement during each of the past several years, as well as the revenues that would be generated under planned and adopted rates to support renewal and replacement during each of the next several years.

Appendix E: Example to Illustrate How to Set Water and Wastewater Rates to Achieve Full Cost Recovery

This appendix provides an example to illustrate one approach to setting water and wastewater rates to achieve full cost recovery. This example follows the nine-step process outlined in Section 3 of this report.

This example is based on a small fictitious town with 3,000 single-family houses and 300 businesses (i.e., industrial, commercial and institutional). All customers are serviced by the municipal water and wastewater systems and the water consumption for each customer is metered. The average annual water demand has been relatively constant over the past five years (i.e., 4.0 ML/d or 1.46 million m^3/year) and there is very little non-revenue water (e.g., leakage). In addition, the monthly water demand remains fairly constant throughout the year.

1. Set Goals

The primary goals of this town are to achieve full cost recovery and user pay.

2. Identify Components of Full Costs

The Town reviewed the potential costs associated with the delivery of water and wastewater services and concluded the following:

- The water and wastewater rates and charges should be sufficient to cover the costs for operation, maintenance and administration (OM&A) of the systems as well as the capital costs for ongoing renewal at a sustainable level and upgrades to meet regulatory standards;
- Costs related to growth should be covered by capital charges levied against new development. In other words, the water and wastewater rates should not include any allowances for costs related to growth;
- The Town has new water and wastewater treatment facilities that currently meet all of the regulatory requirements and therefore, significant costs to upgrade these facilities is not anticipated in the short term; and
- The Town does not have any debt related to their water and wastewater systems and they do not intend to incur any further debt to finance the ongoing renewal of their systems.

3. Estimate Full Costs

Table E–1 summarizes the projected full costs for the water and wastewater services. The projected OM&A costs are based on historical costs and they include an allowance for projected increases due to inflation. The projected renewal costs are based on a detailed study that was recently conducted to develop a long-term program to sustain the water and wastewater infrastructure. This study included a detailed inventory, condition assessment and estimates of the remaining life for each component. The indicated capital cost is an average figure that will vary from year to year. It includes an allowance to be accumulated over time to finance larger projects.

Table E–1: Full Costs for Water and Wastewater Systems

Table E–1
Full Costs for Water and Wastewater Systems

Cost Component	Water	Wastewater
OM&A	$2.00 million	$2.00 million
Capital	$1.50 million	$1.50 million
Total Cost	$3.50 million	$3.50 million
Current Revenues	$3.15 million	$3.15 million
Revenue Shortfall	$0.35 million	$0.35 million

Table E–2
Calculation of fixed charges

4. Conduct Gap Analysis

Table E–1 also summarizes the current revenues from water and wastewater rates. It is apparent that there is a funding shortfall of $0.35 million for the water system and $0.35 million for the wastewater system. The Town has decided that the water and wastewater rates should be increased immediately to cover the full costs.

5. Identify Revenue Sources and Prioritize

The Town has decided that the full costs for the water and wastewater systems will be covered by user rates and the capital charges — property taxes will not be used. In this example, we have not attempted to quantify fire protection charges (or other miscellaneous costs) nor address how these costs should be recovered.

6. Review Financing Methods

The Town has decided that no debt should be incurred and current revenues should be used to finance current year expenditures. Current revenues will also be used to generate a surplus to be accumulated to finance future capital needs.

7. Develop a Financial Plan

The Town has decided to establish segregated accounts to ensure that water and wastewater revenues are only spent on the water and wastewater systems. These funds are further divided into operating (current) and capital components. The financial plan should move the Town from current expenditure levels to sustainable levels in a planned manner.

8. Set the Rates and Charges

a) Set User Rate Principles

The Town has decided that to ensure fairness the charges for water service should be based on metered water usage for each customer.

b) Select Rate Structure

The Town has decided that the water rate should be a two-part tariff with a fixed meter charge and a single block volumetric charge. The Town has also decided that the wastewater charge should be a percentage surcharge on the water bill. Since the total costs for the wastewater system are equal to the total costs for the water system (refer to Table E–1), the sewer rate should be 100% of the water rate.

c) Identify Customer Data

The Town has decided that the volumetric charge should be the same for all customers and that the fixed charge will vary according to the size of the meter. The Town has also decided that 15% of the costs should be recovered from the fixed charge. In this example, 15% of $3.5 million would be $0.525 million.

d) Determine System Data

For the sake of simplicity, the Town has decided that the water rates will be based on average water demands and therefore, those customers which have high peak demands and/or high fire flow requirements will not be expected to pay a premium.

e) Allocate Costs to Rate Components

Table E–2 summarizes the number of customers by the size of meter as well as the fixed charges in order to generate revenue of $0.525 million (i.e., 15% of the total water costs).

Table E–2 : Calculation of fixed charges

Meter Size	No. of Customers	Fixed Charge	Monthly Revenue	Annual Revenue
16 / 19 mm	3,200	$11.3366/month	$36,277	$0.435 million
25 mm	60	$27.68/month	$1,661	$0.020 million
50 mm	30	$110.71/month	$3,321	$0.040 million
75 mm	10	$249.10/month	$2,491	$0.030 million
Total	3,300		$43,750	$0.525 million

Note: for this example, the fixed charge is assumed to be proportional to the cross sectional area of the meter since the cross sectional area closely relates to capacity.

Table E–3: Typical Monthly Water Bill

Meter Size	Monthly Consumption	Fixed Charge	Volumetric Charge	Total Monthly Charge
16 / 19 mm	30 m^3	$11.34	$60.96	$72.30
25 mm	100 m^3	$27.68	$203.21	$230.89
50 mm	200 m^3	$110.71	$812.84	$923.55
75 mm	500 m^3	$249.10	$1,625.68	$1,874.78

Since the balance of the water costs will be covered by the volumetric rate, the unit cost will be $2.03/$m^3$ (i.e., $2.975 million / 1.46 million m^3).

f) Evaluate Rate Impact

The typical monthly water bill for each customer (by meter size) is presented in Table E–3.

Table E–4 summarizes the annual water revenue generated by customers according to meter size.

Since the Town has decided to add a surcharge of 100% to cover the full costs for the wastewater system, the total monthly bill for water and wastewater would be double the amounts indicated in Table E–3.

The Town should compare the proposed typical monthly bill for each customer category with that for previous years in order to confirm that the increase is reasonable. The average increase in water and wastewater rates will be 11% if the Town wishes to close the gap between the projected costs and the current revenues.

g) Develop Implementation Strategy

The Town has decided to develop a communication plan that addresses why rates are being increased. This plan includes a press release, a bill stuffer to notify customers of the change and a complaints desk to receive and respond to calls from customers.

9. Review Full Costs and Cost Recovery Plan Periodically

The financial plan will be reviewed and updated annually to ensure that sufficient revenues are generated to maintain sustainable investment levels. The review includes an annual review and forecast of OM&A costs at budget time. User rates could be set for longer periods as long as there is a comprehensive reliable financial plan. In any case, capital plans should be developed for 5 to 10 years so that a sustainable investment plan can be established and a warning of future rates established.

Disclaimer

This example is provided for illustration purposes only. The water and sewer rates generated in this example are not intended to be a standard that other municipalities should adopt. The process for determining adequate and equitable water and sewer rates will generally require a more detailed analysis than suggested in this example. Readers are encouraged to review other literature in order to obtain additional information on setting water and sewer rates.

Table E–4: Annual Water Revenue

Meter Size	Number of Customers	Fixed Charge	Volumetric Charge	Annual Revenue
16 / 19 mm	3,200	$0.435 million	$2.341 million	$2.776 million
25 mm	60	$0.020 million	$0.146 million	$0.166 million
50 mm	30	$0.040 million	$0.293 million	$0.332 million
75 mm	10	$0.030 million	$0.195 million	$0.225 million
Total	3,300	$0.525 million	$2.975 million	$3.500 million

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