Multisector Asset Management Case Studies

CHAPTER 2 THE CALGARY, ALBERTA, CANADA EXPERIENCE

The City of Calgary (City) is the largest city in the province of Alberta, Canada. It is in the south of the province in an area of foothills and high plains, approximately 50 miles east of the front ranges of the Canadian Rocky Mountains. Calgary’s economy is dominated by the oil and gas industry. Geospatially, Calgary is the second largest municipality in Canada, at 328 square miles. As of the 2007 civic census, Calgary’s population was 1,019,942. Between 2001 and 2006, Calgary’s population grew by 12.4 percent. In the past few years, growth is actually down from 55,000 persons per year to 35,000.
Section 1 Executive Summary

In 1999, the City recognized the need to focus on addressing its infrastructure. Calgary is applying asset management (AM) principles across its transportation, water and wastewater sectors, among others. Calgary’s Corporate Asset Management Program (CAMP) is a corporate function that coordinates AM among 13 infrastructure-related business units. The City’s program is quickly evolving and flourishing at both the strategic and operational levels. The City’s CAMP was formalized in 2004 and consists of the Corporate AM (CAM) team of six staff. The CAM team is within the Infrastructure Services business unit. AM-trained personnel are also embedded into other business units. The CAM team is responsible for:

- Developing the City’s CAM strategy.
- The annual Infrastructure Status Reports (ISRs).
- Promoting and assisting business units with implementing AM principles.
- Helping to develop business unit asset management plans (AMPs).
- Ultimately developing and implementing a corporate (City)-wide AMP.

A corporate-wide infrastructure AM strategy is one of the City’s key corporate initiatives to address Calgary’s growing infrastructure needs and crucial for effective service management by the corporation.  
—Infrastructure Status Report, 2004

A key component of the vision for the City’s CAMP was to separate the AM function from the Finance Department while maintaining a strong partnership. The City’s rationale for this was to focus the management of the AM program on the business side of decision making at the corporate level rather than from purely the accountancy perspective.

From its inception, Calgary’s formal AM approach has been strategic in its vision and organizational level. First championed by an executive-level manager, the effort has been fully embraced by the City Manager. Much effort has been focused on building an enterprise-wide perspective and framework, then moving in a structured manner into the mid- and lower-levels of management.

A corporate-wide infrastructure AM strategy is one of the City’s key corporate initiatives to address Calgary’s growing infrastructure needs and crucial for effective service management by the corporation.  
—Infrastructure Status Report, 2004

A key component of the vision for the City’s CAMP was to separate the AM function from the Finance Department while maintaining a strong partnership. The City’s rationale for this was to focus the management of the AM program on the business side of decision making at the corporate level rather than from purely the accountancy perspective.

From its inception, Calgary’s formal AM approach has been strategic in its vision and organizational level. First championed by an executive-level manager, the effort has been fully embraced by the City Manager. Much effort has been focused on building an enterprise-wide perspective and framework, then moving in a structured manner into the mid- and lower-levels of management.

A corporate-wide infrastructure AM strategy is one of the City’s key corporate initiatives to address Calgary’s growing infrastructure needs and crucial for effective service management by the corporation.  
—Infrastructure Status Report, 2004

A key component of the vision for the City’s CAMP was to separate the AM function from the Finance Department while maintaining a strong partnership. The City’s rationale for this was to focus the management of the AM program on the business side of decision making at the corporate level rather than from purely the accountancy perspective.

From its inception, Calgary’s formal AM approach has been strategic in its vision and organizational level. First championed by an executive-level manager, the effort has been fully embraced by the City Manager. Much effort has been focused on building an enterprise-wide perspective and framework, then moving in a structured manner into the mid- and lower-levels of management.
Preceding the formal structuring at the executive level, experimentation and application of strategic AM practices was emerging in the Utilities Department. The Utilities Department endeavour included whole scale business process redesign and business continuity, implementing work and maintenance management systems to enhance asset workflow and decision making and a formal restructuring of their organizational structure to better enable AM and service delivery.

Unlike older communities, Calgary’s impetus for embracing the multisector AM concept was dealing with its rapid growth, driven to a large extent by the exploding international energy industry. The City needed to balance growth and renewal needs. The City is overseeing the development of 35 new communities in Calgary. At the same time, the City’s infrastructure is also aging—the majority was constructed during the economic growth period from the 1960s to the mid-1980s. More stringent environmental requirements and rapidly increasing construction costs are putting increasing pressures on the already limited funds for infrastructure investment.

A corporate-wide infrastructure AM strategy is one of the City’s key corporate initiatives to address Calgary’s growing infrastructure needs and is crucial for effective service management by the corporation. Calgary’s CAMP supports the City’s growth and development by applying a triple bottom line concept—assessing economic, social and environmental issues. The City is planning its growth around the Unicity concept, which consists of one major core city and adjacent communities. The City has developed initiatives against sprawl intensification in favor of densification.

Calgary has recognized a number of benefits in applying AM, which include the following:

- The application of AM principles has begun to positively affect the quality of decision making—there is more validated information available for assets on which to base project prioritization and budget allocation decisions.
- AM program data is useful to better justify capital and maintenance expenses to the public—the City can better make the case for what taxpayers are paying more for and what new assets will cost them.
- The council is gaining confidence in the data provided under the CAMP.

The City is ahead of most cities in North America in implementing generally recognized AM principles and practices and is working toward its goal of developing a CAMP.
Section 2  Calgary’s AM Vision and Triggers for Initiating AM

A. Initial Vision

In 1999, the City recognized the need to focus on addressing its infrastructure needs. The City established CAMP, oversaw the development of the CAM Strategy and developed annual ISRs to provide council and senior management with information that supports decision making. The City’s efforts pulled together into a corporate focus several separate and rather independent forays into AM that had been for some time informally initiated in several departments, most notably, Roads and Water. These early efforts were internally focused within the departments and targeted the application of practices; specific and relevant to the nature of each department’s unique service requirements. In 2004 Calgary’s city council formally approved the corporate AM program.

Calgary’s AM vision for a successful corporate AM program includes:

- Separating management of the CAM function from the Financial Services Department, while maintaining a partnership;
- Developing business unit AM strategies;
- Developing business unit AMPs and, ultimately, an integrated Corporate AMP;
- Restructuring the capital budget process to connect 3-year business plans with 3-year budgets;
- Using an Expert Choice business model to rank and schedule projects;
- Integrating the information technology (IT) process at the strategic level; and
- Involving land use planners in developing and implementing the Corporate AMP.

As indicated above, before instituting the vision of the CAMP, the Water Resources and Roads departments were applying AM concepts. In 1973, the Water Resources Department started its main break program

Calgary’s CAM vision focuses on four key elements that must be in balance to consistently meet service levels and minimize the overall cost of asset ownership—Strategy, Asset Information, People, Processes and Systems.
and built a database to track main breaks and house data for making main replacement investment decisions. In a parallel endeavour, the Roads Department had developed a pavement management system which it used to create its pavement investment plans, several years before CAMP. As CAMP evolved, the Roads Department expanded the sophistication of its decision-making systems by including more advanced AM concepts.

Calgary’s AM governance model is not based upon a traditional centralized command and control approach. Innovation is not dictated from the corporate office down to the various departments.

- Changes to current AM practices can be developed at the corporate level (for example, in the consistent approach on AM planning, budgeting or governance).
- Or, at the departmental level (including implementing business continuity and benchmarking practices specific for the Utilities Department or the use of GIS in asset decision making in the Roads Department).

In either case, Calgary leverages a cross-departmental group of AM practitioners (known as the AM Network) to disseminate and share AM practice innovations.

- All AM practices are first tried in limited pilot applications, baseline results are established, cost-benefit analyses are conducted, programs are established or changed, and results are checked.
- If the results warrant, the practice is documented in the departmental AMPs and is spread throughout the corporation via the AM Network.

This process assures that the City is confident in its plans because they have been substantially tested, tweaked, and consensus arrived at with the practitioners. It also provides an organic and efficient way of innovating AM both in the departments and at the corporate level.

B. AM as a Strategic Level Corporate Function

In 2004 Calgary’s CAMP was formalized as a strategic-level, corporate function. The objective was to provide a coordinated business link among the many operational, engineering-focused, asset-managing business units and strategic, mid- to long- range planning, land use, IT, and financial functions.
The CAM Office was established as a line of business in the fall of 2004. The AM core team consists of six staff, but AM support staffs are also embedded in other business units. Through this approach, the AM function and AM strategy is \textit{strapped on} (linked) to core City functions at the strategic level. The CAM Manager emphasized that this embedded approach is a key element central for success. The CAM team is considered to be an internal consulting group that provides direction to business units regarding five key AM business functions: (1) Infrastructure Strategy and AM Planning, (2) Infrastructure Investment and Capital Budgeting, (3) Infrastructure Performance Measurement and Program Reporting, (4) Infrastructure Asset Management Advocacy, and (5) Strategic Program Support Services. Calgary recognized early that it was important to bring land use planners on board early in the process.

**C. AM Program is Separate from Financial Operations**

A key aspect of Calgary’s vision for a successful AM program is that most of the CAM Office is separate from the Financial Operations Office. Although the offices work together on projects there is an intentional separation that protects the grassroots/technical engineering functions and decisions from being counteracted purely from the financial/comptroller perspective.

The separation focuses Calgary’s AM program on the managerial side of decision making at the corporate level rather than from solely the accountancy perspective. The result is that it enables the CAM team to better play its role as integrator of AM practices into all business unit areas. The impetus is from a strategic level (City Manager’s Office). The organizational separation enables the CAM team to focus on the technical aspects of infrastructure assets such as residual lives and risk management.

In addition, to proceed with Calgary’s AM vision, it was important to reform the Financial Operations Office’s role and to encourage financial staff to think less like accountants and more like financiers. (Traditionally, governmental financial accounting is restricted to using historic costs rather than replacement costs, thereby severely limiting the utility of the financial reports for infrastructure investment purposes; managerial accounting, on the other hand, may incorporate replacement costs, which are much more relevant to investment decision making.) Calgary’s approach respects that both perspectives are necessary for prudent decision making.

**D. Strategic Planning—CAM Strategy**

City council approved CAMP and \textit{Calgary’s Asset Management Strategy} in 2005. The Strategic Infrastructure Asset Management framework is a suite of corporate-wide business planning
processes, systems and tools that integrates the capital intense operational business units into a common AM approach.

The objective of Calgary’s AM program is to ensure the corporate-wide sustainability of service through the strategic management of infrastructure assets. The program is enabled by instituting (1) risk-based capital investment decision making, (2) mid- and long-term infrastructure planning, (3) life cycle forecasting and (4) infrastructure performance measurement that links infrastructure decisions to corporate financial, economic and growth policy.

E. Strategic Planning—Business Unit AM Strategy

Calgary’s AM approach also involves applying AM strategies at the business unit/operational level. The capital-intense service providers in the City are quickly adopting AM concepts at the operational level. The business units are beginning to use operational AM techniques to; (1) provide work and maintenance management, (2) manage and plan for infrastructure condition and functionality, and (3) develop and operating budgets for their specific service areas. The CAM team respects the importance of allowing the business units to develop their own best practices, recognizing that staff members at that operational level are the best positioned to define the detailed business processes. The development and adoption of operational AM best practices and processes are at various levels and degrees of implementation and operation, depending on the business unit.

F. Business Unit AMPs

To promote development of business unit AMPs, the CAM team has developed a document entitled The Asset Management Planning Guidelines. The guidelines are designed to enable business units to understand the basis and need for AM plans and to provide a framework for developing the AMPs. The business unit AMPs documents the framework for achieving the business unit’s goals and, ultimately, the corporate strategic goals by focusing on levels of service, life cycle AM planning and the resulting long-term cash flow requirements.

The CAM team has also developed the Asset Management Plan Framework, which is an annotated Table of Contents for the business unit AMPs. It provides a succinct overview of an AMP and describes each of the plan’s required elements. The CAM team creates buy-in to the concept of the business unit AMPs by reminding staff that the plans basically pull together what the business unit is already doing and provides the information needed for budget requests. The business unit AMPs also help managers assess needs requests and prepare project funding decisions.

To obtain a snapshot of each business unit’s current capabilities and competencies with respect to applying AM principles, the CAM team hired a consultant to conduct an AM assessment and develop AM improvement strategies. The assessment was built on the
British version of the Australian AM framework and consisted of a questionnaire (29-questions). The findings were summarized in the *Asset Management and Assessment and Improvement Plan* in July 2008. This report provided the CAM team with valuable information about how to better coordinate between business units and how best to break down the silo mentality among groups. It’s intended to facilitate development of business unit AMPs. Business unit assessments have been completed for Recreation, Fire, Emergency Medical Services, Water, Waste and Recycling, Roads, Transit, Fleet, IT, Corporate Properties and Parks. Outstanding assessments include Animal and Bylaw Services, Police, and Development & Building Approvals.

G. Corporate AMP

The ultimate, long-term goal for the business unit AMPs is to roll them up into a Corporate AMP that will organize and document the process and provide a comprehensive, sustainable approach to citywide AM. The City expects to start generating its Corporate AMP this year (2008). The Corporate AMP will link land use data to the capital budget and provide an integrated plan for how services will be delivered. The eventual result of the Corporate AMP is an integrated citywide infrastructure investment strategy.

H. Restructured Business Planning Approach

Before the CAMP could be fully implemented, the City needed to reform the capital budget prioritization process. Since 2005, the City has been implementing a new approach for business planning and is developing 3-year business plans coupled with 3-year budgets. Calgary refers to this process as the Business Planning and Budget Creation (BPBC) process, which is coordinated by the City Manager’s Office and staffed from the Finance Department. The CAMP has developed a parallel process, the 3-Year Strategic Infrastructure Asset Management Business Process (SIAM), which links AM planning, capital budgeting and infrastructure performance measurement, and which specifically links capital prioritization of the Pay-As-You-Go and Life Cycle Reserve to the larger BPBC process.

Prioritization of the capital budget is a CAM function (based on risk); and the Finance and Supply group develops the operation and maintenance budgets. The business plan/budgets require that a business case is developed for each project, and each business unit must include 100-year infrastructure life cycle sustainability forecasts and 10-year capital investment plans.

After a detailed design process in 2009, the intent of the 3-year, SIAM business process is to link the various operational infrastructure AM programs to other corporate-level business planning and financial decision-making/reporting processes (1) the Multiyear BPBC process, (2) the Long Range Financial Plan and (3) the Public Sector Accounting Board (PSAB) Tangible Capital Asset process. 2009–2011 will be the first budget cycle using business case and business unit information which integrates 3-year capital and operating budgets together. At its fully mature stage, the SIAM will facilitate the provision of timely, accurate, and relevant business unit information to the council and senior management.

I. Decision Tools

For 3 years, the City has used a decision-making process (Expert Choice Business Model Software) to assist with the prioritization of capital expenditures. The process applies a triple
bottom line concept and uses 21 criteria to prioritize every project. The model facilitates a cost-benefit assessment to identify the best investments related to how much money is available. This information is presented to an Infrastructure Coordinating Committee (ICC) for final decisions on project prioritization.

The City is also piloting the use of the RIVA (Real-Time Inventory Valuation and Analysis) in its major Business Units. This tool is designed to support infrastructure life cycle modelling and analysis. The system has the capacity to integrate information from the various operational AM systems (including Hansen, DataStream 7i, Oracle World (SPL), Calgary’s financial system (PeopleSoft) and geographic information system (GIS) (ESRI). The concept is that better integration across operational support systems improves strategic infrastructure business intelligence and improves asset decisions.

J. Infrastructure Status Reports

The ISR is an integral component of Calgary’s integrated CAM strategy. In 2003 the Mayor wanted to know, “What are we missing—what are we not funding that we should be funding?” The first ISR was developed in 2004 and is considered by staff as the platform and impetus for AM. The ISR provided the response to the Mayor’s request and put a value on what infrastructure projects should be funded. The ISR was designed to onboard (bring aboard) the council and line departments. The line department managers had resisted the ISR until they saw how council was using it and, thus, its value.

Upon implementation of the SIAM business process in the 2009/11 business cycle, the ISR will compare infrastructure performance against business environment indicators and financial trends and present the expected future effects on service targets and financing levels. While the ISR currently provides a 10-year outlook for infrastructure performance, in the near future, it will align the 10-year infrastructure capital plans within business unit AMPs. Thus, the ISR will be used to make minor annual adjustments to service targets previously set in the 3-year AMPs and to provide guidance for setting service levels for each subsequent 3-year infrastructure AMP.

K. Urban Alliance

Another component of Calgary’s AM vision is the Urban Alliance program. Under this program, the City and the University of Calgary conduct research on how to measure the effect of infrastructure investment from the triple bottom line standpoint. The City’s CAM team recently conducted a pilot project with the University’s Centre for Social Work Research and Professional Development. The purpose of the small pilot project was to explore the social bottom line for infrastructure, identify key social factors relevant to infrastructure, and develop a draft model to be applied to infrastructure decision making.
Section 3 Lessons Learned

The City has learned many lessons developing and implementing its CAMP:

1) Developing a strategic infrastructure AM business process was an imperative to facilitate the provision of timely, accurate and relevant information to council and senior management from AM business units that operated the infrastructure.
   - In building an AM program, start with a long-term view and recognize that its development will take some time. (Do not set in concrete a firm time frame; it is a setup for failure).
   - A successful AM program requires a commitment of front-end training of staff and demands using a common AM language. It was important to speak in plain English and use common terms.

2) Start with things that are most practical and meaningful.
   - In the beginning, stick with basic questions such as, “What do we own? What is it worth?” [This can be considered the Phase 1 deliverable]. If this information is refined within 2–3 years, that is a good start).
   - From there the program can move to conducting risk analysis and budgeting.

3) It is essential to coordinate the delivery of infrastructure at a community level across business areas. The City has learned to take a more hands on approach to the delivery of infrastructure to build whole communities, which is imperative to development in a new area.

   - The AM program has enabled staff to more easily justify required funding for infrastructure needs, based on better data.
   - The general competency in applying AM concepts has dramatically risen, and senior staff takes the program seriously.
   - The council is becoming more familiar with AM concepts and terminology.
   - As a whole, the City has come a long way but still has work to do. He further stated that
   - This is a double-edged sword, we get the money, but then we need to deliver in infrastructure renewal and construction.

   —L. Brad Stevens, General Manager Asset Management & Capital Works
4) Do not hesitate or give in to *analysis paralysis*; just *take the leap* into AM.
   - It is important to encourage a hands-on approach from staff. Allowing staff to *get their hands dirty* and actively participate in infrastructure needs assessments and solutions might be the best way to obtain tangible, short-term gains/savings in AM and set the stage for rolling ideas from lower staff levels to corporate strategic levels.
   - City staffs realize that it is easier to make this suggestion because Calgary’s executive management supports implementing AM principles.
   - A strictly top-down approach can exhaust the budget before gains are realized.

5) Development of the Roads business unit pilot AMP showed staff how to integrate advanced AM concepts into long term planning horizons.
   - Do not make the corporate strategy too prescriptive. Staff should be allowed to collaborate, which leads to more innovation, rather than be stifled by a strict, prescriptive strategy.
   - Develop a program framework and processes that allow for continual evolution, improvement and innovation. Often, municipalities will establish new programs but inadvertently solidify processes that were intended to evolve over time.
   - The field of AM is continually evolving and, as such, the program’s processes must be prepared to adapt accordingly.

6) It is not important for a CAM team to have total control.
   - In fact, CAM staff has learned that they actually get more control by giving up control—by demonstrating good ideas, the ideas sell themselves to business unit staff.
   - The CAM team sets guidelines on minimum expectations, so there is consistency, and an AM program framework for the business units to follow.

7) Embedding AM staff in the business units is a recipe for success.
   - Encourage business units to move forward with AM on their own and not wait for directives from the CAM team. Calgary has seen very good ideas come from the business units that were eventually incorporated into the Corporate Strategic Plan.
   - Bringing all business units to the table has taught some of the smaller business units how to interact with the larger, older business units, voice their needs and compete for funds.

---

While it is not yet the mandate of the CAMP to coordinate capital infrastructure delivery and investment in community developments, the CAM team is working with land use planning staff to establish growth management strategies and capital coordination processes as part of a proposed Integrated Infrastructure Strategy. This strategy was under development at the time this case study was being developed.
Section 4 Benefits of AM

The beneficial outcomes that City staff members have attributed to the CAMP include the following:

1) Applying AM principles has begun to positively affect decision making—there is more and better-validated information available for assets on which to base project prioritization and budget decisions.
   - AM program data is useful to better justify capital and maintenance expenses to the public—the City can better make the case for what taxpayers are paying more for and what new assets will cost them.
   - The council is gaining confidence in the data provided under the CAMP.
   - AM provides a great opportunity for breaking down silos between business areas and getting them to coordinate on AM projects.

2) Institution of the CAM function has encouraged individual business units to implement AM principles and supports the development of a corporate-wide AM strategy.
   - The process of assessing available data has had the added benefit of forcing business units to clean up their data (clean house).
   - The CAM process of bring the separate business units together for discussion about projects has acquainted and educated groups to the necessary trade-offs between assets.

3) The Water Resources business unit projects that the AM approach to replacement and rehabilitation decisions has already saved $30 million in capital replacement and averted $16 million in main break repair costs over the past 10 years. It will have saved a total of $50 million on capital replacement over the original 30-year time horizon by 2027. Better, more substantiated AMPs and business cases more readily yield requested funding.
   - Improved data about assets helps the City target certain projects that generate the most significant payback.
   - Improved asset information also helps validate when an asset or project is already optimized, and money can be saved when council knows that additional budget is not needed for optimized assets/projects.
   - The ISR has been proven to be useful to the council and business units. The report was originally designed to onboard council members to the AM process, and now business unit managers and staff turn to the report as the first source for asset/infrastructure information.

Section 5 Calgary’s AM Program — Where is it Today?

The Corporate Asset Management Teams recent accomplishments include the following:
   - Expanded the governance scope of ICC to include growth management.
   - Leveraged the AM Network to develop AM Plan framework.
   - Linked capital cost escalation to capital budgeting in supported 2008 capital budget adjustments.
• Started to institutionalize AM as a corporate strategy—conducting corporate-wide AM assessments.
• Delivered an AM program integration strategy, including developing communications and change management plans, linking AM to other corporate projects.
• Developed the ISRs.
• Completed CAM business process design for budgeting and began the process automation with Real-time Asset Valuation Analysis (RIVA).

A. Status of Water and Wastewater AM Practices

Much of the City’s infrastructure is still relatively young. The City has essentially completed an asset inventory for all water, wastewater and stormwater assets. The assessment of asset condition and failure modes will be ongoing and is being addressed on a priority basis. These assessments have been conducted for the entire water network infrastructure and are nearly complete for the wastewater infrastructure.

The City has developed rough estimates for water and wastewater treatment plant infrastructure, but these estimates use industry averages and experience (gut feel) of operations staff. Refinements of the estimates will come from experimenting and testing. The City has (1) a high confidence level in its estimates for the residual lives of water network assets, (2) is about a year away from an equal level of confidence with the wastewater and stormwater networks, and (3) has estimates from the operations supervisors for the major treatment plant assets.

Evaluation of life cycle and replacement costs will likely be done on a priority basis as each asset class ages into consuming significant resources (money, repair costs, replacement levels) that provide payback for the effort of estimating the amount of resources the asset class will require in the coming decade.

• The City has not established a formalized target level of service for water and wastewater assets. The working assumption is that generally water and wastewater treatment plants will be upgraded because of changed regulations and City growth, rather than because of asset was deterioration. A comprehensive study on these assets is considered premature because the assets are relatively new.

• The City is well along in determining business risk exposure/criticality for its largest network infrastructure elements (force and feeder mains, syphons, reservoirs) and has started doing so with pump and lift stations. It plans to have this information by 2009.

• For water and wastewater small mains replacement or rehabilitation decisions, staff are using City asset databases extensively and scientifically to optimize operations and
**Maintenance Investment.** Staff members are not, however, using these data for maintenance decisions. Asset information and criticality estimates are used to prioritize inspections of large-main assets. The inspections, in turn, with criticality concerns can then result in proactive capital replacement. Under current operating procedures, maintenance of large mains is still uniform for all those assets.

- The City has begun a project to set the size and priority of pump and lift station maintenance and replacement work on the basis of asset history, condition and criticality. This project is expected to affect decisions by 2009. Water Resources has a long-term **funding strategy to optimize investment strategies** that are reported annually to management and city council. The dynamic growth of Calgary presents issues, yet staffs feel that they are doing very well in large part because they know the City’s needs and the ability of the current infrastructure to address the needs.

Water resources staff members plan to develop the first business unit **AMP** by the end of 2008, refining it to meet senior management’s need for comprehensive, long-term planning by 2010. In addition to applying best practices the Water Resources business unit has done the following:

- diverted $500,000 per year from water main replacement starting in 1997 to build an infrastructure database and research the status of the infrastructure. $2.5 million was diverted to new electromagnetic field inspection technologies that determined the condition of 110,000 meters of the worst water mains, and $2 million per year has been diverted from main replacement to mains rehabilitation via corrosion protection, (anode retrofit), all using what are now standard AM approaches to capital management. This has resulted in the savings of tens of millions of dollars.

- Used the database of 30,000 sewer video inspections combined with cost-benefit analyses of the alternative strategy of sewer lining (rather than sewer replacement), to cancel a planned expansion in the sewers replacement budget from $4 million to $10 million. The new strategy involves investing in more inspections, spot repairs and lining.

- Used AM cost-benefit and triple bottom line risk-management analysis to justify, cost-size and initiate a $1 million per year water feeder main inspection program. It will also use new sensing technologies to avert the largest risks of feeder main failure applying a least cost approach. This new undertaking was in response to the massive feeder main failure in 2004 that cost over $1 million in repairs and significantly compromised service to an area for months.
B. Status of Roads AM Practices

The Roads business unit has an asset inventory of all assets in a GIS. The assets are broken into following major categories (with many subcomponents): Pavement; Concrete (which includes sidewalks, curb and gutter, medians); Bridges; Streetlight System; Traffic Signals; Traffic Signs and Road Markings.

- The Roads business unit is consolidating individual systems and developing a single asset register for all its assets.
- The Streetlight System, Traffic Signals and Traffic Signs have been completed, and the unit is working on the Pavement, Concrete, Bridges and Road Markings.
- By mid-2009, the asset register is expected to be centralized for all the assets listed above. The Roads business unit has a bridge management system that houses data on extensive condition assessments of the bridges. The City also has a bridge preservation program, which is separate from the bridge management system.

The business unit’s status with assessing asset condition and failure modes is as follows:

- A visual condition inspection of 100 percent of the road network is performed annually.
- International Roughness Index information is collected using a laser-equipped van for a sample of the pavement network.
- Condition assessments are performed regularly for all other asset classes as determined by the asset manager;
- Useful lives have been estimated for all asset classes; an annual ISR is produced that reports on the condition of all assets, replacement value and remaining life.
- Planned activities include developing rigorous deterioration models for assets; determining the dominant failure mode for each asset. Also, historically the Roads business unit has focused on physical failure but is looking at other failure modes as well (capacity, demand, financial efficiency, and so on).

Status of determination of residual lives is as follows:

- An annual ISR is produced to report the condition of all assets, replacement value and remaining life; and useful lives have been estimated for all asset classes.
- The business unit bases residual life on a time scale for certain assets that do not have well-defined deterioration curves, such as signs, but would like to develop models that will account for physical condition and levels of service for these assets. Pavement, structures and steel poles have better deterioration curves associated to them.
- To evaluate life cycle and replacement costs/economic evaluation, the business unit has performed some life cycle costing on its assets by analysing annual budgets and estimated lives of its assets. In addition, life cycle costing and economic evaluation was part of the business unit AMP.
Levels of service are defined for many of the Roads assets.

- These levels of service include such things as response times to customer complaints, time taken to complete one pass of the major roads for snow and ice control, response time to replace priority signs, response times for responding to traffic signals trouble calls, and so on.
- The Roads business unit conducts an annual citizen satisfaction survey that is specific to roads. This business unit uses this data to understand customer values and expectations. This year Roads will work with the CAM team to refine its definition of asset levels of service.

The business unit has completed a high-level risk assessment for all its assets. The risk assessment was done for each asset class, not the individual assets. This risk assessment allowed the business unit to understand the asset areas that have the greatest business risk exposure ratings. The next step will be to look at business risk exposure for individual (high-risk) assets and to state the business risk exposure using a common measure (dollars).

With respect to optimizing operations and maintenance investment the City’s Roads department has several initiatives.

- Pavement & Concrete: The Materials & Research section is actively involved in testing the performance of a variety of materials. Asphalt mix designs are chosen on the basis of the test results.
- The City also has a laser-equipped van that it uses to perform inspections that measure the International Roughness Index of the pavement. It uses this information along with visual condition inspections to define the surface overlay program.
- Streetlights: The City has a pole and cabinet painting program to extend the life of these assets, and the City is using junction boxes to splice underground cables rather than replacing entire spans. The resulting cost savings allow more repairs to be completed in the same budget. The City completed a streetlight retrofit project to replace the luminaries on residential streetlights with lower wattage streetlights that minimized the amount of light pollution. The result environmental benefits and financial efficiencies.
- Traffic Signs: The City has installed test signs facing different directions (to vary the sunlight exposure) to evaluate the performance of different reflective materials. It uses test results when specifying materials for use on the signs.
- Road markings: The City monitors a number of test sections to evaluate the performance of different types of paint and durable markings.
The City’s **capital investment strategies are optimized** using the Transportation Infrastructure Investment Plan (TIIP). The TIIP defines the priority and timing of major infrastructure construction projects and life cycle maintenance programs for the Roads department.

- The City reviews this plan is reviewed every 2 to 4 years to update priorities and funding. According to the annual citizen satisfaction survey, transportation issues continue to be a main concern for Calgary’s citizens.

- This TIIP update addresses these concerns by recommending infrastructure and programs that improve mobility; align to council’s approved sustainability principles; and reflect themes in council goals and priorities for the 2009–2011 business planning cycle.

- The City developed a robust and inclusive methodology that considered input from multiple stakeholders and measured alignment to smart-growth principles. TIIP 2009–2018 forms the basis for the Roads department’s 3-year business plan, and capital budget and is one of the main mechanisms to implement strategic planning objectives and promote smart growth.

The Roads business unit is planning to refine its AMP in conjunction with determining a **funding strategy**. In 2008 the Roads business unit hired a consulting team to help develop its first business unit AMP. As part of the process, current business practices were reviewed and evaluated against world’s best practices. The AMP also included a 100-year funding forecast on the basis of a preferred management strategy for each asset type.

### C. Information Technology

Calgary found that it was important to establish early the approach to integrating the IT process at the corporate, strategic level. Collaboration with the IT group has been a key to sustained AM process improvement. The City purchased the RIVA business intelligence tool to assist with life cycle costing analyses. The Roads, Buildings, and Fire business units are getting underway with life cycle costing using these tools. Calgary’s approach to integrating all business unit data systems is to wait for the IT market to produce more attractive and viable solutions.

### Section 6  What’s Next?

In the near term, the CAM team will support the business units in developing their AMPs. The long-term goal of the CAMP is to develop a sustainable process to deliver a sustainable City built on a hierarchy of plans. The CAMP’s ultimate focus will be on cost, level of service, risk relationships, and corporate and business unit strategies.

The highlights of the CAM team’s objectives for 2008 and into 2009/11(from the Strategic AM Update, 2008) include the following:

- Manage the 2009/11 capital budget prioritization process, including management of the ICC prioritization process and the delivery of capital expenditure.

- Manage the initiation of AM planning for the corporation including completing AM assessment for 13 business units, delivering 13 preliminary AM Implementation Plans and a draft corporate implementation plan; developing an AMP Guideline and a
preliminary Corporate AMP Strategy; and developing an overarching Infrastructure Strategy for the corporation.

- Provide ongoing infrastructure reporting to Council and the Administrative Leadership Team.
- Enable various business process and IT improvements in the corporation as related to AM, including implementing a corporate-wide AM business process that links to other corporate business functions.
- Develop and support an external infrastructure advocacy framework for presentation to the ICC, including developing an external Infrastructure Advisory Committee.
- Further support the research of Canadian AM standards and best practices by working with Edmonton/Vancouver establishing the Trilateral Learning Forum and continued support national AM through active participation in the National Roundtable for Sustainable Infrastructure, InfraGuide, Municipal Infrastructure Investment Plan, the Urban Alliance and other university-based research projects.
- Provide professional advice and governance support to the Mayor’s office, the Administrative Leadership Team and the ICC regarding sustainable infrastructure strategy and financing.
- Assist the ICC to identify key systemic financing issues within the existing capital budgeting methodology, including prioritization of the corporate infrastructure bucket capital requirements.

Section 7 Background Facts

Calgary is governed in accordance with Alberta’s Municipal Government Act (1995). The citizens vote for members of the Calgary city council every 3 years, with the most recent vote in October 2007. City council consists of the Mayor and 14 full-time council members. The City has an operating budget of $2.1 billion for 2007. Forty one (41) percent is from property taxes. $757 million in property taxes are collected annually, with $386 million from residential and $371 million from non-residential properties. Fifty-four percent of the budget is for wages of the 13,043 city employees and expenditures.

Thirteen (13) business units manage the City’s infrastructure and are involved in the AM program

- Calgary Police Service
- Civic Partners
- Corporate Properties & Buildings
- Emergency Medical Services
- Fire
- Fleet Services
- Information Technology
- Parks
- Recreation
- Roads
- Transit
- Waste & Recycling Services
- Water Resources/Water Services
A. Water and Wastewater Resources

The Water Resources business unit is responsible for the operation and maintenance of all water, wastewater and drainage infrastructure in the City. Water Resources is also responsible for the collection, transmission, treatment, and disposal of all wastewater and stormwater generated in Calgary.

- Calgary’s storm system runs 3,600 kilometers (km) of mains, 29 pump stations and 148 retention ponds.
- The water system includes two water treatment plants (Glenmore and Bearspaw, undergoing upgrades) a concrete gravity dam, 70,000 valves, 4,600 km of transmission/distribution pipe, reservoirs, pump stations and 290,000 service connections.
- The City operates three wastewater treatment plants (Bonnybrook, Fish Creek and Pine Creek) 4,000 km of wastewater mains, 295,000 lateral connections, 55,000 manholes and 27 sewage lift stations. The business unit also operates the Glenmore Reservoir and Glenmore Dam.

B. Roads Resources

The Roads business unit is responsible for assessing, designing and optimizing permanent and temporary traffic controls; maintenance and operation of street lighting and traffic controls; infrastructure repair and life cycle maintenance of structures, roadways, sidewalks and other roadway assets; street cleaning and snow and ice control; reviewing new road infrastructure designs, monitoring quality, and managing delivery processes (e.g., local improvements and new subdivisions).

Roads assets include:

- 7,042 lane-km local roads; 2,711 lane-km collector roads; 2,879 lane-km arterial roads.
- 6,057,447 square meter (m²) sidewalks; 2,129,000 meter (m) pavement markings; 6,537,000 m streetlight wires.
- 161 vehicular bridges; 117 pedestrian bridges; 93 other (light-rail, rail subways and parks).
- 122,000 traffic signs; 3,070 traffic signal poles.
- 280 pedestrian corridors.
- 69,297 streetlight poles; 78,921 lamps; 793 traffic cabinets; 534 streetlight cabinets.