Environmental Protocols

Environmental Management Systems for Municipal Infrastructure

This document is the fifth in a series of best practices that focus on the interaction of natural systems and their effects on human quality of life in relation to municipal infrastructure delivery. For titles of other best practices in this and other series, please refer to *<www.infraguide.ca>.*

National Guide to Sustainable Municipal Infrastructure

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

Environmental Management Systems for Municipal Infrastructure

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InfraGuide® — Innovations and Best Practices

Why Canada Needs InfraGuide

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

This is what the National Guide to Sustainable Municipal Infrastructure (InfraGuide) seeks to accomplish.

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

A Knowledge Network of Excellence

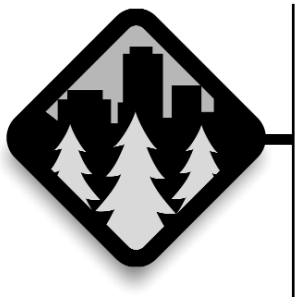
InfraGuide´s creation is made possible through $12.5 million from Infrastructure Canada, in-kind contributions from various facets of the industry, technical resources, the collaborative effort of municipal practitioners, researchers and other experts, and a host of volunteers throughout the country.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

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

Please join us.

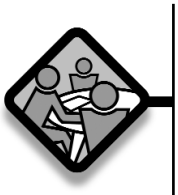
Contact InfraGuide toll-free at **1-866-330-3350** or visit our Web site at <***www.infraguide.ca***> for more information. We look forward to working with you.

The InfraGuide® Best Practices Focus



Environmental Protocols

Municipal infrastructure decisions, particularly those related to potable water, municipal roads, and storm and wastewater can have a significant impact on the natural environment. Environmental protocols focus on the interaction of natural systems and their effects on human quality of life in relation to municipal infrastructure delivery. Environmental elements and systems include land (including flora), water, air (including noise and light) and soil. Example practices include how to factor in environmental considerations in establishing the desired level of municipal infrastructure service; and definition of local environmental conditions, challenges and opportunities with respect to municipal infrastructure.

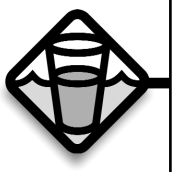


Decision Making and Investment Planning

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

Municipal Roads and Sidewalks

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



Potable Water

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

Transit

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

Storm and Wastewater

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

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

This best practice was created to give municipalities insight into the most effective and efficient means of developing and implementing environmental management systems (EMS), with a special focus on their application to roads, potable water, storm water and wastewater, and transit. It guides municipalities in determining when, where, why, and how to develop a systematic approach to managing environmental issues. This best practice is based on a literature review, surveys of selected municipalities throughout Canada, and input from environmental management experts.

Status of EMS in Canadian Municipalities

Environmental awareness is on the rise among Canadian municipalities. Many are conducting innovative projects—from green buildings to waste diversion to energy efficiency plans. As the range and diversity of environmental programs increase, more municipalities are choosing to co-ordinate their programs using an EMS. The EMS model predominately in use by municipalities and corporations is ISO 14001. At the time of writing, eight municipalities had established an EMS consistent with ISO 14001 and had received certification by an accredited third-party registrar (i.e., at least one facility registered to the standard). Of these eight municipalities, one had all its operations, and the corporation as a whole, registered to ISO 14001. In addition, nine other municipalities are also developing an ISO 14001-based EMS, and another five municipalities are considering the development of an EMS.

EMS Benefits

Municipalities and facilities that have implemented an EMS have realized the following benefits:

- environmental performance improvements;
- cost savings;
- reduced legal and regulatory risk;
- increased operational efficiency (reduced duplication of efforts);
- positive external relations and public image;
- improved communications;
- human health benefits;
- enhanced environmental integrity;
- greater employee stewardship;
- creation of an environmental ethic in municipal staff;
- enhanced governance and demonstrated due diligence; and
- improved natural resource efficiencies.

EMS Development and Implementation

A systems approach to environmental management typically includes the following components:

- A policy statement indicates the organization's overall commitment to the improvement of environmental performance, including waste minimization, pollution control, and continual improvement.
- A set of programs and plans guides implementation of the policy throughout the organization, including the advancement of the program through suppliers and customers.

- Environmental plans are integrated into the daily operation of the organization and innovative techniques are developed to minimize the environmental impact of the organization's activities and operations.
- Environmental management performance of the organization is measured against the plans and programs and auditing and reviewing progress in achieving the objectives and targets.
- Information is communicated to improve understanding of environmental issues, publicizing environmental aspects and performance of the organization.

The specific elements of an EMS are discussed in detail in this best practice, and a case study is presented in Appendix A to help municipalities apply these principles.

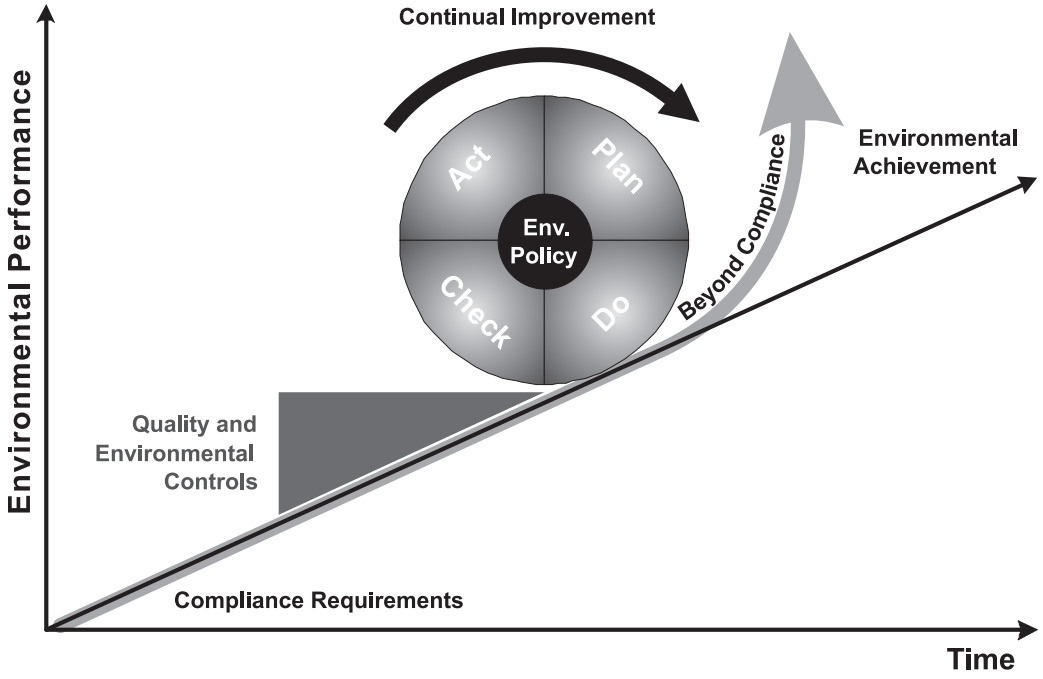
Continual Improvement

Municipalities that implement the elements described in this best practice will have greater assurance that their investment will lead to improving environmental performance and compliance. To achieve the commitments of its environmental policy, it is important for a municipality to develop a culture of continual improvement. The figure below illustrates the point; the implementation of the environmental policy is achieved through the EMS and the "plan-do-check-act" cycle. A municipality may choose to develop an EMS for a variety of reasons. However, the key to success is the commitment to continual improvement. This commitment encourages organizations to review constantly and improve performance over time.

The figure also shows that an EMS can be viewed as a wheel that can be moved toward improved environmental performance through the continuous improvement process. The wheel can be stopped from slipping back through the development of effective quality and environmental controls. Examples of these controls include monitoring and measurement programs, EMS audits, and an effective management review process.

The Role of an EMS in Improving Environmental Performance

In the future, the tools for an efficiently designed EMS discussed in this best practice will be essential, as municipalities move beyond complying with environmental legislation and regulations, toward fully integrating environmental management into their overall business operations.



1. General

1.1 Introduction

This best practice was created to help municipal decision makers assess the merits of an environmental management system (EMS). It describes elements a municipality should review when assessing the need for a systematic approach to managing environmental issues. The text has been developed in consultation with EMS practitioners from municipalities throughout Canada, the InfraGuide EMS Working Group, and independent consultants.

There is growing recognition that environmental issues are associated with virtually all activities of an organization and, therefore, are a major consideration for corporate decision making. For municipalities, environmental issues are influenced by geography, local setting, size (both land area and population), societal objectives, and regulatory requirements. As the complexity associated with managing the broad range of issues and contributing factors increases, a systematic approach to managing environmental issues becomes necessary. With that in mind, the information in this best practice is broad enough to provide interested municipalities with insight into developing and implementing an EMS.

1.2 Purpose and Scope

This best practice gives insight into the most effective and efficient means of developing and implementing an EMS—with a special focus on its application to roads, potable water, storm water and wastewater, and transit.

Its intended audiences are municipal managers and other decision makers who would like to increase their awareness and knowledge of EMS best practices; generate commitment from senior management for the introduction of an EMS; and assist the staff (project team) who have responsibility for developing and implementing the EMS.

This best practice is not meant to be prescriptive. Instead, it focuses on addressing the common issues municipalities encounter when considering an EMS. It provides background information on the origin and development of an EMS, examples of EMS implementation in various communities, and suggestions for adapting the material to local conditions.

Although this best practice has been designed to guide municipalities of all sizes, challenges and opportunities will differ depending on population size. Large municipalities, for example, tend to have more available resources but may encounter more difficulties in co-ordination. Smaller municipalities, on the other hand, typically have streamlined systems and may quickly adopt new concepts. However, they both may face a resource challenge.

1.3 How to Use This Document

This document was designed to complement, and to be used with, other best practices in the InfraGuide series. An EMS is a framework that allows an organization to implement its strategies and co-ordinate environmental programs and initiatives. This document is as a bridge between Strategic Commitment to the Environment by Municipal Corporations (InfraGuide, 2002) and other best practices relating to specific sustainable municipal infrastructure programs.

Section 2 describes common themes of EMS implementation from a municipal perspective, and provides a description of an EMS framework. The rationale for developing an EMS and the drivers for implementing it are also discussed. This section concludes with a review of the benefits and challenges of EMS implementation, and emerging trends. It is particularly relevant to municipalities considering the value of an EMS.

There is growing recognition that environmental issues are associated with virtually all activities of an organization and, therefore, are a major consideration for corporate decision making.

Section 3 details issues that must be taken into consideration at the outset of EMS development to ensure an effective and efficient development and implementation process. In this section, strategies and methods for implementation are discussed as well as resource requirements. Challenges to EMS development are presented, including scoping, commitment, staffing, and resource allocation.

Section 4 describes the phases of EMS implementation and includes a thorough discussion on the plan-do-check-act cycle. This section applies directly to municipalities that have decided to implement an EMS and are in need of clarification and direction.

Section 5 describes the continual improvement concept used to enhance the EMS over time.

1.4 Glossary

Environmental Audit — A systematic, documented, verification process of objectively obtaining and evaluating audit evidence to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with audit criteria, and communicating the results of this process to the client.

Biosolids — A primary organic product produced by wastewater treatment processes that can be beneficially used. These treated solid or semi-solid residues are generated during the treatment of domestic sewage in a wastewater treatment facility. (Such facilities may also receive an industrial component.) Biosolids must meet the regulations of the jurisdiction in which they are produced or applied. Requirements may include pollutant concentration, pathogen reduction, and vector attraction reduction criteria.

Compliance Audit — A procedure that determines whether the organization is meeting the requirements of laws, regulations, permits, and other standards to which the organization subscribes.

Corrective Action — Actions taken to eliminate the cause of nonconformity in order to prevent a recurrence.

Documents — A description of the core elements of the EMS and their interaction, together with associated material that provides guidance (such as operating procedures) and can be revised over time.

Environmental Aspect — Elements of an organization's activities, products, or services that can interact with the environment. Examples include discharges, resource consumption, energy usage, and ecosystem alterations.

Environmental Co-ordinator — An individual charged with the responsibility of co-ordinating environmental policies, programs, and initiatives within the organization. In the municipal context, the environmental co-ordinator is also responsible for reporting environmental achievements to senior management and the public. The scope of the co-ordinator's responsibility may not necessarily include an environmental management system.

Environmental Impact — Any change to the environment, whether adverse or beneficial, wholly or partly resulting from an organization's activities, products, or services.

Environmental Management System (EMS) — That part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy.

EMS Audit — A systematic and documented verification process to obtain and evaluate evidence objectively to determine whether an organization's EMS conforms to the EMS audit criteria.

EMS Co-ordinator — An individual charged with the responsibility of co-ordinating the development and implementation of an environmental management system within an

organization. Specific responsibilities may sometimes include the co-ordination of other environmental programs and initiatives which exist outside the immediate scope of the EMS. The EMS co-ordinator typically reports to senior management on the status and progress of EMS goals, objectives, compliance, and associated targets.

Environmental Policy — A statement of intentions and principles in relation to the overall environmental performance; it provides a framework for action and for setting environmental objectives and targets.

Loss Control Program — A decision-making or technical process used in recognizing, evaluating, controlling, or eliminating the potential adverse effects or hazards.

Non-compliance — A situation in which an operation or activity is not meeting regulatory requirements.

Nonconformity — When a process or activity does not conform with the organization's EMS.

Preventive Action — Actions taken to eliminate the causes of potential nonconformity in order to prevent their occurrence.

Records — An account of history or things that have happened. They cannot be changed or revised over time.

Risk — Probability of an incident occurring within a certain time, together with the consequences for people, property, and the environment.

Stakeholder/Interested Party — People or organizations with an interest in the environmental aspects of the organization's activities, products, and services. This can include government regulators and inspectors, investors (including banks and shareholders), insurance companies, employees, the local community, customers and consumers, non-governmental organizations, environmental groups, and the public.

The Natural Step — A science and systems-based approach to organizational planning for sustainability. The natural step has four system conditions based on meeting human needs worldwide and focusing on interactions between humans and the planet. The framework is based on an integrated assessment of current economic, social, and ecological dynamics, and on the implications of present trends for human society. The framework provides a paradigm for assessing decisions in terms of sustainability and describes a core guiding set of principles for moving toward sustainability. It is designed to assist decision makers understand and integrate sustainability principles into their organization, and plan their activities with key stakeholders.

2. Rationale

Municipalities are increasingly integrating environmental considerations into their business strategy and long-term planning processes. An environmental strategy and policy is often a starting point for this integration. Tools are then developed to provide a means of achieving a policy and objectives. Environmental performance indicators and environmental auditing may also be included. In applying these tools, many municipalities have found they need a systematic approach to environmental management and have begun to develop an EMS.

An EMS is a problem-identification and problem-solving tool that can be implemented in a variety of ways depending on the scope and scale of municipal operations and the needs identified by management. To be effective, the EMS should define and implement the municipality's environmental policy—typically determined by senior management.
An effective EMS depends on the leadership, commitment, and support of senior managers. In the short term (i.e., over several years), even a limited EMS can demonstrate that the financial gains can outweigh costs and that inexpensive measures can yield important environmental and fiscal returns.

2.1 Drivers for EMS Development

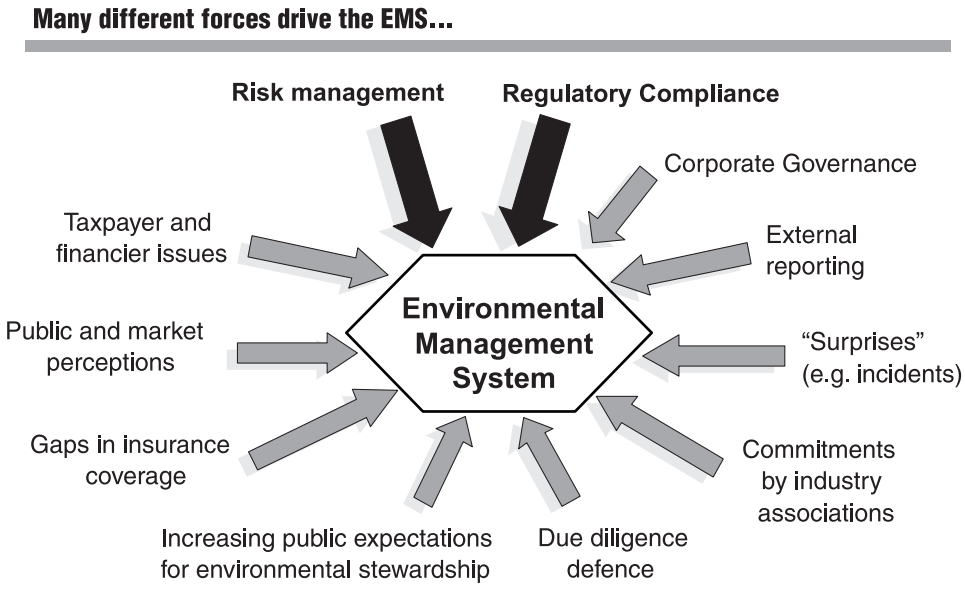
Municipalities that decide to develop a formal EMS do so for a number of reasons, as illustrated in Figure 2–1.

A primary driver for EMS development is risk management. Municipalities can be exposed to environmental liabilities resulting from spills, releases, habitat destruction, and other occurrences. By allowing for a proactive approach, an EMS can offer real opportunities to reduce environmental risks and liabilities.

Another primary driver for EMS development is regulatory compliance. Non-compliance with federal, provincial/territorial, and sometimes local regulations can be costly. A more proactive approach to environmental management may reduce incidents of non-compliance, and allow a municipality to develop better relations with regulators at the provincial and federal levels, as well as with neighbouring municipalities and other interested parties.

Motivation for EMS development can also be driven by the desire of a municipality to demonstrate due diligence. With a due diligence defence to environmental charges, the defendant must establish that the municipality has exercised all reasonable care

Figure 2–1: Municipal EMS Drivers



An EMS is a problem-identification and problem-solving tool that can be implemented in a variety of ways depending on the scope and scale of municipal operations and the needs identified by management.

by establishing a proper system to prevent commission of the offence. Along with having an appropriate system in place, the defendant is also required to take reasonable steps to ensure the effective operation of the system. Both of these requirements can be addressed by developing and implementing an EMS. It establishes the appropriate governance structures, accountabilities, and programs necessary for demonstrating environmental due diligence.

An EMS may also be implemented in response to a municipality advocating a proactive environmental or sustainable development policy.

An EMS may also be implemented in response to a municipality advocating a proactive environmental or sustainable development policy. The EMS provides a framework for considering and implementing environmental goals. The structure is also adaptable to addressing social and economic goals and commitments.

A desire to realize the cost savings from a systematic and efficient approach to addressing a municipality's environmental risks can also lead to the development of an EMS. As a municipality grows, so do the complexities associated with addressing environmental risks and opportunities. An effective EMS allows for prioritization of issues based on their relative importance and impact to the municipality, thus demonstrating fiscal responsibility through the appropriate allocation of limited resources. By optimizing resources, the benefits of the EMS go beyond simply cost savings, to helping the municipality effectively identify and manage its most pressing issues.

2.2 Management System Frameworks

Environmental management system frameworks typically use a plan-do-check-act cycle for effective implementation. The cycle leads to continual improvement by requiring practitioners to plan for environmental performance improvements and implementation of the policy, carry out the plan as designed, check on effectiveness, and then act to modify or update the plan where required. From there, the cycle continues by implementing the new modified plan.

A number of frameworks have been developed and implemented in both the public and private sectors. The ISO 14001 framework for EMS and OHSAS 18001, an occupational health and safety management system framework, grew from the similar ISO 9001 standard for quality management systems. A specific EMS model for biosolids has also been developed. Although other system frameworks exist, the suite of ISO standards is growing in popularity. Loss control programs are a good example of other systems that consider a common and integrated approach to environmental and quality assurance.

2.2.1 ISO 14001

The International Organization for Standardization (ISO) has developed a number of standards in the ISO 14000 series. Key standards in this series include *ISO 14001, Environmental Management Systems—Specification with Guidance for Use* and *ISO 14004, Environmental Management Systems—General Guidelines on Principles, Systems and Supporting Techniques*. The ISO 14001: 1996 standard—originally published in 1996—was updated and published in November 2004 as ISO 14001:2004. The changes to the 2004 version clarifies some concepts and elements of the standard and make it more compatible with the structure and terminology of the ISO 9001QMS (Quality Management System) standard. Other standards in the areas of environmental performance evaluation, environmental labelling, and life cycle assessment can also be found in the 14000 series.

The ISO 14001 standard provides a framework for developing and implementing a series of practices and procedures that, when taken together, result in an environmental management system. ISO 14001 does not prescribe the methods that must be used to develop the framework, nor does it replace technical requirements embodied in regulations. However, it does set process requirements designed to improve the performance of organizations, along with specific commitments to pollution prevention,

legal compliance, and continual improvement. The major requirements of an ISO 14001-based EMS include the following:

- Identify, in a policy statement, commitments to prevention of pollution, continual improvement of the EMS leading to improvements in overall environmental performance, and compliance with all applicable statutory and regulatory requirements.
- Identify all aspects of the organization's activities, products, and services that could have a significant impact on the environment, including those that are not regulated.
- Establish performance objectives and targets, which link back to the commitments identified in the community or organization's policy, its significant environmental issues, and applicable legislation.
- Implement and establish programs to meet these objectives including training employees, establishing work instructions and practices as necessary, planning for contingencies and emergencies, and establishing the metrics by which progress toward achieving the objectives and targets will be measured.
- Establish a program to audit periodically the effectiveness of the EMS.
- Check and take corrective actions and preventive actions when deviations from the EMS occur, regularly evaluating the organization's compliance with applicable regulatory requirements, and maintaining appropriate records of performance.
- Undertake periodic reviews of the EMS by top management to ensure its continuing suitability and performance, and make any necessary improvements.

2.2.2 OHSAS 18001

Occupational Health and Safety Assessment Series (OHSAS) 18001, released in 2000, is a voluntary international standard focusing on the systemic management of an organization's occupational health and safety (OHS) system. It uses risk assessment as the basis for prioritizing health and safety program improvement goals. In addition, activities, such as incident investigations, are formalized and tracked to evaluate trends and support corrective action efforts.

The OHSAS 18001 provides a framework that can be used by organizations to develop and implement a series of practices and procedures that, when taken together, result in improved employee safety awareness, with fewer accidents and reduced costs. In addition, OHSAS 18001 provides a structure organizations can use to integrate quality, environmental, and safety and health program management for increased management efficiencies.

The elements of OHSAS 18001 are similar to the elements of ISO 14001 and include:

- developing an OHS policy;
- hazard identification and risk assessment;
- identifying legal requirements;
- setting OHS objectives;
- establishing an OHS management program;
- training employees;
- implementing OHS control measures;
- emergency planning;
- document and record control;
- internal audit programs;
- corrective action and preventative action; and
- management involvement and management review.

2.2.3 Biosolids EMS

Biosolids are a nutrient-rich, organic by-product of the wastewater treatment process formed from stabilized municipal sludge. They are often suitable for recycling. Recycling biosolids saves a significant amount of money through lower waste management costs and sales of biosolids-derived products. Keeping biosolids out of landfills and placing them where they can be used helps preserve valuable landfill space. The land application of biosolids is beneficial to farmers, municipalities, and the community.

Undertake periodic reviews of the EMS by top management to ensure its continuing suitability and performance, and make any necessary improvements.

An EMS provides organizational and operational capacity to help manage a municipality's environmental impacts efficiently and effectively, and to improve environmental stewardship across the entire organization.

The National Biosolids Partnership (NBP) developed the National Biosolids Code of Good Practice, consisting of a set of principles and strategic biosolids industry goals that emphasize best practices, communication, and the implementation of environmentally sound management programs. The Biosolids EMS (BEMS), as with an ISO 14001-based EMS, is based on a management process that has been used successfully by manufacturing and service organizations in Canada to improve the quality of their activities, products, and services and to manage environmental compliance.

A BEMS includes five sequential steps for developing and implementing an effective environmental manag ement system[1]:

- Develop a biosolids management policy.
- Plan for biosolids management.
- Implement a biosolids program.
- Measure and take corrective action.
- Review management.

2.2.4 EMS Conceptual Model

Figure 2–2 illustrates the interaction of the elements of a management system. The framework outlines the flow of information and the overall structure presented in this best practice. It is important to note that the EMS audit and management review components of the model examine the entire system; hence, the large box along the side of the flow chart. They are also vital contributors to the nonconformity, corrective action, and preventive action elements.

2.3 Benefits from EMS Development

An EMS provides organizational and operational capacity to help manage a municipality's environmental impacts efficiently and effectively, and to improve environmental stewardship across the entire organization. An EMS channels the creativity of all members of an organization, making them active agents of change promoting environmental protection, resource conservation, and improved efficiencies. When all members in the organization are challenged to think differently, it leads to the creation of innovative solutions to the environmental issues faced by the municipality. This can have significant benefits. Municipalities and facilities that have implemented an EMS have realized the following benefits:

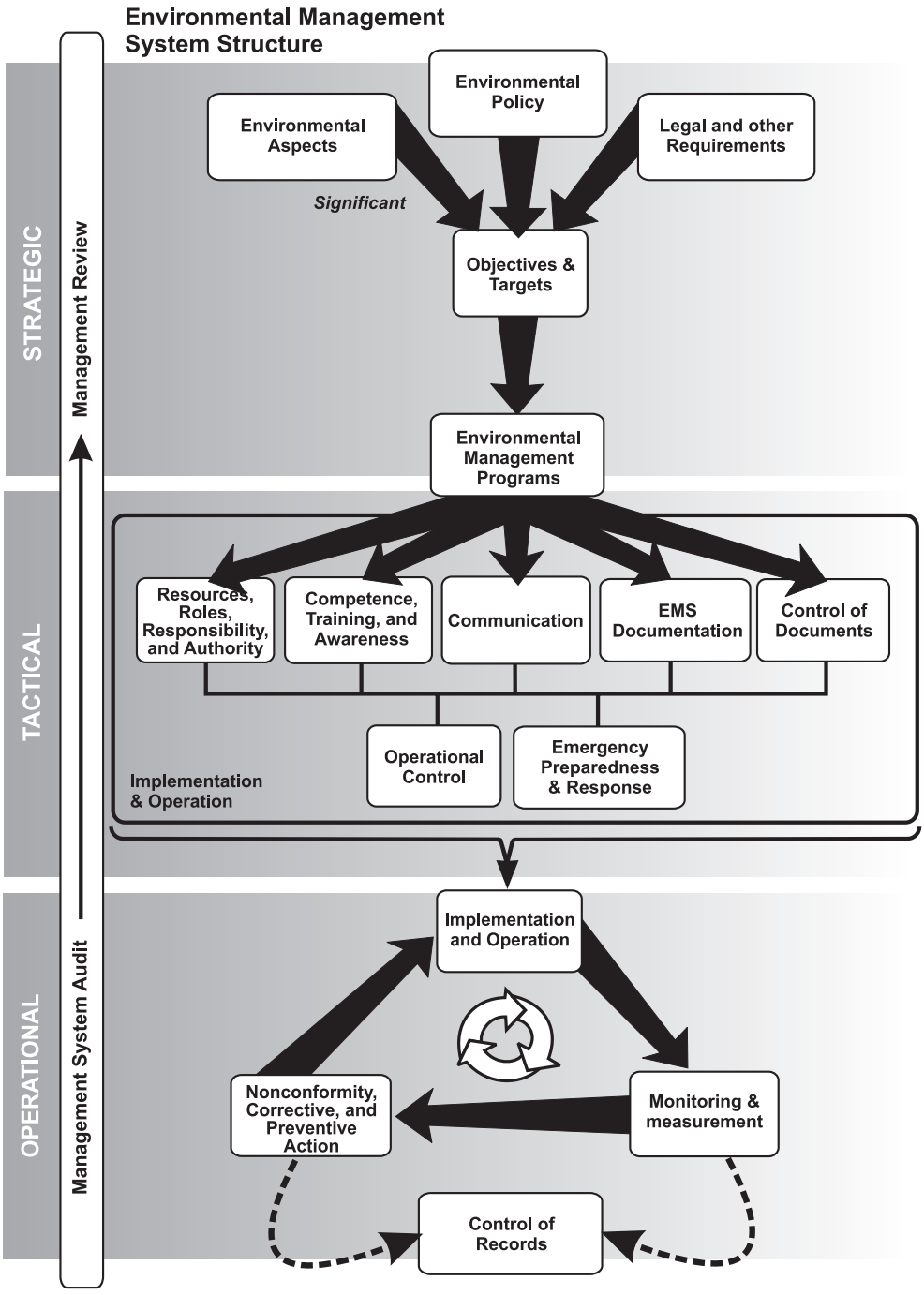
- environmental performance improvements;
- cost savings from improved operational efficiencies;
- improved due diligence and overall risk management;
- increased operational efficiency (reduced duplication of efforts);
- positive external relations and public image;
- improved communication;
- human health benefits;
- increased confidence in decision making;
- a model for integrating other management systems;
- enhanced environmental integrity;
- greater employee stewardship;
- creation of an environmental ethic in municipal staff;
- shared environmental solutions between departments;
- enhanced governance and demonstrated due diligence;
- improved public relations; and
- improved natural resource efficiencies.

Environmental management systems have also benefited organizations by providing tools that can be used as a management model beyond the environmental realm. For instance, consistency in document control can be applied throughout the municipality to help improve the accuracy and reliability of information. Defined communication practices can aid public relations and, considering all aspects of risk in planning situations, can improve decision making.

1. For detailed information on biosolids programs, see InfraGuide Storm and Wastewater Best Practice: Biosolids Quality Management Programs (InfraGuide, 2004).

Figure 2–2
EMS Conceptual Model

Figure 2–2: EMS Conceptual Model



How quickly and effectively a municipality realizes the return on investment is a function of a variety of conditions:

- the status and level of sophistication of any pre-existing management system (i.e., the management system culture of the organization);
- the complexity of the environmental challenges that the system is being designed to address;
- the internal and external resources accessed by the municipality;
- the status of existing environmental management practices;
- the knowledge, skill, and ability of staff with responsibilities relating to environmental management;
- stakeholder expectations; and
- the current status of compliance with legal or other requirements.

2.4 Challenges to Effective EMS Implementation

While some municipalities realize the benefits of an EMS throughout their operations, there are challenges to overcome during EMS development and implementation. Suggestions for successful development and implementation are presented in the remainder of this best practice.

Resources, in particular staff time and money, need to be allocated to the EMS development. Without the allocation of proper resources and training, there is a risk of unsuccessful implementation and loss of investment. An unsuccessful implementation could also lead to disillusionment among personnel. The ongoing commitment of senior management, including the commitment of resources, is essential to successful development and implementation of the EMS and the expected improvement in environmental performance. The short-term cost will lead to long-term benefits. The initial costs can be viewed as a capital investment with the long-term benefits being amortized over a number of years.

Without the allocation of proper resources and training, there is a risk of unsuccessful implementation and loss of investment.

Over time, complacency can lead to deterioration in the realized value of the system. An EMS that has become onerous or outdated may result in a false sense of security. Under these conditions, there may be unnecessary spending on a system that does little or nothing for the organization. An ongoing commitment to continual improvement is necessary to ensure the EMS continues to benefit the municipality and does not become a hindrance.

During initial EMS development, there is often a language barrier to overcome. The jargon of the management system world is often unfamiliar to municipal staff—and to staff in other organizations. The concepts of nonconformity, aspects and impacts, and the distinction between documents and records are often difficult to understand at the outset of EMS development. The glossary provided in this document will help overcome this challenge, along with learning from the lessons of other municipalities and experienced professionals.

2.5 Status of EMS in Canadian Municipalities

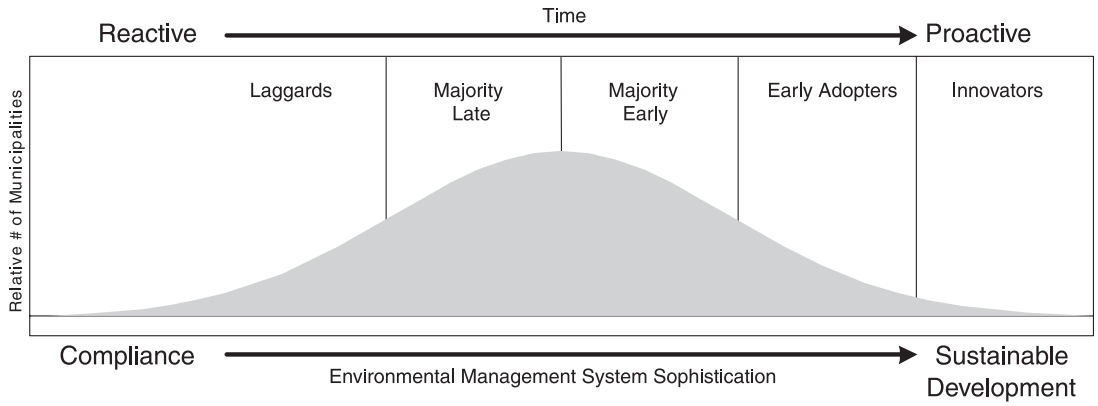
Environmental awareness is on the rise among Canadian municipalities. Many are pursuing innovative environmental programs ranging from green buildings to waste diversion to energy efficiency and demand management. As the range and diversity of environmental programs increase, municipalities may choose to use an EMS as the basis for organizing environmental programs. The EMS model predominantly in use by Canadian municipalities and corporations is ISO 14001. At the time of writing, some eight municipalities had established an EMS consistent with ISO 14001 and had received certification by an accredited third-party registrar (i.e., at least one facility registered to the standard). Of these eight municipalities, one had all its operations, and the corporation as a whole, registered to ISO 14001. In addition, about nine other municipalities are developing an ISO 14001-based EMS, and another five municipalities are contemplating the development of an EMS.

While some municipalities "self-declare" conformance of their EMS to ISO 14001, others have recognized benefits from undergoing the registration process. Registration can be a communication tool. It also helps to keep the focus on continually improving the EMS to maintain registration.

2.5.1 Moving Beyond Compliance

Initially, most municipalities focus on compliance-based management, driven by legislation, regulations, and approvals necessary for the municipality to operate. As the public grows increasingly aware of environmental issues and their expectations increase, some municipalities are moving beyond compliance. Figure 2–3 illustrates the continuum of EMS sophistication. As a municipality moves from left to right on the continuum, there is a shift from reactive, compliance-based environmental management to a proactive sustainable development management approach.

Figure 2–3: Evolution of Municipal Environmental Management Focus



Over time, as environmental issues become more complex, their management becomes increasingly complex, requiring a more proactive effort. As the trend toward proactive management develops and detailed management systems are created, additional components are often incorporated into the system (e.g., green procurement, energy efficiency, and sustainable development). Municipalities with well-established management systems are now looking to incorporate these broader issues into the same EMS framework that has proven successful for handling environmental issues.

Over time, management emphasis shifts from beyond compliance to beyond registration. These organizations use their EMS—and potentially their ISO 14001 registration—to change organizational culture, behaviour, and performance. Traditionally, once an organization has achieved its registration, there has been a tendency to lose momentum. By expanding the scope of the management system to include sustainable community concepts, a municipality can move beyond registration and continue to improve performance as it journeys toward a sustainable community.

In the municipal sector, this trend toward an expanded view of the function of the EMS is also evident in the trend to move beyond the ISO 14001 requirements in the areas of public engagement and accountability. Municipalities see a greater need for public input than what is described in ISO 14001, because of their responsibilities to residents. In some municipalities, the EMS is being used as an effective means to incorporate public environmental concerns and track important issues. In that way, a municipality can demonstrate its commitment to the community.

2.5.2 Integration with Other Management Systems

Another trend in municipal EMS development is the integration of the EMS with other business management processes, including quality management systems (ISO 9001), and health and safety management systems (OHSAS 18001). This approach has the advantage of consistency, alignment, and synergy, when the system used for environmental issues is similar to the system used to manage other aspects of the municipality. Environmental departments and staff no longer follow a separate path to manage environmental issues versus other issues, and results are readily understood across all departments. This approach also helps environmental departments integrate within the larger organization, rather than remaining a separate, isolated entity. Investigations of health and safety incidents, for example, frequently identify environmental and quality impacts. The result is a common system of reporting and investigation that creates opportunities for continual improvement.

In addition to aligning with other management system standards, there is a growing tendency to integrate EMS with strategic asset management (SAM) and corporate-wide risk-

Figure 2–3
Evolution of Municipal Environmental Management Focus

Another trend in municipal EMS development is the integration of the EMS with other business management processes, including quality management systems (ISO 9001), and health and safety management systems (OHSAS 18001).

Figure 2–3
Evolution of Municipal Environmental Management Focus

Good planning is critical to delivering the economic, environmental, and social objectives. An EMS is an excellent tool to help municipalities pursue their sustainability goals.

management programs. Another best practice, *Municipal Infrastructure Asset Management* (InfraGuide, 2004), defines asset management as "a systematic process of maintaining, upgrading, and operating physical assets cost effectively. It combines engineering principles with sound business practices and economic theory, and it provides tools to facilitate a more organized, logical approach to decision making. Thus asset management provides a framework for handling both short and long-range planning." The focus of SAM on planning and decision making to ensure that resource allocation is occurring in a prudent manner provides a number of linkages with an EMS. These links can be found in setting objectives and targets, determining environmental aspect significance, defining operational controls, developing, monitoring, and measurement programs, and tracking nonconformity, and corrective actions and preventive actions. These linkages are further described in other sections of this document (Section 3.2 and all of Section 4).

2.5.3 Performance Measurement

Many organizations find that financial reporting alone does not provide sufficient information to satisfy the needs of all stakeholders, customers, communities, and interested parties. Consequently, organizations rely on reporting that discloses a municipality's economic, environmental, and social performance. This reporting is often referred to as sustainable or environmental reporting; organizations report on progress toward performance goals not only for economic achievements, but also for environmental protection and social well-being. In recent years, sustainability reporting has been recognized as a key component of corporate transparency and accountability.

2.5.4 Sustainable Community

"Sustainable community" is often used to describe the interests, needs, and culture of a community. The most effective sustainable community definitions focus on long-term, integrated, systems approaches that integrate economic (e.g., strong economy, adequate number of jobs with good pay, stable businesses), environmental (e.g., protecting healthy ecosystems and habitat, reducing pollution, providing parks for recreation and wildlife), and social issues (e.g., crime, equity, education) of a community. In this way a municipality can address quality-of-life issues and move toward creating a healthy community.

Most communities recognize sustainability as an evolutionary process. Many Canadian communities are moving toward sustainability by improving existing practices and developing new, sustainable ones. Creating sustainability can be viewed as a learning process. Good planning is critical to delivering the economic, environmental, and social objectives. An EMS is an excellent tool to help municipalities pursue their sustainability goals. (See *Principles and Guidelines for Sustainable Municipal Infrastructure*, InfraGuide, January 2004).

The Federation of Canadian Municipalities (FCM) is one of many organizations that provides leadership by working with partners to implement holistic decision-making and planning processes and innovative projects. The FCM offers financial services and resources to Canadian municipal governments to improve their environmental performance and reduce their greenhouse gas emissions. (See the FCM Web site *<www.fcm.ca>*).

3. Methodology

At the outset of development of an EMS, key decisions must be made about the approach and scope. The following sections identify and address those decisions.

3.1 Approaches to EMS Development

Municipalities use diverse methods to develop their EMS. While some design their EMS to include all activities and operations undertaken by the municipality, others develop department-specific management systems, and then increase the scope of the EMS to include other departments over time. The more common approaches to EMS development are described below.

Municipalities use diverse methods to develop their EMS. While some design their EMS to include all activities and operations undertaken by the municipality others develop department-specific management systems, and then increase the scope of the EMS to include other departments over time.

3.1.1 EMS for the Entire Municipality

Some municipalities develop an EMS that includes all the activities and operations of the municipality, including everything from purchasing and procurement to solid waste management. Although it may be desirable to have the entire municipality included within the scope of the EMS, this approach is often not adopted, because of the complexity associated with non-operational business units-legal, taxations, planning, etc. When municipalities are new to the EMS framework and methodologies, the aspects identification component for these non-operational units may be difficult. In addition, the time and resources required to develop an EMS for an entire municipality may prohibit this approach.

3.1.2 Operating Versus Non-Operating Departments

Another option for EMS development focuses on "operating" departments. Operating departments have activities and operations associated with the most significant environmental aspects and direct environmental impacts. Departments designated as non-operating are associated with office-based activities. Their activities do not have as significant or direct an impact on the environment. Departments associated with infrastructure, such as transit, storm water and wastewater, roads and potable water, would be considered operating departments. Departments, such as legal, taxation, and human resources, would be considered non-operating departments.

By focusing EMS development on the departments where the most environmental impacts can occur, the municipality places attention on the risks of those departments. After an EMS is in place for operating departments, the municipality may choose to develop an EMS for non-operating departments, or it may choose to have the systems in place for the operating departments only.

3.1.3 Department-Specific EMS

Many municipalities have developed an EMS for specific departments; particularly those associated with infrastructure. For a department-specific EMS, defining the scope of the EMS is generally easier, often due to the clear designation of activities and operations under the department's control. It is often easier to manage the EMS development budget when it is within the control of a single department. The EMS is typically developed sooner when its scope is limited to a single department, allowing for more rapid feedback. In addition, it may be easier to get the senior management team of one department to commit to an EMS than to receive the commitment of senior management throughout an entire municipality. If a municipality as a whole is developing an EMS, decisions may have to be approved by council—potentially a time-consuming process. The approval process for a single department, on the other hand, may be limited to a director or an equivalent department head.

Figure 3–1
Relationship between Municipal Infrastructure Management and the Scope of an EMS

Some municipalities take a staged approach by developing an EMS for a specific department as a pilot project.

3.1.4 Pilot EMS Development

Some municipalities take a staged approach by developing an EMS for a specific department as a pilot project. Through this approach, a municipality is able to limit the scope of the EMS and keep it to a manageable size. It allows the municipality to learn from the challenges that become evident while developing the pilot EMS. As it requires fewer resources, this staged approach also allows a municipality to budget the resources that will eventually be required for further EMS development, rather than having to budget for an entire EMS all at once. In addition, the tools developed for implementation of the management system can also be modified and applied in the subsequent EMS development in other departments.

3.2 Scoping the EMS

3.2.1 Scope and Linkages

The task of scoping the EMS is similar to drawing a box or boundary around the activities, operations, and facilities that will be included in the EMS. Many municipalities are complex organizations with activities and operations that cross from one department into another. If the municipality is developing an EMS for a specific department, it is imperative to determine which activities will be within the EMS scope, and which will be excluded.

During the determination of the scope, linkages with other initiatives in the municipality should be considered. If the community has made a commitment to sustainable development, the scope of the management system may need to include economic and social elements of sustainability along with the environment. These linkages are important to determine at the outset, because they will influence how the rest of the management system is created (e.g., what commitments to include in the policy, what issues are significant, how risk exposure will be determined).

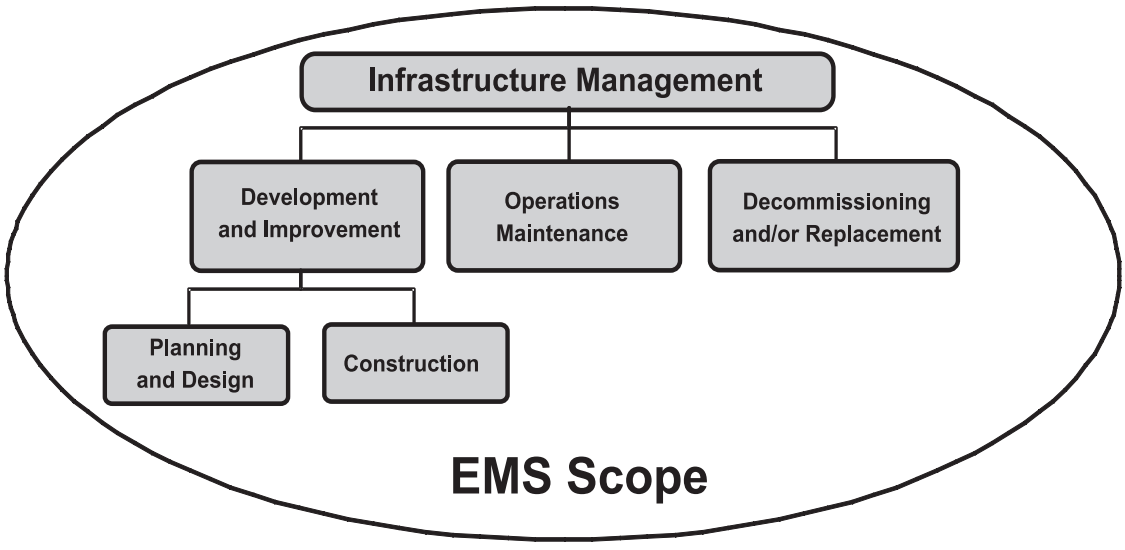
3.2.2 EMS Scope in Infrastructure Management

The main phases in the life of infrastructure should be considered when determining the scope of the EMS (Figure 3–1):

- development and improvement (which can be subdivided into planning and designing);
- operations and maintenance; and
- decommissioning and/or replacement.

Each phase presents environmental issues that must be addressed by the EMS. While the scope of the EMS could include multiple departments, when focusing specifically on municipal infrastructure, the management system should, at a minimum, include these three generic components.

Figure 3–1: Relationship between Municipal Infrastructure Management and the Scope of an EMS



The planning and design phase represents a significant one-time opportunity to influence the type of operational activities that will take place. The line staff routinely interacting with the environment can make invaluable contributions by contributing to the risk assessment processes and development of operational controls. In addition, engineering departments can ensure risks are mitigated or eliminated in infrastructure design.

During the construction sub-phase, third parties are often contracted to perform certain activities. While the municipality may not have direct control over a contractor's activities, it can provide information to make them aware of the municipality's environmental commitments and their legal responsibilities related to environmental aspects of their activities. From the planning to completion of construction projects, relevant EMS goals, objectives, and desired outcomes should be clearly communicated and demonstrated. At the operations and maintenance phase, infrastructure departments often have some components of an EMS already in place. These may include objectives and targets, environmental management programs, operational controls (including engineering controls and operating procedures), emergency response plans and monitoring and measurement programs.

The decommissioning phase presents another challenge for those developing the EMS. Activities associated with decommissioning infrastructure facility are usually well planned, and often have significant environmental aspects that must be taken into account during those planning activities. These may include regulated remediation activities (e.g., soil and/or groundwater remediation), requiring substantial and potentially long-term financial commitments. As with the planning and design and construction phases, the municipality may contract out many or all of the decommissioning activities. The municipality can inform contractors that work should be performed in a way that minimizes potential impacts. The EMS should include any decommission activities that will take place within the infrastructure department.

3.3 Commitment to EMS Development

Preparing for and gaining commitment from senior management is another important step in creating an EMS development strategy. The decision to undertake the development of an EMS might require council approval—requiring time and resources to make the case. Whether council approval or senior management approval is needed, it is essential to obtain their support at the outset. A business case will likely be required, identifying reasons, timing, and resources required to fully develop the EMS.

Engagement is also needed from those responsible for developing the EMS. The individual or team tasked with leading the EMS development must understand, and be committed to, the development process.

All staff affected by the EMS should also be informed early in the development process and their input and commitment sought. Demonstrating the benefits of developing an EMS to staff members can garner their acceptance of the process.

Initial communication is important, and ongoing communication is essential to ensure continued engagement in the EMS. Frequent and regular communication of progress is encouraged. The involvement of individuals or groups in the development of EMS processes is key to ensuring the EMS meets their needs, and is appropriate to their business activities.

3.4 Staffing the EMS Development Team

Finding the appropriate individual or individuals to lead the development of the EMS is often challenging. Even more challenging for them is finding the time to devote to EMS development. Some municipalities select one person to lead the development, while others take a team approach. Regardless of the approach taken, management must realize that EMS development takes time, and those involved must be allowed to spend it. Often, some of the team's existing responsibilities must be removed to allow them sufficient time to devote to EMS development.

Initial communication is important, and ongoing communication is essential to ensure continued engagement in the EMS. Frequent and regular communication of progress is encouraged.

Those developing the EMS are encouraged to seek guidance from other departments or municipalities that have already gone through the process and to benefit from their experience.

During EMS development—and even more so during implementation—line management has a significant role. Staff at the operating level should be sold on the importance of the EMS, and understand its overall value to the organization. In addition, operational staff need to be aware that they play an instrumental role in the development of the EMS. To identify environmental issues associated with municipal activities, the EMS development team needs to involve the operators most familiar with those activities.

3.5 Provision of Resources

The provision of resources, mainly personnel and finances, is often a limiting factor. Resources for developing and implementing the EMS will likely need to be identified before senior management commitment is sought. It is important to scope the EMS fully, develop a timeline, and identify resource requirements to present to senior management. For a department or municipality embarking on this process for the first time, this will be a difficult task. Those developing the EMS are encouraged to seek guidance from other departments or municipalities that have already gone through the process and to benefit from their experience.

Resources required for EMS development include the time of those involved in its development and, potentially, the cost of EMS training for the development team and the provision of external assistance (consultants). A travel budget may also be needed if a visit to another municipality is required to gain from its experience. Resource requirements for ongoing management warrant equal consideration and should be included in initial proposals.

3.6 Initial Environmental Review

Regardless of the approach selected for developing the EMS, an important initial task will be to conduct an extensive review of existing environmental policies, practices, and procedures, as well as the activities and operations that may result in impacts to the environment. This exercise helps to determine the existing status of environmental management within the municipality. Each municipality will have some elements of an EMS already in place (e.g., emergency response, environmental approvals, and environmental records). It is important to use these existing practices in developing the EMS. An initial environment review will serve to complete this internal benchmarking. The review should include three activities: gap analysis, environmental aspects review, and regulatory review. Each activity provides vital information that serves as a starting point for EMS development.

3.6.1 Gap Analysis

The gap analysis is an information-gathering process that identifies and assesses the existing management system components that will make up the EMS, and the actions required to improve or to enhance these components.

Existing processes and procedures for environmental management are evaluated to determine if they meet the EMS framework or standards being used (e.g., ISO 14001), and areas requiring improvement are identified. The results of the gap analysis form the basis for developing an implementation plan to begin the EMS development.

3.6.2 Environmental Aspects Review

The environmental aspects review is a comprehensive identification of the environmental aspects of the municipal activities, products or services that have or can have an environmental impact. Once these aspects are identified, an assessment of risk is conducted to determine the level of relative significance. On completion, the ranked environmental aspects are then used to allocate resources and plan the activities described in the EMS.

3.6.3 Regulatory Review

A regulatory review identifies the regulatory requirements of each environmental aspect identified in the environmental aspects review. The regulatory review includes an examination of federal and provincial legislation, applicable municipal bylaws, and other requirements with which the municipality should comply. By linking these municipal obligations to the identified environmental aspects, a clear relationship can be established between the municipal activities and the requirements that influence them. Ideally, this exercise should include a procedure to identify how the legal and other requirements apply to the municipality's environmental aspects.

Once complete, the initial environmental review provides the information necessary to outline an implementation plan for the EMS. By combining the information from the gap analysis, aspects identification and regulatory review, a municipality can determine the specific requirements of its EMS and allocate development resources.

External input is often co-ordinated through an environmental advisory committee, often linked directly to the municipal governance structure. These committees provide ongoing advice on policy-related issues affecting the environment and make recommendations to council, generally through appropriate standing policy committees. The committees include stakeholders representing groups such as post-secondary institutions, the chamber of commerce, local businesses, environmental non-governmental organizations, provincial/territorial government representatives, regional health authorities, and community organizations (e.g., outdoor organizations, community development, business interests) along with representatives from various municipal departments as appropriate.

Once the engagement process has been completed, the policy needs to be reviewed by appropriate groups in the organization (e.g., legal review, council) and approved at the highest level of the organization. This support could come from the mayor for a municipal-wide policy or a department head for a department-specific policy.

The time commitment associated with the policy development is easily underestimated. Ensuring the policy adequately reflects the true commitments of the municipality to environmental management, addresses external stakeholders, and is adequately reviewed and endorsed can take anywhere three months to over a year.

The environmental policy should be drafted before the development of other EMS elements, as it provides the foundation and direction for the rest of the EMS (see reference section for policy examples). *Strategic Commitment to the Environment by Municipal Corporations* (InfraGuide, 2002) provides guidance that will assist the policy development process.

The regulatory review includes an examination of federal and provincial legislation, applicable municipal bylaws, and other requirements with which the municipality should comply.

4. EMS Development and Implementation

This section addresses the main elements of an EMS founded on the internationally recognized ISO 14001 standard. Figure 3–2 presents a conceptual model for an EMS and should be consulted while reading this section. Elements are presented in the plan-do-check-act process that drives continual improvement. At the beginning of the discussion of each element, a shaded text box describes the intent of that element. Appendix A contains a case study indicating how each element applies to an environmental issue specific to municipal infrastructure. This case study should be consulted as each element in this section is reviewed.

4.1 Plan

4.1.1 Environmental Policy

Create a public guiding statement, endorsed by top management, which summarizes the municipality's environmental commitment and provides a foundation for the EMS.

An environmental policy—the foundation of an EMS—describes the overall commitments a municipality makes to environmental management and stewardship. Developing an environmental policy presents a challenge, because of the diversity of municipal operations and activities, the number of internal stakeholders that may be involved, and the varying views and opinions of external stakeholders. Many municipalities consider the views and opinions of stakeholders and community groups when developing an environmental policy.

Typically, one of two strategies is used to develop an environmental policy related to infrastructure. In both cases, the policy needs to be appropriate to the nature and scope of the EMS and the environmental issues the municipality faces. The first strategy is to develop the policy for a specific department that has responsibility for managing a particular component of the infrastructure. For instance, a municipal water treatment plant may decide to create an environmental policy specific to the issues it faces. The second strategy is to develop a policy for the municipality as a whole, covering all departments. This strategy is often closely linked to an overall environmental strategic plan or sustainable community program.

Some municipalities develop the environmental policy internally and do not include external stakeholders or representatives. For municipalities that want to ensure engagement with the larger community, an environmental advisory committee is often established to develop the environmental policy. The committee may be made up of senior managers from the municipality (or from the specific department undertaking EMS development), municipal environmental management staff, and community stakeholders. The environmental advisory committee provides ongoing advice on policy-related issues affecting the environment and makes recommendations to council, generally through appropriate standing committees. Once the engagement process has been completed, the policy needs to be reviewed by appropriate groups in the organization (e.g., legal review, council) and approved at the highest level of the organization based on the scope of the EMS. This support could come from the mayor for a municipal-wide policy or a department head for a departmental-specific policy. Some municipalities also consider union endorsement.

The time commitment associated with the policy development is easily underestimated. To ensure the policy sufficiently reflects the true commitments of the municipality to environmental management, addresses external stakeholders, and is adequately reviewed and endorsed, the length of time required can range anywhere from three months to more than a year.

An environmental policy—the foundation of an EMS—describes the overall commitments a municipality makes to environmental management and stewardship.

The environmental policy should be drafted before the development of other EMS elements, as it provides the foundation and direction for the rest of the EMS (see reference section for policy examples). The Environment Protocols best practice: Strategic Commitment to the Environment by Municipal Corporations (InfraGuide, 2003) provides guidance that will assist the policy development process.

4.1.2 Environmental Aspects

Establish a process to identify municipal activities, products, or services that have or can have an environmental impact, then determine which of those are significant for the purposes of management.

A process for identifying, reviewing and updating aspects is a key requirement. Most municipalities use some method of aspects identification that link activities, products and services with their impact on the environment.

To assist the EMS planning activities, it is necessary to identify existing environmental aspects and to determine which ones are significant. A process for identifying, reviewing and updating aspects is a key requirement. Most municipalities use some method of aspects identification that link activities, products and services with their impact on the environment. If an environmental aspects identification is completed during the initial Environmental Review, a preliminary list of aspects will already exist.

The most effective method for environmental aspects identification is the workshop approach. A facilitator with an understanding of the aspects identification and assessment process leads a group of employees representing the range of activities, products, and services under review. These employees outline their specific work activities and help identify the environmental aspects associated with their jobs. Examples of municipal infrastructure environmental aspects are provided in Appendix B. The facilitator compiles the information from the workshop in a consistent manner, and ensures the risk assessment process is used consistently across activities and departments. It is important to note that many municipalities have difficulty adequately capturing positive environmental aspects for their operations. However, it is an important part of the process and allows for municipalities to receive credit for the positive environmental impacts (e.g., waste collection and recycling, wastewater treatment). Sample positive environmental aspects are provided in Appendix B.

Environmental aspects are typically assessed for significance based on a qualitative analysis of risk. A common risk assessment methodology—often one that may already exist in the municipality—equates risk to the probability of the defined event occurring and the magnitude of the consequences of that occurrence. This equation is expressed as:

Risk = Consequences X Probability

When considering consequences, there are three important criteria:

- the environmental impact (impact on the biophysical environment);
- the direct impacts on the organization (legal or financial impact, worker health and safety); and
- the indirect impacts on the organization (public relations, public health and safety, media attention).

Similarly, the probability of the impact occurring can be based either on the history of occurrence or an estimate of future probability. The environmental aspects ratings system is relatively subjective; however, its main purpose is to identify which aspects deserve the greatest attention and which deserve the least. An environmental aspects rating table is provided in Appendix C.

Control Versus Influence

In identifying environmental aspects, the concept of control versus influence can be challenging. It is relatively easy to determine those environmental aspects a department or municipality can control. For example, a department can control the inputs and outputs of various processes, having a direct result on the environmental aspects associated with those processes (planning/design phase of infrastructure management). However, for some activities and operations, the department

may use contractors or other external resources and will not be directly in control (construction phase of infrastructure management). In these situations, however, the department or municipality is able to influence how a process or activity is undertaken. It can select contractors based on an evaluation of the contractor's operating procedures and past experience. In addition, the municipality can require contractors to carry out their work in a manner that will not cause environmental impacts. These expectations and conditions can be clearly outlined in service contracts.

The municipality can also influence the activities of community members through community programs. For example, a community water conservation program may include ideas for household water conservation. This influence on community behaviour may result in reduced water use and impact on the environment.

4.1.3 Legal and Other Requirements

Develop a method to ensure the municipality has identified and is aware of its environmental regulatory requirements and other commitments, and knows how those affect operations.

Most municipalities already have procedures to track changes to legislation, regulations, and other requirements. It is important to formalize the process or procedure to ensure it is applied consistently and regularly over time. Some municipalities use their internal legal counsel or hire external sources to assist in this process, while others keep that responsibility within the environmental management function.

At the outset of EMS development, a list of legal and other requirements applicable to the environmental aspects should be developed, or may have already been developed during the initial environmental review. Making a link between the specific legal and other requirements (i.e., specific regulations, guidelines, or codes of practice) allow the municipality to identify the activities affected by legal and other requirement changes that occur over time.

It is important to communicate these legal obligations to employees responsible for the associated activities, to ensure they understand how the legal requirement applies to their daily activities. An effective way to accomplish this task is to incorporate the requirements into standard operating procedures, then to provide access to the appropriate legal information via the Internet (see provincial and territorial Internet sites in reference section) or via a municipal Intranet. If the municipality adopts this approach, it is important that internal interpretation of the legal requirements is available through a corporate environment or legal department.

Generally individual employees are not responsible for meeting these legal obligations directly; this responsibility falls on municipal corporations themselves. Part of that responsibility includes the effective communication of legal requirements by management to staff, and to monitor and ensure expectations are being met. An exception does exist however in some cases, where individual liability has occurred.

4.1.4 Objectives and Targets

Establish a process to generate environmental objectives and targets to help the municipality improve its environmental performance.

While many municipalities regularly set objectives and targets to measure performance, environmental objectives and targets are often not considered. Using the significant environmental aspects, legal and other requirements, community input, and internal requirements as guides, environmental objectives and targets must be established during initial EMS development, and should be reviewed and revised over time.

The process of setting environmental objectives and targets typically involves gathering the senior management team—of a municipality or a department—to discuss current performance, and set objectives and

Using the significant environmental aspects, legal and other requirements, community input, and internal requirements as guides, environmental objectives and targets must be established during initial EMS development, and should be reviewed and revised over time.

Figure 4–1
Relationship between Municipal-Wide and Department-Specific Objectives and Targets

If the scope of the EMS includes all municipal operations, objectives and targets are set for the entire organization.

targets for the coming year. During initial EMS development, setting environmental objectives and targets may be done independently of other business objectives and targets. Over time, the environmental objectives and targets can be integrated into setting overall business objectives and can be done during the annual goal-setting process to ensure alignment with budgeting, and other established business processes.

The information required for setting objectives and targets is closely linked with other documents describing municipal commitments and strategies relating to environmental management. For instance, the objectives and targets should consider municipal vision statements, environmental policy commitments, community sustainable development/growth plans, state of the city reports, annual strategic budgets, and other appropriate documents.

If the scope of the EMS includes all municipal operations, objectives and targets are set for the entire organization. In this circumstance, individual departments may be required to customize the objectives and targets to suit their individual operations (see Figure 4–1). If the EMS is developed for an individual department, the department-specific objectives and targets will exist without an overarching municipal-wide objective and target.

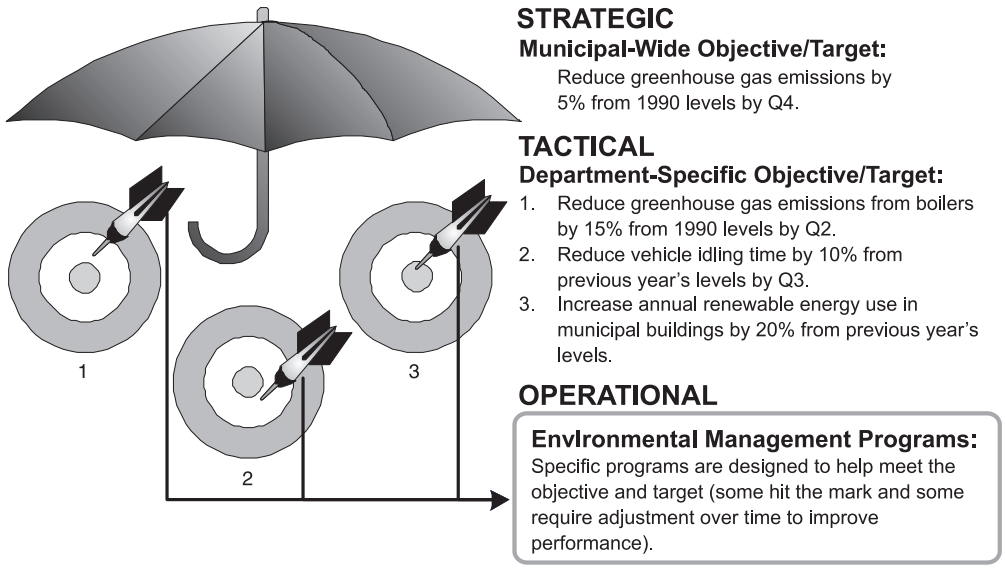
4.1.5 Environmental Management Program(s)

Create a process that will generate the actions necessary to achieve the environmental objectives and targets.

Environmental management programs are established to help an organization achieve its environmental objectives and targets. Municipalities are often good at planning their activities and can quickly adopt a process for establishing environmental management programs. The process typically involves assembling a team of managers whose staff will directly implement the actions required to meet the environmental objectives and targets. The managers identify the activities required to meet the objectives and targets, define departmental resources, capabilities, and budgets, and make informed decisions to create the environmental management programs. The process also allows management to integrate the environmental management programs and the associated resource requirements, with the financial planning and budgeting process.

It is important to document the environmental management programs, and communicate with the personnel responsible for carrying out the activities outlined in the programs.

Figure 4–1: Relationship between Municipal-Wide and Department-Specific Objectives and Targets



Some municipalities include the achievement of environmental management programs (or components of them) in personal performance agreements with staff.

Monitoring the progress of environmental management programs is essential to determine whether people complete their tasks. Many organizations, municipalities included, find it difficult to ensure the tasks are undertaken in a timely manner. Having one municipal staff member (perhaps the EMS co-ordinator) or a senior manager responsible for following up with responsible individuals is often necessary, to ensure the environmental management programs are actually implemented.

A greater challenge lies in integrating the municipality's existing environmental programs into the management system framework. Most municipalities have programs in place to address environmental issues in their jurisdiction (e.g., greenhouse gas management, and water quality, and wastewater treatment). Although these existing programs were not developed as a result of identifying the significant environmental aspects through the development of an EMS, they generally address a significant aspect from an EMS perspective. Once a municipality decides an EMS is appropriate for its operations, these programs need to be integrated into the EMS.

4.2 Do

4.2.1 Resources, Roles, Responsibility and Authority

Define, document, and communicate roles, responsibilities, and authorities to ensure environmental management initiatives are effectively developed, implemented, and resourced.

Municipal departments must assign responsibilities for the actions associated with their activities, products, and services that could have an environmental impact. Depending on the status of environmental management within the municipality, these responsibilities may have already been assigned and described in job descriptions.

Appointment of a specific EMS co-ordinator (either at the departmental level or municipality-wide) is an important step commonly adopted by municipalities during EMS development and implementation. The EMS co-ordinator has the overall responsibility and authority to ensure other municipal staff members are involved in the EMS. As appropriate, EMS responsibilities are allocated to line personnel and management.

Involvement of senior managers in EMS development and implementation is important to ensure their ongoing commitment to the process and resulting environmental performance. They should be given the overall responsibility for providing the necessary resources to ensure the EMS is maintained over time. Because senior management is responsible for overall municipal performance and ensuring due diligence, this places management in a favourable position to establish and maintain corporate commitment to an EMS. As increasing attention is paid to municipal governance practices, senior management needs to demonstrate that appropriate controls are in place to manage environmental risks. Implementation of an EMS demonstrates a commitment to good governance.

Larger municipalities have also used cross-functional teams to communicate best practices and lessons learned. These teams are typically composed of staff from corporate and administrative departments, as well as operating units. This team approach has been touted as one of the most successful tools for ongoing implementation of an EMS.

4.2.2 Competence, Training and Awareness

Ensure that personnel involved with environmental management are adequately trained and competent to perform their duties, and are aware of their role in environmental management.

Municipalities often have a process within their human resources departments to identify the need for employee training, and to arrange for that training in a timely manner. As the EMS is developed, additional training may be required

A greater challenge lies in integrating the municipality's existing environmental programs into the management system framework.

Figure 4–2
An Example of an Environmental Training Matrix

by staff involved in the activities, products, and services associated with significant environmental aspects, or required by regulations. The process used to identify these training requirements is generally referred to as a training needs assessment. The results of this assessment are often recorded in a training matrix used to determine which employees require specific training programs (Figure 4–2). In addition to new training programs, existing training programs should also be reviewed to determine their adequacy regarding the significant environmental aspects, and legal and other requirements.

An EMS awareness-training program should be in place for all staff influenced by the EMS. Employees must know and understand their specific roles and responsibilities in achieving the commitments made in the environmental policy and the activities specified in the EMS. Awareness training should also be included in the orientation of new employees.

Testing for awareness competence is a necessary activity often overlooked after the provision of training. Some municipalities use a variety of tools to test competency including tests and examinations at the completion of a training course, regular site inspections to determine performance, and job shadowing to determine if proper procedures are being used. Annual or more frequent performance reviews can be used as a means of communicating competency requirements to employees. As training methods evolve, there is a movement away from strictly providing course-based training programs to developing specific competency programs with linkages to advancement within the organization (e.g., either linking with seniority designations or compensation).

As training methods evolve, there is a movement away from strictly providing course-based training programs to developing specific competency programs with linkages to advancement within the organization

Figure 4–2: An Example of an Environmental Training Matrix

Environmental Training Matrix

Personnel ①	EMS Assessments	Groundwater Monitoring	Storm Water Monitoring	Final Aid/CPR	WHMIS	Transportation of Dangerous Goods (TDG)	Media Training
General Manager	X			X	X		X
EMS Co-ordinator	X	X	X	X	X	X	X
Department Managers	X			X	X		X
Community Relations	X			X	X		X
Safety Adviser	X			X	X		
Foremen/Women	X			X	X	X	
Industrial Technicians	X	X	X	X	X	X	②
Facility Staff	X			X	X		
Office Staff	X			X	X		

Management System Training

Job-Specific Training

The training matrix can be used as a training record if:
1. the personnel column includes individual names; and
2. the training program cells record expiry dates or renewal frequencies.

Note: A generic training matrix should be maintained to ensure that information is maintained as personnel changes.

4.2.3 Communications

Develop methods for internally and externally communicating information about the EMS and other environmental management matters as appropriate.

Internal Communications

Municipalities have a number of ways of communicating environmental aspects and the EMS with staff (e.g., memos, e-mails, newsletters, posters, Internet and Intranet sites, and verbal communications during staff meetings). The creation of internal support teams to help implement the EMS has also proven to be a very successful tool in communicating information horizontally across the organization—information about best practices, lessons learned, training techniques, and methods for developing operational controls.

External Communications

Municipalities occasionally struggle with how to handle external communications, because of the number and variety of calls that relate to environmental management. As much as possible, municipalities should use existing communication processes. As with all elements of an EMS, it is important that those with communications responsibilities understand their role in communicating EMS-related information.

Key success factors related to both internal and external communications of an EMS include:

- celebrating milestones (both big and small);
- providing feedback up and down the chain of command;
- communicating early and often during EMS development and implementation;
- engaging both internal and external stakeholders to assess the adequacy of the EMS; and
- ensuring that action is taken and resolution is achieved on comments received.

4.2.4 Environmental Management System Documentation

Create a central set of documentation that describes how the EMS functions and interacts with other related procedures in the municipality.

A description of the core elements of the EMS should be documented to allow for consistent implementation over time. Most municipalities document their central EMS procedures in one manual, usually maintained by the EMS co-ordinator. Supporting information (e.g., standard operating procedures, contractor management procedures, emergency response plans, training plans) can be maintained as stand-alone material that is referenced in the EMS documentation—often with electronic linkages. When a municipality begins the process of EMS development, documenting the core elements of the EMS requires the EMS co-ordinator to ensure that existing information is catalogued and reflected in the EMS documentation. Simplified flow charts and other graphic tools in an EMS manual, rather than excessive text, generally make it more accessible to a broader audience.

The manual does not have to be large. It serves as a road map guiding the reader to the appropriate information. It allows the management system to be responsive to specific needs. It also integrates existing programs and practices with the EMS. Most municipalities, for example, have an emergency response plan. Rather than reinventing the plan or duplicating it in the EMS manual, it is more efficient to use the core manual to provide direction to the existing plan.

The creation of internal support teams to help implement the EMS has also proven to be a very successful tool in communicating information horizontally across the organization—information about best practices, lessons learned, training techniques, and methods for developing operational controls.

Figure 4–3
Assessing and Developing Operational Controls

4.2.5 Control of Documents

Establish a method for creating, approving, maintaining, and reviewing EMS-related documentation in a manner that ensures the material is current, available, and contains the appropriate information.

Ensuring that people use the most recent version of a document is difficult, especially if the documents change periodically and if people are using hard copies of documents (e.g., making sure the emergency contact list has the correct phone numbers). The easiest way to ensure control of documents is to use electronic versions where possible. People must be informed that printed versions are valid only on the day of printing, and that they should check to see if a more recent version is available electronically. Documents can change over time and need to be managed accordingly.

Ensuring that people use the most recent version of a document is difficult, especially if the documents change periodically and if people are using hard copies of documents.

If staff members do not have access to the computer network, or if hard copies of documents are required, maintaining control of those documents presents a challenge. A formal system of numbering documents and keeping track of the holders of those documents should be undertaken to ensure updates can be sent to the document holders. Appendix D illustrates Control of Documents.

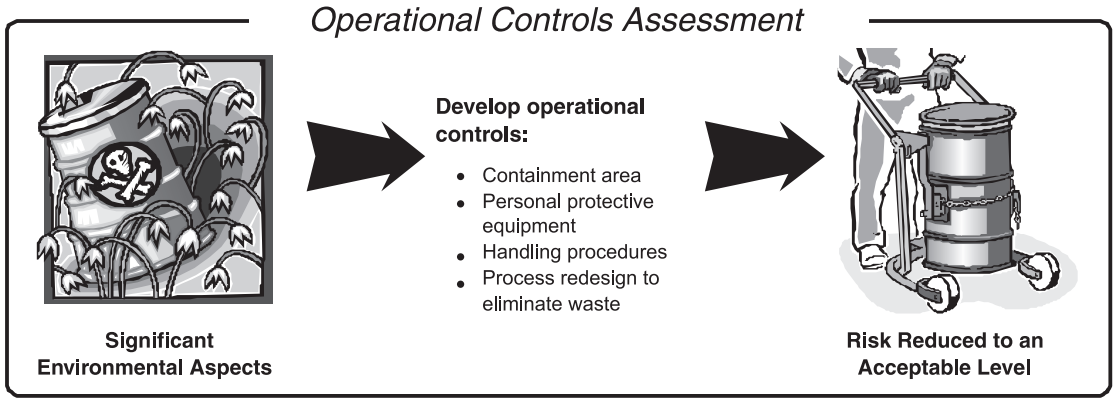
Dealing with obsolete documents presents another challenge. Many obsolete documents are retained for knowledge preservation, and must be identified as such. As a result of recent changes to freedom of information and privacy legislation, many municipalities have examined their document control procedures, specifically as they relate to document retention and management of obsolete documents.

4.2.6 Operational Control

Ensure that a process is developed to generate controls that will help reduce significant risks to an acceptable level and achieve the municipality's environmental policy, objectives, and targets.

Most municipalities have existing operational controls for infrastructure (e.g., engineered controls, such as shut-off valves and berms around tanks, operating procedures for activities associated with environmental aspects). A review of significant environmental aspects should be undertaken to determine if existing operational controls are adequate to prevent impacts to the environment (Figure 4–3). Revising existing operational controls, especially operating procedures, is often required to ensure environmental impacts are prevented. Some circumstances may require the redesign or creation of new operational controls to ensure they are consistent with the management system framework.

Figure 4–3: Assessing and Developing Operational Controls



Operational controls can be administrative (e.g., operating procedures, recycling programs, preventive maintenance programs, inspections) or engineered (e.g., containment areas, equipment guarding, treatment processes). Caution should be used when developing new administrative operational controls to ensure they are consistent with the management system framework.

Not all procedures need to be documented, and should only occur if the absence of a documented procedure could lead to a deviation from the environmental policy, environmental objectives and targets, and cause a significant impact. On-the-job training may be adequate to communicate the procedure.

Linking operational controls back to specific environmental aspects is a valuable exercise that some municipalities undertake. It allows those involved in the ongoing implementation of the EMS to review periodically the list of environmental aspects, and the associated operational controls to determine their adequacy in preventing environmental impacts. This exercise is often accomplished by creating an operation control registry (i.e., a listing of relevant controls and their associated aspects).

Contractor Management

Many environmental aspects of infrastructure development arise from activities carried out by contractors. In these circumstances, the municipality needs to ensure contractor activities are in accordance with the municipal EMS. The most effective contractor management processes include:

- risk assessment process and responsibilities;
- performance indicators and reporting;
- environmental performance self-assessment tools;
- pre-qualification for conducting work;
- communication plan; and
- training.

4.2.7 Emergency Preparedness and Response

Develop methods for identifying potential emergencies, preparing for and responding to emergency situations, testing emergency ocedures, and mitigating any associated environmental impacts.

As required by regulation, municipalities have emergency response plans for various operations and activities (e.g., pollution, health, safety, community emergency response plans, fire management plans, hazardous materials response and recovery). (See Environment Canada, and. "Environmental Emergencies Program." *<http://www.ec.gc.ca/ee-ue/home/home_e.asp>*, for information on emergency prevention, preparedness, response, and recovery.) In some cases, emergency response plans may not exist or may require revision to ensure adequacy. Existing emergency response plans often lack a description of actions required to prevent and mitigate environmental impacts associated with accidents and emergency situations.

They fail to consider environmental impacts that might result from the response to an emergency (e.g., the impact on the storm water system from the use of fire retardant foam and how the impact may be controlled using portable berm devices around storm sewers).

A municipality needs to ensure employees are adequately trained to respond to emergency situations according to the emergency response procedures. To complement this training, a municipality needs to test procedures periodically, to review the response after the test and after an actual emergency. Testing and documenting opportunities for improvement are important components when demonstrating continual improvement of an EMS. These opportunities for improvement should be tracked and management by the nonconformity, corrective action, and preventive action element of the EMS.

A municipality needs to ensure employees are adequately trained to respond to emergency situations according to the emergency response procedures.

4.3 Check

4.3.1 Monitoring and Measurement

Create programs to track significant environmental impacts, objectives and targets, compliance, and environmental performance indicators.

A municipality may already have monitoring and measurement systems in place to measure such environmental parameters as releases, spills, water quality, and effluent. Most environmental management systems require the establishment of monitoring and measurement programs for the significant environmental aspects. These programs can help municipalities track environmental performance, assess operational controls, and conform with environmental objectives and targets. The data gathered from the monitoring programs provide valuable input to the overall business planning process. It is also important for the municipality to document any calibration or verification requirements for its monitoring equipment to ensure the information it is receiving is accurate.

One way of achieving compliance is to establish a program of regular compliance audits. These compliance audits can be supplemented with more frequent site inspections and other routine activities.

Most environmental management systems require periodic evaluations to ensure compliance with relevant environmental legislation and regulations. One way of achieving compliance is to establish a program of regular compliance audits. These compliance audits can be supplemented with more frequent site inspections and other routine activities (e.g., emissions monitoring, water quality testing). Compliance audits can be conducted by external consultants, or by staff trained as environmental compliance auditors. The internal audit team often consists of staff from other functional units within the municipality. Municipalities with functioning environmental management systems often use an environmental reporting system to communicate compliance, monitoring, and measurement results. These reports typically include environmental performance indicators, which are used to demonstrate commitment and overall progress. In addition, each performance indicator often corresponds to a particular environmental aspect in the EMS. This helps assess progress on a more detailed level.

4.3.2 Nonconformity and Corrective Action and Preventive Action

Establish a process to identify any deviations from the EMS or opportunities for improvement, and ensure that process includes methods for identifying and implementing corrective actions or actions to prevent recurrence.

The nonconformity and corrective action and preventive action element of the EMS focuses on performance, process, and system improvement through a formal process for identifying opportunities for improvement. Careful consideration must be given to how nonconformities will be identified, reported, recorded, investigated and acted upon. If the process is too cumbersome and paper-intensive, it will not be used. An appropriate level of detail is required to ensure actions are taken to identify the cause of the nonconformity, implement corrective actions, and modify activities, processes, or controls to avoid recurrence of the nonconformity.

Many municipal departments have processes in place for dealing with incidents. These incidents often focus on health and safety issues; however, environmental incidents are not always included in incident reporting procedures. Often, a few simple changes to the incident report form and the associated procedures for its use are all that is needed to ensure the inclusion of environmental incidents.

A process for conducting investigations of incidents and nonconformities is an important step in achieving continual improvement of the EMS and the resulting environmental performance. It is often one of the first processes implemented during the development of an EMS. Rolling out the nonconformity process early can help with changes to the management system and other processes along the way. It reinforces the message that the EMS undergoes continual improvement. There is another benefit in developing this process early. If a municipality is seeking ISO 14001 registration, the records generated by the nonconformity process are useful in demonstrating the effectiveness of the EMS during the registration audit.

4.3.3 Control of Records

Establish and maintain suitable records to demonstrate what actions are being taken to ensure the EMS is functioning as designed, and the records are secure and accurate.

The management of environmental records is a well-established activity in some infrastructure-related departments, particularly those reporting to a regulatory agency. Records reflect an historical event and cannot change over time, unlike documents, which can change. However, the EMS needs to ensure that environmental records are adequately managed by municipalities to demonstrate due diligence. An important part of an EMS is being prepared to demonstrate that environmentally related activities are being well managed. Keeping environmental records is a primary means of demonstrating that actions are being accomplished. The records provide a means to measure performance over time and act as a catalyst for continual improvement.

Many municipalities manage their environmental records with the same processes used to manage other records and files. As part of an EMS, it is common practice to create a list of environmental records. A municipality may do this by first conducting an inventory of environmental records already on file. The list often includes specifications relating to the location of the record, its retention time, and a person responsible for its management. Disposition (disposal or archiving) of environmental records is also important, because some records must be retained for defined periods of time. Legal counsel is usually sought to determine retention time for all environmental records, and other matters arising from freedom of information and protection of privacy legislation.

4.3.4 Environmental Management System Internal Audit

Create a process to review periodically the functioning of the EMS, ensure that it is being implemented as designed, and identify opportunities for improvement.

Audits are conducted periodically of the EMS to determine whether the management system elements and activities conform to plans and are implemented effectively. Audits assess the effectiveness of the management system in fulfilling the environmental policy, environmental objectives, and performance criteria. Audit results are then used to determine areas for improvement, leading to progressively better management. The EMS audit provides an extra level of confidence in the EMS. Note that an EMS audit differs from a compliance audit. It examines the effectiveness of the EMS, whereas a compliance audit focuses on compliance with legal and other requirements.

Most municipalities have to develop a process to conduct regular EMS audits as they develop their EMS. Auditors external to the facility or department being audited usually undertake EMS audits. Similar to compliance audits, management system audits may also be conducted by external consultants, or by internal staff trained as environmental management system auditors. Internal audits are considered first-party audits and external audits are third-party audits, both of which can be a valuable part of an EMS. The ISO 14001:2004 standard refers to this element of the management system as the "internal audit". An internal management system audit process can provide staff with an opportunity to learn from other departments' activities. The audit schedule for management system audits is typically based on risk associated with a particular operation.

Audits are conducted periodically of the EMS to determine whether the management system elements and activities conform to plans and are implemented effectively.

The results of the EMS audit are communicated to the senior management team, are usually reviewed during the management review, and are an important part of the continual improvement process.

Risk is determined by examining the relative importance of the activities conducted in the department to the overall municipality, the past performance of the management system, and the results and dates of previous audits. An EMS audit protocol is used by the auditors to guide their evaluation. Appendix E contains a sample EMS audit protocol.

The results of the EMS audit are communicated to the senior management team, are usually reviewed during the management review, and are an important part of the continual improvement process. It is equally important to identify the positive EMS audit findings during the audit process. As with the rest of the system, the EMS audit process should also evolve with time to ensure that it continues to provide value. This evolution could involve changes to the frequency of audits, the protocol used to guide the audit process, or the team used to conduct the audits.

4.4 Act

4.4.1 Management Review

Establish a process where senior management annually reviews the EMS to ensure it remains effective, suitable, and adequate for the municipality.

Most municipalities have a process in place for conducting regular reviews of other business systems, but not of environmental issues. When developing an EMS, senior management must make the commitment to review regularly the EMS to assess its continuing suitability, adequacy, and effectiveness. This review is usually done independently from other management meetings, with a focus on the EMS, results of previous audits (EMS and compliance), progress toward achieving environmental objectives and targets, and the resources necessary to continue the implementation of the EMS. It is the responsibility of the EMS co-ordinator to pull together this information for the meeting.

The management review process allows the senior management team to reaffirm its commitment to the EMS by reviewing and authorizing improvement of various components of the system. It is this process that really allows the organization to improve its EMS continually. During the management review, the issue of adequate resources is often raised. Reviews are also often used to set the objectives and targets for the upcoming year (or period up until the next management review). The primary questions are whether the management system is meeting the needs of the organization, and if not, what needs to change to make it work. In other words, is the system having a material effect on the environmental performance of the organization? The management review is usually based on a predetermined agenda that focuses on three elements.

- Effectiveness: Is the EMS helping the municipality or department do what it intended?
- Adequacy: Is the EMS capturing the things that it should?
- Suitability: Is the EMS appropriate for the human, financial, and environmental setting the municipality or department is facing?

The management review process can be aligned with other business planning processes so decisions about the EMS are reflected in budgets and planning.

5. Continual Improvement of the EMS

Municipalities that implement the elements described in this best practice will have greater assurance that their investment in the EMS will lead to improving environmental performance and compliance. Implementing these elements can also promote corporate leadership by demonstrating a commitment to environmental responsibility. For municipal agencies charged with promoting environmental protection, applying this best practice will promote consistency in achieving and maintaining compliance, promote beyond-compliance efforts and help attain more reliable data on environmental performance.

To achieve the commitments formulated in the environmental policy, it is important for the municipality to develop a culture of continual improvement. Figure 6–1 illustrates the implementation of the environmental policy through the EMS and the plan-do-check-act cycle. As discussed earlier, a municipality may choose to develop an EMS for a variety of reasons; however, the key to success is the commitment to continual improvement. This commitment encourages organizations to review constantly and improve performance over time.

Figure 5–1 also shows that an EMS can be viewed as a wheel that can be moved toward improved environmental performance through the continuous improvement process. The wheel can be stopped from slipping back through effective quality and environmental controls. Examples of these controls include monitoring and measurement programs, EMS audits, and an effective management review process.

As municipalities strive to improve their EMS, they are developing some very innovative programs. Examples include:

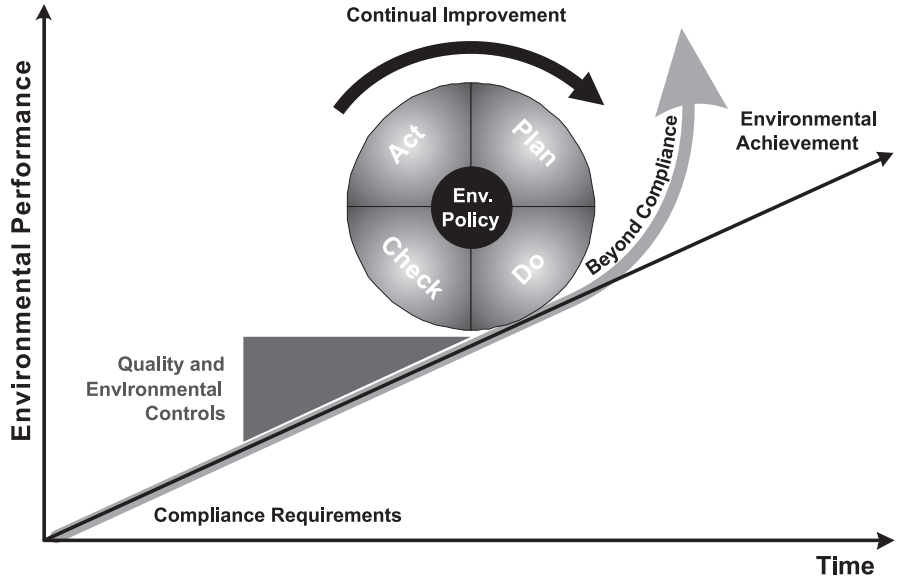
- "Ride the Wind" (transit run on green power);
- biogas development in municipal landfills;
- biophysical impact assessments for development projects;
- municipal composting programs; and
- methane-powered fleet vehicles.

In the future, an efficiently designed EMS will be essential as municipalities move beyond simply complying with applicable environmental legislation and regulations. The result would be fully integrating environmental management into their overall business operations.

Figure 5–1
The Role an EMS Plays in Improving Environmental Performance

Implementing these elements can also promote corporate leadership by demonstrating a commitment to environmental responsibility.

Figure 5–1: The Role an EMS Plays in Improving Environmental Performance



Appendix A: Example of Municipal Infrastructure EMS

The following case study examines how the elements of an EMS are applied to an environmental issue specific to municipal infrastructure.

Issue: Effluent is discharged from the municipal wastewater treatment plant into an adjacent river system.

Environmental Policy

Application: The environmental policy includes a commitment to prevent pollution.

Environmental Aspects

Application: The discharge of effluent has potentially significant environmental impacts.

Aspect	Impact
Discharge of effluent into river system	■ Contamination of surface water ■ Loss of fish-bearing habitat

Legal and Other Requirements

Application: The discharge of wastewater is governed by municipal, provincial/territorial, and federal legislation (e.g., the Fisheries Act) and must be conducted according to their restrictions-including restrictions on phosphorus levels in the wastewater.

Objectives and Targets

Application: Due to the potentially serious impacts of wastewater discharge, an objective (and corresponding target) was set to reduce the phosphorus content per unit of wastewater effluent to 25 percent below the permitted levels by the end of 2004.

Environmental Management Program(s)

Application: The plant establishes a phosphorus reduction project group consisting of individuals from the various production units and the maintenance section. The group determines that a process change will achieve the desired phosphorus reduction and tasks the engineering group to complete the changes by September.

Structure and Responsibility

Application: Planning, target setting, and follow-up on environmental issues are co-ordinated by the environmental manager. Plant operators are designated responsible for ensuring treatment processes are operating and are to report any deviations in effluent quality.

Training, Awareness, and Competence

Application: A training program outlining the municipality's commitment to environmental performance improvements and its EMS is developed, provided to all staff, and customized to ensure the information is appropriate to their jobs. Staff training in water quality testing and the operation of the treatment equipment is identified and implemented as required.

Communication

Application: Staff and management discuss significant environmental issues and their performance improvement objectives during weekly meetings. A process is created to manage public complaints about wastewater effluent.

EMS Documentation

Application: A core manual is written providing instruction on the operation of the EMS and guiding readers to additional information on specific wastewater treatment procedures.

Document Control

Application: A central database is developed to store all the wastewater treatment procedures. The plant operators have access to the system and know that the documents in the system need to be adhered to and are current.

A. Example of Municipal Infrastructure EMS

Operational Control

Application: Sludge removal and wastewater treatment processes are built into the original plant design to minimize phosphorus discharge, and standard operating procedures are written to provide guidance in operating the equipment as designed.

Emergency Preparedness and Response

Application: Emergency response procedures are developed for use in the event of a discharge of wastewater with phosphorus levels above acceptable limits. These procedures are also tested periodically to ensure they function effectively.

Monitoring and Measurement

Application: A process for monitoring the phosphorus levels in the effluent is established, including the calibration procedures for the monitoring equipment.

Non-Conformance, and Corrective and Preventive Action

Application: A process is established to report, investigate, and correct breaches of regulatory limits and accidental releases. This includes such things as odour, noise, wastewater releases, failure to follow procedure, and opportunities for improvement.

Records

Application: Records of wastewater quality monitoring are maintained to demonstrate compliance and track performance toward meeting the reduction objective.

EMS Audit

Application: An EMS audit is conducted annually to confirm that the system is operating as designed, that wastewater effluent processes are functioning, and to identify any areas for improvement.

Management Review

Application: Senior management reviews the EMS annually to determine if the system is effective in managing the wastewater effluent, is adequate for the level of risk posed, and is suitable for the manner in which the plant operates. This review also examines the success in achieving the previous year's objectives and establishes new objectives for the upcoming year.

Appendix B: Sample Environmental Aspects for Municipal Infrastructure

The following table provides a partial listing of environmental aspects and associated impacts for infrastructure activities specific to roads, wastewater, waterworks, and transit.

Roads		
Activity	Environmental Aspect	Environmental Impact
Dust Control of Unpaved Roads	Release of fine particles in atmosphere	Contamination of water courses; impact on human health (air quality)
Loading of asphalt product in hopper and loading into trucks	Release of VOCs and odours into the air	Reduced local air quality
Replacing street lights	Disposing of incandescent, mercury, and high-pressure sodium bulbs	Contamination of landfill
Salting of roads	Release of salt into adjacent soil, storm sewers, and watercourses	Contamination of soil, sewers, and watercourses
Wastewater		
Activity	Environmental Aspect	Environmental Impact
Operation of secondary clarifiers	Release of water high in biomass flocs	Oxygen deficiency in receiving waters
Nutrient removal program	Release of water high in phosphorus	Threat to water quality; eutrophication
Storage of chemicals	Release of chlorine gas	Threat to flora, fauna, and humans
Source control	Diminished biosolids quality	Contamination of land and agricultural products; human and fauna health hazard.
Waterworks		
Activity	Environmental Aspect	Environmental Impact
Watermain flushing	Release of chloramines	Threat fish to waterways and habitat
Taking water from a primary watercourse	Consumption of a natural resource	Altered fish habitat Reduction of a natural resource for other users
Hydrant flushing/testing program	Release of chloramines	Threat to fish habitat and other fauna
Water treatment process	Disposal of sedimentation sludges	Contamination of soil, groundwater, or receiving stream
Transit		
Activity	Environmental Aspect	Environmental Impact
Storage of diesel fuel in above-ground storage tanks	Release of fuel to adjacent soil and watercourses	Contamination of soil and water
Maintenance of transit equipment engines	Release of hydraulic oil from gear boxes	Contamination of soil
Energy used to operate light rail transit	Energy consumption	Depletion of natural resources
Operation of paint booths	Release of volatile organic compounds to the atmosphere	Reduced air quality

(Cont'd)

B. Sample Environmental Aspects for Municipal Infrastructure

(Cont'd)

Positive Environmental Aspects		
Activity	Environmental Aspect	Environmental Impact
Public and internal education	Water conservation	More efficient use of water resources Production of useful by-products (methane, soil additive)
Reducing energy consumption at water treatment facilities	Greenhouse gas reduction	Improved air quality and addressing climate change

Appendix C: Environmental Aspects Rating Criteria

The following tables[2] outline a general approach to ranking environmental aspects. The methodology selected for ranking municipal aspects should be customized to reflect the specific risk tolerances of the municipality.

These values could be estimated using municipal or association data.

Table C–1: Frequency (or Probability)

Rating	Anticipated Frequency
5	Regular — weekly or continuous
4	Frequent — several times per year
3	Occasional — once per year
2	Unusual — once per five years
1	Rare — once per twenty years
0	Remote — less than once per twenty years

The value for the consequences could be selected as the highest value from these categories or some form of aggregate of the three values.

Table C–3: Aspects Significance Assessment Matrix

Consequences	Frequency					
	5	4	3	2	1	0
5	A	A	B	B	B	B
4	A	A	B	B	B	D
3	A	B	B	B	B	D
2	C	C	C	C	D	D
1	C	C	C	D	D	D
0	D	D	D	D	D	D

A = Critically significant — discontinue or substantially change the activity, or implement critical operational controls.
B = Significant — implement operational controls and emergency response procedures.
C = Moderate — implement operational controls and other actions as budgets allow.
D = Not significant — no action required, monitor changes over time.

Table C–2: Consequences

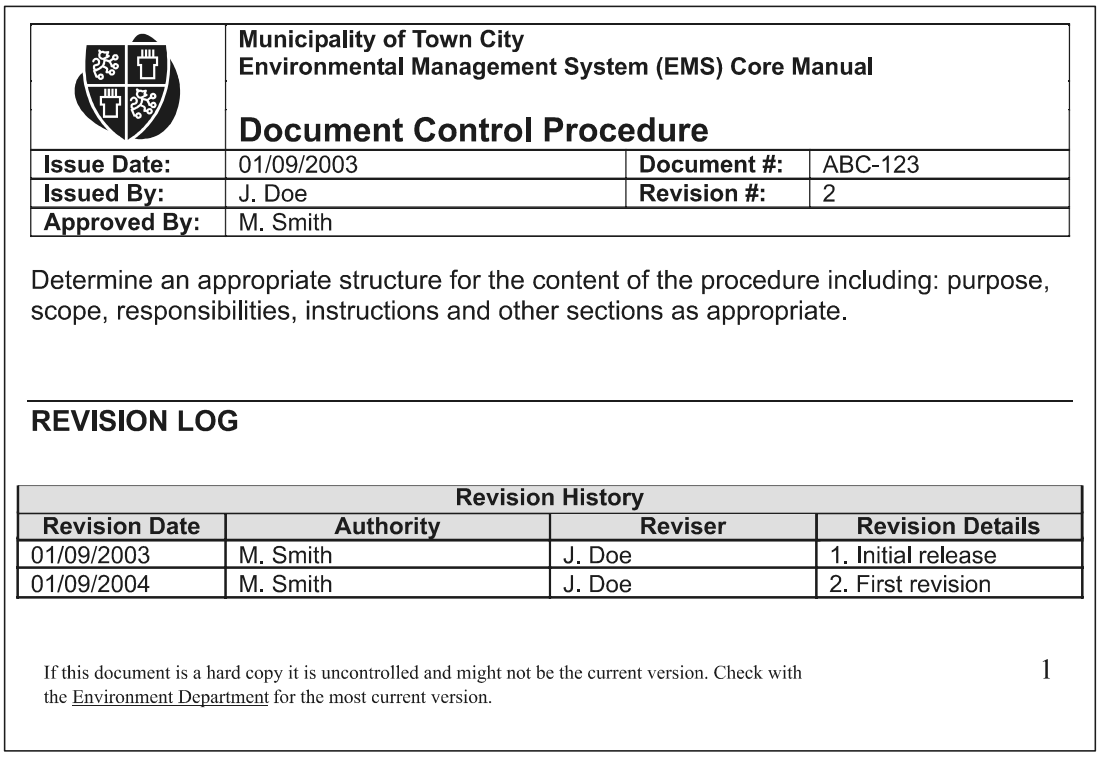
Rating	Environmental Consequences	Costs and Penalties	Public & Stakeholder Relations
5	Catastrophic, extensive and/or irreversible	Material effect on municipal finances or maximum regulatory penalty	National headlines, disastrous community relations
4	Serious, extensive and/or long-lasting	Material effect on department finances or above-average regulatory penalty	Local headlines, serious community relations impacts
3	Serious, limited and reversible	Extraordinary budgetary consideration or average regulatory penalty	Some media attention and/or public disturbance in the local area
2	Significant, localized and reversible	Existing budgets or minor regulatory penalty	Public disturbance in the affected area
1	Insignificant, localized and potentially cumulative	Insignificant cost or penalty	Minor or no inconvenience to the public in the affected area
0	Insignificant, localized and non-cumulative	No cost or penalty	No public interest or notice

2. This appendix is not intended to substitute or replace an overall risk management framework or approach. It is intended to show how a municipality can view specific risks as they relate to environmental aspects in an EMS. For a full description of an appropriate risk management framework, please refer to InfraGuide's best practice on Decision Making and Investment Planning titled *Managing Risk* (InfraGuide, 2005).

Appendix D: Document Control

Document Control Features

The following image illustrates some commonly used document control features required by an EMS.



	Municipality of Town City Environmental Management System (EMS) Core Manual **Document Control Procedure**		
Issue Date:	01/09/2003	**Document #:**	ABC-123
Issued By:	J. Doe	**Revision #:**	2
Approved By:	M. Smith		

Determine an appropriate structure for the content of the procedure including: purpose, scope, responsibilities, instructions and other sections as appropriate.

REVISION LOG

Revision History			
Revision Date	**Authority**	**Reviser**	**Revision Details**
01/09/2003	M. Smith	J. Doe	1. Initial release
01/09/2004	M. Smith	J. Doe	2. First revision

If this document is a hard copy it is uncontrolled and might not be the current version. Check with the Environment Department for the most current version. 1

Appendix E: Sample ISO 14001 EMS Audit Protocol

The following sample EMS audit protocol is based on the requirements for Section 4.1, General requirements, and Section 4.2, Environmental policy, from ISO 14001 General Environmental Policy.*<U.K.http://www.iso14000-iso14001-environmental-management.com>*

Auditor Instructions:

Complete the remainder of the protocol before forming an opinion on 4.1.1 and 4.1.2.

Obtain a copy of the environmental policy. Review its contents and determine whether it contains the commitments required by the standard.

Develop an understanding of the organization's activities, products and services through tours, interviews and review of documents, records and descriptive literature. Evaluate the policy for its appropriateness to related environmental aspects.

Determine how the policy has been communicated throughout the organization. Evaluate these methods for comprehensiveness. Interview employees to determine the effectiveness of these methods in developing employee understanding of the policy's commitments and its implications.

Verify that the policy has been periodically reviewed, revised and/or updated. Determine what methods or procedures are used to make the policy available to the public.

#	AUDIT ITEM	WP CROSS REFERENCE	N/A	SAT	N/I	U/S
4.1	General Requirements					
4.1.1	The EMS has been established in accordance with the requirements of ISO 14001.					
4.1.2	The EMS has been established in accordance with the requirements of ISO 14001.					
4.2	Environmental Policy					
4.2.1	Top management has defined the organization's environmental policy.					
4.2.2	The policy is appropriate to the nature, scale and environmental impacts of activities, products and services.					
4.2.3	The policy includes a commitment to continual improvement.					
4.2.4	The policy includes a commitment to prevention of pollution.					
4.2.5	The policy includes a commitment to comply with relevant environmental legislation and regulations, and other requirements to which the organization subscribes.					
4.2.6	The policy provides a framework for setting and reviewing environmental objectives and targets.					
4.2.7	The policy is documented.					
4.2.8	The policy has been implemented.					
4.2.9	The policy is maintained.					
4.2.10	The policy has been communicated to all employees.					
4.2.11	The policy is available to the public.					

WP = Working Paper N/A = Not applicable SAT = Satisfactory N/I = Needs Improvement U/S = Unsatisfactory

Appendix F: Matrix of Related InfraGuide Best Practices

This table highlights other InfraGuide Best Practices related to Environmental Management Systems.

InfraGuide Best Practice	Integration Component
Environmental Protocols 1: *Strategic Commitment to the Environment by Municipal Corporations*	This Best Practice recognizes that each community is unique, and provides examples of municipalities of various sizes that have developed and implemented environmental practices. It recommends a strategic commitment to the environment as a first step, or to augment initiatives already underway within the corporation and the community.
Environmental Protocols 2: *Accounting for Environmental and Social Outcomes in Decision Making*	This Best Practice details the ways in which decisions regarding infrastructure can consider and integrate social and environmental outcomes. In so doing, this Best Practice address ways to ensure integrated approaches to decision making whereby economic, environmental and social costs and benefits are identified, quantified and monetized.
Environmental Protocols 3: *Environmental Assessment*	This Best Practice is about the systematic integration of considerations, as it details the processes that can be used to identify, analyze and evaluate the potential natural, social, cultural, physical, economic and environmental effects of proposed activities and projects on the environment.
Environmental Protocols 4: *Demand Management*	The purpose of this Best Practice is to create an understanding of demand management as an essential strategy for municipal infrastructure management. This document provides senior municipal officials with guidance on the concepts behind demand management, current best practices, and information needs and tools for initiating and implementing demand management programs.
Municipal Roads 10: *Dust Control for Unpaved Roads*	This Best Practice provides a readily available source of information for minimizing or controlling dust from unpaved roads in rural and urban areas by using a dust suppressant. It is also intended to assist the reader to determine when additions or modifications to dust control programs may be effective and cost efficient.
Municipal Roads 11: *Reuse and Recycling of Road Construction Materials*	This Best Practice describes the current practices being used by municipal agencies to reuse and recycle old asphalt pavements and old concrete (pavements, sidewalks, curb and gutter) recovered during road construction and maintenance work carried out within the public right-of-way. The Best Practice also discusses the current practices for recycling of winter sand (also called street sand) spread to enhance road surface friction during winter maintenance activities and collected by road sweepers during spring maintenance, with emphasis on a significant pilot study currently underway in the City of Edmonton.
Potable Water 2: *Water Use and Loss in the Water Distribution Systems*	This Best Practice provides basics of water auditing: a tool for reducing costs and improving accountability.
Storm and Wastewater 3: *Source and On-Site Controls for Municipal Drainage Systems*	Urban development produces significant environmental and hydrologic changes as undisturbed pervious surfaces become impervious. This Best Practice is aimed to help municipalities minimizes negative impacts through an integrated approach that treats stormwater as a resource to be protected. In addition, the best practice has as complementary objectives, the protection of property, aquatic resources and water quality.
Storm and Wastewater 11: *Storm Water Management Planning*	This Best Practice provides some guiding principles that should be used in implementing storm water management planning.
Storm and Wastewater 12: *Quality Management for Biosolids Programs*	This Best Practice can help Canadian municipalities improve biosolids management programs and gain public acceptance. It describes ways to develop, implement and integrate quality management principles into municipal biosolids management programs.
Decision Making and Investment Planning 9: *Managing Risk*	This Best Practice provides an overview of the risk management process and its value in the development of efficient management programs and corporate polices for sustainable municipal infrastructure assets. It recommends the principles of a best practice to incorporate risk management into an asset management strategy.

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International Standards Organization (ISO), November 15, 2004. ISO 14000: 2004 *Environmental Management Guide*. UK *<http://www.iso14000-iso14001-environmental-management.com>*
(Accessed on June 15, 2005).

———,*ISO 14001, Environmental Management Systems—Specification with Guidance for Use and ISO 14004, Environmental Management Systems—General Guidelines on Principles, Systems and Supporting Techniques*.

University of North Carolina and the Environmental Law Institute, March 12, 2001. *Driver's Designs and Consequences of Environmental Management Systems*. *<http://ndems.cas.unc.edu/document/NDEMS2001Compendium.pdf>*
(Accessed on June 15, 2005).

EMS Web Information Resources

The following documents provide additional information of EMS and may be of interest to readers:

City of Calgary. Environmental Management. *<http://www.calgary.ca/cweb/d_directory/d_dirbrowse.asp?UserID=2&ID=219>*

City of Edmonton. *<http://www.gov.edmonton.ab.ca>*
(Accessed on June 15, 2005).

City of Halifax. Water Resources Management Study. *<http://www.region.halifax.ns.ca/environment/waterres_scope.html>*
(Accessed on June 15, 2005).

City of Hamilton. Vision 2020 Hamilton's Commitment to a Sustainable Community. *<http://www.vision2020.hamilton.ca/resource/city-publications.asp>*
(Accessed on June 15, 2005).

City of Ottawa. Natural Areas Protection. *<http://www.ottawa.ca/city_services/environment/management/1_3_en.shtml>*
(Accessed on June 15, 2005).

City of Waterloo. Environmental Lands. *<http://www.city.waterloo.on.ca/DesktopDefault.aspx?tabID=907>*
(Accessed on June 15, 2005).

City of York. Environmental Assessment & Policy Development. *<http://www.city.toronto.on.ca/eia/land.htm>*
(Accessed on June 15, 2005).

Environment Canada. EMS Topics *<http://www.ec.gc.ca/emsinfo/links_e.htm>*
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Environment Canada. Environmental Emergencies Program *<http://www.ec.gc.ca/ee-ue/home/home_e.asp>*
(Accessed on June 15, 2005).

Environmental Law Institute (ELI). National Database on Environmental Management Systems *<http://www2.eli.org/research/iso>*
(Accessed on June 15, 2005).

Federation of Canadian Municipalities (FCM), October 2003. Green Municipalities: A Guide to Green Infrastructure for Canadian Municipalities. *<http://kn.fcm.ca/ev.php?URL_ID=2789&URL_DO=DO_TOPIC&URL_SECTION=201&reload=1118865535>*
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Global Development Research Center (GDRC): Urban Environmental Management: EMS in the Public Sector, Case Studies and Examples. *<http://www.gdrc.org/uem/iso14001/case-studies/cases.html>* (Accessed on June 15, 2005).

InfraGuide, January, 2004. *Adopting Sustainable Approaches to Infrastructure Services: Principles and Guidelines for Municipalities*, Brochure. *<http://www.infraguide.ca>*

International Centre for Sustainable Cites (ICSC) *<http://www.icsc.ca/project_list.html>* (Accessed on June 15, 2005).

Local Governments for Sustainability (ICLEI), Environmental Management System — A Tool for Sustainable Development. *<http://www.iclei.org>* (Accessed on June 15, 2005).

Town of Banff (Banff National Park of Canada). A Place for Environmental Stewardship. *<http://www.pc.gc.ca/pn-np/ab/banff/docs/plan1/chap9/plan1h_e.asp>* (Accessed on June 15, 2005).

United States Environmental Protection Agency (EPA). Environmental Management Systems *<http://www.epa.gov/ems>* (Accessed on June 15, 2005).

United States Environmental Protection Agency (EPA). Recommended EPA Environmental Management Web Pages. *<http://www.epa.gov/ebtpages/environmentalmanagement.html>* (Accessed on June 15, 2005).

University of Missouri — Rolla (UMR). Environmental Management System. *<http://campus.umr.edu/ems>* (Accessed on June 15, 2005).