

**Strategic Asset Management in the City of Hamilton:**  
**An Analysis of the Integration of Strategic Planning and Management Elements into  
Municipal Infrastructure Asset Management Programs**

**MPA Research Report**

**Submitted to:**

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## **Executive Summary**

Public infrastructure in Canada faces a funding deficit that was estimated to be 125 billion Canadian dollars in 2006, and is forecasted to approach 1 trillion Canadian dollars in 2066. Key to addressing the infrastructure deficit is improved strategic asset management at the local government level. The purpose of this research is to link strategic planning theory and asset management practice by viewing asset management through a theoretical framework informed by strategic planning and management literature. Two research goals were developed: to provide municipal practitioners with a resource to improve their own asset management programs; and, to provide a basis for future quantitative research to determine which of the strategic planning and management elements are correlated to improved municipal asset management performance.

Four key elements of strategic planning and management were identified, including: developing formal plans and using planning tools; setting goals and implementing performance measurement systems; internal and external stakeholder involvement; and, linking the strategic process to the organization's budget. A qualitative case study of the City of Hamilton's asset management program was completed to describe how these strategic elements are practically implemented in a municipal asset management program. It was determined that each of key strategic planning elements can be observed within the City's asset management program.

Future quantitative research effort is required to determine if integrating strategic planning and management principles within a municipal asset management program actually improves program performance. This paper closes with recommendations for a future quantitative research effort.

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## **Introduction and Research Question**

Public infrastructure is central to prosperity and quality of life (Ministry of Infrastructure, 2012). Much of the infrastructure that the public uses in their day to day lives is owned by local municipalities. Despite the importance of municipal infrastructure, municipalities in Canada are facing a growing deficit in infrastructure spending. John Wiebe (2012) summarizes the issue: “Canada’s crumbling infrastructure needs billions of dollars worth of basic maintenance, and that’s not counting the billions more needed to modernize it.” (Wiebe, March 2012). The infrastructure deficit is a significant financing issue facing Canadian municipalities, and resolving this issue begins with improved management of public infrastructure assets (Ministry of Infrastructure, 2012).

Asset management is a strategic process, but there is little in the way of academic literature that describes how local governments have linked strategic planning and strategic management principles to implementation of an asset management program. Practitioner literature is mostly focused on the strategic maintenance of physical assets, providing guidance on how, when, why, and where in an infrastructure asset’s lifecycle maintenance should be performed.

This research attempts to fill this literature gap by viewing asset management through a theoretical framework informed by strategic planning and management literature. This research is an exploratory effort to generate an understanding of the key elements of strategic planning and management that improve organizational performance and implementation of strategic agendas. Once these elements are understood, a qualitative research approach is suggested to describe how these strategic elements are

practically implemented in a municipal asset management program. The research question to be answered is:

*Which elements of strategic planning and strategic management are associated with improved organizational performance, and how are these elements practically implemented in a municipality's asset management program?*

By linking strategic planning theory and asset management practice, the goal of this research is to provide municipal practitioners with a resource to improve their own asset management programs. Further, it is hoped that this research can provide a basis for future quantitative research to determine the extent to which integration of the core strategic planning and management elements within asset management programs is correlated to improved municipal asset management program performance.

## Literature Review

### **Issue Identification**

Public infrastructure is central to prosperity and quality of life (Ministry of Infrastructure, 2012). Well-functioning infrastructure is essential for economic growth, public health, competitiveness, and overall quality of life in a country (Mirza, 2006). Each of these characteristics is closely tied to the adequacy of transportation infrastructure, water quality, and waste disposal (Mirza, 2006). Much of the infrastructure associated with these services is owned by local municipalities.

Despite the importance of municipal infrastructure, municipalities in Canada are facing a growing deficit in infrastructure spending. Economists define the infrastructure deficit as “the difference between the rate at which new infrastructure is built, and the rate at which existing infrastructure wears out” (Wiebe, March 2012). The infrastructure deficit facing Canadian municipalities is not a new phenomenon. In 1985, the deficit was estimated by the Federation of Canadian Municipalities to be 12 billion Canadian dollars (Mirza & Haider, 2003). Mirza and Haider (2003) suggest the infrastructure deficit is the result of continued deferred maintenance compounded over the years by several factors. In Canada, there was a significant investment in new municipal infrastructure which occurred post-World War II to accommodate the country’s population boom and to replace aged infrastructure. In the late-1970s population growth in Canada began to diminish and many Canadians began to suburbanize. This resulted in less dense developments and urban sprawl (Mirza & Haider, 2003). This change in demographic required additional new infrastructure, shifting the focus away from maintaining existing infrastructure in favour of new construction (Mirza & Haider, 2003). Spending on

rehabilitation of municipal infrastructure declined considerably in the late 1970s as a result of decreased funding from upper levels of government and rapidly increasing inflation rates (Mirza, 2006). This trend continued into the early 1980s as Canada faced an economic recession and local authorities were reluctant to borrow at high interest rates for infrastructure needs (Mirza & Haider, 2003). Increased political pluralism at the local government level has exacerbated the problem of deferred infrastructure maintenance as local politicians prefer to construct new politically attractive projects instead of investing in maintenance (Mirza & Haider, 2003).

Several studies have attempted to quantify the current scale of the infrastructure deficit. In 1995, McGill University and the Federation of Canadian Municipalities reported the deficit to be 44 billion Canadian dollars for municipal infrastructure and 100 billion Canadian dollars for all public infrastructure under Federal, Provincial, and municipal jurisdiction (Mirza, 2006). In 2006, the Federation of Canadian Municipalities reported the deficit to have increased to 60 billion Canadian dollars for municipal infrastructure and 125 billion Canadian dollars for all public infrastructure (Mirza, 2006). The Federation of Canadian Municipalities reported that in addition to the rehabilitation deficit, an additional 115 billion Canadian dollars worth of new infrastructure needs to be constructed (Wiebe, March 2012). Mirza (2006) speculates that 79% of Canada's infrastructure is already beyond its anticipated service life, and that the infrastructure deficit could grow to exceed 1 trillion Canadian dollars by 2066.

The infrastructure deficit is a significant financing issue facing Canadian municipalities, and resolving this issue begins with improved management of public infrastructure assets (Ministry of Infrastructure, 2012). The Province of Ontario has

committed to addressing the infrastructure challenge by way of a municipal infrastructure strategy announced in the *Building Together* economic action plan in June 2011.

*Building Together* is a long term plan for municipal infrastructure in Ontario. The plan sets out a strategic framework to help guide future investments. A key element of the framework has been identified as proper asset management at the local level (Ministry of Infrastructure, 2012). The Ministry of Infrastructure defines asset management as a strategic process “of making the best possible decisions regarding the building, operating, renewing, replacing, and disposing of infrastructure assets” (Ministry of Infrastructure, 2012). The process involves setting strategic priorities to determine the best possible course of action and investment in infrastructure assets. The Province has published *Building Together: Guide for Municipal Asset Management Plans* as a guiding document in an effort to provide municipalities with a resource to develop a strategic asset management program.

Literature suggests that strategic planning and management is correlated to improved organizational performance and implementation of strategic agendas (Pagano, McNeil, and Ogard, 2005; Poister, 2005; Poister and Streib, 2005; Poister & Van Slyke, 2002). The Province of Ontario’s guide is a good start to assist municipalities with implementing a strategic approach to asset management, but literature suggests that having a formal plan is only one key element that is correlated to improved performance and delivery of an organization’s strategic agenda. What is needed is an articulation of which other strategic planning and management elements are correlated to improved performance, and how these elements can be practically applied in a municipal asset management program.

This research paper attempts to fill this knowledge gap by linking strategic planning and management theory to asset management practice. In the following section a review of academic literature is presented outlining current research efforts related to strategic planning, strategic management, organizational performance, and the linkage to asset management programs.

### **Theoretical Framework for Analysis**

The first portion of the literature review is focused on identifying which elements of the strategic planning and management process are associated with improved organizational performance and implementation of an organization's strategic agenda. The last section of the literature review presents a more detailed description of each strategic planning and management element that is identified, its affect on performance, and indicators that can be observed to demonstrate its occurrence in an organization.

Strategic planning is defined by John Bryson as “a deliberative, disciplined approach to producing fundamental decisions and actions that shape and guide what an organization (or other entity) is, what it does, and why it does it.” (Bryson, 2011). According to Bryson, strategic planning is not any one thing or action; it is a set of concepts, methodologies, elements, and tools that can help a public organization to achieve their mission and create public value (Bryson, 2011). Bryson further elaborates that strategic planning is a “big picture” approach that allows for an organization to deal with the challenges it faces. The process of strategic planning blends future oriented thinking, objectives analysis, and evaluation of goals and priorities to plan the future course of an organization (Poister T. H., 2005).

Strategic planning is considered to be the cornerstone of strategic management, which is defined as “the broader process of managing an organization in a strategic manner on a continuing basis” (Poister, Pitts, & Hamilton Edwards, 2010). Strategic management is a process that involves the resource management, implementation, performance measurement and evaluation, and updating of the organization’s strategic agenda (Poister T. H., 2005). The intent of strategic management is to maintain the best fit between the external environment and the organization as it moves into the future (Poister T. H., 2005).

Strategic planning and strategic management have been linked to public infrastructure asset management programs by American scholars, but there is little research that directly considers the effect of strategic planning and management on asset management programs. Related research exists regarding the effect of strategic planning and management on public sector organizational performance and implementation of strategic agendas. That research is used to develop the theoretical framework for analysis.

Poister, Pitts, and Hamilton Edwards (2010) completed a meta-analysis of thirty-four articles published over a twenty year period to consolidate relevant research related to strategic planning and management. One of the goals of the research was to shed light on the linkages between the elements of strategic planning and management the implementation of strategic plans and the organizational results were produced. The researchers found that common elements of strategic planning and management were reported to be associated with improved performance in the studies considered in the meta-analysis. The elements associated with successful organizational performance include the involvement of internal and external stakeholders in the planning process,

developing formal plans, setting and measuring targets, conducting an internal and external scan of the organization, and linking planning to the organization's budget (Poister, Pitts, & Hamilton Edwards, 2010).

Similar and contradictory findings are reported by Boyne and Gould-Williams (2003) from empirical research that considered if certain elements of strategic planning had a positive effect on organizational outcomes of Welsh local authorities. In their research Boyne and Gould-Williams reviewed the effect of target setting, external analysis, internal analysis, and the use of action plans on the planning process. Developing action plans was determined to be positively correlated with organizational performance; target setting was found to be negatively correlated to performance; and stakeholder involvement was found to have no association (Boyne & Gould-Williams, 2003).

Poister and Streib (2005) conducted a study that focused on the use of strategic planning and management in American municipalities with a population over 25,000. In this study Poister and Streib attempted to determine which elements of the strategic planning process lead to perceptions of improved the respondent organizations. The authors found that including internal and external stakeholders in strategic planning process was associated with perceptions of increased organizational performance. Poister and Streib (2005) also found that traditional planning tools (feasibility assessments and the development of formal plans), linking the strategic planning process to the budget process, goal setting, and performance measurement of strategic goals and objectives were positively associated with the perceived success of strategic planning and management efforts (Poister & Streib, 2005).

Municipal asset management is a complex and continually evolving process. The process involves planning strategically to meet the ever changing needs of citizens, considering what is needed now, soon, and well into the future. The strategic planning component of asset management involves processes that focus on infrastructure systems at a broader level considering the entire lifecycle of an infrastructure asset. Strategic planning has been linked to asset management programs by American scholars reviewing the best practices of asset management that exist in State departments of transportation. Several separate, but similar, studies exist with relatable findings. Pagano, McNeil, and Ogard (2005) conducted a qualitative review of five state departments of transportation in 2005. Poister and Van Slyke (2002) completed a qualitative review of twenty-one State departments of transportation. Poister (2005) completed an assessment of twenty four departments of transportation from American States and Canadian Provinces. The purpose of each of these research efforts was to determine if implementing elements of strategic planning and strategic management assisted in implementing the departments' strategic agendas. The common findings of each of these research efforts was that for successful implementation of the agencies' strategic agendas the following strategic planning and management elements are important: ownership of the asset management strategies must be built throughout the organization; strategic objectives should be set and supported with a performance measurement system; organizational resources must be targeted to achieve objectives; and external support for the program must be developed (Pagano, McNeil, and Ogard, 2005; Poister , 2005; Poister & Van Slyke, 2002).

The purpose of this research paper is to describe how elements of strategic planning and strategic management have been integrated into a municipal asset

management program. This literature review has found several strategic planning management elements that affect performance and the successful implementation of an organization's strategic agenda. The theoretical framework proposed for the case study analysis focuses on identifying indicators of the four most common elements that have been identified, including: having a formal action plan or using f planning tools; setting goals and implementing a performance measurement system; internal and external stakeholder involvement; and linking the strategic process to the organization's budget.

### **Review of Key Strategic Planning and Strategic Management Elements**

**Formal Plans and Planning Tools:** The literature reviewed suggests that implementing a formal plan, or using planning tools, is positively correlated with organizational performance and implementation the strategic agenda. Having an articulated plan clearly sets out the vision and expectations of the organization's senior leadership and Council. This is expected to lead to a positive correlation to performance (Public Sector Digest, 2013). Formal plans ensure that there is a foundation of good information on which decisions can be based, which leads to improved performance (Cooksey, Jeong, & Chae, 2011). Further, it is a best practice for organizations to link lower level processes in the organization like departmental and individual business unit plans to the formal strategic plan for consistency (Poister & Van Slyke, 2002). To ensure that the lower level plans are aligned with the strategic agenda of the organization, Poister (2005) recommends that these plans be approved by top management.

If a formal strategic plan is not in place, use of planning tools and management processes associated with strategic planning and strategic management have been found

to improve performance and implementation of strategic agendas (Poister & Van Slyke, 2002). Poister and Van Slyke (2002) report that strategic agendas were moved forward in organizations that had implemented planning tools that include: clarification of mission and goals; visioning; internal and external environment assessments; assessment of organizational strengths and weaknesses; identification of strategic issues facing the organization; and the development of initiatives to address strategic issues.

There are a number of indicators that demonstrate the extent to which this element has been integrated into the asset management process. The first indicator is the development of a formal asset management plan. If a formally articulated plan has not been implemented, this does not mean that strategic asset management planning is not present within the organization. Observations that demonstrate the use of the planning tools articulated by Poister and Van Slyke (2002) indicate that strategic management is present in an organization's asset management program. The presence of department or sub-unit level business plans tied to the overall strategic plans may indicate the presence of strategic processes. Lastly, establishing a schedule to regularly review the strategic agenda of the organization, with a focus on developing new strategic initiatives to address adjusting to environmental changes, indicates that strategic planning and management processes are present (Poister T. H., 2005).

**Goal Setting and Performance Measurement:** There are conflicting views about the effect of goal setting and performance measurement on performance. On one hand, researchers suggest that setting goals and measuring them are found to have a positive effect on organizational performance and implementation of strategic agendas (Pagano, McNeil, and Ogard, 2005; Poister, 2005; Poister and Streib, 2005; Poister &

Van Slyke, 2002). Setting goals and targets is a way to clearly articulate the vision and priorities of the organization, and is expected to lead to a higher level of performance (Public Sector Digest, 2013). On the other hand, Boyne and Gould-Williams (2003) found a negative correlation between setting goals and objectives and performance. Their findings were that the setting of goals and objectives, and subsequent measurement, created a negative culture in the organizations that used this approach and this led to reduced performance (Boyne & Gould-Williams, 2003). For the purpose of this research, setting of goals and objectives will be assumed to be positively correlated to organizational performance based on the number of research articles that emphasize the importance of this planning element. However, this assumption requires further testing through empirical study due to the conflicting results presented.

Pagano, McNeil, and Ogard (2005) recommend that strategic focus areas, or strategic objectives, must be developed to address each of an organization's strategic priority areas. The researchers further note that linking strategic asset management goals to the budget can ensure that resources are available for successful implementation. These goals should be supported by rigorous performance measurement that informs the next iteration of objectives setting and financial planning. It is important to align the objectives and performance measures of an organization's strategic plan with its asset management program. Regular communication of results produces an organizational consistency that helps to communicate the goals of the asset management program across intra-organizational boundaries (Pagano, McNeil, and Ogard, 2005; Poister, 2005; Poister & Van Slyke, 2002). This approach produces a stronger linkage between strategic

planning and asset management (Pagano, McNeil, and Ogard, 2005; Poister , 2005; Poister & Van Slyke, 2002).

Poister (2005) cautions that when setting goals, organizations should focus on addressing those issues that are truly strategic in nature, and should be selective in the number of goals and objectives that are set. Setting a wide range of goals and objectives is observed to dilute the effectiveness of strategic management as organizational attention is spread out in many directions and on issues that have no direct link to long term performance (Poister T. H., 2005). Poister (2005) observes that best practice locales identify a relative few strategic issues facing the organization, focus attention on these issues, and devote significant resources to developing strategies to address the issues.

Indicators of the use of goal setting and performance measurement include an established process for collecting data from stakeholders and integrating the data collected directly into the process of setting goals and objectives. Best practice locales also develop performance measurement systems that incorporate outcome and output measures that are specifically designed to track progress on the strategic priorities that have been set (Poister T. H., 2005). Poister (2005) further observes that best practice locales use the goals and objectives that have been set to develop numerical targets with specific time frames established for achievement of the targets. Lastly, best practice locales will proactively use performance measures to manage their strategic agendas (Poister T. H., 2005).

**Internal and External Stakeholder Involvement:** Poister and Streib (2005) describe strategic planning and management as an action oriented process that must be carefully linked to implementation for success. Internal stakeholder involvement is

important as research suggests that strategic planning and management efforts that fail at the implementation stage stem from internal managerial issues rather than external political issues (Poister, Pitts, & Hamilton Edwards, 2010). These internal issues develop as a result of resistance from employees who feel threatened by the change (Poister & Streib, 2005).

Involving an organization's employees in strategic planning is expected to build buy-in for the strategic approach which leads to more effective implementation (Cooksey, Jeong, & Chae, 2011). Involving a broad group of managers and front line staff is expected to build ownership of the strategic agenda by way of communicating the goals and objectives of the planning process (Poister & Van Slyke, 2002). In organizations where responsibilities for delivering the strategic agenda cross departmental boundaries, involving internal stakeholders is an effective way to clearly communicate responsibilities to the managers involved (Poister T. H., 2005). Internal stakeholder involvement is expected to result in organizational champions that will lead the implementation of the process, and this has been reported to be directly related to the success of the process (Cooksey, Jeong, & Chae, 2011). Internal stakeholder involvement improves management and analytical capacity in staff; leads to an improved ability to respond effectively to changing environmental circumstances; and leads to more effective organizational leadership and culture. Each of these organisational improvements leads to overall performance improvement (Poister, Pitts, & Hamilton Edwards, 2010).

Involvement of external stakeholders is expected to build support for the strategic agenda, and leads to improved performance. External stakeholder involvement results in a more positive public opinion and more political support for the organization (Poister,

Pitts, & Hamilton Edwards, 2010). A proactive external stakeholder engagement program has been found to mobilize support for the strategic agenda amongst the public advocates of the organization, and has been found to neutralize organizational antagonists and those who do not support the proposed strategic agenda (Poister & Van Slyke, 2002). Specific to strategic asset management, receiving feedback from the public regarding the condition of municipal infrastructure is expected to promote investment decisions by the elected officials (Public Sector Digest, 2013). Educating the public about the asset management plan is expected to build external support for the plan (Public Sector Digest, 2013).

Indicators of internal stakeholder involvement demonstrate a vertical and horizontal approach to the planning process. For example, clear internal communication of goals should be present, a champion of the process should be assigned, and staff at all levels of the organization should be involved in the performance measurement process (Cooksey, Jeong, & Chae, 2011). Top management in the organization should be seen as visibly supporting the strategic agenda and organizational sub-units should be required to develop their own business plans that are subsequently approved by top management (Poister T. H., 2005).

Indicators of external stakeholder involvement demonstrate that the public is integrated into the planning process (Public Sector Digest, 2013). Organizational processes should incorporate external comments and concerns into the planning process; set goals in the strategic agenda to address these concerns; planning tools should be made publicly available for public comment and feedback; and active public education should be undertaken (Poister, 2005, Poister & Van Slyke, 2002, Public Sector Digest, 2013).

**Budget and Resources Allocation:** Linking the organization's budget to the strategic management process is expected to result in improved performance. In a study of the implementation of strategic planning in State agencies Berry and Wechsler (1995) found that linking strategic planning and management to budget practices leads to two key organizational improvements: making budget decisions simpler; and providing a mechanism to gain support for the budget priorities of the organization (Berry & Wechsler, 1995).

Linking strategic management processes to the budget ensures that there will be sufficient funds available to implement the strategic priorities identified and improve organizational performance (Pagano, McNeil, and Ogard, 2005; Poister & Van Slyke, 2002). A key to successfully implementing the strategic agenda is to link asset management goals directly to the budgeting process (Pagano, McNeil, & Ogard, 2005), and to use performance goals when determining annual budget allocations (Poister T. H., 2005). Poister (2005) recommends against directly presenting the costs of the strategic initiatives within the planning documents. This approach can have the effect of sinking a specific initiative prior to implementation as stakeholders, Council, and top management view the initiative as too costly (Poister T. H., 2005). Related to asset management specifically, effective programs allocate resources in a timely fashion so that capital investment prevents rising operating costs as an asset deteriorates (Public Sector Digest, 2013). ). The various budgetary analyses completed during the planning process are expected to lead to an increased awareness of the need to fund infrastructure and will positively affect performance (Public Sector Digest, 2013)

Indicators of the linkage between strategic management and budget include putting both processes on the same cycles. Preferably, the strategic processes are complete first its principles drive the budget process (Berry & Wechsler, 1995). This approach ensures that budget decisions are made in the context of the plan. In many organizations, budget requests must be directly tied back to the strategic plan of the organization, or back to departmental business plans that have adopted the principles of the strategic plan (Berry & Wechsler, 1995). Many researchers strongly advocate for organizations to develop performance measures that are directly linked to the organization's budget, and to set budget metrics as performance measures (Berry & Wechsler, 1995; Pagano, McNeil, and Ogard, 2005; Poister , 2005; Poister & Van Slyke, 2002).

## Methodology

### **Research Design**

The question to be answered by this research is:

*Which elements of strategic planning and strategic management are associated with improved organizational performance, and how are these elements practically implemented in a municipality's asset management program?*

As determined through the literature review the strategic planning and management elements to be considered in the theoretical framework are: having a formal action plan or using formal planning tools and processes; setting goals and developing a performance measurement system; internal and external stakeholder involvement; and linking the strategic process to the organization's budget.

This research aims to answer how the elements of strategic planning and management are practically applied in a municipal asset management program. This will be determined by a case study of the City of Hamilton. The case study approach was chosen because this research method is a preferred approach for exploratory research attempting to answer a "how" question (O'Sullivan, Rassel, & Berner, 2008). A single "instrumental" case study approach was selected because this research focuses on a municipal program that is bounded within a single organization. The instrumental case study approach is acceptable when the case is bounded and the intent of the research is to further illustrate one particular matter or issue (Creswell, 2012).

The City of Hamilton was chosen based on a review of asset management practitioner literature which indicates the City's positive reputations in this field and by a recommendation from Ministry of Infrastructure staff. Hamilton is generally considered to have one of the most advanced and effective asset management programs among

Canadian municipalities (Harmer, 2013). A conscious decision was made to select a public organization that is presumed to have a successful program so that municipal practitioners can use the practices identified as a resource to improve their own asset management programs. In addition, a presumed successful program was chosen so that the theoretical indicators expected to be observed can be practically described. These findings can be drawn upon to operationalize the concepts of asset management performance and strategic planning and management in a future research effort.

### **Data Collection Methods**

To ensure the case study was focused and unbiased the research was conducted considering an initial hypothesis as recommended O'Sullivan (O'Sullivan, Rassel, & Berner, 2008). To guide this research effort the following hypothesis was developed:

*H<sub>1</sub>: If a municipality is considered to have a successful asset management program then elements of strategic planning and management will be evident in their asset management program.*

To apply the theoretical framework proposed, successful program performance is taken as a given, based on the relevant literature and opinions of professionals in the field.

O'Sullivan recommends developing a model for data collection prior to initiating a case study, and states that it is acceptable to narrow the research scope to focus on components of a program (O'Sullivan, Rassel, & Berner, 2008). The framework of this research was designed to narrow the data collection effort to the four key planning elements identified. To focus the research, questions specific to each strategic planning

and management element were adapted from benchmark statements presented by Poister and Streib (2005) and were used as the research model. Table 1 at the end of this section presents the statements adapted to reflect indicators of strategic asset management.

Primary and secondary sources of information were used to collect indicator data. The primary sources of information were relevant, publicly available, municipal documents including: 2007 public works department strategic plan; 2012 – 2015 corporate strategic plan; 2014 asset management plan; 2009 *State of the Infrastructure* report; 2014 capital and operating budget summaries; and relevant staff reports. Additionally, a telephone interview was completed with the key manager at the City of Hamilton responsible for asset management. Secondary sources of information, including a consultant's report who worked directly on the City's program and other literature documenting the City's program, were used to fill in any outstanding information gaps.

### **Research Limitations**

Key to a successful case study is to generate data from many different sources including documents, archival information, interviews, direct observation, participant observation, and physical artifacts (O'Sullivan, Rassel, & Berner, 2008). Reviewing a large number of cases provides breadth to case study research (O'Sullivan, Rassel, & Berner, 2008).

A limitation of this research effort is resources, and it is difficult to achieve the breadth that O'Sullivan recommends. Because of limited resources, only one bounded cases was chosen and data collection efforts have been limited to the most accessible data. The thoughts and opinions of external and internal stakeholders cannot be gathered

as they relate to either program that is studied. Direct observation of municipal budgeting or strategic planning efforts cannot be conducted. This limits the data that is collected and makes cross referencing findings between data sources difficult. By using the case study method and limiting the field of study to one bounded case, broad scale generalizations regarding municipal asset management programs are not possible.

### **Research Assumptions**

A significant assumption of this research design is that strategic planning and strategic management elements have been integrated into the City's asset management program. This is a fundamental assumption to this effort, and one that is necessary to generate the research question. If this assumption is incorrect this research will not have been without its use. The case program that has been studied is considered to be one of the leaders in the field, and if strategic planning and strategic management elements have not been a part of that success then it's likely that other lessons can be learned from this case.

To apply the theoretical framework to the case study a fundamental assumption is made that the City has a successful asset management program. In this research, performance, as a dependent variable, is not defined or measured. Successful performance is taken as a given based on the relevant industry literature and opinions of professionals in the field. To apply the theoretical framework this assumption cannot be avoided. A future research suggestion is to define and measure asset management performance as a dependent variable using the strategic planning and management elements identified as independent variables

<b>Table 1: Research Statements to Test Indicators of Strategic Planning and Management in Asset Management Programs</b>			
<b>Formal Plans and Planning Tools</b>	<b>Goal Setting and Performance Measurement</b>	<b>Internal and External Involvement</b>	<b>Budget and Resource Allocation</b>
<ul style="list-style-type: none"> <li>– A formal asset management plan exists, and is tied directly to the corporate strategic plan.</li> <li>– Individual departments are required to prepare strategic business plans that are directly tied to the corporate strategic plan and approved by top management.</li> <li>– Strategic priorities are set as the relate to asset management, and involve the development of a mission statement, visioning, setting of goals, internal and external environment scans, and SWOT analyses</li> </ul>	<ul style="list-style-type: none"> <li>– Performance measures are used to track the implementation of projects or other initiatives called for in the asset management plan.</li> <li>– Performance measures are used to track the accomplishment of goals and objectives contained in the asset management plan.</li> <li>– Performance measures are used to track the outcome conditions targeted in the asset management plan.</li> <li>– Performance measures associated with the asset management plan are reported to Council on a regular basis.</li> <li>– Programs are targeted for more intensive evaluation based on the goals and objectives of the asset management plan.</li> <li>– Performance measures associated with the asset management plan are reported to the public on a regular basis.</li> <li>– Performance measures are benchmarked against other jurisdictions to gauge the effectiveness of asset management initiatives.</li> <li>– Performance data is tracked over time to determine whether performance in asset management has improved over previous levels.</li> </ul>	<ul style="list-style-type: none"> <li>– Council has been centrally involved in developing the asset management plan.</li> <li>– The top administrator has been centrally involved in developing the asset management plan.</li> <li>– Department heads and senior managers have been centrally involved in developing the asset management plan.</li> <li>– Lower level employees have been centrally involved in developing the asset management plan.</li> <li>– Citizens and other external stakeholders have been centrally involved in developing the asset management plan.</li> </ul>	<ul style="list-style-type: none"> <li>– The annual budget strongly supports the goals, priorities, and objectives established in the asset management plan.</li> <li>– City council considers the strategic goals and objectives of the asset management program when reviewing the annual budget.</li> <li>– The capital budget reflects the goals, objectives, and priorities of the asset management plan.</li> <li>– New money in the budget is targeted to achieving asset management goals and objectives.</li> <li>– The asset management plan has a strong influence on the budget requests submitted by department heads and other managers.</li> <li>– Performance data tied to asset management goals and objectives play an important role in determining resource allocations.</li> </ul>

## **Case Study Analyses: City of Hamilton's Asset Management Program**

This section presents a case study analysis of the City of Hamilton's asset management program. First the program environment is described. Next, observations of the program are presented as they relate to each of the key strategic planning and strategic management elements that have been identified in the theoretical framework.

### **Program Environment**

The City of Hamilton is located on the western shore of Lake Ontario in Ontario, Canada. The current municipal structure is the result of a wide scale municipal amalgamation. In the year 2000 the regional Municipality of Hamilton-Wentworth amalgamated with six other surrounding municipalities to form the current City of Hamilton. The City has an estimated population of 500,000 and is expected to grow to 622,420 by the year 2031 at the current growth rate (United States Environmental Protection Agency, 2011).

The City of Hamilton's asset management program began in 1998, prior to amalgamation, and has won numerous awards for its innovations. Much of the Ontario Ministry of Infrastructure's *Building Together: Guide for Municipal Asset Management Plans* is based on the City of Hamilton's asset management practices. Currently, the City's asset management program is focused on public works assets including water treatment and distribution, sanitary sewage treatment and conveyance, stormwater treatment and conveyance, municipal roadways, and municipal bridges and culverts. The current replacement value of the assets the program manages is 14.4 billion Canadian dollars (City of Hamilton, 2014).

Several external factors affect the City's asset management program. In the past ten years the City has been impacted by global economic decline. The City's financial landscape has changed from a major industrial centre that financially supported growth, to a declining employment centre (City of Hamilton, 2014). As a result, the City faces reduced funding from taxes raised from the industrial property class and has become more reliant on tax funding that is generated from the residential tax class (City of Hamilton, 2014). This has the impact of reducing funding available for the asset management program.

From a regulatory perspective the asset management program is affected by Provincial regulations and policies. First, there are mandated budget linkages for the asset management program. On January 1, 2009, the Public Sector Accounting Board's (PSAB) new accounting rules came into effect for Canadian municipalities requiring municipalities to report the value of tangible capital assets on their financial sheets rather than just annual asset expenses. On January 1, 2011, Ontario Regulation 453 was established under the Safe Drinking Water Act 2002 requiring the development of a financial plan for all municipal water systems. Second, as part of the *Building Together* economic action plan the Province of Ontario requires that any municipality applying for Provincial infrastructure funding to have completed a formal asset management plan by December 31, 2013.

### **Formal Plans and Planning Tools**

The City of Hamilton's strategic approach to asset management is described as a "top-down" approach to planning, and a "bottom-up" approach for implementation of the

strategic agenda (R.V. Anderson Associates Limited, 2011). The program's "top-down" approach begins with a clear linkage between the city's asset management plan and the City's corporate 2012-2015 strategic plan. The City's strategic plan specifically references aspects of the asset management program in the strategic objectives and actions developed to achieve identified strategic priorities. Strategic action 1.2 (i) is the clearest demonstration of the link between the strategic plan and the asset management program with a specific reference to the *State of the Infrastructure* report:

*“Strategic Objective*

*1.2 Continue to prioritize capital infrastructure projects to support managed growth and optimize community benefit.*

*Strategic Actions*

*1.2.(i) Update the State of the Infrastructure Report (based on 2011 asset analysis)”*

(City of Hamilton, 2012)

In the asset management program the integral document is the City's recently approved asset management plan. As a part of its *Building Together* economic action plan the Province of Ontario requires that any municipality applying for Provincial infrastructure funding to have completed a formal asset management plan by December 31, 2013, although there is no penalty for having prepared a plan after this date. The current version of the asset management plan was approved by municipal Council in April 2014 to meet the policy requirements of the Province of Ontario. Within the staff report that Council considered when approving the asset management plan the link to the strategic plan is made clear. Staff report PW14035 specifically references the links to the strategic plan, linkages that are formally documented in the asset management plan. Figure 1 below is an excerpt from the asset management plan where the links to the strategic plan are documented.

**Figure 1 – Alignment of City of Hamilton Asset Management with Strategic Planning Statements**

Strategic Plan Statement	AMP Alignment
<b>Corporate Vision:</b> To be the best place in Canada to raise a child, promote innovation, engage citizens and provide diverse economic opportunities.	Reliable high quality infrastructure services are required to attract residents and new businesses. The AMP aligns capital spending with needs based on target level of service standards across various service areas
<b>Strategic Objective 1.2:</b> Continue to prioritize capital infrastructure projects to support managed growth and optimize community benefit	AMP provides procedures and tools to allow for optimal allocation of capital infrastructure spending
<b>Strategic Objective 1.3:</b> Promote economic opportunities with a focus on Hamilton's downtown core, all downtown areas and waterfronts	AM data provides a better understanding of older infrastructure and provides decision-makers with tools to allow for optimal selection of asset intervention options
<b>Strategic Objective 1.6:</b> Enhance Overall Sustainability (financial, economic, social and environmental)	AMP provides a level of service framework that captures financial, social and environmental objectives and helps align decisions with these objectives
<b>Strategic Objective 2.2:</b> Improve the City's approach to engaging and informing citizens and stakeholders.	AMP provides transparency in communicating priorities and outlining how capital spending decisions are made across various service areas

(City of Hamilton, 2014)

The asset management plan sets out the City's long term approach to strategically managing its public works assets. The plan covers the asset categories for the municipal services of water, wastewater, storm water, roadways, and bridges. Strategic priorities are set as they relate to asset management in Section 5 of the plan. In that section of the plan, the current inventory of asset management practices is presented along with recommended future strategies to address future infrastructure demands. The plan establishes the overall objective for the asset management program, articulates service level goals for each asset category, establishes performance measures, and describes internal and external environmental threats that may prevent the City from achieving its goals. The plan establishes a review schedule at once every five years to coincide with the five year update of the City's *State of the Infrastructure* report.

The City's asset management plan is a compilation of the many well established asset management practices that the City has implemented (City of Hamilton, 2014). A number of formal planning tools specific to the asset management program existed prior to the asset management plan's adoption, and are still present within the asset

management program. Prior to the adoption of the asset management plan, the central guiding document for the asset management program was a business unit strategic plan for the Public Works Department. In March 2007 the City's Public Works Department adopted its strategic plan titled *Innovate Now! A Compass to Public Works to 2017*. The strategic plan was developed using the traditional planning approaches of visioning, developing values, internal and external environmental scan, developing strategic priorities, and developing strategic actions to achieve these priorities (City of Hamilton, 2007). The strategic plan directly considers the City's infrastructure, identifying infrastructure as one of the main strategic issues facing the city. The public works strategic plan calls for the City to implement the asset management program in a "triple bottom-line perspective – taking into account environmental and social performance in addition to financial performance" (United States Environmental Protection Agency, 2011).

The "bottom-up" approach to implementation of the asset management program begins with the City's *State of the Infrastructure* report. This is the primary supporting document for the 2007 departmental level strategic plan and for the 2014 asset management plan. The document is a mix of planning approaches and hard engineering data for each of the infrastructure categories considered. The *State of the Infrastructure* report was first developed in the year 2005, and updated in the years 2006, 2009 and 2013. The *State of the Infrastructure* report is a key piece of the City's asset management program and provides information regarding which maintenance and investment requirements are necessary to maintain the current service levels for infrastructure. The

report attempts to predict future infrastructure trends based on financial investment levels (R.V. Anderson Associates Limited, 2011).

The *State of the Infrastructure* report provides a summary of the specific processes and other planning tools that the City uses to plan and manage its infrastructure. Located at the bottom level of the program hierarchy are planning tools in the form of monitoring and condition assessment activities that feed data upwards into the planning process. The City uses various reports and assessments depending on the infrastructure category, and the information generated by these activities informs the next iteration of the *State of the Infrastructure* report. For example, roadways use a “Pavement Management System” which is a software tool that stores road condition data that is gathered from inspections. The software prioritizes road rehabilitation needs and rehabilitation strategies and predicts future funding needs. Similar approaches are taken for the other core infrastructure categories. Bridges undergo legislated bi-annual inspections and the results of the inspections are integrated back into the management system. Water distribution and sanitary sewer systems undergo regular and detailed condition assessments.

In summary, a number of indicators of implementing strategic planning and management tools are observed within the City of Hamilton’s asset management program. In a benchmark case, academic literature expects to find the following indicators: development of a formal asset management plan; use of the planning tools; department or sub-unit level business plans tied to the overall strategic plans; and an established process to regularly review the strategic agenda of the organization as it relates to asset management. First, a formal asset management plan has been developed,

is tied directly to the corporate strategic plan, and has an established review period. In addition, the asset management plan: articulates strategic priorities for the asset management program; includes a detailed internal and external environmental scan as it relates to the asset management program; and articulates the many planning tools that the City has implemented to support the asset management program. Lastly, the Public Works Department has developed a business unit level strategic plan that has been directly tied to the corporate strategic plan and included top management in its development.

### **Goal Setting and Performance Measurement**

The high level vision, goals, and objectives of the asset management program are set out by the City's corporate strategic plan as shown previously in Figure 1. The asset management plan sets out a specific objective as it relates to public works infrastructure to achieve the overall corporate objectives:

*“The objective is to maximize benefits, manage risk, and provide satisfactory levels of service to the public in a sustainable manner”*

(City of Hamilton, 2014)

The specific goals of the program resulting from this objective statement are:

- 1. Sustain Service through the operation, maintenance, and renewal of existing infrastructure, and*
- 2. Enhance Service to address growth, and changing service requirements through the upgrading and expansion of existing infrastructure.*

(City of Hamilton, 2014)

The City uses a range of measures and indicators to evaluate asset performance, identify trends, and benchmark performance measures. The current majority of

performance indicators used by the City are asset specific technical indicators. This is the traditional method of measuring asset performance which is founded in engineering.

Examples of these indicators include number of water main breaks per kilometer of water main, number of water service interruptions per year, cost per unit to operate sewer mains, et cetera.

Performance of infrastructure assets is documented within the *State of the Infrastructure* report which now forms a section of the City’s asset management plan. There are clear examples of benchmarking and trend evaluation within the asset management program. The City develops annual *State of the Infrastructure* “report cards” to provide an easy to understand reference to track the City’s performance trends. This report card compares the overall trend of all performance measures in each asset category on an annual basis. The report card is presented to municipal Council on an annual basis, and there is evidence that the trends are acted upon. After receiving the 2009 report card Hamilton City Council engaged their engineering consulting firm to provide information and strategies on how to improve higher rating scores in asset groups including roads and traffic and storm water (R.V. Anderson Associates Limited, 2011). Figure 2 below presents an example of the report card included in the 2014 asset management plan.

**Figure 2 – 2014 State of the Infrastructure Report Card**

Asset Class	Value (millions)	Rating	Trend
Water	\$2,771	B-	→
Wastewater	\$4,419	C	→
Stormwater	\$1,996	D	↘
Roads and Bridges	\$5,211	C-	↘
TOTAL	\$14,397	C	↘

Legend: → stable trend, ↘ decreasing trend

(City of Hamilton, 2014)

Many of the technical indicators measured by the City are inward facing, and only a limited amount of external benchmarking is completed. Benchmarking is completed against internal metrics considering trends in infrastructure performance over time. Figure 3 provides an example of the internal benchmarking that is presented in of the asset management plan. This summary table shows the trend of various technical indicators for wastewater asset performance. Additionally, this summary table links the existing technical indicators with new “level of services” goals that are discussed later.

**Figure 3 – 2013 State of the Infrastructure Trends – Wastewater**

Service Goal	TLOS	2007	2008	2009	2010	2011	Trend
Affordable	O&M Cost ('000) / km Length	\$2.8	\$3.1	\$3.1	\$2.5	\$2.4	↗
Protect the Public	5 Year Average Emergency Sewer Repairs / 100 km Length	2.5	2.2	1.7	1.2	0.7	↗
Sufficient quality / quantity	# of Wastewater Related Customer Complaints / 1,000 People Served	5.5	1.72	12.58	3.31	2.92	↗
	# of Blocked Sewers / 100 km Length	4.5	1.3	0.9	4.1	6.8	↘
	% of Length Cleaned	8.0%	3.0%	4.0%	3.0%	4.0%	→
Uninterrupted Service	% of Length CCTV Inspected	12.10%	6.90%	6.00%	6.90%	6.00%	→
	5 Year Average Emergency Sewer Repairs / 100 km Length	2.5	2.2	1.7	1.2	0.7	↗
	# of Blocked Sewers / 100 km Length	4.5	1.3	0.9	4.1	6.8	↘

(City of Hamilton, 2014)

There is an observable variation in the sophistication of established metrics. For example, within the water and waste water division many performance metrics have been developed, and a number of performance trend evaluations are completed. For roads, fewer performance indicators have been developed. Currently performance trends are only developed for a “road condition index” indicator, and other indicators have not been developed. For bridges, bridge condition index is the only indicator that is tracked, and no performance trending is observable.

The asset management plan provides a thorough discussion of the internal and external threats that the City faces to achieving its goals. The plan also includes an articulation of the limitations of the current performance measurement system with a recommendation to change the performance measurement philosophy to one that is founded on “levels of service” rather than on technical indicators only. The City is in the midst of developing a performance measurement system that considers what the “acceptable” level of service is for each asset category. This system aims to develop performance measures that are based on three levels of consideration: corporate level, considering corporate goals; customer level, defining the acceptable level of service to citizens; and asset level, defining the technical requirements to achieve service objectives (City of Hamilton, 2014). Under this new system the City has identified nine high level performance indicators that need to be achieved, and clear service level goals have been defined. As the system moves forward the City has identified that additional performance measures will need to be established. Presently, the City is reconciling the existing technical performance indicators with the proposed level of service performance measurement. Figure 4 below provides a visual example of this reconciliation process.

**Figure 4 – Reconciliation of Existing Technical Indicators to New Level of Service Goals**

Service	Service Goal	Technical Level of Service
Accessible	Affordable	O&M Cost / ML Treated
		Chemical Cost / ML Treated
	Accommodate Growth	Average Day Demand / Existing Water License Capacity
Safe	Keep employees safe	Not currently tracked; Measure under development
	Protect the Public	# of Occurrences of Total Coliforms
Reliable	Sufficient Quality /Quantity	Average Day Demand / Existing Water License Capacity
		Average Value for Turbidity (NTU)
		Median Value for Nitrates (mg/L)
	Uninterrupted Service	Not currently tracked; Measure under development
Regulatory	Meet License - Safety	# of Occurrences of Total Coliforms
	Meet License - Environment	Not currently tracked; Measure under development
Customer Service	Responsive	Not currently tracked; Measure under development
	Accurate	Not currently tracked; Measure under development

(City of Hamilton, 2014)

As a part of the reconciliation the City has compared the current performance measurement trends with the new level of service goals to show the initial trend in each asset category. Figure 5 below shows the current results:

**Figure 5 – Reconciliation of Existing Performance Trends to New Level of Service Goals**

Dimension	Service Goal	Water		Wastewater		Transportation	
		Treatment	Distribution	Treatment	Collection	Roads	Bridges
Accessible	Affordable	↘	↘	→	↗	↘	↘
	Accommodate Growth	→	-	→	-	→	→
Safe	Keep employees safe	-	-	-	-	→	→
	Protect the Public	→	→	→	↗	→	→
Reliable	Sufficient Quality /Quantity	↗	↗	→	↗	↘	→
	Uninterrupted Service	-	↘	-	↘	↘	→
Regulatory	Safety	→	-	→	-	→	→
	Environment	-	-	-	-	-	-
Customer Service	Responsive	-	-	-	-	-	-
	Accurate	-	-	-	-	-	-

Legend: "-" Not currently tracked / Measure under development, ↘ decreasing trend, → stable trend, ↗ increasing trend

(City of Hamilton, 2014)

In summary, there is a clear link between the asset management program and the strategic elements of goal setting and performance measurement. In a benchmark case, academic literature expects to find the following indicators: an established process for collecting data and integrating the data collected directly into the process of setting goals and objectives; performance measurement systems that incorporate outcome and output measures that are specifically designed to track progress of the strategic priorities; numerical targets are set to achieve goals, with specific time frames established for achievement of the targets; and benchmarking of performance measures. Presently, technical performance indicators and performance measures have been developed by the City to document trends in infrastructure over time. Performance measures associated with the asset management program are reported to Council on a regular basis through annual report cards. There is evidence of follow-up on downward performance trends as

Council has directed follow-up in several downward trending areas. Some benchmarking of performance measures occurs, however the comparison is primarily internal and there is only limited external benchmarking.

What is lacking in the asset management program's performance measurement system is a clear articulation of what specific performance targets are to be achieved for each goal. High level goals and objectives statements for the program are observable, but these statements have not been transferred into specific numerical targets to be achieved. As a result, the performance indicators and trend evaluation that have been established are useful to document performance over time, but by not having specific targets established for the technical performance indicators it is not clear what ultimate goals the program is working towards. Of importance is the lack of clear performance targets as they relate to the financial metrics. A key strategic planning and management indicator is the development of performance measures that are budget related, and these do not appear to be evident. Many of the infrastructure performance measures that have been established by the City are cost based, but no specific targets have been established for these financial based indicators.

### **Internal and External Stakeholder Involvement**

The City's organizational structure provides for clear delegation of responsibility for the asset management program. The large scale municipal amalgamation in Ontario in 2000 provided the opportune time for the City to develop a specific Asset Management Group responsible for the asset management program (United States Environmental Protection Agency, 2011). The senior managers leading the City through the process of

amalgamation formed the Asset Management Group with a staff compliment of 5 employees (R.V. Anderson Associates Limited, 2011). The group's initial task was to develop forecasts for overall asset lifecycles and to collect current condition data for the new City's assets. This process of data collection formed the foundation of the new asset management program implemented by the amalgamated City (R.V. Anderson Associates Limited, 2011).

Today, the City's Asset Management Group resides within the Engineering Services Division of the Public Works Department. Clear responsibility for the asset management program is observed as the program has been delegated to the "Manager – Asset Management" and the group's twenty-one full time employees. The Asset Management Group is responsible for preparing the Public Works Department's annual capital budget and approving all infrastructure improvement projects. In this process all projects are required to be vetted by the Asset Management Group through an "Infrastructure Project Coordinating Committee". The committee was established as a forum for all divisions within the Public Works Department to become involved in the asset management program through the review of the projects planned for the annual capital budget (United States Environmental Protection Agency, 2011). The purpose of the committee's review is to provide feedback and identify issues from the perspectives of the various divisions before project plans are finalized into the Public Works Department's capital plan (Murray, 2014). This process helps to ensure that the capital plan that is developed for Council's consideration follows the strategic priorities established for the asset management program (Murray, 2014). To ensure that there is active participation from all divisions the senior managers responsible for the committee

have established a standing rule *“If you do not attend the coordination meetings, you do not get funding for your projects”* (United States Environmental Protection Agency, 2011). The process established by this committee is a demonstration of horizontal integration of the asset management program

To further the depth of the committee’s review, the Asset Management Group has involved front line operations and maintenance staff in the project review process. This group of internal stakeholders has been added to the process because of their close contact with the assets on a day to day basis which adds informed insight to the decision making process (Murray, 2014). Involvement of front line staff demonstrates a clear vertical integration of internal stakeholders into the asset management program.

Further internal stakeholder involvement is observed in the development of planning documents for the asset management program. In 2007 the Public Works Department developed a strategic plan to serve as a business unit plan. The process of developing this business unit plan is described as being “bottom-up” because it was initiated at the department level rather than being directed from the corporate level (City of Hamilton, 2007). The process of developing the plan is observed to be collaborative, involving members of staff representing each division within the department of Public Works. Up to forty members of the department formed an “Extended Departmental Management Team” (XDMT) and participated in once per month half-day workshops to develop the departmental strategic plan (City of Hamilton, 2007). In between meetings members of the XDMT were responsible for communicating with staff at all levels of the department to gather their input. In addition, seventy City staff members from other departments, including the City Manager and other senior leaders, were engaged to

provide feedback into development of the public works strategic agenda through to the year 2017. This planning process is a clear example of horizontal and vertical stakeholder involvement in the development of a planning tool that helps to drive the asset management program.

Evidence has been observed that municipal Council is well integrated into the asset management program. Council endorsement and understanding of the asset management program has been identified by staff as a key success factor for the program (City of Hamilton, 2014). As a result, there is regular communication between division staff responsible for asset management and the elected officials. This includes presentation of the annual *State of the Infrastructure* “report card” for feedback on observed trends. Each year, representatives of the asset management group meet with all Council members to review the current three year capital plan and the projects contained within the plan. In addition, a once per year bus tour is scheduled with the Mayor, Council, and asset management staff in attendance. The purpose of the bus tour is to review each ward of the City in an effort to demonstrate to Council the scale of the program and the initiatives that are implemented (Murray, 2014). The bus tour is meant to serve as a “reality check” for all councillors so that ward specific issues can be compared against the entire scope of the issues that the asset management program is attempting to address. As a part of the tour, maps showing the location of current and future projects in each ward are provided to Councillors. This is supported by staff from the asset management actively providing information to Councillors when responding to citizen inquiries regarding priority of projects. This extensive Council engagement plan is

reported to have reduced hesitation from Council members in promoting projects that are outside of their local wards (United States Environmental Protection Agency, 2011).

Presently, there is not clear evidence of external stakeholder involvement in the asset management program. In 2012, the Asset Management Group attempted to conduct a wide scale public engagement activity that failed for numerous reasons, primarily political involvement. Since that time no further attempts to engage the public in the asset management program have been attempted.

Moving forward, the City has identified improved public engagement as one of its priorities in the corporate strategic plan and the City is in the midst of a broad public engagement initiative. As a part of the initiative a focus group of twenty city residents has been established to offer consultation on the asset management program as the program shifts its performance measurement philosophy to one that is based upon levels of service. The purpose of the public engagement piece is to determine what citizens consider to be acceptable service levels, what is important to residents in terms of which services are delivered, and how much they are willing to pay for services. The engagement process further aims to determine the value the public puts in various services and whether these are aligned with the City's corporate values. As a part of the engagement program, the asset management group plans to present the public with specific service level and cost challenges and solicit feedback on the preferred approach to deal with these challenges.

In summary, there is clear evidence within the City's asset management program of internal stakeholder engagement, and this is a strength of the program. In a benchmark case academic literature notes that internal stakeholder involvement should demonstrate a

vertical approach to the planning process with the following indicators evident: a clear vertical communication of goals should be present; a champion of the process should be assigned, staff at all levels of the organization should be involved in the process; top management in the organization should be seen as visibly supporting the strategic agenda; and organizational sub-units should be required to develop their own business plans that are subsequently approved by top management. A program champion has been assigned, and responsibility for the asset management program has been delegated to the staff position of the “Manager – Asset Management” Manager. Importantly, the asset management plan has been considered and approved by Council, and the program uses a Council tour to ensure that Council is informed of the asset management program’s initiatives. Council was not directly involved in developing the current asset management plan, but Council has been regularly consulted on the *State of the Infrastructure* report. The City Manager and senior management have been directly involved in the program through the development of the Public Works Department’s strategic plan. Employees below the senior management level are regularly involved in the asset management program, particularly through the budgeting process.

Currently there is not strong evidence of external stakeholder involvement within the program. Indicators of external stakeholder involvement should demonstrate that the public is clearly integrated into the planning process, including: incorporating external comments and concerns into the planning process; setting strategic goals to address these concerns; planning tools should be made publicly available for public comment and feedback; and active public education should be undertaken. All program documentation is made available to the public, but this is the extent of the indicators that have been

observed in the asset management program's current approach. This is a weakness in the program that has been self identified by the City and a corporate level approach to improve public engagement has been targeted as a priority in the City's corporate strategic plan. Specific to the asset management program, the City is in the midst of public engagement sessions as a part of its shift in performance measurement philosophy to a "level of service" focus.

### **Budget and Resources Allocation**

Prior to considering how the City of Hamilton links the asset management program to the annual budget it is important to understand the regulatory framework that the program operates within. Two recent regulatory changes have established a mandated budget linkage for the program. On January 1, 2009, the Public Sector Accounting Board's (PSAB) new accounting rules came into effect for Canadian municipalities. The purpose of the new accounting rules was to establish accounting requirements for municipalities to report the value of tangible capital assets on their financial sheets rather than just annual asset expenses. This was a significant shift for municipalities and the requirements were established to force a mechanism onto municipalities to account for and consider the costs and values of their assets (Public Sector Digest, 2011). On January 1, 2011, Ontario Regulation 453 was established under the Safe Drinking Water Act 2002. This regulation required the development of a financial plan for all municipal water systems to ensure that the system was financially sustainable over periods of five years. Similar to the PSAB changes, this regulation brought additional attention to municipal infrastructure and established a mandated link to each municipality's budgeting process.

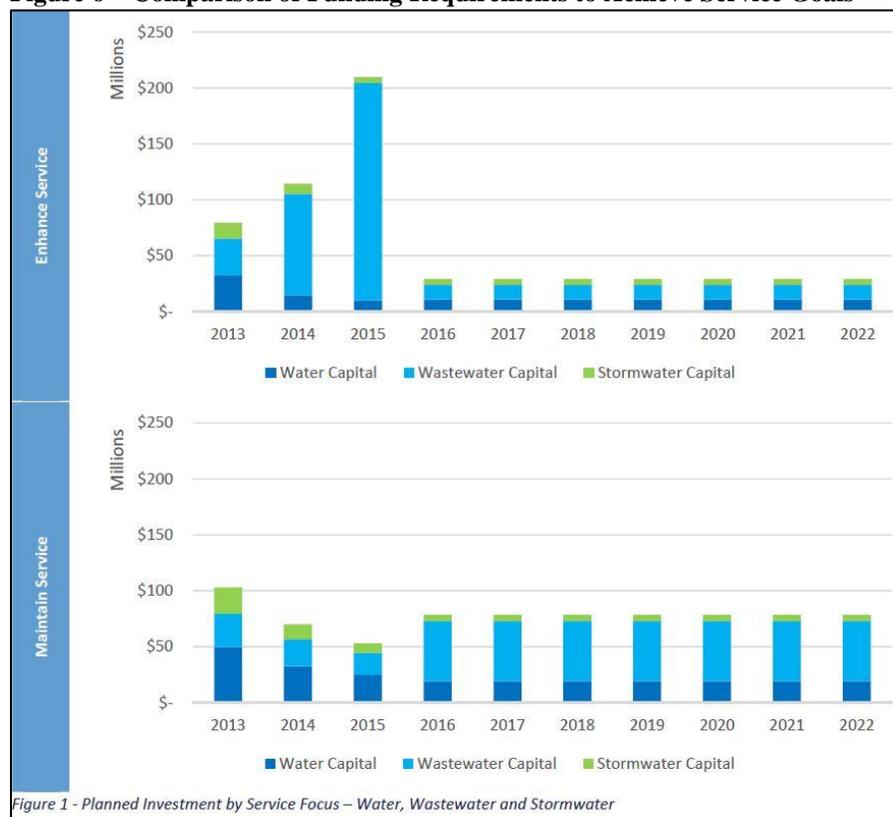
The City has established several linkages between the asset management program and the annual budgeting process. The linkage begins at the organizational structure and responsibilities level. Within the Public Works Department the Asset Management Group has been delegated full responsibility for producing the department's capital budget program on an annual basis. The Public Works Department consists of several divisions, and delegating responsibility for budgeting to the Asset Management Group was done to ensure that a consistent approach to budgeting was taken, and to ensure that the annual budget reflects the priorities established within planning documents (City of Hamilton, 2014).

The budgeting process begins as a parallel effort coordinated between the finance and engineering staff members that work within the Asset Management Group. The Asset Management Group includes staff members that are specialists in municipal finance who are responsible for creating the financial data for tangible capital asset reporting under the PSAB requirements. The PSAB reporting generates a higher level perspective to the financial trends of the infrastructure assets, and illustrates the trends of where the City is committing sufficient funds to the asset management program, and where it is lacking (Public Sector Digest, 2011).

The standard requirement under the PSAB reporting is to account for the historical cost of assets on the City's financial returns (Public Sector Digest, 2011). The Asset Management Group has recognized that considering the historical costs of assets understates the actual capital needed at the time of asset replacement (Public Sector Digest, 2011). As a result, the Asset Management Group has modified their approach to develop financing strategies that consider the expected replacement value of assets based

on their expected lifecycle. By integrating the expected replacement value into the program the City is able to generate an understanding of the sustainable funding levels that are required annually to achieve various levels of service. This information is integrated directly into the Public Works Department’s annual budget submission to Council so that Council is made aware of the resources that are required to maintain and enhance service levels. Figure 6 below provides a sample of the reporting that is used:

**Figure 6 – Comparison of Funding Requirements to Achieve Service Goals**



(City of Hamilton, 2014)

As a part of the parallel process to developing the budget technical staff members within the Asset Management Group prepare the annual *State of the Infrastructure* report card. The City’s current approach to performance measurement uses technical indicators which inform the asset condition data that is integrated into capital project prioritization. Engineers within the group collect the necessary asset condition and performance data

which is transferred to an asset database. The database is used to complete an infrastructure project needs assessment to determine the priority of projects in the long term capital plan. The needs assessment and the asset financial data are integrated into the City's annual *State of the Infrastructure* report card which dictates the projects that come forward in the City's annual and long term capital budgeting program. The performance trends tracked in the *State of the Infrastructure* report cards are used to justify new money in the City's capital budget to address downward trends. In particular, downward trends observed in the water and roads asset categories were attributed to insufficient funding levels and as a result Council approved new money in the budget to be committed to these areas of need (Murray, 2014).

The Asset Management Group prepares budget information for Council at three levels: strategic level (10 – 100 years, dependent upon asset life spans), the tactical level (3 – 10 years), and the project level (1 – 3 years). The strategic level information is used to inform Council of the long term needs and trends in infrastructure financing to achieve sustainable levels of service. The tactical level of budget planning is used to inform Council of the upcoming needs and various funding strategies that are required over the short term. The strategic and tactical level information is tested against potential financing and program threats. Within the asset management plan the City has reviewed a number of potential challenges with acquiring the necessary funds to maintain service levels and to meet infrastructure needs in the future. For example, the City has articulated that its current funding level for transportation assets is not sustainable and that service levels are expected to decrease in the future if additional resources and funding are not added to the program.

The project level budget information describes what work and financing activities will take place within the one to three year budgeting horizon. To prepare the three and ten year plans the Public Works Department uses an integrated approach that involves management from each of the department's divisions. The budgeting process is lead by the Asset Management Group and meetings are held between each of the divisions to coordinate project requirements and to develop a final listing of priority projects based on the results of detailed financial analyses. The project level information that is presented to Council reflects the immediate needs of the asset management program, and illustrates to Council the funding requirements and which funding strategies will be used.

In summary, there is a clear link between the asset management program and the City's budget, and many of the indicators of strategic planning and strategic management are evident. In a benchmark case academic literature expects to find the following indicators: budgeting and planning processes are on the same cycles, or the planning process first and allowing its principles to drive the budget process; budget requests must be directly tied back to the strategic plan of the organization, or back to departmental business plans that have adopted the principles of the strategic plan; performance measures are developed that are directly linked to the organization's budget; budget metrics are established as performance measures. In the case of Hamilton the asset management plan and the associated planning tools of the program are used to generate asset condition and asset financial data prior to the corporate budgeting cycle. This data directly informs which projects are placed in the project level, tactical level, and strategic level capital plans. This shows a clear link between the asset management program and the budget cycle. In addition, the City has established goals to sustain the current service

levels of infrastructure and to enhance service levels of infrastructure. These goals are considered within the budgeting process as the Asset Management group prepares financial forecasts to articulate the resources required to achieve these goals. This information is integrated into the annual budget for Council to consider. Lastly, there is some linkage of performance measures of the asset management program to the budgeting process. The City's current approach to performance measurement uses technical indicators which inform the condition data that is integrated into project prioritization as described above. However, a key strategic planning and management indicator is the development of performance targets that are budget related, and these do not appear to be evident. Many of the infrastructure performance indicators that have been established by the City are cost based but no specific targets have been established for these financial based indicators.

### **Conclusion and Recommendations for Future Research**

The purpose of this research was to fill a literature gap by viewing asset management through a theoretical framework informed by strategic planning and management literature. By linking strategic planning theory and asset management practice, the first goal of this research was to provide municipal practitioners with a resource to improve their own asset management programs. The research question to be answered was:

*Which elements of strategic planning and strategic management are associated with improved organizational performance, and how are these elements practically implemented in a municipality's asset management program?*

The research was an exploratory effort to generate an understanding of the key elements of strategic planning and management that improve organizational performance. Through a literature review the following four key elements of the strategic planning and management process were identified as being associated with improved organizational performance and implementation of strategic agendas: having a formal action plan or using formal planning tools and processes; setting goals and developing a performance measurement system; internal and external stakeholder involvement; and linking the strategic process to the organization's budget.

Once these elements were understood, a qualitative case study of the City of Hamilton's asset management program was completed to describe how these strategic elements are practically implemented in a municipal asset management program. Through review of publically available municipal documents, interview with the City's Asset Manager, and review of practitioner literature it was determined that each of key strategic planning elements are observed within the City's asset management program.

The research is limited in its design because it considers a single bounded case. The limitation is that these findings cannot be generalized to all municipal asset management programs. Because of this research limitation one is not able to claim that strategic planning and management elements will be evident in all municipal asset management programs. Rather, the findings noted in the case study describe how practices that exist within the City of Hamilton's asset management program compare to the academic literature related to strategic planning and management.

These observed practices are useful to inform future research. The second goal of this research was to provide a basis for future quantitative research to determine which of the identified strategic planning and management elements are correlated to improved municipal asset management performance. A fundamental assumption of this research was the City of Hamilton is a successful asset manager. This assumption was made so that the theoretical framework established could be applied. In this research, performance, as a dependent variable, was not defined or measured. A future research suggestion is to define and measure asset management performance as a dependent variable using the strategic planning and management elements identified as independent variables. Future research could collect measures of performance and measures of each of the planning elements for statistical analysis to determine if the strategic elements are correlated with performance in municipal asset management programs. The dependent variable to be investigated is asset management performance, and the independent variable is strategic planning. Each of strategic planning and management elements can be tested with their own specific hypothesis as suggested below:

- H<sub>1</sub> – If a municipal organization has a formal strategic asset management plan or used formal planning tools, then asset management performance will be more effective.*
- H<sub>2</sub> – If a municipal organization sets and measures goals related to asset management, then asset management performance will be more effective.*
- H<sub>3</sub> – If a municipal organization involves internal and external stakeholders in the asset management process, then asset management performance will be more effective.*
- H<sub>4</sub> – If a municipal organization has clear linkages between their budget and asset management, then asset management performance will be more effective.*

Important to the future research effort will be operationalizing the concepts presented. This current research effort will be of some use to assist with the process of operationalizing the dependent variable and developing measures of the independent variables. The literature review and description of best practices from the City of Hamilton's asset management program should serve to inform the development of the required measures.

Based on the findings of this current research effort, a preliminary recommendation for operationalization of the concept of asset management performance is to consider using a municipality's infrastructure deficit as a measure. At the outset of this paper a definition of infrastructure deficit was provided as "the difference between the rate at which new infrastructure is built, and the rate at which existing infrastructure wears out" (Wiebe, March 2012, p. 5). This definition can be used to operationalize the concept of performance, and has been used by Public Sector Digest when preparing municipal asset management plans. The measure of asset management performance could be defined as the ratio of infrastructure spending in a budget year compared to the

funding actually needed in the budget year to ensure infrastructure sustainability (\$ spent/\$ needed) (Public Sector Digest, 2013).

For future research efforts the independent variable has been identified as strategic asset management planning. Through the literature review, this concept has been broken down into a set of key planning and management elements. For each element, there are a number of indicators that can be measured to determine the extent to which strategic asset management principles have been implemented. These indicators have been identified in the literature review section, and Table 1 offered various benchmark statements that can be used and refined for future measurement of these elements.

In closing, strategic asset management will be an important organizational program for Canadian municipalities as they move forward into the future and attempt to address the growing infrastructure deficit. From this research, it appears as though strategic planning and management principles can be integrated into a municipal asset management program. Future quantitative research effort is required to determine if strategic planning and management principles actually improve asset management program performance, but the prospect is promising as these organizational and program management principles represent a solution for the future that can be adopted by all Canadian municipalities.

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