

# Drainage Services Stormwater Quality Strategy



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Design and Construction  
Drainage Planning (Private Development, Monitoring and Assessment,  
Private Development, and Public Services)

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Planning and Development  
Asset Management and Public Works  
    Parkland Services  
    Land and Buildings  
Transportation  
Office of the Environment  
Office of Natural Areas

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Elaine Trudeau  
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## Preface

The intent of the Stormwater Quality Strategy is to bring together thoughts and philosophies on approaches to improving the City's stormwater quality. It includes the current and proposed guidelines/policies as listed in the Position Paper. The strategy is not an Implementation Plan but does include an Action Plan section to indicate possible approaches to improving stormwater quality. The Strategy is intended to serve as a stand-alone document for City-wide distribution.

The Stormwater Quality Strategy evolved from a project charter, to a lengthy discussion paper, and then to a series of Drainage Services internal workshops. Following the workshops a Position Paper was developed that documents current policies/guidelines in use by Drainage staff and proposed guidelines for improving stormwater quality. The Strategy evolved from the Position Paper.

It is intended that following Drainage Services' approval the Strategy Paper be distributed to other City departments. Other City department staff will be met with individually prior to a formal workshop for City stakeholders. After receiving input from City departments, external stakeholders will be contacted and their feedback solicited.

On-going feedback from Drainage Services is critical to shape this program and especially for considering funding options for stormwater quality initiatives.

In parallel with the development of this Strategy is a related study: the Major Storm Outfall Mitigation/BMP Study. Information and consultant findings that emerge from this study will help shape a proposed Implementation Plan.

An Appendix is attached that provides additional information.



## Executive Summary

This document outlines Drainage Services' position on stormwater quality management for the benefit of key stakeholders so they can adapt their practices to conform to the City's position.

The quality of stormwater runoff and related pollutant load impacts are important issues. Alberta Environment's Approval to Operate the drainage system requires monitoring of water quality in storm sewer and snow storage site detention pond discharges, stating that:

*'When stormwater is discharged to a water body, consideration will be given to the development of strategies or options for improving the quality of stormwater and decreasing the impact it may have on receiving water quality.'*<sup>1</sup>

It also requires all municipalities:

*"to develop a stormwater management plan with emphasis on stormwater discharge controls and possible quality management options...."*<sup>2</sup>

The mission of The City of Edmonton Asset Management and Public Works Drainage Services Strategic Planning is to

*"Mitigate the water quality impacts to the North Saskatchewan River by reducing contaminants in stormwater"*<sup>3</sup>

and

*"To develop a Stormwater Quality Strategy and Action Plan that will enable the City of Edmonton to manage stormwater releases so that the impact is managed and the quality of water in the North Saskatchewan River is protected."*<sup>4</sup>

This strategy paper provides an overview of the vision, mission and directives of Drainage Services as well as key issues. Notably, Alberta Environment believes that the major contributor to a reach of a river is the entity responsible for the quality of the water entering the river within that reach.<sup>5</sup> A regional approach for managing stormwater issues is also advocated by AENV.

The primary concern with greenfield development is site erosion during and following storms and snow melt, as well as vehicles carrying soil when leaving a site. Redevelopment issues are similar to greenfield development, especially in determining their importance relative to lot size. Other issues include stormwater contamination from industrial truck routes, Dangerous Goods Routes and snow storage sites, and education of public on the impact of their everyday activities on stormwater contamination.

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<sup>1</sup>K. Chinniah, "Municipal Policies and Procedures Manual." Environmental Service. Environmental Science Division, Municipal Program Development Branch, Alberta Environment., p1-1, April 2001.

<sup>2</sup> ibid, p 6-2.

<sup>3</sup> Sawatzky, K. The Underground Connection. Drainage Services. Special Edition, January 2004.

<sup>4</sup> Stormwater Quality Strategy and Action Plan Project Charter. Drainage Services. September 30, 2003

<sup>5</sup> Personal communication with Asoke Weerasinghe. AENV. 2003.

The Strategies to achieve improvement in stormwater quality and decrease the impact on the North Saskatchewan River (NSR) are grouped under three improvement concepts:

- A) Optimization of municipal operations;
- B) Land development servicing requirements; and
- C) Street and lot-level initiatives.

The Storm Water Quality Strategy proposed initiatives and accompanying guidelines relating to each concept. It also incorporates an action plan that promotes installation of structural BMPs and implementation of operational BMPs. The Action Plan proposes tasks that can be carried out by the City, or encouraged by the City, in order to achieve Strategy initiatives. The Action Plan also includes an implementation plan for each of the initiatives, further developing the Strategy and leading to a subsequent call for action. Additionally, this document's action plan includes: a rudimentary Financial Plan, Capital Construction Plan, Education and Awareness Outreach Plan and an outline of Timelines.

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# 1.0

## Principles and Policies

### 1.1 Vision

The vision of Drainage Services is:

“To be recognized as a leader in environmental management and in the utilization of best practices for drainage service delivery.”<sup>6</sup>

The Strategic Planning vision for stormwater quality is:

“Mitigate the water quality impacts to the North Saskatchewan River by reducing contaminants in stormwater.”<sup>7</sup>

### 1.2 Mission

Strategic Planning’s mission for this initiative is:

“To develop a Stormwater Quality Strategy and Action Plan that will enable the City of Edmonton to manage stormwater releases so that the impact is managed and the quality of water in the North Saskatchewan River is protected.”<sup>8</sup>

### 1.3 Directives Related to Stormwater Quality

Program development, operational activities and capital expenditures are the key stormwater management activities of Drainage Services.

#### 1.3.1 Approval to Operate<sup>9</sup>

The provincial government grants the City of Edmonton approval for the construction, operation, and maintenance of the wastewater system and storm drainage system. The terms, conditions and requirements attached to the approval state:

“The approval holder shall develop a comprehensive Storm Water Quality Control Strategy and a plan for implementing this strategy.” Section 6.2.2

“The approval holder shall submit the Storm Water Quality Control Strategy report to the Director by June 1, 2008.”<sup>10</sup> Section 6.2.3

<sup>6</sup> The City of Edmonton Drainage Master Plan, 2004 – 2014, Implementation and Strategies. Prepared By: City of Edmonton, Asset Management and Public Works, Drainage Services. January 2004.

<sup>7</sup> Sawatzky, K. The Underground Connection. Drainage Services. Special Edition, January 2004.

<sup>8</sup> Stormwater Quality Strategy and Action Plan Project Charter. Drainage Services. September 30, 2003.

<sup>9</sup> Approval No. 639-02-00, Alberta Environmental protection, Province of Alberta, May 31, 2005.

<sup>10</sup> Ibid, Part 6, Section 6.2 (page 13)

By June 2008, implementation of a storm water quality strategy needs to be underway. The approval also requires the monitoring of water quality in the storm drainage system and snow storage sites.

### 1.3.2 Drainage Master Plan 2004 – 2014 Implementation and Strategies

The 2003 Drainage Master Plan identifies key issues and describes strategies to address these issues, including: total loadings to the North Saskatchewan River, new water quality parameters, industrial land development, communication and education.

In July 2002, Council approved the Land Drainage Utility, which came into effect January 1, 2003 and allowed Drainage Services to develop long-term implementation plans for stormwater management projects. This provides a funding mechanism to further improve water quality in the North Saskatchewan River....<sup>11</sup>

This Master Plan was approved by City Council January 20, 2004.

### 1.3.3 Performance Targets

- Stormwater discharged from newly developed residential lands and lands being redeveloped shall:
  - Comply with the Sewers Use Bylaw,
  - Comply with relevant City-approved Best Management Practice (BMP) codes of practice, and
  - Meet Alberta Environment's policy of 85% removal (by mass) of suspended solids  $\geq 75 \mu\text{m}$  particle size<sup>12</sup>.
- Base flow, and limited wet weather flow of stormwater, from the four major storm outfalls in Edmonton's existing stormwater system to receive treatment that will provide a 50% reduction in mass loading in the treated flow.
- Manage the risk of spills and illegal discharges.
- Examine water quality parameters related to emerging environmental and public health issues.
- Support stakeholder initiatives for the improvement of stormwater quality.
- Harmonize federal and provincial regulatory expectations.

**Measures of performance include conforming to the BMP checklist for site installations in the design phase and adherence to BMP codes of practice for operations.**

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<sup>11</sup> The City of Edmonton Drainage Master Plan, 2004 – 2014, Implementation and Strategies. Prepared By: City of Edmonton, Asset Management and Public Works, Drainage Services. January 2004. Executive Summary.

<sup>12</sup> K. Chinniah, "Municipal Policies and Procedures Manual." Environmental Service. Environmental Science Division, Municipal Program Development Branch, Alberta Environment. p6-2, April 2001.

### 1.3.4 Alberta Environment's Municipal Policies and Procedures Manual

Policy 1-7 states:

- "When stormwater is discharged to a water body, consideration will be given to the development of strategies or options for improving the quality of stormwater and decreasing the impact on receiving water quality. In some instances, alternatives to direct discharge of stormwater into a receiving body of water will be required."<sup>13</sup>
- "Stormwater management techniques to improve water quality shall be included to effect a minimum of 85% removal of sediments of particle size 75 µm or greater. Additional quality management measures shall be required, based on site-specific conditions.  
"All municipalities will be required to develop a stormwater management plan with emphasis on stormwater discharge controls and possible quality management options (i.e. both immediate and ultimate plans to protect the receiving waters). Where appropriate, this process should be integrated into the Drainage System Approval for the municipality, i.e. if the Approval is issued that incorporates the 'total loading concept.'"<sup>14</sup>

### 1.3.5 Federal Legislation

Federal legislation that impacts stormwater is primarily located in the regulations for the Fisheries Act. This Act deals with the protection of fish habitat in Subsection 35(1) and (2).

- Subsection 35(1) states:  
"No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat."
- Subsection 35(2) states:  
"No person contravenes Subsection 35(1) by causing the alteration, disruption or destruction of fish habitat by means or under conditions authorized by the Minister or under regulations made by the Governor in Council under this Act."

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<sup>13</sup> ibid, p1-1

<sup>14</sup> ibid, p 6-2.

### 1.3.6 City Bylaws and Policies

The main objective of the Strategy is to promote more sustainable land development while maintaining storm drainage system level of service for flooding control. The following bylaws help preserve natural spaces and better control total suspended solids (TSS):

#### 1.3.6.1 City Bylaws

- The *Sewers and Sewers Use* bylaws cite City regulations regarding connections to the storm sewer system and what is prohibited from being released into the system.
- The goal of the North Saskatchewan River Valley Area Redevelopment Plan (*Bylaw 7188*) is: "... preservation of the natural character and environment of the North Saskatchewan River Valley and Ravine System." The North Saskatchewan River Valley Area Redevelopment Plan "... identifies a boundary for the river valley and ravine system and a set of policies and development approval procedures for lands within this boundary."<sup>15</sup> It requires an environmental screening report for new stormwater outfalls and an environmental impact assessment for any major utility installation.

#### 1.3.6.2 City Policies

- The City of Edmonton policy number *C-467 Conservation of Natural Sites in Edmonton's Table Lands* states:  
 "The City of Edmonton will encourage the conservation and integration of as many environmentally sensitive and significant natural areas into Edmonton's future urban environment as are sustainable and feasible. The identification of environmentally sensitive areas and significant natural areas has no legal implications for the respective owners and, with the exception of the information requirements, participation in this policy is voluntary."<sup>16</sup>

The purpose of the policy is to:

"Enhance the liveability, attractiveness and bio-diversity of Edmonton and ensure consistent, uniform and equitable conservation of natural sites by:

- directing the Corporation to conserve environmentally sensitive areas and significant natural areas in discharging their duties;
- encouraging the retention and integration of natural areas through the physical planning and development process...;
- seeking to conserve in a proactive fashion, with the landowners, the four regionally significant environmentally sensitive areas identified on Edmonton's table lands and encouraging conservation of the nationally, provincially and regionally significant environmentally sensitive areas identified in Edmonton's river valley."<sup>17</sup>

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<sup>15</sup> A Guide to Environmental Review Requirements in the North Saskatchewan River Valley and Ravine System, The City of Edmonton, Planning and Development Department, Edmonton, Alberta, December 2000.

<sup>16</sup> The City of Edmonton, Bylaw No. 7188, p5

<sup>17</sup> *ibid*, p 13 & 14

### 1.3.7 Servicing Standards and Operating Framework

Standards for the management of stormwater are found in “The City of Edmonton Design and Construction Standards”. These standards set planning requirements, storm drainage policies, goals, and objectives, as well as both storm and sanitary design requirements. The standards mainly address stormwater quantity control. However there is an opportunity to incorporate quality control measures and BMPs as they are developed and endorsed by Drainage Services.

Section 12.8 of the Servicing Standards states:

“The City encourages storm drainage facilities to be designed to meet environmental objectives. The City’s objectives are:

- The protection and enhancement of aquatic environments through the use of appropriate BMPs, such as constructed wetlands.
- The prevention and abatement of the degradation of natural channels, ravines, river banks and valley slopes and environmental reserves in any way which might inhibit or detract from their recreational and aesthetic uses.
- For new and redeveloped areas, all stormwater runoff is to be treated prior to discharge to receiving watercourses.
- For new industrial roadways, stormwater quality treatment is required prior to discharge into any existing storm drainage system.
- Dry ponds are not considered a treatment facility for water quality improvement.

### 1.3.8 Drainage Services Policies

Drainage Services has only informal policies to deal with the quality and quantity of stormwater. This lack of formal policies highlights the need for the development of a stormwater quality strategy.







# 2.0

## Development of the Stormwater Quality Strategy

### 2.1 Strategy Development

#### 2.1.1 Identification of Issues/Concerns

In April 2001 a Master Plan Working Committee was formed. This committee identified six issues that were placed under the Stormwater Quality Strategy:

- Total Loadings,
- Stormwater quality enhancement,
- New water quality parameters,
- Land development requirements,
- Wetland retention, and
- Environmental protection.

#### 2.1.2 Project Charter

During May 2003, a draft project charter (Charter) for the stormwater quality strategy was prepared. The charter was finalized and signed by the Director of Drainage Planning on November 6, 2003.

The Strategy's goal as written in the Charter is to "... develop a Stormwater Quality Strategy and Action Plan that will enable the City of Edmonton to manage stormwater releases so that the impact is managed and the quality of water in the North Saskatchewan River is protected...." The project charter identified three stakeholder groups: Drainage Branch, other departments within the City, and external entities that would have an interest in stormwater management.

The charter originally indicated that there would be a minimum of six workshops to gain input from the stakeholders before the Strategy and accompanying Action Plan are to be finalized. Prior to each of the workshops a draft of the Discussion Paper/Strategy/Action Plan was to be circulated to the workshop stakeholders for review and comment. The comments were to be collated and provided to the workshop attendees.

Following the last workshop and the finalizing of the Strategy and Action Plan Policies, revised Standards, amendments to bylaws, and information manuals are to be made available.

#### 2.1.3 Discussion Paper

In the spring of 2003, the Stormwater Quality Strategy Steering and Working Committees under the Stormwater Quality Strategy were set up and a discussion paper was developed. The Discussion Paper was reviewed at the

initial meeting of the Steering Committee, refined and further discussed at a subsequent Steering Committee workshop held September 16, 2003.

The Strategy goal was determined to be: “Manage the impact of stormwater discharges on the North Saskatchewan River to protect the water quality in the river.” The Steering Committee suggested additional topics be explored by the Working Committee at future workshops.

### 2.1.4 Position Paper

Proposed “guidelines” were developed into a position paper at the January 8, 2004, Drainage Services Stakeholders Workshop #1.

Four primary areas of interest categorized the guidelines: government, industry, public and land development. Several policies and concepts, such as criteria, were incorporated into other guidelines, while others were referred to the Land Drainage Servicing Strategy Committee.

The position paper contained a glossary, a statement of purpose for the document, a table on “Stormwater Management Facilities: Release Rates” (Appendix 6), a table on “Requirements for Stormwater Treatment by Land-Use Type (Appendix 5)” and the guidelines. Each guideline included a rationale and a proposed implementation plan.

The position paper was reviewed at the May 27, 2004, Drainage Services Stakeholders Workshop #2.

### 2.1.5 Stakeholder Workshops

#### 2.1.5.1 *Steering Committee Workshop*

A workshop for the Steering Committee was held in September 16, 2003 and was attended by the following Drainage Planning section staff:

- Drainage Planning Director
- Strategic Planning General Supervisor
- Monitoring and Assessment General Supervisor
- Private Development General Supervisor
- Strategic Planning Senior Environmental Engineer
- Strategic Planning Environmental Engineer
- Strategic Planning Planning Engineer
- Strategic Planning Consultant

The Steering Committee Workshop:

- Identified a need for a definition for stormwater treatment that referenced the quality improvement needed.
- Recommended five objectives.
- Reviewed and suggested revisions to the Discussion Paper.
- Identified two studies required to develop the Strategy and Action Plan:
  - Evaluation of BMPs (structural and non-structural) as to how to apply to specific sub-basins; and
  - Major Storm Outfall Mitigation Study including detail design on the Quesnell outfall.
- Identified stakeholders.

### *2.1.5.2 Drainage Services Stakeholders Workshop*

All four sections of Drainage Services were represented at the initial Drainage Services Stakeholders' Workshop held January 08, 2004. Presentations were made by the Senior Environmental Engineer, the Senior Engineer responsible for development of the Stormwater Servicing Strategy, and a consultant who outlined the study being carried out on erosion and sedimentation for Private Development, Drainage Services.

The Discussion Paper contained items that Drainage Services considered "policies", and other "concepts", and were to be developed into policies. Following discussion of the "Policies" and "Concepts", it was decided to revise the terminology and use the term "guidelines."

A second Workshop was held May 27, 2004.

These workshops were attended by staff from the following sections of Drainage Services:

- Strategic Planning, Drainage Planning
- Private Development, Drainage Planning
- Monitoring and Assessment, Drainage Planning
- Public Services, Drainage Planning
- Environmental, Drainage Operations
- Structures, Design and Construction
- Regulatory, Waste Treatment

### *2.1.5.3 City Stakeholders Workshop*

Various consultations and meetings were conducted with City Stakeholders on March 17, April 19 and October 11, 2005. During these meetings, the draft Stormwater Quality Strategy and position papers were presented. Before each meeting, these papers were circulated to other City Departments' staff for review, and comments. The Working Committee reviewed, evaluated, and addressed comments and incorporated them into the Strategy and Position papers. Some comments need yet further study.

The City Departments who attended the meetings and provided feedback include:

- Planning and Development (Environmental Planning, Corporate Planning and Policy)
- Parkland Services, Asset Management and Public Works
- Transportation and Streets (Streets Engineering, Transportation Planning)
- Office of Environment
- Land & Buildings, Asset Management and Public Works

A formal City Stakeholders' workshop will be held in early 2006.

### *2.1.5.4 External Stakeholders Workshop*

External entities that would provide significant input to the Stormwater Quality Strategy are:

- Alberta Environment,
- EPCOR Water Services,
- North Saskatchewan Watershed Alliance,

- Greater Edmonton Home Builders Association,
- River Valley Alliance,
- Urban Development Institute, and
- Others, as needed.

## 2.2 Integration with other Developing Activities

- A Land Drainage Servicing Strategy being developed by Strategic Planning, and
- Erosion and Sedimentation Control Guidelines have been developed.



# 3.0

## Stormwater Quality Issues

Various issues need to be addressed to implement an effective stormwater management improvement plan. These issues can be categorized as follows:

- Regional issues,
- Reduction of pollution discharge to the North Saskatchewan River (NSR), and
- Development issues.

### 3.1 Regional Approach

Alberta Environment follows the principle that the major pollutant load contributor to a reach of a river is to be the entity responsible for the quality of the water in that river reach.<sup>18</sup>

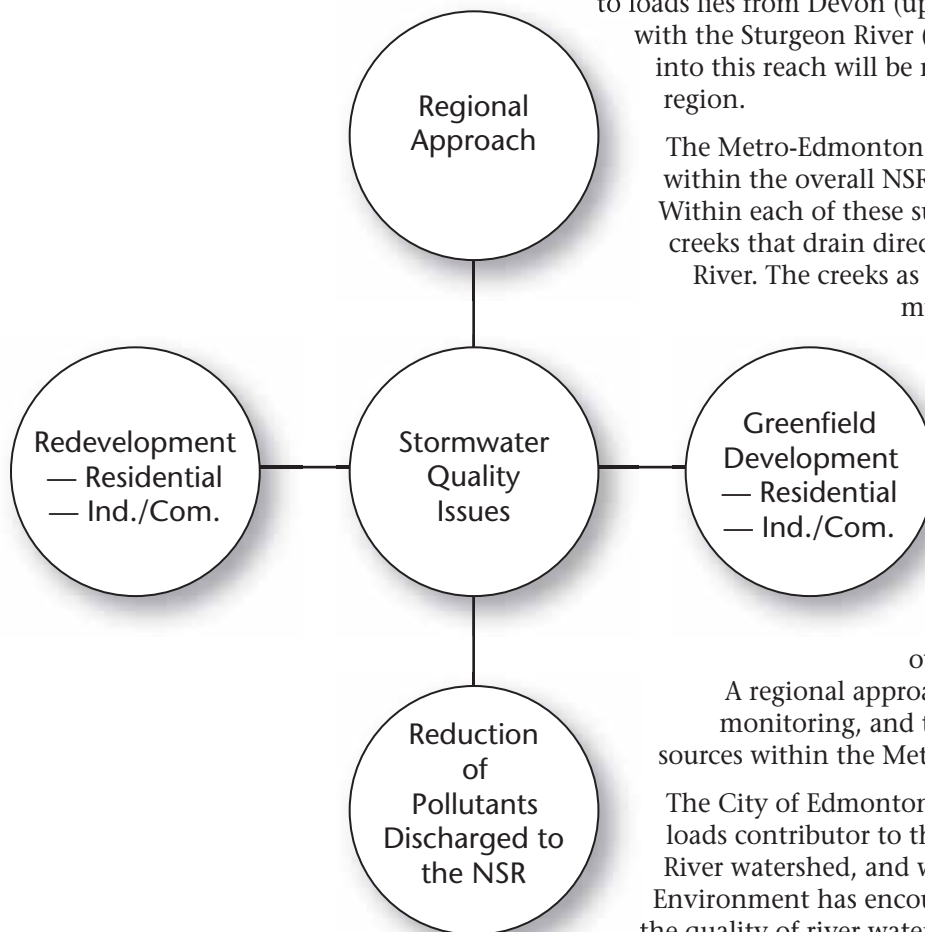
The reach of the North Saskatchewan River (NSR) of most interest with respect to loads lies from Devon (upstream) to the NSR's confluence with the Sturgeon River (downstream). The lands that drain into this reach will be referred to as the Metro-Edmonton region.

The Metro-Edmonton region overlaps two sub-watersheds within the overall NSR basin — Strawberry and Beaverhill. Within each of these sub-watersheds there are several creeks that drain directly into the North Saskatchewan River. The creeks as well as major industries and municipalities in the Metro-

Edmonton area are listed in Appendix 1 — “Stormwater Contributors to the NSR in the Metro-Edmonton Region.” Some of these releases are termed point-sources, and as such are already regulated by Alberta Environment. Other releases to the NSR include non-point sources, such as overland flow, that are not regulated.

A regional approach would lend itself to identifying, monitoring, and to some extent controlling these sources within the Metro-Edmonton area.

The City of Edmonton is generally taken to be the major loads contributor to the overall North Saskatchewan River watershed, and within the metro region. Alberta Environment has encouraged the City to lead a study on the quality of river water in the region as a timely follow



<sup>18</sup> Personal communication from Asoke Weerasinghe. AENV. 2003.

up to the Joint Industrial-Municipal River Study carried out from 1992 to 1994. With BNR and UV implementation at both the Gold Bar and Capital Region WWTPs, it is expected that river water quality steadily has improved since 1994. Issues remain however, and a new joint river study would help to quantify major sources of contaminants entering the river.

Alberta Environment has moved towards a Total Maximum Loading Limits (TMLL). The approach taken by Alberta Environment is not to set mass pollutant load limits for key water quality parameters but rather have municipalities develop and implement management plans for long-term loads reductions. Some of the parameters generally applicable in any such plan include: total suspended solids (TSS), faecal coliforms, ammonia (NH<sub>3</sub>), total phosphorus (TP), nitrite plus nitrate (NO<sub>2</sub><sup>-</sup>/NO<sub>3</sub><sup>-</sup>), and total kjeldahl nitrogen (TKN). Other parameters that can be considered include: total dissolved phosphorous (TDP), chloride (Cl<sup>-</sup>), metals, dissolved oxygen (DO), and *E. coli*. In future years, it is expected that pesticides and pharmaceutical compounds would warrant further discussion.

Issues in applying a regional approach to a stormwater management include:

- Obtaining the cooperation and “buy-in” of the region’s major stakeholders.
- Co-operation with River Valley Alliance and North Saskatchewan Watershed Alliance.
- City participation in the Integrated Watershed Management Planning study (IWMP).
- Encouraging surrounding communities to adopt similar policies and practices, including the requirement for equivalent BMPs.
- Stormwater pollutant loads from outside the City being attributed to the City.
- Similar BMP designs and implementation plans across the metro-Edmonton region would avoid the possibility of one community appearing more favourable to the land development industry than compared to its neighbours.
- Jurisdictions within the Metro-Edmonton area including the City of Edmonton need to effectively cooperate in order to establish a consistent framework for implementing these stormwater management initiatives.

### 3.2 Reduction of Pollutant Loads into and Impact on Stormwater System and the North Saskatchewan River

Stormwater is a major contributor of some contaminants in the North Saskatchewan River. Reducing the concentration of these contaminants is a major challenge. While the City has little direct influence in reducing contaminants entering from non-point sources outside the city, it can have a significant impact on contaminants from within its boundaries and possibly on watercourses that enter and flow through the city.

The City

- can influence new development going forward within the City;
- can influence public behavior in the City and in the surrounding area to some extent; but

- will have difficulty, both technically and financially, where retrofitting stormwater quality control in existing development is mandated.

Other issues include:

- Identifying sources and types of pollutants in stormwater runoff from new development, redevelopment, existing domestic, commercial, and industrial areas, as well as from Truck Routes and Dangerous Goods Routes;
- Determining the impact of stormwater on the North Saskatchewan River from different reaches;
- Establishing priorities for impact mitigation to cost-effectively reduce loads;
- Establishing requirements for:
  - erosion and sediment control at all development sites;
  - standards to be included in an erosion/sediment control guidelines, the Sewers Use Bylaw and/or BMP codes of practice;
  - inspection procedures and bylaw enforcement.

### 3.3 Greenfield Development

During the construction phase in greenfield development, primary concerns are site erosion during and following storms, as well as snow melt and departing vehicles carrying soil off-site. This eroded/transported soil increases the solids loading on the storm sewer system.

Other issues include:

- Feasibility of including pollution prevention procedures in site development;
- Criteria for site imperviousness following development;
- Provision for preservation of natural buffers adjacent to water bodies and natural wetlands;
- Provisions to restore the site hydrologic regime to mimic the natural and/or predevelopment condition;
- Preservation of environmentally sensitive areas;
- Requirement for constructed wetland elements upstream of natural wetlands;
- Requirement that only constructed wetlands be used for stormwater treatment when the flow is to be discharged to the North Saskatchewan River upstream of the E.L. Smith Water Treatment Plant.

#### 3.3.1 Residential

Issues include:

- Larger areas result in greater quantities of stormwater runoff.
- Land development issues.
- Homebuilder practices may need to be examined to determine if Best Practices are warranted in the industry.

- While after-development stormwater run-off from residential areas should have base-level contamination, the area contributes to increased levels of contaminants in the system due to:
  - domestic car washing;
  - lawn and garden care chemicals being washed into the system;
  - oil and exhaust particles being washed off streets and parking areas;
  - illegal dumping into the stormwater system of oils and hazardous chemicals.

### 3.3.2 Commercial/Industrial

Issues include:

- Commercial and industrial greenfield development have similar areas of basic erosion issues as residential greenfield development.
- Depending on the end use of the area, there may be additional issues relating to spillage of substances used in the site construction and equipment installation.
- The site will produce a high pollution load per surface area.
- There will be industrial roadways that require treatment of runoff.
- There will be a higher risk of spill with some of the substances being non-water miscible.
- Inclusion of pollution prevention procedures for site development;
- Requirement for site designs to include transfer of snow melt from parking lots, streets and snow storage sites to a treatment facility;
- BMPs suitable for fuelling stations;
- BMPs for industrial sites;
- Treatment of stormwater, melt water and spill runoff from industrial and DGR streets.
- BMPs for stormwater, melt water and spill runoff from bridges and bridge approaches.

### 3.3.3 Commercial Site Parking Lots

Recent research<sup>19</sup> indicates that the concentration of pollutants in sediment from stormwater ponds receiving runoff from commercial areas was significantly higher than in any of the ponds receiving runoff from other land use areas. Runoff from commercial parking lots appeared to be the major source of the pollutants.

Issues include:

- Requirement for appropriate treatment of runoff;
- Snow removal, storage and treatment of snow melt;
- Parking lot size for required treatment.

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<sup>19</sup> Watkins C., Evaluating the Credibility of Current State Policy in Governing the Management of Stormwater Pond Sediment, Public Works Management & Policy, Vol. 7 No. 3, January 2003, p 160 171.



### 3.4 Redevelopment

Issues with redevelopment in an area:

- Similar to the issues in greenfield development, including homebuilders' practices.
- At what lot size does stormwater run-off quality become an issue?
- A mechanism via the planning process is required to notify Drainage Services that redevelopment is taking place.
- Solutions to stormwater quality issues are more difficult because of:
  - site size constraints;
  - existing infrastructure;
  - cost impacts are higher per square metre;
  - stronger resistance to providing stormwater quality management.
- Cost of:
  - construction, especially on a small site;
  - operating a small Stormwater Management (SWM) facility.

### 3.5 Existing Development

Issues include reduction of pollutant loading without redevelopment:

- Public education;
- Conveyance system BMPs;
- Source control:
  - retrofitting existing fuelling stations;
  - retrofitting large commercial parking lots;
- Lot-level BMPs;
- End-of-pipe treatment BMPs such as constructed wetlands will require additional land in the river valley for naturalized SWM facilities. This will be an issue due to the North Saskatchewan River Redevelopment Bylaw.
- End-of-pipe stormwater treatment systems for four (4) existing major storm outfalls (on-site, satellite site, or conveyance to sanitary system);
- Quantity to be treated/conveyed;
- Co-operation with Community Services.

### 3.6 Dangerous Goods Routes

Issues include:

- New route designs to include spill containment and treatment of runoff.
- Existing bridge approach and deck runoff presently goes directly to creek or the North Saskatchewan River.
- Does the City correct deficiencies before major bridge maintenance is carried out?

### 3.7 Snow Storage Sites

Issues include:

- Design requirements to include quality control;
- Disposal of sediments;
- Melt from commercial snow storage sites.

### 3.8 Best Management Practices

A Best Management Practice (BMP) is defined as an activity, procedure, practice, device or method for removing, reducing, retarding, or preventing stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters.<sup>20</sup>

- Non-structural BMPs include special zoning requirements, ordinances (bylaws), maintenance activities, and education/outreach programs.<sup>21</sup>
- Structural BMPs are devices designed to temporarily store or treat urban stormwater runoff in order to mitigate flooding, reduce pollution and provide other amenities.<sup>22</sup> Structural BMPs include treatment systems such as settling basins or vaults, oil/water separators, biofilters, wet ponds, constructed wetlands, infiltration systems, and emerging technologies such as media filtration.<sup>23</sup>

A major issue is selecting the best design to achieve optimum, cost effective stormwater treatment in each of the different land-use scenarios indicated above. Since each land-use scenario has a different problem and corresponding solution, a roadmap is needed for executing and implementing technologies suitable for the corresponding land use.

Other issues include:

- The administration of BMPs;
- Monitoring of and data collection from BMPs:
  - who, where and what?;
  - who finances monitoring and data collection?;
- Incentive programs for private installation of BMPs;
- Emphasizing either source control BMPs or end-of-pipe.

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<sup>20</sup> Urban Stormwater BMP Performance Monitoring, GeoSyntec Consultants Urban Drainage and Flood Control District, Urban Water Resources Research Council of ASCE, and the United States Environmental Protection Agency, EPA-821-B-02-001, April 2002, p10.

<sup>21</sup> 2003 ASCE Report Card on Georgia Infrastructure: Issues Brief 2: Stormwater

<sup>22</sup> [www.stormwatercenter.net/into\\_glossary.htm](http://www.stormwatercenter.net/into_glossary.htm)

<sup>23</sup> Washington State Department of Ecology Water Quality Program, Stormwater Management Manual for Western Washington, August 2001, p 1-3

### 3.9 Public Education

- Dialogue with the general public on stormwater management will encourage greater public participation in programs that reduce the contaminants entering the stormwater system and mitigate water quality impacts to the North Saskatchewan River.
- This will require an effective public education program and public cooperation in the reduction of contaminants being released to the stormwater system.

### 3.10 Integration with Land Servicing Strategy

Drainage Services is developing a Land Servicing Strategy that deals primarily with stormwater quantity control. Many of the strategies for quantity control also impact stormwater quality. Conversely, quality control strategies will affect quantity control. Integrating the two strategies is essential for optimizing stormwater management.

### 3.11 Miscellaneous Stormwater issues

Miscellaneous Issues include:

- Involvement of bylaw enforcement;
- Interdepartment roles and responsibilities;
- Staffing;
- Communication with the public and special-interest groups;
- Preservation of terrestrial habitat and maximizing the conservation of natural sites;
- Restoration of degraded stream beds and banks;
- Agricultural activities within City boundaries such as
  - horse training facilities;
  - livestock manure management; and
- Maintenance of private septic systems.





# 4.0

## Strategies to Achieve Vision

The initiatives and accompanying guidelines, along with the rationale for each guideline, are intended to provide direction for improving the quality of the stormwater being released to the North Saskatchewan River from 2005 to 2025. The guidelines will outline a framework and policies for the City and the other stakeholders. These guidelines will also provide the foundation on which the Action Plan (Section 5 of this document) is to be built.

The initiatives are grouped under three improvement concepts:

- A) Optimization of municipal operations;
- B) Land development servicing requirements; and
- C) Street and lot-level controls.

### 4.1 Optimization of Municipal Operations

#### Initiative 1 — A Regional Approach to Stormwater Quality Management

##### Guideline

**A regional approach encompassing the Metro-Edmonton area will be used by the City for monitoring and evaluating stormwater quality. The City will cooperate and share its findings with Alberta Environment and will manage the quality of stormwater originating within the City.**

##### Rationale

Alberta Environment has encouraged the City of Edmonton to lead the regional management of stormwater discharge quality to the North Saskatchewan River. Many of the creeks and drainage basins within the City have watershed boundaries that extend into the surrounding jurisdictions. Conversely, City stormwater represents only part of the load of constituents being released into the river from within the area commonly referred to as the Edmonton Region.

Alberta Environment suggests the City of Edmonton spearhead regional river water quality studies, and will likely be looking to Edmonton to establish parameters for managing the quality of stormwater entering the North Saskatchewan River across the region. The City is willing to assume leadership in monitoring the quality of stormwater in the Metro-Edmonton area and assessing the impact on the North Saskatchewan River. The City will also take responsibility for management of stormwater within and leaving the Edmonton. However the City considers it inappropriate to develop by-laws and guidelines for stormwater quality in other jurisdictions throughout the region.

### Triggering Criteria

- Potential for improvement in the stormwater quality released to the North Saskatchewan River from within city boundaries.

### Development Criteria

- Boundaries of Metro-Edmonton area to be determined;
- Water quality objectives to be established;
- Water quality in the North Saskatchewan River within Metro-Edmonton to be assessed, including pesticides;
- Gaps between objectives and actual water quality analyzed to determine potential for meeting objectives;
- Assess the potential impact of water quality improvement;
- Initiate steps for improvement of the quality of stormwater originating within Edmonton;
- To promote better understanding and environmental protection the City of Edmonton is willing to consider partnering with other entities that discharge to the river; and
- As the major contributor to stormwater contamination, the City will lead implementation of stormwater quality management, with the support of Alberta Environment, if so directed.

### Performance Measures

- Steps taken to manage stormwater quality throughout the city, starting with new development and redeveloped areas.
- Plan implemented at the area planning stage.

Appendix 4, “Current Practices for Stormwater Treatment by Land-Use Type”, indicates the City’s current position on stormwater management. Appendix 5, “Requirements for Stormwater Treatment by Land-Use Type,” highlights expectations that pollution prevention and BMPs will reduce the contamination of stormwater entering the watercourses in Edmonton.

## Initiative 2 — Treatment of Runoff/Spills from Dangerous Goods Routes and Designated Truck Routes

### Guideline for New Construction

**Storm runoff from new Dangerous Goods Routes (DGRs) and designated Truck Routes (DTRs) in areas near environmentally sensitive zones (wetlands, creeks, rivers, etc.) will be conveyed through a constructed BMP (oil/grit separator, wet pond, etc.) prior to being released into a receiving watercourse. Where a DGR crosses a watercourse, surface drainage from the bridge deck and roadway approaches will receive treatment in a constructed BMP that also provides spill containment control.**

### Guideline for Redevelopment of a DGR

**When existing Dangerous Goods Routes (DGRs) are redeveloped in areas near environmentally sensitive zones (wetlands, creeks, rivers, etc.), storm runoff will be conveyed through a constructed BMP prior to being released into a receiving watercourse. Where a DGR crosses a watercourse, surface drainage from the bridge deck and roadway approaches will receive treatment in a constructed BMP that also provides spill containment.**

### Rationale

Due to potential spills, runoff from Dangerous Goods Routes (DGRs) and designated Truck Routes (DTRs) may contain substances detrimental to the water quality of receiving watercourses, and are not necessarily appropriate for treatment in the same SWM facility as runoff from the surrounding area. This will facilitate the containment, treatment and clean up of spills on DGRs. The management concept is to control spills as close as practical to the spill location.

### Triggering Criteria

- Construction of new streets classified as truck routes.
- Redevelopment of Dangerous Goods Routes.

### Development Criteria

- DGRs are those defined in the City of Edmonton Bylaw No. 5590, Schedule VIII "Schedule of Dangerous Goods Routes."
- DTRs are those truck routes defined as truck routes in the City of Edmonton Bylaw No. 5590, Schedule I "Schedule of Truck Routes."
- For new DTRs, stormwater runoff shall be treated using a constructed BMP prior to release to the receiving watercourse.
- For new and redeveloped DGRs, a constructed BMP that provides an acceptable level of spill containment shall be used for runoff from bridge decks and roadway approaches at river and creek watercourse crossings.
- Constructed BMPs such as oil/grit separators will be designed such that the six (6) month return period storm (or alternative approved flow-rate based design criteria) receives treatment.

### Performance Measure

- Runoff from new DTRs and DGRs, as well as from redeveloped DGRs, flows through constructed BMPs that provide an acceptable level of treatment as defined in Initiative 5, Performance Measures.

## Initiative 3 — Snow Storage Site Requirements

### Guideline

**All City operated snow storage sites require permanent facilities for on-site treatment to control settleable and floatable materials prior to discharging stormwater into the drainage system or receiving watercourses.**

### Rationale

Melt from snow storage sites contains significant amounts of constituents such as settleable and floatable solids, chlorides from road salt, petroleum products, and heavy metals. On-site Best Practical Technology for treatment of snow melt targets settleable and floatable materials and will remove only a small portion of the petroleum and heavy metal constituents. The City of Edmonton is responsible for the release of constituents when melt water from the site is not treated.

### Triggering Criteria

- This guideline does not apply to on-lot snow storage.
- Development of new snow storage site.
- Redevelopment of an existing snow storage site.

### Development Criteria

- By 2015 Transportation and Streets will only have permanent storage sites for snow storage.
- By 2015 all commercial snow storage sites will be at permanent locations.
- Each snow storage site will include a structural BMP capable of treating the melt water being released from the site to standards acceptable to the City of Edmonton.
- All new snow storage sites will have ground water monitoring wells on the site.
- Ongoing monitoring of all sites and a review for continued improvement of water quality.

### Performance Measures

- Runoff from new and redeveloped snow storage sites provides an acceptable level of treatment (see Initiative 5).
- Continued monitoring of water quality in discharges from snow storage sites.



## Initiative 4 — Watercourse Stabilization and Improvement

### Guideline

**To support existing aquatic life and maintain the natural treatment function in watercourses, the City will encourage watercourse stabilization through the use of natural restorative smethods.**

### Rationale

The ecosystem in a watercourse is changed by erosion due to increased runoff from developed land. Natural restorative methods provide a better alternative in maintaining the original ecosystem watercourse.

### Triggering Criteria

- Developer submits an erosion and sediment control plan for a new development that includes a natural watercourse.
- Planned watercourse stabilization.

### Development Criteria

- Applies to existing major creeks.
- Restoration activity within creek reaches as part of watercourse stabilization, as needed.
- Erosion and sediment control plans include natural restorative methods for stabilization of the watercourses within the natural watercourse within the developments.
- Implement and maintain tree/shrub riparian zones along creek/stream courses in newly developed areas and along watercourses being restored.

### Performance Measures

- State of watercourses in new development to be the same as prior to the latest development.
- Restoration of developed watercourse returned to a more natural state.
- Tree/shrub riparian zones in place along creeks/stream(s) in newly developed areas.

## 4.2 Land Development Servicing Requirements

### Initiative 5 — Structural Best Management Practices for Treatment of Stormwater on Public Lands

#### Guideline

**For public lands, stormwater contamination will be minimized through pollution abatement practices, and treatment optimized through the effective use of structural BMPs.**

### Rationale

Keeping pollutants out of the drainage system is more cost effective than treating pollutants end-of-pipe. However, prevention programs alone are usually not sufficient for development projects and other City construction activities. The use of proven structural BMPs, prior to the flow entering the system, can significantly reduce contaminant loadings.

### Triggering Criteria

- Development of area structure or concept plans.
- Development plan or design drawings submission.
- Submission of Neighbourhood Structure Plan and/or Neighbourhood Design Reports.

### Development Criteria

- Approved BMPs (structural and non-structural) that will effectively keep contaminants from entering the stormwater runoff or will significantly reduce the quantity of contaminants present in the stormwater included in the development plan.
- ISO 14001/Drainage Services Environmental Management Program (EMP) compliance.

### Performance Measures

- Approved BMP included in development of the Area Structure Plan and in design drawings.
- Acceptable level of treatment is defined as:
  - 1) At least 85% removal (by mass) of suspended solids  $\geq 75 \mu\text{m}$  particle size;
  - 2) Complying with Sewers Use Bylaw No. 9675 Schedule C requirements; and
  - 3) Complying with relevant City-approved BMP codes of practice.
- Compliance with Drainage Services EMP/ISO 14001.

## Initiative 6 — Stormwater Management Facility Design and Operations

### Guideline

**Public Storm Water Management facilities will be designed and operated to improve stormwater runoff quality to the maximum extent practical.**

### Guideline

**Where cost effective, existing public Storm Water Management facilities will be redesigned and operated to improve stormwater runoff quality to the maximum extent practical.**

### Rationale

Reduce the contaminants in stormwater entering the North Saskatchewan River to the maximum practical extent. Land development results in increased stormwater flows with increased contaminants reaching the river. Pollution prevention practices do not sufficiently reduce contaminants; therefore effective treatment systems are required to minimize loadings and impacts. Some existing SWM facilities (e.g. dry ponds) require redesign to provide for treatment benefits.

### Triggering Criteria

- Development of area structure plan.
- Redevelopment plan submitted.
- Outcome of study to review dry pond impacts.

### Development Criteria

- Facilities will be designed for sufficient storage volume and increased hydraulic residence time.
- Facilities should have naturalized features using the 'biological mimicry' principal.
- Facility should incorporate the best treatment method for stormwater.
- Constructed treatment types ranked in order of preference are:
  1. Constructed wetlands,
  2. Naturalized wet ponds,
  3. Wet ponds, then
  4. Oil/grit separators.
- Other technologies such as grassed swales, catch basin (CB) filter inserts and infiltration systems may be acceptable, upon further study, to address operational and maintenance concerns.
- Greenfield development above the E.L. Smith Water Treatment Plant will include a constructed wetland as the final barrier before release of stormwater to the North Saskatchewan River or to a watercourse discharging to the river above the E.L. Smith Plant.

### Performance Measures

- Facilities design indicates sufficient storage volume and increased hydraulic residence time.
- Facilities have naturalized features using the 'biological mimicry' principal.
- Facilities incorporate the best treatment method for stormwater.
- Development above the E.L. Smith Water Treatment Plant includes a constructed wetland as the final barrier before release of stormwater.

## Initiative 7 — On-site Best Management Practices: During and Post-Construction

### Guideline

**Stormwater runoff from new developments and lands being re-developed will receive an acceptable level of treatment prior to discharge to the stormwater drainage system or the receiving watercourse.**

### Rationale

The objective is to reduce the contaminants in stormwater entering the North Saskatchewan River to the maximum practical extent. Land development results in increased stormwater flows with increased contaminants reaching the river. Industrial/commercial pollution prevention (P2) practices are not sufficient; therefore effective treatment systems are required to minimize loadings.

### Triggering Criteria

- Development of area structure plan.
- Development of neighborhood structure plan.
- Development design drawings submitted.
- Redevelopment plan submitted for:
  - residential infill/redevelopment of 1ha or greater;
  - institutional, commercial and industrial areas with impervious areas equal to or greater than 0.4 ha;
  - redevelopment of a lot equal to or greater than 0.3 ha to a commercial or industrial site.

### Development Criteria

- Residential infill/redevelopment of areas less than 1 ha are exempt from this guideline.
- Residential infill development greater than 1 ha will not automatically require stormwater treatment but will be evaluated by Drainage Services on an individual basis.
- In new areas system-level SWM facilities (wet ponds and wetlands) will be constructed outside existing creek watercourses (i.e. off-line).
- Construction of system-level SWM facilities (wet ponds and wetlands) within creek watercourses will be discouraged in existing developed areas.
- A tree/shrub riparian forest zone BMP concept use.
- An off-line design is preferred for street-level BMPs such as oil/grit separators rather than in-line systems.
- Fewer, larger constructed wetlands are preferred over more, smaller constructed wetlands.
- Oil/grit separators are acceptable, if appropriately designed and constructed, when site considerations preclude the use of wet ponds or wetlands.
- Appropriate design of structured BMPs to retain accumulated sediment.

- Constructed wetlands will be designed to ensure optimum retention time.
- A natural area management plan developed (e.g.: Mill Creek Roper Pond).
- ISO 14001/Drainage Services Environmental Management Program (EMP) compliance.

### Performance Measures

- Acceptable level of treatment is defined as:
  1. At least 85% removal (by mass) of suspended solids  $\geq 75 \mu\text{m}$  particle size;
  2. Complying with Sewers Use Bylaw No. 9675 Schedule C requirements; and
  3. Complying with relevant City-approved BMP codes of practice.
- Different land uses have separate stormwater management systems.
- A natural area management plan has been developed.
- Compliance with Drainage Services EMP/ISO 14001.
- Compliance with erosion control and sedimentation guidelines.

## Initiative 8 — Conservation of Naturalized Wetlands

### Guideline

**Whenever feasible, existing urban wetland sites should be integrated into the drainage system to provide treatment of stormwater runoff so that natural site features are retained and negative impacts to wetland functionality are mitigated.**

### Rationale

The planning and Development Branch requires natural wetlands in developing urban areas be saved whenever possible. Natural wetlands are at least as effective in removing contaminants as constructed systems. Wetlands are a natural part of the stormwater drainage basin. Integration makes sense when all surrounding lands are to be developed, resulting in complete alterations to the pre-development system. Implementation of this guideline will retain the existing natural features rather than risk their loss, and be required to construct a man-made wetland in the immediate locale.

### Triggering Criteria

- Development and submission of Area Structure Plan.

### Development Criteria

- All wetlands are part of the stormwater drainage system.
- The guideline applies to wetlands that currently receive run-off from the site to be developed.
- Wetlands' drainage basins will not be enlarged.
- Existing wetlands will not be materially altered except to enhance their capability to handle increased flow and sediment transfer from their existing drainage basins.

- Design shall include pretreatment facility to mitigate impacts and protect existing urban wetlands.

### Performance Measures

- All wetlands currently receiving run-off from sites to be developed are included in the plan.
- Wetland drainage basins not enlarged and not materially altered except to enhance their capability flow and sediment transfer from their existing drainage basins.
- Pretreatment facility has been constructed.
- A vegetation management plan for wetlands developed.
- Natural area management plan be developed for natural wetlands.

## Initiative 9 — Shoreline Ownership of Stormwater Management Facilities

### Guideline

**City ownership of Stormwater Management Facilities (SWM) will include one hundred percent (100%) of the site up to and including the high water level, for the following facility types:**

- **Constructed wetlands, and**
- **Dry ponds.**

**Up to 50% of the shoreline perimeter of wet ponds may be privately owned.**

### Rationale

For wetlands, the City must own 100% of the site due to the following reasons:

- Maintain the sensitive vegetation within and around those wetlands and eliminate the possible inability of private ownership to sustain the appropriate vegetation; and
- Ensure public safety since the sites do not have permanent wet areas and public safety could be jeopardized during inundation.

In the case of wet ponds, where sensitive vegetation does not exist and where available storage will not be jeopardized, some private ownership of shoreline is acceptable. The province has ownership of natural wetland beds and shorelines.

### Triggering Criteria

- Developer application to utilize Stormwater Management Facilities shoreline.

### Development Criteria

- Land requirements are stated in the Design and Construction Standards Manual.

#### Performance Measures

- Adherence to the shoreline guideline.

### Initiative 10 — Redevelopment and Improvement to Stormwater Management

#### Guideline

**Design for existing areas being retrofitted to improve flood protection level of service will include review of options for improvement of stormwater quality.**

#### Rationale

Retrofit designs that include both quality improvement considerations and flow control can be cost effective to minimize loadings and impacts to the river.

#### Triggering Criteria

- Plan to modify existing facility and/or add a new facility to an existing area.
- Plan to redevelop one or more SWM facilities.

#### Development Criteria

- Cost effective BMPs for stormwater quality improvement included in the design.

#### Performance Measures

- Improved water quality that approaches or exceeds acceptable level of treatment.

## 4.3 Street and Lot-level Initiatives for Residential and Non-residential Property

### Initiative 11 — Street and Lot-Level Storage and Infiltration

#### Guideline

**To reduce the volume of stormwater discharged off-lot, the City of Edmonton will encourage street or on-lot storage and infiltration of precipitation.**

#### Rationale

Development currently results in increased runoff with increased pollutants entering storm sewers and watercourses by reducing infiltration of stormwater and snow melt. Street or on-lot storage and infiltration could reduce this

runoff. This would reduce pollution in the receiving water, reduce erosion, and encourage growth of vegetation by re-charging the sub-surface soil. Field measurements would be needed for successful site-specific applications.

### Triggering Criteria

- Development of Area Structure Plan.
- Development of Neighborhood Structure Plan.
- Lot redevelopment design plan submitted.

### Development Criteria

- Encourage the use of alternate drainage designs on public lands in new developments such as the grass swale concept to reduce off-site volumes discharged.
- Stormwater containing hazardous substances should not be infiltrated on-site to avoid groundwater contamination.
- The City will carry out field measurements to determine where infiltration can be successfully applied.
- Where field measurements show infiltration to be successful in reducing runoff without reducing soil stability, the City will encourage the use of pervious surfaces in development and redevelopment areas, as well as the use of porous material for driveways, walkways, parking lots, and patios.
- The City will encourage the construction of tree/shrub riparian forest zones along creek/stream watercourses running through property.
- City approved lot grading and surface drainage plans should lessen the load on the household and neighbourhood drainage systems for new buildings and major building retrofits.
- For new buildings and major building retrofits a grading and drainage plan that includes first floor finished elevation shall be submitted.
- Roof top storage may be allowed, but only in redevelopment where other options are not available and where flow control is feasible.
- Where roof top storage is allowed, and where possible, some parking lot storage should be included.
- Exceptions to on-lot infiltration and parking lot porosity would include lots near ravines that are susceptible to subsidence.
- Lot design will include the capture of precipitation from a 5 mm or less storm.
- Lot design shall include consideration of source control BMPs for on-lot storage.



### Performance Measures

- Lot design includes consideration of source control BMPs for on-lot storage and infiltration.
- An annual letter of notification on the status of the flow device is required.
- Tree/shrub riparian zone in place along creek/stream(s) in newly developed lot(s).

## Initiative 12 — Structural Best Management Practices for Industry

### Guideline

**The City will encourage industry to minimize stormwater contamination through pollution prevention (P2) practices, and optimize treatment through the effective use of structural BMPs.**

### Rationale

It is more cost effective to keep contaminants out of the drainage system by use of proven BMPs, than compared to subsequent treatment/removal.

### Triggering Criteria

- Development application for industrial lands.

### Development Criteria

- Industry will develop BMPs (structural and non-structural) that effectively keep contaminants from entering the stormwater runoff or significantly reduce one or more contaminants present in stormwater.

### Performance Measures

- Acceptable level of treatment is defined as:
  1. At least 85% removal (by mass) of suspended solids  $\geq 75 \mu\text{m}$  particle size;
  2. Complying with Sewers Use Bylaw No. 9675 Schedule C requirements.
- Industries will be expected to develop BMPs for:
  - On-site treatment of stormwater;
  - Disposal of contaminants captured in privately owned/operated CB filters;
  - Disposal of sludge from CBs, wet ponds and wetlands;
  - Retention of runoff from storms of less than 5 mm precipitation;
  - Spill containment; and
  - On-lot/on-site infiltration.

## Initiative 13 — Public Education and Awareness

### Guideline

**The City will encourage the public to improve the quality of stormwater runoff from their individual lots.**

### Rationale

Public education leads to a ripple effect that enhances the City's efforts to improve water quality.

The public will be educated and encouraged in:

- Responsible use of fertilizers and pesticides;
- Reduction in soil erosion;
- Reduction of runoff from vehicle washings;
- Dealing with ice formation during winter melt conditions;
- Responsible disposal of liquid wastes and hazardous waste;
- Responsible lawn watering; and
- On-lot storage and infiltration.

### Triggering Criteria

- Approval of the strategy.
- Approval of funding to implement the strategy, including public outreach.

### Development Criteria

- The City will encourage reduced use of fertilizer and pesticides on private property through targeted education programs.
- Drainage Services will actively support and participate in Corporate Services' proposed pesticide public awareness program when it becomes available.
- Drainage Services will support and encourage partnership initiatives to improve the quality of water flowing in the creeks/streams within the City.
- City staff implementing the Strategy will be familiar with various initiatives to reduce stormwater contaminants before educating residents.

### Performance Measures

- Public Awareness plan in operation.
- Manuals and information packages available to the public.
- Greater general awareness of problems resulting from contaminants entering the stormwater system.
- Understanding of what can be done to reduce the problems.
- Reduction in the amount of contaminants entering the stormwater.

## Initiative 14 — Commercial Parking Lot Stormwater Quality Controls

### Guideline

**The City will require treatment of stormwater runoff from parking lots at commercial establishments.**

### Rationale

Runoff from the parking lots of commercial establishments is one of the biggest contaminants (per square meter) to stormwater due to the high turnover of vehicles using these lots compared to industrial, institutional or residential parking lots. Vehicles and vehicle start-up is a major source of these contaminants.

### Triggering Criteria

- Lot/site development application that includes a commercial establishment.
- Development permit application received for the refurbishing of a parking lot at a commercial establishment.

### Development Criteria

- Parking lots of commercial establishments with less than 50 (tentative) stalls may be exempt from this guideline.
- This Guideline applies to establishments in Land Use Zones CHY, CSC, CNC, CB1, CB2, CO, DC1 and DC2.

### Performance Measures

- Pollutants removed by BMP treatment from stormwater draining from the parking lot to meet the levels set in Schedule C of the Sewers Use Bylaw or to the satisfaction of the City.

## 4.4 Integration with Other Drainage Services Activities

### 4.4.1 Linkage with the Land Drainage Servicing Strategy

Actions taken under the Stormwater Quality Strategy and Action Plan and the Land Drainage Servicing Strategy are inherently linked to each other. Formally linking them will result in economical benefits and improved efficiency in implementing both strategies.

Following the development of both strategies, a team from both committees will develop an action plan for linking the two strategies and their implementation.

#### 4.4.2 Linkage with the Erosion and Sedimentation Manual and Guidelines Study

A regional approach to Stormwater Quality Management and Alberta Environment's watershed protection position are also directly linked. The Erosion and Sedimentation Study may provide ways of protecting creeks and tributaries, thereby minimizing impacts to the river. Appropriate sedimentation and erosion protection plans and good housekeeping practices can significantly improve on-site stormwater quality during construction phase and in the post construction phase.

#### 4.4.3 Linkage with Drainage Services Public Education Plan

Drainage Services' Public Education Plan can serve the interests of the SWQS. This encompasses education programs, pesticide public awareness programs, and overall efforts to improve stormwater quality. Community Services has a pivotal role in strengthening the relationship between the City and various target publics with a vested interest in stormwater quality management.

#### 4.4.4 Linkage to Bylaws

The level of treatment expected from new developments and redevelopments links the Stormwater Quality Strategy with City bylaws and codes of practice. Bylaws concerning the preservation of the environment and natural character of the North Saskatchewan River valley correspond to the Stormwater Quality Strategy's requirements to reduce the contamination of stormwater entering the river and the preservation of naturalized wetlands.

#### 4.4.5 Linkage to InfraGuide

The InfraGuide is a source of Canadian experience and knowledge in the field of best practices for controlling stormwater pollution. The InfraGuide also includes best practices for a strategic commitment to environmental protection. This should lead to a Stormwater Quality Strategy to deal with impacts that infrastructure has on the natural environment. Resolution becomes a collaborative effort.

The City of Edmonton endorsed the best practices concept from the National Guide to Sustainable Municipal Infrastructure (InfraGuide). This guide "... aims to provide a decision-making and investment planning tool as well as a compendium of technical best practices. It provides a road map to the best available knowledge and solutions for addressing infrastructure issues."<sup>24</sup> Two "best practices" for stormwater have been published to-date and three more are under development.

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<sup>24</sup> Source and On-Site Controls for Municipal Drainage Systems, Copyright National Guide to Sustainable Municipal Infrastructure, March 2003, Issue No. 1.0, p v.

#### 4.4.6 Linkage with EMP/ISO 14001

Drainage Services is implementing an environmental management system that includes the following environmental management programs that are inherently linked to the objectives of this Strategy:

- Total Loading Study;
- Enhanced standards and policies for watershed protection;
- Target 85% removal of TSS;
- Enhanced environmental monitoring;
- Control interconnection discharges;
- Approval-to-Operate issuance; and
- Future City-wide ISO 14001 Certification.

### 4.5 Integration with other City Activities

#### 4.5.1 Linkage to the Office of Conservation

The preservation of naturalized wetlands and their incorporation into the drainage system will require a significant level of cooperation with the Office of Conservation.

#### 4.5.2 Linkage to the Office of the Environment

The Office of the Environment is continually working on contaminated sites. This work will influence the quality of the stormwater runoff from those sites.

#### 4.5.3 Linkage to Transportation and Streets

Policies outlined in this strategy will affect the construction of streets through new industrial areas and new/reconstructed DGRs. Transportation and Streets should incorporate increased costs for controlling the flow and treatment of stormwater from new DTRs and DGRs.

This strategy will also affect Transportation and Streets' work with contaminated sites and the development of future snow storage sites.

#### 4.5.4 Linkage to Planning and Development

Drainage Services will need to develop an integrated linkage with Planning and Development to assure that stormwater quality requirements are integrated into the planning of development.

#### 4.5.5 Linkage to Community Services

The linkage to Community Services involves several aspects including:

- Watercourses stabilization and improvements;
- Preservation of naturalized wetlands;
- Incorporation of constructed wetlands into park areas;
- Vegetation management of constructed wetlands; and
- Joint pesticide monitoring.





# 5.0

## Action Plan

### 5.1 Purpose of the Action Plan

The Action Plan issues tasks and assigns responsibilities to achieve the initiatives of this strategy. These tasks will be measured by the corresponding performance measures for each initiative. The Action Plan promotes the installation of structural BMPs and implementation of operational BMPs. In the design phase, reviews of BMP checklists are the mechanism for benchmarking and evaluating performance. It is not based on the sampling/testing numerical comparison approach. The BMP code of practice will recommend appropriate operational practices.

### 5.2 Implementation Plan

#### 5.2.1 Regional Approach for the Metro-Edmonton Area

Alberta Environment encouraged The City of Edmonton to lead in the management of stormwater quality in the region. To the extent possible, the City will team with Alberta Environment and other regional stakeholders for an overall watercourse monitoring program within the Metro-Edmonton area. The intent of the program is to identify significant pollutant impacts on the quality of water in the North Saskatchewan River. Information gathered from the study would be shared with other municipalities in the Metro-Edmonton region for management of their stormwater.

Where an impact from stormwater is identified, the City will attempt to determine whether the origin of the pollutant falls within the City's jurisdiction or within the jurisdiction of others.

Where the source is within the City's jurisdiction the City will determine the action to mitigate the impact. Where the source is from non-City entities the City will inform Alberta Environment and work with these parties to mitigate the impact.

The City will continue monitoring of the North Saskatchewan River within the Metro-Edmonton area to determine the state of the river's water quality and record improvements, as well as identifying new impacts.

Specific actions that would be undertaken include:

- Determine the boundaries of Metro-Edmonton area;
- Adjust and expand the current stormwater quality monitoring program being carried out by Drainage Services. This includes extended monitoring efforts of the North Saskatchewan River, as well as dry and wet weather in stream monitoring of tributaries to obtain more reliable daily pollutant load estimates. The monitoring will provide data for the total loading concept that is to be integrated with the City's Approval to Operate;
- Evaluate the water quality in the North Saskatchewan River;
- Involve interested downstream stakeholders in the study;

- Forward results to and consult with Alberta Environment;
- Consult with the Planning and Development department for a regional approach at the area planning stage;
- Manage the stormwater quality throughout the city, starting with new development and significant redevelopment activities; and
- Storm and Combined Sewer Outfalls (CSOs) will need continued monitoring.

### 5.2.2 Designated Truck Routes and Dangerous Goods Routes Stormwater and Spill Treatment

Metro-Edmonton has a significant trucking industry. Trucks can deposit a large pollutant load on street and highway surfaces, and have the potential to spill quantities of contaminants and materials that are classified as Dangerous Goods.

Currently, when notified of a spill, the Drainage Services Operation Section determines the location and size of the spill. Small spills that have not reached the sewer system are covered with absorbent pads or peat moss. The absorbent material is then picked up and disposed of in an appropriate manner. Absorbent pads are placed in the sewer to absorb spill material that may have reached the sewer system. Larger spills are handled by calling the Fire Department, which dispatches a Dangerous Goods team. The spill is boomed, and then sanded. The sand is collected and disposed of in an appropriate manner. If a larger spill reaches the sewer, the outfall is boomed and the hazardous material is recovered from the watercourse.

To further eliminate the impact of pollutants from spills and Dangerous Goods transportation the following actions should be taken:

- Design of new DTRs and DGRs to include structural BMPs (SBMP);
- DGRs that cross watercourses will have spill containment included in the SBMP;
- Haulers to be consulted to identify materials that could potentially be released into watercourses;
- Determine the effectiveness of generic SBMPs in treating pollutants and potential spill material;
- A list of acceptable SBMPs to be developed and maintained;
- Design new DTRs and DGRs to include approved SBMPs;
- DGRs that cross watercourses to have spill containment included in the SBMP.

### 5.2.3 Snow Storage Sites

Transportation and Streets is currently developing plans to construct additional permanent snow storage sites, and to convert existing snow storage sites so they will comply with Alberta Environment site design criteria.

Drainage Services will:

- Determine the acceptability of the proposed BMPs for constituent removal; and
- Identify issues involved in licensing commercial snow storage sites.



#### 5.2.4 Watercourse Stabilization and Improvement

Natural restorative methods will be used to provide a better alternative in maintaining original ecosystem watercourses. Major creek watercourses will:

- maintain their original state in areas being developed;
- be restored as needed, as part of watercourse stabilization in areas already developed;
- Where possible, areas being restored will include a tree/shrub riparian zone of 7.5 metres for gentle and shallow slopes, and 10 metres for steep and deep slopes or greater in width; and
- Further action on erosion prevention and control is expected with the completion of the Erosion and Sediment Control Guidelines.

#### 5.2.5 Best Management Practices for Public Lands

##### 5.2.5.1 *Operational Best Management Practices*

Operational Best Management Practices (BMPs) are non-structural and include procedures put in place to reduce contaminants from reaching stormwater. They include special zoning requirements, bylaws, and operational and maintenance activities.

The anticipated results include:

- Reduced level of pollutants entering the system;
- Improved performance of the stormwater management system; and
- Improved image of the City.

Challenges faced include:

- Additional operational costs to both the City and “industry”;
- Sustaining interest of the staff and industry; and
- Maintain a database of BMP installation for EMS/ISO 14001.

##### 5.2.5.2 *Neighbourhood-level Constructed Best Management Practices*

Neighbourhood-level CBMPs are structural devices installed by a developer when developing a neighbourhood (or by the City at a later date). They temporarily store or treat stormwater runoff to mitigate flooding, reduce pollution and provide other amenities.<sup>25</sup> These structural devices include treatment BMPs such as settling basins or vaults, oil/water separators, biofilters, wet ponds, constructed wetlands, infiltration systems, and emerging technologies such as media filtration.<sup>26</sup>

Anticipated results include:

- Reduced level of pollutants passing through the system;
- Improved aesthetics in the neighbourhoods; and
- Increased land value in neighbourhoods.

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<sup>25</sup> [www.stormwatercenter.net/into\\_glossary.htm](http://www.stormwatercenter.net/into_glossary.htm)

<sup>26</sup> Washington State Department of Ecology Water Quality Program, Stormwater Management Manual for Western Washington, August 2001, p 1-3.

Challenges will include:

- Increased land development costs;
- Reduction in the land available for lot development;
- Additional smaller treatment units requiring service;
- Increased staff requirements by Drainage Operations; and
- Higher operational budget.

#### *5.2.5.3 Basin-level Best Management Practices*

Basin-level CBMPs are structural devices installed by the City to treat stormwater flow from major storm outfalls. They fall into three categories: constructed vaults, constructed wetlands, and low flow devices.

Anticipated results include:

- Reduced level of pollutants entering the North Saskatchewan River;
- Increased capability of the City to meet its Approval to Operate; and
- Improved aesthetics in the river valley.

Challenges will include:

- Obtaining approval to develop SWMFs in the river valley;
- Installation costs;
- Integration of SWMFs into the surrounding area;
- Additional treatment units requiring service;
- Increased staff requirements by Drainage Operations; and
- Higher operational budget.

#### *5.2.5.4 Best Management Practices/Outfall Study*

Appendix 4, "Current Practice for Stormwater Treatment by Land-Use Type," provides an overview on how pollution prevention and BMPs are currently utilized by the City to reduce the contamination of stormwater entering the watercourses within Edmonton.

Appendix 5, "Requirements for Stormwater Treatment by Land-Use Type," highlights how these practices should to be utilized in the future to further reduce stormwater contamination within the city.

Cost effective BMPs will be used in stormwater quality management on public lands. Cost effective BMPs will be determined using the following processes:

- A study will be carried out to establish which BMPs are cost effective in removing contaminants from stormwater;
- A list of cost effective BMPs will be maintained;
- New BMPs with the potential for removing significant pollutants from stormwater will be studied and added to the list if shown to be cost effective;
- BMPs will be examined for the following areas:
  - Street sweeping;
  - Street flushing in combined sewer areas;
  - Use of road salt;
  - Pet excrement control;
  - Disposal of captured contaminants in CB filters;

- Disposal of sludge from CBs, wet ponds and wetlands;
- Runoff capture for rainfall events of 5 mm or less;
- Spill containment;
- Inter-connection remediation; and
- Waterline flushing for fire hydrant regular maintenance.<sup>3</sup>

#### 5.2.5.5 *Riparian Zone BMPs*

The riparian zone along a stream, creek or river has a direct effect on the quality of water in that watercourse. Recent studies<sup>27</sup> indicate that a riparian forest at streamside that is composed of native trees, shrubs and herbaceous plants improves the health of the stream.

To better understand the effect of a riparian forest on the quality of water in a stream Drainage Services will, in partnership with the Alberta Fish and Game Association, undertake the following studies to generate fundamental knowledge of the local riparian systems:

- Develop a definition of riparian health;
- Develop biological health indicators for riparian areas; and
- Develop and evaluate tools and techniques that can suit a variety of stakeholders to manage various threats to the riparian system.

Drainage Services will also:

- Support a partnership with Alberta Fish and Game Association on riparian zone monitoring; and
- Support initiatives of the River Valley Alliance, provided watercourse riparian zones and stormwater quality are maintained and protected.

#### 5.2.5.6 *Maintenance of BMPs on Public Lands*

Pending the outcome of the BMP study, City options regarding the maintenance of BMPs on public lands include:

- Frequency of street cleaning;
- Frequency of catch basin cleaning;
- Scheduling of regular catch basin cleaning;
- Swale maintenance;
- Optimizing road salt use and properly managing winter materials; and
- Reduction of aquatic herbicide use in SWM facilities.

### 5.2.6 Stormwater Management Facility Design and Operation

New stormwater management facilities will be designed to reduce the contaminants in stormwater. To aid private sector implementation:

- Only cost-effective BMPs will be approved;
- Design guidelines will be developed;
- Design guidelines will be incorporated into the Servicing Standards;
- Design parameters will be communicated to consultants; and
- A standard practice BMP will be developed for each type of approved SBMP.

<sup>27</sup> [www.stroudcenter.org/research/riparianbuffer.htm](http://www.stroudcenter.org/research/riparianbuffer.htm)

Redesign of existing SWM facilities will be examined to reduce the contaminants in stormwater as follows:

- Study the feasibility of converting existing dry ponds in critical areas to wet ponds or wetlands;
- Conduct BMP studies in the following areas to determine the effectiveness of:
  - retrofitting CBs with filter inserts,
  - converting dry ponds to wet facilities,
  - converting wet ponds to naturalized wet ponds;
- Developing design guidelines;
- Incorporating the design guidelines in the Servicing Standards; and
- Communicating the design parameters to consultants.

Constructed wetlands are to be considered for areas to be redeveloped. The following steps will be taken:

- Consultation with Urban Development Institute regarding the use of wetlands smaller than 1 ha for use in redeveloped areas and the development of standards for managing small wetland areas;
- Consultation with Community Services on wetland vegetation/landscape planning and requirements; and
- Research system design and vegetation management features to maximize mosquito control and either encourage or discourage wetland bird habitat depending upon locality.

## 5.2.7 On-site Best Management Practices: During and Post Construction

### 5.2.7.1 *On-site CBMPs for treatment of stormwater leaving developments*

On-site CBMPs are required for the treatment of stormwater leaving developments, including residential subdivisions, institutional, commercial and industrial sites. This initiative will apply to both greenfield development and sites being redeveloped.

- Developers will submit data showing the proposed BMP(s) meet the Criteria under the Guideline in Initiative 8;
- The City of Edmonton's Sewers Use Bylaw will be amended to incorporate the criteria under Initiative 8 and to include significant deterrents for not meeting the criteria; and
- Bylaw enforcement staff will be given sufficient authority to enforce the Bylaw(s).

### 5.2.7.2 *On-site CBMPs for High Potential Contaminant Release Area*

The issues include:

- Defining servicing requirements;
- Plan checking up to date;
- Need for inspection;
- Need for a data base;

- Tracking letters of maintenance; and
- Bylaw revision to specify action for fuelling stations.

#### 5.2.7.3 *BMP for Information Management*

Actions to improve Information Management:

- Environmental Planning sub-group within Strategic Planning to assume responsibility for Building and maintaining the data base for:
  - Structural BMPs; and
  - Letters of notification regarding location, maintenance, and responsibility for industrial and public lands BMPs.

#### 5.2.8 Preservation of Natural Wetlands

Implementation of this guideline will include retaining the existing natural features. To preserve the naturalized wetlands the following steps will be taken:

- Clarify the role of City Policy C467 in integrating existing wetlands with the stormwater drainage system;
- Determine zoning and ownership of wetlands;
- Consult with Corporate Services Conservation Coordinator;
- Consult with Parkland Services regarding integration of SWM facilities and wetlands;
- Consult with Planning and Development regarding changes to give Drainage Services management of wetlands;
- Establish a vegetative management plan for wetlands that have been or will be preserved or constructed for drainage purposes;
- Ensure that SWM features of proposed design plans preserve the naturalized wetlands with their existing natural features;
- Amend City bylaws to include significant deterrents for not following design plans; and
- Provide Bylaw enforcement staff with the authority to enforce the Bylaw(s).

#### 5.2.9 Shoreline Ownership of Stormwater Management Facility

The following steps will be taken:

- Develop minimum size requirements for dry ponds, adding them to the Design and Construction Standards manual;
- Produce public information brochures to inform owners of lots in the vicinity of SWMFs;
- Consult with property owners to gain general support for the conversion of wet ponds to naturalized wet ponds; and
- Consult with UDI in the Design and Construction Standards manual review.

#### 5.2.10 Retrofitting Existing Stormwater Management Facilities

The redesign of existing SWM facilities to reduce the contaminants in stormwater will be accomplished as follows:

- Study the feasibility of converting existing dry ponds in critical areas to wet ponds or wetlands;
- Conduct BMP studies in the following areas to determine effectiveness:
  - retrofitting CBs with filter inserts,
  - conversion of dry ponds to wet facilities,
  - conversion of wet ponds to naturalized wet ponds;
- Develop design standards;
- Incorporate the design standards in the Servicing Standards;
- Communicate the design parameters to consultants.

#### 5.2.11 Street and Lot-level Storage and Infiltration

The following steps will be taken:

- Research applicability of porosity/infiltration in the Edmonton area;
- Consider cost effectiveness of installing infiltration BMPs;
- Produce public information brochures to inform owners of ways to manage and store stormwater on lot;
- Investigate grey-water use;
- Consult with other departments including Planning and Development;
- Consult Drainage Operations regarding maintenance of swales;
- Consider rain barrel or subsurface storage subsidy;
- Study the correlation between roof top storage, parking lot storage, rain gardens and green roofs;
- Develop construction BMPs for flow regulating devices;
- Develop protocol for an annual letter of notification regarding flow-regulating devices; and
- Develop data handling system for information received regarding flow-regulating devices.

#### 5.2.12 Structural Best Management Practices for Industry

Carry out BMP studies that assess the capability of BMPs in the following areas:

- On-site treatment of stormwater;
- Disposal of contaminants captured in privately owned/operated CB filters;
- Disposal of sludge from CBs, wet ponds and wetlands;
- Runoff capture for rainfall events of 5 mm or less;
- Spill containment;
- On-lot/on-site storage and infiltration;
- Evaluate costs and benefits of different BMP's through ongoing studies; and
- Amend the Sewers Use Bylaw.

### 5.2.13 Public Education and Awareness

Drainage Services, with extensive support from the Communications Business Partners will develop public education programs for the general public, the land development industry and consultants.

Challenges facing this public education program will include:

- Program initiation;
- Providing adequate funding to support the program; and
- Measuring the effectiveness of the program.

The following steps will be taken:

- Improve communications with City of Edmonton staff;
- Work with Community Services in public education;
- Encourage and support volunteer watershed stewardship programs;
- Support the establishment of a volunteer water quality monitoring program in collaboration with other partners;
- Monitor concentrations of pesticides in the watershed;
- Monitor BMPs for effectiveness in removing pesticides;
- Produce public information brochures to inform owners of ways to manage and store stormwater on lot; and
- Produce public information brochures to inform owners of lots abutting SWMFs.

### 5.2.14 Commercial Parking Lot Stormwater Quality Controls

The following actions will be taken:

- Define “commercial” as used in this initiative;
- Discuss Planning’s requirements regarding size of large commercial parking lots;
- Develop criteria of size of parking lot requiring stormwater treatment;
- Determine types of contaminants of concern;
- Determine types of BMP that will remove contaminants;
- Investigate the potential soil/groundwater contamination if this stormwater is allowed to seep into the soil;
- Coordinate this with the requirements for parking lots that come out of the Stormwater Servicing Strategy;
- Investigate, if available data indicates that effluent from oil/grit separators will meet Schedule C;
- Consult with Alberta Environment;
- Consult with commercial property owners;
- Revise applicable codes of practice; and
- Revise applicable bylaws.

## 5.3 Financial Plan

### 5.3.1 Proposed Revenue Sources

Effective stormwater programs require cost-effective BMPs and sufficient funding. Stormwater programs and maintenance could rely on all or some of the following:

- Funding provided by the Land Drainage Utility charges;
- Permit fees:
  - New development building permit,
  - Storm sewer connection permit,
  - Stormwater permit;
- Inspection fees:
  - Stormwater discharge inspection,
  - Construction site inspection; and
- Land Drainage Servicing Strategy may locate new revenue.

### 5.3.2 Expenditures

Activities with cost estimates that have been presently identified included:

- Total Maximum Loading Limit Scoping study completed October 2003 at a cost of \$60,000;
- Detailed River Impact Modeling Study (formerly known as the TMLL Study) completed October 2005 at a cost of \$200,000;
- BMP/Outfall Study expected completion date of January 2006 at an estimated cost of \$200,000;
- NSR Water Quality Study;
- Storm sewer upgrades:
  - Upgrades budgeted at \$2.2 million for the period 2004 – 2008;
- Inspection and Monitoring (existing and proposed):
  - Development and construction sites,
  - Post development for compliance with Servicing Standards, Land Drainage and Sewers Use Bylaws,
  - Private industrial sites for compliance with bylaws,
  - Inspection of wetlands for maintenance of site, including the cleaning of forebay; and
  - Maintenance of inspection/monitoring database.

More detailed costs and priorities for implementation will be developed by the early 2007 (with the BMP/Outfall Study completed).



## 5.4 Capital Construction Plan

Development of a stormwater management facility requires municipal financing that includes all of the following:

- Land acquisition;
- Land Drainage Servicing Strategy for finding new revenue for building new construction across the city;
- Contingency and permitting;
- Design;
- Geotechnical and hydrological testing;
- Erosion and sedimentation control during construction;
- Site conditions and drainage area assessment;
- Structural BMP construction; and
- Operation and maintenance.

Drainage Services' 20 Year Plan will be reviewed and revised annually to identify works related to the Stormwater Quality Strategy. Projects will be identified as "funded" or "unfunded" with priorities set through budgeting processes.

## 5.5 Education and Awareness Outreach Plan

Public education programs also encompass the following:

- Fertilizer and pesticide management and alternatives;
- Open houses;
- Develop curriculum based information/materials on environmental education (with field trips) for use in schools in the service area;
- Improvement and monitoring projects for streams and creeks;
- Improving residential housekeeping practices for hazardous liquid substances;
- Improving housekeeping practices in industrial, commercial and institutional settings regarding loading dock spills, gas station spills, etc.;
- Providing codes of practice whenever possible; and
- Issuing manuals and valuable information with water utility bills, reaching most households and reinforcing the direct connection between consumer behavior and sustained water quality of the North Saskatchewan River.

## 5.6 Timelines

The following timelines give an indication of how the Stormwater Quality Strategy might unfold. Not all of these projects are presently funded. More definitive project costs and schedules will be developed as Drainage Services' 20 Year Plan is updated.

- 2005 – Construction of the southeast snow storage site.
- 2006 – Construction of the southwest snow storage site.
- 2007 – Transportation and Streets to review north side temporary snow storage site.
  - Bylaw revisions and formalizing codes of practice.
- 2008 – Major storm outfall end-of-pipe treatment facility construction.
  - Public education program in place, town hall meetings, brochures at public events, pamphlets for new homebuyers around lakes and wetlands.
- 2009 – Public participation expected (gutter cleaning, volunteers like Compost Pros), Quesnell and Groat Road base-flow diversions to GBWWTP.

# Glossary

*Since the meaning of certain terms in the stormwater industry is fluid, this Glossary is provided to assure that the reader understands the meaning of the terms used in this paper.*

## ■ Best Management Practice (BMP)

An (activity), procedure, (practice), device or method for removing, reducing, retarding, or preventing stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters.<sup>6</sup>

- Non-structural BMPs include special zoning requirements, ordinances (bylaws), maintenance activities, and education/outreach programs.<sup>7</sup>
- Structural BMPs are devices designed to temporarily store or treat urban stormwater runoff in order to mitigate flooding, reduce pollution and provide other amenities.<sup>8</sup>
- Structural BMPs include treatment BMPs such as settling basins or vaults, oil/water separators, biofilters, wet ponds, constructed wetlands, infiltration systems, and emerging technologies such as media filtration<sup>9</sup>

## ■ Environmentally Sensitive Area

An undisturbed or relatively undisturbed site which, because of its natural features, has value to society<sup>10</sup>. (These areas are identified in Policy Number C467, Conservation of Natural Sites in Edmonton's Table Lands.)

## ■ Greenfield

## ■ Guideline

A principle or criterion guiding or directing action.<sup>11</sup>

## ■ Infiltration

The slow passage of a liquid through a filtering medium; "the percolation of rainwater through the soil."<sup>12</sup>

## ■ Inundation

The rising of a body of water and its overflowing onto normally dry land...<sup>13</sup>

## ■ Lot-level

On a particular titled lot.

<sup>6</sup> Urban Stormwater BMP Performance Monitoring, GeoSyntec Consultants Urban Drainage and Flood Control District, Urban Water Resources Research Council of ASCE, and the United States Environmental Protection Agency, EPA-821-B-02-001, April 2002, p10.

<sup>7</sup> 2003 ASCE Report Card on Georgia Infrastructure: Issues Brief 2: Stormwater

<sup>8</sup> [www.stormwatercenter.net/intro\\_glossary.htm](http://www.stormwatercenter.net/intro_glossary.htm)

<sup>9</sup> Washington State Department of Ecology Water Quality Program, Stormwater Management Manual for Western Washington, August 2001, p 1-3

<sup>10</sup> City of Edmonton Policy C467

<sup>11</sup> Barber, Katherine editor, The Canadian Oxford Dictionary, Oxford University Press, Don Mills Ontario, 1998.

<sup>12</sup> <http://dictionary.reference.com/>

<sup>13</sup> <http://dictionary.reference.com/>

■ **Non-Point Source (NPS) Pollution**

NPS pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground; picks up pollutants; and deposits them into rivers, lakes, and coastal waters; or introduces them into ground water. It is simply the broad term referring to the type of pollution that is caused by non-specific sources, including human-made and natural pollutants. By contrast, the direct dumping of chemicals into a water body by a factory would be a specific source for pollution.<sup>14</sup>

■ **On-stream**

Built in the stream bed.

■ **Policy**

A course or principle of action adopted or proposed by a government, party, business, or individual etc. <sup>6</sup>

■ **Pollution Abatement**

The reduction of and/or removal of contaminants prior to entry into the stormwater drainage system.

■ **Pollution Prevention**

The use of processes, practices, materials, and energy that avoid or minimize the creation of pollutants and wastes at source.<sup>15</sup>

■ **Practice**

Performed habitually; carry out in action.<sup>6</sup>

■ **Site-level**

Sub-division or neighborhood level.

■ **Strategy**

- A long-range policy designed for a particular purpose.
- The process of planning something or carrying out a plan in a skilful way.<sup>6</sup>

■ **Storm Drainage System**

City owned facilities for the collection, storage, transportation, and pumping of stormwater and includes pipes, swales, ditches, channels, pipes, and stormwater management facilities.<sup>16</sup>

■ **Stormwater runoff**

That portion of precipitation that does not naturally infiltrate into the landscape but rather travels overland as surface flow.<sup>17</sup>

■ **Stormwater Treatment**

The reduction/ removal of contaminants from stormwater using a combination of structural and non-structural BMPs.

■ **System level**

Multi-site or multi-lot level.

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<sup>14</sup> <http://www.stormwaterauthority.org/glossary.aspx>

<sup>15</sup> Canadian Council of Ministers of the Environment, <http://www.ccme.ca/initiatives/pollution.html>.

<sup>16</sup> Adopted from City of Edmonton Bylaw 9425, Sewers Bylaw, p6 – “sewerage system”.

<sup>17</sup> [www.edc.uri.edu/Eelgrass/300\\_6.pdf](http://www.edc.uri.edu/Eelgrass/300_6.pdf), p 1

**■ Watercourse**

- i. The bed and shore of a river, stream, lake, creek, lagoon, swamp, marsh or other natural body of water, or
- ii. a canal, ditch, reservoir, stormwater management facility or other man-made surface feature, whether it contains or conveys water continuously or intermittently.<sup>18</sup>

**■ Watershed**

A region draining into a river, river system, or other body of water.<sup>19</sup>

**■ Wetlands**

Lands that are seasonally or permanently covered by shallow water as well as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.<sup>20</sup>

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<sup>18</sup> City of Edmonton Bylaw 9675, Sewers Use Bylaw, p11

<sup>19</sup> [http://www.nswa.ab.ca/know\\_your-Watershed/know-main.shtml](http://www.nswa.ab.ca/know_your-Watershed/know-main.shtml)

<sup>20</sup> <http://www.hyperdictionary.com/dictionary>



# Appendices

## Appendix 1— Strategy Development and Guidelines

### Introduction

The quality of stormwater runoff and related pollutant load impacts is an important issue. The City of Edmonton's Approval to Operate the drainage system, as issued by Alberta Environment, requires the City to monitor water quality in storm sewer and snow storage site detention pond discharges, stating that:

*'When stormwater is discharged to a water body, consideration will be given to the development of strategies or options for improving the quality of stormwater and decreasing the impact it may have on receiving water quality.'*<sup>1</sup>

It also requires all municipalities:

*"to develop a stormwater management plan with emphasis on stormwater discharge controls and possible quality management options...."*<sup>2</sup>

The mission of Drainage Services, City of Edmonton Asset Management and Public Works, is to:

*"Mitigate the water quality impacts to the North Saskatchewan River by reducing contaminants in stormwater"*<sup>3</sup>

and

*"To develop a Stormwater Quality Strategy and Action Plan that will enable the City of Edmonton to manage stormwater releases so that the impact is managed and the quality of water in the North Saskatchewan River is protected."*<sup>4</sup>

A stormwater quality strategy is being developed to improve the quality of stormwater and to lessen its impact on the North Saskatchewan River by bringing together creative ideas and innovative approaches to improve Edmonton's stormwater quality. The Stormwater Quality Strategy was initially a project charter that evolved into a lengthy discussion paper and eventually became a series of Drainage Services internal workshops. The result is a position paper that documents current and proposed policies and guidelines for improving stormwater quality.

<sup>1</sup> K. Chinniah, "Municipal Policies and Procedures Manual." Environmental Service. Environmental Science Division, Municipal Program Development Branch, Alberta Environment., p1-1, April 2001.

<sup>2</sup> ibid, p 6-2.

<sup>3</sup> Sawatzky, K. The Underground Connection. Drainage Services. Special Edition, January 2004.

<sup>4</sup> Stormwater Quality Strategy and Action Plan Project Charter. Drainage Services. September 30, 2003

Upon Drainage Services' approval of the Strategy Paper, other City department staff will be consulted and provided with both the Strategy Paper and Position Paper, leading to a formal workshop for City stakeholders. External stakeholders will then be contacted and their feedback solicited prior to formal external stakeholder workshops.

Drainage Services considers the feedback critical to shaping this program and considering funding options for stormwater quality initiatives.

## Background

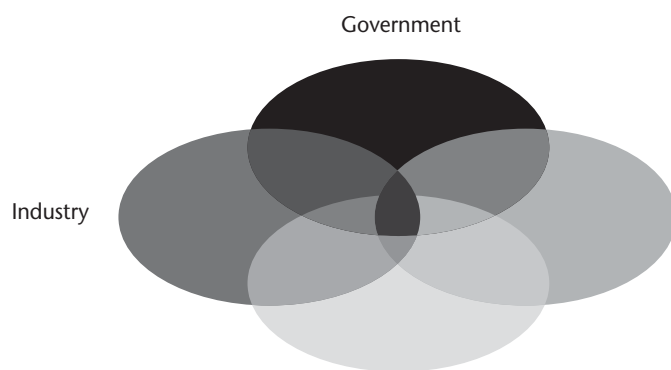
This document is primarily for Drainage Services' staff and is intended to help define the Branch's position on managing stormwater quality. Development of a Stormwater Quality Strategy & Action Plan will help the City to further reduce stormwater impacts on the North Saskatchewan River and ensure that water quality is protected.

There are four primary stakeholders/activities who need to be involved in issues that impact watershed protection. They are:

1. Government: a general category including not only the City of Edmonton and Alberta Environment but also all governing entities in the Edmonton region.
2. Industry: includes all non-residential lands.
3. Public: the landowners and other general public.
4. Land development: includes all new developments and all redevelopments.

These stakeholders are all either responsible for or are directly impacted by these guidelines, some of which may overlap and affect more than one group. The following diagram illustrates the overlapping of the four groups:

## Primary Stakeholders/Activities



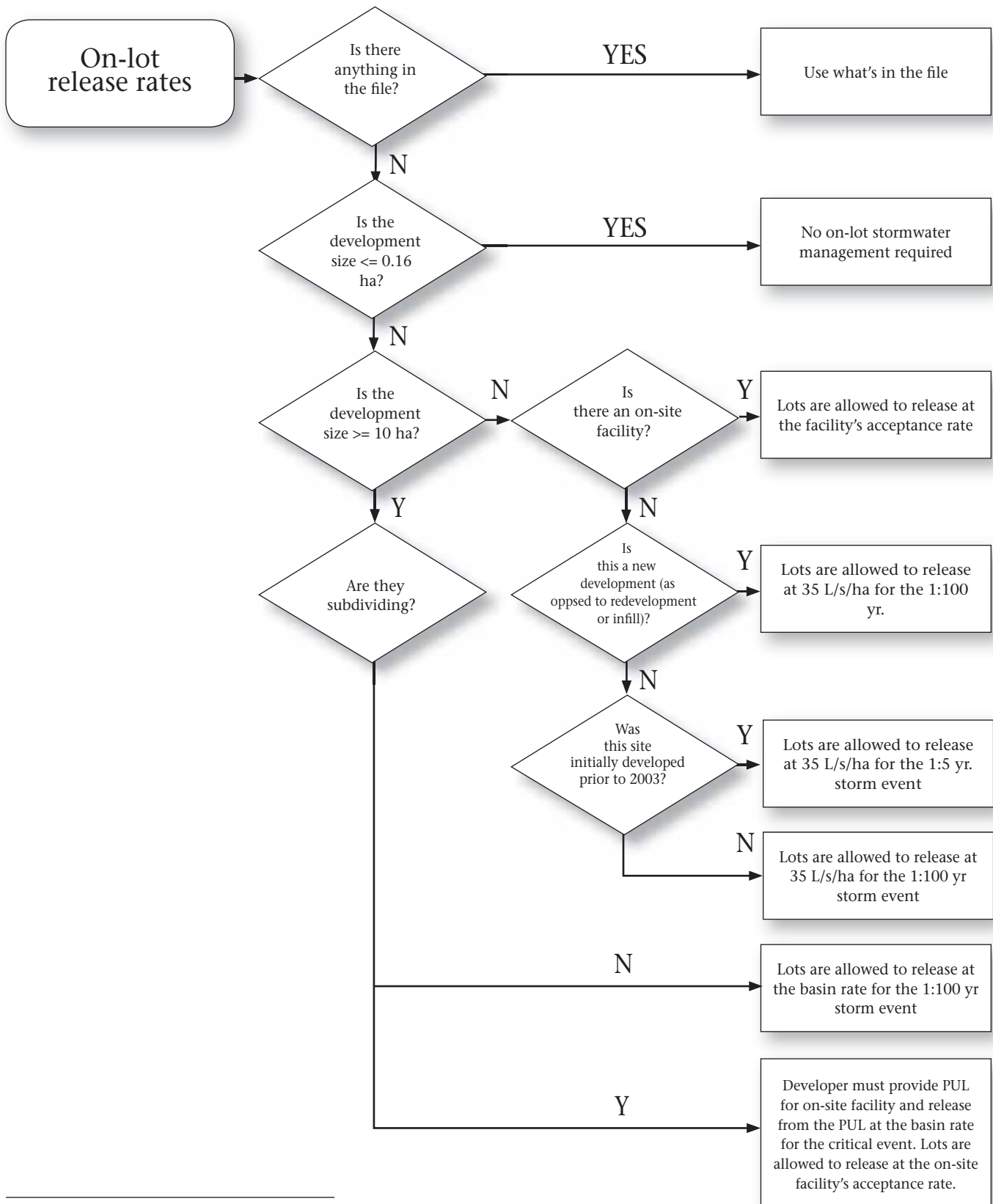
The Guidelines that follow are each placed in one of the four aforementioned stakeholder groups.

Appendix 4 "Current Practice for Stormwater Treatment by Land-Use Type" outlines current expectations for stormwater treatment for new developments, infill and redevelopment of property. Currently there are no requirements for managing stormwater in existing developed areas.

Appendix 5 "Recommended Guidelines for Stormwater Treatment by Land-Use Type" outlines stormwater treatment recommended for different land-use areas to adequately remove constituents to meet the objectives as outlined in this document.

The following flowchart, "Current Practice for On-lot Release Rate" developed by the Land Drainage Servicing Strategy Committee indicates flow restrictions for new developments and redevelopment.



Current Practice for On-lot Release Rate<sup>5</sup><sup>5</sup> Developed by the Land Drainage Servicing Strategy Committee

# Guidelines

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## Guideline 1

**A regional approach encompassing the Metro-Edmonton area will be used by the City to manage stormwater quality.**

### Rationale

Many of the creeks and drainage basins within the City have watershed boundaries extending into surrounding jurisdictions. Conversely, stormwater released into the North Saskatchewan River by the City of Edmonton contains only part of the load of constituents being released into the river from within the area commonly referred to as the Edmonton Region. Alberta Environment's position appears to be that the major contributor within a region has the responsibility for that stretch of river within that region. Alberta Environment has suggested the City of Edmonton lead river water quality studies for the Edmonton region.

In view of Alberta Environment's watershed protection philosophy, the City of Edmonton may well be asked to lead the management of the stormwater quality throughout the region.

### Current Practice

There is no current practice. The City manages only the stormwater runoff generated within the City.

## Proposed Implementation Plan

### Criteria

- Examine all impacts on water quality in the North Saskatchewan River from within city boundaries as well as from downstream industry.
- Determine the level of chemical constituents in the river and the degree to which aquatic and benthic organisms are impacted.
- Manage stormwater quality throughout the Edmonton, starting with new developments and areas being redeveloped.
- Implement the plan at the area planning stage.
- Establish a vegetative management plan for wetlands.
- Examine costs to the Corporation for ongoing implementation.

## Impact

- Undertake a joint municipal/industry study. This is a regional approach requirement that will cost approximately \$500,000 in addition to costs associated with the Approval to Operate.
- Minimize the impact of stormwater entering the North Saskatchewan River from the City of Edmonton and protect the quality of the water in the North Saskatchewan River.
- Provide a framework for establishing consistent development guidelines within the region.

## Guideline 2

### New DGR/DTR Construction

**Storm runoff from new Dangerous Goods Routes (DGRs) and Designated Truck Routes (DTRs) in areas near environmentally sensitive zones (natural wetland, creek, river, etc.) will be conveyed through a constructed BMP (oil/grit separator, wet pond, etc.) prior to release to a receiving watercourse. Where a DGR crosses a watercourse, surface drainage from the bridge deck and roadway approaches will receive treatment in a constructed BMP that also provides for spill containment control.**

### DGR Redevelopment

**When existing Dangerous Goods Routes (DGRs) are redeveloped in areas near environmentally sensitive zones (wetland, creek, river, etc.), storm runoff will be conveyed through a constructed BMP (oil/grit separator, wet pond, etc.) prior to being released into a receiving watercourse. Where a DGR crosses a watercourse, surface drainage from the bridge deck and roadway approaches will receive treatment in a constructed BMP that also provides spill containment.**

## Rationale

Runoff from DGRs and DTRs may contain substances detrimental to the water quality of receiving watercourses and not applicable for treatment in the same Stormwater Management Facilities (SWMFs) as runoff from the surrounding area. This will facilitate the containment, treatment and clean up of spills on DGRs. The management concept is to control spills as close as practical to the spill location.

## Current Practice

There is no consistent practice for BMPs regarding DGRs and DTRs.

## Proposed Implementation Plan

### Criteria

- DTRs and DGRs are those defined in the current edition of the City of Edmonton Truck Route Map.
- For new and redeveloped DTRs, stormwater runoff shall be treated using a constructed BMP prior to release to the receiving watercourse.
- For new and redeveloped DGRs (not applicable to DTRs), a constructed BMP that provides an acceptable level of spill containment shall be used for runoff from bridge decks and roadway approaches at river and creek watercourse crossings.
- Constructed BMPs such as oil/grit separators will be designed such that runoff due to a one in six (6) months rainfall (or alternative approved flow-rate based design criteria) receives treatment.

### Impact

- Roadways designated as DGRs and DTRs will require additional land.
- Cost of DGR and DTR roadways will increase due to the cost of conveying runoff to appropriate treatment and/or spill control BMPs. This may also impact arterial roadway assessment in DGR and DTR roadways.
- Significant cost increases will arise in addressing direct-discharge of runoff from DGR bridge crossings to the river during rehabilitation.

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## Guideline 3

### New Construction

**Public Storm Water Management facilities will be designed to improve stormwater runoff quality to the maximum extent practical.**

### Redevelopment

**Where it is cost-effective, existing public Storm Water Management facilities will be redesigned to improve stormwater runoff quality to the maximum extent practical.**

### Rationale

Reduce the contaminants in stormwater entering the NSR to the maximum practical extent. Land development means increases stormwater flow reaching the North Saskatchewan River. The flow picks up contaminants that degrade water quality. Pollution prevention practices do not sufficiently reduce these contaminants; therefore effective treatment systems are required to minimize loadings and impacts to the river. Some existing SWM facilities (e.g. dry ponds) require redesign to reduce stormwater contaminants to the maximum extent practical.

## Current Practice

Current practices focus on storage volume. Water quality is a secondary benefit.

## Proposed Implementation Plan

### Criteria

This Guideline applies to greenfield development but may be applied to developed community storm system retrofits.

- The facilities shall be designed for sufficient storage volume and enhanced hydraulic residence time.
- The facility should have naturalized features using the 'biological mimicry' principal.
- The facility should incorporate the best stormwater treatment method.
- Constructed treatment types ranked in (tentative) order of preference are:
  1. Constructed wetlands,
  2. Naturalized wet ponds,
  3. Wet ponds, then
  4. Oil/grit separators.
- Other technologies such as grassed swales and catch basin (CB) filter inserts may be acceptable, following further study, to address operational and maintenance concerns.

### Impact

- Higher capital costs.
- Potential for higher operational costs.
- Improved quality of stormwater entering the North Saskatchewan River.
- Wetland versus wet pond land requirements.

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## Guideline 4

**All City operated snow storage sites require permanent facilities for on-site treatment to control settleable and floatable materials prior to discharge into the stormwater drainage system or receiving watercourses.**

### Rationale

Melt from snow storage sites contains significant constituents such as settleable and floatable solids, chlorides from road salt, petroleum products, and heavy metals. On-site Best Practical Technology for treatment of snowmelt targets settleable and floatable materials, and will remove only a small portion of the petroleum and heavy metal constituents. The City of Edmonton becomes responsible for the release of constituents if the melt water from the site is not treated.

## Current Practice

The Transportation Branch is currently designing additional permanent snow storage sites to control settleable and floatable materials.

## Proposed Implementation Plan

### Criteria

- This Guideline does not include on-lot snow storage (i.e. private property such as parking lots).
- By 2015 Transportation and Streets should have only permanent storage sites for snow storage.
- By 2015 commercial snow storage sites will be permanent locations.
- Each snow storage site will include a structural BMP able to treat the melt being released from the site, meeting standards acceptable to the City of Edmonton.
- All new snow storage sites will have on-site ground water monitoring wells.

### Impact

- No major impact on Asset Management and Public Works.
- No unplanned impact on Transportation and Streets.
- Commercial snow storage to be impacted.
- Reduced pollutants in runoff from snow storage sites draining to the stormwater system.

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## Guideline 5

**To reduce the volume of stormwater discharged off-lot, the City of Edmonton shall encourage on-lot storage and infiltration of precipitation.**

## Rationale

Increasing development means increased impervious surfaces, reduced infiltration of stormwater and snow melt and increased runoff to storm sewers and watercourses. This runoff picks up pollutants and causes further reduction in the water quality of the receiving stream. On-lot storage and infiltration will reduce the runoff and ensuing pollution in the receiving water, reduce erosion and encourage growth of vegetation by putting water back into the sub-surface soil.

## Current Practice

Currently, infiltration of stormwater runoff is not encouraged.

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## Proposed Implementation Plan

### Criteria

- In new developments, encourage the use of alternate drainage designs to reduce off-site volume discharged on public lands.
- Stormwater containing hazardous substances should not be infiltrated on site. This will avoid groundwater contamination.
- Encourage the use of pervious surfaces in development/redevelopment areas, and establish requirements for the use of porous material for driveways, walkways, parking lots, and patios.
- Roof top storage may be allowed only in redevelopment where other options are not available and where flow control is feasible.
- Roof top storage/parking lot storage should be allowed where appropriate.
- Annual reporting is required where roof top storage is utilized.
- For new buildings and major building retrofits, a grading and drainage plan that includes first floor finished elevation shall be submitted.
- Lot design shall include consideration of source control BMPs.
- Lots near ravines are excluded from on-lot infiltration and parking lot porosity unless proven to be stable and acceptable for stormwater infiltration purposes. This will be determined through geotechnical assessment.

### Impact

- Reduced pollutant loading to the stormwater drainage system.
- Improved aesthetics.
- Increased maintenance costs.
- Increased monitoring of commercial/industrial establishments and associated record keeping.
- Land cost issues due to additional area required for infiltration.
- Due to increased lot size to accommodate infiltration, there will be fewer homes built per hectare.
- Reduced profits for developers.
- Potentially significant costs to home/lot owners.
- Reduced street flooding.

## Guideline 6

**To support existing aquatic life and maintain the natural treatment function in watercourses, the City shall encourage watercourse stabilization through the use of natural restorative methods.**

### Rationale

Ecosystems in watercourses are changed by erosion due to increased runoff from developed land. Natural restorative methods better maintain the original ecosystem watercourse.

### Current Practice

No current practice.

## Proposed Implementation Plan

### Criteria

- Applies to existing natural features in major creek watercourses.
- Restoration activity within creek reaches as part of watercourse stabilization, as needed.

### Impact

- Reduced erosion.
- Improved quality of stormwater runoff.
- Aquatic habitat maintained.
- Watercourse stabilization may result in outfall redesign and retrofit.

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## Guideline 7

**For public lands, stormwater contamination will be minimized through pollution abatement practices and optimized treatment through the effective use of structural BMPs.**

### Rationale

Pollution abatement plans will not sufficiently reduce contaminants. Proven BMPs will be more cost effective for keeping contaminants out of the system rather than removing them once they are in.

### Current Practice

There has been some incremental progress toward implementing this guideline.



## Proposed Implementation Plan

### Criteria

BMPs will be instituted for the following areas:

- Street sweeping;
- Use of road salt;
- Pet excrement control;
- Disposal of captured contaminants in CB filters;
- Disposal of sludge from CBs, wet ponds, and wetlands;
- Retention of runoff from storms of less than 5mm precipitation;
- Spill containment;
- Inter-connection remediation;
- Street washing;
- Water line flushing for fire hydrants; and
- Use of fertilizers and pesticides by City staff on City property.

### Impact

- The City may require pollution prevention (P2) planning.

---

## Guideline 8

**The City will encourage industry to minimize stormwater contamination through pollution prevention (P2) practices, and optimize treatment through the effective use of structural BMPs.**

### Rationale

It is far more cost effective to keep contaminants out of the system by use of proven BMPs, than to remove them once they are in the system.

### Current Practice

No current practice.

## Proposed Implementation Plan

### Criteria

Industries will be expected to develop/install site-specific BMPs such as:

- On-site treatment for stormwater;
- Disposal of contaminants captured in privately owned/operated CB filters;
- Disposal of sludge from CBs, wet ponds and wetlands;
- Retention of runoff from storms of less than 5 mm precipitation;
- Spill containment; and
- On-lot/on-site infiltration.

## Impact

- Increased cost to industry.
- Industry monitoring and reporting of on-site stormwater runoff quality prior to releasing stormwater into the City stormwater system.

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## Guideline 9

**The City will initiate new public education campaigns on:**

- 1. Improving the quality of stormwater runoff from individual lots;**
- 2. The purpose of stormwater management facilities; and**
- 3. Potential safety issues such as boating and skating on wetlands and wet ponds.**

## Rationale

Public education and public involvement have ripple effects that enhance City efforts to improve water quality.

The public should be educated and encouraged in:

- Knowledgeable use of fertilizer and pesticides;
- Reduction in soil erosion;
- Reduction in runoff from vehicle washing;
- Responsible lawn watering;
- On-lot storage and infiltration; and
- Dealing with ice formation during winter melt conditions.

The public also needs to be aware of:

- The purpose of stormwater management facilities around their area; and
- Safety around the ponds and wetlands.

## Current Practice

At present, there is no public outreach program.

City staff is knowledgeable in appropriately applying pesticides and fertilizers to public lands.

## Proposed Implementation Plan

### Criteria

- The City shall encourage, through targeted education programs, the reduced use of fertilizers and pesticides on private property.
- The City remains committed to monitor pesticides and sediment movement in the watershed.
- Drainage Services will actively support and participate in Corporate Services' proposed Pesticide Public Awareness Program when it becomes available.

- Drainage Services and Community Services shall jointly implement public relations and community communications initiatives to explain the purpose of stormwater management facilities and safety measures around these facilities.
- City staff involved in the implementation of the Strategy shall acquire knowledge/education on various programs to reduce stormwater contaminants prior to educating residents.

## Impact

A more knowledgeable public:

- Will reduce contaminants entering the stormwater drainage system;
- Appreciate and help protect the integrity of our stormwater management facilities; and
- Acquire public safety awareness around stormwater management facilities.

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## Guideline 10

**Stormwater runoff from new developments and land being redeveloped shall receive an acceptable level of treatment prior to discharge into the stormwater drainage system or the receiving watercourse.**

## Rationale

The objective is to reduce the stormwater contaminants entering the North Saskatchewan River to the maximum practical extent. Land development results in an increased stormwater flow picking up further contaminants that degrade stormwater. Industrial/commercial pollution prevention (P2) practices are not sufficient. Therefore, effective treatment systems are required to minimize loading and impact to the river.

## Current Practice

There are current practices for new development areas.

There are currently no practices for areas being retrofitted or redeveloped.

## Proposed Implementation Plan

### Criteria

- Acceptable level of treatment is defined as:
  - At least 85% removal (by mass) of suspended solids  $\geq 75 \mu\text{m}$  particle size,
  - Complying with Sewers Use Bylaw No. 9675 Schedule C requirements,
  - Complying with relevant City-approved BMP codes of practice.
- Different land uses have separate stormwater management systems;
- For Commercial and Industrial lots  $>0.16 \text{ ha}$ , stormwater treatment is required on-site, prior to release into the stormwater system;

- In new areas system-level SWM facilities (wet ponds and wetlands) shall be constructed outside of existing creek watercourses (i.e. off-line);
- In existing developed areas the construction of wet SWM facilities within creek watercourses will be discouraged;
- When site considerations preclude the use of wet ponds and/or wetlands, oil/grit separators are acceptable if appropriately designed and constructed;
- For street-level BMPs such as oil/grit separators an off-line design is preferred rather than an in-line system. For newly asphalted roadway surfaces, BMPs (oil/grit separators) should be used to capture hydrocarbon-based products from stormwater runoff prior to release into the stormwater system;
- For Greenfield development, fewer and larger wetlands are preferred over numerous, smaller constructed wetlands;
- Appropriate design of structured BMPs should retain accumulated sediment;
- Constructed wetlands shall be designed to ensure optimum retention time;
- Residential redevelopment (Zones RF1 – RF4) is exempt from this guideline for areas less than 1 ha in size; and
- Redevelopment of a lot to a commercial or industrial site shall be subject to this guideline.

### Impact

- Criteria above be considered during the land development permitting process.
- Higher property redevelopment cost.

---

## Guideline 11

**Existing natural wetlands in urban areas should be integrated, wherever feasible, with the drainage system to provide stormwater runoff treatment so that natural site features are retained and negative impacts to wetland functionality are mitigated.**

### Rationale

Planning and Development requires that natural wetlands in urban areas be saved wherever possible. From Drainage Services' perspective, the benefit in retaining natural wetlands for stormwater treatment is that they are at least as effective in removing contaminants as constructed systems. Natural wetlands, whenever possible, shall be integrated into the storm drainage system. Integration makes sense when all surrounding lands are to be developed, resulting in complete alterations to the predevelopment system. Implementation of this guideline will mean that existing natural features are retained, rather than risking their loss requiring subsequent man-made wetland facilities in the same locale.

## Current Practice

There is no current practice, although it is under review.

## Proposed Implementation Plan

### Criteria

- All wetlands are part of the stormwater drainage system.
- The guideline applies to wetlands that currently receive run-off from a site to be developed.
- The wetland's drainage basin shall not be enlarged.
- An existing wetland shall not be materially altered except to enhance its capability to handle increased flow and sediment transfer from its existing drainage basin.
- Design shall include a pretreatment facility to mitigate impacts and protect existing urban wetlands.

### Impact

- The natural system will be impacted to some extent but will be largely preserved.
- There will be positive impacts of conservation within the urban area.
- Drainage Services will play an increased role in identifying and managing wetlands.
- Operational costs for sediment removal from sediment forebays are expected as will be the case with wet ponds.

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## Guideline 12

**The City will require treatment of stormwater runoff from parking lots at commercial establishments.**

## Rationale

Research has shown that runoff from parking lots of commercial establishments is one of the biggest contributors of contaminants per square meter to stormwater. This is due primarily to the high turnover of vehicles using a parking lot at a commercial establishment compared to industrial, institutional or residential parking lots. The pollution load is due to dripping from warm vehicles and the startup of these vehicles.

## Current Practice

There is no current practice.

## Proposed Implementation Plan

### Criteria

- This guideline applies to establishments in land use zones CHY, CSC, CNC, CB1, CB2, CO, DC1 and DC2. (See page 72)
- Parking lots of commercial establishments with less than 50 (tentative) stalls may be exempt from this guideline.
- BMP treatment shall remove pollutants to below the levels set in Schedule C of the Sewers Use Bylaw or to the satisfaction of the City.

### Impact

- Additional costs in the design and construction of parking lots of larger commercial establishments.
- Higher work load for Source Control Inspectors.
- Revised codes of practice and revised bylaws

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## Guideline 13

**City ownership of Stormwater Management Facilities (SWM) shall include one hundred percent (100%) of the site up to and including the high water level, for constructed wetlands, and dry ponds. Up to 50% of the shoreline perimeter of wet ponds may be privately owned.**

### Rationale

One-hundred percent ownership of the site by the City is required in order to maintain the sensitive vegetation within and around wetlands and to ensure the ability of the system to sustain appropriate vegetation under private ownership.

The City requires 100% ownership of these sites for public safety. The sites do not have permanent wet areas, and public safety could be jeopardized during inundation.

For wet ponds, where sensitive vegetation does not exist and where available storage will not be jeopardized, some private ownership of the shoreline can be accommodated.

The province has ownership of natural wetland beds and shorelines.

### Current Practice

This is current practice.

## Proposed Implementation Plan

### Criteria

- Land requirements are stated in the Design and Construction Standards Manual.
- Adherence to the Fifty Percent Shoreline Policy must be maintained.

### Impact

- As this is an existing policy, there are no new impacts.

---

## Guideline 14

**Design for existing areas being retrofitted to improve flood protection level of service will include opportunities for stormwater quality improvement.**

## Rationale

Retrofit designs that include quality improvement considerations, in addition to flow control can be cost effective in minimizing loadings, thereby minimizing impacts to the river.

## Current Practice

There is no current practice.

## Proposed Implementation Plan

### Criteria

- The facilities shall be designed for sufficient storage volume and increased hydraulic residence time.
- The facilities should have naturalized features incorporating the 'biological mimicry' principal.
- The facilities should incorporate the treatment method that will achieve the best results in treatment of the stormwater.

### Impact

- Improved stormwater quality.

## Appendix 2— Stormwater Contributors to the North Saskatchewan River in the Metro-Edmonton Region

### Sub-Watersheds<sup>28</sup>

#### Strawberry:

Within the sub-watershed are several lesser creeks that drain to the North Saskatchewan River:

- Whitemud Creek,
- 2 minor, unnamed tributaries draining into the river from lands to the south of the river, and
- 3 minor, unnamed tributaries draining into the river from lands to the north of the river.

#### Beaverhill:

##### South Shore:

- Mill Creek;
- Fulton Creek;
- Old Man Creek;
- Point-aux-Pins Creek; and
- Ross Creek.

##### North Shore:

- Horsehills Creek; and
- Unnamed tributaries 1, 2, and 3.

### Municipalities and Settlements Areas:

#### Strawberry:

- Devon;
- County 31 Parkland;
- Stony Plain Indian Reserve 135;
- Leduc;
- County 25 Leduc;
- Kavanagh;
- Nisku;
- Beaumont;
- Rolly View;
- Looma;
- New Sarepta; and
- Edmonton.

#### Beaverhill:

- Edmonton;
- Sherwood Park;
- County 20 Strathcona County;
- County 22 Camrose;
- County 9 Beaver;
- Half-Moon Lake;
- South Cooking Lake;
- North Cooking Lake;
- Ardrossan;
- Antler Lake;
- Fort Saskatchewan; and
- Josephberg.

#### Industries:

- International Airport;
- AltaSteel Ltd.;
- B.F. Goodrich;
- BP Chevron;
- Celanese Canada Inc.;
- Degissa Gibbons;
- Dow Chemical Canada Inc.;
- EPCOR;
- Geon Canada Inc.;
- Imperial Oil Products Division;
- Oxyvinyls;
- PetroCan Refinery;
- Shell Canada; and
- Sherritt Agrium Westain.

<sup>28</sup> North Saskatchewan Watershed Alliance: The Alliance has determined the boundaries of each sub-watershed and named in after the “highest order tributary” in the sub-watershed,



## Appendix 3 — Stormwater Quality Control Initiatives

Improvement Concept	Improvement Initiatives	Primary Stakeholders	Secondary Stakeholders	Focus
<b>A) Optimization of Municipal Operations</b>	1) Regional Approach to Stormwater Quality Management	Government	-	Greenfield development, in-fill and redevelopment
	2) Treatment of Runoff/Spills from Dangerous Goods Route and Designated Truck Routes	Government	Industry and Land Developers	Retrofit existing when redeveloping and in-filling
	3) Snow Storage Site Requirements	Government	Industry Public	Retrofit existing when redeveloped
	4) Watercourse Stabilization/Restoration	Government	-	Retrofit existing
<b>B) Land Development Servicing Requirements</b>	5) Structural Best Management Practices for Public Lands	Government	Public	Retrofit existing
	6) Stormwater Management Facility Design and Operations	Land Developers	Government	Greenfield development, in-fill and redevelopment
	7) On-site Best Management Practices: During and Post-Construction	Land Developers	Government and Industry	Greenfield development, in-fill and redevelopment
	8) Preservation of Naturalized Wetlands	Land Developers	Government and Industry	Greenfield development, in-fill and redevelopment
	9) Shoreline Ownership of Stormwater Management Facilities	Land Developers	Government and Public	Greenfield development
	10) Stormwater Management Facility Redevelopment	Land Developers	Government	Redevelopment and in-fill
<b>C) Street and Lot-level Initiatives for Residential and Non-residential Property</b>	11) Street and Lot-level Storage and Infiltration	Land Developers	Public, Industry and Government	Greenfield development, redevelopment and in-fill
	12) Structural Best Management Practices for Industry	Industry	Government and Land Developers	Redevelopment and in-fill
	13) Public Outreach	Public	Government	Retrofit exist
	14) Commercial Parking Lot Stormwater Quality Controls	Industry	Government and Land Developers	Greenfield development, redevelopment and in-fill

## Appendix 4 — Current Practice for Stormwater Treatment by Land-Use Type

Land Use	Residential	Institutional & Commercial	Commercial Sites with $\geq 50$ Parking Stalls	Industrial	DTRs & DGRs
<b>New Development</b>	Encourage On-lot Stormwater retention plus On-site wet SWMF	On-lot/On-site BMP with downstream wet SWMF	No requirement	On-site CBMP with flow to a downstream regional wet SWMF	*
<b>Redevelopment and Infill</b>	Where no filed agreement, oil/grit separator recommended	No requirement	No requirement	Compliance with Sewer Use Bylaw with flow to downstream wet SWMF	
<b>Existing</b>	No requirement	No requirement	No requirement	No requirement	No requirement

Note: Whenever the opportunity arises, the stormwater leaving a BMP is to be routed through a Wet SWMF.

### Definitions:

**DTR:** Designated Truck Route;

**DGR:** Dangerous Goods Route;

**On-lot:** Within the boundary of the individual titled lot;

**On-Site:** Within the boundary of one development;

**SWMF:** Storm Water Management Facility;

**BMP:** Best Management Practice;

**CBMP:** Constructed BMP specifically designed to remove contaminants expected from that industry;

**Wet SWMF:** A Constructed Wetland or Naturalized Wet Pond;

\*A BMP designed to treat hydrocarbons in stormwater prior to flowing into a storm sewer or local wet SWMF;

### Land Use Zones:\*

**Residential:** RF1, RSL, RF2, RPL, RF3, RF4, RF5, RF6, RA7, and RMH.

**Institutional:** US, A, AJ, AN and AP.

**Commercial:** PU, RA8, RA9, CNC, CSC, CB1, CB2, CHY and CO.

**Industrial:** MA, I, IB, IM, IH and IS.

**Zones DC1 & DC2:** Uncertain about the treatment required in these zones.

\*[www.edmonton.ca/infraplan/zoningByLaw/ByLaw\\_12800.htm](http://www.edmonton.ca/infraplan/zoningByLaw/ByLaw_12800.htm)

## Appendix 5 — Recommended Guidelines for Stormwater Treatment by Land-Use Type

Land Use	Residential	Institutional & Commercial	Commercial Sites with ≥ 50 Parking Stalls	Industrial	DTRs & DGRs
<b>New Development</b>	Encourage On-lot Stormwater retention plus On-site wet SWMF	Encourage On-lot Stormwater retention plus On-lot/On-site BMP with downstream wet SWMF	On-lot/On-site CBMP with downstream wet SWMF.	On-lot/On-site CBMP with downstream wet SWMF	*,†
<b>Redevelopment and Infill</b>	Encourage On-lot Stormwater retention plus BMP	Encourage On-lot Stormwater retention plus On-lot BMP	On-lot CBMP	On-lot CBMP with downstream wet SWMF	
<b>Existing Development</b>	Encourage On-lot Stormwater retention plus ‡BMP	Private ownership/operation of BMP	Private ownership/operation of BMP	Private ownership/operation of BMP and/or On-lot CBMP	* following resurfaced

Note: Whenever the opportunity arises, the stormwater leaving a BMP is to be routed through a wet SWMF.

### Definitions:

**DTR:** Designated Truck Route;

**DGR:** Dangerous Goods Route;

**On-lot:** Within the boundary of the individual titled lot;

**On-Site:** Within the boundary of one development;

**SWMF:** Storm Water Management Facility;

**BMP:** Best Management Practice;

**CBMP:** Constructed BMP specifically designed to remove contaminants expected from that industry;

**wet SWMF:** A Constructed Wetland or Naturalized Wet Pond;

**\*:** For routine stormwater, runoff from DTRs and DGRs must be conveyed through a constructed BMP prior to release to a receiving watercourse.

**†:** Where a DGR crosses a watercourse the drainage from between the adjacent sub-catchments shall flow into a swmf that includes a BMP designed specifically for spill containment prior to release.

**‡:** City's responsibility to construct and maintain where retrofitting is warranted.

### Land Use Zones:

**Residential:** RF1, RSL, RF2, RPL, RF3, RF4, RF5, RF6, RA7, and RMH.

**Institutional:** US, A, AJ, AN and AP.

**Commercial:** PU, RA8, RA9, CNC, CSC, CB1, CB2, CHY and CO.

**Industrial:** MA, I, IB, IM, IH and IS.

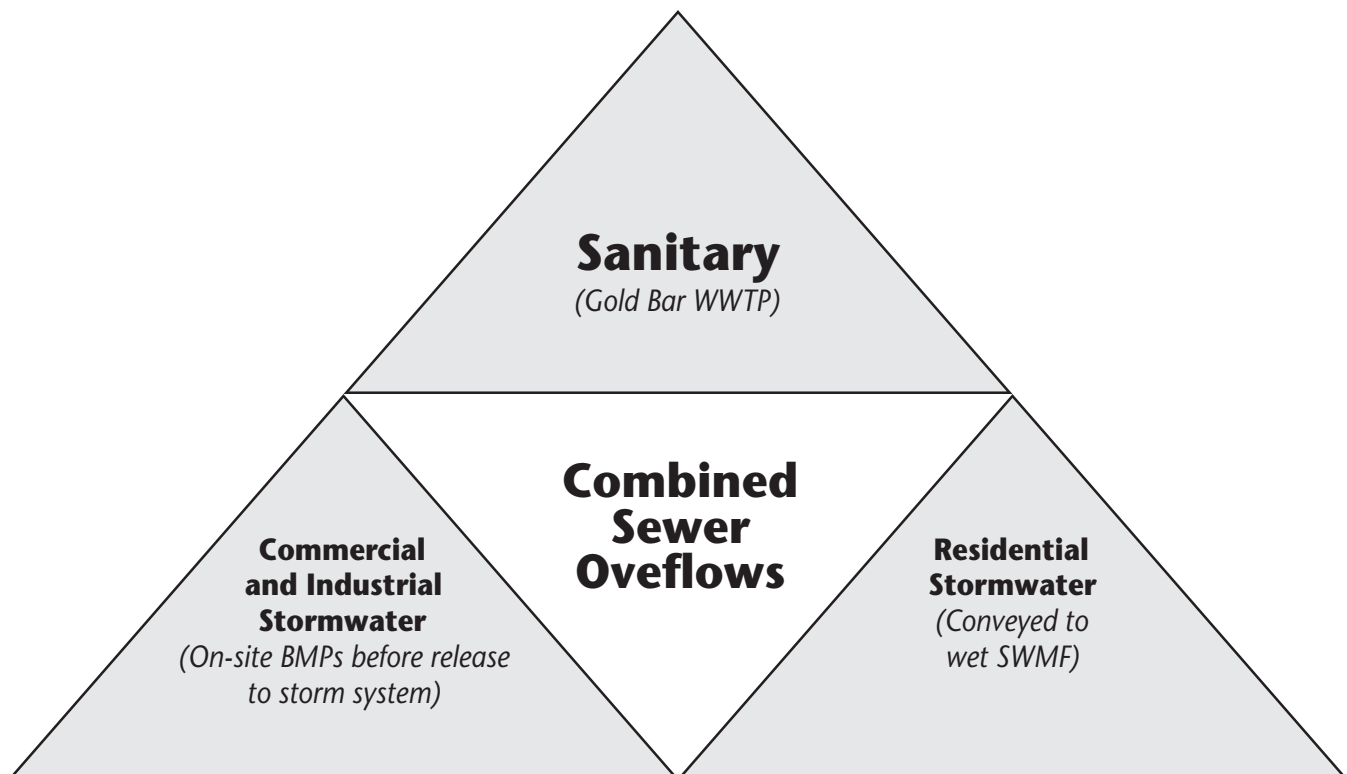
**Zones DC1 & DC2:** will be treated as Industrial Zones unless the developer has a firm Land Use Plan.

## Appendix 6 — Stormwater Management Facilities: Release Rates\*

Development Area	Residential	Non-Residential
< 0.2 ha	n.a.	n.a.
0.2 – 10.0 ha		On lot (35 L/ s per ha)
> 10.0 ha		PUL (35 L/s per ha)

\* From the Land (Stormwater) Drainage Servicing Strategy

## Contaminant Loads Sources and Treatment



## Appendix 7 — Executive Summary

### North Saskatchewan River Impact Study: Development of Total Loading Management Objectives for The City of Edmonton

In June 2005, the City of Edmonton received its new Approval to Operate license issued by Alberta Environment which is effective from June 2005 to May 2015. As required, the City of Edmonton Drainage Services employed Golder Associates Ltd. to conduct a detailed river impact modeling study. The results from this study are to be used to develop the total management objectives for the City of Edmonton. Below is the executive summary of the study.

#### Background

In 1995, the City of Edmonton was issued Approval to Operate under the Alberta Environmental Protection and Enhancement Act allowing for the continued release of storm water runoff and treated municipal effluent to the North Saskatchewan River (Approval #95-MUN-114). A condition of the approval, which has been refined and clarified in subsequent communications, specified that the City of Edmonton must develop a total loading management plan for the following core loading parameters:

- total suspended solids (TSS);
- nitrogen [ammonia and nitrate];
- phosphorus;
- fecal coliforms; and
- carbonaceous biochemical oxygen demand (CBOD).

Approval Condition 5.2.1 also specifies that the total loading management plan must address inputs from the City of Edmonton's storm sewers, combined sewer outflows (CSOs) and Gold Bar Wastewater Treatment Plant (WWTP), to protect water quality in the North Saskatchewan River. Key points include the protection of aquatic life within the river, maintaining its recreational value and safeguarding the health of human users. The list of loading parameters considered in the total loading management plan was to be extended as required to include any metal and organic compounds that may also be of concern.

The City of Edmonton retained Golder Associates Ltd. to undertake the North Saskatchewan River Impact Study in response to this condition. The primary study objective was to develop total loading management objectives for each of the key parameters. These objectives can then be used by the City of Edmonton to help formulate the total loading management plan.

#### Approach

A five-step process was adopted to facilitate the development of the total loading management objectives. The first step identified key pathways by which loading from the City of Edmonton can influence water quality, and

then examined available metal and organic data to identify compounds of potential concern. A predictive computer model was then constructed to include all of the key pathways, so that it could predict how water quality in the North Saskatchewan River responds to the release of materials. The model, referred to as the North Saskatchewan River Water Quality Model (NSRWQM), simulates concentrations of TSS, fecal coliforms, CBOD, phosphorus, nitrate, ammonia and dissolved oxygen, as well as the density of aquatic vegetation, in the river from the Town of Devon to the Town of Pakan. The 162 km model reach includes the City of Edmonton, the Capital Region Wastewater Treatment Plant and a series of industrial dischargers located downstream from the City of Edmonton. Metal and organic compounds were not included in the model because results of the data screening exercise indicated that total loading management objectives are not required, or cannot currently be developed, for either metals or organics.

The third step in the development process defined broad goals for the river system, such as protecting river aquatic life, maintaining the river's recreational value and safeguarding downstream water use. The fourth step involved taking the most restrictive goals and translating them into specific in-stream thresholds. The most restrictive loading parameter was the protection of aquatic life, with the exception of fecal coliforms. The associated thresholds represent concentrations above which or, in the case of dissolved oxygen, below which detrimental effects to aquatic organisms or human health are expected to occur. For fecal coliforms, the most restrictive goal was the protection of human health, and the associated threshold represents a concentration above which recreational use of the North Saskatchewan River become impaired. All thresholds were developed using existing water quality guidelines and data from relevant toxicological literature.

Finally, the total loading management objectives themselves were defined by using the North Saskatchewan River Water Quality Model in combination with the in-stream thresholds to define the maximum amount of material that can be released without detrimentally affecting the health of aquatic life or impairing recreational use of the river.

## Summary of Key Findings

The North Saskatchewan River Water Quality Model was successfully developed, calibrated and validated. It was an effective tool for linking loading to in-stream water quality. Calibrated parameters included TSS, fecal coliforms, ammonia, nitrate, phosphorus, CBOD, water temperature, phytoplankton and benthic algae. Results of the validation show the model to be sufficiently accurate for establishing total loading management objectives for the City of Edmonton.

In-stream thresholds for TSS, ammonia, fecal coliforms and dissolved oxygen were developed from existing water quality guidelines and data contained in relevant toxicological literature. The thresholds are based on “no observed” or “lowest observed” effects levels, and are protective of aquatic biota in and human users of the North Saskatchewan River. They determine how much material could be discharged into the river without detrimentally affecting its aquatic ecosystem or recreational value.

In 2004, average TSS loading rates within the study area were expected to be below the proposed management objective of 37,156 kg/day. As the Edmonton continues to grow and expand, TSS loading rates will likely exceed

the TSS objective. Additional treatment systems or treatment technology will be required to maintain compliance with future TSS objectives. The most effective means of controlling TSS loading appears to be through the treatment of storm water runoff.

A numerical total loading management objective was not developed for fecal coliforms, because further work is required to define a threshold that protects human health and is achievable. It is likely that a reduction in current fecal coliform loading rates will be required to comply with the revised thresholds. The most effective means of achieving the required reductions may be through the implementation of UV disinfection at the Capital Region Wastewater Treatment Plant, as well as treatment of the Gold Bar Wastewater Treatment Plant secondary and total plant bypass flows. Storm sewer and CSO improvements are also likely to be effective.

Numerical water quality-based objectives were not developed for phosphorus, nitrogen (i.e., ammonia and nitrate acting as nutrients), ammonia (acting as a toxicant) or CBOD. Once biological nutrient removal (BNR) technology is introduced at the Capital Region treatment plant, dissolved oxygen levels in the NSR will likely comply with in-stream thresholds over the next 10 years, provided that performance at the Capital Region plant is comparable to Gold Bar. Similarly, predictive modeling indicates that ammonia concentrations in the North Saskatchewan immediately downstream of the Gold Bar and Capital Region plants currently comply with in-stream thresholds. Compliance will continue over the next 10 years, provided that BNR technology is implemented at the Capital Region treatment plant and that it performs as well as Gold Bar. Therefore the City of Edmonton and other dischargers located within the study area should apply best management practices and use technology-based performance limits, such as those outlined by Alberta Environment (AEP 1997b), to control nutrient, ammonia and CBOD loading to the North Saskatchewan River.

As previously noted, total loading management objectives are not required, or cannot be developed at this time, for either metals or organics. Further sampling of input water quality, including storm sewer and CSO inflows, would be required to support such an endeavor. Metals, rather than organics, should be the focus of future sampling programs, since concentrations of organics compounds have typically been below analytical detection limits. Aluminum should be included in the metals analysis, since concentrations of total aluminum appear to increase in the river as it passes through the Edmonton. It would be beneficial to analyze both total and dissolved aluminum to assess total loading rates and bioavailability.

## Recommendations

Recommendations were developed and grouped into three categories:

- Loading management;
- Enhancement and further validation of the North Saskatchewan River Water Quality Model; and
- Ongoing monitoring to assess compliance with in-stream thresholds developed as part of this study.

A complete list of all 19 recommendations is provided in Section 8 of the final report.