

***MUNICIPAL INFRASTRUCTURE:
Organizational Structure, Financing
and Delivery of Service***

prepared for

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PURPOSE

The state of municipal infrastructure across Canada has been an ongoing debate. In the present fiscal environment of deficits, debt and balanced budgets, the expenditures and the administrative structures for the delivery of services are being questioned. The purpose of this report is to expand the debate by considering the relationships amongst the delivery systems, the administrative structures, the sources of funding, the levels of expenditures and the quality of selected municipal services. In reviewing these relationships, the report focuses on five metropolitan regions in Canada and highlights the various approaches to the financing and delivery of water, sewer and transit services.

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The authors also would like to acknowledge and thank the staff at the Institute of Urban Studies who helped in the research and preparation of this report and the many others in the five cities who were generous with their knowledge and time.

EXECUTIVE SUMMARY

Urban governments in Canada are facing complex issues of governance, finance and the delivery of services. Municipalities, traditionally the provider of property-based services, increasingly have taken on responsibility for a range of soft services, from recreation to social assistance, that place an additional burden on their financial resources. Yet municipalities continue to be the main provider of hard services such as the collection, treatment and disposal of sewage, the provision of potable water and the development and maintenance of the urban roads and streets.

The five urban areas chosen for this study, Victoria, Calgary, Winnipeg, Hamilton and Halifax are mid-sized metropolitan areas with different characteristics and methods of delivery of services. Victoria, as part of the Capital Regional District (CRD), and Halifax, as part of the Halifax Regional Municipality, have two-tier delivery systems with no consistency amongst municipalities on how various services are delivered. Both Winnipeg and Calgary are single-tier municipalities. But while Calgary has maintained the integrity of its regional influence through the annexation of areas of potential urban development on its periphery, Winnipeg has a number of smaller municipalities on its boundaries competing for urban growth. Hamilton-Wentworth is a regional government and has a well defined two-tier system of government with relatively clear divisions of responsibility.

The three services under review in this study, sewer, water and transit, were selected, partly on the basis of available information, and partly because of the nature of the services themselves. The administrative structures, the level of service delivered by the upper and lower tiers, the financial procedures, expenditure patterns and sources of revenue vary from city to city. All three are well defined services. Although the five cities do not deliver these services in the same way they do lend themselves to being delivered on a regional bases.

The funding for infrastructure has been constrained by the fiscal problems facing all levels of government. Growth in suburban and exurban areas places pressure on municipalities to expand municipal infrastructure to serve these areas. As a result the maintenance, repair and replacement of existing infrastructure often has to compete for resources. Within that context this report considers a number of issues including:

1. Is there a relationship amongst the delivery systems, the administrative structures, the source of funding, and the level and type of expenditure on cost and quality of services?

2. Are recent trends in expenditures on infrastructure affected by fiscal constraint programs?
3. What are the feasible approaches to service financing and delivery that will maintain and improve services without increasing property taxes?
4. Are the present financial pressures on municipalities forcing changes in the way services are delivered and financed?

The challenge facing local governments is twofold: to provide infrastructure at the lowest cost possible and to secure the resources to pay for it. Municipalities use a number of revenue sources to finance infrastructure: property taxes, provincial grants, user fees, development charges and borrowing. But cutbacks combined with rising demands for infrastructure improvements have forced municipalities to seek new and innovative ways to finance infrastructure. The present trend appears to be moving toward additional user fees, a greater role for the private sector and public-private partnerships.

At the same time local governments are becoming more oriented to customer service. This has created an imbalance in determining and ranking the condition of infrastructure. As more emphasis is placed on the consumer, measurements such as number of customer complaints and customer satisfaction may tend to carry more weight than do objective measures of effectiveness, efficiency or workload performed. The actual state of a city's infrastructure may be considered by some to be less politically important than its perceived state.

This, combined with the demand for public funds to build new infrastructure for new communities, has contributed to infrastructure decay. The practice of building new infrastructure rather than the efficient use or reconstruction of existing systems often is politically motivated. By catering to immediate needs and demands, municipalities may further compound the infrastructure decay problem by providing for the rehabilitation and replacement of visible infrastructure rather than underground infrastructure.

The profile of the five cities identifies some of the differences and similarities that exist among the cities. The complexities of the two-tier systems in Victoria and Halifax suggest that the municipal administrative and political organization do have an influence on how services are delivered. On the other hand Hamilton, although a two tier-system, has a more clearly defined division of responsibilities between the municipalities and the regional government, particularly when it comes to water, sewer and transit. Thus the delivery of these services in Hamilton is similar to that of

the two prairie cities included in the study. In many ways the single-tier structure of Winnipeg and Calgary allows for simpler administration and delivery of services. Control of expenditures and revenues are not complicated by split jurisdiction and both the monitoring and the political control of departmental or utility activities are more easily tracked. The extent to which this can be related to the quality of the service is made difficult by the shortage of common data and the lack of consistent performance measures.

While each city delivers its services in slightly different ways, the five cities do divide into two distinct groups. Calgary, Winnipeg and Hamilton deliver water and sewer services through an administrative structure that deals with the city as a single area. In contrast both Victoria and Halifax have structures that divide the responsibilities and services between regional and local authorities. This creates a complicated inter-relationship amongst neighbouring municipalities. In the case of transit the cities also are divided into the same two groups. Although all five cities operate the transit system as a single agency at the regional level, the systems are of different scales and Victoria and Halifax operate much smaller systems than Calgary, Winnipeg and Hamilton.

Of the municipalities studied, the delivery of sewer and water in the Victoria Capital Regional District (CRD) and the Halifax metropolitan area are the most complicated. Given the split jurisdictions, the number of municipalities and the lack of coordination in the delivery of the services, the gathering of data was difficult and there is little consistency in information between the municipalities in each region. While Halifax did have a metropolitan authority during the years of the study, its responsibilities were restricted to transit and solid waste. As such it had little influence on the delivery of sewer and water services.

It is the view of the authors that the trend towards the regional delivery of hard services such as sewer and water is likely to continue in Canada. Nor is this seen as necessarily a bad situation. Whether this will be done through a two-tier system as in Hamilton-Wentworth or through a single-tier government as in Calgary and Winnipeg is not the issue. Rather the issue is the need for metropolitan areas to deliver high quality services at reasonable costs. The nature of sewer, water and transit are such that they lend themselves well to regional coordination and delivery. While the main advantage identified in this report for the regional delivery of the three services is the simplification of the administrative and delivery structure, its importance should not be underestimated. It forces better accountability through more direct ties to the political process. It provides the opportunity for the utilities more easily to assess the condition of the regional infrastructure and to develop repair, replacement and maintenance schedules.

The questions raised in this report about the relationship between the condition of the infrastructure and the delivery of services are not easily answered. As urban areas expand, the delivery of transit, sewer and water services have expanded to accommodate the growth. There is evidence that transit, water and sewer systems are in need of additional funding. Municipalities are struggling with a financial environment where additional resources are unlikely. Without a comprehensive assessment of the condition of its infrastructure, a municipality is left with few options for making the case for increased funding for hard services. In the absence of such analysis, the alternative is the continued deterioration or even failure in the water or sewer system.

Les administrations urbaines du Canada font face à des questions complexes de régie, de finances et de prestation de services. Les municipalités, dispensatrices traditionnelles de services fonciers, ont assumé de plus en plus de responsabilités à l'égard d'une gamme d'équipements de service, allant des loisirs à l'aide sociale, qui grèvent davantage leurs ressources financières. Et pourtant, les municipalités continuent d'être le principal prestataire de services d'infrastructure associés entre autres au captage, au traitement et à l'élimination des eaux usées, à l'alimentation en eau potable et à la création et au maintien des rues et artères urbaines.

Les cinq régions urbaines retenues pour les fins de la présente étude, soit Victoria, Calgary, Winnipeg, Hamilton et Halifax, sont des régions métropolitaines de taille moyenne affichant différentes caractéristiques et méthodes de prestation de services. Victoria, qui fait partie du district régional de la capitale, et Halifax, de la municipalité régionale d'Halifax, possèdent des systèmes à deux niveaux de prestation, mais les municipalités ne partagent aucune uniformité quant à la diversité des services offerts. Winnipeg et Calgary ont toutes deux instauré un système à un seul niveau. Calgary a préservé la totalité de son influence régionale grâce à l'annexion de zones périphériques, mais Winnipeg dénombre un plus petit nombre de municipalités limitrophes se disputant la croissance urbaine. Hamilton-Wentworth constitue une municipalité régionale qui dispose d'un système à deux niveaux bien défini qui répartit assez clairement les champs de responsabilité.

Les trois services à l'étude, en l'occurrence les égouts, l'eau et le transport, ont été choisis d'une part, en fonction de l'information disponible et, d'autre part, en raison de la nature des services proprement dits. Les structures administratives, le niveau de service dispensé par les niveaux supérieur et inférieur, les mécanismes financiers, les profils des dépenses et les sources de revenus varient d'une ville à l'autre. Tous les trois constituent des services bien définis. Bien que les cinq villes n'assurent pas la prestation de ces services de la même façon, elles se prêtent à la prestation régionale des services.

Le financement des équipements d'infrastructure a été restreint par les problèmes financiers auxquels font face tous les paliers de gouvernement. La croissance des zones suburbaines et exurbaines pousse les municipalités à étendre leurs infrastructures pour les desservir. En conséquence, l'entretien, les réparations et le remplacement des infrastructures existantes doivent souvent se disputer les ressources. Dans ce contexte, le présent rapport envisage certaines questions :

1. Existe-t-il un rapport entre les modes de prestation, les structures administratives, la source de financement, et le niveau ou le type de dépenses liés au coût et à la qualité des services?
2. Les programmes de contraintes financières influent-ils sur les récentes tendances des dépenses en matière d'infrastructure?

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3. Quelles sont les façons possibles d'assurer le financement et la prestation des services susceptibles de maintenir et d'améliorer les services sans qu'il faille augmenter les taxes foncières?
4. Les pressions financières auxquelles sont actuellement soumises les municipalités motivent-elles des changements dans la façon d'assurer la prestation et le financement des services?

Le défi auquel font face les municipalités locales comporte deux volets : offrir les infrastructures au coût le plus bas possible et obtenir les ressources nécessaires à leur financement. Les municipalités tirent leurs revenus de différentes provenances dans le but de financer les infrastructures : les taxes foncières, les subventions gouvernementales, les frais imputés aux utilisateurs, les charges d'aménagement et les emprunts. Mais les réductions des dépenses jumelées à l'augmentation de la demande d'amélioration des infrastructures ont contraint les municipalités à trouver de nouvelles façons innovantes de financer les infrastructures. La tendance actuelle semble s'orienter vers l'imputation additionnelle de frais aux utilisateurs, l'élargissement du rôle du secteur privé et des partenariats publics-privés.

Par la même occasion, les municipalités s'orientent de plus en plus vers le service à la clientèle. Cette situation a créé un déséquilibre dans la façon de déterminer et d'évaluer l'état des infrastructures. Puisqu'on met davantage l'accent sur le consommateur, le nombre de plaintes de la part de consommateurs et le degré de satisfaction de la clientèle pourraient peser plus lourd dans la balance que les mesures objectives d'efficacité ou la charge de travail accomplie. D'aucuns pourraient considérer l'état réel des infrastructures d'une ville comme moins important sur le plan politique que leur état perçu.

Combinée à la demande que des fonds publics soient consacrés à l'aménagement d'infrastructures à l'intention de nouvelles collectivités, cette orientation a contribué à la dégradation des infrastructures. Le fait d'aménager de nouvelles infrastructures plutôt que d'utiliser avec efficacité ou de reconstruire les réseaux en place est souvent motivé par des raisons politiques. En satisfaisant à la demande et aux besoins immédiats, les municipalités risquent d'amplifier encore plus la dégradation des infrastructures en prévoyant la remise en état et le remplacement des infrastructures visibles au lieu des infrastructures souterraines.

Le profil des cinq villes permet de cerner certaines différences et similitudes parmi les villes. La complexité des systèmes à deux niveaux de Victoria et de Halifax indique que l'organisation administrative et politique des municipalités influe bel et bien sur le mode de prestation des services. Par contre, Hamilton, qui exploite un système à deux niveaux, jouit d'une répartition des responsabilités beaucoup mieux définie entre les municipalités et le gouvernement régional, particulièrement en ce qui concerne l'eau potable, les égouts et le transport. Par conséquent, la prestation de ces services à Hamilton ressemble à celle des deux villes des Prairies dont fait état la présente étude. De bien des façons, la structure à un seul niveau des villes de Winnipeg et de Calgary simplifie l'administration et la prestation des services. La répartition des responsabilités ne vient pas compliquer le contrôle des dépenses et des revenus, si bien qu'on peut mieux suivre la vérification et le contrôle politique des activités départementales ou des services publics. Il

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devient difficile d'établir à quel point cette situation est liée à la qualité du service en raison de la pénurie de données communes et du manque de mesures de performance cohérentes.

Bien que chaque ville assure la prestation de ses services selon des modes légèrement différents, les cinq villes se rangent en deux groupes distincts. Calgary, Winnipeg et Hamilton offrent les services d'eau potable et d'égouts par voie de structure administrative qui définit la ville comme une seule zone. Par contraste, les deux villes de Victoria et de Halifax disposent de structures qui répartissent les responsabilités et les services entre les autorités régionales et locales. Il s'ensuit des rapports compliqués entre les municipalités environnantes. Dans le cas du transport, les villes sont également divisées dans les deux mêmes groupes. Même si les cinq villes exploitent le système de transport comme s'il relevait d'un seul organisme régional, les systèmes se situent à des échelles différentes, sans compter que Victoria et Halifax exploitent des réseaux beaucoup plus petits que ceux de Calgary, Winnipeg et Hamilton.

Parmi les villes étudiées, la prestation des services d'eau potable et d'égouts au sein du district régional de la capitale Victoria et de la région métropolitaine de Halifax s'avèrent les plus compliqués. Vu la répartition des sphères de compétence, le nombre de municipalités et le manque de coordination dans la prestation des services, le rassemblement de données s'est révélé difficile et l'information témoigne de peu d'uniformité entre les municipalités de chacune des régions. Bien que Halifax ait été chapeautée par une municipalité régionale pendant les années de l'étude, ses responsabilités se limitaient aux domaines du transport et des déchets solides. À ce titre, elle exerçait peu d'influence sur la prestation des services d'alimentation en eau et d'évacuation des eaux usées.

Les auteurs estiment que la tendance vers la prestation régionale des équipements d'infrastructure portant notamment sur l'eau potable et les égouts risque probablement de se poursuivre au Canada, situation pas nécessairement vilaine. Que la prestation se fasse à deux niveaux comme dans le cas de Hamilton-Wentworth ou à un seul palier administratif comme à Calgary et Winnipeg importe peu. Il importe plutôt que les régions métropolitaines offrent des services de qualité élevée à des coûts raisonnables. De par leur nature, les services d'eau potable, d'égouts et de transport se prêtent bien à la prestation et à la coordination au palier régional. Bien que le principal avantage relevé dans le rapport concernant la prestation régionale des trois services réside dans la simplification de la structure de l'administration et de la prestation, son importance ne doit pas être sous-estimée. Elle oblige à une meilleure imputabilité grâce à des liens plus directs avec le pouvoir politique. Elle offre l'occasion aux services d'utilité publics d'évaluer plus facilement l'état des infrastructures régionales et à dresser des calendriers de réparation, de remplacement et d'entretien.

Il n'est pas facile de répondre aux questions soulevées dans le présent rapport à propos de la relation existant entre l'état des infrastructures et la prestation des services. À mesure que les zones urbaines prennent de l'expansion, la prestation de services de transport, d'alimentation en eau et d'évacuation des eaux usées épouse ce mouvement de croissance. Il semble que les services d'eau potable, d'égouts et de transport requièrent des fonds supplémentaires. Les municipalités doivent composer avec un environnement financier qui ne leur consentira vraisemblablement pas de ressources additionnelles. Sans une évaluation complète de l'état de ses infrastructures, une

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municipalité dispose de peu d'options d'établir le bien-fondé d'augmenter les fonds à l'égard des services d'infrastructure. En l'absence d'une telle analyse, le seul autre choix consiste à constater la poursuite de la détérioration ou même la défaillance du réseau d'eau ou d'égouts.

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INTRODUCTION

Urban governments in Canada are facing complex issues of governance, finance and the delivery of services. Municipalities, traditionally the provider of property-based services, increasingly have taken on responsibility for a range of soft services, from recreation to social assistance, that place an additional burden on their financial resources. Yet municipalities continue to be the main provider of hard services such as the collection, treatment and disposal of sewage, the provision of potable water and the development and maintenance of the urban roads and streets.

The state of municipal infrastructure across Canada has been an ongoing debate. In the early eighties the Canadian Federation of Municipalities undertook a study which concluded that \$15 billion was needed immediately to bring the infrastructure in Canadian cities up to an acceptable level. There may have been some dispute between the provinces and the municipalities over the size of the figure but there was no argument about the need to direct funding toward the improvement of deteriorating infrastructure in many of our cities.

In response to these needs, some provincial governments developed programs to aid municipalities in improving the condition of their infrastructure, but these were limited in both extent and dollars. The federal government did initiate a national infrastructure program to create employment and improve infrastructure quality. The program in most instances was directed towards improving the hard services in Canadian cities and it did introduce some new dollars for infrastructure. Both the funding and term of the program, however, were limited and deterioration of infrastructure remains a problem.

The funding for infrastructure has been further constrained by the fiscal problems facing all levels of government. Growth in suburban and exurban areas places pressure on municipalities to expand municipal infrastructure to serve these areas. As a result, the maintenance, repair and replacement of existing infrastructure often have to compete for resources. Within that context this report considers a number of issues including:

1. Is there a relationship amongst the delivery systems, the administrative structures, the source of funding, and the level and type of expenditure on cost and quality of services?
2. Are recent trends in expenditures on infrastructure affected by fiscal constraint programs?
3. What are the feasible approaches to service financing and delivery that will maintain and improve services without increasing property taxes?
4. Are the present financial pressures on municipalities forcing changes in the way services are delivered and financed?

In the research on infrastructure and the delivery of urban services, the emphasis in studies to date has been on the differences of the structural systems, both political and administrative, responsible for delivery rather than on the consequences of such systems. (O'Brien, 1993. Sanction, 1991.) Provincial governments have tended to use structural changes to respond to difficulties in the delivery of urban services but there has been very little work done on how the structural systems impact on the quantity and quality of services.

This report, in reviewing the organizational structure, financing and delivery of services of five Canadian cities, examines how different cities are dealing with the infrastructure issues they face. The five cities are Victoria, Calgary, Winnipeg, Hamilton-Wentworth and Halifax. The focus of the report is on the delivery of three services, water, sewer and transit. Given the diversity of budgeting procedures and methods of recording information amongst municipalities, there is a shortage of consistent data on the delivery of services. Even so the responsibility for these services remains with the municipalities and each municipality, within the scope of powers delegated by its provincial government, has evolved its own methods for dealing with the infrastructure problems it faces. The provinces, in turn, continue to adjust the structures of local government. In Nova Scotia, as of April 1, 1996, the municipalities in the Halifax region have been consolidated into one municipality. In Manitoba, there has been pressure for fragmentation of the Winnipeg region with the secession of parts of the fringe area from the city. Two-tier systems in the larger provinces continue to adjust to new financial pressures and changing growth patterns. And an extensive review of the Toronto region has been followed by a proposal to consolidate Metro Toronto into one municipality.

Municipalities are struggling with the realities of scarce resources and deteriorating infrastructure. Additional financial assistance from senior levels of government is unlikely. Deficits, debt and the pursuit of balanced budgets have resulted in many provinces decreasing the level of both conditional and unconditional grants to municipalities. In this environment, the financing and level of expenditures and the administrative structure for delivery of services are being questioned.

BACKGROUND

Municipal infrastructure has generally referred to the framework that “establishes the physical network upon which the country’s economy depends” (Apogee, 1987, p.3). While infrastructure can be physical - the roads or a water treatment plant - it also includes the provision of the service - such as the movement of people or the provision of potable water. Much of this infrastructure, installed during the past century, provides an essential foundation for Canada’s economic competitiveness and the health of its citizens. The main objective of this background is to obtain information on performance indicators from published literature and from urban municipalities across Canada.

In 1993, almost \$15 billion was spent on infrastructure in Canada by the public and private sectors combined (Statistics Canada, 1993). This includes expenditures for new infrastructure and for repairs to existing roads, bridges, water, sewer, gas mains and electric distribution systems. Almost 67 percent of expenditures on linear infrastructure are made by governments. Table 1 summarizes the expenditures on water, sewers and drainage, and roads and bridges by level of government for 1993. The largest expenditures were made by municipal governments (52 percent) and these were evenly split between roads and bridges and water and sewers. Provincial governments made the second largest expenditures (43.5 percent) and these were mainly for roads and bridges. Most provincial expenditures are related to the maintenance and construction of provincial highways. Provincial grants are provided to municipalities for infrastructure but usually these are a small component of the total municipal expenditure. Federal government expenditures were the smallest proportion of total government expenditures (4.5 percent) on linear infrastructure with slightly higher expenditures on roads and bridges than on water and sewer (Statistics Canada, 1993). While all levels of government are involved, to one degree or another in infrastructure development, this study relates only to municipal infrastructure expenditures.

The challenge facing governments is twofold: to provide infrastructure at the lowest cost possible and to secure the resources to pay for it. Municipalities use a number of revenue sources to finance infrastructure: property taxes, provincial grants, user fees, development charges and borrowing. But cutbacks combined with rising demands for infrastructure improvements have forced municipalities to seek new and innovative ways to finance infrastructure. The trend appears to be moving toward additional user fees, a greater role for the private sector and public-private partnerships.

There is a body of literature covering both the background to performance measurement in municipal government (its history and purpose) and the merits and accuracy of specific types of measurements for different municipal services. In contrast there is little published information on actual

Table 1:
Expenditure by Level of Government, 1993 (\$ millions)

Category of Expenditure	Water, Sewer, Drainage		Roads & Bridges		Total	
		%		%		%
Federal Government	199.8	7.4%	235.7	3.4%	435.5	4.5%
Provincial Governments	101.0	3.8%	4,137.3	58.6%	4,238.3	43.5%
Municipal Governments	2,378.0	88.8%	2,682.0	38.0%	5,060.0	52.0%
Total Governments	2,678.8		7,055.0		9,733.8	

Statistics Canada, *Construction in Canada, 1991-1993*. Catalogue 64-201

performance, performance indicators or standards, and the search of the literature revealed limited information on performance indicators for municipal services. The literature and data on performance indicators tend to focus on services, not agencies. The emphasis is on the end product that a local government is to provide to the public, rather than on the administrative body that provides the service. The tendency for performance indicators is to focus on the quality and quantity of output of the service - i.e. potable water - rather than the method of delivering the service. The performance measurements for the quality of the actual infrastructure - i.e. the pipes and treatment plants - vary from city to city and are less well developed in the literature.

Performance in general terms refers to "any evaluation or comparison measure" (Transportation Research Board, 1994: 6). Implicit in the concept of performance evaluation is the notion that performance must be tracked against some previously established standard, goal, or guideline or some other measurement of past performance. Simply put, the purpose of any performance indicator is to give agencies of all sizes incentives to improve performance. But not all agencies use the same indicators for performance measurement, nor the same benchmarks. What may be considered an acceptable level of service in one city may not be tolerated in another.

The specific measures that define performance include effectiveness, efficiency, impact, productivity, and quality of service (The Urban Institute, 1974: 3). Each of these measures has certain indicators that are used to evaluate performance for specific services. It is useful to distinguish three broad types of performance measurements:

1. Effectiveness measures assess the extent to which the goals and objectives of the service are being met. These measures attempt to determine:
 - the degree to which the intended purposes of the service are being met;
 - the degree to which unintended, adverse impacts of the service on the community occur;
 - the adequacy of the quantity of the service provided relative to the community's needs, desires, and willingness to pay;
 - the speed and courtesy displayed in responding to citizen requests; and citizen satisfaction and perceptions of the service (The Urban Institute, 1974: 3).
2. Efficiency measures compare the amount of a service produced to the amount of input required to produce it, for example, the number of tonnes of refuse being collected per man-hour. This measurement indicates how efficiently the service is being provided. Efficiency measures complement measures of effectiveness since an ineffective service can be provided efficiently and an effective service can be provided inefficiently. The term "productivity measure" is often used to refer to an efficiency measure in the form of output per unit of input (The Urban Institute, 1974: 4).
3. Measures of workload performed measure the amount of work done. These measures serve various operational purposes and are often used to justify expenditures and to determine budget requirements. Although such measures (e.g. litres of water processed) indicate little about the effectiveness or the quality of the service, they are often erroneously substituted for effectiveness measures (The Urban Institute: 4). Many authors strongly recommend against this practice for assessing effectiveness.

Ideally, a performance measurement should indicate how effectively a service is meeting its service objectives. In order to do this, the literature identifies two critical factors: there must be a clearly defined program or service objective to serve as a point of reference for performance evaluation; and

the performance measurement should focus on outputs (rather than inputs or process) which directly reflect and indicate the degree to which that objective has been reached (Canadian Conference on Urban Infrastructure, 1987: 3). Many performance measurements do not meet these conditions. Instead, there is a tendency to focus on efficiency and the quantity of work done. This is because the data are usually more readily collected in this format. These measurements are presumed to be related to the quality of the service, and therefore to the effectiveness of the service, but they provide an incomplete evaluation of service delivery effectiveness.

There are three principal sources of data for performance measurement in municipal services (Allen, 1983: 3-7). The first is municipal records: these may be supplemented by records from other levels or divisions of government, (e.g. Statistics Canada), professional and trade associations and private firms. These data are usually easy to acquire and comprehensive to a point, but the recording methods are often inconsistent between municipal jurisdictions. Several authors have noted that many municipalities do not yet have mapping systems and inventory records to enable them to determine their infrastructure needs (McGill University, 1996: 3). Others simply do not have the necessary information. In addition, the lack of staff in some small communities contributes to inadequate information and the inability to analyze the available information. In many cases, available data do not meet a critical need of performance measurement - how successfully program goals were achieved (City of Edmonton, 1985: 4). For example, most cities' public works departments have records on the number of water main breaks and the time and resources required to mend the breaks. They are less likely to have any records indicating how the repair activity relates to the quality of service.

The second method for data collection is the trained observer rating. This is the least common of the three methods. Although rarely used in Canada, it has been used to rate the effectiveness of services in Fort Worth, Texas and New York City. The principal advantage of trained observer ratings is that they are able to focus on the final program output by evaluating the quality of the service provided, rather than measuring only the effort spent or the amount of work done. This method does have drawbacks. Sufficient training and periodic checking are required to ensure consistency between observers. Ensuring consistency between different organizations is even more difficult, and may be impossible if different rating scales and evaluation criteria are used. Trained observer ratings involve extra personnel cost, and may not be perceived to be as objective as other measurements (City of Edmonton, 1985: 4).

A third method of collecting data for performance measurement is to survey either citizens at large, or users of a particular service. This method focuses on end results - how well services are provided to the public - rather than on process and means. There are different opinions on the validity or information gained from surveys. Some research suggests that citizen evaluation of services were found not to be associated statistically with levels of service outputs (Brudney and England, 1982: 128). Other studies have found that citizen survey responses tend to cluster in the middle of the scale, perhaps as a result of "lack of interest or knowledge" (Allen, 1983: 7). A survey may produce a large number of responses indicating that a service is "fair" or "satisfactory" without any clear indication of what is meant by these terms and how much respondents really care about the service. Citizen's perceptions and opinions, however determined, are important for policy making since a goal of many programs is to increase citizen satisfaction.

Although the "will of the people" is considered to be the driving force behind public policy, Canadian municipalities place minimal emphasis on gauging the satisfaction of citizens through surveys (Das, Das and McKenzie, 1995: 78). While researchers have identified and developed ways

of measuring service satisfaction rates, surveys on these topics are uncommon in Canada. Das, Das and McKenzie identified two factors that contribute to this contradictory state of affairs.

First, services by their very nature pose special problems in evaluation studies. Four unique characteristics of services are: intangibility, inseparability, heterogeneity and perishability (Das, Das and McKenzie: 1995, 78). Intangibility implies that a service is "rendered and experienced - no physical ownership is transmitted" (Das, Das & McKenzie, 1995: 78). Inseparability refers to the fact that service production and consumption are not easily separated. Services are heterogeneous because they are difficult to standardize - the quality and essence of a service can show substantial variation from customer to customer and from day to day.

Secondly, services provided by the private and public sectors are perceived differently. In the private sector, market conditions prevail; consequently the likelihood of a consumer understanding or accepting the price on his or her transaction is greater. Many services provided by government agencies fall into the category of public goods or publicly delivered goods. In the public sector, prices may be fixed through legislative mechanisms and cost constraints may lead to a rationing of services. Budget limitations often decide the service availability and quality rather than consumer need and satisfaction. In the case of many of these services, it is difficult for individual members of the public to significantly increase or decrease the quality or quantity of the service consumed (Das, Das and McKenzie, 1995: 79). Rawson notes that public service agencies often have no single goal but attempt to carry out several: to provide services to the general public, and to provide services in their role as a political arm of the government (Rawson, 1991). Public services are complex and therefore harder to measure, rate and standardize. This makes their assessment more challenging.

Several studies have emphasized the importance and necessity of performance standards. In 1983, the Federation of Canadian Municipalities (FCM) created a Task Force and a Technical Committee on Municipal Infrastructure. A comprehensive national study was undertaken. In 1985, the FCM published the results in a report entitled *Municipal Infrastructure in Canada: Physical Condition and Funding Adequacy*. The report related information on the state of the nation's infrastructure and recommended the "establishment of service standards and a national standard for assessing the condition of infrastructure" (Federation of Canadian Municipalities, 1985: 16). Later an American study, by the National Council on Public Works Improvement, addressed the need to maintain or improve the maintenance of infrastructure (National Council on Public Works Improvement, 1988: 20-28). Both studies recognized the need to improve infrastructure management systems. They also identified a need for performance standards which could lead to improving the performance and efficiency of existing facilities. In many instances this need still exists.

Water

During the late 1800s cholera and typhoid fever outbreaks, exacerbated by poor water and sewage systems, killed thousands of Canadians. For decades, "watermen" using ox carts hauled untreated water from nearby rivers and lakes, delivering it by barrel to commercial and residential customers. Sewage in the rivers eventually rendered that supply undrinkable. After the watermen, most cities' water came from artesian wells that produced unreliable and sometimes dangerously polluted drinking water.

Despite the health crisis, efforts to obtain piped water and to secure sewage system facilities were very protracted in many communities (Hodge, 1991: 74). It took Winnipeg from 1882, when it started a public water and sewer system, until 1906 to pass a by-law requiring all buildings to be connected (Hodge, 1991: 74). In many cities typhoid outbreaks forced authorities to provide water

and sewer services. Local authorities began collecting a property tax to finance the provision of services and it was logical that they should also assume responsibility for the provision of water and sewer services. Except for some municipalities whose water and sewer services are the responsibility of a regional government, this arrangement still exists today.

According to a report by the Federation of Canadian Municipalities (1985), the condition of Canadian water systems is not well known. The major cities in the central and eastern regions of Canada, and some older western cities such as Winnipeg, are likely to have watermains in their systems more than 100 years old. With the post-war construction boom and the large scale suburban developments of the sixties and seventies, the average age of watermains is about 40 years.

McDonald and Felio (1995) reported recently on the methods used to assess the condition of municipal infrastructure. They surveyed approximately fifty cities and towns about their storm and sanitary sewer collection systems and water distribution networks. The measurements used to determine infrastructure condition varied greatly from city to city. Even so there are a few measurements commonly used by most cities (McDonald & Felio, 1995: 3). For example the following are often used to determine the condition of the water distribution network:

- number of breaks
- number of customer complaints
- pressure to meet required flow at fire hydrants
- size of pipe
- service connection type
- experience of personnel
- maintenance records (McDonald & Felio, 1995)

Some of these measurements are subjective and therefore are not a reliable means of evaluation as they cannot be related to a benchmark. Others could be used country-wide to assess the condition of the water distribution network if a reference level were set.

Sanitary and Storm Collection Systems

As with the water supply systems, the condition of sewer systems in general is not known. The situation is more complicated than for the water system because of the presence of combined storm and sanitary sewers. Although the majority of the population is served by relatively new separate sanitary sewer systems, in the core area of some older cities combined storm and sanitary sewers still exist.

McDonald and Felio (1995) suggest that, as with the water systems, some of the measurements currently used to assess the condition of the storm and sanitary systems are not accurate and should be used with caution. The common measurements for determining the condition of the sanitary and storm collection systems include:

- closed circuit television (CCTV) inspection reports
- experience of personnel
- number of customer complaints
- level of replacement
- age of system
- maintenance records.

McDonald and Felio found that no national standards exist to determine or rank the condition of water distribution networks or the storm and sanitary collection systems. Rather, the measurement of system condition appears to be very subjective. A variety of measurements is used by operators to determine the condition of infrastructure and the quality of service delivery. McDonald and Felio suggest that in some cases the measurements used are "not even related to the physical condition of the system" (McDonald & Felio, 1995: 24). Therefore they conclude that it is difficult to evaluate the overall adequacy of the nation's water distribution and sewage collection systems. Further, they argue that no direct comparison can be made between cities.

Das, Das and McKenzie (1995) reported the findings of other authors on customer dissatisfaction. Hirschman argued that if suitable alternative services are not available, consumers would have higher complaint rates. Fornell and Didow compared the complaint rates in monopoly and competitive settings and concluded that monopoly settings breed more customer complaints. Gronhaug and Arndt suggest that the limited divisibility and oligopolistic nature of many public services present a high potential for dissatisfaction.

Transit

Transit systems began in Canada in the 1850s with the introduction of horse-drawn buses and by 1890 horse-drawn buses had been replaced by electric streetcars in many communities. As real estate developers began to pressure transit companies to expand into specific geographic areas, local councils became involved in the provision of transit services in order to gain greater control over municipal planning and development activities (Kitchen, 1986: 2). The tremendous growth in ridership at the time of World War One sparked the development and expansion of a more complex and integrated municipal transit system (CUTA, 1985). The booming post-war Canadian economy and subsequent increase in disposable income meant that private automobiles became more accessible and as a result many transit systems experienced declines in ridership. This led to a reduction in services. The economic depression of the 1930s and a continued decline in ridership and revenues threatened to destroy the Canadian transit industry. In an attempt to save it, many local governments took over the operation of private transit companies.

After World War Two greater affluence made the private automobile more popular and some transit companies ceased operation. During the early seventies however, urban congestion and rising gasoline prices led to increased use of transit systems. Although during this period some transit systems recorded profits the introduction of services that were more costly on a per-ride basis (for example, servicing of less populated areas) created a necessity for provincial subsidies. Ontario was the first province to announce an urban transit support policy in 1971, and Nova Scotia was the last in 1978 (Kitchen, 1990: 109).

Although methods of providing transit services vary, most Canadian cities and towns have a municipal transit system. Some municipalities operate their own transit systems - others contract out the provision of this service either to the private sector or to a neighbouring municipality (Kitchen, 1990: 108). Municipal transit systems are funded by both the province and the municipality. The extent to which each of these levels of government contributes may depend on criteria such as the province in which the municipality is located, the population served and revenue base of the municipality itself (Kitchen, 1990: 121). Federal assistance has traditionally taken the form of capital subsidies to the provinces for improvements to the urban transit infrastructure.

Although there is some variation in the level and type of service, most transit systems provide a fixed-route service. Some also offer dial-a-bus services, transportation for the disabled and downtown shuttles. Although the mode of transit is determined by the municipality, over 80 per cent of all municipal transit vehicles are buses. Rail vehicles account for an additional 11 per cent, trolley coaches 5 per cent, light rail vehicles 3 per cent, and commuter rail vehicles 1 per cent (Kitchen, 1990: 110). Except for the largest cities (Vancouver, Calgary, Edmonton, Toronto, Montreal) where more than one type of transit vehicle is used, most municipalities use only buses (CUTA, 1985: 10).

The administrative structures responsible for providing urban transit services are more varied than any other municipal service (Kitchen, 1990: 115). Municipal departments are the most common. Next is the provision of transit services through a commission (either separately or in combination with other utilities), and finally, there are some privately contracted services located in Ontario and British Columbia. Commission-run operations tend to be more prominent in Atlantic Canada and Quebec while municipal departments dominate the administrative structure on the Prairie provinces. In addition to privately contracted services in Ontario, there are several commission and municipal department operations. British Columbia has a combination of commission run operations and privately contracted systems (Kitchen, 1986: 66-85). Outside Victoria and Vancouver, most municipal governments, in partnership with BC Transit, contract out the operation of their transit service.

Municipal transit systems are financed by passenger fares and by provincial and local government subsidies. Some transit systems also generate funds from charters, rental services, advertising, and miscellaneous income. Provincial governments provide subsidies to offset part of transit operating deficits. The provinces do not have total control over the size of the deficits nor are they usually involved in the establishment of fare policies.

In most instances, municipal councils approve local transit budgets regardless of the type of administrative structure responsible for providing the service. This gives municipal councils control over the financial and operational side of the transit system. As well, most municipalities and provinces require transit systems to submit audited financial statements and, in some instances, an annual report (Kitchen, 1990: 113). While there are no direct provincial controls over operating budgets, provincial authorities do exert considerable control over capital expenditures. In BC, the provincial government, through BC Transit, does have the ability to control the total operating budgets for transit. Capital subsidies, which are designed to assist municipalities in the acquisition, upgrading, and maintenance of transit vehicles and facilities, are not usually available unless provincial approval has been granted in advance of incurring expenditures (Kitchen, 1990: 113).

The concern about the increasing size of operating deficits has generated debate regarding the level of transit fares. A number of social, economic and political factors are considered in setting fares. These include the availability of and access to substitute forms of transportation, the ability of residents to pay for transit services, the opinions of local politicians, and the portion of operating cost to be recovered from fares (Kitchen, 1990: 113). In almost all communities the tendency is to set different fares for different groups of riders. The highest fare is set for adults and the lower fares are for senior citizens, students, and children. Discounts are often available for quantity purchases or monthly passes. Average fares tend to be higher in larger areas compared to smaller centres. This may be partly because provinces generally fund a smaller percentage of the deficit in larger communities. But it also may be because larger centres usually have a higher quality of service than many smaller communities.

Although performance evaluation of municipal transit systems may cover a number of areas, it ultimately turns to an analysis of financial issues. According to Fielding (1987), efficiency describes how well factors such as labour, equipment, facilities and fuel are used to produce outputs such as vehicle hours or kilometres of services. Overall performance indicators integrate efficiency and effectiveness measures - cost per passengers and the ratio of revenue to the cost of producing the service (Transportation Research Board, 1994: 7).

The quality of public transit systems also depends on conditions external to the service agency such as: street maintenance and traffic engineering, politically-based decisions on issues such as fares, hours and routes, social conditions such as unemployment, and in the long term, land use planning. These external factors affect both the effectiveness and the efficiency of a transit system. For example, land use planning issues such as accessibility, population density of a neighbourhood and development patterns affect the public transportation performance profile. Some aspects of public transit have proved elusive to measure. These include the ability to drive without many stops for traffic controls or congestion, the placement of traffic controls, the overall convenience of driving in the municipality, and the amount of through-traffic in residential neighbourhoods (The Urban Institute, 1974: 53).

Much of the available literature deals with the establishment of appropriate performance measures (Transportation Research Board, 1994: 6). Performance measurement and evaluation are used for the following:

- As aids for assessing management performance expectations of the transit system in relation to community objectives;
- As mechanisms for assessing management performance and diagnosing problems, such as disproportionate cost in relation to service;
- As methods to allocate resources among competing transit properties, on the basis of relative cost effectiveness or other criteria; and
- As management and monitoring tools to facilitate continued and improved performance by management and personnel.

Canadian municipalities use a set of performance indicators established in conjunction with the Canadian Urban Transit Association (CUTA) to determine the condition of their transit systems. These include: financial performance, average fare, cost effectiveness, cost sufficiency, service utilization, amount of service, average speed, vehicle utilization, labour productivity and average top wage rates (CUTA, 1992). These are compiled and published each year by CUTA.

A recent report by the Federation of Canadian Municipalities indicated that transit systems in larger cities are "aging, deteriorating and undercapitalized whereas transit systems in smaller cities are under used and overcapitalized (McGill University, 1996: 5). Encouraging people to use public transit is becoming increasingly difficult. Lifestyle changes and fewer incentives for using public transportation have left most systems underutilized and with a decreasing ridership.

Commentary

It appears that the trend in government is to become more oriented to customer service. This has created an imbalance in determining and ranking the condition of infrastructure. As more emphasis is placed on the consumer, measurements such as number of customer complaints and customer satisfaction may tend to carry more weight than do objective measures of effectiveness, efficiency or workload performed. The actual state of a city's infrastructure may be considered by some to be less

politically important than its perceived state. If measurements of customer satisfaction are going to carry more weight, the public sector may have to follow the concern for quality and customer orientation which has changed private sector operations in the recent past. Given shrinking resources, varying customer expectations, and an uncertain political environment, the use of performance measurements by municipal governments and service agencies is likely to become increasingly important.

This, combined with the demand for public funds to build new infrastructure for new communities, has contributed to infrastructure decay. The practice of building new infrastructure rather than the efficient use or reconstruction of existing systems is politically popular (Federation of Canadian Municipalities, 1996: 12). By catering to immediate needs and demands, municipalities may further compound the infrastructure decay problem by providing for the rehabilitation and replacement of visible infrastructure rather than underground infrastructure. This has been countered in Canada by the practice of sewer and water systems being delivered through a self-supporting utility or department with its own sources of revenues. As such, they do not compete directly for funds from property tax supported revenues.

In the United States hundreds of governmental functions have been privatized. Several forms of privatization, including contracting out, franchising, the use of nonprofit organizations, subsidies and the voucher system, and the use of volunteers have been attempted by governments to deliver public services. To some extent this is related to the strong forces of fragmentation and decentralization that exist in municipal government structures in the United States.

Privatization has been slower to happen in Canada where the forces of consolidation and centralization are encouraged by the provincial governments, and where municipal governments have a tradition of the public delivery of services. Privatization of the delivery of services in the United States is related to competitive forces between neighbouring municipalities. In Canada, in large metropolitan areas, two-tier and single-tier municipal government structures are the norm. Services such as water, sewage and transit are usually delivered at the regional level and the competitive forces that have encouraged privatization in the United States are less prominent.

LOCAL GOVERNMENT IN THE CANADIAN CONTEXT

Under the Constitution, municipal governments are the sole responsibility of the provinces. The structure, financing and responsibilities of cities in Canada have evolved separately as each province developed its own approach to urban centres. As a result, while there are similarities, a number of divergent delivery systems for hard services have been developed.

The delivery method, the level and type of financing, and the political and administrative structures under which hard services are provided vary from province to province and city to city. Substantial reductions in grants from provincial governments to municipalities have been the rule in most provinces in recent years. At the same time as grants from provincial governments are threatened, traditional sources of revenues such as property taxes, business taxes and user fees are under attack. Issues of access to resources for hard services, high property taxes and the duplication of services between provinces and their cities are significant within the context of the present fiscal climate.

The potential relationships between neighbouring municipalities in an urban region are diverse. The prairie tradition has been consolidation and annexation. The larger provinces have tended toward two-tier systems. The Maritimes are struggling with both concepts. These broader jurisdictional approaches have an impact on infrastructure and the delivery of services. Changes in the way cities are evolving may have long term implications for the shape of urban areas in Canada. While Joel Garreau (1991) suggests that edge cities, his term for development on the periphery of large metropolitan areas, are mostly an American phenomenon, signs of it are apparent in the Toronto region. Even in municipalities with slow growth, such as Winnipeg, much of the new growth in the region has occurred outside city boundaries. Whether new types of employment, early retirement, perceptions of crime in the inner cities or high municipal taxes are the reasons, some city dwellers are seeking a different life style and are moving out of the city. While in the five cities studied here the actual numbers themselves may be small, the percentage of growth occurring outside existing municipal boundaries suggests that the long term implications on infrastructure may be significant.

The five urban areas chosen for this study, Victoria, Calgary, Winnipeg, Hamilton and Halifax, are mid-sized metropolitan areas with different characteristics and methods of delivery of services. Victoria, as part of the Capital Regional District (CRD), has a two-tier delivery system with no consistency amongst municipalities on how various services are delivered. Both Winnipeg and Calgary are single-tier municipalities. But while Calgary has maintained the integrity of its regional influence through the annexation of areas of potential urban development on its periphery, Winnipeg has a number of smaller municipalities on its boundaries competing for urban growth. Hamilton-Wentworth is a regional government and has a well defined two-tier system of government with relatively clear divisions of responsibility. Even so, the present Chairman elected-at-large in the region, has initiated a debate on consolidation and the provincial government is considering a single-tier municipal government as an option for Hamilton-Wentworth.

Halifax has been a weak two-tier system with the upper-tier, the Metropolitan Authority, having few responsibilities, the main two being solid waste and transit. The time frame of this study precedes the April 1, 1996 consolidation of the Halifax region into one municipality. To what extent the consolidation was driven by lack of cooperation amongst the municipalities and the failure of the Metropolitan Authority is debatable. It is not the intent here to deal with the consolidation but it

could be argued that the delivery of services did have an influence on the province's decision to pursue consolidation.

The three services under review in this study, sewer, water and transit, were selected, partly on the basis of available information, and partly because of the nature of the services themselves. The administrative structures, the level of service delivered by the upper and lower tiers, the financial procedures, expenditure patterns and sources of revenue vary from city to city. All three are well defined services. Although the five cities do not deliver these services in the same way, they do lend themselves to being delivered on a regional bases.

While transit is not strictly a hard service, there are differences in the way the service is delivered. In Victoria the transit system is a provincial responsibility with a gasoline tax levied to support the costs of the transit system. In Winnipeg, transit operates as a utility and in Calgary it operates within the departmental structure. In Halifax and Hamilton the system is the responsibility of the regional government. Even so there is some consistency in the way the cities in Canada record information on expenditures, ridership and level of service.

Different organization structures for the collection, treatment and disposal of sewage are well represented in the five selected cities, including the privatization of the treatment facility in Hamilton. While this occurred at the end of the time period for this study, it does show that municipalities are considering privatization of major services traditionally delivered by the municipality. In Halifax both storm drainage and sewage are in the same budget envelope and, while Halifax and Dartmouth do not have treatment facilities, a large portion of the sewage is treated in the Halifax County Municipality and in Bedford. Both Halifax-Dartmouth and Victoria dispose of sewage into the ocean.

Water is delivered as a utility in Winnipeg and Calgary by city forces, by the regional government in Hamilton, and as a separate authority in Halifax and Victoria. Both Victoria and Halifax have different delivery systems for different parts of their regions. This has resulted in complex organizational structures, split responsibilities and a variety of types of expenditures. The major source of revenue for the water systems is a user fee charged against usage. Although water pricing does not form part of this study, both fixed rates and metered rates are used, depending on the city.

Hard services not examined in this study include hydro and the transportation network. Hydro, although a significant municipal source of revenue on the prairies, elsewhere is usually delivered outside the purview of the municipalities.

Roads, streets and bridges are a major infrastructure responsibility of municipalities. But there is little consistency between cities on how streets are designated, and which level of government undertakes the expenditures. The hierarchy of streets, such as provincial highways, major thoroughfares, regional streets and local streets, is designated differently from city to city. Since the repair and maintenance of streets are usually funded through general revenues, it is difficult to isolate specific expenditures in any consistent fashion. Funding from provincial governments for capital and current expenditures varies from province to province and most are reducing funding to municipalities. The role of the province in the maintenance and development of the road systems also is often dependent on the size of the municipality.

Victoria, Calgary, Winnipeg, Hamilton and Halifax have different growth patterns, climatic conditions, geographic characteristics and socio-economic factors. They reflect some of the differences that exist across Canada. Municipal reform in Canada has been ad hoc with the structure

and organization of urban areas being dependent on provincial legislation. Thus the diversity amongst the selected cities. With different provincial governments, the responsibilities, political structures and delivery systems for services vary. Yet within Canada there has evolved a municipal political culture with a number of similarities including the strong council/weak mayor system. And to a surprising extent, municipal governments across the country deliver many similar types of services. How these services are delivered in the future will depend upon how provincial and municipal governments deal with the financial challenges they face.

A PROFILE: THE CITIES AND THE DELIVERY OF SERVICES

The demographic characteristics in Table 2 point out some of the differences and similarities that exist. The socio-economic conditions, the age of the infrastructure, the population characteristics and the levels of income and unemployment all have implications for a municipality's ability to raise revenues and provide services. Both the aging population and the increase in single-parent families, two significant trends in Canada over the past 25 years, (CMHC, 1989: pp. 3-6.) can have an effect on local government and the delivery of services. The costs of support services and social assistance for these groups can place financial pressures on municipalities and be in competition with hard services for scarce resources.

A review of Table 2 points out a number of social, economic and demographic differences among the cities. As might be expected, population growth is the highest in Victoria and Calgary and the lowest in Winnipeg. Victoria, with the highest percentage of its population, 17.2%, over 65, reflects its status as a popular retirement city. Winnipeg and Hamilton have the next highest elderly population at 11.9% each with Halifax and Calgary being 8.7% and 7.1% respectively. Victoria has the lowest percentage of households equal to or below the poverty line. While in 1991 Victoria had the second lowest unemployment rate and the lowest youth unemployment rate, by 1995 these were the highest of any of the cities. This suggests that the high percentage of government transfers to Victoria in 1991, which is 19.9% with Winnipeg next at 11.5% and Calgary the lowest at 7.1%, reflects the large number of elderly in Victoria rather than the economic or social conditions in the city. Household income levels are highest in Calgary, \$44,417, and lowest in Winnipeg, \$36,602. While Victoria has the next lowest household income levels, \$38,104, its income levels for individuals is relatively high. This can be explained by the retirement population with its correspondingly smaller sized households.

While a direct relationship between age of houses and the condition of housing can not be made, Table 2 does suggest that Winnipeg has the oldest housing stock in the worst condition. Victoria, although it has a high percentage of houses built before 1946, has a housing stock in relatively good condition.

Calgary has high incomes, low unemployment rates, a young population, a new housing stock in good condition and the lowest percentage of transfers from senior governments. In contrast, Winnipeg has the lowest incomes, the highest unemployment rates, the highest percentage of households equal to or below the poverty line and the highest number of single parent families. Victoria appears to be a stable city with an aging population but with a high youth unemployment rate. Halifax and Hamilton are generally positioned between Winnipeg and Calgary. They have similar income levels, unemployment rates, household incomes, and transfer payments. The differences between Hamilton and Halifax are in the percentage of population over 65 with Halifax being relatively low at 8.7%, and in education levels which are the highest in Halifax for all the cities. Hamilton has the highest percentage of owner occupied houses at 64.6% while Halifax, at 58.0%, is the lowest.

Although the services under review in this study are considered on their own, the demographic and socio-economic characteristics of the individual municipality have an influence on these services. So

**Table 2:
Social-Economic and Demographic Statistics¹**

Item	Victoria	Calgary	Winnipeg	Hamilton-Wentworth ²	Halifax ³
Population - Total	287,897	754,033	652,354	599,760	320,501
Population - Growth 1986 to 1991	12.8%	12.3%	4.3%	7.7%	8.3%
Gender - Male	47.9%	49.9%	48.6%	48.9%	48.7%
Female	52.1%	50.1%	51.4%	51.1%	51.3%
Age - 65 +	17.2%	7.1%	11.9%	11.9%	8.7%
Unemployment Rate: 1991	7.7%	7.6%	9.2%	8.9%	9.2%
• 15 - 24	11.1%	12.2%	14.0%	14.9%	14.2%
• 25 +	7.0%	7.0%	7.4%	7.6%	9.1%
Unemployment Rate: 1995	9.2%	8.1%	8.2%	6.6%	8.9%
• 15 - 24	16.6%	10.8%	13.6%	14.3%	13.8%
• 25 +					
Educ. levels: age 15 +					
• < grade 9	5.6%	6.0%	10.7%	11.6%	7.7%
• Univ. Degree	14.7%	16.3%	13.0%	11.1%	16.8%
Single parent households	12.5%	12.9%	14.8%	12.3%	14.0%
Hsld. Income - median	\$38,104	\$44,417	\$36,602	\$43,761	\$41,397
Male - median	26,085	27,927	24,515	29,860	27,394
Female - median	14,930	15,476	12,732	14,242	14,351
% of households = or below poverty line	13.6%	17.2%	20.3%	15.1%	14.1%
Owner occupied houses	61.1%	60.6%	62.0%	64.6%	58.0%
Houses built > 1946	18.2%	6.5%	20.3%	20.0%	16.2%
Houses needed major repair	6.2%	5.7%	8.4%	7.0%	7.1%
% total income from government transfers	19.9%	7.1%	11.5%	10.8%	10.3%

1 Statistics Canada

2 Census data for Hamilton-Wentworth metropolitan regions includes areas outside the Regional Municipal boundaries.

3 Census data for the Halifax metropolitan region does not include all parts of the new Halifax Regional Municipality.

too have the political and administrative organization of the municipality and the structure of the agencies, commissions and departments delivering the individual services.

Victoria and the Capital Regional District

Victoria, as the capital of British Columbia and located on Vancouver Island, has characteristics that are unique. Its moderate climate makes it a popular retirement community and its government offices give Victoria a large civil service work force. The Capital Regional District (CRD) is a two-tier system of local government that stretches from Sooke in the west to the Outer Gulf Islands to the north and east.

The Capital Regional District was formed to provide and coordinate selected local, municipal and regional services. As one of British Columbia's 29 regional districts, it delivers both general and local services. In the CRD services are provided in the following areas: (1) municipal finance, (2) community health and hospital planning, (3) environmental waste and management, (4) recreation, parks and leisure services, (5) regulatory services, and (6) affordable housing. Services are funded in a number of ways: by tax requisitions to member municipalities, by user fees for general services and through user charges and property tax levies for local services.

A regional district in British Columbia is governed by a board of directors composed of elected mayors and councillors from the local municipalities. Unincorporated rural areas within a regional district elect directors that sit on the board. Thus the regional districts, as they relate to rural areas, are partly a single-tier system. The CRD Board is made up of 21 directors representing 12 municipalities and 4 electoral areas. The representation on the board and the weight of each director's votes are determined by population. The Chair of the CRD is elected yearly by the Board of Directors.

The four electoral areas are Sooke, Salt Spring Island, Outer Gulf Islands and Langford. The municipalities in the CRD are Saanich, Victoria, Oak Bay, Esquimalt, Langford, Central Saanich, Colwood, Sidney, North Saanich, View Royal, Metchosin and Highlands. Given the number of municipalities and the complexity of the systems, the information was difficult to gather and organize. There are a variety of administrative and delivery structures that exist within the regional district with responsibilities shared between the municipalities and CRD. The focus in this report, which excludes the Gulf Islands and the rural electoral areas, is on the City of Victoria and CRD. Even so it was not always possible to disaggregate the information in a format that was similar to that of other cities in the study.

The administrative structure of the City of Victoria has evolved into the current city manager model. The City Manager acts as the chief executive officer and provides Council with support and professional advice and expertise. The City of Victoria elects a mayor and 8 councillors at-large. Three representative of the Council, usually the Mayor and two councillors, are appointments to the CRD Board of Directors.

Sewer & Water

There are split responsibilities for the administration, financing and delivery of sewer and water services between the municipalities and the CRD. The Engineering Department of the CRD is responsible for 5 water utilities, 4 sewer utilities, 2 trunk sewer systems and, on the Saanich Peninsula, 3 sewage treatment plants and the bulk water supply system. Sewer and liquid waste services are provided in several different ways. Trunk sewers are provided to the four core municipalities, Victoria, Oak Bay, Esquimalt and Saanich and the three western municipalities, View Royal, Colwood and Langford. In the three peninsula municipalities, Central Saanich, North Saanich and Sidney, the CRD provides trunk sewers and secondary treatment and disposal. About 90% of the

peninsula is connected to services. When borrowing is required for major capital expenditures the approval is usually done by consent of the benefiting municipalities. On occasion borrowing consent may be obtained by referendum.

The Greater Victoria Water District (GVWD) was established in 1949. Initial membership consisted of the Corporation of the City of Victoria, the Corporation of the District of Saanich and the Corporation of the Town of Esquimalt. The Corporation of the District of Oak Bay later became a member of the core group in 1951. Expansion of the membership of the Water District requires a referendum in the applicant municipality and an amendment to the Act. The governance of the GVWD is presently under review (Perry, 1996).

The activities and objectives of the Water District are governed by the *Greater Victoria Water District Act*, an act of the Provincial Legislature. Included in the objectives is the supplying of water for use by areas adjacent to the four core municipalities. Because the Water District sells water to parties other than the four core municipalities, it is subject to the regulatory requirements of the *Utilities Commission Act* and the *Water Utility Act*. Regulation under these acts is administered by the Comptroller of Water Rights. GVWD is a non-profit, inter-municipal corporation that functions as a wholesaler of water to the District municipalities. Water rates outside the four core municipalities are approved by the province through the Comptroller of Water Rights.

In addition to supplying water on a bulk basis to the four core municipalities, Victoria, Saanich, Esquimalt and Oak Bay, the GVWD sells water on a bulk basis to the Capital Regional District. The Capital Regional District in turn resells the water as the Saanich Peninsula Water Commission for redistribution by the Town of Sidney and the Municipalities of Central and North Saanich. The GVWD also sells water on a wholesale basis in the Western Communities including the Town of View Royal, the City of Colwood, the District of Langford, the District of Metchosin and the unorganized areas of Sooke and East Sooke. While the Western Communities do not at the present time have a formal relationship with the GVWD, the development of an operating agreement is underway.

The majority of the retail business of the Greater Victoria Water District is the 13,000 individual accounts of retail customers in the Western Communities and Sooke. The Water District also has a retail service agreement with Construction Aggregates Ltd., a large industrial water customer. The GVWD owns all of the pipelines and other assets serving the retail accounts. Since some areas in the Western Communities were developed with their own water system and later turned over to the GVWD, there are a number of different levels of service and qualities of infrastructure. Thus upgrading and replacements are frequent and this is reflected in higher water rates in the Western Communities. Both the retail and the bulk operations are self-supporting.

The Chief Commissioner of the GVWD is responsible for the day-to-day management of the utility. Within the parameters established by the Administration Board, the Chief Commissioner provides overall managerial and technical direction to the five department managers. The Waterworks Department, the GVWD's largest department, is central to the District's mandate of supplying water to its wholesale and retail customers. This department is responsible for the release of water from source, the operation and maintenance of system pipelines and disinfection facilities, and for repairs and installation.

In the past the GVWD has used logging operations on land it owned to help finance capital infrastructure. Logging operations recently have been halted and this has resulted in some rate

increases. The GVWD has land outside its drainage area that it wishes to trade with logging companies currently logging on private lands inside the drainage area. This has not been accomplished and private companies continue to log in the catchment area. With this access to revenues through logging, debt and borrowing have not been an issue with the GVWD. Given the growth occurring in the CRD additional capacity requirements are expected. The reservoir capacity can be increased by 80% for only \$15.5 million.

The GVWD has a ten year capital program of \$100 million for the upgrading and replacement of the infrastructure. These activities are based on a study for the GVWD done by a consultant who analyzed the problem areas in the system. Sample tests were done and the system evaluated.

In the four municipalities that own the GVWD, water is a self-supporting utility. Each local service is self-financing and its accounting is internalized. The only shared resource is manpower which is contracted to local areas and fully charged. In the City of Victoria the utility uses accumulated surpluses to buffer rate increases but there are no reserves as such. Generally capital expenditures are balanced with the revenues, spread evenly over time and included in the operating budget.

Summary of Political and Administrative Structures

Regional Structure: Victoria Capital Regional, composed of 12 municipalities and 4 electoral districts. The Capital Regional District, is a two-tier metropolitan structure.

Size of Council: the Capital Regional District (CRD) has 21 directors elected at the local level. The chair is elected by the directors. The City of Victoria has a mayor and 8 councillors elected at large with the mayor and two of the councillors appointed to the board of directors of the CRD.

Water: the Greater Victoria Water District (GVWD), which supplies water to the region, is owned by 4 core municipalities, Victoria, Saanich, Esquimalt and Oak Bay. The core municipalities obtain water in bulk and operate their own water systems. The GVWD also supplies water in bulk to CRD and to individual customers at retail rates in the Western Communities. The CRD purchases water from the GVWD and supplies it to certain municipalities. Generally water systems are administered as self-supporting utilities by the municipalities and the CRD.

Sewage: responsibility for sewage is split between the CRD and municipalities in built up areas around Victoria with the CRD responsible for trunk sewers and municipalities local sewers. The CRD provides treatment facilities to the Saanich Peninsula municipalities. Generally sanitary systems are administered as departments.

Transit

Created in 1978, the Urban Transit Authority (UTA) was the crown corporation responsible for urban transit systems throughout the Province of British Columbia. In 1982, the UTA became BC Transit. In 1985, BC Transit merged with the Metro Transit Operating Company (MTOC), the Crown corporation formed in 1980 with responsibility for operating the transit systems in Vancouver and Victoria. Now, as well as providing transit services in the regions of Vancouver and Victoria, BC Transit provides funding and a variety of professional services in 45 other communities throughout British Columbia. These other transit systems are generally operated by private companies, non-profit agencies or municipal departments. In short, BC Transit is a regionalized Crown corporation. It

also funds "handyDART", a transportation system for disabled persons unable to use conventional transit.

BC Transit operates as a utility. BC transit systems are financed through direct operating revenues from fareboxes, passes and advertising, and a funding formula specifying the share of operating costs to be covered by the provincial and municipal governments. In Greater Vancouver and Victoria, municipal government contributions may be raised through a combination of property taxes, electrical power levies and gasoline taxes. In the rest of the province, local government contributions are made from general municipal revenues. In the CRD the transit system is funded through a 1.5 cent-per-litre gasoline tax and a mill rate levy applied to the property tax. (In Vancouver there is a 4 cent-per-litre gasoline tax.) The size of the levy in the CRD is determined by the Transit Commission. The bus replacement schedule is approximately 18 years and buses are amortized over the expected life span of the buses.

The Transit Commission was established to give municipalities input into the decision-making process. The involvement of the municipalities marked the evolution from a centralized to a regional organization focusing on the areas where the service is delivered. This resulted in a public role for BC Transit. The Transit Commission is composed of the mayors of Victoria and Saanich and five members appointed by the province including either the mayor of Oak Bay or Esquimalt, a mayor from one of the western communities, a mayor from one of the three peninsula municipalities and one councillor for each of Saanich and Victoria.

Calgary

Calgary is one of the fastest growing cities in Canada. While the growth rate in Victoria is similar a large part of its growth is related to its popularity as a retirement community. Calgary, with the highest incomes, low unemployment rates and the fewest elderly, is a new city that has high quality infrastructure. Its roads, transit system, and other hard services are in excellent condition. Although its debt load was relatively high in relation to other cities, its financial resources are such that this is under control. Using pay-as-you-go capital budgeting, it has reduced its debt substantially even during a time of dramatic decreases in provincial support to municipalities in Alberta. It is a self-contained one-tier system of government that has been able to annex areas of urban growth on its borders as they developed. Thus the city has control over the delivery of all municipal services in the built up urban area.

Calgary city council is composed of a mayor elected at large, who is the presiding officer of council, and 14 Aldermen elected by wards. The administration in the City of Calgary operates under the Commissioner system. There is a Chief Commissioner and three commissioners who are delegated administrative responsibilities by council. These commissioners are charged with supervising and coordinating the activities of the departments under their jurisdiction and together with the mayor constitute the commission board. This board is responsible for determining how council's general policy directions are to be carried out through the administrative structure. The sewer and water utilities report through the appropriate commissioner to the standing committee.

Sewer & Water

The Waterworks Division is responsible for supplying potable water, providing a sub-system of fire hydrants with adequate flows and pressures and for promoting water conservation. The Sewer Division is responsible for the collection, transport and treatment of waste water and the monitoring

and controlling of discharges. The growth in Calgary in a time of fiscal constraint has placed certain pressures on the systems. The volumes of sewage increase by approximately 2% per year.

As well as operating as self-supporting utilities, the sewer and water systems also are used as sources of revenue for the city. The utility bill includes charges for water, sewer and hydro. The costs for sewage are charged against water on the utility bill. There is no mandatory metering of water flows in Calgary and 65% of the accounts are billed on a flat rate. There have been three plebiscites on water metering but in each instance mandatory metering was turned down. Although at one time the flat rate was based on assessment, the rate now is based on the lot area and the footprint of the building. These rates are approved by council and do not have to go to a Public Utilities Commission.

Revenues from the utilities transferred to general revenues of the city come from two different sources. One is a return on equity to the city - a return to general revenues on the investments made by the city in the utility. The other is a tax on revenues - the equivalent of a franchise fee. Retained earnings by the utilities are modest since other available funds are used for capital expenditures. These capital expenditures are used both for replacement and upgrading and to accommodate growth in the system. For water, these capital expenditures have been generally watermain replacements. For sewer, they have tended to be plant expansion and upgrades. All the combined sewers in Calgary were separated in the sixties (City of Calgary, 1995).

The Water Division tracks several trends on an annual basis which are used by management as indicators of overall performance. These include the historical costs of repairs to mains, main replacement costs per metre, estimated system leakage, main breaks and total employees per 1,000 population. Leakage of water is calculated through a leak detection program and is between 11% and 15%. Over the period of this study, costs of repairs and replacements have remained relatively constant while leakage, repairs and ratio of employees per 1,000 population have decreased.

Storm drainage is mill rate supported and costing is on a per job bases. There is a work order system with the costs for the job calculated and charged against general revenues. Since storm drainage is mill rate supported, it is competing more directly with other activities for resources during the budgeting process.

Summary of Political and Administrative Structures

Regional Structure: Calgary has a single-tier municipal structure.

Size of Council: Mayor elected at large and 14 Aldermen elected by wards.

Water and Sewage: both water and sewage are operated as self-supporting utilities with the director of the individual department reporting to the appropriate commissioner.

Transit

Calgary Transit is a division of the Transportation Department. The department has both a traffic operations and a transportation planning component. Transit is not an independent entity as it is in the other cities in this study. In Calgary the transit system must compete with the other divisions within the department, such as streets and roads, for resources. The transportation planning group is responsible for giving advice on how resources are allocated. Calgary Transit uses a short term and a long term model to forecast ridership and to relate the forecast to ridership through the year.

Capital grants from the province come as one grant for both transit and transportation and the city determines priorities. The grant is \$25 per capita which is about \$20 million a year. Calgary is the only city in the study to have a light rail transit system (LRT). As a result, its capital requirements tend to be higher than the other cities. The farebox and advertising account for approximately 50% of the revenues. The 50% of revenues derived from the transit system is used as a guideline but it is not a fixed percentage. The shortfall is mill rate supported and comes from general revenues. The rates for Calgary Transit are set by city council. Any requirements for capital debt servicing for transit are included in the capital budget.

Winnipeg

Winnipeg is the major urban centre in Manitoba with nearly 60% of the province's population living within the city. With its concentration of manufacturing and service industries and its position as capital and media centre, it plays an important role in the economic and political activities of the province. Winnipeg has an aging population and the lowest incomes, highest ratio of single parent households, and the slowest growth rate of the five cities. The infrastructure is aging and large areas of the inner city are still utilizing combined storm and sanitary sewers.

Winnipeg operates under the City of Winnipeg Act. The council is composed of a mayor elected at large and 15 councillors elected by wards. Recent legislative changes have given the mayor power of appointment of a deputy mayor and the four chairs of the standing committees. The appointments are made annually in early November and the mayor has the authority to remove and replace an appointee during the year. The mayor is chair of executive policy committee (EPC) which is composed of the mayor and his/her five appointees. EPC formulates and presents recommendations to council on overall policy. The administration operates under a commissioner system with a chief commissioner and four commissioners whose responsibilities loosely relate to the four standing committees. (This system was modified in 1994 and there is now one less commissioner.) Sewer, water and transit utilities report to the same standing committee, Works and Operations, and the manager of the utility reports through the commissioner to the standing committee.

Sewer and Water

In Winnipeg, both water and sewer are operated as utilities with their own forces for repairs and maintenance. Local lines are repaired by the Water and Waste Department and are fully financed through the utility. Most operations are done according to by-law approved by council although some responsibilities are delegated to the standing committee.

The City has increased sewer and water rates in recent years to provide funding for infrastructure maintenance. There is also a frontage levy on the tax bill for both water and sewer. The replacement of water mains is now funded by the frontage levy with the repair of breaks included in the operating budget. Since this levy was initiated in the late eighties, the increased maintenance has decreased the number of breaks from 2500 to under 1300 a year. Pumping stations and treatment plants are considered to be in adequate condition.

There is no new sewer debt being incurred. Sewer services are all pay-as-you-go and the level of debt has peaked. Both water treatment facilities and aqueduct repairs are now cash financed. The water utility is moving toward pay-as-you-go but is not as far along as the sewer utility. The City has established an aqueduct levy to finance the rehabilitation of the existing aqueduct. An additional source of water supply will be needed by 2015. Following the example in other prairie cities,

Winnipeg has formalized the transfer of 10% of the sewer and water utilities' net sales to general revenues.

Summary of Political and Administrative Structures

Regional Structure: Winnipeg has a single-tier municipal structure.

Size of Council: Mayor elected at large and 15 councillors elected by wards.

Water and Sewage: both water and sewage are operated as self-supporting utilities with the manager of the individual department reporting through the appropriate commissioner to the standing committee.

Transit

Winnipeg Transit, although considered a city department, has been established as a utility operation. It is treated as a totally separate financial entity accounting for all revenues and expenses associated with the operation. Winnipeg Transit also manages its human resources and negotiates, with support from the city, its union agreements. Winnipeg Transit builds an operating reserve fund and operates on retained earnings. There is no transfer of revenues to the city. Since it makes no sense to allow the utility to slide into the red, the city will make a special contribution if Winnipeg Transit experiences a bad year financially.

The city charges the transit utility approximately \$1.1 million for administration expenses. Bus replacement is calculated on an 18 year life span. Currently the transit department is trying to include 30 buses a year in their operating budget as transit moves to a pay-as-you-go system. This is expected to be in place by the year 2000.

Winnipeg regularly does origin/destination studies with modeling capabilities using a program developed jointly with the University of Montreal. To some extent the quality of service is dependent upon the number of buses, overall traffic conditions and the social service emphasis of council. In recent years, as with the other systems in this study, ridership and overall travel and traffic have been down. As a result, Winnipeg Transit is now operating fewer bus hours than it did in 1980.

The Regional Municipality of Hamilton-Wentworth

The Regional Municipality of Hamilton-Wentworth, with an urban population of 460,000, was established on January 1st, 1974, by legislation passed by the provincial government. Its proximity to Toronto and its steel manufacturing tradition has influenced the development of the region. The City of Hamilton with 70% of the population is the largest single municipality in the region. Its City Council is composed of a mayor elected at large and sixteen aldermen, two from each of eight wards. The administration of the City of Hamilton operates as a city manager system with a chief administrative officer. All members of the Hamilton Council sit on the Regional Municipality of Hamilton-Wentworth Council. The two-tier system of regional government includes the municipalities of Hamilton, Dundas, Stoney Creek, Flamborough, Ancaster and Glanbrook. The Regional Council is composed of 28 elected members including a Chair elected at large in the region. In addition to the 17 members from Hamilton, there are 2 members from each of the other five municipalities. The administration of Hamilton-Wentworth is headed by a chief administrative officer.

While the two-tier system has been in operation for over twenty years, its role has been questioned in the past year in a report of the Constituent Assembly on Municipal Government System in Hamilton-Wentworth. This Assembly was established by the Regional Council in February, 1995 and presented its final report on March 31, 1996. The Assembly recommends the creation of a single unified Municipal Council with a community committee system to ensure local interests are included in the decision-making process. While this debate is occurring after the time frame of this study, it does reflect the ongoing concern over how municipalities may best govern themselves.

Responsibilities are divided between the local municipalities and the regional municipality. The local municipalities have sole responsibility for waste collection, storm water, fire protection and convention facilities, and shared responsibilities with the region for land use planning, roads, parks and recreation, administrative functions and heritage and culture. The regional municipality has sole responsibility for recycling and waste disposal, pollution control, water, sewage, economic development, public transit, police, public health, social and family services and storm sewers in the City of Hamilton. Certain activities such as ambulance, hospitals, housing, libraries, school boards and hydro utilities are the responsibility of other agencies.

Water and Sewer

Both sewer and water are the sole responsibility of the Regional Municipality, operate as self-supporting utilities and are administered by the Environmental Services Department. Water, sanitary sewer and storm drainage have completely separate financial arrangements. About 50% of the residences have water meters and are charged by the amount used. Non-metered units are charged on a flat rate based on assessment. A surcharge for sanitary sewers is included on the water bill. Water and sanitary sewer debt servicing usually are done internally and are self-financed.

Treatment facilities have been privately operated since 1994 when a ten year agreement was reached between Philip Utilities Management Corporation (PUMC) and the Regional Municipality of Hamilton-Wentworth. The treatment plants and pumping stations are operated by PUMC with Hamilton-Wentworth being responsible for collection of waste. The performance criteria are based on the operating performance of the Region during the previous four years. Capital improvements are generally the responsibility of the Region. The public debate on the privatization of the treatment facilities revolved around two major issues, financial savings and economic development including the potential for jobs and investment. A direct approach was made to the Hamilton-Wentworth Council by PUMC on the concept of privatization of the treatment facilities. Staff were directed by council to undertake negotiations with PUMC. Included in the agreement is a profit sharing formula with any initial profits going to the Region, a second component going to PUMC and, if there is further profits, these are shared 60% by PUMC and 40% by Regional Municipality.

Summary of Political and Administrative Structures

Regional Structure: Hamilton-Wentworth has a two-tier municipal structure with the Regional Municipality of Hamilton-Wentworth and six local municipalities. The City of Hamilton is the dominant municipality with approximately 70% of the regional population.

Size of Council: the Regional Council is composed of 28 members, the mayor and all 16 aldermen from Hamilton, two members from each of the other five municipal councils and a chair elected at large in the region.

Water and Sewage: both water and sewage are operated as self-supporting utilities at the regional level, are administered by the Environmental Service Department and report to a standing committee of the Regional Municipality.

Transit

Originally privately owned, the Hamilton Street Railway Company (HSR) was purchased by the city of Hamilton in 1960 and set up as a transit commission. It was acquired by the Regional Municipality of Hamilton-Wentworth in 1977. It functions as a department of the Regional Municipality although, for all practical purposes, it is a stand-alone operation. The transit department reports to a standing committee of the Regional Council, the Transportation Services Committee. The chair of the Transportation Services Committee is nominated and elected by the regional council for a three year term. The commissioner of Transportation Services officially reports to the Chief Administrative Officer but also reports to the standing committee.

The area serviced by the transit system is not congruent with the boundaries of the Hamilton-Wentworth region. There is a Transit Service Area which defines the area serviced by the buses. The Regional Council determines the level of service, sets the fares and levies taxes in the urban transit area (UTA). In Hamilton, there is a levy for transit services. In municipalities other than Hamilton, bus services are contracted to the municipalities. The local municipality determines the level of service and there is a formula to calculate the cost that the HSR charges the municipality. Although the service may only be in the urban district of the municipality, the charge is applied to everyone in the municipality. While the Regional Municipality controls activities on regional streets, the local streets are the responsibility of the municipality. Thus, the location of some bus stops and the exact routing may come under dispute between the local and regional municipalities.

The cost of operating the transit system at present is approximately \$52 million. Of that, \$9 million comes from an operating grant from the province, although the formula for the grant has been capped and is now being rolled back. The drop in ridership has caused costs to rise and recent additional costs including the social contract initiated by the province and a Workers' Compensation Board buy-out have placed financial pressures on the HSR.

Approved capital expenditures such as buses are funded up to 75% by the province. The replacement cycle for buses is 18 years. Buses are on shorter term debentures while other capital expenditures such as buildings and garages are on longer term debentures.

Halifax

Halifax is the capital and major city in Nova Scotia. The Metropolitan Authority was created in 1978 to provide regional services for the City of Dartmouth, the City of Halifax, the Town of Bedford and the Halifax County Municipality. These municipalities were amalgamated into one single-tier municipality on April 1, 1996. Unless otherwise noted, the discussion in this paper covers the years from 1992 to 1994, prior to amalgamation. The Halifax region at that time was organized as a weak two-tier system with the Metropolitan Authority as the upper-tier of government in the region. The Authority was governed by a twelve member Board of Directors, the mayor and two councillors from Halifax, Dartmouth and the Halifax County Municipality and the mayor and one councillor from Bedford. The chair was independently chosen by the board and was not an elected official. The two main responsibilities of the Authority were transit and solid waste. Budgets were set by the Authority

and charged to the municipalities. Some have argued that the failure of the Metropolitan Authority to take on additional regional responsibilities was a driving force behind the amalgamation.

The new Halifax Regional Municipality (HRM) has a population of 350,000, which is over 1/3 the population of the province, and stretches over 200 kilometres. Approximately 20,000 people are rural residents with the rest living in the urban area of the Halifax metropolitan region. The Council of the amalgamated municipality is composed of 23 councillors elected by ward and a mayor elected at large. HRM is now responsible for services such as transit, sewer and streets. Consideration is being given to community committees as a means of dealing with local issues. The water system in the new municipality is owned and operated by a separate Commission, the Halifax Regional Water Commission, which has taken over responsibility for water services that previously existed in the region. Although it has a separate administration for the delivery of water services, it does have some ties to the Regional Council.

Sewer and Water

Prior to amalgamation there were three water utilities: the Halifax County Water Utility, the Dartmouth Water Utility and the Halifax Water Commission. The Halifax Water Commission, which was owned and operated by the city, provided water to Halifax and water in bulk to parts of the Halifax County Municipality. The City of Halifax distributed water locally. After Bedford incorporated as a separate municipality, it continued to have its water supplied by the Halifax County Municipality. Dartmouth had its own water utility. As well as serving Dartmouth, it also supplied water to certain areas within the Halifax County Municipality. All residential units were metered and water rates were based on usage. In Dartmouth and in the areas of the County serviced by Dartmouth, there was a waste water management charge on the water bill to cover the cost of waste. In areas where the County delivered water services on its own, the service functioned within the departmental structure of the County.

Halifax and Dartmouth had no sewage treatment facilities, but they did have their own pipes and their own collection and disposal system. The Halifax County Municipality owned treatment facilities which also treated sewage from certain areas in Halifax and Dartmouth. The County charged Halifax and Dartmouth directly for these services. Bedford had its own sewage collection but the treatment facility located in Bedford, which served all but a few subdivisions in the municipality, was owned and operated by the County. The treatment plants in Bedford and the Halifax County Municipality handled waste from the other municipality and therefore there was some cost sharing of the facilities between the two municipalities. The sewage systems in Bedford and the Halifax County Municipality were generally financed through revenues from a sewer area rate and a waste water maintenance charge, with maintenance, upgrading and repairs a departmental responsibility.

Sewer was a municipal responsibility provided to areas within defined boundaries for urban development. In the City of Halifax, it was the responsibility of the Engineering Department whose services included sanitary sewers, roads, storm drainage and pollution control. The municipal sewer rate was established by by-law. The operating costs for both trunk lines and local sewers were included in the rates. Waste was completely self-financing and although it operated as a municipal department it functioned as a utility. No conscious effort was made to create a surplus that could be used as general revenues.

In the City of Halifax local water and sewer services, although operated as departments, were self-supporting. The rates were determined by the cost of service and were included on the water bill.

Rates amongst the municipalities for sewer and water varied. In Halifax and Dartmouth, there were two charges: one for the costs of operations and the other, a Pollution Control Charge, for capital costs. This dedicated pollution control charge was sometimes considered a reserve fund and there is now up to \$50 million in the Pollution Control Reserve account for treatment facilities. The pollution control charge has been used by Halifax for capital expenditures such as the extension of sewers to an industrial park. Dartmouth, with provincial approval, did use some of this reserve in general revenues. The tradition in Halifax was pay-as-you-go while the other municipalities tended to borrow for capital infrastructure.

Summary of Political and Administrative Structures

Regional Structure: The Halifax Metropolitan Region, up until its amalgamation on April 1, 1996, was a weak two-tier system of local government with the Metropolitan Authority as the upper tier and four municipalities, Halifax, Dartmouth, Bedford and the Halifax County Municipality at the local level.

Size of Council: the Metropolitan Authority had a 12 member board of directors composed of the mayor and two councillors from Halifax, Dartmouth and the County and the mayor and one councillor from Bedford. The Chair was chosen by the board and was not an elected official.

Water: Halifax Water Commission, owned and operated by Halifax, provided water to Halifax and to parts of the County in bulk which in turn provided water to Bedford. The County also supplied and distributed water to small hamlets outside the urban area. Dartmouth had its own water utility which provided water to Dartmouth and parts of the County. Water services generally were operated as self-supporting utilities.

Sewage: Halifax and Dartmouth operated their own collection systems with disposal mostly into the Halifax Harbour. The County and Bedford had their own treatment facilities which covered nearly all the built up areas in their municipalities. In general the municipalities operated their sewage services through departments with inter-municipal agreements used when services were shared.

Transit

Although the Regional Transit Act in the early 1980's established the Regional Transit Commission, the Halifax area was not include in this act and was described separately in the Metropolitan Authority Act. Originally created as a separate commission, Metro Transit was subsequently changed to a line department of the Metropolitan Authority. Until April 1995, there were per capita operating grants from the province based on area of service but unrelated to service levels. Currently the fare box collects up to 70% of operating costs. Capital grants from the province cover 50% of the cost of buses.

The Metropolitan Authority Act established a cost-sharing formula for transit funding which was mileage based. Since much of the Halifax County Municipality is rural, the Metropolitan Authority sent out a bill using area rates that related to the level of service within the County. With the amalgamation, this cost-sharing formula is no longer required although the need to establish boundaries for urban and rural tax structures is now under review by the new municipality. The formula has created some difficulties. In the Halifax County Municipality, a charge was levied against property in urban areas while in the cities of Halifax and Dartmouth the charge was paid from general revenues. Provincial operating grants, which amounted to about 7% of total costs, were

discontinued in the 1994-5 fiscal year. Debentures for capital expenditures are usually for 10 years. Since the provision of reserves for capital replacement was not permitted, Metro Transit had no flexibility to establish a vehicle reserve fund for bus replacement until amalgamation. The bus fleet is 170 buses and 8 to 10 buses are purchased each year.

The profile of the five cities identifies some of the differences and similarities that exist among the cities. The complexities of the two-tier systems in Victoria and Halifax suggest that the municipal administrative and political organization do have an influence on how services are delivered. On the other hand Hamilton, although a two tier-system, has a more clearly defined division of responsibilities between the municipalities and the regional government, particularly when it comes to water, sewer and transit. Thus, the delivery of these services in Hamilton is similar to that of the two prairie cities included in the study. In many ways the single-tier structure of Winnipeg and Calgary allow for simpler administration and delivery of services. Control of expenditures and revenues are not complicated by split jurisdiction and both the monitoring and the political control of departmental or utility activities are more easily tracked.

The extent to which this can be related to the quality of the service is made difficult by the shortage of common data and the lack of consistent performance measures. The next sections of the report, as they look at the expenditure and revenue patterns of the five cities, do attempt to show how the trends in the delivery of the three services, water, sewer and transit, have evolved over the three year period covered in this study.

A COMPARISON OF EXPENDITURES, REVENUES AND CONDITION ASSESSMENT

While each city delivers its services in slightly different ways, the five cities do divide into two distinct groups. Calgary, Winnipeg and Hamilton deliver water and sewer services through an administrative structure that deals with the city as a single area. In contrast both Victoria and Halifax have structures that divide the responsibilities and services between regional and local authorities. This creates a complicated inter-relationship amongst neighbouring municipalities and has resulted in an incomplete analysis of expenditures and revenues. In the case of transit the cities are also divided into the same two groups. Although all five cities operate the transit system as a single agency at the regional level, the systems are of different scales and Victoria and Halifax operate much smaller systems than Calgary, Winnipeg and Hamilton.

The Delivery of Sewer and Water in Calgary, Winnipeg and Hamilton-Wentworth

The three cities, Calgary, Winnipeg and Hamilton, have very similar administrative systems for the delivery of sewer and water. Although Hamilton has a two-tier political and administrative system, sewer and water are the sole responsibility of the Hamilton-Wentworth Regional Municipality. All operate as self-supporting utilities and are administered by a single department/agency for the delivery of all aspects of the sewer and water services. The information is gathered in a similar, if not identical fashion, and each of the systems self-finances both operating and capital expenditures. As such, borrowing costs are tied to the sewer and water rates and are not reflected in the property tax bill.

**Table 3:
Calgary Waterworks: Expenditure and Revenue Comparison: 1992-94 (\$000s)**

Population	717,100.0			727,700.0			738,100		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
Franchise Fees	9,294.0	10.9		9,577.0	10.9		10,271.0	11.8	
Financing Charges	29,805.0	34.8		29,462.0	33.7		29,909.0	34.4	
Production	10,528.0	12.3		10,576.0	12.1		10,679.0	12.3	
Distribution	17,117.0	20.0		17,670.0	20.2		15,676.0	18.0	
Other Expenditures ¹	18,861.0	22.0		20,251.0	23.1		20,557.0	23.6	
Total	85,605.0	100.0	119.37	87,536.0	100.0	120.29	87,092.0	100.0	117.99
Expenditures									
Revenues:									
Recoveries	6,982.0	6.6		7,617.0	7.0		7,930.0	6.9	
Revenues	98,487.0	93.4		100,570.0	93.0		106,883.0	93.1	
Total Revenues	105,469.0	100.0	147.08	108,187.0	100.0	148.67	114,813.0	100.0	155.55
Surplus or (Deficit)	19,864.0		27.71	20,651.0		28.38	27,721.0		37.56

1 Other Expenditures include customer billing/collection, depreciation, administration and engineering and one-time costs.

Calgary

While the water and sewer systems are well established in all five cities, Calgary, as the newest city with a healthy tax base, has an infrastructure system that is in good condition. Both sewer and water, as utilities owned and operated by the city, are used as sources of revenue for the city. A return on investment and a franchise fee are charged by the city. Thus Calgary, of all the cities reviewed in this study, uses the utilities as a means of the keeping the level of property taxes down.

Because much of the growth in Calgary occurred after 1950, the infrastructure is relatively new and all older combined sewers have been separated since the late sixties. As shown in Tables 3 and 4, in addition to the approximately 11% to 12% of expenditures for water and sewer allocated as franchise fees, there are substantial surpluses in both utilities. Of the surplus for the sewer utility of \$17.0 million in 1992, \$6.9 million was transferred to general revenues as a return on equity. The remainder of the surplus in any year is used by the utility for ongoing capital construction, with part used as a contribution to the reserve fund for future capital expenditures. During the period of this study, the financial charges are approximately 22% of revenues for both sewer and water. Using the surpluses available, the utility has moved to pay-as-you-go for capital construction and debt servicing is being phased out.

During the past decade Calgary has pursued an aggressive watermain replacement program. As a result, there was higher than normal borrowing and debt servicing was approximately 28% of expenditures. As with the sewer utility, the franchise fee was approximately 12% of expenditures and a portion of the surplus in each year goes to general revenues. In 1992, \$9.6 million of the \$19.9 million surplus was the return on equity.

The water utility uses a Geographic Information System (GIS) and a Condition Assessment Model (CAM) to assess what replacements and upgrades need to be done. A maintenance management system is used along with the GIS and CAM to determine the maintenance schedule. The sewer

Table 4:
Calgary Sanitary Sewer: Expenditure and Revenue Comparison: 1992-94 (\$000s)

Population	717,100			727,700			738,200		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
Franchise Fees	7,001.0	11.7		7,222.0	12.0		7,575.0	11.9	
Financing Charges	13,880.0	23.1		13,560.0	22.5		14,510.0	22.7	
Maintenance	9,344.0	15.6		9,454.0	15.7		10,414.0	16.3	
Treatment Plants	13,854.0	23.1		14,148.0	23.5		13,984.0	21.9	
Depreciation	8,302.0	13.8		8,441.0	14.0		11,550.0	18.1	
Other Expenditures ¹	7,615.0	12.7		7,506.0	12.4		5,792.0	9.1	
Total Expenditures	59,996.0	100.0	83.66	60,331.0	100.0	82.90	63,825.0	100.0	86.46
Revenues:									
Recoveries	1,963.0	2.5		2,358.0	3.0		1,948.0	2.4	
Revenues	75,038.0	97.5		76,436.0	97.0		79,363.0	97.6	
Total Revenues	77,001.0	100.0	107.38	78,794.0	100.0	108.28	81,311.0	100.0	110.15
Surplus or (Deficit)	17,005.0		23.72	18,463.0		25.38	17,486.0		23.69

¹ Other expenditures include administration/general, customer billing/collection, and inspection.

The water utility uses a Geographic Information System (GIS) and a Condition Assessment Model (CAM) to assess what replacements and upgrades need to be done. A maintenance management system is used along with the GIS and CAM to determine the maintenance schedule. The sewer utility, already included in the GIS, is in the process of developing similar systems to assess maintenance and replacement needs. The maintenance management system has been used for some time at the treatment plants and is now being used in the sewage collection and transmission systems.

Calgary has evolved a sophisticated matrix for establishing the replacement schedule for the water lines. The items in column 1 of the table below are assessed against the items in column 2 for both cast iron and ductile water pipes.

Column 1	Column 2
<ul style="list-style-type: none">• The number of breaks per kilometre per year over a 5 year span for pipes <200 mm.• The number of breaks per kilometre per year over a 5 year span for pipes >200 mm.• The number of breaks per kilometre per year over the life span for pipes <200 mm.• The number of breaks per kilometre per year over the life span for pipes >200 mm.• Ratio of complaints to property damage for pipes <200 mm.• Ratio of property damage to condition assessment analysis for pipes less than 200 mm.	<ul style="list-style-type: none">• Water lines approved for replacement in previous year but not yet completed.• Water lines promised in previous years but not yet approved or undertaken.• Size of pipe: <200 mm and >200 mm.• Paving schedule in relation to condition of underground services.• Fire protection needs and pressure in pipes.• Number of complaints• Property damaged by water line breaks.• Condition assessment

The condition assessment is based on an analysis of the estimated life spans of the water mains. The life spans are determined by the corrosion rate of the soil, high, medium and low, by the types of pipes used, thick wall cast iron (pre-1955), thin wall cast iron (1956 and after) and ductile iron (1965 and later), and by the age of the mains. Given the ongoing analysis, availability of resources and aggressive watermain replacement program, the water distribution system is in good condition.

While the analysis of sanitary sewer collection lines is not as far advanced as that of the water mains, the age of the system and the available funding has meant that the sanitary sewers are in good condition as well. Even so Calgary is reviewing the long-term construction plans for sewer replacements against the age and likely rate of deterioration of the system. As a result, they have projected a potential peak problem for sewers in the years beginning around 2025. As their analysis shows, there may be limited need for sewer replacements in the early part of the next century. Unless plans are made, either to set money aside for future replacement needs or to begin replacing sewers in advance and in anticipation of the need, Calgary could find itself short of adequate funding for the replacement of its sewers when it is most needed..

The maintenance and repair of the sewer and water systems are generally undertaken by city forces in the respective department. For new construction and replacement of lines in 1994, approximately 85% of the sewer work and 57% of the water work were contracted out.

Summary of Condition Assessment

Water: Calgary has sophisticated assessment methods for both water and sewer services. For water, it is based on a condition assessment model and an analysis of the estimated life spans

of the water mains. Life spans are determined by the corrosion rate of the soil, the types of pipes used and the age of the mains.

Sewage: the condition of the sanitary sewers is assessed through a combination of field inspections, both during maintenance and when responding to complaints, and through a review of CCTV tapes taken on a regular basis.

Winnipeg

The first quarter of this century was a period of rapid growth in Winnipeg. The last quarter of this century has been a period of slow growth. As a result much of the underground services is aging and in need of repair. While the sanitary treatment system and the water distribution system have undergone significant upgrading in recent years, the sewer collection system has not had the same attention.

Over the past decade Winnipeg has undertaken an aggressive replacement and preventative program for its water distribution system. A frontage levy initiated in the late eighties provided increased funding for water line replacements. Water lines are considered for replacement when there are five breaks per kilometre per year. Replacement schedules also are coordinated with paving and road construction. Prior to the frontage levy, however, there was not adequate funding to keep pace with the number of breaks and only lines with many more breaks per kilometre were being replaced. With the additional funding from the frontage levy, the city is now able to meet (or at least approach) the goal of replacing pipes with five breaks a year.

In the early nineties, following a consultant's report, the city initiated a cathodic protection program to reduce the amount of corrosion in the pipes. When metal pipes were repaired at the time of a break, an anode was attached to the pipe as passive cathodic protection. There is evidence that cathodic protection has been an effective method of extending the life of the cast iron pipes and this program has been expanded both by adding anodes independent of breaks and by the use of electric charges. In conjunction with the National Research Council (NRC), the city is undertaking soil testing for resistivity and relating this to the rate of corrosion. Other variables being considered in the NRC study include frost and climatic conditions. Both the water and sewer systems now are identified on GIS. As a result of the preventative and replacement programs, the number of water breaks has been cut in half during the past decade. There is general satisfaction with the level of funding and the condition of the water lines in Winnipeg.

The funding for sewer maintenance is less than that available for the water lines even though the cost of replacing sewers is higher. At present the sewer replacement schedule is less than 0.5 per cent of the pipes per year and some have argued that the replacement cycle is over 700 years. Winnipeg also has a number of old clay pipes, particularly in the inner city, that are subject to leakage and collapse. The condition of the sewer system is assessed through a review of CCTV tapes which are kept up-to-date. Using the tapes the sewer conditions are rated, a scoring system applied and the replacement schedule developed. This schedule is adjusted as required to meet sewer breaks. As much as 50 per cent of the sewer system has combined storm and sanitary sewers and there is not a program for their separation. With inadequate funding and an aging system, a portion of the sewers in Winnipeg is in need of repair and replacement.

A large component of the construction of new sewer and water lines is contracted out. The city maintains a work force to undertake emergency repairs and the same in-house work force is used for both sewer and water and charged back to the individual utility. Tables 5 and 6 outline the expenditures and revenues for the years 1992, 1993 and 1994. The increases in debt charges from \$18.9 million to \$28.1 million over the three year period of this study are related to the completion of the capital projects at the Westend and Southend Wastewater Treatment Plants. It appears that extensive capital funding has, in recent years, been assigned to the treatment of sewage, while the sewers themselves have not been allocated an adequate level of funding. It is difficult to assess to what extent this is the result of environmental standards for outflows into the Assiniboine and Red Rivers.

In 1992, as shown in Table 6, \$13.8 million was allocated as a contribution to capital. As a consequence the deficit for the sewer utility in that year was \$12.9 million. The contribution was related to the construction of the Westend and Southend Wastewater Treatment Plants and came from a retained earnings fund. The fund is used to even out expenditures over the years and is maintained at approximately 20 per cent of the yearly revenues. In 1992 the retained earnings after the contribution to capital were over \$8 million on revenues of \$51.1 million.

Table 5:
Winnipeg Waterworks: Expenditure and Revenue Comparison: 1992-94 (\$000s)

Population	631,700			635,400			636,900		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
To General Revenue	5,223.8	11.3		4,470.1	9.6		4,080.4	8.3	
Municipal Taxes	2,621.6	5.7		2,768.3	5.9		2,698.0	5.5	
Debt and Finance Charges	9,377.7	20.3		8,572.6	18.4		9,697.8	19.7	
Contributions to Capital	604.7	1.3		354.6	0.8				
To Aqueduct Reserve							1,503.4	3.1	
Other Corporate expenditures	2,963.7	6.4		4,740.6	10.2		4,292.8	8.7	
Water Supply	9,400.9	20.4		10,353.6	22.2		10,430.4	21.2	
Water Distribution	15,906.0	34.5		15,435.7	33.1		16,478.2	33.5	
Total Expenditures	46,098.4	100.0	72.97	46,695.5	100.0	73.49	49,181.0	100.0	77.22
Revenues:									
Sale of Goods and Services	43,167.9	92.5		44,644.8	95.4		48,126.6	95.3	
Other Revenues	3,495.7	7.5		2,170.6	4.6		2,375.7	4.7	
Total Revenues	46,663.6	100.0	73.87	46,815.4	100.0	73.67	50,502.3	100.0	79.29
Surplus or (Deficit)	565.2		0.89	119.9		1.89	1,321.3		2.07

**Table 6:
Winnipeg Sewage Disposal: Expenditure and Revenue Comparison: 1992-94 (\$000s)**

Population	631,700			635,400			636,900		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
To General Revenue	4,996.9	7.8		5,045.6	9.0		5,394.0	8.7	
Municipal Tax	2,543.4	4.0		2,506.9	4.5		2,595.4	4.2	
Debt and Finance Charges	18,861.9	29.5		24,302.9	43.5		28,077.5	45.1	
Contributions to Capital	13,776.3	21.6							
Other Corporate expenditures	1,269.0	2.0		1,856.8	3.3		2,603.4	4.2	
Sewage Interception and Treatment	17,494.8	27.4		17,709.2	31.7		18,613.6	29.9	
Sewage Collection and Sewer Service	4,984.2	7.8		4,490.2	8.0		4,969.8	8.0	
Total Expenditures	63,926.5	100.0	101.19	55,911.6	100.0	87.90	62,253.7	100.0	97.74
Revenues:									
Sale of Goods and Services	47,188.9	92.4		53,529.1	96.1		56,576.2	95.9	
Other Revenues	3,867.9	7.6		2,165.2	3.9		2,438.1	4.1	
Total Revenues	51,056.8	100.0	80.82	55,694.3	100.0	87.65	59,014.3	100.0	93.61
Surplus or (Deficit)	(12,869.7)		(20.37)	(217.3)		(0.25)	(3,239.4)		(4.13)

While debt and financial charges are in the range of 20% for the water utility, they are much higher, 43.5% and 45.1%, in 1993 and 1994 respectively for the sewage utility. This reflects the upgrading and construction of new treatment facilities but it also means that few resources are available for the maintenance and repair of the sewer system. While Winnipeg has not used revenues from the utilities to the same extent as Calgary, it does transfer from 8% to 11% of revenues to general revenues and another 4% to 6% in lieu of municipal taxes. In 1996, Winnipeg formalized the equivalent of a franchise fee of 10% from each utility.

Summary of Condition Assessment

Water: replacement of pipes is determined by the number of breaks per kilometre. In conjunction with the NRC, Winnipeg is undertaking a study that includes soil testing for resistivity and relating this to the rate of corrosion of water pipes.

Sewage: the condition of the sewer system is assessed through a review of CCTV tapes which are kept up-to-date. Using the tapes, the sewer conditions are rated, a scoring system applied and the replacement schedule developed.

The Regional Municipality of Hamilton-Wentworth

Like Winnipeg, Hamilton is an older city. As with most cities, since the Second World War, much of the growth in the region has been in the suburbs with relatively new underground services. There are, however, some unique problems with the corrosion of water pipes and the relationship between the road construction and the lifespan of the water mains. As a relatively recent regional government, formed in 1974, the regional municipality has a mixture of age and type of pipes. Since water and sewer are the responsibility of the regional level of government, there is only one tier of government dealing with these services. This does provide the opportunity for some coordination of the analysis and upgrading of the systems.

Hamilton-Wentworth has relied on life-cycle assessments to determine the condition and replacement schedule for its water and sewer mains. A recent problem with the rapid corrosion of the ductile pipes has been witnessed in Hamilton. Slag from the steel mills is considered an excellent backfill for road beds and has been used extensively in recent years in the construction of new streets and roads. What

Table 7:
Hamilton-Wentworth Water Works: Expenditure and Revenue Comparison: 1992-94 (\$000s)

Population ¹	472,693			475,521			477,541		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
Water Treatment	4,218.2	14.3		4,685.8	15.4		4,403.4	11.9	
Debt Charges ²	6,228.8	21.2		5,506.0	18.1		5,396.0	14.6	
Transfer to Capital ²	7,234.2	24.6		8,083.0	26.6		9,323.0	25.2	
Other Financial Expenses ²	911.9	3.1		1,038.6	3.4		1,459.7	3.9	
Infrastructure Maintenance	5,255.8	17.9		5,806.5	19.1		10,977.4	29.6	
General Expenses	3,491.9	11.9		3,517.3	11.6		3,848.9	10.4	
Other Expenditures	2,101.0	7.1		1,724.5	5.7		1,642.2	4.4	
Total Expenditures	29,441.7	100.0	62.28	30,361.7	100.0	63.84	37,050.6	100.0	77.58
Revenues:									
Transfers	1,719.4	5.8		882.6	2.9		3,381.0	9.1	
Transfer -Debt							3,601.3	9.7	
Water Sales	25,191.3	85.6		27,307.6	89.9		28,600.7	77.2	
Other Revenues	2,531.0	8.6		2,171.5	7.2		1,467.6	4.0	
Total Revenues	29,441.7	100.0	62.28	30,361.7	100.0	63.84	37,050.6	100.0	77.58
Deficit or (Surplus)	0.0			0.0			0.0		

1 The estimated population for 1994 is an average of the 1993 and 1995 population estimates.

2 Debt charges and transfers to capital are based on budgeted figures for 1993-4 and 1994-5. Other expenses, combined with debt charges and transfers to capital for those years, reflect actual financial expenditures. Thus total expenditures and revenues are actual figures.

was not anticipated was the effect that the high sulphuric content of the soil would have on the watermains that were replaced at the time of the road construction. There are signs of significant corrosion and unacceptable levels of watermain breaks with some occurring in as little as five years. This is an emerging, rather than an ongoing, problem and life-cycle analysis is not adequate for determining the replacement schedule. Since the problem is too recent to rely on trend analysis for assessing future replacement and repair requirements, the municipality is undertaking a review of the situation and trying to project the number of breaks that can be anticipated. One approach that is being considered is the use of plastic rather than ductile pipes to minimize corrosion.

Adequate funding exists for the minor repair and maintenance of the water distribution system but there is a need, given the emerging corrosion problems, for additional funding for replacement, inspections and preventative maintenance. There is some indication that the sewer collection system is less well funded for both minor repairs and maintenance and for replacement. As with Winnipeg, there appears to be a tendency for funding to be directed toward the sanitary treatment facilities, possibly at the expense of the collection system.

Hamilton-Wentworth has a relatively high level of contracting out of its work. Basically all new work and replacement of water and sewer lines are contracted out by tender. In addition, nearly all the minor repairs and maintenance of the sewer lines are contracted out as well. Most of the minor repairs and maintenance of the water lines are done in-house by Hamilton-Wentworth forces. Given that the operation of the treatment plants also has been privatized since 1994, Hamilton-Wentworth, of all the cities studied, has moved the farthest with its contracting out.

The privatization of the treatment facilities was based on previous budgeted figures for the operations of the facility and did not necessarily reflect actual expenditures which may have been less. Philip Utilities Management Corporation (PUMC) agreed to save the municipality \$500,000 a year over the budgeted figures, which amounts to approximately 3% of the budget costs of operation. There also is an overhead and administrative cost to PUMC of approximately \$200,000, which was previously included in the budget of the treatment facilities.

As Tables 7 and 8 show, the expenditures for both sewer and water have remained relatively constant over the three year period of the study. The one exception is the doubling of infrastructure maintenance expenditures between 1993 and 1994. The winter of 1994 was an abnormally severe one and there was a dramatic increase in frozen lines and watermain breaks. Infrastructure maintenance costs in 1995 returned to 1992 and 1993 levels. Nearly 25 percent of expenditures are a transfer to capital for, as much as possible, pay-as-you-go financing of capital projects. Debt charges of approximately 18% include both external borrowing and internal borrowing from reserve funds.

Hamilton-Wentworth does not use the utilities as a source of revenue, with any surpluses or deficits transferred to or from general revenues. Thus, for example the Water Works received from 2.9% to 9.1% of its revenues in transfers and the Sewer Works transferred 0.7% of its revenues in 1993 and received 6.9% and 5.3% in transfers in 1992 and 1994 respectively. Even so some requests for funds from the utilities for such items as the social contract may be interpreted as a transfer of funds to the general revenues of the Regional Municipality.

Table 8:
Hamilton-Wentworth Sewage Works: Expenditure and Revenue Comparison: 1992-94 (\$000s)

Population ¹	472,693			475,521			477,541		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures:									
General Expenses	4,739.2	15.1		2,489.4	8.7		3,317.9	10.3	
Treatment Plants - Operations	6,107.4	19.5		6,381.0	22.3		6,192.8	19.2	
Debt Charges ²	6,984.9	22.3		6,245.2	21.9		7,049.2	21.9	
Transfer to Capital ²	7,775.8	24.8		8,013.0	28.0		8,475.0	26.3	
Financial Expenses ²	1,437.5	4.6		2,008.4	7.0		3,749.8	11.7	
Infrastructure Maintenance	1,078.6	3.4		804.9	2.8		494.1	1.5	
Treatment Plant - Maintenance	2,578.8	8.2		2,476.0	8.7		2,738.0	8.5	
Other Expenditures	653.7	2.1		158.3	0.6		165.9	0.5	
Total Expenditures	31,355.9	100.0	66.33	28,576.2	100.0	60.09	32,182.7	100.0	67.39
Revenues:									
Transfers	2,158.5	6.9		(205.9)	(0.7)		1,716.9	5.3	
Sewer Rates: metered and non-metered, etc.	25,799.7	82.3		25,386.1	88.8		26,244.4	81.5	
Other Revenues	3,397.7	10.8		3,396.0	11.9		4,221.4	13.1	
Total Revenues	31,355.9	100.0	66.33	28,576.2	100.0	60.09	32,182.7	100.0	67.39
Surplus or (Deficit)	(0.0)			(0.0)			0.0		

1 The estimated population for 1994 is an average of the 1993 and 1995 population estimates.

2 Debt charges and transfers to capital are based on budgeted figures for 1993-4 and 1994-5. Other expenses, combined with debt charges and transfers to capital for those years, reflect actual financial expenditures. Thus total expenditures and revenues are actual figures.

Summary of Condition Assessment

Water: Hamilton-Wentworth has relied on life-cycle assessment and trend analysis to determine the condition and replacement schedule for its water mains.

Sewage: Video inspections and problem response are used to determine the condition of the sewer system. A life-cycle assessment process is being developed.

The Delivery of Sewer and Water in the Victoria and Halifax Metropolitan Regions

Of the municipalities studied, the delivery of sewer and water in the Victoria Capital Regional District (CRD) and the Halifax metropolitan area are the most complicated. Given the split jurisdictions, the number of municipalities and the lack of coordination in the delivery of the

services, the gathering of data was difficult and there is little consistency in information between the municipalities in each region. While Halifax did have a metropolitan authority during the years of the study, its responsibilities were restricted to transit and solid waste. As such, it had little influence on the delivery of sewer and water services. The Nova Scotia provincial government does develop municipal statistics annually which give aggregated figures for sewer and water and these have been used in gathering information on the four Halifax regional municipalities.

The municipalities in the Victoria region and the Capital Regional District share responsibility for the delivery of water and sewer services but the administration, delivery and the type of service vary from municipality to municipality. In contrast to the other cities in the study, the transit service is delivered by the provincial government with some local control being exercised through a transit authority made up of representatives from the municipalities.

Before the amalgamation of Halifax, the water systems in the Victoria and Halifax regions were similar in that specific municipalities within the region owned and operated a separate water commission. In the Halifax region, a water commission was owned by the City of Halifax and both Dartmouth and the County had their own water utilities. In Victoria the water commission, owned by four municipalities, Victoria, Esquimalt, Oak Bay and Saanich, also provides both retail and wholesale services in other municipalities of the CRD.

Victoria and the Capital Regional District

There is limited coordination of the data in the CRD for the delivery of sewer and water services. The CRD retains responsibility for the operation, maintenance and construction of sewer and water trunk lines. While the CRD also has certain responsibilities for the delivery of water and sewer services in the outlying municipalities and the Saanich peninsula, the older built up areas of the Victoria region deliver water and sewer services at the local level. Thus, the jurisdiction and responsibility is unevenly split between the local municipalities and the Capital Regional District.

Considering its age, the City of Victoria's sewer and water infrastructure are in adequate condition while the infrastructure in the CRD, being relatively new, is in good condition. While there are some problems with water lines in the City of Victoria, a program to reline the pipes is now underway. There are some peak problems in capacity in summer with lawn watering and irrigation.

The City of Victoria acquires its water in bulk from the Greater Victoria Water District (GVWD) and distributes it using city owned and maintained mains and local lines. Since water is run as a utility and there is a predictable level of funding, the capital expenditures are on a pay-as-you-go bases. The process for determining the condition and the repair and maintenance schedule is based on two types of analysis, a time-to-failure and a network analysis. The former is based on the age of the system and the rate of expected replacement while the latter is a computer model which analyzes the capacity of the system and the projected growth. Since most of Victoria is built-up, projected growth usually relates to proposed medium or high density developments which may have an effect on the capacity of the system.

In the City of Victoria, capital works for sewer and storm drains are funded through borrowing and general revenues. The debt becomes part of the general debt of the municipality. In keeping with trends in other cities, Victoria is slowly moving toward a pay-as-you-go capital program. A priority for capital projects is placed on improving the separation of storm and sanitary drainage. Although the storm and sanitary sewers are mostly separated, there is some leakage and overflow from sanitary sewers into the drainage system.

Storm drainage, not included in this study, is the responsibility of the municipality. There is very little inter-municipal drainage and therefore no inter-municipal arrangements. Generally, whatever drains into a municipality is that municipality's responsibility. In Victoria, CCTV cameras are used for inspections of storm drains. Repairs, maintenance and upgrading are done through general revenues and storm catchment management is used as an operating technique. This includes the cleanup of catchment areas to prevent pollutants at storm drainage outflows near public beaches. A harbour cleanup program has placed pressure on Victoria to reduce contaminants where storm sewers drain into the beaches around Victoria.

On the operating side, there is a sewer charge on the utility bill which covers some of the costs of sewer, water and solid waste. Other sources of funding include a frontage charge on tax bills, connection fees, provincial grants and general revenues. Sewer charges are based on the winter water bill cycle since, during the summer months, water usage is higher due to the irrigation of lawns.

There is an annual budget for extended maintenance for the replacement and repair of sewers identified as in serious need of repair in Victoria. The schedule for this is based on analysis of CCTV inspections. The costs are included in the budgets and the expenditures are matched with revenue increases. These are not considered capital expenditures but rather long term maintenance costs. This maintenance is done gradually. Prior to any major work the sewers are checked by CCTV inspections. Usually about 10 to 15% of a particular line needs replacing on older pipes from the 1910-15 era. Although on occasion this is done by excavation with deteriorated sections being cut out and replaced, in most instances pipes are relined from manhole to manhole without excavation. In some pipes, aggressive soil conditions have caused corrosion but it is limited and only occurs in certain areas.

The major method for determining the conditions of the sewers is through the review of the CCTV tapes. In general, the CCTV analysis is done on sewers which are in areas where road construction is planned and on sewers which have given problems in the past. There is no specific long term identification of the condition of the sewers and construction activity tends to be related to problems as they arise. There is some pressure for treatment facilities to be built and, while CRD is investigating the costs and potential locations for such a facility, it is not a priority.

Municipalities pay for both the operating and capital expenses of the CRD. Operating costs are charged to the municipality by the CRD on the amount of flow from the municipality into the trunk sewers. Regional trunk lines are owned and operated by the CRD. The flows are metered on entry to the trunk lines and operating costs of the CRD are charged back to municipalities. Capital expenditures are based on capacity rather than flow and the amount of debt servicing is included in the operating costs. The CRD does the borrowing through the Municipal Finance Authority which borrows for local governments.

Table 9a: Greater Victoria Water District: Expenditure and Revenue Comparison: 1992-94 (\$000s)			
	1992-3	1993-4	1994-5
Expenditures:¹			
Wholesale Water Operation			
Operations and Maintenance	2,997.1	3,619.4	3,865.8
Other Expenses	1,759.5	740.1	876.9
Retail Water Operations			
Distribution System	1,849.9	2,275.2	1,831.6
Cost of Water	682.8	855.7	1,147.7
Other Expenses	764.7	1,122.8	886.2
Financing Charges	464.4	372.8	302.2
Total	8,518.4	8,986.0	8,910.4
Expenditures			
Revenues:			
Wholesale Water Operation			
Municipalities	3,662.6	4,652.6	5,523.3
Capital Region Dist.	541.8	675.5	808.1
Outside Distrib. Syst.	682.8	855.6	1,147.7
Other Revenues	47.7	54.6	534.2
Retail Water Operation			
Metered water sales	3,112.1	3,080.5	3,346.0
Investment and other income	1,583.7	653.0	318.8
Other Revenues	346.1	245.4	189.4
Total Revenues	9,976.8	10,217.2	11,867.5
Forestry:			
Forestry Expenses	1,886.9	518.2	396.1
Forestry Revenues	2,102.1	577.6	112.2
Forestry Total	215.2	59.4	(283.9)
Surplus or (Deficit)	1,673.6	1,290.6	2,673.2
1 Expenses do not include a provision for depreciation.			

GVWD has the major responsibility for providing, usually in bulk at wholesale prices, potable water to the various municipalities in the Victoria metropolitan region. Individual municipalities take on major responsibility for the retail sale and delivery of water at the local level. A recent report of the special commission on the Greater Victoria Water Supply (Perry, 1996) makes recommendations regarding the supply of water in the CRD. Unfortunately it does not deal with the issue of either the split jurisdiction in wholesale and retail responsibilities or in the supply and delivery of water. In

Calgary, Winnipeg and Hamilton, both regional and local responsibilities are consolidated in one service delivery agency. In the Halifax region those split responsibilities have now been combined with the recent consolidation of the four Halifax region municipalities. So Victoria remains the only city in the study that does not have a regional delivery system for water and for sanitary services.

As Tables 9a, 9b and 9c show, the costs of the delivery of water have been relatively constant during the three year period of this study, particularly when considered in relation to the growth in the Victoria region. Per capita figures for sewer and water services are not applicable because of the split responsibilities and the number of municipalities not included in the review of the Victoria metropolitan region. The population of the CRD, excluding the Gulf Islands and the four core municipalities, increased by 2% from 1993 to 1994 while the CRD expenditures on water increased by 7.8% over the same period. Between 1993 and 1994 the City of Victoria's population increased by 0.8% while the water expenditures increased by 3.4%. The expenditure of the GVWD decreased by 0.8% during the same period. The combined expenditures for the GVWD, CRD and Victoria water services increased by 1.6% while the revenues increased by 13% between 1993 and 1994.

Although the water system within the responsibility of the CRD is basically new, the Saanich peninsula does have areas of corrosive soil. Cathodic protection has been successfully used on metallic pipes to limit the corrosion. The CRD does testing of flow and pressure on water lines to monitor leakage.

Table 9b: Capital Regional District Water: Expenditure and Revenue Comparison: 1992-94 (\$000s)			
	1992-3	1993-4	1994-5
Expenditures:			
Administration	1.7	3.0	8.3
Bulk Purchasing	554.6	671.8	891.1
Contingency			
Service of Supply	690.7	667.5	633.9
Transfer to General Capital Fund	12.2	29.0	
Transfer to Reserve Fund		114.5	78.1
Debt Reserve Fund	52.3		
Total	1,311.4	1,485.8	1,611.3
Expenditures			
Revenues:			
User Charge	1,234.3	1,388.4	1,743.4
Other Revenues	49.3	97.4	1.7
Total Revenues	1,283.6	1,485.8	1,745.1
Debt Charges ¹	1,581.0		
Revenues from Municipalities to cover debt charges ¹	1,664.3		
Surplus or (Deficit)	55.5	0.0	133.8
1 Debt charges and revenues to cover debt charges were moved from the CRD water budget after 1992.			

**Table 9c:
City of Victoria Water: Expenditure and Revenue
Comparison: 1992-94 (\$000s)**

	1992-3	1993-4	1994-5
Expenditures:			
General Expenses	1,006.4	618.3	704.1
Purchase of Water	1,881.1	2,256.0	2,761.1
Maintenance of system	985.1	1,066.9	1,002.1
Replacement	786.7	601.1	541.0
New Services	530.5	611.2	736.7
Other Expenses	584.9	1,002.3	629.1
Total Expenditures	5,774.7	6,155.8	6,374.1
Revenues:			
Metered Rates	3,006.3	3,336.4	4,311.2
Service Charges	1,874.4	1,895.8	1,800.8
New Services - Connection fees	483.6	607.6	672.6
Other Revenues	729.1	403.4	227.3
Total Revenues	6,093.4	6,243.2	7,011.9
Surplus or (Deficit)	318.7	87.4	637.8

The CRD is in the fortunate position of having the majority of its sewer and water trunk lines built within the past two decades. Except for the Northwest and the Northeast sanitary trunks built in 1912 all other sewer trunks have been built in the past twenty years. The water trunks all have been built in the past fifteen years. As such there is limited need for replacements and repair of CRD operated trunk lines. The older Northwest trunk is inspected visually and repairs done manually. The Northwest sewer trunk is eight foot diameter which allows for visual inspections. Inspections of the whole system are carried out on a five year cycle and repairs and maintenance undertaken as required.

The cost of CRD sewer services, outlined in Table 10a, increased by 13% from 1992 to 1994. But during the same period the costs of the two older Northeast and Northwest trunks, which account for well over half of the sewer expenditures, increased by 21.7%. Because of accounting procedures used at the City of Victoria, storm drainage expenditures are added to the sewer expenditures and revenues. The costs of storm drainage is generally covered through tax-supported general revenues. As Table 10b shows, there has been a substantial increase in the sewer expenditures. This reflects the move by Victoria toward a pay-as-you-go policy for capital sewer expenditures.

**Table 10a:
Capital Regional District Sewers: Expenditure and Revenue
Comparison: 1992-94 (\$000s)**

	1992-3	1993-4	1994-5
Expenditures:			
Total: Administration Charges	0.6	6.0	6.0
Sewage: Sidney	385.8	434.9	533.4
Sewage: Bazan Bay	566.8	238.5	216.1
Sewage: C. Saanich	369.0	397.8	369.2
Sewage: East Coast Inter.	561.1	509.5	442.4
Sewage: Northeast Trunk	684.6	965.5	1,189.6
Sewage: Northwest Trunk	958.0	1,110.0	1,290.2
Total: Sewage Treatment and Disposal	3,519.3	3,656.2	4,040.9
Transfer: Sidney	5.5	19.5	
Transfer: Bazan Bay	1.4		32.0
Transfer: C. Saanich	1.4	2.5	
Transfer: East Coast Inter.			4.0
Transfer: Northeast Trunk		2.5	
Transfer: Northwest Trunk	80.0	8.3	4.0
Total: Transfer to General Capital Fund	88.2	32.7	40.0
Total: Other Expenditures and Recoveries		32.8	62.6
Total Expenditures	3,608.0	3,727.7	4,149.5
Revenues:			
Municipal: Sidney	400.3	474.2	455.1
Municipal: Bazan Bay	191.3	221.3	247.6
Municipal: C. Saanich	407.5	369.4	369.1
Municipal: East Coast Inter.	418.2	451.7	331.6
Municipal: Northeast Trunk	593.8	769.8	1,119.0
Municipal: Northwest Trunk	739.6	986.4	1,013.5
Total: Revenues from Municipalities	2,750.7	3,272.8	3,535.9
Other: Sidney	30.8	0.0	34.9
Other: Bazan Bay	411.7	18.3	34.3
Other: C. Saanich	0.7	51.7	30.7
Other: East Coast Inter.	202.2	193.2	205.1
Other: Northeast Trunk	183.1	198.8	124.3
Other: Northwest Trunk	335.7	174.4	281.7
Total: Other Revenues	1,164.1	636.3	711.0
Total Revenues	3,914.8	3,909.1	4,246.9
Surplus or (Deficit)	306.8	181.4	97.4

Table 10b: City of Victoria Sewers: Expenditure and Revenue Comparison: 1992-94 (\$000s)			
	1992-3	1993-4	1994-5
Expenditures:			
Design and Supervision	139.4	210.0	337.4
Maintenance	481.7	662.1	641.2
Replacement and Rehabilitation	170.5	242.2	136.2
Cleaning and Inspection	75.0	135.9	140.8
Debenture Costs			253.6
New Laterals			281.3
Other Expenditures	131.4	185.3	149.5
Total Expenditures	998.0	1,435.5	1,940.0
Revenues:			
Sewer Consumption	615.1	759.6	1,103.9
Sewer Frontage Tax	168.5	336.6	376.2
Provincial Sewer Grants	433.4	435.5	432.4
Connection Fees and Miscellaneous	202.3	218.6	236.4
Total Revenues	1,419.3	1,750.3	2,148.9
Surplus or (Deficit)	421.3	314.8	208.9
Storm Drainage Expenditures	1,419.3	1,750.3	2,148.9
Combined Storm and Sewer Expenditures	2,417.3	3,185.8	4,088.9

Summary of Condition Assessment

Water: In the City of Victoria conditions of the water system are determined by a time-to-failure analysis and a network analysis based on a computer model which analyzes the capacity of the system to handle future growth. The CRD does testing of flow and pressure on water lines to monitor leakage. The GVWD uses visual inspections and break frequencies and, in the western communities, it has an aggressive program for replacement of substandard pipes.

Sewage: In the City of Victoria the conditions of the sewer system are determined through the review of CCTV tapes. These are usually done in places where problems have occurred or when road construction is planned. The CRD carries out inspections of its system on a five year cycle.

The Halifax Metropolitan Region

During the period from 1992 to 1994, the Halifax region had a weak two-tier municipal structure with the Halifax Metropolitan Authority as the upper-tier responsible for solid waste and transit. The local municipalities were responsible for the sewer and water services. Since 1994, a pollution levy has been assessed against the water bill and the funds are earmarked for future capital projects, particularly the development of treatment facilities in support of the clean-up of the Halifax Harbour. At present, Halifax and Dartmouth do not treat their sewage and the outfalls go directly into the harbour. There are treatment facilities for Bedford and the urban areas of the County. Both Halifax and Dartmouth still have combined storm and sanitary sewers in the older areas.

The condition of the sewer system in Halifax was assessed through the use of CCTV tapes done for the whole system on a three to five year cycle. Specific funds were designated for infrastructure upgrades. Priorities for repair and replacement were determined by comparing the structural problems identified in the tapes, projected problems identified through a capacity analysis of present and future growth and the level of sewer back-up complaints received. Maintenance included the regular cleaning of catch basins. Halifax had a Geographic Information System (GIS) which extending into parts of Dartmouth. Expansion of GIS into other areas of the Regional Municipality is planned.

In Dartmouth, there was no planned program for assessing the condition of the water or sewer system although an ongoing maintenance program for lines known to be subject to tree root damage was in place. The methods used for determining maintenance and replacement schedules were based on the age of the pipes and on responses to problems as they arose. Some coordination of construction activities between the sewer and water systems and proposed road construction was undertaken.

The Halifax County Municipality delivered urban services to areas neighbouring Halifax, Dartmouth and Bedford. The county also included rural areas stretching over 200 kilometres which required very different types of services. For example, there are six water systems and five treatment systems to serve small communities outside the urban areas. The water system and much of the sewer system in the urban areas of the County are relatively new, having been constructed over the past thirty years. The water utility for the County purchased water from the Halifax Water Commission and established rates to cover the costs of both operating expenses and the County's share of the Commission's costs. The County operated three sewage treatment plants which served the urban areas surrounding Halifax and Dartmouth. In these areas there were no combined storm and sanitary sewers. While Dartmouth supplied water to the Cole Harbour area, the sewer treatment in Cole Harbour was done by the County.

Much of the construction for repairs and replacements, as well as all new sewer and water systems, were contracted out by the County. The County used TV inspections for all new construction with one inspection done at the completion of the work and a second approximately 10 months later before the warranty period had expired. The most common problems encountered were the sagging of PVC pipes and leakage from concrete pipes. Most of the sewer system in the County used PVC pipes while much of the water system used metallic pipes. The County also had a program of inflow infiltration tests to identify leakage in the sewer system. When leaks were found TV inspections were undertaken to determine the condition of the pipes.

The County had an aggressive leak detection program for the water system with zone meters used to check the rate of flows and to measure the leakage. All new construction was subjected to a strict pressure test. While some sewer and water construction was tied to road construction, the newness of the systems meant there were few problems of coordination of construction activities.

With four different municipalities with different populations, densities and resources, the sewer and water systems were operated separately, with inter-municipal agreements used where services were shared. There was cooperation between municipalities but at times when municipalities were in competition for industrial development some disagreements did arise. The treatment facilities and water systems of individual municipalities in some instances delivered services to other municipalities. But generally the municipalities operated the systems with their own administrative and financial arrangements. Because of this, it was difficult to assess the condition of the systems in the municipalities. Both Dartmouth and Halifax still have large areas with combined storm and sanitary sewers. Halifax and Dartmouth do not have treatment facilities and their sewage flows into the Halifax Harbour. Since the sewer systems in the County and Bedford are relatively new they appear to be in better condition than those in Dartmouth and Halifax. While the water systems are, as with other cities, in better condition than the sewer systems, Dartmouth's appeared to be in need of more work than the other municipalities in the Halifax region.

As can be seen from Table 11 and Table 13, expenditures for water services per capita are not

Table 11:
Halifax Metropolitan Region: Aggregate of Water Systems: Expenditures and Revenues
Comparison: 1992-94 (\$'000s)

Population ¹	330,846			330,752					
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Expenditures;									
Source of Supply	848.9	3.7		877.1	3.7		988.7	4.0	
Transmission & Distribution	8,546.8	37.7		8,901.7	37.5		8,969.1	36.4	
Admin. & Gen. Expenses	3,864.4	17.0		3,970.5	16.7		3,962.0	16.1	
Depreciation	2,626.5	11.6		2,674.4	11.3		3,028.0	12.3	
Municipal Taxes	809.7	3.6		862.0	3.6		841.8	3.4	
Capital Debt Charges	5,604.0	24.7		5,033.7	21.2		4,641.4	18.8	
Other Expenditures	369.0	1.6		1,389.0	5.9		2,220.1	9.0	
Total Expenditures	22,669.3	100.0	68.56	23,708.4	100.0	71.68	24,651.1	100.0	
Revenues:									
Water Sales	14,987.3	63.9		15,287.2	60.8		16,135.1	59.9	
Water Sales: other utilities	613.8	2.6		618.9	2.5		649.2	2.4	
Public Fire Protection	6,303.0	26.9		6,486.3	25.8		6,828.8	25.4	
Other Revenues	587.8	2.5		624.5	2.5		578.2	2.14	
Non-operating Revenues	968.6	4.1		2,134.5	8.5		2,734.2	10.2	
Total Revenues	23,460.5	100.0	70.91	25,151.4	100.0	76.04	26,925.5	100.0	
Deficit or (Surplus)	791.2			1,443.0			2,274.4		

1 Population figures for 1992-3 are from 1991 census and for 1993-4 from estimates prepared during study of amalgamation of the Halifax region which has a slightly lower population for the Halifax County Municipality. 1994-5 population figures not available.

dissimilar to those in the other cities in the study. Table 12, however, shows that sewer services at approximately \$26 per capita are substantially lower than Calgary, Winnipeg and Hamilton-Wentworth. Although the County stretches for over 200 kilometre, 94% of the population of the region and 85% of the population of the County live in urban areas with full municipal services. Thus the rural nature of the County can not explain this difference. In fact as Table 14 shows, the expenditures for sewer services for the Halifax County Municipality and Bedford in 1993-4, which have treatment facility in the urban areas, is approximately \$40 per capita while it is only \$15.77 and \$9.72 in Halifax and Dartmouth respectively for the same fiscal year.

Summary of Condition Assessment

Water: The County used zone meters to check rates of flow and to measure leakage. All new construction was subjected to a strict pressure test to ensure proper installation. In Dartmouth there was no planned program for assessing the condition of the water or sewer system, with maintenance and replacement schedules based on age of the pipes and responses to problems. The Halifax Water Commission used velocity, flow patterns and pressure tests to monitor the condition of the water system.

Sewage: The County used TV inspections for all new construction to ensure proper installation and had an ongoing monitoring program of inflow infiltration tests to identify leakage. In Halifax CCTV was used to monitor the condition of trunk lines on a 3 to 5 year cycle of inspections for the whole system.

**Table 12:
Halifax Metropolitan Region: Aggregate of Sewer Systems: Expenditures Comparison: 1992-94 (\$000s)**

Population ¹	330,846			330,752			330,752		
	1992-3			1993-4			1994-5		
	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita	Budget	% of Budget	\$ per capita
Admin., Gen. & Other Expenses	2,272.8	27.0		2,376.3	28.0		2,388.9	28.1	
Sewer Collection System	2,706.1	32.1		2,663.0	31.3		2,800.9	32.9	
Sewage Lift Stations	88.4	1.0		101.3	1.2		109.6	1.3	
Sewage Treatment and Disposal	3,358.0	39.9		3,361.3	39.5		3,215.2	37.8	
Total Expenditures	8,425.3	100.0	25.47	8,501.9	100.0	25.70	8,514.6	100.0	*

1 Population figures for 1992-3 are from 1991 census and for 1993-4 from estimates prepared during study of amalgamation of the Halifax region which has a slightly lower population for the Halifax County Municipality. 1994-5 population figures not available.

* Unknown for the year.

Table 13:
Halifax Metropolitan Region: Water Systems: Expenditure and Revenue Comparison:
1992-94 (\$000s)

	City of Halifax			Halifax County Municipality			City of Dartmouth		
Population ¹	114,455			136,975			67,798		
	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5
Expenditures:									
Source of Supply	46.0	42.9	65.2	718.9	730.2	746.5	84.0	104.0	177.0
Transmission & Distribution	4,944.0	5,248.7	5,163.2	1,029.8	1,010.0	1,053.9	2,573.0	2,643.0	2,752.0
Admin. & General Expenses	2,164.6	2,177.7	2,150.0	646.8	692.8	729.0	1,053.0	1,100.0	1,083.0
Depreciation	1,791.8	1,823.0	2,150.0	181.7	198.4	210.0	653.0	653.0	668.0
Municipal Taxes	127.8	120.2	118.8	0.9	0.8	1.0	681.0	741.0	722.0
Capital Debt Charges	3,340.0	3,043.6	3,041.3	891.0	747.1	656.1	1,373.0	1,243.0	944.0
Other Expenditures	30.5			338.5	1,389.0	2,220.1			
Total Expenditures	12,444.7	12,456.1	12,688.5	3,807.6	4,768.3	5,616.6	6,417.0	6,484.0	6,346.0
Per capita expenditures:	\$108.73			\$27.80			\$94.65		
Revenues:									
Sale of Water	8,234.8	8,355.2	9,109.3	2,885.5	3,012.0	3,108.8	3,867.0	3,920.0	3,917.0
Sale of Water: other utilities	613.8	618.9	649.2						
Public Fire Protection	3,038.2	3,038.2	3,221.5	1,039.8	1,049.1	1,085.3	2,225.0	2,399.0	2,522.0
Other Revenues	314.6	333.2	313.8	158.2	169.3	185.4	115.0	122.0	79.0
Non-operating Revenues	280.4	329.4	340.0	388.2	1,544.1	2,394.2	300.0	261.0	
Total Revenues	12,481.8	12,674.9	13,633.8	4,471.7	5,774.5	6,773.7	6,507.0	6,702.0	6,518.0
Surplus or (Deficit)	37.1	218.8	945.3	664.1	1,006.2	1,157.1	90.0	218.0	172.0

1 Population figures are from 1991 census.

Table 14:
Halifax Metropolitan Region: Sewage Systems: Expenditures and Revenues Comparison: 1992-94 (\$000s)

	County of Halifax					City of Halifax					Town of Bedford					City of Dartmouth		
	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5	1992-3	1993-4	1994-5
Population ²	136,975					114,455					11,618					67,798		
Expenditures																		
Admin., Gen. & Other Expenses:	1,964.8	2,039.4	2,009.0															
Sewer Collection System	1,724.1	1,551.0	1,593.9	630.0	710.0	756.0												451.0
Sewage Lift Stations							88.4	101.3	109.6									
Sewage Treat. and Disposal	1,541.3	1,616.2	1,301.8	1,175.0	1,125.0	1,300.0	334.7	288.1	270.4	307.0	332.0	343.0						
Total Expenditures	5,230.2	5,206.5	4,904.6	1,805.0	1,835.0	2,056.0	731.1	726.3	759.9	659.0	734.0	794.0						
per capita expenditures:	\$38.19			\$15.77			\$62.92			\$9.72								
Revenues																		
Sewer Area Rate	4,631.4	4,918.8	1,931.6															
Waste Water Maintenance:			1,501.2															
County Utility																		
Waste Water Maintenance: Dartmouth Utility			1,292.3															
Other Revenues	438.8	426.5	70.4															
Total Revenues¹	5,070.2	5,345.3	4,795.4															
Surplus or (Deficit)	-160	138.8	-109.2															

1 In the years under study only the Halifax County Municipality of the four Halifax regional municipalities had revenues included in the Nova Scotia statistical analysis. The other three municipalities did not isolate sewer revenues from general revenues.
2 Population figures are from 1991 census.

COMPARISON OF TRANSIT OPERATING AND PERFORMANCE DATA

The Canadian Urban Transit Association (CUTA) is a national association representing the urban transit industry. It is the recognized source of statistical data and information about the provision of urban transit services in Canada. CUTA gathers data each year from member transit systems and monitors industry trends. Performance is determined by a series of equations which measure levels of financial performance, cost efficiency, cost effectiveness, service utilization and labour productivity. This, along with each system's operating data, is assembled and published yearly by CUTA.

Individual transit systems may have different categories and accounting procedures which can result in certain inconsistencies in the data compilation. The data are affected by factors such as fare structures, service policies, subsidy levels and the local operating environment. External factors such as economic conditions, demographic trends, development activities and differences in spatial characteristics of the cities can distort comparisons. While these factors suggest that comparisons should be viewed with caution, CUTA provides comparable data for transit systems across the country that is superior to the other comparisons of services considered in this report.

Prior to and throughout the early 1980s, Canadian urban public transit systems were able to maintain and even improve ridership levels (Patterson, 1993: 43). This was due to the willingness of both municipal and provincial governments to subsidize urban public transit expansion. According to Patterson, from 1966 to 1986, "urban public transit moved from a break-even service ... to one in which half the costs were raised other than from the fare box" (Patterson, 1993: 43). During the late 1980s as governments became preoccupied with deficit reduction, urban public transit began to lose the financial support of municipal and provincial governments. Patterson notes the examples of Regina and Saskatoon where Saskatchewan was the first provincial government to terminate subsidies. As indicated for Calgary in Table 15 under the heading of the provincial share of operating costs, Alberta also terminated specific transit subsidies in 1994.

Although provincial and municipal operating subsidies have declined substantially since the early 1980s, they have remained relatively stable between 1992 and 1994 for Victoria, Winnipeg, Hamilton-Wentworth and Halifax. The level of provincial and municipal subsidies is directed by established policy. For example, in Ontario the subsidy is a percentage of the operating cost and depends on the size of the municipality, whereas in British Columbia the subsidy is a percentage of the operating deficit (Kitchen: 1990, 112). Subsidies may therefore fluctuate slightly from year to year. The amount varies from city to city and depends to some extent on the vision of the city and the social service emphasis of the municipal council and provincial government.

The literature suggests that transit fares are not important variables in determining overall transit patronage (Patterson: 1993, 41). Fares tend to be a more important factor with respect to short term changes in ridership. When fares are increased, ridership may at first decline, but following a period of adjustment by riders, ridership levels tend to bounce back. At first glance, the operating data appear to show a correlation between rising fares and decreasing ridership. In Calgary, the adult fare remains unchanged at \$1.50; adult fares in Halifax, Hamilton, Winnipeg and Victoria have increased yearly by 5 and 10 cents. Ridership levels are declining in both Winnipeg and Hamilton. Between 1992 and 1994, ridership declined by nearly 6 million passengers in Winnipeg and by 2.2 million in Hamilton-Wentworth.

But declining ridership levels are a nation-wide trend that may be associated more with high unemployment rates, demographic and life style changes, declining employment in the CBD, and the dispersal of employment associated with urban sprawl than with the increase of fares. Calgary is a case in point. Its fare has remained constant but ridership continued to decline. Victoria appears to be the only city exempt from this trend. This may be partly due to changes in service design, marketing and pricing which specifically targeted the adult commuter and post secondary school markets.

Declining ridership levels have resulted in escalating operating expenses and declining revenues. Government subsidies to a certain degree have tried to keep pace but to compensate, most transit systems are placing greater emphasis on generating funds from advertisement and charter services. Unfortunately to-date, the CUTA operating data do not indicate the amount of revenue generated from these activities.

The five cities deliver transit services as single agencies at the regional level although Calgary and Winnipeg have much larger systems. The five cities can be divided into two groups based on ridership and population. Calgary and Winnipeg had ridership levels in 1994 of 52.6 million and 41.6 million respectively. In Victoria, Hamilton-Wentworth and Halifax, in 1994 the ridership levels were 16.8 million, 20.7 million and 13.0 million respectively.

Transit Services in Calgary and Winnipeg

Both Calgary and Winnipeg have well established transit systems. As prairie cities many of the main streets are wide and can more readily support buses during peak traffic periods than can older Canadian cities with narrower street systems. This is particularly true of Winnipeg. Calgary, with substantial provincial capital funding in the 1970s and early 1980s, developed an extensive light rail transit (LRT) system along side its bus system.

Table 15 and Table 16 outline the operating data of the two cities. While ridership in both cities has declined, the drop in Calgary was only 2.4% between 1992 and 1994 while in Winnipeg it was 12.4%. And in 1995 in Calgary there was a modest increase in ridership. The fact that the decrease in Calgary was less than other cities can be explained partly by the lower rate of unemployment in Calgary. Revenues in Calgary increased by less than 1% between 1992 and 1994 while operating expenses decreased by 5.7%. In comparison, Winnipeg's revenues increased by 3.7% while its operating expenses increased by 1.8%. With a stable ridership Calgary was able to decrease its operating costs and in Winnipeg, even though ridership was declining substantially, cost increases remained below increases in revenues. Thus both systems have been able to deal with the changes occurring in ridership and costs. Since Calgary is the only city of the five that has a LRT system, it is not unexpected that the costs per passenger are higher in Calgary than in Winnipeg. Even so the costs are comparable with those in Victoria and much lower than those in Hamilton-Wentworth.

**Table 15:
Calgary Transit Operating Data: 1992-94**

	1992	1993	1994
Adult Fare	\$1.50	\$1.50	\$1.50
Service Area Population	717,133	727,719	738,184
Ridership ¹	53,900,000	53,269,100	52,607,700
Number of Vehicles	668	677	650
Number of Full-time Employees	1,708.0	1,761.0	1,585.0
Passenger Revenues	\$48,015,151	\$48,599,000	\$48,335,696
Total Operating Revenues	\$50,595,825	\$51,338,000	\$50,783,784
Total Revenues	\$51,083,021	\$51,764,000	\$51,402,841
Total Operating Expenses ²	\$144,478,124	\$162,969,000	\$136,218,283
Net Operating Cost	\$93,395,103	\$111,205,000	\$84,815,442
Provincial Share ³	\$6,024,295	\$6,081,000	\$0
Municipal Share	\$80,207,768	\$101,064,000	\$80,429,065

1. The figures used in this table are from CUTA and vary in some instances from adjusted figures provided by Calgary. For example, for the three years of the study adjusted ridership figures were 55.3 million, 54.5 million and 53.9 million, adjusted number of vehicles was 668, 661 and 654 and of full-time employees was 1,616, 1,602 and 1,553.

2. The high total operating expenses for 1993 are directly related to a once-only principal repayment of \$21.5 million.

3. Note that in 1994 the provincial transit operating grant was discontinued.

Canadian Urban Transit Association, *Canadian Transit Fact Books* 1992, 1993 & 1994

**Table 16:
Winnipeg Transit Operating Data: 1992-94**

	1992	1993	1994
Adult Fare	\$1.20	\$1.30	\$1.35
Service Area Population	613,485	613,485	613,485
Ridership	47,531,169	44,366,451	41,622,826
Number of Vehicles	554	550	535
Number of Full-time Employees	1,329.0	1,304.0	1,321.0
Passenger Revenues	\$38,186,469	\$38,376,102	\$39,319,273
Total Operating Revenues	\$39,611,137	\$39,861,049	\$40,642,117
Total Revenues	\$40,269,016	\$40,021,640	\$41,765,494
Total Operating Expenses	\$73,061,987	\$74,756,236	\$74,395,242
Net Operating Cost	\$34,792,971	\$34,734,596	\$32,638,736
Provincial Share ¹	\$17,450,000	\$17,100,000	\$13,966,385
Municipal Share	\$17,342,971	\$17,634,596	\$17,586,904

1 The drop in provincial share of operating expenses in 1994 is related to changes in accounting of Handitransit funding.

Canadian Urban Transit Association, *Canadian Transit Fact Books* 1992, 1993 & 1994

As Table 17 shows, both Calgary and Winnipeg have in most instances modest changes in the performance indicators over the three year period. Total revenues as compared to total operating expenses have increased slightly in both cities while net operating costs per passenger have remained stable in Calgary and decreased from \$0.73 to \$0.68 in Winnipeg. Because of the drop in ridership in Winnipeg, the operating costs per passenger trip increased from \$1.49 to \$1.65 while in Calgary it decreased from \$1.91 to \$1.88 (or \$1.83 to \$1.81: see Table 18, footnote 2). The decline in service utilization also is larger in Winnipeg with passenger trips decreasing from 77.5 to 67.9 per capita while the decrease in Calgary was from 75.2 to 71.3. Even so the utilization in Calgary and Winnipeg is much higher than in any of the other three cities where passenger trips in 1994 varied from 50.3 in Halifax to 54.2 in Victoria per capita. This reflects the higher use of transit in larger cities where more traffic congestion can be expected.

Table 17:
Calgary and Winnipeg: Transit Performance Indicators: 1992-94

Performance Indicators:	Calgary			Winnipeg		
	1992	1993	1994	1992	1993	1994
Financial Performance:¹						
Total operating revenue/ Total operating expenses	49%	49%	51%	55%	57%	59%
Net direct operating cost/ Regular service passengers	\$0.91	\$2.09	\$0.92	\$0.73	\$0.78	\$0.68
Average Fare:²						
Regular service passenger revenue/passenger trips	\$0.89	\$0.91	\$0.92	\$0.80	\$0.86	\$0.94
Cost Effectiveness:						
Total direct operating expenses/passenger trips	\$1.91	\$1.93	\$1.88	\$1.49	\$1.57	\$1.65
Cost Efficiency:						
Total direct operating expenses/Revenue vehicle hour	\$76.37	\$78.89	\$82.58	\$51.94	\$52.68	\$52.99
Service Utilization:						
Regular service passenger trips/Capita	75.2	73.2	71.3	77.5	72.4	67.9
Regular service passenger trips/Revenue vehicle hours	40.0	40.9	44.0	34.8	33.6	32.1
Amount of Service:						
Revenue vehicle hours/Capita	1.9	1.8	1.6	2.2	2.1	2.1
Top Wage Rates:						
Operators	\$18.41	\$18.41	\$18.41	\$16.59	\$16.59	\$16.97
Mechanics	\$20.89	\$21.93	\$21.93	\$19.07	\$19.07	\$19.51

1. The figures used in this table are from CUTA and vary in some instances from adjusted figures provided by Calgary. For example the adjusted figures provided by Calgary for the net direct operating cost/regular service passengers are \$1.06, \$1.07 and \$1.02 for the three years from 1992 to 1994. The 1993 CUTA figure of \$2.09 is distorted by the principal repayment noted in Table 16.
2. The average fare figures do not include free rides in the 14 block downtown area. The adjusted figures provided by Calgary are \$0.78, \$0.80 and \$0.80 for the three years respectively. Cost Effectiveness, cost efficiency, service utilization and amount of service figures also have minor variations between CUTA and the adjusted figures.

Canadian Urban Transit Association, *Canadian Transit Fact Books* 1992, 1993 & 1994

Winnipeg's transit system has consistently fared well in the performance indicators. Winnipeg and Halifax are more cost effective and cost efficient than the other three cities. Although the fare increased in Winnipeg from \$1.20 to \$1.35, it is still well below the fares in Calgary and Hamilton-Wentworth and the same as in Victoria. Only Halifax has a lower fare at \$1.25. Since an increase in fares in the short term often results in a decrease in ridership, it is too early to predict whether the decline has long term implications for Winnipeg Transit.

The Delivery of Transit Services in the Victoria, Hamilton-Wentworth and Halifax Regions

The metropolitan regions of Victoria, Hamilton-Wentworth and Halifax have smaller transit systems than Calgary and Winnipeg. Although the population of Hamilton-Wentworth serviced by transit is larger, its service utilization is at about the same level as Victoria and Halifax while the service utilization in Calgary and Winnipeg is substantially higher. As with the Victoria Capital Regional District, the boundaries of the Hamilton-Wentworth Regional Municipality and the Halifax Metropolitan Authority extended far beyond the built-up areas. The transit systems serve only the urban portion of the regions. In Winnipeg and Calgary the transit systems are part of the departmental structure of a single-tier municipality. In contrast BC Transit, the Hamilton Street Railway Company (HSR) and Metro Transit in Halifax operate as single purpose agencies even though the Hamilton and Halifax systems are tied to the regional level of government.

Table 18, Table 19 and Table 20 provide the operating data for the three cities. Victoria, with an increase of 3.1% in ridership, is the only region where ridership has not decreased during the period of the study. Ridership has decreased by 8.7% in Hamilton-Wentworth and by 5.8% in Halifax. Victoria also is the only region where the number of vehicles has increased. In 1994, Victoria operated with 165 vehicles, 17 more than in 1992. Hamilton-Wentworth with 210 had 2 fewer vehicles than in 1992 and Halifax maintained its number of vehicles at 170 over the three years. While the higher fares in Hamilton-Wentworth may reflect the generally higher transit rates in the Toronto region, the HSR is the only transit system of the three to substantially increase fares over the three year period. While in Victoria and Calgary the fares remained the same, and in Halifax they increased by 5 cents, in Hamilton-Wentworth they increased by 20 cents from \$1.50 to \$1.70. Winnipeg had an increase of 15 cents over the same period with the fare remaining relatively low at \$1.35.

The differences in the changes in operating revenues and operating expenses over the three years support the view that the Halifax and Victoria systems are in a better financial operating position than Hamilton-Wentworth. Although revenues increased by 3.4% in Hamilton-Wentworth from 1992 to 1994, operating expenses increased by 12.2%. In Halifax, revenues increased by 1% while operating expenses increased by 2.2%. In Victoria revenues increased by 18.4% while the increase in operating expenses was less at 14.6%. In both Victoria, with a stable ridership, and Halifax, with a declining ridership, the transit authorities have been able to keep increases in operating costs in line with revenues. This has not been the case in Hamilton-Wentworth where at a time of declining ridership and only modestly increasing revenues, operating costs have increased substantially. As argued earlier, this may be explained partly by the temporary decrease in ridership that often follows fare increases. But the increases in operating expenses in 1994 for HSR also are related to a one-time payment to WCB of \$2.5 million, a \$1.2 million social contract transfer unrelated to transit operations and \$0.97 million in recoverable services to external agencies such as GO Transit. These expenditures have tended to distort the figures for HSR and make direct comparisons questionable.

**Table 18:
Victoria BC Transit Operating Data: 1992-94**

	1992	1993	1994
Adult Fare	\$1.25	\$1.25	\$1.35
Service Area Population	292,000	292,190	311,495
Ridership	16,353,282	16,465,679	16,872,612
Number of Vehicles	148	148	165
Number of Full-time Employees	474	465	480
Passenger Revenues	\$13,814,445	\$13,851,544	\$16,293,650
Total Operating Revenues	\$14,066,579	\$14,054,912	\$16,655,286
Total Revenues	\$14,067,793	\$14,056,397	\$16,655,286
Total Operating Expenses	\$32,824,324	\$31,620,783	\$37,626,971
Net Operating Cost	\$18,756,531	\$17,564,386	\$20,971,685
Provincial Share	\$13,126,547	\$11,468,858	\$11,927,750
Municipal Share	\$5,629,984	\$6,095,528	\$9,043,935

Canadian Urban Transit Association, Canadian Transit Fact Books 1992, 1993 & 1994

**Table 19:
Hamilton Street Railway Company Operating Data: 1992-94**

	1992	1993	1994
Adult Fare	\$1.50	\$1.60	\$1.70
Service Area Population	419,000	402,000	401,500
Ridership	22,867,027	21,526,041	20,662,000
Number of Vehicles	212	213	210
Number of Full-time Employees	760	722	675
Passenger Revenues	\$21,590,650	\$21,345,650	\$21,470,279
Total Operating Revenues	\$22,820,171	\$22,445,331	\$22,540,211
Total Revenues	\$22,820,171	\$23,598,809	\$23,585,493
Total Operating Expenses	\$52,934,762	\$56,303,403	\$59,376,368
Net Operating Cost	\$30,114,591	\$32,704,594	\$35,790,875
Provincial Share	\$9,946,342	\$10,331,467	\$11,423,142
Municipal Share	\$19,963,670	\$21,081,915	\$21,100,429

Canadian Urban Transit Association, Canadian Transit Fact Books 1992, 1993 & 1994

Table 20: Halifax Metro Transit Operating Data: 1992-94			
	1992	1993	1994
Adult Fare ¹	\$1.15	\$1.20	\$1.25
Service Area Population	259,381	262,009	259,000
Ridership ²	13,834,810	13,512,117	13,031,304
Number of Vehicles	170	170	170
Number of Full-time Employees	404.0	397.0	422.0
Passenger Revenues	\$14,306,130	\$14,270,117	\$14,489,285
Total Operating Revenues	\$14,803,130	\$14,608,239	\$14,858,512
Total Revenues	\$14,803,130	\$14,650,783	\$14,896,436
Total Operating Expenses	\$25,234,870	\$25,880,683	\$24,680,756
Net Operating Cost	\$10,431,740	\$11,229,900	\$9,784,320
Provincial Share	\$1,527,755	\$1,172,402	\$1,179,042
Municipal Share	\$9,109,085	\$10,051,261	\$8,605,278
<p>1. These figures were provided by Halifax Regional Municipality, Transportation Services, and do not correspond to the CUTA figures of \$1.20, \$1.25 and \$1.20 for 1992-93-94 respectively.</p> <p>2. Ridership of 16,151,449 for 1993 as indicated in the CUTA information included transferees who were not included in the 1992 and 1993 data.. The ridership for 1993 has been adjust to make the three years consistent.</p> <p>Canadian Urban Transit Association, <i>Canadian Transit Fact Books 1992, 1993 & 1994</i></p>			

Table 21 compares the performance indicators for Victoria, Hamilton-Wentworth and Halifax. Of the three cities, Hamilton-Wentworth has the least cost effective service and the largest drop in ridership. Even with the highest fares, its operating costs per passenger trip of \$2.70 in 1994 exceed both Victoria and Halifax by \$0.73 and Calgary and Winnipeg by \$0.82 and \$1.05 respectively. Of the three smaller systems, Victoria at 57% receives the highest percentage of its net operating costs funded from the provincial government. In contrast in 1994 provincial support of net operating costs in Hamilton-Wentworth was 31.9% and in Halifax 12%. This is partly explained by Halifax having the highest percentage of its costs, 66%, being recouped through the farebox while the corresponding figures for Victoria and Hamilton-Wentworth are 50% and 40% respectively. Thus there is less reliance on provincial support in Halifax. In cost effectiveness and cost efficiency, Halifax is the best of the three cities over the three year period and Halifax compares favourably with the larger systems in Calgary and Winnipeg.

Table 21:
Victoria, Hamilton-Wentworth and Halifax: Performance Indicators: 1992-94

Performance Indicators:	Victoria Region			Hamilton-Wentworth			Halifax Region		
	1992	1993	1994	1992	1993	1994	1992	1993	1994
Financial Performance:									
Total operating revenue/ Total operating expenses	47%	50%	50%	44%	41%	40%	64%	61%	66%
Net direct operating cost/ Regular service passengers	NA	\$0.89	\$0.98	\$1.32	\$1.52	\$1.61	\$0.75	\$0.70	\$0.59
Average Fare:									
Regular service passenger revenue/passenger trips	\$0.84	\$0.87	\$0.97	\$0.94	\$0.99	\$1.04	\$1.03	\$0.88	\$1.11
Cost Effectiveness:									
Total direct operating expenses/passenger trips	\$1.82	\$1.78	\$1.97	\$2.22	\$2.50	\$2.70	\$1.67	\$1.46	\$1.97
Cost Efficiency:									
Total direct operating expenses/Revenue vehicle hour	\$64.71	\$61.33	\$65.35	\$66.95	\$72.34	\$80.09	\$54.81	\$49.84	\$49.12
Service Utilization:									
Regular service passenger trips/ Capita	56.0	54.5	54.2	54.6	53.6	51.5	53.3	61.6	50.3
Regular service passenger trips/ Revenue vehicle hours	35.6	34.5	33.2	30.2	29.0	29.7	32.9	34.0	28.4
Amount of Service:									
Revenue vehicle hours/Capita	1.6	1.6	1.6	1.9	1.9	1.7	1.6	1.8	1.8
Top Wage Rates:¹									
Operators	\$20.07	\$20.07	\$20.88	\$18.81	\$19.66	\$19.17	\$14.40	\$14.40	\$13.96
Mechanics	\$23.01	\$23.01	\$24.54	\$20.26	\$21.17	\$20.64	\$16.07	\$15.11	\$15.59
1. Decrease in Wage Rates in Halifax a result of provincial legislation. Canadian Urban Transit Association, <i>Canadian Transit Fact Books 1992, 1993 & 1991</i> .									

COMMENTARY

Although the differences in political organization, administrative structures, delivery systems and accounting procedures amongst the cities make comparisons difficult, they do have implications for the services reviewed in this report. With the amalgamation of Halifax in 1996, now only the Victoria Capital Regional District does not have centralized delivery of sewer and water services. This move toward consolidation of municipalities, particularly evident today in Nova Scotia, New Brunswick and Ontario, is provincially initiated. While the reasons are varied, equalized property tax bases, the single delivery of regional services and efficiency leading to cost savings are common arguments in favour of the consolidation of urban municipalities. Provincial governments continue to use the restructuring of municipalities as a response to a perceived or real need for change in the delivery of services in metropolitan areas.

When the complications of the municipal delivery of sewer and water in Victoria and Halifax are compared to the delivery of these services in Calgary, Winnipeg and Hamilton-Wentworth, the administrative advantages of the single delivery of regional services are apparent. The accounting procedures, costs, revenues and expenditures are more easily identified, the maintenance and repairs more easily organized and the monitoring of the condition of the total system more easily undertaken. It does not follow automatically that administrative simplicity will result in more efficient or effective service. But it does provide the utility with more control over its operations. And given the organizational structure and reporting relationship of the utilities, administrative simplicity does allow for more direct political input. Where this is not the case, as with the water utilities in Victoria and Halifax, steps have been taken, or are being considered, to simplify the structure.

Treatment facilities do appear to have an influence on the delivery of sanitary services. Costs in Calgary, Winnipeg and Hamilton were substantially higher than Halifax and, although the figures are not complete, Victoria also appeared to have lower costs than cities with treatment facilities. Treatment facilities absorbed from 23% to 30% of sanitary expenditures. Debt charges for Calgary, Winnipeg and Hamilton-Wentworth, which were closely related to the cost of treatment facilities, ranged from 22% for Hamilton to as high as 45% for Winnipeg in 1994. In Victoria and Halifax debt charges for sanitary services were usually included with the general debt of the municipality and therefore were not as easily identified. The costs in these two cities may be less, but without debt charges included and with limited treatment facilities, comparisons could not be made. Certainly when it comes to the treatment of sanitary waste, Halifax and Victoria lag far behind the other three cities. This is a more serious pollution problem in Halifax where disposal is into the Halifax Harbour. Thus higher costs in Calgary, Winnipeg and Hamilton-Wentworth were accompanied by more complete sanitary systems. Although conclusions could not be drawn from this sample, single delivery, self-supporting sewer utilities have the advantage of access to resources separate from the general revenues of the municipality. This provided some financial autonomy and allowed the utility to balance expenditures and revenues and, in the cases of Calgary, Winnipeg and Hamilton-Wentworth, establish a more complete sanitary system.

The need for the delivery of clean, safe and tasteless water places pressures on municipalities. There is much less room for error in the delivery of water services and, as will be discussed below, resources for water tend to take priority over those for sanitary services. The ease of

sanitary services for the three larger cities. Debt charges as a percentage of expenditures for water for 1994 varied from a low of 14.6% in Hamilton-Wentworth to a high of 34.4% in Calgary. The percentage of expenditures allocated to the supply of water for 1994 varied from 11.9% in Hamilton to 21.2% in Winnipeg. The percentage for distribution for the same year varied from 18% in Calgary to 33.5% in Winnipeg. These comparison for sewer and water services should be used only as very approximate examples since differences in accounting procedures make exact comparisons impossible. Although figures are not available for the Victoria region, the Halifax region figures do reflect the other three cities. For example, aggregate debt charges varied from 24.7% of expenditures in 1992 to 18.8% in 1994, distribution varied from 37.7% to 36.4% and supply from 3.7% to 4% over the same period. The cost for water systems in the Halifax region of approximately \$70 per capita was not out of line with the other three cities. Only Calgary at \$118 per capita was substantially more and this can be explained partly by the transfer of approximately 20% of the water utility revenues to general revenues.

The use of the water and sewer utility as a source of general revenues on the prairies does distort the per capita expenditures for sewer and water in Calgary and Winnipeg. The condition of the system seems more related to age than it does the amount of revenue generated or expenditures made. Calgary's newer infrastructure is considered to be in good condition while Winnipeg's older infrastructure is in need of additional funding. As Calgary's medium-term projections suggest, sewer and water replacement costs may actually decrease over the next twenty-five years.

From discussions with officials in the five cities there are indications that the sewer collection systems in the cities are in worse condition than the water distribution systems. This may be attributed to a number of factors.

- There is a large component of safety/quality/health related to water which requires that the system be of an acceptable standard. Standards for water quality are carefully monitored and controlled. In other words, the supply of unpotable water is not acceptable.
- Because water systems are under pressure, it is much easier to identify leaks and the consequences of leakage; inadequate pressure, water percolating to the surface and customers without water are usually immediately evident.
- Since sanitary sewers are not under pressure and often do not have adequate monitoring, leakage can go unnoticed.
- Since sewage is a "throw-away" by-product, there is less public awareness or concern about the consequences of neglect of the system than for water systems.
- The consequences of leakage, such as sink holes or polluted ground water and rivers, may occur over time and not be immediately evident.
- More rigid environmental standards have caused municipalities to undertake major expenditures on sewage treatment facilities. This has sometimes been at the expense of the collection system.

The recent trends in expenditures for sewer and water services do not indicate any dramatic change. In general, modest increases in expenditures were balanced by modest to more substantial increases in revenues. For example, revenues for water between 1992 and 1994 increased by 8.1% for Calgary, 7.6% for Winnipeg, 20.5% for Hamilton-Wentworth and 12.9% for the Halifax region. The

comparable increases for sewer revenues were 5.3% for Calgary, 13.5% for Winnipeg and 2.6% for Hamilton-Wentworth. During the same period, expenditures for sewer and water increased by the same or a smaller amount. In the Victoria region from 1992 to 1994 revenues for water increased by 26.4% for the CRD, 13.1% for the City of Victoria and 15.9% for the GVWD. The expenditures over the same period increased by 18.6% for the CRD, by 9.4% for the City of Victoria and by 4.4% for the GVWD. Thus water and sanitary services continued to maintain their level of expenditures during a period of population growth and fiscal restraint.

As self-supporting utilities with their own sources of revenues, water and sewer services were able to increase revenues where necessary to ensure that the level of maintenance and repair of the infrastructure was maintained. In instances such as Winnipeg and Hamilton-Wentworth where funding may not be adequate, the maintenance continues to fall behind the need.

It is interesting to note that much of the new construction for sewer and water systems and some of the maintenance and repair of the systems are contracted out to the private sector. The municipalities have maintained control over the monitoring of standards and over immediate repairs, particularly with water utilities, while allowing the private sector a major portion of the construction activity. Only in Hamilton-Wentworth with the privatization of the treatment facility have there been signs of a more fundamental change in the approach to the delivery of the services. But while this may reflect trends in the United States, the savings are expected to come from cost efficiencies rather than lower wages since existing union contracts continued under the new management.

The utilities have shown restraint in expenditures, if not in revenues, over the period of this study. The close ties to the political decision-making process in the five cities appear to have kept cost increases to a modest level. The effect this has had on condition of the service is less apparent. What is clear, however, is that the larger municipalities, Calgary and Winnipeg, have more sophisticated procedures for the assessment of the condition of their infrastructure. The other municipalities have a sense of the condition of the infrastructure from their experiences in the field, number of complaints and visual and video inspections. These methods may not always be adequate to explain and justify need when a utility is competing for scarce resources or making a cost-benefit decision.

While there were no obvious changes in the pattern of expenditures and revenues for transit services, transit does appear to have some problems in balancing revenues with expenditures. Declining ridership and a trend toward increased costs have caused the transit systems to review their operations. With the exception of Victoria where transit use is increasing, the other cities in 1994 had reduced ridership, fewer employees and except for Halifax where the number remained the same, fewer vehicles than in 1992. Provincial governments in Nova Scotia, Ontario and Alberta have decreased, or are in the process of decreasing provincial cost sharing for municipal transit operations. Even so the transit services in the five cities have been able to keep the performance indicators relatively constant over the three year period of this study. While transit systems may be struggling they are still surviving.

The assessment of the condition of hard services in Canadian cities continues to be mainly subjective and ad hoc. With the exception of Calgary, which has in place ongoing testing and monitoring of the sewer and water systems, the cities in this study are still developing assessment procedures. What is apparent is that all cities see the importance of identifying the condition of their sewer and water systems. There is, however, no consistent approach to the

procedure for assessing the condition of infrastructure might emerge unless the municipalities themselves take the initiative. The Canadian Urban Transit Association (CUTA) has been able to establish performance indicators for the transit systems across the country. But there are some differences that make this possible. The systems tend to be single purpose agencies with separate administrative structures and similar mandates. Because of the uniqueness of transit services, it has been easier for transit officials to coordinate their reporting systems to a national body.

It is the view of the authors the trend towards the regional delivery of hard services such as sewer and water is likely to continue in Canada. Nor is this seen as necessarily a bad situation. Whether this will be done through a two-tier system as in Hamilton-Wentworth or through a single-tier government as in Calgary and Winnipeg is not the issue. Rather the issue is the need for metropolitan areas to deliver high quality services at reasonable costs. The nature of sewer, water and transit are such that they lend themselves well to regional coordination and delivery. While the main advantage identified in this report for the regional delivery of the three services is the simplification of the administrative and delivery structure, its importance should not be underestimated. It forces better accountability through more direct ties to the political process. It provides the opportunity for the utilities to undertake more comprehensive analyses of expenditures and costs.

The questions raised in this report about the relationship between the condition of the infrastructure and the delivery of services are not easily answered. As urban areas expand, the delivery of transit, sewer and water services have expanded to accommodate the growth. There is evidence that transit, water and sewer systems are in need of additional funding. Municipalities are struggling with a financial environment where additional resources are unlikely. Without a comprehensive assessment of the condition of its infrastructure, a municipality is left with few options for making the case for increased funding for hard services. In the absence of such analysis the alternative is the continued deterioration or even failure in the water or sewer system.

Recommendations for Further Research

This study, in reviewing the service delivery of water, sewage and transit systems in five cities, has identified the advantages of the regional delivery of services and the shortage of consistent data for assessing the condition of the services. This lack of a common information base amongst the cities highlights the need for some form of national standards or benchmarks if the present condition and future needs of hard services are to be evaluated. While individual cities have, to varying degrees, an understanding of the condition of their infrastructure, cities do not always have a sense of how the condition relates to that of other cities and to what extent remedial action in one city fits with the activities of other cities.

The authors have identified three areas of research that could further develop the themes and concepts that form the basis for this report: the establishment of national standards or benchmarks for water and sewer systems, the relationship between total municipal expenditures and expenditures on selected services, and the delivery systems and condition of infrastructure in cities of varying sizes.

In the case of transit, the Canadian Urban Transit Association (CUTA) has established a common information base for transit systems across the country. While transit operators may question, from time to time, the way the information is gathered and interpreted, they do accept the need and the value of the common base. In the case of water and sewer utilities, there is no parallel organization that gathers data nationally.

and the value of the common base. In the case of water and sewer utilities, there is no parallel organization that gathers data nationally.

Further research into the types of national standards and benchmarks that could be used to evaluate the performance and condition of the sewer and water systems across the country would be valuable. Some municipalities, such as Calgary, are developing sophisticated methods for monitoring the condition of their infrastructure. These are used to prepare long range plans for the repair, maintenance and upgrading of the services. Although cities have unique situations and comparisons will always be difficult, the sharing of information through a common base could assist cities in the long range planning necessary for the improvement in the delivery and quality of services.

While this study reviews the revenues and expenditures of certain services, these expenditures are not related directly to the overall expenditure and revenue sources of the cities. The implications of how revenues are used from services such as water and sewer systems should be considered. Municipalities searching for additional sources of revenues may find utilities an avenue for expanding revenues. On the prairies, utilities are a prime source of additional revenues and can provide over 20 per cent of a municipality's revenues (Diamant and Cory, 1994: 34). This does not appear to be the case outside the prairies. None of the other cities studied, Victoria, Hamilton and Halifax, uses self-supporting utilities as a source of general revenues. In Calgary in 1994 sewer and water expenditures were approximately 18.3 per cent of total expenditures while in the same year they were 16.2 per cent in Winnipeg. Even though the sewer and water systems in Calgary are relatively new and considered to be in good condition, the city allocated a higher portion of its expenditures to these services than Winnipeg. Comparing expenditures on hard services to total expenditures could provide insights into the relative emphasis municipalities give to the various services they deliver.

The cities studied in this report were selected because of their similar size and variety of administrative and political organizational structures. While the information gathered suggested that the regional delivery of services in this size of city has certain advantages, the application to other sizes of cities was not considered. Smaller cities are facing similar problems of service delivery. Larger regions such as Toronto and Vancouver are encountering rapid suburban and ex-urban development that is raising questions about the appropriate methods for delivering services at the expanded regional level. The trends identified here may have application to both smaller and larger urban areas. Expanding the techniques used in this study to consider the service delivery in varying sized municipalities could add to the information gathered. It could assist in identifying common methods of assessing the condition and quality of service and assist in the development of national standards and benchmarks for sewer and water systems in Canada.

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