Best Management Practices for Stormwater Management Facilities

Strathcona County

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Executive Summary

Strathcona County is located within the North Saskatchewan Watershed, which begins in the Columbia Ice Fields in Banff National Park and extends through central Alberta and Saskatchewan, and ends where the North Saskatchewan and South Saskatchewan Rivers join east of Prince Albert, Saskatchewan.

It is important that Strathcona County partner with other municipalities, organizations and the province in order to be involved with initiatives for watershed ecosystem protection, and water quality and quantity protection on as large a scale as possible.

Strathcona County has committed to being part of Alberta's Water for Life Strategy (Alberta Environment, 2003). The Water for Life Strategy has outlined strategies committed to protecting the quality and quantity of Alberta's water resources.

The Water for Life Strategy includes three key strategic directions, which focus on adopting a watershed approach to managing Alberta's water. These strategies will define how water management and decision making is carried out in the future for Alberta while maintaining economic prosperity. They include:

- Safe, secure drinking water supply
- Healthy aquatic ecosystem
- Reliable quality water supplies for a sustainable economy.

Stormwater management in Strathcona County specifically contends with the healthy aquatic ecosystem and reliable quality water supply for a sustainable economy of Best Management Practices in the design of new stormwater management facilities (SWMF).

Through the guidelines and best management practices (BMP), Strathcona County will help protect the watershed by managing the quality and quantity of stormwater flowing into receiving waters. As urban and rural Strathcona County grows, stormwater management design, construction and location of new developments will influence the level of protection applied to the watershed.

Stormwater in Strathcona County will be managed using a watershed approach. The County's watershed planning approach involves:

- looking at the natural characteristics of the watershed
- taking into account past, present and future land use
- considering all of the past, present, and future water use
- working to ensure that stormwater discharges cause the least impact possible on our natural drainage systems
- taking a proactive role in stormwater management to increase the quality of water flowing to the receiving waters.

SWMF's should include the following mechanisms for managing water quality and quantity:

- Settling of suspended solids
- Reducing or eliminating erosion
- Filtration and chemical precipitation through contact of the water with the substrate
- Chemical transformation
- Adsorption and ion exchange on the surface of plants, substrates, and sediment
- Breakdown and transformation of pollutants by micro organisms and plants
- Uptake and transformation of nutrients by micro organisms and plants
- Predation and natural die off of pathogens.

Best management practices now being used within the design of facilities will aid in protection of aquatic ecosystems. With improved water quality flowing to the receiving waters, the ecosystems will sustain a lesser impact. Water quality will be the foundation for each of Strathcona County's BMP's.

Vision

- Commit to environmental leadership by conservation and protection of the watershed environment as the highest priority.

- Proposed stormwater management facilities will be designed, engineered, constructed and managed in a most safe, efficient, cost effective and environmentally responsible manner ensuring all government guidelines, standards and regulations are met. Existing will be managed with the same approach.

- Integrate social, economic and environmental objectives into a coordinated decision making process to maintain high standards of living, social harmony and environmental quality.

- Recognize that the importance of ensuring that the principles of sustainable development are embodied in all planning decisions, particularly those related to development and management of overall growth.

- Inform and educate all stakeholders of the purpose, function, design, construction, management and importance of stormwater management facilities.

Mission

This policy will include the most current Best Management Practices that will result in:

- Environmentally responsible, safe, efficient and sustainable stormwater management
- Cost effective stormwater management
- Stormwater management shall be a priority within the annual budget

- Efficient planning decisions
- Consistent stormwater management
- Managed to Provincial and Federal standards for stormwater quality and quantity
- Inform and educate residents and employees of Strathcona County with regards to stormwater management.

Strathcona County will incorporate Best Management Practices as the tools to ensure the vision and mission of stormwater management are accomplished. Strathcona County will commit to:

1. Comply with Alberta Environment, Department of Fisheries and Oceans standards, and all other Provincial regulations for water quality and quantity in stormwater management.
2. Develop a Master Drainage Plan that addresses water quality and quantity.
3. Establish a routine water quality and quantity monitoring program with annual operating budget considerations.
4. Determine cost effective, site specific BMP's for water quality and quantity.
5. Establish a mechanism for emergency response

This is the first stormwater management document produced by Strathcona County and it will be updated on a regular basis as standards, designs and regulatory requirements change or evolve to meet or exceed the expectations of our stakeholders.

There are several different SWMF designs that may be used to collect, store, improve water quality and moderate stormwater run-off. Each design will be used based on the site specific requirements and receiving waters.

The County uses:

- ❑ buffer strips
- ❑ constructed wetlands
- ❑ dry ponds
- ❑ filters
- ❑ oil/grit separators
- ❑ vegetative swales
- ❑ wet ponds.

Legislation

The variety of legislation that has developed over time related to water is an indication of the high value placed on this resource and recognizes the potential conflicts that can arise. There are federal, provincial and municipal regulations, specifications and guidelines surrounding the management of water. Strathcona County's municipal policies have been included as appendices to the document.

The guidelines set out by the Alberta Government are intended to be viewed as a tool to assist in making decisions and not as a rulebook for stormwater management solutions.

The guidelines outline objectives of stormwater management and the available methodologies and concepts for the planning, design and operation of a SWMF. As of 2005, the guidelines are not policy or regulation.

Best Management Practices

Strathcona County uses four types of BMP's: point source control, lot level, conveyance and treatment.

Point source control BMP's act to remove pollutants at their source. They include:

- managing pesticides and fertilizers
- good household practices
- control of construction activities
- street sweeping
- catchbasin cleaning
- animal control bylaw (proper pet waste disposal)
- promote natural aquatic vegetation.

Lot level BMP's act to reduce and slow surface water runoff volumes and/or treat runoff before it reaches the SWMF. The BMP's are applied at the individual lot-level or on multiple lots that drain a small area (less than 2 ha). Lot-level BMP's are site specific. They include:

- reduced lot grading
- superpipe storage
- infiltration trenches.

Conveyance system BMP's transport surface water and stormwater runoff from developed areas through sewers or grassed swales.
They include:

- vegetative swales/bioswales
- vegetative channels/ditches.

Treatment BMP's are typically called stormwater management facilities (SWMF). Treatment SWMF receive surface and stormwater runoff from a variety of conveyance systems. Treatment SWMF provide water quality improvement prior to discharge into a receiving water body (with the exception of dry ponds which are used to manage water quantity).
They include:

- wet ponds
- wetlands
- dry ponds
- filters.

Stormwater Management

There is some limited experience with stormwater techniques and designs in Alberta particularly when it comes to wetland design and best management practices. While this should not discourage use of new technologies, there must be a higher regard for monitoring performance. Ongoing maintenance is extremely important to ensure continued effectiveness and resources to ensure this is part of the management strategy required.

Currently, the Alberta Provincial Government guideline is that 85% of all Total Suspended Solids (TSS) in a stormwater management facility must be removed before the water is allowed to flow to receiving waters. TSS are solids in water that can be trapped by a filter and can include a wide variety of material, such as silt, industrial wastes, decaying plant and animal matter.

In order to ensure the Provincial guidelines are being met, it is Strathcona County's goal to require developers to monitor and model SWMF functions (including design) between the Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC) in order to meet the Provincial guideline of 85% total load removal.

Nutrients, heavy metals and pathogens should be managed so levels do not reach a point where the SWMF cannot naturally handle them. In most cases point-source BMP's will aid in these processes.

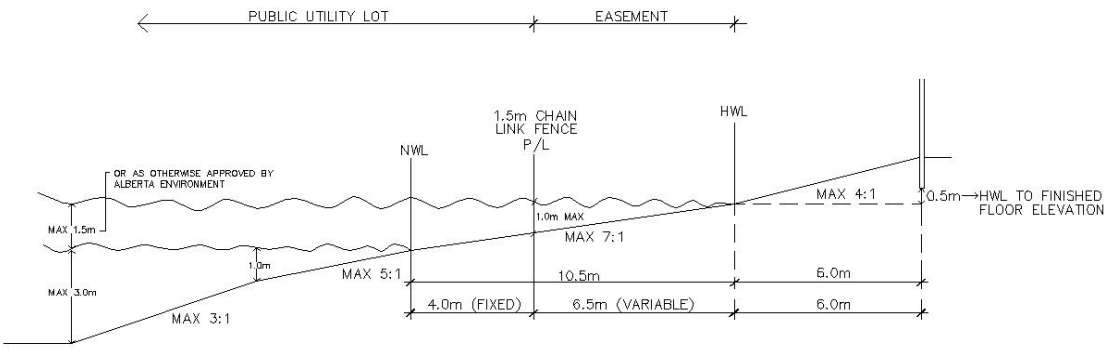
As Strathcona County expands and becomes more urbanized, manmade and natural drainage flows will be more noticeable and are higher than the pre-developed state. The drainage flow following a rainfall event is also more rapid.

Traditionally, stormwater management was managed for quantity control. One of the primary functions of SWMF is to handle rainfall events to minimize the potential of flooding, the increased risk to life, and the increased risk to property damage.

Changes in the environment can cause flooding, stream erosion and sedimentation. Flooding and erosion can have direct effects on public safety, while erosion and sedimentation can affect the habitat of aquatic animals.

A proactive management strategy may limit liabilities and additional costs that may be incurred with SWMF's. Often, when SWMF's are not managed effectively and efficiently, the failure rate increases, which may result in preventable expenditures. It is the responsibility of Strathcona County and the developer to maintain SWMF's. Maintenance can be divided into preventative and corrective measures. Preventative maintenance (proactive management) includes the regular maintenance of a SWMF, inspections, record keeping and analysis of data. Corrective maintenance (reactive management) is unscheduled, generally a response to an emergency including pipe breaks, collapses, or washouts. These actions can be taken to reduce liability, prevent injury, reduce flood potential, and/or to protect the environment.

In general Strathcona County may maintain all County owned land adjacent to the SWMF.



NEW COUNTY STANDARD

JULY 25, 2002

A land owner adjacent to a SWMF is responsible for fence and landscape maintenance on private property.

Vegetation along the SWMF will be maintained in a natural state. Use of native plant materials or plants that possess characteristics similar to native plants will be used along SWMF. This will reduce long term management requirements, assist in the management of noxious weeds, help stabilize the shoreline and eventually result in shorelines that are similar to those of naturally occurring local bodies of water.

Algae will be managed using various techniques dependent on the SWMF. Aquashade, a vegetable-based food dye, will be applied to SWMF to inhibit algae growth. When there is a significant amount of dead vegetation or an abundance of vegetation that negatively affects the functioning of SWMF, harvesting may be considered, however only used if necessary. Residents adjacent to the SWMF will be notified of any significant activity occurring in or around the SWMF.

Stormwater Management Facilities provide for excellent wildlife habitat potential when managed in an effective manner and increase the aesthetics of the facility. Maximizing vegetation density around the SWMF may discourage the entry of domestic animals that would prey on wildlife as well as discourage water fowl from foraging on shorelines.

Sediment removal, or dredging, from a SWMF will depend on a variety of factors including:

- Size of the facility, smaller SWMF's may require more frequent dredging as sediments will build up quicker. Larger SWMF's may require less frequent

dredging perhaps 10 years after being constructed. A regular monitoring program would determine when dredging would be required.

- Type of SWMF
- Upstream land use and level of imperviousness
- Effectiveness of BMP's in place prior to discharge into SWMF (example, point source controls, lot level etc.)
- Municipal Practices (i.e. sanding)
- Age of facility.

Sediment removed will be tested and disposed of depending on analysis of sediment.

Storage capacity for minor infrastructure (catchbasins, underground piping, inlets and outlets) is designed to accommodate the runoff from a 1:5 year storm event or greater. Major infrastructure (wetlands, wet ponds, etc.) are designed to accommodate runoff from a 1:100 year event. However, prior to 1997 systems were designed to accommodate a 1:25 year storm.

Maintenance requirements on the SWMF in Strathcona County depend on each facility. Utilities and Recreation, Parks & Culture have the lead roles in maintaining these facilities.

Responsibilities

Developer responsibilities of the SWMF lie between the Construction Completion Certificate (CCC) and the Final Acceptance Certificate (FAC). Strathcona County maintains and operates the SWMF infrastructure, but the developer is responsible for all major deficiencies or repairs required to the SWMF. The developer must monitor and model SWMF functions (including design) to ensure the Provincial guideline of 85% total load removal is being met.

Once a FAC has been granted, Strathcona County is responsible for operation, maintenance and repair of the SWMF. Residents that are adjacent to a SWMF must understand and adhere to maintenance requirements as outlined in the BMP's.

Vision for the future

The BMP's will incorporate new technologies as they become available and are proven an effective tool for managing stormwater.

Low Impact Development (LID) technology is an alternative ecologically friendly comprehensive approach to stormwater management. It aims to mitigate development impacts to land, water and air. The LID approach emphasizes the integration of site design and planning techniques that conserve natural systems and hydrologic functions of a site. LID aims to reduce the amount of impervious surfaces. Strathcona County currently uses some aspects of LID such as vegetative swales and more recently cluster concept developments.

1.0 INTRODUCTION

“Preserving fresh water ecosystems and the quality and availability of Canada’s fresh water is perhaps the most pressing of the many environmental challenges on the natural horizon.”

- The State of Canada’s Environment 1991

1.1 Watershed

A watershed is an entire landscape region (or "basin"), which drains into a river or river system. A watershed typically includes several sub-basins with components from the mountains to the sea including glaciers, tributaries, lakes, ponds, aquifers and wetlands. Every watershed is the unique product of its complex make-up. Landscape, geology, soils, wind and precipitation, plants and animals, humans and our activities - all shape and define the watersheds. Each watershed has an overall hydrologic function to capture, store and safely release water. How well a watershed is able to perform this overall function is dependent upon how well each geomorphic* component landform is functioning within the watershed. Component landforms that commonly occur in a watershed include water courses, rivers, stream channels, wetlands, floodplains, stream terraces, slopes and ridge tops. Each has their own function individually however if one component landform is ecologically altered or degraded, its ability to perform its function within the watershed or ecosystem becomes impaired and will not be able to function properly. Each component landform is interrelated with the others within the watershed. For example, the condition of a stream is closely related to the condition of its floodplain. If the floodplain has been degraded, the water that flows over the floodplain to the stream will degrade as it passes. Each component landform needs to be considered when planning and setting watershed goals.

Strathcona County is located within the North Saskatchewan Watershed, which begins in the Columbia Icefields in Banff National Park and extends through central Alberta and Saskatchewan. It ends where the North Saskatchewan and South Saskatchewan Rivers join east of Prince Albert, Saskatchewan. The watershed covers approximately 80,000 km^2.

Figure 1-1: North Saskatchewan Watershed

Source: North Saskatchewan Watershed Alliance

It is important that Strathcona County partner with other municipalities, organizations and the province in order to be involved with initiatives for watershed ecosystem protection, and water quality and quantity protection on as large a scale as possible.

Strathcona County is a member of the North Saskatchewan Watershed Alliance (NSWA), a non-profit group whose purpose is to protect and improve water quality and the watershed function of the North Saskatchewan Watershed within Alberta.

The NSWA includes members from industry, government, agriculture, research, education, municipalities, aboriginal communities, health and environmental organizations to provide diverse views on what is important to Albertans regarding watershed protection. The NSWA aims to “find the balance between human desires and watershed integrity.”

1.2 Water for Life

Strathcona County has committed to being part of Alberta’s Water for Life Strategy (Alberta Environment, 2003). The Water for Life Strategy has outlined strategies committed to protecting the quality and quantity of Alberta’s water resources.

It includes three key strategic directions, which focus on adopting a watershed approach to managing Alberta’s water. These strategies will define how water management and decision making is carried out in the future for Alberta while maintaining economic prosperity. They include:

- Safe, secure drinking water supply
- Healthy aquatic ecosystem
- Reliable quality water supplies for a sustainable economy

Water for Life is led by Alberta Environment and will remain accountable for any decisions made regarding the strategies. A network of three partnerships between Provincial Water Advisory Council, Watershed Planning Advisory Councils, and Watershed Stewardship Groups, will play a vital role in making recommendations to the government. Each partner will partake in its own initiatives informing, supporting and mentoring the others.

The Provincial Water Advisory Council (PWAC) will:

- Guide implementation of water strategy
- Investigate and report on emerging issues
- Identifying research priorities
- Policy advice to government

This group includes provincial government departments, municipal government, stakeholders and environmental organizations.

The Watershed Planning Advisory Councils (WPAC) are responsible for:

- River basin planning
- State of watershed reporting
- Best management practices
- Education and stewardship

This group includes government, industry stakeholders, other water users and environmental organizations.

Community-based Watershed Stewardship Groups (WSG) are responsible for:

- Volunteer stewardship
- Local activities and solutions

This group includes volunteer membership from communities and their citizens. Government, industry and businesses offer their support for the volunteer groups.

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Through the guidelines and best management practices (BMP), Strathcona County will help protect the watershed by managing the quality and quantity of stormwater flowing into receiving waters. As urban and rural Strathcona County grows, stormwater management design, construction and location of new developments will influence the level of protection applied to the watershed.

Designing systems that minimize stormwater pollution at its source will reduce Strathcona County's costs for maintenance and management of these facilities as well as reduce negative effects on receiving waters and its habitats, as opposed to treating the water once it has reached receiving waters. Part of Strathcona County's Stormwater Management Communications plan will relay messages to residents on the importance of surface water quality and how it affects the quality of the watershed.

Stormwater in Strathcona County will be managed using a watershed approach. The County's watershed planning approach involves:

- looking at the natural characteristics of the watershed
- taking into account past, present and future land use
- considering all of the past, present, and future water use
- working to ensure that stormwater discharges cause the least impact possible on our natural drainage systems
- taking a proactive role in stormwater management to increase the quality of water flowing to the receiving waters

SWMF's should include the following mechanisms for managing water quality and quantity:

- Settling of suspended solids
- Reducing or eliminating erosion

- Filtration and chemical precipitation through contact of the water with the substrate
- Chemical transformation
- Adsorption and ion exchange on the surface of plants, substrates, and sediment
- Breakdown and transformation of pollutants by microorganisms and plants
- Uptake and transformation of nutrients by microorganisms and plants
- Predation and natural die off of pathogens

Best management practices now being used within the design of facilities will aid in protection of aquatic ecosystems. With improved water quality flowing to the receiving waters, the ecosystems will sustain a lesser impact. Water quality will be the foundation for each of the Strathcona County's BMP's.

1.3 Ecosystem

An ecosystem is all of the organisms in a given place interacting with their nonliving environment. An ecological assessment determines the importance and conservation values of natural habitats and consists of a biophysical (vegetation, wildlife, soils and water) survey to provide a basis for habitat mapping, priority ranking and impact assessment. Ecological assessments must be performed by a professional hired by the developer on all SWMF during the design stage to ensure there is minimal negative impact from the facility to the surrounding ecosystem.

a) *Ecological Functions*
   Ecological functions include natural cycling of nutrients, the proper function of the hydrological cycle and the existence of a high degree of biodiversity. Proper ecological function necessitates the existence of at least parts of the natural habitat of the area.
b) *Ecological Landscapes*
   A heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout.

1.4 Background

Development of this document involved establishing a committee of internal departments that are responsible for reviewing facilities from design to management. The first task of the committee was to establish a Vision (where we want to be), Mission (how we are going to get there), and Goals. They are listed in the following sections.

1.4.1 Vision

- Commit to environmental leadership by conservation and protection of the watershed environment as the highest priority.

- Proposed or existing stormwater management facilities will be designed, engineered, constructed and managed in a most safe, efficient, cost effective and

environmentally responsible manner ensuring all government guidelines, standards and regulations are met.

- Integrate social, economic and environmental objectives into a coordinated decision making process to maintain high standards of living, social harmony and environmental quality.

- Recognize that the importance of ensuring that the principles of sustainable development are embodied in all planning decisions, particularly those related to development and management of overall growth.

- Inform and educate all stakeholders of the purpose, function, design, construction, management and importance of stormwater management facilities.

1.4.2 Mission

This policy will include the most current Best Management Practices that will result in:

- Environmentally responsible, safe, efficient and sustainable stormwater management
- Cost effective stormwater management
- Stormwater management shall be a priority within the annual budget
- Efficient planning decisions
- Consistent stormwater management
- Managed to Provincial and Federal standards for stormwater quality and quantity
- Inform and educate residents and employees of Strathcona County with regards to stormwater management

1.4.3 Goals

Strathcona County will incorporate Best Management Practices as the tools to ensure the vision and mission of stormwater management are accomplished. Strathcona County will commit to:

6. Comply with Alberta Environment, Department of Fisheries and Oceans standards, and all other Provincial regulations for water quality and quantity in stormwater management.
7. Develop a Master Drainage Plan that addresses water quality and quantity.
8. Establish a routine water quality and quantity monitoring program with annual operating budget considerations.
9. Determine cost effective, site specific BMP’s for water quality and quantity.
10. Establish a mechanism for emergency response

This is the first stormwater management document produced by Strathcona County and will be updated on a regular basis as standards, designs and regulatory requirements change or evolve to meet or exceed the expectations of our stakeholders.

While the goal of this document is to provide baseline BMP's, it is not meant to restrict technological innovation and evolution. Design flexibility is important for site specific conditions. Alternative approaches may be considered if it can be demonstrated that there are better ways of achieving the same goals.

2.0 DESCRIPTIONS AND DEFINITIONS

2.1 Stormwater Management Facilities (SWMF) Descriptions

Stormwater management has evolved over the past several years and it is now recognized that comprehensive planning is necessary to protect human and animal life, property, and the natural receiving waters. Planning must be coordinated with several agencies, ranging from government regulators to developers to private property owners to users.

Watershed Management Plans are comprehensive strategies that establish broad water management goals and targets for an entire watershed area. Physical, chemical and biological characteristics of the basin are examined and then analyzed to define the existing and potential water uses. Sub-watershed plans address the requirements for stormwater management on a sub-basin level. The information gathered in the Watershed Management Plan is used to develop necessary sub-watershed stormwater controls (infiltration, trenches, swales, stormwater ponds). Stormwater Management Plans should be considered at an early stage of land development as it will significantly affect the layout of subdivision lots, roadways and other services.

The design and construction of all SWMF should retain as much of the natural runoff characteristics and infiltration components of the undeveloped system as possible and reduce or prevent water quality degradation. Strathcona County must review and approve the engineering drawings and landscape plans for all SWMF's constructed within the Municipality to ensure the facility has reasonable aesthetic qualities, sufficient storage capacity, appropriate discharge rate, water quality objectives and fulfill public safety criteria. SWMF shall meet all Provincial and Federal regulations as well as Strathcona County Engineering Servicing Standards and Open Space Development Standards.

There are several different SWMF designs that may be used to collect, store, improve water quality and moderate stormwater run-off. Each design will be used based on the site specific requirements and receiving waters.

2.1.1 Buffer Strips

Vegetated buffers around the perimeter of the pond are recommended for erosion control and additional sediment and nutrient removal. Buffer strips are natural areas located between development and receiving waters. They are designed to protect wetlands, streams and valley corridor systems and to protect vegetated riparian zones adjacent to water bodies and water courses to minimize the impact of development of the stream itself. Buffer strips are the first filter for surface water and stormwater runoff by slowing the runoff rate and filtering sediment. The protection of stream and valley corridors provides significant benefits to wildlife, aquatic habitat, terrestrial habitat, and linkage between natural areas.

For further information refer to **Section 4.4.5** *Buffer Strips*

2.1.2 Constructed Wetlands

It is important to understand that engineered SWMF's should not be used to mitigate the loss of natural wetlands. A natural wetland is a complex ecosystem with aquatic and terrestrial, vegetation and wildlife components supported by the physical environment including soil and water. Constructed wetlands are not intended to replace all of the functions of natural wetlands but to minimize point source and non point source pollution prior to entry into streams, natural wetlands and other receiving waters. The primary function for a SWMF is to maintain and treat stormwater runoff, while the secondary functions include providing wildlife habitat. If a natural wetland is incorporated into a SWMF, protection of the natural wetland habitat must be considered.

In the future the most common type of SWMF will be a constructed wetland. Constructed wetlands retain surface water and improve stormwater runoff and may improve water quality once established. Constructed wetlands consist of shallow extended detention areas with extensive native species plantings and are typically created by excavating a depression. Sedimentation, filtration, biological and chemical processes affect water quality improvement. It has been shown that constructed wetlands effectively lower biochemical oxygen demand, total suspended solids, and total nitrogen concentrations.

Constructed wetlands have been in wide use for the last decade, but limited performance monitoring has been conducted. Constructed wetlands are suitable for large drainage areas, for residential, commercial and industrial lands. Unless designed specifically for industrial waste treatment, the runoff must not contain high levels of toxic pollutants that may negatively affect the native vegetation. Constructed wetlands should be designed specifically for water quantity storage and water quality treatment, not simply to mimic a natural feature for aesthetic purposes.

For further information refer to **Section 4.4.2** *Constructed Wetlands*

2.1.3 Dry Ponds

Dry ponds are also known as detention ponds, and are designed to intercept and temporarily impound a volume of stormwater for gradual release to the storm sewer system. Dry ponds are designed to completely empty out between storm events, and therefore primarily provide stormwater runoff rate control (water quantity), as opposed to water quality control. Dry ponds can provide limited settling of particulate matter, but a large portion of this material can be resuspended by subsequent storm events. Dry ponds are not designed to provide stormwater retention for more than 24 hours, resulting in lower contamination removal than wet ponds.

Strathcona County currently maintains three dry ponds and will not approve constructing additional dry ponds. It has been determined that dry ponds pose a long-term management expense to Strathcona County with limited productive return in the form of recreational opportunities, wildlife uses, water quality improvements or aesthetic quality.

For further information refer to **Section 4.4.3** *Dry Ponds*

2.1.4 Filters

Filters are treatment BMP's that promote pollutant removal and are designed to remove pollutants from surface water runoff. Filters can be designed and constructed as either surface or subsurface systems. A filter is constructed with an impermeable liner to prevent adjacent material from clogging pore spaces and to prevent filtered water from entering the groundwater. Infiltrated water is collected in a pervious pipe system and conveyed to a downstream outlet. Surface filters are commonly covered by a layer of grass. The most common type of filter is a sand filter, with organic filters available as well. An organic filter has a layer of peat in addition to the sand that acts to improve the removal of nutrients and trace metals.

Filters are a water quality BMP and have no application for erosion or quantity control. Winter performance is unknown. Filters are suitable for drainage areas less than 5 ha and are commonly used in parking lots and commercial sites. Filters can be landscaped using native trees, shrubs and grasses, and can also be used beneath hard surfaced landscapes.

For further information refer to **Section 4.4.4** *Filters*

2.1.5 Oil/Grit Separators

Oil/grit separators are a variation of the traditional settling tank, designed to capture sediments and trap hydrocarbons in surface water runoff. An oil/grit separator is an underground retention structure that takes the place of a manhole in the storm sewer system. There are two designs; the three chamber and the bypass separator. Three chamber separators operate most effectively when constructed off-line, with low flows directed to this separator. Bypass separators should be installed on-line, as they can handle high flows.

Oil/grit separators provide effective treatment of surface water runoff quality when used at the source or as pre-treatment. Separators that do not incorporate a flow bypass are ineffective in removing and containing sediments and oils due to continuous resuspension. Oil/grit separators are effective in reducing total suspended sediments, depending on land use, drainage areas and site conditions. Oil/grit separators are not designed to provide water quantity control.

Oil/grit separators are suitable for drainage areas smaller than 5 ha. They are best suited to areas of high impervious cover where there is a potential for hydrocarbon spills and polluted sediment discharges, including parking lots, commercial sites, industrial sites, gas stations, airports and pre-treatment in residential areas. Regular maintenance is important for performance. Waste removed from these receptors may be classified as hazardous waste and may require testing prior to disposal.

For further information refer to **Section 4.4.6** *Oil/grit Separators*

2.1.6 Vegetative swale

A vegetative swale is a broad shallow earthen channel vegetated with erosion resistant and flood tolerant grasses, and underlain by an engineered soil mixture. They are open channels that are designed specifically to treat and attenuate stormwater runoff for a specified water volume during minor and major rain events. There are several swale designs including grassed, dry, and wet, however all provide the same purpose of improving stormwater run-off quality.

The purpose of the vegetative swale is to convey stormwater runoff at a low enough velocity that will not cause erosion, in order to enhance water quality through infiltration, sedimentation, filtration and designed in such a manner that minimal mowing is required. Where possible, vegetative swales should be designed as a conveyance system into or between SWMF's. Vegetative swales provide effective water quantity and quality control of urban and rural runoff. Many stormwater contaminant particulates are effectively filtered by vegetative swales including heavy metals, chemical oxygen demand (COD), nitrate and ammonia, nitrogen, and suspended solids. They are especially effective near highways and residential roadways.

For further information refer to **Section 4.3.2** *Vegetative Channel/Ditches*

2.1.7 Wet ponds

A wet pond is the most common end-of-pipe management facility for the control of peak surface water runoff discharges. The primary function of the wet pond is to promote sedimentation, reduce surface water runoff velocities, provide storage and remove pollutants. They store surface water and stormwater runoff to promote pollutant removal and control discharge to predevelopment levels to reduce downstream flooding and erosion in receiving water bodies. Wet ponds are characterized by having a permanent natural or man-made (or combination) water body. The permanent pond in the wet pond system is the major source of water quality improvement.

Wet ponds are recognized for providing the most reliable water quality treatment due to their moderate to high pollutant removal capabilities. Runoff entering the wet pond is slowed by the permanent pond and suspended solids and pollutants settle out of the water column.

The major biological process that occurs in the wet pond is nutrient uptake by vegetation around the perimeter and algae and pollutant degradation by microorganisms. Vegetation provides improved pollutant removal, shading, wildlife habitat, safety, and aesthetics.

Wet ponds are normally less land intensive than some other end of pipe BMP facilities (such as constructed wetlands). Wet ponds are suitable for large drainage areas, for residential, commercial and industrial lands.

The secondary function of a pond is to provide wildlife habitat, and to provide tertiary recreational activities (i.e., non-contact activities such as walking, bird watching, photography etc.)

For further information refer to **Section 4.4.1** *Wet Ponds*

2.2 Glossary of Terms

Active Storage - is the temporary or dry storage (volume) provided in a stormwater pond. In a dry pond it is between the bottom of the pond and the High Water Line (HWL). In a wet pond/land it is between the Normal Water Line (NWL) and HWL

Adsorb - To take up and hold (a gas, liquid, or dissolved substance) in a thin layer of molecules on the surface of a solid substance

Aquatic ecosystem - an aquatic area where living and non-living elements of the environment interact. These include rivers, lakes and wetlands, and the variety of plants and animals associated with them.

Barge - a roomy usually flat-bottomed boat used chiefly for the transport of goods on inland waterways and usually propelled by towing

Biochemical Oxygen Demand (BOD) - a measure of how much dissolved oxygen is being consumed as microbes break down organic matter. A high demand, therefore, can indicate that levels of dissolved oxygen are falling, with potentially dangerous implications for the river's biodiversity

Best Management Practices (BMP) - Includes schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent, eliminate, or reduce the pollution of waters of the receiving waters. BMP's also include treatment requirements, operating procedures, and practices to control plant site runoff spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Bog - A peat landform which is raised or level with the surrounding terrain and receives water exclusively from precipitation. Generally the water table is at or slightly below the bog surface. Bogs are typically nutrient poor and acidic with Sphagnum dominated vegetation.

Buffer Strip - are the natural vegetated areas between development and receiving waters.

Catchbasin - An entryway to the storm drain system, usually located in a low or depressed area on the street.

Conserve - to protect from wasteful, destructive use or loss of natural resources

Constructed Wetland - engineered wetlands that are built for stormwater treatment. Engineered facilities designed to manage a specific amount of stormwater. Designed to mimic natural wetland systems by incorporating appropriate wetland vegetation and soils to assist with reducing shock-loading effects of contaminated stormwater.

Construction Completion Certificate (CCC) - The certificate issued and signed for construction completion (entire work except for maintenance/guarantee period)

Detention Storage - temporary storage and gradual release of stormwater in a storage element

Dredging – removal of sediment from the bottom of a water body using a machine that contains buckets on an endless chain or a suction tube

Dry pond - designed to contain runoff temporarily as off-line storage areas and remain dry most of the time. Pond design such that any storm runoff in excess of the permitted predevelopment flow shall be stored in the pond. The pond bottom and slopes are top soiled and seeded.

Easement - a right created by grant, reservation, agreement, prescription or necessary implication, which of has in the land of another. It is either for the benefit of land (appurtenant), such as right to cross A to go to B, or “in gross” such as a public utility easement.

EEP - Engineering & Environmental Planning Department (Strathcona County) - (780) 464 8279. The department responsible for coordinating the receipt, review and acceptance of open space landscape design plans provided by Developer’s Representatives as well as distribution of security release

Encroachment - a physical intrusion (generally construction) of a structure,

part of a structure or construction onto the property or property interest of another.

Environmentally sensitive area - Refers to the lands in a natural or unaltered state and their ecological significance. Lands may be unusual or unique in the local and/or regional context and perform a natural function that is of importance at a regional level.

Environmental Reserve (ER) - lands that are considered undevelopable and may consist of a swamp, gully, ravine, or natural drainage course, or may be lands that are subject to flooding or are considered unstable.

Erosion - Removal of soil particles by wind and water. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally but can be intensified by human activities such as farming, development, road-building, and timber harvesting.

ESS - Engineering Servicing Standards. This manual is used to provide information, set guidelines and establish requirements for Developers, Engineering Consultants, Utility Companies and County Departments, regarding standards governing design, preparation and submission of plans and specifications for construction of municipal improvements within Strathcona County.

Evapotranspiration - the loss of water to the atmosphere through the combined processes of evaporation and transpiration, the process by which plants release water they have absorbed into the atmosphere

Event - A single precipitation and associated runoff occurrence.

Final Acceptance – when the entire work, including maintenance period, has been performed to the requirements of the Development Agreement, landscape plans, OSDS

Final Acceptance Certificate (FAC) –The certificate issued for final acceptance.

Fen – Peat landform with a fluctuating water table, which is at the soil surface, or may be above or below for variable periods of time. Fens receive water from ground water and surface flow that is rich in dissolved minerals. Vegetation on fens is related to depth of the water table and chemistry of the water present. Wet fens are generally dominated by grasses, sedges and brown mosses. Trees and shrubs may be present on drier fens.

Filter - engineered conveyance systems designed to remove pollutants from surface water runoff.

First Flush - the first major rain event which flushes out the accumulated pollutants in the storm drain system

Flood plain - can be either a natural feature or statistically derived area adjacent to a water body where water from the water body overflows its banks at some frequency during extreme storm events

Groundwater - All water under the surface of the ground whether in liquid or solid state. It originates from rainfall or snowmelt that penetrates the layer of soil just below the surface. For groundwater to be a recoverable resource, it must exist in an aquifer. Groundwater can be found in practically every area of the province, but aquifer depths, yields and water quality vary.

Habitat - used to describe the natural home of a living organism. The three components of wildlife habitat are food, shelter and water.

Heritage Parkway Trail System - a 3.0 m wide asphalt surface pathway and linear park system constructed through the Urban Services Area of Sherwood Park

Household purposes - water used for human consumption, sanitation, fire prevention, and watering animals, gardens, lawns and trees.

HWL or High Water Level - is the engineered design high water level for a specific facility.

Impermeable or Impervious Surface - The part of the catchment surfaced with materials which prevent infiltration of rainwater into the underlying soil and groundwater.

Integrated Pest Management (IPM): An ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism.

Marsh - Is a wetland that has shallow water, with levels that usually fluctuate daily, seasonally or annually due to tides, flooding, evapotranspiration, groundwater recharge, or seepage losses. The water table usually remains at

or below the soil surface. Portions of a marsh may dry up and have exposed sediment under drought conditions. Marsh vegetation predominantly comprises of emergent graminoids (reeds, rushes, sedges, grasses); shrubs; emergent, floating or submergent herbaceous plants; and non-vascular plants such as mosses and algae.

MDP or Master Drainage Plan - is a drainage plan for a sub-basin or watershed that identifies drainage management concepts within the existing topography, as well as the physical and biological resources of the area. It should detail short, medium and long-term strategies to establish a sub-basin wide stormwater management system.

MR or Municipal Reserve - municipally owned parcels of land meant for public use. They may be used for parks, recreation facilities, public buildings, schools, natural areas, and horticultural or agricultural uses. Some facilities or buildings may be owned by charitable corporations.

Non-point source pollution - is a contamination that cannot be identified as originating from one site. This type of pollution comes from a larger area of land and is carried by run-off and/or groundwater.

NWL or Normal Water Level - is the engineered design level in a facility associated with dry weather periods or periods of low stormwater flows

Open Space Development Standards (OSDS) - standards set out by Strathcona County applicable to both Strathcona County contracts and private development projects. Document is meant to provide minimum standards; variations for a better technical or economical solution are encouraged to be presented to Strathcona County for approval.

PDS – Planning, and Development Services (Strathcona County) - (780) 464 8080 The department responsible for coordinating Development Agreements, Development Permits and land management (easements, encroachments etc.)

Point source pollution - pollution that originates from an identifiable cause or location, such as a sewage treatment plant or feedlot

Potable water - water that is fit for human consumption

Public Utility Lot (PUL) - Strathcona County owned land required to accommodate public utilities.

Retention Storage - the collection and storage of runoff for a considerable length of time, whereby release is by evaporation, transpiration or infiltration.

Riparian area - the area along streams, lakes and wetlands where water and land interact. These areas support plants and animals, and protect aquatic ecosystems by filtering out sediments and nutrients originating from upland areas.

Riprap - a layer of stones laid together without order or similar material on an embankment slope to prevent erosion

RPC - Recreation, Parks and Culture Department (Strathcona County) - (780) 467 2211. The department responsible for landscape maintenance

Run-off - the water that moves over the surface of the ground. Run-off collects sediments and contaminants as it moves from higher elevations to lower elevations.

Sediment - Soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud waters so that sunlight does not reach aquatic plants.

Sediment Forebay - a permanent pool that is designed to facilitate maintenance and improve pollutant removal by trapping larger particles near the inlet of a pond

Stormwater - All surface water runoff from rainfall and snowmelt, predominantly in urban catchments. Such areas may include rural residential zones.

Stormwater management facilities* (*SWMF) – may include Wetlands, Constructed Wetlands and Man Made Creeks, Stormwater Wetlands, Stormwater Ponds, Wet and Dry Ponds, overland drainage systems and vegetative swales located within an easement and/or County owned property (PUL).

Surface Water - All waters on the surface of the Earth found in rivers, streams, ponds, lakes, marshes, wetlands, as ice and snow, and transitional, coastal and marine waters.

Swamp - Defined as a treed or tall shrub (also called thicket) dominated wetland that is influenced by minerotrophic groundwater, either on mineral or organic soils. Essential features of swamp classes have dominance of tall woody vegetation, generally over 30% cover and the wood-rich peat laid down by this vegetation.

Trust Account - A financial contribution from the customer or the developer towards the future operations and maintenance expenditures.

Turbidity - a measure of the clarity of water. Turbidity is caused by the presence of suspended matter such as clay, silt, algae and other microbiological particles.

Undisturbed - Not previously disturbed by human activities. A disturbance is an event that causes significant changes from the normal pattern.

Utilities Department (Strathcona County) - (780) 467 7785. The department responsible for the maintenance activities surrounding stormwater quality and quantity management

Utility Right-of-Way (easement) – an interest in land required for the purpose of constructing, maintaining or operating a road, railway, aerial, electric or other tramway, surface or elevated cable, electric or telephone pole line, chute, flume, pipeline, drain or any right or easement of a similar nature.

Vegetative swale - a low gradient open channel with a dense vegetative cover through which run-off is directed during storm events.

Water for Life - is the Government of Alberta's strategy focusing on three specific areas: (1) Safe, secure drinking water supply, (2) Healthy aquatic ecosystems, and (3) Reliable, quality water supplies for a sustainable economy

Watershed - the area of land that catches precipitation and drains into a larger body of water such as a marsh, stream, river or lake.

Water Quality - The chemical, physical and biological condition of water.

Wetland - A transition zone between terrestrial and aquatic systems where the water table is near, at or just above the surface of the land. Wetland boundaries are delineated using three basic parameters:

1. Presence of plant species adapted to life in moist or saturated soils
2. Presence of soils displaying characteristics that develop due to lack of oxygen
3. Evidence of hydrologic input from surface water and/or ground water creating conditions favourable to water loving and water tolerant plants and to the development of wetland soils.

Wet Pond - a stormwater management facility that is partially inundated on a permanent basis and is built to attenuate peak flows downstream while providing improved water quality.

2.3 Stormwater Management Acronyms

ESS - Engineering Servicing Standards

FAC - Final Acceptance Certificate

HWL - High Water Level

IPM - Integrated Pest Management

LID - Low Impact Development

MDP - Master Drainage Plan

MR - Municipal Reserve

NWL - Normal Water Level

OSDS - Open Space Development Standards

OSMP - Open Space Management Plan

PDS – Planning, and Development Services

PUL - Public Utility Lot

RPC - Recreation, Parks and Culture

SWMF - Stormwater Management Facility

3.0 REGULATIONS, SPECIFICATIONS, GUIDELINES AND DESIGN

The variety of legislation that has developed over time related to water is an indication of the high value placed on this resource and recognizes the potential conflicts that can arise (Haekel, 2002). It is critical that there be a basic understanding of the relevant legislation which governs what can and cannot be done in and around a water body.

The following regulatory summary is intended for general information purposes only. Interpretation and administration of the Act(s), policies and guidelines should be the responsibility of a lawyer or the responsible department representatives.

3.1 Acts (Federal and Provincial)

3.1.1 Provincial - *Public Lands Act*

The *Public Lands Act* deals with two factors: (1) ownership of the beds and shores of permanent water bodies, and (2) prohibition of certain activities that may cause injury to the beds and shores of permanent water bodies. Since 1930, the *Public Lands Act* has provided for provincial ownership of the beds and shores of “all permanent and naturally occurring” bodies of water and “all naturally occurring rivers, streams, watercourses and lakes”. Water and the use of water are also under provincial jurisdiction through the *Water Act*.

The extent of the Province’s ownership of the bed and shore of a water body is limited by the bank of the water body. The bank is defined as the line along the upper limit of the bed and shore formed by the normal, continuous action of presence of surface water on the lands. This is a natural boundary between the bed and shore and privately owned land. The location of the bank is not affected by drought or flooding. The bed of a water body is defined as the land on which the water sits. The shore is defined as that part of the bed that is exposed when water levels are not at the normal level.

When a flooding event occurs, water may overflow the bank and cause erosion on private land. With approval by Strathcona County via *Policy SER-012-009* private landowners may protect their land from erosion and flooding by armouring the bank of the SWMF with rock.

Crown land generally refers to provincial and federal government lands. In the 1970’s, the provincial government referred to lands administered under the *Public Lands Act* as “public land” not “Crown land”. Public land administered under the Act is owned by the government of Alberta and its uses are allocated in the Act. The beds and shores of a variety of water bodies are public lands, therefore the public can typically walk along the water’s edge below the bank without trespassing on private property. It should be recognized that accidental trespassing may occur when the location of the bank is not readily obvious.

Section 54(1) of the Act contains a general prohibition that no person shall do anything on public land that: (1) may injuriously affect watershed capacity, (2) is likely to result in injury to the bed and shore of any river, stream, watercourse, lake or other body of water or land in the vicinity of that public land, or (3) is likely to result in soil erosion. Any unauthorized use of public land may be subject to a variety of penalties, including fines, disposition cancellation, ministerial orders to restore disturbed areas, or legal action imposed penalties.

Due to the sensitive nature of shore resources, most activities on the bed and shore require authorization from either Public Lands or Water Management. Conditions are placed on all authorizations: (1) to ensure that compatible activities and resources are used properly, (2) to limit the chance of degrading aquatic and shore environments, and where necessary, (3) to mitigate, reclaim or restore an area where disturbance is unavoidable. Approved activities and developments are monitored to ensure environmental standards are maintained (Haekel, 2002).

Management for wetlands (and their shores) on public land is concerned with conservation, mitigation of degradation and enhancement/restoration/creation of wetlands in areas where they have been degraded or lost.

3.1.2 Provincial - *Water Act*

The *Water Act* is the primary legislation dealing with water and its management, from ownership of the resource and the regulation of activities with water bodies, to the allocation and use of water by a licensing and approval system. The *Water Act* is designed to safeguard the aquatic environment, defined as “the components of the earth related to, living in or located in or on water or the beds or shores of a water body, including but not limited to all organic and inorganic matter, and living organisms and their habitat, including fish habitat, and their interacting natural systems”.

The Crown owns the resource of water through the *Water Act*. The Act applies over a water bodies floodplain, as well and the bed and shore of the water body. An approval is required under Section 36 of the Act for all activities that may impact water and the aquatic environment.

It is an offence under the *Water Act* to commence or continue an activity unless an approval or other authorization under the Act has been issued; to contravene a term or condition of an approval or license; to contravene a water management order; or contravene an enforcement order. Penalties may include fines, water management orders, remedial orders, court orders and civil remedies (Haekel, 2002).

Water management is typically to address increasing demands on aquatic resources and to ensure that a clean abundant supply of water is available for a variety of uses, including for the protection of the aquatic environment. Water management may involve a small area (lake management) or a watershed. The key component of the process includes public participation.

3.1.3 Provincial – *Municipal Government Act*

The *Municipal Government Act* is the primary mechanism that enables municipalities to function, administer, plan and direct development within their jurisdictions. With respect to water management issues, the Act provides municipal authority to:

- determine and control the type and density of land uses
- determine and control extent of land subdivided
- regulate the type and extent of development on private land
- establish bylaws and controls on activities and the use of lands within their jurisdictions
- regulate the type of water disposal systems for cottage and recreational development next to a water body
- regulate the use of zoning bylaws, the placement of seasonal piers within a subdivision.
- Take the floodable land as Environmental Reserve

60(1) Subject to any other enactment a municipality has the direction, control and management of the rivers, streams, watercourses, lakes and other natural bodies of water within the municipality, including the air space above and the ground below.

3.1.4 Provincial – *Environmental Protection and Enhancement Act*

One key component of the *Environmental Protection and Enhancement Act* (EPEA) is to provide a framework for evaluating the impacts of activities on water quantity and quality, protecting the quality of both surface and groundwater, regulating the discharge or deposition of harmful substances into water bodies and aquifers, and managing land uses that can have a significant impact on the quality of water supplies.

The Act prohibits the release of any substance that causes or may case a significant adverse effect unless the release has been authorized. Penalties are issued for knowingly conducting a prohibited activity, releasing prohibited substances, providing false or misleading information, or for violating an approval, Environmental Protection or Enforcement Order.

3.1.5 Provincial – *Public Health Act*

The *Public Health Act* is concerned with the protection of public health. One aspect of the Act is water management. Water management is regulated in the form of nuisances, drinking water, waste management facilities and outdoor lavatories, and contaminants. The primary concern for health officials and landowners is the recreational water quality and drinking water. Guidelines have been established at the federal level for drinking water and recreational water quality.

3.1.6 Federal – *Fisheries Act*

The *Fisheries Act* is likely the most significant piece of legislation affecting water users. The Act provides a strong tool for resource managers to control, manage and protect fish habitat. Fish habitat is defined as “the spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes”.

An approval is required to regulate all activities that may affect fish habitat within a water body. Typically, if an approval is required under the *Public Lands Act* or *Water Act*, the proposed activities are referred to Fisheries staff for approval. Unauthorized cutting of aquatic plants and/or deposition of fill is a violation under the Act.

3.1.7 Federal – *Navigable Waters Protection Act*

The *Navigable Waters Protection Act* is focused on the prevention of navigation obstructions in rivers and lakes. Navigable water includes “any body of water capable, in its natural state, of being navigated by floating vessels of any description for the purpose of transportation, recreation or commerce”.

With respect to stormwater management, regulations under the Act require that any works to be constructed in a navigable water body need to be approved by the Coast Guard. The act provides penalties for activities that result in the accumulation of material that affects navigation, such as sediments resulting from erosion of a development site. A development that may interfere with navigation will require an approval administered by the Minister of Transport (Canadian Coast Guard). The construction of works without an approval in, on, over, through or across any navigable water that may substantially interfere with navigation is prohibited. Penalties include substantial fines and enforcement is common.

3.1.8 Provincial - *Wastewater and Storm Drainage Regulation*

Municipal stormwater drainage and wastewater systems have been regulated by Alberta Environment primarily through the use of the Clean Water Act and related regulations. This legislation sets out requirements for the construction and operation of municipal plants for handling of stormwater drainage and wastewater.

Alberta's environmental laws have been consolidated and updated by EPEA. Part 4, Division 1 of the Act deals with the release of substances into the environment, regulating releases and creating general prohibitions with respect to substance release, and also provides the necessary powers to regulate the handling of storm drainage and wastewater. The Wastewater and Storm Drainage Regulation and the Wastewater and Storm Drainage (Ministerial) Regulation enable the Department to regulate the operation of storm drainage and wastewater systems and establish standards for such facilities and their operators. These regulations replace the following legislation:

- Clean Water Act;
- Clean Water (General) Regulations; and
- Clean Air Act.

These regulations have updated references to standards and guidelines for specific design and operating criteria, referring to the most recent edition of the *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* (Alberta Environment, 1997).

As well, these regulations have modified requirements for the certification of operators of storm drainage and wastewater systems. Operators of most systems require a certificate as set out in the most current version of the *Water and Wastewater Operator's Certificate Guidelines* (Alberta Environment, 2003).

3.1.9 Provincial - *Wildlife Act*

This Act governs the management of wildlife as a Crown resource and enables the hunting and trapping of wildlife, stating that the remains of dead animals are the property of the Crown unless otherwise specified; also addresses conservation of species at risk (endangered, threatened).

3.2 Policies (Provincial and Municipal)

To reference Municipal policies refer to **Appendices A – E.**

3.2.1 Municipal – *SER 001-002 Surface Water Management, Water Management and Erosion Control Program*

This policy indicates that Strathcona County will promote the sound management of surface water resources utilizing the technical and financial support of various governments, non-profit agencies and cooperating landowners where applicable. The policy states that future maintenance will be carried out in an appropriate fashion and is the County's job to ensure projects are maintained in this manner. Refer to *Appendix A.*

3.2.2 Municipal – *SER 012-008 Encroachments onto Lands in which the County holds an Interest*

This policy states that Strathcona County at its sole discretion may authorize encroachments which have occurred onto County property or a County Easement/Right-of-way through a written agreement with the infringing party. The policy outlines the responsibilities and types of encroachments onto County easements, roads and road allowances, Public Utility Lots, municipal reserves and other County owned properties. Refer to *Appendix B*.

3.2.3 Municipal – *SER 012-009 Stormwater Management Facility Easements*

The Stormwater Management Facility Easements Policy outlines the non-County use of stormwater management facilities, easements and the management of easement

interests. The policy defines an encroachment as any illegal intrusion onto a stormwater management facility. The County may or may not approve proposed encroachments made onto County easements/Right-of-Way both prior to policy and post policy encroachments. Under the new policy, development of retaining walls is prohibited. The policy outlines the responsibilities of the County, the Developer and the land owner. Refer to *Appendix C.*

3.2.4 Municipal – *SER 001- 009 Vertebrate Pest Control*

This policy states how pests, nuisance and problem wildlife will be controlled. Vertebrates covered under this policy include beaver, coyotes, skunks, rabies vector, rats, squirrels, and ground squirrel (gophers). Refer to the policy for information on how they are controlled. The policy states that it shall be a joint responsibility between Strathcona County and the Province of Alberta. The policy states that human safety, municipal liabilities, mitigation of non-target capture and humane capture techniques are the primary importance. SWMF wildlife will be controlled under the guidelines stated in this policy which include acceptable controlling devices for specific wildlife species, responsibilities, and procedures. Refer to *Appendix D.*

3.2.5 Municipal – *SER -001-004 Weed Control Enforcement Program*

The control of weeds is a shared responsibility between land owners, occupants and Strathcona County. The County will implement and administer a program of control for restricted, noxious and nuisance weeds on public and private lands in accordance with the obligations delegated to it by the Weed Control Act. This policy will affect stormwater management in the method used to remove the weeds. In accordance with the Best Management Practices set forth in this document, controlled weeds should be eradicated using techniques that do not affect the effectiveness of the SWMF (refer to **Section 5.3.2** Vegetation Management). Refer to *Appendix E.*

3.2.6 Provincial - *Water for Life Strategy: Alberta's Strategy for Sustainability*

The Water for Life Strategy developed by Alberta Environment in 2003 is the Government of Alberta's response to develop a new water management approach and outline specific strategies and actions to address issues Alberta is facing with population growth, droughts, and agriculture and industrial development. The strategy's goals are:

- safe, secure drinking water supply
- healthy aquatic ecosystems
- reliable, quality water supplies for a sustainable economy

The strategy outlines the short, medium and long term objectives broken into three areas: Knowledge and Research, Partnerships and Water Conservation.

The strategy affects how stormwater management is conducted; ensuring watershed protection and improved water quality is the foundation of each best management practice.

Currently, the Water for Life Strategy does not have enforcement authority. However two of the strategy's short term targets are to establish a provincial water advisory council and complete a partnership framework, outlining roles, responsibilities and relationships between government and its partners which may be enforceable.

3.2.7 Provincial - *Stormwater Management Guidelines for the Province of Alberta*

These guidelines were updated in 1999 by the Alberta Government from the 1987 stormwater guidelines. The document was intended to be viewed as a tool to assist in making decisions and not as a rulebook for stormwater management solutions. The guidelines outlined objectives of stormwater management and the available methodologies and concepts for the planning, design, and operation of a SWMF. The guidelines describe water quantity and quality techniques to be used for effective stormwater management.

3.3 Specifications and Guidelines

3.3.1 Engineering Servicing Standards (ESS)

The ESS manual is used to provide information, set guidelines and establish requirements for Developers, Engineering Consultants, Utility Companies and Strathcona County Departments, regarding standards, governing design, preparation and submission of plans and specifications for construction of municipal improvements within Strathcona County.

3.3.2 Open Space Development Standards (OSDS)

The OSDS manual is used to provide information, set guidelines and establish requirements for Developers, Developers Representatives and Strathcona County Departments, regarding standards, governing open space design, preparation and submission of plans and specifications for construction of landscape development within urban and rural areas of Strathcona County. The OSDS are meant to provide minimum standards; variations for a better for a better technical or economical solution are encouraged to be presented to Strathcona County for approval.

3.3.3 Open Space Management Plan (OSMP)

The Open Space Management Plan is intended as an internal working document that provides guidance to Strathcona County on how to effectively manage open spaces that will ensure the their long term sustainability.

3.3.4 Recreational Activities

It is important that SWMF are not treated as regular lakes, as such recreational activities involving contact with the water in SWMF may be limited. Acceptable recreational activities are located within the **OSDS** (specifications to be written).

3.4 Design

3.4.1 Facility

Specific SWMF design is located in ESS or OSDS. For locating specific facilities refer to Section 4.0 Stormwater Management Best Management Practices.

3.4.2 Landscaping

Landscaping Design acceptable for SWMF is located in the OSDS. Refer to **OSDS** *Design Standards.*

3.4.3 Pond Edge Treatment

Pond Edge Treatment is located in the OSDS. Refer to **OSDS Section** (specifications to be written).

4.0 STORMWATER MANAGEMENT FACILITY BEST MANAGEMENT PRACTICES

4.1 Point Source Control BMP's

Point source control BMP's act to remove pollutants at their source. If possible, surface water and stormwater should be prevented from coming into contact with surfaces where pollutants are concentrated. The following table outlines possible pollutants found in SWMF and their sources.

Table 4-1: Summary of Pollutant Sources

Contaminant	Contaminant Source
Sediment	Street, lawns, driveways, roads, construction activities, atmospheric deposition, drainage channel erosion
Pesticides and herbicides	Residential lawns and gardens, utility right of ways, commercial and industrial landscaped areas, soil washoff
Organic Material	Residential lawns and gardens, commercial landscaping, animal wastes
Metals	Automobiles (zinc from tire wear, deteriorating brake pads, or leaks and spills of oil), bridges, atmospheric deposition, industrial areas, soil erosion, corroding metal surfaces, combustion processes
Oil and grease/hydrocarbons	Roads, driveways, parking lots, vehicle maintenance areas, gas stations, illicit dumping to storm drains
Bacteria and viruses	Leaky sanitary sewer lines, sanitary sewer cross-connections, animal waste, septic systems
Nitrogen and phosphorus	Lawn fertilizers, atmospheric deposition, automobile exhaust, soil erosion, animal waste, detergents

In order to implement an effective point source control BMP, it is necessary to include those landowners who are the source of the pollution or affected by the pollution, to develop a sense of ownership and stewardship. The landowners can be informed as to problems, consequences and implications and the solution. Effective education programs are aimed at the public and private sectors and include household, recreational and work activities that may result in pollutants. Information regarding pollution reduction will be a focus.
Point source control BMP's include:

- managing pesticides and fertilizers

- good household practices
- control of construction activities
- street sweeping
- catchbasin cleaning
- animal control bylaw (proper pet waste disposal)
- promote natural aquatic vegetation

For specific maintenance and management requirement for point source control BMP's refer to **5.0 SWMF Management Section.**

4.1.1 Pesticides and Fertilizers

Residents, industry, government, and commercial companies use pesticides and fertilizers for various reasons. Even though pesticides are important for activities associated with the various users, the amount and timing of application must be managed. Property owners adjacent to SWMF must be educated on how their use of pesticides and fertilizers affects the water quality of the facility. Refer to **Sections 5.3.10** *Communications* and **6.3** *Public/Landowner Roles and Responsibilities*. Pesticide use can be minimized through Integrated Pest Management (IPM). The IPM practices develop and deliver sustainable ways to manage pests that are cost-effective and pose minimal risks to human health and the environment.

The IPM practices promote the following alternatives to pesticides and fertilizers by:

- Using natural predators and pathogens to control pests
- Ensuring the timing of applications are conducted during the most vulnerable phase of the pest's life cycle
- Removing insects (including eggs and larvae) and weeds using mechanical devices
- Using pesticides that are degradable and non-carcinogenic
- Concentrating efforts on the most widely affected areas
- Using site specific methods
- Weed control to be done by hand where possible

Fertilizers are a significant source of nutrients in surface water runoff, specifically nitrogen and phosphorous. The use of fertilizers can be minimized by limiting the amount and timing of application. Other alternative practices may include:

- Limiting application
- Incorporating fertilizers directly into the soils rather than surface applications
- Use slow releasing fertilizers
- Substituting natural materials, such as compost and horticulture manure, for fertilizer
- Limiting applications to seasonal periods that minimize losses to surface runoff and groundwater percolation
- Avoid application during extended dry periods
- Avoid over watering lawns to limit excess runoff

4.1.2 Household Activities

Good housekeeping practices can effectively control point source pollution. Residents can practice certain activities, however they can be applied to commercial, industrial, and construction sites as well. For a complete list of activities refer to **Section 6.3.1** *Household Activities*. Public education is the key component to controlling point source pollution. Household, commercial and industrial activities potentially pollute stormwater.

4.1.3 Commercial & Industrial Activities

Commercial and industrial activities that generate metal and organic pollutants must be managed in a way that promotes recycling and reusing. Generated pollutants that cannot be altered or changed should be covered or contained. If pollutants enter the surface water runoff, on-site treatment is required or routing contaminants to the sanitary sewer, if permitted. Spill prevention and control should be the focus as a proactive and not reactive measure.

Activities related to automobiles typically generate metals and hydrocarbons. Several point source control measures include:

- Cleaning heavily used parking and commercial lots
- Using oil and grease recycling centers
- Inspecting and repairing vehicle fluid leaks upon detection
- Reducing vehicle use

Road de-icing during the winter contributes to heavy metal, cyanide and high salt concentrations in surface water runoff. By reducing the use of de-icing salt or using alternative de-icers, the impact of pollutants can be minimized. Strathcona County currently uses salt, and calcium chloride ($CaCl_2$). Strathcona County may investigate using Magnesium Chloride ($MgCl_2$) in the future.

4.1.4 Construction Activities

Construction activities have been recognized as a principal source of causing sedimentation in stormwater. Sediment is soil particles suspended in water. Sediment is caused by soil erosion created by a variety of construction activities. Soil erosion is the removal and loss of soils via water, wind, gravity, or ice movement. In addition to erosion, construction activities also generate pollutants from use of pesticides, petroleum products, nutrients, solid waste, garbage, and construction materials. Refer to Strathcona County's Policy **SER-001-002** *Surface Water Management, Water Management and Erosion Control Program*.

Pollutants can be minimized using point source controls. For specific roles and responsibilities refer to **Section 6.4** *Commercial and Industrial Responsibilities*.

4.1.5 Catchbasin Cleaning

Catchbasins collect debris and sediment. Cleaning the debris and sediment from catchbasins will reduce the amount of pollutants discharged in the SWMF and is the most cost effective mechanism for removing pollutants. Specific design criteria for catchbasins can be located in **ESS** Section **E2.5**.

4.1.6 Street Sweeping

Street sweeping removes pollutants deposited on roads and parking lots, thereby reducing pollutant runoff to the SWMF. The effectiveness of street sweeping is dependant upon the time of year, frequency, length of time between rainfall, type of sweeping equipment and the road surface. Early spring is the most effective time to remove accumulated pollutants. To significantly reduce pollutant loadings, street sweeping must be done very frequently. Because this would not be a cost effective option, the primary advantage of street sweeping is to control street solids and the associated pollutants. Strathcona County currently sweeps the entire urban area (including residential, collector, industrial and arterial) once a year. Collector, arterial and/or industrial may be swept as well on an as needed basis June through October.

4.1.7 Animal Waste Removal

Fecal bacteria from animal waste are a significant pollutant and risk to human health. Street sweeping is not an effective method for controlling fecal material. Therefore prohibiting littering and controlling the disposal of animal waste on adjacent land will reduce pollutant loading of the surface water runoff. Public education is paramount to raise public awareness, see **Section 5.3.10** *Communication* for further information.

4.1.8 Specifications and Design

Specific design criteria for point source control BMP's can be located in the **ESS** Section **E2**. Public Education Signage for SWMF can be located in the **OSDS** *Design Guidelines.*

4.2 Lot level

Lot-level BMP's act to reduce and slow surface water runoff volumes and/or treat runoff before it reaches the SWMF. The BMP's are applied at the individual lot-level or on multiple lots that drain a small area (less than 2 ha). Lot-level BMP's are site specific.

4.2.1 Reduced Lot Grading

4.2.1.1 Purpose

Reducing lot grades will reduce the volume of runoff by increasing runoff travel time, depression storage and infiltration. The intention of reduced lot grading is to promote recharge and reduce downstream erosion.

4.2.1.2 Description

In Strathcona County, the local building codes require a minimum lot grade of 10% within 1.5 m of a building. Minimum and maximum slopes on landscaped areas are to be 2% and 10% respectively. It is within this range of allowable slopes that reduced lot grading can be implemented to achieve the desired benefits. Reduced lot grading BMP's promote depression storage and natural infiltration and reduces risks associated with flooding and erosion. The maintenance of natural infiltration could have positive impacts on base flow depending on evapotranspiration rates.

All lot grading are to be within private property. Where private property grade is higher then surrounding SWMF grades, back sloping is to end at property line. All grades are to form a smooth, even transition into public lands. Fill will not be permitted within the SWMF. This will be strictly applied to lands adjacent to natural wetlands.

4.2.1.3 Applicability

Reduced lot grades can be recommended as a lot-level stormwater BMP for any new developments and in regarding or re-landscaping of existing lots in established developments.

4.2.1.4 Effectiveness

Very little information has been recorded on the effectiveness of lot grades on overall runoff volumes from a developed area. This practice will impact the capacity of usefulness on the landowner's land as the water ponded on lots may take 24 to 48 hours to drain. However, this impact will be greatest during the spring period, with negligible impacts during the summer.

4.2.1.5 Design

Refer to **ESS** Section **E1.4.2.3**

4.2.2 Superpipe Storage

4.2.2.1 Purpose

Superpipes can be used to reduce peak flow rates be providing sub-surface storage. Superpipes are used for small catchment areas where water quality enhancement is not a priority and there is insufficient surface space to construct a detention facility.

4.2.2.2 Description

Large pipes are installed with small outlet pipes. As inflow rates are much larger than the outflow rates, runoff is detained within the pipes. Generally, detention times are in the order of a few hours. Land requirements for superpipes are generally small while material costs are high when compared to traditional surface storage facilities.

4.2.2.3 Applicability

Installation locations include parking lots, grassed swales and adjacent to property boundaries. Generally, superpipes are utilized for small development sites where there is insufficient surface space to construct detention facilities. Superpipes should be installed where the pipes can be easily excavated for maintenance. Superpipes should not be constructed under structures that cannot be excavated. They should be located in close proximity to fire hydrants that supply flushing water for the removal of sediments.

4.2.2.4 Effectiveness

Superpipes are very effective in reducing site peak flow rates. There is little water quality benefits as only some of the coarser sediment particles will settle out.

4.2.2.5 Design

Specific design considerations are not currently documented however, will be incorporated into the next version of the ESS.

4.2.3 Infiltration Trenches

4.2.3.1 Purpose

The purpose of an infiltration trench is to collect and provide temporary storage of surface water runoff and to promote infiltration.

4.2.3.2 Description

Infiltration trenches may be constructed at ground surface to intercept overland flows directly or constructed in the subsurface as part of a storm sewer system. Generally, infiltration trenches are composed of a clean stone storage material with a sand or peat filter layer.

4.2.3.3 Applicability

Infiltration trenches are recommended for small drainage areas less than 2 ha, specifically for small residential areas of a few lots, multi-family housing, commercial areas, parking lots and open space areas. Use of infiltration trenches for industrial land is discouraged due to a greater potential for pollutants. Some form of upstream pre-treatment may be required.

4.2.3.4 Effectiveness

Infiltration trenches provide limited water quantity control as they are sized for quality control. Infiltration trenches do result in reduced runoff which reduces end-of-pipe storage requirements. Infiltration trenches provide groundwater recharge potential and enhance water quality however pre-treatment may be required if sediment content is high.

4.2.3.5 Design

Refer to **ESS** Section **E1.4.1.3(b)**

4.3 Conveyance System

Conveyance system BMP's transport surface water and stormwater runoff from developed areas through sewers or grassed swales.

4.3.1 Vegetative Swales/Bioswales

4.3.1.1 Purpose

Vegetative swales have been historically constructed for stormwater conveyance, currently they are used to store, infiltrate and convey road and on-lot runoff. Swales are normally associated with low-density developed drainage basins.

4.3.1.2 Description

Emergent aquatic plant species (grasses, cattails, sedges) within the swale reduce flow velocities, prevent erosion and filter pollutants (heavy metals, chemical oxygen demand, nitrate nitrogen, ammonia nitrogen, and suspended solids). Plants with deep roots should be avoided as they may puncture the filter fabric at the top of the trench.

4.3.1.3 Applicability

Vegetative swales are typically used in more rural areas with rolling or relatively flat land. Swales may be designed to replace curb and gutter controls.

4.3.1.4 Effectiveness

Water quality improvement is dependent upon the contact area between the water and the swale and the longitudinal slope. Deep narrow swales are less effective than shallow wide swales.

4.3.1.5 Design

Specific design considerations are not currently documented however, will be incorporated into the next version of the ESS.

4.3.2 Vegetative Channel/Ditches

4.3.2.1 Purpose

Vegetative channels are constructed to store, infiltrate and convey road and on-lot runoff. Channels are normally associated with low-density developed drainage basins.

4.3.2.2 Description

Vegetative channels differ from vegetative swales in size and volume/speed of flow that passes through. Vegetative channels have less naturalized characteristics and may have a more unstable bank.

4.3.2.3 Applicability

Vegetative channels are applicable to define flow. Having a flat vegetated bottom discourages erosion.

4.3.2.4 Effectiveness

Channels are effective in residential areas where roof and impervious surface runoff primarily collects in the channel.

4.3.2.5 Design

Specific design considerations are not currently documented however, will be incorporated into the next version of the ESS.

4.4 Treatment

Treatment BMP's are typically called stormwater management facilities (SWMF) and includes wet ponds (lakes), wetlands, dry ponds and filters. Treatment SWMF receive surface and stormwater runoff from a variety of conveyance systems. Treatment SWMF provide water quality improvement prior to discharge into a receiving water body (with the exception of dry ponds which are used to manage water quantity).

4.4.1 Wet Ponds

4.4.1.1 Purpose

Wet ponds store surface water and stormwater runoff to promote pollutant removal and control discharge to predevelopment levels to reduce downstream flooding and erosion in receiving water bodies.

4.4.1.2 Description

When properly designed, wet ponds are one of the most common treatment BMP's. Their dependability can be credited to several factors:

- the permanent pool prevents re-suspension

- the permanent pool minimizes blockage of outlet
- biological removal of pollutants
- the permanent pool provides extended settling time for silt

Runoff entering the wet pond is slowed by the permanent pond and suspended solids and pollutants settle out of the water column. The major biological processes that occur are nutrient uptake by vegetation and algae and pollutant degradation by microorganisms. Vegetation provides improved pollutant removal, shading, wildlife habitat, safety, erosion resistance and aesthetics. Friction of vegetation on water slows the speed of runoff.

4.4.1.3 Applicability

Wet ponds are suitable for large drainage areas, for residential, commercial and industrial lands.

4.4.1.4 Effectiveness

The permanent pond in the wet pond system is the major source of water quality improvement. Wet ponds are very effective in controlling peak runoff discharges and the enhancement of water quality. Wet ponds are designed to meet specific water quality and quantity objectives.

4.4.1.5 Design

For specific design criteria refer to **ESS** for pond design and the **OSDS** *Stormwater Management Facilities* **Section** (specifications to be written) for landscape treatments.

4.4.2 Constructed Wetlands

4.4.2.1Purpose

Constructed wetlands retain surface water and stormwater runoff and improve water quality.

4.4.2.2 Description

Constructed wetlands consist of shallow extended detention areas with extensive native species plantings. Constructed wetlands are similar to wet ponds in that:

- the permanent pool prevents re-suspension
- the permanent pool minimizes blockage of outlet
- biological removal of pollutants
- the permanent pool provides extended settling time for silt

4.4.2.3 Applicability

Constructed wetlands are designed to meet specific water quality and quantity objectives. Constructed wetlands are suitable for large drainage areas, for residential, commercial and industrial lands.

4.4.2.4 Effectiveness

Sedimentation, filtration, biological and chemical processes affect water quality improvement. It has been shown that constructed wetlands effectively lower biochemical oxygen demand, total suspended solids, and total nitrogen concentrations.

4.4.2.5 Design

For specific design criteria refer **ESS** for pond design and the **OSDS** for landscape *Stormwater Management Landscape Design* **Section** (specifications to be written)

4.4.3 Dry Ponds

4.4.3.1 Purpose

As mentioned in previous sections, dry ponds are designed to temporarily store stormwater; they do not retain a permanent pool of water. They are largely used for water quantity and erosion control and are used in conjunction with other SWMF's.

4.4.3.2 Description

Existing dry ponds will be maintained to existing standards as a part of our stormwater management system. They are not parks, and cannot be maintained to that standard and will be left in a more natural state. Strathcona County does not approve the development of dry ponds in future developments and encourages alternate methods of handling stormwater. Recreation amenities (i.e., playing fields, playgrounds) will not be located in dry ponds. Dry ponds will not be accepted as any portion of the Municipal Reserve (MR) dedication.

4.4.3.3 Applicability

Strathcona County does not support new development of dry ponds, for further information contact the **Engineering and Environmental Planning** department **(464-8279)** or **Planning and Development Services** department **(464-8080)**.

4.4.3.4 Effectiveness

Dry ponds are ineffective for water quality control since they can only infiltrate limited volumes of stormwater. They should be used in conjunction with wet ponds and wetlands to remove suspended solids.

4.4.3.5 Design

Strathcona County does not support new development of dry ponds, for further information contact the **Engineering and Environmental Planning** department **(464-8279)** or **Planning and Development Services** department **(464-8080)**.

4.4.4 Filters

4.4.4.1 Purpose

Filters are treatment BMP's that promote pollutant removal. Filter strips are engineered conveyance systems designed to remove pollutants from surface water runoff.

4.4.4.2 Description

Filters can be designed and constructed as either surface or subsurface systems. A filter is constructed with an impermeable liner to prevent adjacent material from clogging pore spaces and to prevent filtered water from entering the groundwater. Infiltrated water is collected in a pervious pipe system and conveyed to a downstream outlet. Surface filters are commonly covered by a layer of grass. The most common type of filter is a sand filter, with organic filters available as well. An organic filter has a layer of peat in addition to the sand that acts to improve the removal of nutrients and trace metals.

Filter strips treat small drainage areas less than 2 ha. A filter typically consists of a level spreader and vegetation. The vegetation functions to filter the pollutants and promote infiltration.

Filters can be landscaped using native trees, shrubs and grasses, and can also be used beneath hard surfaced landscapes. Filter strips are best used adjacent to buffer strips, watercourses or drainage swales and may be used adjacent to overland escape routes and in parks.

4.4.4.3 Applicability

Filters are suitable for drainage areas less than 5 ha and are commonly used in parking lots and commercial sites.

4.4.4.4 Effectiveness

Performance and efficiency of filter strips has not been well documented although properly designed filter strips are capable of removing a high amount of stormwater pollutants. Filters are a water quality BMP and have no application for erosion or quantity control. Winter performance is unknown.

4.4.4.5 Design

Specific design considerations are not currently documented however, will be incorporated into the next version of the ESS.

4.4.5 Buffer Strips

4.4.5.1 Purpose

Buffer strips are natural or naturalized areas between development and receiving waters. They are designed to protect wetlands, streams and valley corridor systems and to protect vegetated riparian areas within the valley system to minimize the impact of development of the stream itself.

4.4.5.2 Description

Buffer strips are the first filter for surface water and stormwater runoff by slowing the runoff rate and filtering sediment. The protection of stream and valley corridors provides significant benefits to wildlife, aquatic habitat, terrestrial habitat, and linkage between natural areas.

4.4.5.3 Applicability

Buffer strips are best applied as one of a combination of BMP's as the maintenance of sheet flow through the vegetation has been difficult to maintain in practice. With uneven sheet flow consistent water quality benefits is difficult to attain.

4.4.5.4 Effectiveness

Limited buffer strip performance data is available although it is generally thought that properly designed buffer strips are capable of removing a high percentage of stormwater particles. Vegetative buffers around the perimeter of the SWMF are recommended for erosion control and additional sediment and nutrient removal. They also provide a barrier, protection and habitat for wildlife. The effectiveness of buffer strips has been difficult to determine in practice because residents in these areas still have a perception that this is unnatural weed growth and they mow it down. With the introduction of the Best Management Practices, enforcement and education will assist in ensuring the buffer strips remain in place to function as they were designed.

4.4.5.5 Design

A schematic of vegetated and wooded buffer strips are shown in figure 8-16 of Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*.

Specific design considerations are not documented, although vegetation should be suited to the adjacent habitat and land uses.

4.4.6 Oil/Grit Separators

4.4.6.1 Purpose

Oil/grit separators are a variation of the traditional settling tank, designed to capture sediments and trap hydrocarbons in surface water runoff.

4.4.6.2 Description

An oil/grit separator is an underground retention structure that takes the place of a manhole in the storm sewer system. There are two designs; the three chamber and the bypass separator. Three chamber separators operate most effectively when constructed off-line, with low flows directed to this separator. Bypass separators should be installed on-line, as they can handle high flows.

4.4.6.3 Applicability

Oil/grit separators are suitable for drainage areas smaller than 5 ha. They are best suited to areas of high impervious cover where there is a potential for hydrocarbon spills and polluted sediment discharges, including parking lots, commercial sites, industrial sites, gas stations, airports and pre-treatment in residential areas. Regular maintenance is important for performance.

4.4.6.4 Effectiveness

Oil/grit separators provide effective treatment of surface water runoff quality when used at the source or as pre-treatment. Separators that do not incorporate a flow bypass are ineffective in removing and containing sediments and oils due to continuous resuspension. Oil/grit separators are effective in reducing total suspended sediments, depending on land use, drainage areas and site conditions. Oil/grit separators are not designed to provide water quantity control.

4.4.6.5 Design

Specific design considerations are not currently documented however, will be incorporated into the next version of the ESS.

5.0 STORMWATER MANAGEMENT

There is some limited experience with stormwater techniques and designs in Alberta particularly when it comes to wetland design and best management practices. While this should not discourage use of new technologies, there must be a higher regard for monitoring performance. Ongoing maintenance is extremely important to ensure continued effectiveness and resources to ensure this is part of the management strategy required.

5.1 Water Quality

As Alberta continues to grow and the demand for water increases, water quality is becoming an important issue that must be addressed. Water quality will play a prominent role in defining water management. The useable volume of water from underground sources is limited by its quality. In general, only groundwater within 400 m of the surface is suitable for domestic consumption or industrial use (Alberta Environment Protection, 2003). In association with the altered drainage characteristics caused by urbanization, there are changes in water quality. The runoff from the urban area contributes to the pollution loading of nutrients, bacteria, sediment, heavy metals, oils, grease and, in the spring road salt in receiving water courses.

Traditionally, stormwater has been managed from a *quantity* rather than a *quality* perspective. In prior years, it was perceived that stormwater posed a relatively low source of pollution, however recent studies have shown that there can be a significant pollutant load risk in stormwater runoff. It is now being recognized that the discharge from Stormwater Management Facilities (SWMF) can have an adverse affect on the receiving waters. Stormwater runoff may be contaminated with various pollutants from industrial lots, automobile emissions, and other household pollutants (pesticides, fertilizers) often at concentrations exceeding water quality objectives. If not managed properly, these contaminants may become a significant source of pollution and may ultimately affect the potable water supply. The Federal *Fisheries Act* goes so far as to say that it is prohibited to deposit deleterious substances into waters that are frequented by fish or that may provide potential habitat for fish.

In January 1999, the Provincial *Water Act* came into effect, requiring approvals and licenses for any activities that may alter natural drainage constructing improved drainage channels and outfall structures affecting natural water bodies. Refer to **Section 3.1.2** *Provincial Water Act*. The Act states that a Master Drainage Plan will be required within five years of the *Wastewater and Storm Drainage Regulation* coming into effect. A Master Drainage Plan is a stormwater drainage plan that is generally prepared for a single storm event; however, it may incorporate several events.

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As of January 1999, the Alberta Provincial Government guideline for Total Suspended Solids (TSS) from a stormwater facility is 85% minimum removal of the total load. (Alberta Environment, 2001).

In order to ensure the Provincial guidelines are being met, it is Strathcona County's goal to require developers to monitor and model SWMF functions (including design) between the CCC and FAC in order to meet the Provincial guideline of 85% total load removal.

Table 5-1: Common Stormwater Pollutants

Constituents	Effects
Sediments – Silt, dissolved solids, turbidity	Stream turbidity Habitat changes Recreation/aesthetic loss Contaminant transport Filling of SWMF
Nutrients – Nitrate, nitrite, ammonia, organic nitrogen, phosphate, total phosphorus	Algae blooms Eutrophication Ammonia and nitrate toxicity Recreation/aesthetic loss
Microbes – Total and fecal coliforms, fecal streptococci viruses, *E. coli*, enterocci	Ear/intestinal infections Recreation/aesthetic loss
Organic matter – Vegetation, other oxygen-demanding materials	Dissolved oxygen depletion Odours Direct and indirect fish mortality
Toxic pollutants – heavy metals (cadmium, copper, lead, zinc), organics, hydrocarbons, pesticides/herbicides	Human and aquatic toxicity
Thermal pollution	Dissolved oxygen depletion Habitat changes Direct and indirect fish mortality
Trash and debris	Recreation/aesthetic loss

Source: Municipal Stormwater Management, 2nd Edition

Interest has steadily increased over the last two decades in the use of natural physical, biological and chemical aquatic processes for the treatment of polluted waters. This interest has been driven by growing recognition of the natural treatment functions performed by wetlands and aquatic plants, by the escalating costs of conventional treatment methods and by a growing appreciation for the potential ancillary benefits provided by such systems.

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The many water quality improvement functions and values of wetlands are now widely recognized. At the same time, concern has grown over the possible harmful effects of toxic pollutant accumulation and the potential for long-term degradation of wetlands from altered nutrient and hydraulic loading that can occur with the use of wetlands for water treatment. Natural wetlands do function within the watershed to improve water quality, and conservation or restoration of wetlands to maintain or improve water quality are acceptable practices. However, pollutants should not be intentionally diverted to wetlands for primary treatment. **Wetlands must be part of an integrated landscape approach to water quality control, and cannot be expected to compensate for insufficient use of BMP's within the contributing area of the drainage basin.** Restored wetlands are subject to the same restrictions as unmodified natural wetlands. Mitigation (or compensation) wetlands created from upland habitat for mitigating the loss of other wetlands, as required by regulatory agencies, are generally also subject to the same restrictions as natural wetlands. Constructed wetlands that are designed and developed specifically for water quality treatment are not intended for the same protections as natural wetlands, and can serve as a valuable BMP option.

5.1.1 Suspended Solids

Total Suspended Solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material, such as silt, industrial wastes, decaying plant and animal matter. High TSS can block light from reaching submerged vegetation. As the amount of light passing through the water is reduced, photosynthesis slows down. Reduced rates of photosynthesis causes less dissolved oxygen to be released into the water by plants. If light is completely blocked from bottom dwelling plants, the plants will stop producing oxygen and will die. As the plants are decomposed, bacteria will use up even more oxygen from the water.

Settling of TSS from stormwater is a key process in the removal of contaminants. Reduction in flow velocity as runoff enters deeper water is a primary means of increasing settling of solids. TSS also settle as flows are slowed by submerged and emergent vegetation and suspended solids may be trapped on the leaves and stems of underwater vegetation.

5.1.2 Biological Oxygen Demand (BOD)

BOD may be in particulate or dissolved form. Removal of the particulate fraction can be achieved by settling. The treatment of dissolved BOD requires oxidation, usually by bacteria and other decomposers. For a wetland to be effective there must be adequate retention time to allow microbes to treat the dissolved fraction. Wetlands may also produce BOD as vegetation dies and decays (City of Edmonton, 2000).

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5.1.3 Nutrients

Nutrients occur in dissolved form. A portion is taken up (absorbed) by plants, used in plant production and bound into biomass. Treatment of nutrients in stormwater involves passing the nutrient water through a plant/algal community that is actively taking up the nutrients. Urban runoff contains increased levels of phosphorus and nitrogen. These increased levels are caused from decaying organic matter from vegetation, animals and fertilizer applications.

Nutrients are released when the plants die and decay in the fall and winter. Vegetation may also act as a pump by drawing nutrients from the soil, transporting them to the shoots and releasing them to the surroundings. When the system reaches equilibrium, phosphorus removal is likely to be reduced to the range of 30% to 50% (City of Edmonton, 2000).

5.1.4 Heavy Metals

Heavy metals are common contaminants in stormwater. Major sources of metals are from exhaust emissions, oil and grease, corrosion, pigments in paint and stains and breakdown of the road surface. The removal of metals in wetland systems is attributed to precipitation and adsorption. Chemical precipitation is enhanced by wetland metabolism, especially by algal cells that reduce dissolved CO_2 concentrations, raise the pH and facilitate chemical changes that result in metal precipitates. Metals also adsorb onto organic material and clay particles and settle along with these particles. Therefore, settling is a partial treatment for heavy metals. Metals such as arsenic, cadmium, chromium, nickel and zinc are quickly concentrated in soils and plants compared with water concentrations, primarily through direct adsorption and absorption by plants (City of Edmonton, 2000).

5.1.5 Pathogens

The pathogens of concern in stormwater may include parasites, bacteria and viruses. Major sources of pathogens are from animal and bird waste and cross connection of sewer systems with storm systems. They are removed from the stormwater by predation, sedimentation, adsorption, and dieoff due to unfavourable environmental conditions.

5.2 Water Quantity

As Strathcona County expands and becomes more urbanized, manmade and natural drainage flows respond more quickly and are much higher than the pre-development flows. Drainage flow recession following a rainfall event is also more rapid. This

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increase in discharge may cause erosion of the drainage channels, due to higher flow velocities but not if properly designed and/or retention of riparian vegetation is incorporated. Evapotranspiration and water infiltration into the soil decrease as there is more impermeable surfaces. The reduction in infiltration results in almost immediate runoff and lowers groundwater discharge and baseflow.

Traditionally, stormwater management was managed for quantity control. One of the primary functions of SWMF is to handle rainfall events to minimize the potential of flooding, the increased risk to life, and the increased risk to property damage. Changes in the hydrological cycle can cause flooding, stream erosion, sedimentation. Flooding and erosion can have direct effects on public safety, while erosion and sedimentation can affect the habitat of aquatic animals.

The amount of runoff is related to the season, generally, most winter and spring storms are of low intensity over a long duration. Therefore, the capability to manage the runoff produced during these storms is readily managed. During the summer and fall, significant change is expected, as storms during these periods are short and intense. Flooding is more common in urban areas because of the increased runoff of precipitation and the presence of systems that carry this runoff to receiving streams quickly. Managing these storms successfully is necessary for the SWMF to be effective in managing stormwater quantity and runoff rates must be considered in the design of an SWMF.

For calculations on determining rainfall/runoff infiltration rates refer to **ESS** Section **1.2.1.2 to 1.2.1.4** or Alberta Environment's *Stormwater Management Guidelines for the Province of Alberta* Section 4.0.

5.3 Management Strategy

A proactive management strategy may limit liabilities and additional costs that may be incurred with SWMF's. Often, when SWMF's are not managed effectively and efficiently, the failure rate increases, which may result in preventable expenditures. It is the responsibility of Strathcona County and the developer to maintain SWMF's. Maintenance can be divided into preventative and corrective measures. Preventative maintenance (proactive management) includes the regular maintenance of an SWMF, inspections, record keeping and analysis of data. Corrective maintenance (reactive management) is unscheduled, generally a response to an emergency including pipe breaks, collapses, or washouts. These actions can be taken to reduce liability, prevent injury, reduce flood potential, and/or to protect the environment.

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5.3.1 Floodplain Maintenance

A floodplain is land surrounding a SWMF that is susceptible to being inundated by floodwater following a rain event or during spring thaw. The floodplain area is usually documented by an easement agreement on the lands surrounding the SWMF to accommodate for storm events.

There will be an increased cost of floodplain maintenance, as the County adopts the new Open Space Development Standards (OSDS). Previously the homeowner typically had an easement on their land from NWL to the HWL. No fencing was required. The easement of 8.4 metres was incorporated into the homeowner's property and landscaping often affected design and function of the SWMF functionality. Because there was no fence required shorelines beyond the 8.4 metres were often altered to match the landscape. The **new** policy for the floodplain easement indicates that a fence is to be built at property line and the County is responsible for a minimum of 4 metres from property line/fence line to NWL into the SWMF. The property owner is responsible for maintaining up to a maximum 6.5 metre easement remaining inside private property from the fence/property line to the HWL in accordance with Strathcona County Policy. A policy (*SER – 012-009 Stormwater Management Facility Easements*) has been developed as to what types of landscaping will be permitted in this area (see Figure 5-1). In general Strathcona County will maintain all County owned land adjacent to the SWMF. Measurements are variable and should have minimum and maximums mentioned.

The OSDS designates the County as being responsible for the maintenance of wet pond shorelines from the edge of the water (NWL) to the property line around the perimeter of the SWMF. In order for there to be no confusion for the current and future owners of the property or those interested in purchasing property adjacent to a SWMF regarding floodplains, communication must be relayed regarding required landscaping and level of maintenance by the County and the property owner. The easement policy should be disclosed to the property owner at time of purchasing. In some cases new SWMF are being built with property line falling at the same location as HWL therefore the County would be responsible for maintenance on the entire easement area. Municipal Reserve (MR) around any SWMF will not be given for the Public Utility Lot (PUL) where lands are below the HWL.

Property owners may be dissatisfied with the level and schedule of maintenance set by the County, however it is imperative that they understand what is required for the SWMF to operate efficiently and effectively. Maintenance requirements are outlined in the **OSDS** (Section to be written).

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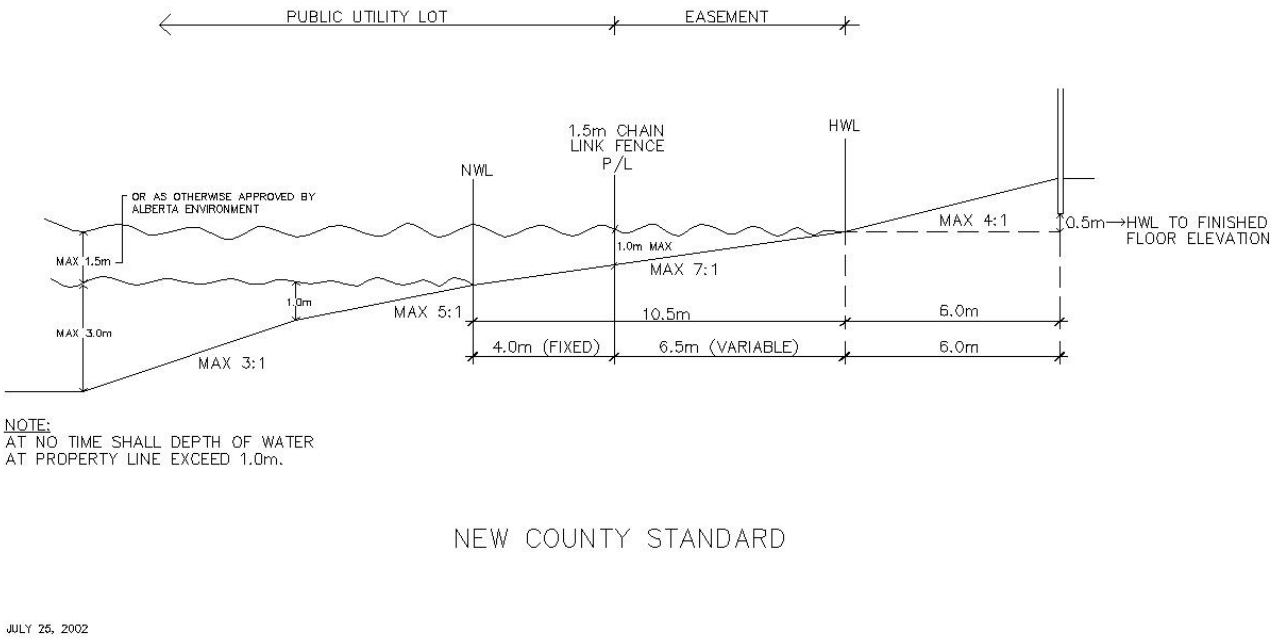
The County must work with developers to ensure that purchasers and the public in general know what the expected level and schedule of maintenance will be.

Standards and Requirements

Floodplain easement standards are shown in Figure 5-1 below.

Figure 5-1: County Floodplain Standard (2003)



Land owner adjacent to a SWMF is responsible for fence and landscape maintenance on private property.

5.3.2 Vegetation Management

Vegetation establishment and management is an essential component in the design and functionality of a SWMF.

The objectives of vegetation management are to:

- meet a set standard for SWMF vegetation by the development and ongoing monitoring of naturalization maintenance standards
- Require the use of native plant materials or plants that possess characteristics similar to native plants. This will reduce long term management requirements,

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assist in the management of noxious weeds, help stabilize the shoreline and eventually result in shorelines that are similar to those of naturally occurring local bodies of water
- Educate the public regarding the kinds of vegetation and levels of management to be expected

An ongoing communication with the public who own or who are considering purchasing property adjacent to SWMF's is required regarding the expected vegetation levels of management of the vegetation, and its importance to the improvement of water quality.

Restricted and noxious weeds should be managed using Integrated Pest Management (IPM) activities to prevent destruction of adjacent vegetation and limit the potential for introducing herbicides to the water. Aquatic weed growth may be controlled by several methods as growth along the inside perimeter of the pond may create problems such as affecting water quality and quantity, emitting foul odours, and providing habitat for noxious insects such as mosquitoes. The County applies herbicides in compliance with the Code of Practice for Pesticides to manage vegetation. Other methods to control restricted and noxious weeds include:

- remove weeds annually
- drain the SWMF to remove growth
- cultivation
- NWL could be lowered during the winter months and then re-established during the spring to drown, noxious weed seeds

To manage submergent vegetation, Strathcona County will determine methods on a site to site basis. Spraying requirements will be addresses through an Herbicide Management Plan prior to application

5.3.3 Pesticides

All pesticides must be applied in compliance with *Environmental Protection and Enhancement Act* (EPEA). For specific pesticide use refer to Alberta's ***Code of Practice for Pesticides*** Section **16(10)** and **16(11)** Pesticide Application within 30 Horizontal Metres of an Open Body of Water.

Perimeter weed growth should be accepted as a natural state of maintenance; only restricted and noxious weeds will be controlled. This method is the most economical as it protects the pond's water quality, requires the least amount of maintenance of the other methods and increases the aesthetic value of the pond.

5.3.3.1 Algae

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Algal blooms in SWMF's may occur if the pond is artificially high in nutrients (specifically nitrogen and phosphorous from surface water runoff), and are most likely near inlets. Blooms may be significant with prolonged warm weather and should be treated with chemicals only on an "as required" basis. Chemicals such as alum or lime are acceptable chemicals for control (pesticides must be approved by Alberta Environment and should only be used as a last resort).

The County has adopted an alternative method for controlling algal blooms by using rotting Barley/flax straw. A natural algaecide is released from the lignan in the straw as it rots. The installation of the barely bags have to be done such that they are suspended off the bottom of the pond. This requirement ensures the release of lignin is not absorbed in the clay bottom. Straw may be applied at any time of year, however it is much more effective before the algal growth takes place (autumn to early spring). The straw will usually become active within one month and will continue to inhibit algal growth for approximately six months. When the temperature of the water is above 20°C the straw has been proven effective in controlling algal blooms within four to five weeks, while at lower temperatures it may take eight to ten weeks.

In 2004 the County began a new pilot project for algae management. The project involves the application of a dye called Aquashade to selected SWMF's as a control mechanism for submerged weeds. The dye is designed to shade portions of sunlight that algae need to grow. The dye does not harm the other existing vegetation, which is needed for proper functioning of the SWMF. Following an application of Aquashade, the water will appear as an aqua-blue colour. The tint of the water varies somewhat depending upon depth, sediment in the water, and the bottom colour. The results of the effectiveness of Aquashade on algae growth are to be monitored over subsequent years.

When there is significant amount of dead vegetation or an abundance of vegetation that negatively affects the functioning of SWMF, harvesting may be considered, however only used if necessary. It should be noted that a significant build-up of dead vegetation is a sign that the SWMF may not be functioning properly, for example the native microorganism population that function to degrade organic matter may not be sufficient, which in turn may mean that the overall SWMF habitat is not appropriate to support the microorganism population.

5.3.3.2 *Standards and Requirements*

Landscape plans must be submitted with the construction drawings as per **OSDS** Section **3.0** *Design Standards*, Section **11.0** *Stormwater Management Facility (SWMF) Engineering* , Section **9.0** *Plant Material*) and reviewed and approved by EEP. Landscape construction must pass an inspection process for a Construction Completion

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Certificate and Final Acceptance Certificate. All landscaping must be prepared by a qualified landscape architect who is knowledgeable in natural and constructed wetland ecosystems, as per the OSDS. The Engineering Servicing Standards (ESS) indicates that all shoreline improvements shall be subject to review and acceptance by EEP (**ESS** Section **E1.4.3.3.5.8**)

A planting strategy is required to provide:

- Shading – shading from trees, shrubs and emergent vegetation will affect temperature SWMF
- Aesthetics – vegetation will increase the overall visual appeal of the pond
- Safety – vegetation along the perimeter of the SWMF will help create an obstruction to keep the public from accessing the SWMF.
- Enhanced pollutant removal
- Waterfowl management, specifically Canada Geese
- Wildlife habitat
- Sediment filter

The purpose of re-vegetation is to provide a sustainable naturalized wetland community. Plants native to central Alberta should be used where possible. The developer generally over-plants new projects to accommodate for plant mortality and to choke out weeds to the greatest extent possible. Woody vegetation around the perimeter of the pond should be considered as an alternative to deter waterfowl. Specific planting regulations are located in the **OSDS** (section to be written). For additional information, refer to *Appendix G.*

Native plant selection should consider the slope of the SWMF, as certain species are adapted to certain slope aspects and when established properly would control erosion and provide long-term stability of the slope. Wetland vegetation should be selected for its tolerance of inundation and oxygen-poor, reduced environments. Desirable characteristics for optimum treatment include tolerance of prolonged inundation and therefore low oxygen concentrations in the water and soils, and rapid dense growth to shade surface waters and reduce algal production. For a detailed list of native plants acceptable for use, see **OSDS Appendix 5**. The ESS requires the shoreline treatment between the HWL and NWL shall be chosen to ensure that erosion does not occur and natural wetland vegetation develops (**ESS** Section **E1.4.3.3.5.9**). All vegetation surrounding SWMF requires long-term management although with the selection and establishment of appropriate species, management should be less intensive compared to formally landscaped areas.

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5.3.4 Signage Regulation

Signs are necessary and required for SWMF in order to communicate to the public the type and function of a particular SWMF. Signs are required at all entrances to the pond and at any other critical points.

The purpose of this signage is to:

- identify SWMF as engineered facilities and not natural lakes or wetlands
- identify activities not permitted
- identify permitted non-contact activities
- compliment education program
- display the importance and intent of the landscape design of the engineered facility or the intent of the conservation of a natural feature
- reduce misconceptions of the form and function of a SWMF to current and future property owners
- educate the public regarding the potential and importance of establishing or maintaining wildlife habitat within an urban setting
- display health hazards, promote water quality conservation
- assist bylaw enforcement by displaying a telephone number and contact the public can use at any time

The signs have several advantages. They may reduce County liability by adding a permanent avenue of education, assist current and future property owners in making informed decisions about property backing onto SWMF, and eliminate the perception of SWMF being recreation facilities (lakes). In addition, an educated public may reduce water contamination, removal of vegetation, encroachment and protection of wildlife and may take ownership of the subdivision and promote neighbourhood preservation or enhancement through Adopt-a-Park or other community initiatives.

Standards and Requirements

Signs will be installed and constructed within all SWMF in accordance with **OSDS** Section **4.0** (Table 1: *Development Activities* Section **16** Park Signs, and **STD-47**). Signs will be located at accesses to SWMF or areas requested by Strathcona County. Smaller signs (thin ice, no swimming) will be located between NWL and HWL. The developer is responsible for the cost of purchasing and installation of the sign.

The signs will require the following information:

- SWMF name (i.e., Clarkedale Stormwater Management Facility)
- A brief paragraph describing the SWMF operation, function, health hazards and prohibited recreational uses (confirming the area is not a lake)

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- Prohibited activities such as fishing, swimming, wading, and boating (with exception to Broadmoor Lake)
- Landscaping and Trails
    - A layout plan of the SWMF with the trail system, rest stops, landscaping including no mow areas, activity and picnic areas
    - Identify the wildlife and vegetation. The removal of vegetation bylaw and contact number.
    - A summary statement for the protection of water quality and the environment with a number to call for information, reporting violations or safety concerns (Education Liaison).

Signage must be completed at the same time subdivision and area structure plan signs are installed in new subdivisions. The installation and timing must be a condition of the Development Agreement. If signs cannot be installed at that time, a construction certificate will not be issued on infrastructure or landscaping of SWMF until such a time as signs are installed.

Dry pond signage is required. Requirements will adhere to **OSDS** *Design Standards***.** This is a grand fathering process to be completed by Strathcona County.

5.3.5 Wildlife Management

Stormwater Management facilities provide for excellent wildlife habitat potential when managed in an effective manner and increases the aesthetics of the facility. The species of vegetation chosen should maximize heterogeneity and value to all types of wildlife. Maximizing vegetation density around the SWMF may discourage the entry of domestic animals that would prey on wildlife. Vegetation will attract various species of songbirds making the SWMF a desirable location for bird watching.

Bank erosion, bank undermining, breaching berms, and flooding from blockages to inlets and outlets may occur if naturalization of wetlands is not established as this would encourage an increased population of waterfowl. Wildlife may be a source of parasites and diseases through public contact with the water contained within these facilities. Wildlife may also damage adjacent private property if shorelines are not managed effectively and may cause injury to people if approached too closely (protecting their young).

Waterfowl, particularly during spring and fall migration, can congregate in large numbers and use SWMF's as loafing areas between morning and evening foraging in agricultural areas. Daytime foraging on adjacent private property may result in damage to ornamental landscapes, accumulation of feces, damage to fencing, and over browsing of shoreline vegetation. According to the North American Lake Management Society,

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ammonia levels in ponds with waterfowl habitation may be 2 to 10 times higher than those ponds without waterfowl. Large algal blooms are more prevalent in ponds with waterfowl (or high nutrient loading from surface water runoff), which affects water quality. In addition, waterfowl may generate bacterial pollution and muddy ponds. Keeping the perimeter of a pond dense with vegetation (uncut grass, shrubs, and trees) will discourage waterfowl. Strathcona County will not relocate or control waterfowl.

Beaver dams may contribute to warming of the pond causing algal blooms due to reduced water flow and therefore require removal. Dams may also cause flooding of public and private land. In addition, beavers and muskrat may spread disease to humans. Part of beavers and muskrats normal internal bacterial flora is *Francisella tularensis* or tularaemia (rabbit fever), is hazardous to humans, and may be fatal. It is transported via bite from infected ticks, inhaling dust from contaminated soil, or contact with untreated water where infection may be common among beavers or muskrats. Beaver and muskrats will be controlled in SWMF through use of traps. Refer to Strathcona County's *Vertebrate Pest Control Policy* for types of traps acceptable control methods for use.

Strathcona County will implement design criteria including naturalized shoreline vegetation, buffering, fencing, and maintenance, to create a desirable environment for wildlife therefore minimizing damage to private property and human health. Strathcona County will not support any new landscaping or other habitat enhancements specifically intended to improve reproduction success of nuisance wildlife (i.e., Canada geese nesting rafts) for any SWMF other than on Broadmoor Lake.
There is a potential increase in budget and labour to control wildlife, however if not undertaken, conditions that favour nuisance wildlife populations will continue to grow. Nuisance wildlife species may displace the more desirable wildlife species through competition and/or aggression.

Standards and Requirements

All control methods must abide by the provincial *Wildlife Act*. Strathcona County must receive written permission from the property owner before undertaking control methods on private property. Specific procedures and regulations for controlling wildlife in Strathcona County are outlined in the *Vertebrate Pest Control Policy.*

5.3.6 Sediment Removal and Disposal

One function of SWMF is to remove suspended solids from the water column, which results in an improved in water quality. As the sediments accumulate, the SWMF may not operate effectively as the storage volume is reduced and the water quality may decrease to a point where it becomes unacceptable.

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Sediment removal or dredging of a SWMF is performed to manage the accumulations of solids, silts and debris to maintain the original capacity and function of the designated facility. In existing facilities, the ability to make improvements through recontouring is desired. Monitoring sediment levels is the best process to ensure water quality remains at an acceptable level. Sediment removed from SWMF must be tested and analyzed.

Further requirements and guidelines may be developed by Utilities as required. A Sediment Removal Schedule and Erosion Control Management Plan may be required. Details outlined in the OSDS (Specifications to be written).

The most cost effective and efficient method of dredging will need to be determined on a site-to-site basis. Options include the barge method on an active body of water as well as the method of dewatering the facility and removing the solids and recontouring at that time. The barge method is where a barge is placed on the SWMF with a dredge or pump and the sediment is removed. In addition, a method needs to be developed for the maintenance of the silt traps and channels in constructed and natural wetlands and creeks. Depth of sediment build up may be monitored using markers placed in strategic locations where build up is likely to occur.

Frequency of dredging will depend on the various factors including:

- Size of the facility, smaller SWMF's may require more frequent dredging as sediments will build up quicker. Larger SWMF's may require less frequent dredging perhaps 10 years after being constructed. A regular monitoring program would determine when dredging would be required.
- Type of SWMF
- Upstream land use and level of imperviousness
- Effectiveness of BMP's in place prior to discharge into SWMF (example, point source controls, lot level etc.)
- Municipal Practices (i.e. sanding)
- Age of facility

When dredging it is imperative that solids are not re-suspended. To help reduce the risk of re-suspension, dredging during the drier months of the year or during the winter may be an optimal opportunity.

Disposal of the sediment collected during dredging would depend on the analysis of the material. There are two generalized disposal methods off-site and hazardous waste. Off-site is preferred as the sediment disposal does not reduce the developable area, landscaping does not have to be performed and there are no perceived liability/health concerns with adjacent landowners. The sediment would be taken to an off-site location

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(sanitary landfill or disposal). Hazardous waste must be deposited at a hazardous waste facility (i.e. Swan Hills) with licensed haulers used to transport the sediment. Permission must be granted from Alberta Environment as to where the sediment may be disposed.

5.3.7 Underground Infrastructure Maintenance and Utilization

SWMF are broken down into minor and major sewer infrastructure. The minor system is designed to accommodate the runoff from a 1:5 year storm event or greater. This means that the most severe storm would be expected to occur once in a 5-year period. The stormwater generated from these 1:5 year storms go into the underground infrastructure.

The minor system includes:

- All underground piping
- Catch basins
- Inlet and outlet structures
- Stormwater Manholes

It is important to note that *sanitary sewer manholes* must be located outside of the SWMF areas and should not be located within overland drainage routes.

The major systems are intended for larger than minor events and allows for flood control. Major systems are designed to accommodate a 1:100 year storm. However, prior to 2003 systems were designed to accommodate a 1:25 year storm. Major systems are always in place. A major system usually involves grading plans to ensure that an overland flow path is able to accommodate a reasonable capacity. The major systems include:

- Roads and gutters
- Receiving waters
- Above and below ground conveyance systems
- Stormwater Management Facilities
- Lot drainage

Infrastructure is managed by Strathcona County under the proposed Infrastructure Management System (IMS). Information gathered will be used in conjunction with Closed Circuit Television (CCTV) inspections to plan for future maintenance and rehabilitation projects. The IMS requires the following information:

- What type of infrastructure does Strathcona County have
    - Type of structure
    - Material of construction

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    - Type of cover
- Where is it located
    - Sub-basin
    - Street or road priority
    - Public or private
- What condition is it in
    - Structural condition
    - Service condition

The inspection form used (Storm Manhole / CB Manhole / CB Inspection Report) is used to record the specifics of the inspections as well as a place to make remarks or recommendations.

See *Appendix I* for Storm Manhole / CB Manhole / CB Inspection Report form and specific form explanations and requirements.

Standards and Requirements

For estimating flows of storms, see **ESS** Section **E1**. For specific infrastructure design, requirements see **OSDS** Section **3.0** *Design Standards*.

5.3.8 Fountains

Fountains are external structures installed in wet ponds. They may aesthetically improve appearance of the lake for the surrounding community. Fountains provide minimal aeration and circulation in wet ponds; and as such do not provide a significant improvement in water quality. Fountains may have adverse effects on water quality, as they may encourage algae growth and the re-suspension of nutrients that have settled on the bottom of the facility. Generally, Strathcona County will not fund any fountains, contact Strathcona County's Utilities department for more information.

5.3.8.1 Trust Fund

Where fountains have been approved, the developer must provide a trust fund for operation and maintenance of the fountain for 15 years. The trust fund would be used for the electrical requirements of the fountains. At time of approval, electrical costs will be determined based on requirements each fountain to establish the amount of the trust fund.

5.3.9 Water Diversion

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Municipalities must apply annually in order to draw water from the SWMF under Alberta's Water Act. The major objective of water diversion is to attain water out of the SWMF and use it for other purposes. Strathcona County's objective is to establish parameters where controlled diversion may be permitted if required. Strathcona County reviews any water diversion license applications with Water Resources.

Strathcona County supports RPC's application to Water Resources to access stormwater for use for irrigation rather than potable water for water conservation purposes.

5.3.10 Communication

A stormwater communications plan can improve understanding and lead to sharing knowledge on stormwater issues. It will provide information on stormwater policies and issues to stakeholders to promote awareness. When enacted, it will communicate with many "publics" involved in stormwater management (publics refers to both the external and internal groups involved in the program. External publics include the target audience, secondary audiences (or people that influence the targets decisions), policymakers, and regulators, while the internal publics are those who are involved in some way with either approval or implementation of the program).

The goals of a communication plan are to:

- Improve understanding within Strathcona County about stormwater management including the issues surrounding stormwater management
- Improve understanding within the Province of Alberta about Strathcona County's approach to stormwater management
- Raise public awareness about Strathcona County's approach to stormwater management
- Increase the public's understanding that it is much more cost-effective to maintain a proactive approach to stormwater management by preventing source pollution rather than removing pollution from SWMF

In order to effectively convey the message of Strathcona County's communication plan, several external target audiences must be identified. These audiences include property owners adjacent to SWMF, the public, children, municipal government officials, developers, and individual departments of Strathcona County. The same message will not be effective for every target audience, therefore several target messages to multiple and different audiences will achieve a greater response.

The communications plan will define several key themes in order to improve the public's understanding of stormwater issues. They include:

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- Stage One: Define pubic outreach objectives
- Stage Two: Identify the target audiences
- Stage Three: Develop materials for those audiences
- Stage Four: Distribute the materials to appropriate audiences

These stages will be defined and explored in detail for implementation in Strathcona County's proposed *Communication Plan for Stormwater Management*. Messages must be tailored to each of these target audiences based on the objective to be achieved.

Initiatives that have been undertaken by Strathcona County are outlined in the following chart:

Table 5-2: Stormwater Management communication initiatives currently undertaken

Communication	Objectives communication aimed to achieve	Dates communication was transmitted
Yellow Fish Road	To inform residents of Strathcona County which catchbasins and drains lead to a SWMF.	Trade Show 2005, Girl Guides
Open House – Nottingham Lake	Obtain feedback from residents of Nottingham and address any issues they have with the SWMF	May 17, 2001
Mail Out	To inform property owners adjacent to Clover Bar Lake and Village on the Lake of dredging to take place	Summer 2003
Brochure	Inform residents of Strathcona County what a SWMF is and how it functions	2003 Trade Show Ongoing
Website	Inform residents of Strathcona County what a SWMF is, how it functions and policies pertaining to SWMF	Ongoing
Mail out	Inform property owners adjacent to SWMF of Policy SER-012-009. To gain	February 2004

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	property owners' understanding of policy and have their cooperation in complying with the policy.	
School Presentations	To inform children (grade 4) what a SWMF is and its safety requirements.	September 15, 2003 October 2, 2003

Future initiatives are endless; stormwater management will becomes more prominent issue as Strathcona County continues to become urbanized. Innovative communication initiatives will be explored to effectively reach the target audience in the most cost-effective manner.

5.3.11 Emergency Response

Access to SWMF is important from an emergency response perspective. Sufficient access is required in order to manage emergencies such as flooding, hazardous spills and/or fire. Emergencies must be to be reported to **Utilities (467-7785).** Utilities has the materials to respond to an initial spill contaminant however will contact **CEDA (1-888-793-2378)** for final cleanup support and maintenance. For specific protocol on emergencies, refer to Strathcona County's **Emergency Response Plan**.

Emergency response accessibility design requirements for are found in the **OSDS** (section to be written).

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5.4 Facility Management Requirements

Table 5-3: Wet pond Maintenance

***** Facilities will be monitored to establish parameters for removing accumulated sediment
****W&WW – Water & Waste Water ***Ag – Agriculture Services**

Operation or Maintenance Activity	Department Responsible	Broadmoor Lakes	Clover Bar Lake	Eastgate Lake	Fountain Creek Lake	Foxboro Lake	Griffon Ind. Lake	Golf Course Lake	Nottingham Lake	Upper Ball Lake	Village on the Lake	Woodbridge Lake
Year Complete	--	1981/94	1988	1971/80	1992	2004	1980	1981/03	1980	1996	1984	1978
High water level	--	714.7	697.2	717.73	727.7	717.80	669.2	712.50	726.32	729.6	710.4	707.47
Normal water level	--	713.5	696.4	715.67	726.0	715.9	667.4	711.70	725.12	728.4	709.6	706.07
Grass cutting	RPC	Four times a month	Twice a month	Twice a month	Twice a month	Twice a month	n/a	Eight times a month	Once a month	Twice a month	Twice a month	Twice a month
Weed Management	RPC	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required
Upland vegetation replanting	RPC	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)
Floodplain vegetation replanting	RPC	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)
Aquatic vegetation management	UTILITIES (W&WW**)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)	As needed (seldom)
Removal of accumulated sediments	UTILITIES (W&WW**)	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*
Outlet valve adjustment	UTILITIES (W&WW)	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Oil/grit separator or catchbasin cleaning	UTILITIES (W&WW)	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events	As conditions warrant or after major storm events
Silt Trap Cleaning	UTILITIES (W&WW)	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Water quality monitoring	UTILITIES (W&WW)	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially	3-4 times biennially
Inlet/outlet inspection	UTILITIES (W&WW)	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall
Wildlife Management	TAS (Ag***)	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Accept design of SWMF and adjacent public lands	EEP	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Specification Management	EEP	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Permit Approvals/policy implementation	PD&S	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Land Management	PD&S	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required	As required
Street Sweeping	TAS (roads)	Annually	Annually	Annually	Annually	Annually	Annually	Annually	Annually	Annually	Annually	Annually
Trash Removal	RPC	Once or twice a year from the SWMF. Once or twice a month from public greenspace adjacent to the SWMF										

5.4 Facility Management Requirements

Table 5-4: Wetland Maintenance

Operation or Maintenance Activity	Department Responsible	Clarkdale Lake	Heritage Wetlands
Year Complete	--	2000	2003
High water level	--	705.6	717.80
Normal water level	--	702.7	717.00
Grass cutting	RPC	Once a season	Once a season
Weed Management	RPC	Spraying as required	Spraying as required
Upland vegetation replanting	RPC	As needed (seldom)	As needed (seldom)
Floodplain vegetation replanting	RPC	As needed (seldom)	As needed (seldom)
Aquatic vegetation management	UTILITIES (W&WW**)	As needed (seldom)	As needed (seldom)
Removal of accumulated sediments	UTILITIES (W&WW**)	5 – 7 year cycle for sediment pond*	5 – 7 year cycle for sediment pond*
Outlet valve adjustment	UTILITIES (W&WW)	As required	As required
Oil/grit separator or catchbasin cleaning	UTILITIES (W&WW)	As conditions warrant or after major storm events	As conditions warrant or after major storm events
Silt Trap Cleaning	UTILITIES (W&WW)	As required	As required
Water quality monitoring	UTILITIES (W&WW)	3-4 times biennially	3-4 times biennially
Inlet/outlet inspection	UTILITIES (W&WW)	Spring and Fall	Spring and Fall
Wildlife Management	TAS (Ag***)	As required	As required
Accept design of SWMF and adjacent public lands	EEP	As required	As required
Specification Management	EEP	As required	As required
Permit Approvals/policy implementation	PD&S	As required	As required
Land Management	PD&S	As required	As required
Street Sweeping	TAS (Roads)	Annually	Annually
Trash Removal	RPC	Once or twice a year from the SWMF. Once or twice a month from public greenspace adjacent to the SWMF	

***** Facilities will be monitored to establish parameters for removing accumulated sediment

****W&WW – Water & Waste Water**

*****Ag - Agriculture**

Table 5-5: Dry Pond Maintenance

Operation or Maintenance Activity	Department Responsible	Broadmoor Centre	Davidson Creek	Estates 1,2 and 3	Garland Pond	Glen Allen	Highway 16	Millshaven
Year Complete	--	1977	n/a	1987	n/a	n/a	1991	n/a
HWL	--	n/a	n/a	n/a	719.330	717.190	n/a	708.040
NWL	--	n/a	n/a	n/a	717.830	713.990	n/a	705.580
Grass cutting	RPC	Once a month	Once a month	Once a month	Once a month	Once a month	Once a month	Once a month
Weed Management	RPC	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required	Spraying as required
Upland vegetation replanting	RPC	Seldom	Seldom	Seldom	Seldom	Seldom	Seldom	Seldom
Floodplain vegetation replanting	RPC	Seldom	Seldom	Seldom	Seldom	Seldom	Seldom	Seldom
Removal of accumulated sediments	UTILITIES (W&WW)	As required*	As required*	As required*	As required*	As required*	As required*	As required*
Outlet valve adjustment	UTILITIES (W&WW)	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall
Oil/grit separator or catchbasin cleaning	UTILITIES (W&WW)	As required*	As required*	As required*	As required*	As required*	As required*	As required*
Trash removal	UTILITIES (W&WW)	Once a month	Once a month	Once a month	Once a month	Once a month	Once a month	Once a month
Silt Trap Cleaning	UTILITIES (W&WW)	As required*	As required*	As required*	As required*	As required*	As required*	As required*
Inlet/outlet inspection	UTILITIES (W&WW)	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall	Spring and Fall

***** Facilities will be monitored to establish parameters for removing accumulated sediment

5.4.1 Facility Inspection

Facility inspection is done to examine inlets and outlets, vegetation condition (is the vegetation flourishing), visual water quality (oily sheen, frothy), debris and general upkeep of the facility. High water level (HWL) is to be monitored in the spring and fall. Refer to Table 5-3 and Table 5-4 for specific frequency and timing of inspections.

5.4.2 Grass Cutting

Grass cutting is undertaken to enhance perceived aesthetics of the facility. Grass cutting will not enhance water quality and will provide additional safety benefits for wet facilities. Frequency is dependent on surrounding land uses. Grass cutting around a wet facility should ensure that the grass is not to be cut at the edge of the permanent pool. Grass should be done as far up from the shoreline as possible with a minimum of one mower width adjacent to private property. Grass clippings will be ejected upland (to reduce potential for organic loadings to the pond) on SWMF that currently do not contain the naturalized strip along the shoreline (i.e. Broadmoor Lake, Woodbridge Farms). SWMF with naturalized strips and/or riparian growth will have grass clippings ejected down-slope towards the water. SWMF without naturalized and/or riparian growth will have grass clippings mulched without ejection. This reduces the potential for organic loading to the pond and eliminates clippings from entering private property up-slope.

5.4.3 Weed Management

As previously mentioned in Section 5.3.2, weed management should be controlled by hand or mechanical activities to prevent destruction of adjacent vegetation and to limit the potential for introducing herbicides to the water. Frequency should be determined each year on a site-specific basis. Restricted and noxious weeds must be controlled, for a list of noxious weeds in Strathcona County see *Appendix H Restricted and Noxious Weeds.*

5.4.4 Vegetation Replanting

Once established upland and floodplain plantings are generally stable and should not need much maintenance or re-establishment. Some vegetation re-establishment or enhancement may be required every five years. As aquatic vegetation is harder to establish, there should be a contingency for the re-establishment during the first two years after construction to ensure conditions for colonization are created. Planting methods can be separated into three main categories based on the major treatment zones in the SWMF, 1) upland, 2) riparian, and 3) shallow water.

Upland plantings include ground cover (grasses) and woody shrubs and trees. Planting should be completed in the spring, but after water levels have stabilized. Ground cover could be installed by either hydroseeding or using a custom seed mix in a nutrient rich medium saturated in an erosion control biodegradable blanket (geojute). Wet riparian

planting should be carried out in mid-May to early June. Some form of protection of the seed mixture should be provided in this dynamic zone of water level fluctuation. The biodegradable blanket is highly recommended to establish ground cover. Shrubs and trees can be planted through openings in the blanket.

Establishing shallow water plantings may require short and long term monitoring. Emergent vegetation may be planted by hand if the substrate is suitable. Young shoots (as opposed to rhizomes or corms) are preferable for planting as they provide for early stability (established root structure). Plants should be at least 10 cm tall for planting and should be done late May to early June. Sprigs or plugs of emergent plant material would be preferable for planting as the root material is already contained in suitable growth medium. Submerged rooted plants should be planted as mature vegetative growth if planted in late spring to early summer. Mature growth will take advantage of warmer water and sunlight penetration. Plantings in early spring or fall should use vegetative propagules such as turions or rhizome plugs, which can germinate in spring or over-winter and begin growing in the following growing season. Live topsoil from adjacent wetland areas will also assist with quick establishment of emergent vegetation and initiate microorganism development. Further details are outlined in **OSDS** Section *(to be written)*

5.4.5 Outlet Valve Adjustment

Valves should be tested to ensure they are in working order during the spring and fall. These outlets include Clarkedale Lake, Eastgate Lake, Heritage Lake and the Estates of Sherwood Park dry ponds.

5.4.6 Oil/grit separators

Oil/grit separators should be cleaned out using a vacuum truck. Refer to **Table 5-3** or **5-4** for specific frequencies and timing for routine maintenance. Cleaning is required, after any known spills have occurred.

5.4.7 Trash Removal

Generally, there will be a need to undertake an annual spring cleanup to remove trash from all SWMF. Trash removal will then be performed on an as required basis based on observations during regular inspections after major rain events.

5.4.8 Sediment Removal

Frequency of sediment removal is site-specific and dependent on various factors mentioned in **Section 5.3.6** *Sediment Removal and Disposal.* Specific criteria for dredging have not been established thus far. Monitoring SWMF sediment quantity levels will be carried out to establish what level will it affect the functionality of the SWMF. Surveys will be undertaken of individual SWMF to determine if that site requires

dredging. The chart below demonstrates a process for determining if dredging is required.

5.4.9 Catchbasin Cleaning

Catchbasin cleaning in Strathcona County is performed annually, however only selected catchbasins are cleaned each season. Twenty five percent of catchbasins will be cleaned annually. Catch-basin cleaning is done via the use of a vacuum truck which extends a hose into the sump of the catch-basin and sucks out the material which has been deposited in the sump. Currently Strathcona County's Standard Operating Procedure **OP-1213** for proper protocol on catchbasin cleaning is under review and being updated, for current procedures contact **Utilities** at **467-7785**.

5.4.10 Water Quality Monitoring

A water quality-monitoring program will be developed in 2004. The monitoring program will explore the most effective methods and locations to be used in order to ensure Strathcona County complies with the required water quality standards set forth by Alberta Environment. Currently, samples for monitoring water quality are randomly taken, once samples have been collected, they are sent to a laboratory for analysis. Results are recorded into a database.

6.0 DEVELOPER AND STRATHCONA COUNTY ROLES AND RESPONSIBILITIES

In order for Stormwater management to be effective, roles and responsibilities must be coordinated between all parties involved from designing to maintenance to residing by a SWMF. Strathcona County will take the lead role in determining roles and responsibilities of parties involved or affected by SWMF. For further information on what management techniques Best Management Practices (or BMP's) required, refer to specific section in **Section 4.0** *Stormwater Management Facilities BMP's*, **Section 5.0** *Stormwater Management Facilities Management* and/or Table 5-3 for department responsibilities.

6.1 Developer Roles and Responsibilities

6.1.1 General

- Between the Construction Completion Certificate (CCC) and the Final Acceptance Certificate (FAC) Strathcona County maintains and operates the Stormwater Management Facility (SWMF) infrastructure, but the developer is responsible for all major deficiencies or repairs required to the SWMF.
- Strathcona County will respond to emergencies during this maintenance period and the developer will be notified when any corrective maintenance costs that are required.
- It is the responsibility of the developer to understand and abide by all requirements and standards set forth by Strathcona County as outlined in the Development Agreement.

6.1.2 Stormwater Management Facilities

The Developer is:

- In accordance with the Open Space Development Standards (OSDS) responsible for the maintenance of all landscaping for a minimum of two years after issuance of the CCC and until the FAC is issued.

6.1.3 Water Quality

The Developer is:

- To monitor and model SWMF functions (including design) between the CCC and FAC in order to ensure the Provincial guideline of 85% total load removal is being met.
- To report hazardous spills to **Utilities (467-7785)** immediately and to Alberta Environment (1-800-222-6514).
- Responsible for all activities and expenses required to remediate any contamination to the satisfaction of Utilities and Alberta Environment between CCC and FAC.

6.1.4 Floodplain Maintenance

The Developer is:

- Responsible for maintenance and all applicable fees on Strathcona County approved encroachments within the easements or Strathcona County held land interest.
- Responsible for maintenance within Public Utility Lot (PUL) for a minimum of two years from date of issuance of a CCC until FAC.
- Responsible for the restoration of encroachments.

6.1.4.1 Encroachments

The Developer is:

- Responsible for submitting an application for proposed encroachments onto SWMF easement/utility to Strathcona County, including legal description of land upon which the Encroachment would exist, details regarding the encroachment and any other information Strathcona County requires.
- Responsible for contacting and obtaining written consent from any utility or service company authorized by agreement with the County (i.e., Telus, Shaw, Atco etc.) operating in the general area of the proposed encroachment.
- Responsible for knowing what encroachments are and are not permitted on SWMF.

For more information refer to Strathcona County's **SER-012-009** *Stormwater Management Facility Easements Policy*. Refer to *Appendix C.*

6.1.5 Vegetation Management

The Developer is:

- Responsible for the removal of all restricted noxious weeds, in accordance with Strathcona County and Provincial Legislation (i.e. Weed Control Act). For a list of restricted and noxious weeds in Strathcona County refer to *Appendix H*.
- Responsible to ensure all dead plant material as per the approved landscape plans is replaced in a timely manner during the maintenance period to ensure plant material will be in a healthy, vigorous growing condition prior to issuance of FAC.
- Responsible upon issuance of CCC during maintenance period for submitting any herbicide or fertilizer treatment programs to Transportation and Agriculture Services prior to application.

6.1.6 Signage

The Developer is:

- Responsible for all new development SWMF signage design installation and maintenance as approved by Strathcona County in accordance with the OSDS and this document.

6.1.7 Sediment Removal

The Developer is:

- Responsible to ensure erosion and sediment deposit is controlled and removed throughout lifespan of construction. Removal of all sediments in silt pond areas is required before FAC. The developer must provide a Sediment Removal Schedule and Erosion Control Management Plan to Strathcona County for maintenance process by the Developer and future maintenance by Strathcona County.
- Responsible to ensure access for maintenance is considered in designs of all SWMF.

6.1.8 Underground Infrastructure Maintenance

The Developer is:

- Responsible for cleaning and inspection prior to the FAC being issued.

6.1.9 Communications

The Developer is:

- Responsible for informing new or potential homeowner(s) of responsibilities involved living adjacent to an SWMF. It is recommended that a brochure should be provided to property owners that includes the following information:
    - Specific function of SWMF
    - Water quality inherent with the function of the wetland and the impact of water quality resulting from fertilizers
    - Permitted tertiary uses (recreational, refer to **OSDS** *Stormwater Management Facilities* for more details)
    - Maintenance concerns and the potential for increased maintenance charges to residents to increase the level of maintenance deemed necessary.

6.1.10 Bylaw and Legal Enforcement

The Developer must:

- Be aware and adhere to all Provincial and Federal regulations, Municipal Bylaws, policies and conditions outlined in the Development Agreement brought forth by Strathcona County.

6.1.11 Other Considerations

- A trust fund may be required of the developer. Refer to **Section 5.3.8.1** *Trust Fund*, for further information.

- Any new technique or BMP that the developer believes would increase effectiveness or is cost beneficial is encouraged to be brought to Strathcona County's attention for review and or consideration.

6.2 Strathcona County's Roles and Responsibilities

6.2.1 General

- Best Management Practices (BMP) committee is responsible for interdepartmental communication and drafting BMP document.
- Commercial and industrial activities that generate metal and organic pollutants must be managed in a way that promotes recycling and reusing. Generated pollutants that cannot be altered or changed should be covered or contained. If pollutants enter the surface water runoff, on-site treatment is required or routing contaminants to the sanitary sewer, if permitted. Spill prevention and control should be the focus as a proactive and not reactive measure.

- Road de-icing during the winter contributes to heavy metal, cyanide and high salt concentrations in surface water runoff. By reducing the use of de-icing salt or using alternative de-icers, the impact of pollutants can be minimized.

- Activities related to automobiles typically generate metals and hydrocarbons. Several point source control measures include:

    - Cleaning heavily used parking and commercial lots
    - Using oil and grease recycling centers
    - Inspecting and repairing vehicle fluid leaks upon detection
    - Reducing vehicle use

6.2.2 Stormwater Management Facilities

Strathcona County is:

- Responsible for management of a SWMF and the land contained within the PUL following issuance of the FAC to the developer.
- Responsible for establishment of design standards outlined in Engineering Servicing Standards (ESS) and Open Space Development Standards (OSDS).

6.2.3 Water Quality

Strathcona County is:

- Responsible for reporting hazardous spills to **Utilities (467-7785)** or Alberta Environment (1-800-222-6514). Strathcona County has a small inventory of equipment for a first response to a spill; however Strathcona County would contact **CEDA (1-888-793-2378)** for final cleanup and maintenance.
- Responsible for reporting water quality concerns to **Utilities (467-7785).**

- Responsible for creating a database of water quality samples to monitor impact on surrounding PUL.
- Responsible for defining the water quality issues for each type of SWMF.
- Responsible for a routine water quality monitoring program.
- Responsible to ensure that water quality complies with Alberta Environment Code of Practice for SWMF.

6.2.4 Floodplain Maintenance

Strathcona County:

- Maintains the publicly owned land surrounding the SWMF between the NWL and PUL property line (including debris removal).
- Will manage the vegetation along the shore and adjacent riparian slopes for a naturalized condition.
- Grass cutting around a wet facility should ensure that the grass is not cut within one metre (one mower width) of NWL. SWMF with naturalized strips and/or riparian growth will have grass clippings ejected down-slope towards the water. SWMF without naturalized and/or riparian growth will have grass clippings mulched without ejection.
- May undertake extensive mowing or other vegetation removal between the NWL and private property but, only to the extent necessary for noxious and restricted weed control and to remove the excess accumulation of dead vegetation residues.

6.2.4.1 Encroachments

Strathcona County (is):

- Responsible for receiving, evaluating, and responding to all requests for encroachments onto SWMF.
- Will prepare and execute all necessary documentation for encroachment agreements and/or reviews
- Must inform encroachment applicants of approval procedures and provide any information required to contact utility and/or service companies operating in the general area of the proposed encroachment.
- Responsible for approving amendments and consider appeals to the Stormwater Management Facility Easements Policy.
- Exempt from the SWMF Easement Policy as it will assist in maintenance or operations of the SWMF.

For more information refer to Strathcona County's **SER-012-009** *Stormwater Management Facility Easements Policy*. Refer to *Appendix C.*

6.2.5 Vegetation Control

Strathcona County is:

- Responsible for maintaining, planting vegetation, spraying, weed control.
- Responsible for publishing plans for weed control around SWMF in local paper.
- Responsible to educate property owners adjacent to SWMF about effects of fertilizers and herbicides on the vegetation on the PUL to encroach upon open water in the SWMF.
- Responsible to obtain approval from Alberta Environment before application of herbicides and/or pesticides.

6.2.6 Signage

Strathcona County is:

- Responsible for creation, display, and maintenance of thin ice and no swimming signs.
- Responsible to retrofit and maintain information signs on existing SWMF.
- Strathcona County is responsible for reviewing and approving new signage from developer.

6.2.7 Wildlife

Strathcona County is:

- Responsible for controlling wildlife. Any nuisance wildlife affecting the function of SWMF (i.e., water quality) will be removed from SWMF.

6.2.8 Sediment Removal

Strathcona County is

- Responsible to determine the frequency of dredging required for SWMF.
- Responsible to take a proactive role in preventing excessive sedimentation. Streets will be cleaned as frequently as determined by the County to be most efficient and effective.

6.2.9 Underground Infrastructure Maintenance

Strathcona County is:

- Responsible for street cleaning and cleaning of storm sewers upon issuance of FAC.
- Responsible for catchbasin debris and sediment cleaning upon issuance of FAC.
- Responsible for inspection and evaluation of infrastructure on a 10 year basis.

6.2.10 Communications

Strathcona County is:

- Responsible for distributing a brochure (and a copy of *Policy SER 012-008* and *SER 012-009*) when the Final Lot Grade Certificate is issued to the property owner adjacent to a SWMF to enforce the message of:
    - Specific function of SWMF's

- Water quality inherent with the function of the wetland and the impact of water quality resulting from fertilizers
- Permitted tertiary uses (acceptable recreational activities to be written after **OSDS**)
- Maintenance concerns and the potential for increased maintenance charges to residents to increase the level of maintenance deemed necessary.

- Responsible to establish a communication link between safety inspectors and Strathcona County as per timing of communications sent out.
- Responsible to ensure communications from developer and Strathcona County display continuity in the messages being relayed to the property owner.
- Responsible once FAC has been issued, Strathcona County assumes the role in communications to property owner from that point forward.
- Required by the *Environmental Protection and Enhancement Act* to notify property owners adjacent to SWMF when major maintenance to SWMF is proposed or undertaken (i.e., dredging, spraying for weeds/algae, etc.).

6.2.11 Bylaw and Legal Enforcement

Strathcona County is:

- Responsible for establishment of bylaws pertaining to stormwater management and their enforcement.
- Not responsible for assuming liabilities with respect to the land, buildings or personal property located on PUL and/or easements unless it is proven negligent in its responsibilities.
- Responsible for enforcing Dog Bylaw to ensure pet waste is being disposed of in a proper manner.

6.2.12 Construction Activities

Strathcona County is

- Responsible for frequent collection and disposal of petroleum wastes, cleaning materials, garbage, and site debris.
- Responsible for erosion and sediment controls as required for controlling soil erosion and retaining soil on-site.
- Responsible for erosion and sedimentation controls to be developed as a part of the planning process.
- Responsible in order to monitor the effectiveness of the point source controls, water quality in receiving waters should be monitored before, during and after completion of construction activities.

6.2.13 Municipal Activities

Strathcona County is:

- Responsible for street sweeping which removes pollutants deposited on roads and parking lots, thereby reducing pollutant runoff to the SWMF.
- Responsible for prohibiting littering and controlling the disposal of animal waste which will reduce pollutant loading and fecal bacteria of the surface water runoff.
- Responsible for catchbasins collection of debris and sediment. Cleaning the debris and sediment from catchbasins will reduce the amount of pollutants discharged in the SWMF and is the most cost effective mechanism for removing pollutants.

6.2.14 Other Considerations

- Strathcona County will continue to research more effective and cost beneficial BMP's on an ongoing basis to ensure that stormwater management is current and effective.

6.3 Public/Landowners Roles and Responsibilities

6.3.1 General

6.3.1.1 Household Activities

Good housekeeping practices can effectively control point source pollution. Residents can practice the following activities, however they can be applied to commercial, industrial, and construction sites as well:

- Promptly contain and clean up solid and liquid pollutant leaks and spills. Absorbent materials should be used where practical
- Do not hose down or discharge pollutants to storm drains, conveyance ditches or receiving water
- Promptly repair or replace all leaking connections, pipes, hoses, valves that can contaminate stormwater
- Sweep handling and storage area regularly and dispose of dust and debris
- Recycle materials such as oils, solvents, coolants, waste, etc.
- Cover and contain materials, equipment, waste and compost piles
- Use drip pans to collect leaks and spills equipment
- Do not dispose of animal waste in a SWMF
- Use environmentally safer raw material, products, additives, etc.

Public education is the key component to controlling point source pollution. Household, commercial and industrial activities potentially pollute stormwater.

6.3.2 Water Quality

Property owners are:

- Responsible for reporting hazardous spills to Strathcona County **Utilities (467-8875).**

- Responsible for reporting concerns with water quality to **Utilities (467-8875).**

6.3.3 Floodplain Maintenance

Property owners are:

- Responsible to understand what types of encroachments may be permitted by the County and which are not.
- Responsible for submitting application for encroachments onto SWMF to Strathcona County, including legal description of land upon which the proposed encroachment would exist, details regarding the encroachment and any other information Strathcona County requires.
- Responsible for any damage sustained to encroachments onto SWMF (i.e., retaining walls) from any maintenance required on SWMF will not be the responsibility of Strathcona County as outlined in **Policy SER-012-009** *Stormwater Management Facility Easements Section 13.0* Refer to *Appendix C.*
- Responsible for complying with the conditions of any registered encumbrances, liens and interests on their properties. Under the Utility Right of Way/Easement Agreement, the Landowner shall not without the prior written consent of the County excavate, drill, install, erect or permit to be excavated, drilled installed or erected over, under or through the said right-of-way, any pit, foundation, pavement, building, fence, sidewalk, or other structure or installation. The Landowner shall not alter the surface grade level in any manner which would affect the rights of the County. The Landowner is responsible for the maintenance of their property.

For more information refer to Strathcona County's **SER-012-009** *Stormwater Management Facility Easements Policy.* Refer to *Appendix C.*

6.3.4 Vegetation Control

Property owners are:

- Responsible to understand the purpose and importance of vegetation maintenance on PUL.
- Responsible to know the difference between weeds and desirable plants.
- Responsible to understand impact of maintenance on SWMF (i.e. use of herbicides and fertilizers).

6.3.5 Signage

Property owners are:

- Responsible for following directions or recommendations put forth by signage surrounding SWMF.

6.3.6 Wildlife

Property owners are:

- Responsible not to disturb wildlife. Includes dogs on leash and avoiding potential nesting areas.
- Report any nuisance wildlife (i.e., beavers, muskrats) to Strathcona County **Transportation and Agriculture Services (780) 417-7100.**

6.3.7 Underground Infrastructure Maintenance

Property owners are:

- Responsible for not depositing anything down a storm drain.
- Responsible for not tampering with Stormwater infrastructure.
- Responsible for not entering and/or exploring stormwater infrastructure.

6.3.8 Communications

Property owners are:

- Responsible to review their land titles and review and understand what actions and behaviours are and are not permitted on their property in regards to a SWMF. Any questions or concerns can be clarified by Strathcona County.

6.3.9 Bylaw and Legal Enforcement

Property owners are:

- To abide by any legal enforcement or bylaws regarding SWMF.
- To ensure any encroachments or landscape improvements abide by Strathcona County's Policies.
- To ensure any encroachments or landscape improvements are approved by Strathcona County.

6.3.10 Other Considerations

- Where the developer has constructed a SWMF on their private property (e.g., Lakeland Village) it is the responsibility for the owner to maintain and fund maintenance on SWMF. Facilities must comply with all regulations and standards set forth by Alberta Environment.

6.4 Commercial and Industrial Responsibilities

Commercial and industrial responsibilities are the same as Public/Landowners roles and responsibilities however include the following additional areas of responsibilities.

Commercial and industrial activities that generate metal and organic pollutants must be managed in a way that promotes recycling and reusing. Generated pollutants that

cannot be altered or changed should be covered or contained. If pollutants enter the surface water runoff, on-site treatment is required or routing contaminants to the sanitary sewer, if permitted. Spill prevention and control should be the focus as a proactive and not reactive measure.
Activities related to automobiles typically generate metals and hydrocarbons. Several point source control measures include:

- Cleaning heavily used parking and commercial lots
- Using oil and grease recycling centers
- Inspecting and repairing vehicle fluid leaks upon detection
- Reducing vehicle use

6.4.1 Construction Activities

Construction activities have been recognized as a principal source of causing sedimentation in stormwater. Pollutants can be minimized using point source controls. Some of these controls include frequent collection and disposal of petroleum wastes, cleaning materials, garbage, and site debris. Erosion and sediment controls are required to control soil erosion and retain soil on-site. Erosion and sedimentation controls should be developed as a part of the planning process. In order to monitor the effectiveness of the point source controls, water quality in receiving waters should be monitored before, during and after completion of construction activities.

7.0 OTHER CONSIDERATIONS

7.1 Vision for the future

Low Impact Development (LID) technology is an alternative ecologically friendly comprehensive approach to stormwater management. It aims to mitigate development impacts to land, water and air. The LID approach emphasizes the integration of site design and planning techniques that conserve natural systems and hydrologic functions of a site. LID aims to reduce the amount of impervious surfaces. LID decentralizes and micromanages stormwater at its source, rather than using traditional treatment BMP's. Strathcona County currently uses some aspects of LID such as vegetative swales and more recently cluster concept developments. Cluster concept development is when housing is clustered into smaller lot areas and can allow for more preserved open space to be used for recreation, visual aesthetics, and wildlife habitat.

Some of the most common LID practices outlined by Puget Sound are as follows:

- *Permeable pavement blocks* – porous concrete or asphalt allows water flow to an underground gravel area where it can be slowly released back into the soil.
- *Open swales* – used at the edge of parking lots to receive runoff, help treat pollutants and promote infiltration.
- *Vegetated (green) rooftops* – a combination of specialized planting media and vegetation that helps filter pollutants, store runoff and reduce energy consumption
- *Tree filter boxes* – a bio-retention container that uses soil and crushed stone to store and slow down runoff and filter out pollutants.
- *Specialized inlets* – inlets that prevent the inflow of trash and debris or can store and detain stormwater to change the timing of runoff into the storm system.
- *Soil amendments* – sand and organic materials (e.g., mulch) are added to the soil to increase infiltration characteristics of soil and filter pollutants.
- *Bio-retention* – specialized landscaped areas used to filter and store runoff and promote groundwater recharge via infiltration.
- *Disconnectivity* – the practice of directing runoff from impervious areas onto landscaped and vegetated areas. (Puget Sound, 2001)

A cost comparison from a 21 acre single-family subdivision in Prince George's County, Maryland, have shown that development costs for an LID approach were reduced by almost 30 percent compared with a conventional approach.

LID practices are small in scale so they can be used in many places where land is limited or constrained by utilities. Even though they are smaller in scale, they still provide for adequate conveyance of stormwater and provide additional protection for the watershed.

Table 7-1: Summary of LID benefits to Various Stakeholders

Stakeholder	Benefit
Municipalities	• Protect community's flora and fauna • Balance growth needs with environmental protection • May reduce maintenance costs of SWMF • Increases property and community appearance and aesthetics which may increase property resale values (curb appeal of landscape) • Reduce municipal infrastructure maintenance costs (streets, curbs, gutters, sidewalks, storm sewers) • Increase collaborative public/private partnerships and public education
Developer	• Reduce land clearing and grading costs • Potentially reduce infrastructure costs (streets, curbs, gutters, sidewalks) • Reduce stormwater management costs (SWMF) • May allow for more lots by reducing size of stormwater ponds • Potentially reduce impact fees and increase lot yields • Increase lot and community marketability
Environment	• Preserve integrity of ecological and biological systems • Protect site and regional water quality by reducing sediment, nutrient and toxic loads to receiving water bodies • Reduce impacts to local terrestrial and aquatic plants and animals • Preserve trees and natural vegetation

Source: Puget Sound, 2001

For additional information on LID refer to *Environmentally Green…Economically Green, Tools for a Green Land Development Program* by the NAHB Research Center.

APPENDIX A

SER-001-002	Strathcona County Municipal Policy Handbook

Surface Water Management, Water Management and Erosion Control Program

Date Approved by Council: **05/23/89; 09/27/94;** Resolution No: **484/89; 475/90, 888/94; 356/99 05/11/99**

Lead Role: **Chief Commissioner** Replaces: **60-61-003**

Last Review Date: **03/2000** Next Review Date: **03/2003**

Administrative Responsibility: **Environmental Operations**

Policy Statement

Strathcona County will promote the sound management of surface water resources utilizing the technical and financial support of various government, non-profit agencies and cooperating landowners where applicable.

1.0 Purpose

The County will have in place a formal procedure to maximize water management opportunities provided by the Alberta Water Management and Erosion Control Program for the benefit of the cooperating landowners, the environment and the Corporation.

2.0 Definitions

2.1 Manager: is the Manager of Environmental Operations

3.0 Responsibilities

3.1 Coordinator, Real Estate and Land Development:

_ provide support services in matters related to land management control

3.2 Manager:

_ ensure that the procedures of this policy are complied with in a timely fashion

3.3 Agricultural Services Board: (hereinafter referred to as the "Board")

_ recommend to County Council the initiation of a water management project

_ recommend to County Council the acceptance of the Preliminary Engineering Report

_ approve a list of priority projects at the first Agricultural Service Board meeting each year.

3.4 County Council

_ approve initiation of a water management project

_ approve, for submission to Alberta Environment, the Preliminary Engineer Report

_ approve any amendments to or variations from this procedure

4.0 Authorization

4.1 The process leading to a potential water management project may be initiated by a formal request from the Public or from the Municipality.

Comments will be requested from the Area Councillor, Public Works, and Planning and Development Review Services.

Alberta Environment will be requested to provide a preliminary investigation report to determine the suitability of the proposed project for funding under the Alberta Water Management and Erosion Control Program.

4.2 Ducks Unlimited will provide a waterfowl impact analysis where applicable.

4.3 If sufficient comments in opposition to the proposed water management project are received from the referral departments, Environmental Operations will recommend to the Agricultural Service Board that the project not proceed.

4.4 If comments from the referral departments indicate that the project would be beneficial to the County and its residents and is eligible for cost sharing with Alberta Environment, the Environmental Operations Department will recommend to the Agricultural Service Board to support the initiation of a water management project.

5.0 Project Priority Ranking

5.1 Projects will be ranked in order of priority utilizing the following criteria as detailed in the Preliminary Engineering Report.

5.1.1 safety/protection of assets, i.e. buildings/roads

5.1.2 benefit/cost analysis
- based on improved agricultural capabilities of land and/or the enhancement of assets in relation to the cost of the proposed improvements

5.1.3 environmental/wildlife impact

5.1.4 recreational/aesthetic enhancement of a water body

5.2 Priority ranking of projects will be approved by the Agricultural Service Board at the first regularly scheduled Board Meeting of the year and will form the basis for the Department's Five-Year Capital Projection. This list will be forwarded to Alberta Environment to assist in provincial budget preparation for the following fiscal year.

6.0 Project Licensing

6.1 All projects initiated under the Alberta Water Management and Erosion Control Program will be licensed in the name of Strathcona County.

7.0 Future maintenance Responsibilities

7.1 It will be the responsibility of the County to ensure that the Project is maintained in an appropriate fashion through the use of County forces or private contractors.

7.1.1 In the event a design indicates that a machinery accessible ditch is preferred, maintenance responsibility of such will be at the discretion of the Municipality.

7.2 The landowner may be requested to restrict livestock access to the drainage course to mitigate the damages such access may cause, i.e. slumping of side slopes. If a fence is constructed the following criteria should be observed:
(a) An access point must be provided to allow equipment entry to the drainage course for maintenance purposes.
(b) the fence must be set back a minimum of four (4) metres from the top edge of the bank on each side of the drainage course.

7.3 The County will not be responsible for the maintenance of improvements that are not specifically detailed in the construction easement, i.e. dugouts, fencing, etc.

SECTION II - PROJECTS INITIATED BY LANDOWNER

8.0 Project Initiation

8.1 Landowners who wish to initiate a water management project will submit to the Environmental Operations Department a petition, available from the Environmental Operations Office, in a form as provided by Sections 219 through 224, of the Municipal Government Act, SA 1994 c.M-26.1.

8.1.1 This petition will contain the signature of all landowners directly affected by the proposed project.

8.1.2 If comments from landowners indicate that the project is required to correct a situation that is perceived to be the result of a previous action by the municipality the Manager will research the claim to determine its validity.

8.1.3 If the claim is valid, a recommendation to proceed with the project as a municipal initiative will be forwarded to the Board for approval.

8.2 On receipt of a petition, the Manager will determine the level of support for the proposed project from the appropriate departments and external agencies.

8.3 After all comments have been received the petition and an administrative recommendation will be presented to the Board for consideration.

8.4 If the petition receives the support of the Board, the County will notify landowners directly affected by the proposed project and host a Public Meeting with representatives from Alberta Environment, and any other agencies with an interest in the project to address questions/concerns that the public may have about the proposed project.

8.5 If the landowners agree unanimously to proceed with the project, a Committee consisting of three (3) landowners will be appointed from the landowner group directly affected by the project.

8.5.1 The Committee will be responsible to obtain from landowners directly affected by the proposed project:
a) Right of Entry Agreements (for survey purposes only); and
b) A deposit in an amount as specified in Appendix 'A'.

8.5.2 The Committee will provide items listed in 8.5.1 above within sixty (60) days of the Public Meeting. (item 9.2)

9.0 Preliminary Engineering Report Preparation and Construction Easement Acquisition

9.1 Upon execution and receipt of all Right of Entry agreements and financial contribution from the landowners for the development of the Preliminary Engineering Report, the County will request proposals for the development of a Preliminary Engineering Report.

9.1.1 A consultant will be selected by the Manager utilizing Strathcona County Guidelines for Consultant Selection Policy FIN-001-003.

9.1.2 Upon execution of a Consultant Contract with the County, the consultant will be instructed to proceed with Stage One of the Report, consisting of a level one survey, preliminary design, and benefit/cost analysis. Information gathered from the survey and discussions with the landowners will provide the basis for easement acquisition, and project priorization.

9.2 A Public Meeting will be held to provide an opportunity for the County and Consultant to present the findings of Stage One of the Report.

9.3 It will be the responsibility of the Manager, or his designate, to finalize construction easements with the landowners.

9.3.1 An inability to secure the necessary construction easement, may result in the termination of all or portions of the Project.

9.3.2 Upon successful completion of easement negotiations with the landowners, the Coordinator, Planning and Development Review Services will ensure that the easements are executed by the appropriate County officials and registered against the individual landowners' Certificates of Title.

9.4 The consultant will be directed to proceed with the completion of the Preliminary Engineering Report.

9.5 Upon completion of the Report a draft copy will be sent to the agencies providing technical and/or financial support to the Project for comment.

10.0 Project Approvals

10.1 The final draft of the Report will be submitted to the Agricultural Service Board and County Council for approval.

10.2 The Report will then be submitted to Alberta Environment for approval and funding consideration under the Alberta Water Management and Erosion Control Program.

10.3 When approval for funding is received from Alberta Environment, the Engineering Consultant will be instructed to proceed with final design and tendering process.

10.4 Contracts will be awarded by the County in its sole discretion. The lowest or any tender may not be accepted.

11.0 Project Funding

11.1 Preliminary Engineering Report

11.1.1 The County will, upon receipt of a financial contribution from the landowners affected by the proposed project (see Appendix "A"), provide the remaining funds required for the development of the Report.

11.1.2 If, for the reasons detailed below, the Project does not proceed to the construction phase, the financial contribution toward the development of the Report may be forfeited to the County.
a) provincial approval not granted
b) inability to secure easements
c) the landowners decide to abandon the Project.

11.1.3 The funds received from the landowners for the development of the Report will receive interest based on the County "prime" rate of interest and will be subject to interest compensation up to initiation of project construction.

11.1.4 If, after five years of the County priority process, a project has not been advanced to the construction phase, the County will refund to the owners of the land affected by the Project, 100 per cent of the deposit received for the development of the Report.

11.1.5 If the Project proceeds to the construction phase, the landowners will be reimbursed for the costs of developing the Report to a maximum of 65 per cent of costs. This reimbursement will occur after the Construction Completion Certificate is issued to the construction contractor.

11.2 Construction/Engineering Costs

11.2.1 The level of financial support for construction and related engineering costs will be related to the level of financial support received from Alberta Environment under the terms of the Alberta Water Management and Erosion Control Program.

11.2.2 Whenever appropriate the County will pursue alternate financial options to decrease the municipality's financial contributions - i.e. Duck Unlimited, Bucks for Wildlife.

11.3 Maintenance of Project

11.3.1 Financial support for the costs of maintaining each project will be the responsibility of the County subject to 11.3.2.

11.3.2 In a case where the Municipality deems it appropriate for the landowner to assume the responsibility for maintenance of a defined section of the ditch, the Municipality will not provide a financial contribution for the maintenance of the defined section of the ditch.

SECTION III - PROJECTS INITIATED BY MUNICIPALITY

12.0 Project Initiation

12.1 A water management project may be initiated by the municipality if, in the opinion of the Board, such undertaking:
a) is a significant contributor to the public good of the County as a whole as opposed to only the landowners directly benefiting from such an initiative; or

b) it can be shown that a water management project is required to mitigate damage caused by the action or lack thereof on the part of the municipality; or

c) an external agency (i.e. Ducks Unlimited) wishes to initiate a project.

12.2 Upon identification of a project deemed to meet one of the above criteria, Environmental Operations will solicit comments from the appropriate departments and external agencies. (See Sec. 4.0)

12.3 Upon receipt of comments, an administrative recommendation will be forwarded to the Board for approval.

12.4 Upon ratification by the Board, a Terms of Reference will be prepared for the development of Preliminary Engineering Report and a consultant selected by the Manager.

13.0 Preliminary Engineering Report Preparation

13.1 Upon execution and receipt of all Right of Entry agreements, the County will request proposals for the development of a Preliminary Engineering Report.

13.2 An Open House will be held to discuss with the public the intent of the proposed project and to solicit input regarding their particular situation as it relates to the project.

13.3 The consultant will be directed to proceed with Stage 1 of the Report, consisting of a level 2 survey, preliminary design, and benefit/cost

analysis. Information gathered from the survey and discussions with the landowners will provide the basis for easement acquisition and project priorization.

13.4 It will be the responsibility of the Manager to finalize construction easements with the landowners.

13.5 The consultant will be directed, upon finalization of easement acquisition, to complete a draft of the preliminary engineering report.

13.6 Upon completion, the report will be forwarded to the agencies providing technical and/or financial support to the project for comment.

14.0 Project Approvals

14.1 The final draft of the Report will be submitted to the Agricultural Service Board and County Council for approval.

14.2 The Report will then be submitted to Alberta Environment for approval and funding consideration under the Alberta Water Management and Erosion Control Program.

14.3 When approval for funding is received from Alberta Environment, the Engineering Consultant will be instructed to proceed with final design and tendering process.

15.0 Project Funding

15.1 Those costs not funded by Alberta Environment or any other agency and are associated with:

a) the development of a Preliminary Engineering report,
b) construction and engineering supervision of a project,
c) future maintenance of a project, will be borne by the municipality.

Appendix "A"
SER-001-002

Fees and Charges Schedule

A. Preliminary Engineer Report

(a) landowner contribution - $500/land parcel to a maximum of 50 per cent of the cost of developing the Report
(b) municipal contribution - remaining funds necessary to develop the Report.

B. Maintenance Costs
- subject to section 11.3.2


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APPENDIX B

Encroachments onto Lands in which the County holds an Interest

Date Approved by Council: **05/06/2003**
Resolution No: **393/2003**
Lead Role: **Chief Commissioner**
Replaces: **SER-012-006**
Last Review Date: **05/2003**
Next Review Date: **05/2006**

Administrative Responsibility: **Planning and Development Services**

Policy Statement

The County shall, at its sole discretion, authorize encroachments which have occurred onto County property or a County Easement/Right-of-Way through the execution of a written agreement with the infringing party or the issuance of a Consent Letter (where appropriate).

Definitions, guidelines and / or Procedures

1.0 Purpose

The County shall evaluate encroachments onto lands in which the County holds an interest or is subject to the direction, control, and management of the County (the "Subject Lands") to determine the necessity and feasibility of executing a written agreement with the infringing party or issue a Letter of Consent (where appropriate) to protect the County's rights and obligations with respect to the Subject Lands and to minimize the County's exposure to liability with respect to these encroachments failing which the County may require removal of the encroachment(s). The County shall endeavor to maintain a records system regarding such encroachments onto the Subject Lands.

2.0 Authorization

2.1 Section 61 of the Municipal Government Act authorizes a municipality to grant rights over its property as follows:

61(1) A municipality may grant rights, exclusive or otherwise, with respect to its property, including property under the direction, control and management of the municipality.

(2) A municipality may charge fees, tolls and charges for the use of its property, including property under the direction, control and management of the municipality.

2.2 Section 651.2 authorizes a municipality to register a caveat with respect to encroachments over roads as follows:

651.2(2) Despite the Land Titles Act or any other enactment, a municipality may register a caveat under the Land Titles Act in respect of any encroachment agreement entered into by the municipality with the registered owner of a parcel of land that adjoins a road that is under the direction, control and management of the municipality.

2.3 The Council hereby delegates the authority to implement this Policy to the Chief Commissioner and his delegate, the Coordinator, Land Management Services.

3.0 Definitions

3.1 "Amending (Encroachment) Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations in which a structure is to be permitted over an existing easement or right-of-way area.

3.2 "Amending (Utility Right-of-Way Drainage) Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations in which a structure is to be permitted over an existing easement or utility right-of-way area constructed or utilized for drainage purposes.

3.3 "Applicant" - Any party who has encroached onto lands in which the County holds an interest or is subject to the direction, control, and management of the County.

3.4 "Consent Letter for Minor Encroachments" - The County's standard form of letter attached, as amended from time to time in accordance with this Policy, for situations in which the Coordinator, Land Management Services, or his designate, determines, at his sole discretion, whether an

Encroachment is of a minor nature such that an Agreement is not required.

3.5 "Encroachments" - An illegal intrusion onto lands (including a structure, improvement, or use) in which the County holds an interest or is subject to the direction, control, and management of the County.

3.6 "Franchisee" - Any utility or service company authorized by agreement with the County or by statute to use and/or occupy utility right-of-ways held by the County which include, but are not limited to Telus, Shaw Cable, Atco and Aquila.

3.7 "License Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations where there are two titled parcels of lands and a use is permitted over one parcel (or portion thereof). One of the parcels of land may be designated as a municipal reserve, public utility lot or municipally owned land.

3.8 "Plan of Survey" - such plan, survey, diagram or document as may be acceptable to the Coordinator, Land Management Services including, but not limited to, a Real Property Report prepared by a registered Alberta Land Surveyor.

3.9 "Road Encroachment Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations in which a structure is to be permitted over a road.

3.10 "Road License Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations where a particular use is to be permitted over a road under the direction, control and management of the County.

3.11 "Traditional Encroachment Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations where there are two titled parcels of land and where there is a structure encroaching upon one parcel of land.

3.12 "Utility Right-of-Way" - a right granted on, over, or under land to the County for the purpose of constructing and/or maintaining a public utility.

4.0 Responsibilities

4.1 The Chief Commissioner and his delegate, the Coordinator, Land Management Services are hereby authorized to revise the standard form of Agreements and Letters referred to in this Policy as may be required

from time to time.

4.2 The responsibilities of the Coordinator, Land Management Services include:

4.2.1 To receive, evaluate and respond to all requests for encroachments onto lands in which the County holds an interest or is subject to the direction, control, and management of the County.

4.2.2 To evaluate these requests in accordance with this Policy.

4.2.3 To prepare and execute all necessary documentation to allow the encroachment (where applicable).

4.2.4 To ensure that the appropriate documentation is registered at the Land Titles Office (where applicable).

4.2.5 To maintain an inventory of all documentation relating to Encroachments evaluated by the County.

4.3 The responsibilities of the County's Planning and Development Services Department include:

4.3.1 To advise any Applicants of the County's process regarding the evaluation of Encroachments and provide a listing of Franchisees for the Applicant to contact.

4.3.2 To consider the execution of encroachment agreements or other authorizing documentation in this Policy as part of its review process with respect to the issuance of letters of compliance and development permits on properties where Encroachments exist.

4.4 The responsibilities of the Council of Strathcona County include:

4.4.1 To approve any amendments to this Policy if necessary.

4.4.2 To consider appeals referred to in this Policy.

5.0 For Encroachments onto County Easements or Utility Right-of-Ways:

5.1 The Applicant will submit to the Planning and Development Services Department particulars of the Encroachment including the legal description of the lands upon which the Encroachment exists, a Plan of Survey detailing the Encroachment and any other information the Planning and Development Services Department requires (the "Application").

5.2 The Applicant shall contact all Franchisees operating in the general area to obtain their written comments or written consent to the County to

allow the Encroachment onto the County's Utility Right-of-Way.

5.3 Once these consents and/or comments are received by Planning and Development Services, the Application will be reviewed by the Coordinator, Land Management Services, or his designate, as to whether the County will grant its consent to the Encroachment. If the Applicant is unable to obtain the consent of the Franchisee for the Encroachment, then the process detailed in Section 6.0 will be followed.

5.4 If the County grants the encroachment, then the Coordinator, Land Management Services will prepare an Amending (Encroachment) Agreement. This Agreement will then be forwarded to the applicant for review, execution and return to the County for further processing.

5.5 Upon approval of the Amending (Encroachment) Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Amending (Encroachment) Agreement.

5.6 Upon the full execution of the Amending (Encroachment) Agreement, Planning and Development Services will take the necessary steps to register the Agreement at the Land Titles Office.

6.0 Non-Consent to Encroachment by Franchisee

6.1 If for any reason a Franchisee is not prepared to grant their consent to an Encroachment, then the Coordinator, Land Management Services may discuss the matter with the Franchisee and consult the County Engineer on the substance of the object to the Encroachment. If resolution to the objection cannot be determined, then the Coordinator, Land Management Services, will prepare a recommendation and background report to the Executive Team on the granting of the Encroachment.

6.2 If, notwithstanding the non-consent of the Franchisee, the Executive Team makes a decision to grant the Encroachment, then the Coordinator, Land Management Services will notify the Franchisee of the County's decision to grant the Encroachment and advise that they have seven (7) days from the date of notification to appeal the decision to the Council of Strathcona County. At the expiration of seven (7) days, if no appeal is received, then the Coordinator, Land Management Services will follow the process in Sections 5.4, 5.5, and 5.6.

6.3 If the Executive Team does not allow the Encroachment, then the Coordinator, Land Management Services will notify the Applicant of the

County's decision. The Applicant will have seven (7) days from the date of notification to appeal the decision to the Council of Strathcona County.

7.0 For Encroachments onto County Easements or Utility Right-of-Ways Involving Drainage Matters:

7.1 The Applicant will submit to Planning and Development Services particulars of the Encroachment including the legal description of the lands upon which the Encroachment exists, a Plan of Survey detailing the Encroachment and any other information Planning and Development Services requires (the "Application").

7.2 Upon receipt of a completed application, the Application will be reviewed by the Coordinator, Land Management Services, or his designate as to whether the County will grant its consent to the Encroachment.

7.3 If the County grants the Encroachment, then the Coordinator, Land Management Services will prepare an Amending (Utility Right-of-Way Drainage) Agreement. This Agreement will then be forwarded to the Applicant for review, execution and return to the County for further processing.

7.4 Upon approval of the Amending (Utility Right-of-Way Drainage) Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Amending (Utility Right-of-Way Drainage) Agreement.

7.5 Upon the full execution of the Amending (Utility Right-of-Way Drainage) Agreement, Planning and Development Services will take the necessary steps to register the Agreement by way of caveat at the Land Titles Office.

8.0 Encroachments onto Roads and Road Allowances

8.1 Encroachment (structure) over a Road or Road Allowance

8.1.1 For Encroachments of a structure onto a road or road allowance under the direction, control and management of the County, the Applicant will submit to Land Management Services, particulars of the Encroachment including the legal description of the lands upon which the Encroachment exists, a Plan of Survey detailing the Encroachment and any other information Planning and Development Services requires (the "Application").

8.1.2 Upon receipt of a completed application, the Application will be reviewed by the Coordinator, Land Management Services, or his designate as to whether the County will grant its consent to the Encroachment.

8.1.3 If the County grants the encroachment, then the Coordinator, Land Management Services will prepare a Road Encroachment Agreement. This Agreement will then be forwarded to the Applicant for review, execution and return to the County for further processing.

8.1.4 Upon approval of the Road Encroachment Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Road Encroachment Agreement.

8.1.5 Upon the full execution of the Road Encroachment Agreement, Planning and Development Services will take the necessary steps to register the Agreement by way of caveat at the Land Titles Office.

8.2 Encroachments (Use) over a Road or Road allowance

8.2.1 For situations involving a particular use to be permitted over a road or road allowance under the direction, control and management of the County, the Applicant will submit to Planning and Development Services Department particulars of the Encroaching Use including the legal description of the lands upon which the Encroaching Use exists, a Plan of Survey detailing the Encroachment and any other information Planning and Development Services requires (the "Application").

8.2.2 Upon receipt of a completed application, the Application will be reviewed by the Coordinator, Land Management Services, or his designate as to whether the County will grant its consent to the Encroaching Use.

8.2.3 If the County grants the Encroaching Use, then the Coordinator, Land Management Services will prepare a Road License Agreement. This Agreement will then be forwarded to the Applicant for review, execution and return to the County for further processing.

8.2.4 Upon approval of the Road License Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Road License Agreement.

8.2.5 Upon the full execution of the Road License Agreement, Planning and Development Services will take

the necessary steps to register the Agreement by way of caveat at the Land Titles Office.

9.0 Encroachments onto Municipal Reserves, Public Utility lots or County-owned Land

9.1 Encroachment (structure) over Municipal Reserves, Public Utility lots or County-owned Land

9.1.1 For Encroachments of a structure onto Municipal Reserves, Public Utility lots or County-owned Land, the Applicant will submit to Planning and Development Services Department particulars of the Encroachment including the legal description of the lands upon which the Encroachment exists, a Plan of Survey detailing the Encroachment and any other information Land Management Services requires (the "Application").

9.1.2 Upon receipt of a completed application, the Application will be reviewed by the Coordinator, Land Management Services, or his designate as to whether the County will grant its consent to the Encroachment.

9.1.3 If the County grants the Encroachment, then the Coordinator, Land Management Services will prepare a Traditional Encroachment Agreement. This Agreement will then be forwarded to the Applicant for review, execution and return to the County for further processing.

9.1.4 Upon approval of the Traditional Encroachment Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Traditional Encroachment Agreement.

9.1.5 Upon the full execution of the Traditional Encroachment Agreement, Planning and Development Services will take the necessary steps to register the Agreement by way of caveat at the Land Titles Office.

9.2 Encroachments (Use) over Municipal Reserves, Public Utility lots or County-owned Land

9.2.1 For situations involving a particular use to be permitted over Municipal Reserves, Public Utility lots or County-owned Land, the Applicant will submit to Planning and Development Services Department particulars of the Encroaching Use

including the legal description of the lands upon which the Encroaching Use exists, a Plan of Survey detailing the Encroachment and any other information Planning and Development Services requires (the "Application").

9.2.2 Upon receipt of a completed application, the Application will be reviewed by the Coordinator, Land Management Services, or his designate as to whether the County will grant its consent to the Encroaching Use.

9.2.3 If the County grants the Encroaching Use, then the Coordinator, Land Management Services will prepare a License Agreement. This Agreement will then be forwarded to the Applicant for review, execution and return to the County for further processing.

9.2.4 Upon approval of the License Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the License Agreement.

9.2.5 Upon the full execution of the License Agreement, Planning and Development Services will take the necessary steps to register the Agreement by way of caveat at the Land Titles Office.

10.0 Non-Approval of Encroachment or Encroaching Use

10.1 If permission for the Encroachment of a structure or an Encroaching Use is denied, then the Coordinator, Land Management Services may issue a written notice to the property owner for immediate removal of the Encroachment and/or the cessation of the Encroaching Use.

10.2 If the Encroachment is not removed or the Encroaching Use has not ceased within sixty (60) days, the Coordinator, Land Management Services may take advantage of whatever legal remedies are available to the County to ensure the removal of the Encroachment or cessation of the Encroaching Use.

11.0 Minor Encroachments

11.1 Notwithstanding any other section in this Policy, the Coordinator, Land Management Services, or his designate, shall have the sole discretion to determine if an Encroachment is of such a minor nature that the County will issue a Consent Letter to the Applicant for the encroachment rather than require the execution of an Agreement.

12.0 Fees

12.1 If the Encroachment or Encroachment Use is allowed by the County, the Applicant will be responsible for the fees established by the Council of the County from time to time.

Strathcona Policy SER-012-008 Encroachments onto Lands (E0248685).doc

APPENDIX C

Storm Water Management Facility Easements

Date Approved by Council: **11/04/2003**
Resolution No: **812/2003**
Lead Role: **Chief Commissioner**
Replaces: **n/a**
Last Review Date: **11/2003**
Next Review Date: **12/2008**

Administrative Responsibility: **Planning & Development Services**

Policy Statement

The County shall have in place a formal policy and procedure outlining the non-County use of storm water management facilities, easements and the management of easement interests.

The County shall, at its sole discretion, authorize encroachments which have occurred onto County property or a County Easement/Right-of-Way through the execution of a written agreement with the infringing party or the issuance of a Consent Letter (where appropriate).

Definitions, Guidelines and/or Procedures

1.0 Purpose

The County shall evaluate encroachments onto Storm Water Management Facilities (the "Subject Lands") to determine the necessity and feasibility of executing a written agreement with the infringing party or issue a Letter of Consent (where appropriate) to protect the County's rights and obligations with respect to the Subject Lands and to minimize the County's exposure to liability with respect to these encroachments failing which the County may require removal of the encroachments(s).

The County shall endeavor to maintain a records system regarding such

encroachments onto the Subject Lands. The County shall have in place a policy to ensure the County is in compliance with the licenses as provided by Alberta Environment. The policy is to establish criteria to reduce the need for written agreements or Letter of Consent.

2.0 Authorization

2.1 Section 61 of the Municipal Government Act authorizes a municipality to grant rights over its property as follows:

> *61(1) A municipality may grant rights, exclusive or otherwise, with respect to its property, including property under the direction, control and management of the municipality.*
>
> *61(2) A municipality may charge fees, tolls and charges for the use of its property, including property under the direction, control and management of the municipality.*

2.2 The Council hereby delegates the authority to implement this Policy to the Chief Commissioner and his delegate, the Coordinator, Land Management Services.

3.0 Definitions

3.1 "Amending Storm Water Management Facility Encroachment Agreement" - The County's standard form of Agreement, as amended from time to time in accordance with this Policy, for situations where there are two titled parcels of land or a titled parcel of land and a Utility Right-of-Way (easement) interest and where there is a structure encroaching upon one parcel of land or upon a Utility Right-of-Way (easement) interest.

3.2 "Applicant" - Any party who has encroached onto a Storm Water Management Facility.

3.3 "Bio-swale" - A low gradient open channel with a dense vegetative cover through which run-off is directed during storm events.

3.4 "Consent Letter for Minor Encroachments" - The County's standard form of letter attached, as amended from time to time in accordance with this Policy, for situations in which the Coordinator, Land Management Services, or his designate, determines, at his sole discretion, whether an Encroachment is of a minor nature such that an Agreement is not required.

3.5 "Constructed Wetland and Man Made Creeks"- Engineered Wetlands that are built for storm water treatment. Engineered facilities designed to manage a specific amount of storm water. Designed to mimic natural wetland systems by incorporating appropriate wetland vegetation and soils to assist with reducing shock-loading effects of contaminated storm water.

3.6 "Dry Pond" - Is designed to contain runoff temporarily as off-line

storage areas and remain dry most of the time. Pond designed such that any storm runoff in excess of the permitted predevelopment flow shall be stored in the pond. The pond bottom and slopes are top soiled and seeded.

3.7 "Encroachments" - An illegal intrusion onto a Storm Water Management Facility.

3.8 "Franchisee" - Any utility or service company authorized by agreement with the County or by statute to use and/or occupy utility right-of-ways held by the County which include, but are not limited to Telus, Shaw Cable, Atco and Aquila.

3.9 "High Water Line" - Is the engineered design high water level for a specified facility.

3.10 "Natural Wetland" - Its structure and function is determined by existing "natural site" conditions, topography, vegetation, soils, runoff, infiltration, recharge and discharge and water depth rather than conditions engineered for the site.

3.11 "Normal Water Line" - The engineered design level in a facility associated with dry weather periods of low storm water flows.

3.12 "Overland Drainage System" - Rather than a piped conveyance system, it is an overland drainage system.

3.13 "Plan of Survey" - such plan, survey, diagram or document as may be acceptable to the Coordinator, Land Management Services including, but not limited to, a Real Property Report prepared by a registered Alberta Land Surveyor.

3.14 "Retaining Wall" - Where grades differ, a structure designed to keep in place or keep fixed soil, sand, gravel etc. preventing erosion or movement of material.

3.15 "Storm Water Management Facility" - includes Wetlands, Constructed Wetlands and Man Made Creeks, Storm Water Wetlands, Storm Water Lakes, Wet and Dry Ponds, overland drainage systems and bio-swales located within Utility Rights-of-Way (easement) and/or County owned properties (Public Utility Lots and/or Reserves).

3.16 "Storm Water Wetland" - Natural wetland incorporated into a development for the combined purpose of preserving natural form and function and providing for increased urban storm water management.

3.17 "Utility Right-of-Way (easement)" - a right granted on, over, or under land to the County for the purpose of constructing and/or maintaining a public utility.

3.18 "Wet Pond" - A storm water management facility that is partially inundated on a permanent basis and is built to attenuate peak flows downstream while providing improved water quality.

4.0 Responsibilities

4.1 The Chief Commissioner or his delegate, the Coordinator, Land Management Services are hereby authorized to revise the standard form of Agreements and Letters referred to in this Policy as may be required from time to time.

4.2 The responsibilities of the Coordinator, Land Management Services include:

4.2.1 To receive, evaluate and respond to all requests for encroachments onto Storm Water Management Facilities.

4.2.2 To evaluate these requests in accordance with this Policy.

4.2.3 To prepare and execute all necessary documentation to allow the Encroachment (where applicable).

4.2.4 To ensure that the appropriate documentation is registered at the Land Titles Office (where applicable).

4.2.5 To maintain an inventory of all documentation relating to Encroachments evaluated by the County.

4.3 The responsibilities of the County's Planning and Development Services Department include:

4.3.1 To advise any Applicants of the County's process regarding the evaluation of Encroachments and provide a listing of Franchisees for the Applicant to contact.

4.3.2 To consider the execution of encroachment agreements or other authorizing documentation in this Policy as part of its review process with respect to the issuance of letters of compliance and development permits on properties where Encroachments exist.

4.4 The responsibilities of the Council of Strathcona County include:

4.4.1 To approve any amendments to this Policy if necessary.

4.4.2 To consider appeals referred to in this Policy.

5.0 For Encroachments onto County Storm Water Management Facilities:

5.1 The Applicant will submit to the Planning and Development Services Department particulars of the Encroachment including the legal description of the lands upon which the Encroachment exists, a Plan of Survey detailing the Encroachment and any other information the Planning and Development Services Department requires.

5.2 The Applicant shall contact all Franchisees operating in the general area to obtain their written comments or written consent to the County to allow the Encroachment onto the County's Utility Right-of-Way (easement).

5.3 Once these consents and/or comments are received by Planning and Development Services, the Application will be reviewed by County stakeholder departments and the Coordinator, Land Management Services, or his designate, as to whether the County will grant its consent to the Encroachment. If the Applicant is unable to obtain the consent of the Franchisee for the Encroachment, then the process detailed in Section 6.0 will be followed.

5.4 If the County grants the encroachment, then the Coordinator, Land Management Services will prepare an Amending (Storm Water Management Facility Encroachment) Agreement. This Agreement will then be forwarded to the applicant for review, execution and return to the County for further processing.

5.5 Upon approval of the Amending (Storm Water Management Facility Encroachment) Agreement by the Coordinator, Land Management Services, the proper signing officers are thereby authorized and empowered to sign and seal the Amending (Storm Water Management Facility Encroachment) Agreement.

5.6 Upon the full execution of the Amending (Storm Water Management Facility Encroachment) Agreement, Planning and Development Services will take the necessary steps to register the Agreement at the Land Titles Office.

6.0 Non-Consent to Encroachment by Franchisee:

6.1 If for any reason a Franchisee is not prepared to grant their consent to an Encroachment, then the Coordinator, Land Management Services may discuss the matter with the Franchisee and consult the County Engineer on the substance of the object to the Encroachment. If resolution to the

objection cannot be determined, then the Coordinator, Land Management Services, will prepare a recommendation and background report to the Executive Team on the granting of the Encroachment.

6.2 If, notwithstanding the non-consent of the Franchisee, the Executive Team makes a decision to grant the Encroachment, then the Coordinator, Land Management Services will notify the Franchisee of the County's decision to grant the Encroachment and advise that they have seven (7) days from the date of notification to appeal the decision to the Council of Strathcona County. At the expiration of seven (7) days, if no appeal is received, then the Coordinator, Land Management Services will follow the process in Sections 5.4, 5.5 and 5.6.

6.3 If the Executive Team does not allow the Encroachment, then the Coordinator, Land Management Services will notify the Applicant of the County's decision. The Applicant will have seven (7) days from the date of notification to appeal the decision to the Council of Strathcona County.

7.0 Storm Water Management Facility Alterations - Existing prior to this Policy SER-012-009)

7.1 Where the High Water Line is located inside the private property line, the following improvements may be permitted in the Storm Water Management Facility within the Utility Right-of-Way (easement) area of the Storm Water Management Facility:

- Original grading as approved by County Engineer and Alberta Environment to be maintained.
- Firepits
- Patios
- Trees, shrubs and ground cover. Recommend natural wetland vegetation plantings to prevent soil erosion.
- Gravel, cobble stone, shale, rip-rap
- Ponds, fountains or engineered structures (decks) on piles that do not reduce or impact the Storm Water Management Facility storage capacity or impact shoreline grade or vegetation. A survey and/or engineers report and landscape design is required.
- Chain link fencing
- Natural plant material fringe, where applicable, to be maintained as originally designed. Any alterations to be approved by Strathcona County.
- Retaining walls

7.2 The following improvements are not permitted within Storm Water Management Facilities:

- Floatable material: eg. Wood chip mulch, peat moss, and small floatable structures
- Docks, buildings, sheds
- Gates or alterations to chain link fencing
- Alterations outside fence
- Electrical outlets
- Chemicals such as pesticides and paints
- Culverts

7.3 Wetlands

- No alterations are permitted in Natural Wetlands
- Enhancements to ensure ecological integrity of the wetland ecosystems are maintained may be permitted on approval by Strathcona County.

7.4 Where the High Water Line is located on public property, no encroachments are permitted within the Public Utility Lots and/or Reserves without the prior written approval of the County Engineer and must be documented by Strathcona County.

7.5 From and after the date of this Policy, no further encroachments will be allowed in Public Utility Lots and/or Reserves.

8.0 Storm Water Management Facility Alterations - Subsequent to Policy SER 012-009

8.1 Where the High Water Line is located inside the private property line, the following improvements may be permitted in the Storm Water Management Facility within the Utility Right-of-Way (easement) area of the Storm Water Management Facility:

- Original grading as approved by County Engineer and Alberta Environment to be maintained.
- Firepits
- Patios
- Trees, shrubs and ground cover. Recommend natural wetland vegetation plantings to prevent soil erosion.
- Gravel, cobble stone, shale, rip-rap
- Ponds, fountains or engineered structures (decks) on piles that do not reduce or impact the Storm Water Management Facility storage capacity or impact shoreline grade or vegetation. A survey and/or engineers report and landscape design is required.
- Chain link fencing
- Natural plant material fringe, where applicable, to be

maintained as originally designed. Any alterations to be approved by Strathcona County.

8.2 The following encroachments are not permitted on Storm Water Management Facilities:

- Retaining walls
- Floatable material: Wood chip mulch, peat moss, and small floatable structures
- Docks, buildings, boats, sheds, bridges, boardwalks
- Gates or alterations to chain link fencing
- Alterations outside fence
- Electrical outlets
- Chemicals such as pesticides and paints
- Culverts

8.3 Wetlands

- No alterations are permitted in Natural Wetlands
- Enhancements to ensure ecological integrity of the wetland ecosystems are maintained may be permitted on approval by Strathcona County.

8.4 No encroachments are permitted within the Public Utility Lots without the prior written approval of the County Engineer and must be documented by Strathcona County. Cutting of native vegetation: eg bulrush/cattails within the Public Utility Lots and/or Reserve is not permitted.

9.0 Exemption

9.1 Strathcona County shall be exempt from the application of this Policy and may in its sole and unfettered discretion construct and maintain structures and/or facilities within a storm water management facility. This will assist the County in the maintenance, or operation of the storm water management facility and provides for the construction of structures or facilities by the County within the storm water management facility which would not be affected by the operation or maintenance of the storm water management facility

10.0 Enforcement

10.1 If an Encroachment of a structure or an Encroaching Use is not permitted or if permission to Encroach is denied, then the Coordinator, Land Management Services may issue a written notice to the property owner for immediate removal of the Encroachment and/or the cessation of the Encroaching Use.

10.2 If the Coordinator, Land Management Services does not permit the encroachment, the applicant may within thirty (30) days of date of mailing

of the written notice, appeal the decision to the Manager of Planning and Development Services and the County Engineer. The Manager of Planning and Development Services and the County Engineer collectively render a final decision as to whether the encroachment will or will not be permitted and must be removed.

10.3 If the Manager of Planning and Development Services and the County Engineer uphold the decision of the Coordinator, Land Management Services and if the Encroachment is not removed or the Encroaching Use has not ceased within sixty (60) days, the Coordinator, Land Management Services may take advantage of whatever legal remedies are available to the County to ensure the removal of the Encroachment or cessation of the Encroaching Use.

10.4 Enforcement will be ranked in order of priority utilizing the following criteria:

a) Liability and risk to the County
b) Prior issues of flooding
c) Safety protection
d) Form and function of storm water management facility
e) Benefit/cost analysis
f) Resource availability

11.0 Documentation

11.1 Notwithstanding any other section in this Policy, the Coordinator, Land Management Services, or his designate, shall have the sole discretion to determine if an Encroachment is of such a minor nature that the County will issue a Consent Letter to the Applicant for the encroachment rather than require the execution of an Agreement.

12.0 Fees

12.1 If the County allows the Encroachment or Encroachment Use, the Applicant will be responsible for the fees established by the Council of the County from time to time.

13.0 Liability

13.1 Strathcona County, while undertaking preventative maintenance on or during the normal operation of any Storm Water Management Facility, will not be held liable for any damages incurred to landscaping improvements constructed within the Utility Right-of-Way (easement) area or Storm Water Management Facility.

APPENDIX D

Vertebrate Pest Control

Date Approved by Council: **06/25/91; 01/14/95;** Resolution No: **564/91;71/95; 36/97; 108/2001 01/21/97; 02/20/2001**
Lead Role: **Chief Commissioner** Replaces: **n/a**
Last Review Date: **02/2001** Next Review Date: **02/2004**

Administrative Responsibility: **Environmental Operations**

Special Notes: Cross-reference to the Firearms Control Bylaw which prohibits the discharge and use of firearms within a designated areas.

Policy Statement

The control of pests, nuisances and problem wildlife is a shared responsibility between landowners, the Province of Alberta and Strathcona County. The County shall have in place a formal policy to ensure that the control of pests, nuisances and problem wildlife is undertaken is as efficient and effective manner as possible. Human safety, municipal liabilities, mitigation of non-target capture and humane capture techniques are the primary importance.

Guidelines

Strathcona County will implement and administer this policy in accordance with the obligations delegated to it by provincial legislation for the control of wildlife, pests and nuisances, including the Wildlife Act, Agricultural Pests Act and municipal policy.

Definitions

AGRICULTURAL PESTS ACT	Means the Agricultural Pests Act, RSA 1980, c. A-18.1, as amended or replaced from time to time

BEAVER:	Means an animal of the family "Castor canadensis"
CONTROL DEVICE:	Shall include live traps, leghold traps, snares, firearms or any device used to capture animals
CONTROL WORK:	Means the setting of Control Devices, removal of wildlife and/or destruction or disturbance of dens, lodges and dams
COORDINATOR:	Means the Coordinator, Agriculture Services
COYOTE:	Means an animal of the family "Canus latrans"
GROUND SQUIRREL:	Means an animal of the genus "Spermophilus"
INSPECTOR:	Means a person appointed as an inspector by County Council and includes and ex officio inspector
Landowner:	Means a person who is registered under the Land Titles Act as the Owner
NUISANCE:	Means an animal or bird that is destroying or harming or is likely to destroy or harm any land, livestock or property in Alberta and is declared a nuisance by the Agricultural Pests Act
OCCUPANT:	Means a person occupying or exercising control over or having the right to occupy or exercise control over land
PEST:	Means an animal that is destroying or harming or is likely to destroy or harm any land, livestock or property in Alberta and is declared a pest by the Agricultural Pests Act
POISON:	Means Compound 1080 tablets (5 mg Sodium Monofluoroacetate) and Sodium Cyanide (840 mg cartridge) registered for Coyote control under the Pest Control Products Act

PROBLEM WILDLIFE:	Means any animal that is defined as wildlife in the Wildlife Act and is destroying or harming or is likely to destroy or harm any land, livestock or property in Strathcona County
RAT:	Means an animal of the genus "Rattus"
SKUNK:	Means an animal of the family "Mephitis mephitis"
SQUIRREL: WILDLIFE ACT:	Means an animal of the family "Tamiasciurus hudsonicus" Means the Wildlife Act, RSA 1980, c. W-9.1 as amended or replaced from time to time

Responsibilities

1. The Agricultural Service Board shall serve as the Appeal Committee for the purpose of any appeal pursuant to the Agricultural Pests Act.

2. The Environmental Operations Department will:

provide Landowners and Occupants with information on how to control any Problem Wildlife that they want to control. The information provided will conform to all laws and be practical for the control of the individual species.

direct Landowners and Occupants to Alberta Environment, Natural Resources Service for assistance where Problem Wildlife control requires special permits, is not allowed or is outside of the services provided by the County.

carry out Control Work in a safe manner consistent with all legislation and guidelines that may apply. Where in the opinion of the Coordinator, staff cannot safely carry out Control Work, the onus and responsibility for control will rest with the Landowner or Occupant.

ensure the Landowner or Occupant executes a right-of-entry agreement before any Control Work is undertaken on private property.

ensure that all animals are captured in as humane a manner as possible.

Ensure that all animals captured under the terms of this policy will be euthanised. The coordinator may, at his discretion, approve the relocation of animals.

Procedures

1. Beaver Control

Beaver are classified as wildlife by the Wildlife Act. Although extirpated in this area at one time, reintroduction, change in land use and lack of natural predators has resulted in an over abundance of Beavers. A Landowner or a person authorized by the Landowner may hunt Beaver on private property at any time of year. Damming of watercourses by Beaver can reduce erosion and create valuable wetland habitat for other wildlife species. Flooding of roads and agricultural land plus the loss of valuable trees can cause severe economic losses if not controlled.

(a) Requests for service - private and non-municipal public lands

Beaver Control Work may be undertaken at the request of a Landowner or Occupant or at the initiative of the County on lands to which right-of-entry agreement has been obtained.

(b) Requests for service - municipal public lands

Staff will actively pursue and eradicate Beaver and breach Beaver dams on municipally controlled property.

Public Works Operations is responsible for the maintenance of road culverts and ditches blocked by Beaver. Communication between Environmental Operations and Public Works Operations is critical to ensuring the removal of Beaver is coordinated with the cleaning operations.

(c) Priority of Service

Calls for Beaver removal and Beaver dam breaching will be prioritized. Beaver problems that have the greatest potential to damage property will receive the highest priority. The following priority will be observed:

i. Public infrastructure.
ii. Private buildings and private roads.
iii. Cultivated agricultural land.
iv. Pasture and any other land.

(d) Dam removal

The County will provide assistance to residents for the breaching of Beaver dams with the use of explosives.

Beaver dams causing flooding will be breached as soon as possible. Where the retention of water will not cause immediate damage, breaching of dams will be coordinated to not interfere with the planting and harvesting of agricultural crops, to

coincide with spring runoff and have a minimal effect on nesting birds. Breaching of dams in autumn that may cause on-going water seepage and icing of culverts will be delayed until spring.

Where Beaver dams are not causing problems to agricultural land or County infrastructure, Landowners will be encouraged to retain the Beaver dams for wildlife habitat.

Where explosives cannot be safely detonated, or the use of explosives will have limited or no effect on breaching the Beaver dam, the Landowner or right-of-way owner will be responsible to utilize an alternative method to remove the dam.

Environmental Operations will not remove any blockages, manually or with dynamite, to culverts, bridges or other crossings located on private property. The responsibility for removal of such blockages rests with the Landowner. The Coordinator may approve exceptions in emergency situations.

Removal of blast debris will be the responsibility of the Landowner.

Where a Landowner will not remove a dam causing flooding or damage to adjacent property, the matter will be referred to Alberta Environment for enforcement action under the Water Act.

2. Coyotes

Coyotes are an important wildlife species that consumes large numbers of rodents and carrion. Coyote predation on free ranging livestock and pets is a manageable risk. Sound management practices can reduce or eliminate most problems with Coyotes. Where these practices do not control the problem, removal of the offending Coyote(s) is necessary.

Coyotes are classified as wildlife under the Wildlife Act and a Nuisance under the Agricultural Pests Act. A Landowner or a person authorized by the Landowner may shoot, but not trap, a Coyote on private land at any time of year. Municipalities may pass bylaws to restrict the use of firearms in areas where safety is a concern. A damage control license is required to trap Coyotes outside the open trapping season. The Agricultural Pests Act authorizes the use of Poisons to control Coyote predation of livestock.

(a) Request for Service - Municipal or Public Land

Due to the hazards associated with Coyote Control Devices, no Control Devices will be placed on public or municipal lands where access by residents and pets is not restricted.

(b) Request for Service - Private Land

All requests to remove Coyotes will be assessed to confirm that Coyotes are creating problems. Residents will be advised of management techniques that may deter or prevent the Coyotes from becoming a problem.

Coyote control work may be undertaken at the request of a Landowner or Occupant or at the initiative of the County on lands where a right-of-way entry agreement has been obtained.

County staff will not use any Control Devices, with the exception of firearms, in a rural subdivision or hamlet.

(c) Poison

Alberta Agriculture, Food & Rural Development (AAF&RD) is responsible for all Poison issued for Coyote predation control in Alberta. AAF&RD guidelines will be followed by County Inspectors for the use of Poison.

County Inspectors will not issue Poison to residents.

3. Skunks

Skunks are classified as a Nuisance under the Agricultural Pests Act. A Skunk will easily coexist with people. If it were not for the offensive odour, used as a defense mechanism, Skunks would not bother most people. Skunks can also be a problem by killing poultry. Landowners or people authorized by them may trap but not Poison Skunks on private land at any time of year.

Traps will be available to County residents for the live capture of skunks.

At the discretion of the Coordinator, a resident may be denied access to County traps if there is evidence that a resident is not handling trapped skunks in a humane manner.

County staff may not handle Skunks that are caught in privately owned traps that have open sides or are large and cumbersome.

4. Rabies Vector

Rabies is a declared Pest under the Agricultural Pests Act. Although rabies is a virus, it is spread by contact with an infected animal. Skunks and bats are the main rabies vectors in Alberta.

Environmental Operations, will respond to requests by the Federal District Veterinarian or the Local Health Authority for the capture and submission for testing of any animal suspected of being rabid.

Environmental Operations will assist the Federal District Veterinarian in controlling an outbreak of rabies.

5. Rats

Any Rat of the genus Rattus is a declared Pest. The Rat control zone along the Saskatchewan border, the northern boreal forest, the mountains and the prairies prevent Rats from migrating into Alberta. Infestations in the areas outside the Rat control zone come from Rats traveling on trucks and trains. Rats can cause severe economic hardship if they are not controlled.

Alberta Agriculture Food and Rural Development (AAF&RD) will be contacted when a Rat is found in Strathcona County. Staff will assist AAF&RD in controlling the infestation.

6. Squirrels

The Red Squirrel is classified as wildlife by the Wildlife Act. Squirrels can damage buildings by making entrance holes, building nests in attics and chewing electrical wiring.

Traps will be made available to County residents for the live capture of squirrels.

At the discretion of the Coordinator, a resident may be denied access to County traps if there is evidence that a resident is not handling trapped squirrels in a humane manner.

7. Ground Squirrels

The Ground Squirrel, commonly called the gopher, is found in localized areas throughout the County. These ground squirrels can damage lawns, flowerbeds and golf courses with their digging. Their burrows can weaken and collapse ditch banks. In agricultural crops, mounds of soil can damage farm equipment. The ground Squirrel is classified as a Nuisance.

Control Devised for ground squirrel control may be used on municipal and public property.

Poisons approved for use on municipal property may be used to control ground squirrels when other methods of control have proven ineffective.

County staff may enter upon private property, where a right-of-entry agreement has been obtained, to control ground squirrels that are destroying County infrastructure.

8. Other Animals

Residents having difficulty with wildlife and Nuisances that are not listed in this policy will be given information on how to control the problem themselves. Where it is available, the resident will be directed to other agencies or private companies that provide services to control their problem.

The coordinator may direct staff to remove Problem Wildlife and Nuisances, not listed in this policy, form municipal lands where damage to County infrastructure is occurring or there is the threat to human safety.


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APPENDIX E

Weed Control Enforcement Program

Date Approved by Council: **07/03/90; 04/09/96; 05/11/99; 02/20/2001**
Resolution No: **620/90; 261/96; 357/99; 109/2001**
Lead Role: **Chief Commissioner / Agricultural Service Board**
Replaces: **n/a**
Last Review Date: **02/2001**
Next Review Date: **02/2004**

Administrative Responsibility: **Manager, Environmental Operations**

Policy Statement

The control of weeds is a shared responsibility between owners, occupants and Strathcona County. The County shall have in place a formal policy to ensure that the control of weeds is undertaken in an efficient and effective manner.

Guidelines

Except as modified by this Policy, Strathcona County will implement and administer a program of control of restricted, noxious and nuisance weeds on public and private lands in accordance with the obligations delegated to it by the Weed Control Act, RSA 1980, c. W-6 as amended.

Definitions

ACT: is the Weed Control Act RSA 1980, c.W-6 as amended and regulations made thereunder.

BOARD: is the Agricultural Service Board of the County.

CROPPING
MANAGEMENT PLAN: means a plan to control the growth of weeds.

LANDOWNER: in the case of land a person who is registered under the Land Titles Act as the owner, or in the case of personal property, a person who is in lawful possession of the property or who has the right to exercise control over the property.

MANAGER: means the Manager, Environmental Operations or his designate.

NOTICE OF WEED
CONTROL SERVICES
INVOICE: means an invoice for weed control services rendered by the County for non-compliance with a Weed Notice.

OCCUPANT: is a person occupying or exercising control or having the right to occupy or exercise control over land.

PROHIBIT SEEDING means a Notice to Control the Growing and Use of Crops under the Act.
NOTICE:

WEED INSPECTOR: a person appointed as an inspector by the local authority under Section 5 of the Act.

WEED NOTICE: means a Weed Notice under the Act.

Responsibilities

1. The Agricultural Service Board shall serve as the Appeal Committee for the purpose of any appeal pursuant to the Weed Control Act and this Policy.

2. The Environmental Operations Department shall:

_ Be responsible to work with Landowners and Occupants to develop Cropping Management Plans to control the growth of weeds.

_ Be responsible to ensure Landowners and Occupants are informed of their weed control responsibilities and avenues of appeal, if any, by way of letter attached to the notice or invoice

_ In the case of Form "A" Weed Notices, see attached Appendix A

_ In the case of Notice of Weed Control Services Invoice, see attached Appendix B.

_ Be responsible to issue extensions to a Notice issued if extenuating circumstances have prevented a landowner or occupant from carrying out the terms of a Notice.

Procedures

1. Cropping Management Plans

_ The Weed Inspector will identify those severely weed infested fields that may require special attention to rectify the weed problem in July/August of each year.

_ The Manager will contact the Landowner in writing prior to September 1, informing him that the land has been identified as severely weed infested.

_ The Landowner or Occupant will have 30 days to contact the Manager with respect to entering into a Cropping Management Plan for the property in question.

_ Once the Cropping Management Plan is finalized, a Prohibit Seeding Notice will be prepared incorporating the terms of the Plan and served on the Landowner and Occupant, if applicable, in the same manner as a Weed Notice.

_ If the Manager and the Landowner or Occupant are unable to agree to terms for the Cropping Management Plan the Manager will prepare a Prohibit Seeding Notice instructing the Landowner or Occupant to maintain the property using appropriate weed control techniques the following crop year.

_ The Landowner or Occupant will be provided with an opportunity to appeal the Prohibit Seeding Notice within10 days from receipt of the Notice.

_ If the land has been farmed in an appropriate fashion in the crop year following the issuance of the Prohibit Seeding Notice, the Manager will forward an administrative recommendation to the first meeting of the Board following the summer recess, to rescind the notice.

2. Appeal of Weed Control Services Invoice

_ A person who

- _ has an interest in land as an Landowner, and
- _ considers himself aggrieved by the Weed Control Services Invoice may appeal to the Board by filing a notice of appeal.

_ A notice of appeal shall be in writing and will set out

- _ the name and address of the appellant,
- _ a copy of the notice in respect of which the appeal is being taken,
- _ the legal description of the land affected, and
- _ the grounds for appeal.

_ A notice of appeal shall be accompanied by cash or a certified cheque in the amount of $50 which shall be refunded to the appellant if the appeal is successful.

_ A notice of appeal shall be delivered personally or sent by double registered or certified mail to the Manager within 30 days of receiving the weed invoice. Failure to appeal within 30 days of receipt of an invoice shall result in an automatic forfeit of the right to appeal.
_ The Board shall hear and determine the appeal at the next regularly scheduled Agricultural Service Board Meeting.
_ The Manager will, on determination of the appeal, send a copy of the decision together with the written reasons, if any, by double registered or certified mail to the appellant.

Note: The County is under no legislative requirement to provide an appeal process for a weed control services invoice.

SER-001-004
Appendix A

Dear <landowner/occupant>:

Re: Weed Notice # - <legal land description>:

Provision of the Provincial Weed Control Act permit the issuance of Weed Notices to a property containing noxious weeds and/or restricted weeds.

Please: Read the Weed Notice **First**, front and back, as it contains important information outlining your responsibilities and legal rights as per the Weed Control Act.

1. If you SELL the land to which the notice applies the Weed Control Act requires you PASS THIS WEED NOTICE TO THE NEW OWNER.

2. After you complete the actions necessary to comply with the notice, please contact the undersigned at {phone number} prior to the notice due date.

3. A Weed Inspector will be checking your property shortly after the notice expiry date. If you have failed to perform the necessary weed control detailed in the weed notice a weed control crew will be dispatched to effect the necessary weed control on your property at the landowner's expense.

4. Please remember that the noxious and/or restricted weeds will require your attention more than once through the growing season. It is our intention to maintain a program of periodic checks throughout the growing season with NOTICES issued as required.

Please Note**:** No further notification will be provided to you if you fail to meet the terms of the notice within the time specified in the notice and County crews are required to

enter your property to undertake the required weed control measures.

Your co-operation in this matter is appreciated. If you have any questions or concerns please call the undersigned at {phone number}.

<name>
Weed Inspector
Strathcona County

enclosure

SER-001-004
Appendix B

Dear <landowner>

Re: Weed Notice # - <legal land description>:

Attached is an invoice for weed control services rendered on your property. Payment is requested within thirty (30) days of receipt of this notice.

If payment is not received within 30 days, Strathcona County shall cause the amount owing to be placed on the tax roll as an additional tax against the land concerned and it shall be collected in the same manner as taxes.

Appeal Process:
(a) A person who
i has an interest in land as an owner or occupant and
ii considers himself aggrieved by the weed invoice may appeal to the Agricultural Service Board of Strathcona County by filing a notice of appeal.

(b) A notice of appeal shall be in writing and shall set out
i the name and address of the appellant,
ii a copy of the notice in respect of which the appeal is being taken,
iii the legal description of the land affected, and
iv the grounds for appeal

(c) A notice of appeal shall be delivered personally or sent by double registered mail or certified mail to the Assistant Agricultural Fieldman, within 30 days of receiving the weed notice.

(d) A notice of appeal shall be accompanied by cash or certified cheque in the amount

of $50 which shall be refunded if the appellant is successful in his appeal.

(e) Failure to appeal within 30 days of receipt of the attached invoice shall result in an automatic forfeit of the right to appeal the invoice.

Please direct any questions or comments to the Environmental Operations Department at {phone number}.

Assistant Agricultural Fieldman
Strathcona County

enclosure


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APPENDIX F

Contact Information

Legislation	Responsible Authority	Contact Information
Fisheries Act	Department of Fisheries and Oceans	Edmonton Office: Whitemud Business Park 4253 – 97th Street Edmonton, AB T6E 5Y7 Tel: (780) 495-4220 Fax: (780) 495-8606
Environmental Protection and Enhancement Act	Alberta Environment	David Lloyd, Director Parkland Region Provincial Building #301, 4920 – 51 Street Red Deer, AB T4N 6K8 Tel: (403) 340-7052 Fax: (403) 340-5022
Water Act	Alberta Environment	Parkland Region Provincial Building #501, 4920 – 51 Street Red Deer, AB T4N 6K8 Tel: (403) 340-7654 Fax: (403) 340-7662
Wildlife Act	Alberta Sustainable Resource Development	Edmonton, AB Tel: (780) 944 0313 Fax: (780) 427 4407
Wastewater and Storm Drainage Regulation	Alberta Environment	Alberta Environment Environmental Assessment Division Tel: (780) 427-6270
Public Lands Act	Alberta Sustainable Resource Development	Public Lands Division Provincial Building #301, 4920 – 51 Street Red Deer, AB T4N 6K8 Tel: (403) 340-5451 Fax: (403) 340-7081
Municipal Government Act	Ministry of Alberta Municipal Affairs	Alberta Municipal Affairs 18th Floor, Commerce Place 10155-102 Street Edmonton, AB T5J 4L4 Tel: (780) 427-8862 Fax (780) 422-1419
Water for Life: Alberta's Strategy for Sustainability	Alberta Environment	Alberta Environment Main Floor, Oxbridge Place 9820 106 Street Edmonton, AB T5K 2J6 Tel: (780) 427-6310 Fax: (780) 422-4086

Legislation	Responsible Authority	Contact Information
Stormwater Management Facility Easements	Strathcona County Planning and Development Services	Planning and Development Services 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 464-8080 Fax: (780) 464-8145
Vertebrate Pest Control	Strathcona County Environmental Operations	Environmental Operations 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 449-5514 Fax: (780) 464-0557
Surface Water Management, Water Management and Erosion Control Program	Strathcona County Environmental Operations	Environmental Operations 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 449-5514 Fax: (780) 464-0557
Weed Control Enforcement Program	Strathcona County Environmental Operations	Environmental Operations 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 449-5514 Fax: (780) 464-0557
Encroachments on to Utility Right-of-Ways	Strathcona County Planning and Development Services	Planning and Development Services 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 464-8080 Fax: (780) 464-8145
Stormwater Management Guidelines for the Province of Alberta	Environmental Sciences Division	Municipal Program Development Branch Environmental Sciences Division Environmental Service Alberta Environmental Protection 4th Floor 9820 106 Street Edmonton, AB T5K 2J6 Tel: (780) 427-8536
Engineering Service Standards	Strathcona County Engineering and Environmental Planning	Engineering and Environmental Planning 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 464-8279 Fax: (780) 464-8116
Open Space Development Standards	Strathcona County Engineering and Environmental Planning	Engineering and Environmental Planning 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 464-8279

		Fax: (780) 464-8116
Legislation	**Responsible Authority**	**Contact Information**
Open Space Management Plan	Strathcona County Engineering and Environmental Planning	Engineering and Environmental Planning 2001 Sherwood Drive Sherwood Park, AB T8A 3W7 Tel: (780) 464-8279 Fax: (780) 464-8116

APPENDIX G

APPENDIX G: Recommended Plant Species for Stormwater Management Facilities

Botanical Name	Common Name	Moisture Regime				Recommended Location	Notes
		Aquatic	Emergent	Hydric to mesic upland	Mesic to xeric upland		
Grasses							
Agropyron riparium	Streambank Wheat Grass			*	*	Roadsides and disturbed areas	High tolerance to saline-alkali soils
Agropyron trachycaulum	Awned/Slender Wheatgrass			*	*	Wet to dry soil, open woods	Excellent for erosion control
Alopecurus aequalis	Water Foxtail		*			Moist fertile soil, wet meadows edges of ponds and ditches	
Beckmannia syzigachne	Slough Grass		*	*		Wet to moist soils, wet meadows, swamps, marshes and shallow water	
Bouteloua gracilis	Blue Grama Grass				*	Dry, open habitats in basic saline soil	Rehabilitate disturbed sites and to revegetate dry soils
Bromus anomalus	Nodding Brome		*	*		Coarse soils, moist prairie grasslands	
Calamagrostis Canadensis	Bluejoint Grass		*	*		Prefers wet sites, marshes and moist woodlands	Potentially invasive Good for erosion control
Calamagrostis inexpansa	Northern Reedgrass		*	*		Wet meadows, marshy places, around sloughs and lakeshores	Flood tolerant
Calamagrostis stricta	Narrow-Leaved Reed Grass		*	*		Wet meadows, banks, shores, alkaline soil	
Calamovilfa longifolia	Sand Grass, Prairie Sand Reed				*	Sandy soils, open woods, sand dunes	Excellent for stabilization of sandy soils
Cinna latifolia	Slender Wood Grass, Drooping Wood Reed			*		Moist soils, damp woods and filtered shade	
Danthonia parryi	Parry Oat Grass				*	Prairies, coarse soils	
Deschampsia caespitosa	Tufted Hair Grass			*		Meadows, bogs, damp woodlands, heavy soils, badly drained clay soils	Suited to low spots with difficult drainage Excellent for erosion contrl
Distichlis stricta	Alkali Grass, Salt Grass		*	*		Depressed areas that receive seasonal runoff or have water tables near the soil surface.	Excellent for erosion control

Elymus canadensis	Canada Wild Rye			*	*	Dry sandy gravelly or rocky soil, river banks	Toleratant to wide range of soils
Elymus cinereus (E. piperi)	Giant Wild Rye				*	Silty and clayey soil, tolerant of sandy textured soil, riverbanks, ravines, moist slopes	Flood, drought tolerant
Festuca campestris	Foothills Rough Fescue				*	Moist soil, forest openings	
Festuca halli	Plains Rough Fescue				*	Moist black soil	
Glyceria grandis	Tall Manna Grass		*	*		Swales, along meadow streams, slough margins, riverbanks	
Helictotrichon hookeri	Hooker's Oatgrass				*	Black soil, moist to moderately dry prairies	
Hierochloe odorata	Sweet Grass			*	*	Rich, moist soil, open woods	Potentially invasive Excellent for erosion control
Muhlenbergia richardsonis	Mat Muhly		*	*		Moist lowlands, medium to heavy soils, moderately alkaline situations	
Oryzopsis hymenoides	Indian Rice Grass				*	Well-aerated rocky or sandy soils such as sand dunes, dry exposed river banks and eroded slopes	Useful for revegetation on sandy, arid areas Excellent for erosion control
Phalaris arundinacea	Reed Canary Grass		*	*		Marshes, alluvial meadows, shores and ditches	Potentially invasive Excellent for erosion control
Poa canbyi	Early Bluegrass, Canby Bluegrass			*	*	Shallow, dry, and stony soil conditions, dry grasslands	Useful for erosion control
Poa juncifolia	Alkali Bluegrass		*			Saline-Alkaline Soil, roadsides and disturbed sites	
Poa palustris	Fowl Bluegrass			*		Wet meadows and damp soils	Quick establishing in wetlands and retention basins
Poa sandbergii	Sandberg Bluegrass				*	Moderately coarse sands to fine clays, dry plains	It has a remarkable ability to produce roots which effectively suppress weed growth
Puccinellia distans	Slender Salt-Meadow Grass			*		Roadsides and disturbed sites, salt tolerant	Excellent for estblishing cover on saline soils
Puccinellia nuttalliana	Nuttall's Alkali Grass			*		Moist alkaline soils	Tolerant of alkaline soils
Sagittaria cuneata	Arrowhead			*		Wet meadows, calcareous or muddy shores and shallow water	
Sanicula marilandica	Snakeroot			*		Roadsides, moist thick woods and thickets, prefers limestone-based soils	

Schizachyrium scoparium	Little Bluestem			*		Sandy to clay-loam soils, sandy rangeland	Provides nice ornamental quality in winter
Scolochloa festucacea	Spangle Top		*			Wet depressed meadows, prairie potholes, lake and river margins, shallow water, marshes	
Spartina gracilis	Alkali Cord Grass		*	*		Finely textured saline sandy soils	Good bank stabilizer
Spartina pectinata	Prairie Cord Grass		*	*		Marshes, swales, shores and gravels	Good for riparian restoration
Stipa comata	Needle And Thread Grass, Spear Grass				*	Sandy to loamy well drained soils; this plant does not grow well on heavy clay soils	Will survive with no supplemental water once established
Stipa curtiseta	Western Porcupine Grass				*	Dry ridges and xeric slopes, especially where the soil is thin	
Stipa richardsonii	Richardson's Needle Grass				*	Forest openings and at forest edges on dry, steep slopes, moist grasslands	
Stipa spartea	Porcupine Grass				*	Wet/heavy loamy soil	
Stipa viridula	Green Needle Grass			*	*	Clay soils, moderately dry to moist areas, in shrubbery, forest margins, moist ditches	
Sedges, Rushes, And Broad-Leafed Aquatics							
Alisma plantago-aquatica	Broad-Leafed Water Plantain		*			Ditches, damp ground and muddy shallow water up to 15cm deep	
Alisma triviale	Western Water Plantain		*			Mud Flats	
Carex aquatilis	Water Sedge		*	*		Disturbed habitats, swamps, wet meadows, shores, any other low-lying area with restricted water drainage	Tolerates heavy metal contamination in soil and water
Carex atherodes	Awned Sedge		*	*		Clay, marl, and calcareous soils, meadows, swales, floodplains	Excellent for erosion control
Carex rostrata	Beaked Sedge		*	*		Edges of ponds and lakes, swamps, marshes	
Ceratophyllum demersum	Hornwort	*				Free floating in ponds and ditches	Shade tolerant; rapid growth
Eleocharis acicularis	Least Spike-Rush	*				Grow on lake bottom	Food source for waterfowl, plants may break away and form living floating mats on water
Eleocharis palustris	Creeping Spike-Rush	*				Wet meadows, tidal marshes, and shorelines. Soils may be very coarse-fragment rich to deep and fine-textured	Excellent soil stabilizer
Equisetum hyemale	Horsetail Rush	*	*			Moist soil, damp marshy areas, shady streambanks	

Hippuris vulgaris	Mare's Tail		*	*		Shallow water or muddy margins of lakes, ponds, marshes, and streams. Prefers non-acidic waters	May choke up ditches
Juncus balticus	Wire Rush, Baltic Rush		*	*		Damp to wet soils, usually in saline conditions, shorelines	Excellent streambank stabilizer
Juncus nodosus	Knotted Rush		*	*		Wet meadows, marshes, edges of ponds in shallow water	
Juncus torreyi	Torry's Rush		*	*		Muddy or sandy shores, strip mine areas, swales and ditches.	
Lemna minor	Duckweed	*				Floating aquatic plants, still water	Great potential to remove mineral contaminants from waste waters
Mentha arvensis	Canada Mint			*		Moist soils and along streams	
Myriophyllum exalbescens	Spiked Water Milfoil	*				Lakes, ponds and ditches	Avoid faster flowing water
Polygonum amphibium	Water Smartweed	*				Ponds, ditches, wet soil	
Ranunculus cymbalaria	Creeping Buttercup		*	*		Wet soils, poorly drained soils and disturbed sites	
Scirpus acutus	Hardstem Bulrush, Great Bulrush		*			Shallow water of lake, marshes and pond margins water up to 1 metre deep	Excellent soil stabilizer
Scirpus americanus	American Bulrush		*			Marshes, moist shores, riverbanks and mud flats	
Scirpus maritimus	Alkali Bulrush		*			Salt marshes	
Scirpus microcarpus	Small-Fruited Bulrush		*			Streams and freshwater marshes. Thrives in saturated soils and shallow seasonal standing water	
Scirpus validus	Common Great Bulrush		*			Swamps, wet ditches, mud flats, lake and pond margins	Excellent soil stabilizer
Triglochin maritima	Arrow Grass	*	*			Alkaline and saline sites	
Typha latifolia	Common Cattail		*			Swamps, marshes, wet shores and ditches.	Potentially invasive. Very tolerant of poor water quality
Trees and Shrubs							
Alnus crispa	Green Alder			*		Streams, lakeshores, bogs. Soil textures range from sandy to gravelly or rocky	Good for erosion control

Amelanchier alnifolia	Saskatoonberry				*	Limestone plateaus, riparian areas, thickets, woodland edges and banks of streams, moist well-drained soils	Good for erosion control
Arctostaphylos uva-ursi	Kinnikinnick, Common Bearberry				*	Well-drained, gravely, sandy, slightly acidic soil, dry open woods, roadsides	Good soil stabilizer, often indicator of poor soil
Artemisia campestris	Plains Wormwood, Green Sagewort				*	Dry, open prairies, plains, and roadsides, usually associated with sandy or gravelly soils	
Artemisia cana	Sagebrush				*	Rocky open sites, river valleys, flood plains, Moist to moderately dry soils. Often most abundant in deep loamy and sandy soils	alkali tolerant
Betula glandulosa	Bog Birch		*			Fens, streambanks, marsh margins, lakes, bogs, seepage areas	Tolerates high alkalinity
Betula occidentalis	Water Birch, Black Birch		*	*		Steam banks, tolerates low soil oxygen, flooding, and clay soil but needs moist conditions	Well adapted for revegetating disturbed riparian sites
Chrysothamnus nauseosus	Rabbit-Brush				*	Sandy soil, gravely poor soil, or heavy clayey alkali soils in open places, eroded slopes	
Clematis ligusticifolia	Western Clematis			*		Silt loam soils, over trees and shrubs along rivers, creek banks	
Clematis occidentalis	Purple Clematis			*		Slopes or rolling topography	
Cornus stolonifera	Red Osier Dogwood			*		Moist sandy soils, riverbanks, coulees	Excellent soil stabilizer
Crataegus rotundifolia	Northern Hawthorn, Round-Leaved Hawthorn				*	Ravines and wooded areas	
Elaeagnus commutata	Silver-Berry; Wolf Willow				*	Loamy soils, but is commonly found in dry, sandy or gravelly soils on exposed hillsides	Useful for erosion control
Juniperus communis	Common Juniper				*	Rocky or sandy shores, woods, open southern facing slopes	
Juniperus horizontalis	Creeping Juniper				*	Dry rocky soil, sterile pastures and fields, dry banks	Good for erosion control
Lonicera dioica	Twining Honeysuckle			*		Open woods and clearings	
Philadelphus lewisii	Mock Orange				*	Dry, rocky, gravelly loams on open hillsides,	

						to well-drained deep, rich alluvial loams near riparian zones	
Picea glauca	White Spruce			*	*	Shores and streambank, rocky hills and slopes, succeeding in a variety of soil conditions	
Picea mariana	Black Spruce			*		Peat bogs and swamps, also on transitional sites between peatlands and uplands. Tolerant of nutrient-poor soils	
Populus balsamifera	Balsam Poplar			*		Gravels, deep moist sandy soils of river bottomlands, stream banks, borders of lakes and swamps	Good for erosion control
Populus treuloides	Trembling Aspen			*		Moist areas	Excellent for erosion control
Potentilla fruticosa	Shrubby Cinquefoil				*	Damp rocky ground, shorelines, lime rich soil, open woods	Tolerant of acidic conditions
Pseudotsuga menziesii	Douglas Fir				*	Well-aerated, well-drained deep loamy soils with plenty of moisture	Intolerant of poor drainage
Ribes aureum	Golden Currant			*	*	Along streams, prefers sunny, moist sites, river banks, rocky slopes	Tolerant of drier conditions
Ribes lacustre	Bristly Black Currant		*	*		Wet woods and swamps	
Ribes oxyacanthoides	Wild Gooseberry, Northern Gooseberry			*		Rocky and sandy shores, stony banks, moist woods, and thickets	
Rosa acicularis	Prickly Rose			*	*	Rocky ridges and shores, moist thickets, swamps, woods, roadsides	Revegetation on moist to wet sites; a good choice for erosion control
Rosa arkansana	Prairie Rose			*	*	Sandy tame pastures, roadsides, and at the edges of woods	
Rubus idaeus	Wild Red Raspberry			*	*	Clearings or borders in boreal forests, in ravines, on bluffs and streambanks of prairie regions. Well-drained sandy loam to silty clay loam	Good for erosion control
Rubus pubescens	Dewberry			*	*	Damp woods, bogs, low thickets	
Salix amygdaloides	Peach-Leaved Willow			*		Muddy streambanks and in low wet woods bordering rivers	Excellent streambank stabilizer

Salix bebbiana	Beaked Willow			*		Upland forests, wet lowlands, thickets, swamps, lakes and muskegs. Moist sandy or gravelly soils	Good soil stabilizer, can tolerate some flooding
Salix discolor	Pussywillow; Diamond Willow			*		Moist swampy locations, stream banks, aspen and mixed woods, thickets around sloughs	
Salix exigua	Sandbar Willow, Coyote Willow			*		Immediately adjacent to water's edge, slough margins	Invasive, excellent streambank stabilzer
Salix glauca	Smooth Willow		*	*		Streambanks, sandy and gravelly floodplains. Rocky, well-drained soils	
Salix lucida	Shining Willow		*	*		Wet ground, swamps, along streams, sand dune slacks	
Salix lutea	Yellow Willow			*	*	Stream and river edges, moist ditches, and moist alluvial terraces. coarse-textured soils, deep silts to sand	
Salix petiolaris	Meadow Willow			*		Open wetlands, stream banks	Good for stream bank stabilization
Salix pyrifolia	Balsam Willow			*		Moist/wet soils, slough margins	
Sambucus racemosa	Elderberry			*		Moist swampy locations, open woods	Useful for controlling erosion on moist sites
Shepherdia argentea	Silver/Thorny Buffaloberry			*	*	Semi-wet loamy soils with good drainage, will grow in drier conditions	Good for reclamation and erosion control
Shepherdia Canadensis	Canada Buffaloberry, Russet Buffaloberry				*	Sand, gravely or rocky soils, open woods	Useful for revegetating disturbed sites with poor soils Good for erosion control
Spiraea alba	Narrow-Leaved Meadow Sweet			*		Wet prairies, open habitats with wet soil. Best in moist soil, but adaptable to dry soil	Fast growing
Spiraea betulifolia	White Meadowsweet			*		Thin forested areas of low to moderate precipitation	Medium soil erosion reduction potential when planted with other vegetation
Symphoricarpos albus	Snowberry			*	*	Open woods and clearings, rocky or sandy soils	Adapts well to disturbed sites, useful for rehabilitating riparian areas
Symphoricarpos occidentalis	Buckbrush, Wolfberry, Western Snowberry			*	*	Swale depressions, upland ravines, alluvial floodplain terraces, roadsides	Adapts well to disturbed sites, useful for rehabilitating riparian areas Good for erosion control
Viburnum edule	Low Brush Cranberry			*		Moist, well-drained alluvial soils	
Viburnum opulus	High Bush Cranberry			*	*	Moist woods or forests, along stream or lake	

						margins on gravel or rocky banks, and on swamp or bog margins	
Forbs							
Achillea millefolium	Common Yarrow			*	*	Can tolerate either dry or moist conditions, meadows, pastures, lawns	Excellent for erosion control, among the hardiest of perennials
Agoseris glauca	False Dandelion			*		Wetland edges, disturbed or eroded sites	
Allium cernuum	Nodding Onion			*		Rocky soils, grasslands, open woods, thickets	
Allium schoenoprasum	Wild Chives			*		Normal, sandy, clay soils. Wet meadows, banks, shores	
Allium textile	Prairie Onion				*	Alkaline to neutral soils, dry prairies, calcareous rocks and open woods	
Anaphalis margaritacea	Pearly Everlasting				*	Dry, open, sandy, rocky locations	
Androsace septentrionalis	Fairy Candelabra, Pigmy Flower				*	Dry, open, disturbed sites. Very sandy or gritty loam	
Anemone canadensis	Canada Anemone			*		Damp thickets, meadows, wet prairies, lake shores, streamsides, clearings	
Anemone cylindrical	Long-Fruited Anemone				*	Average to dry soil, prairies, dry, open woods, pastures and roadsides	
Anemone multifida	Cut-Leaved Anemone			*		Moist, sandy-hummusy soils	Can be very invasive in loose soils
Anemone occidentalis	Western Pasqueflower			*		Well-drained sites with deep soils, in seepage areas	
Anemone patens	Prairie Crocus			*	*	Dry open woods, sandy soils. South-facing slopes	
Antennaria rosea	Rosy Everlasting				*	Very dry well drained soils	
Aralia nudicaulis	Wild Sarsaparilla			*		Moist shady woods, deep wooded ravines	
Arnica fulgens	Shining Arnica			*		Open places, moist meadows, mixture of sand, loam and peat	
Artemisia frigida	Pasture Sage				*	Dry open sites, dry prairies, plains and rocks	Soil stabilization and erosion control
Artemisia ludoviciana	Prairie Sage			*	*	Normal, sandy, clay soils, thin woodland. Average to poor soil conditions	

Aster borealis	Rush Aster			*		Fens, marshy ground, bogs	
Aster conspicuous	Showy Aster				*	Dry, sandy soil, woodlands, clearings	
Aster ericoides	Tuffed White Prairie Aster			*		Dry black soil, gravel prairies, openings in dry rocky forests, areas along roadsides and disturbed areas	
Aster falcatus	Creeping White Prairie Aster				*	Dry open areas	
Aster hesperius	Western Willow Aster			*		Meadow plantings or reclaiming a disturbed site, stream banks, ditches, moist ground	
Aster laevis	Smooth Aster			*	*	Woodland edges, moist meadows	
Aster sibiricus	Arctic Aster				*	Rocky sites	
Astragalus alpinus	Alpine Milk Vetch			*		Sandy or gravelly sparsely wooded lakeshores, moist banks	
Astragalus americanus	American Milk Vetch			*		Moist woods, riverbanks, openings	
Astragalus bisulcatus	Two-Grooved Milk Vetch				*	Dry sites, eroded banks and clay soils	
Astragalus Canadensis	Canada Milk Vetch				*	Loam, sand, mesic soils, shores, thickets and open forests	Poisonous to livestock
Astragalus crassicarpus	Ground Plum, Buffalo Bean				*	Rocky open woods, and limestone outcroppings	
Astragalus drummondii	Drummond's Milk Vetch				*	Dry soils, grasslands and prairies	
Astragalus gilviflorus	Cushion Milk Vetch				*	Dry gravely sites on plains, dry eroded sites	May be toxic to wildlife
Astragalus gracilis	Slender Leaved Milk Vetch				*	Hilltops, wooded or brushy hillsides, ravines, and roadsides	
Astragalus missouriensis	Missouri Milk Vetch				*	Gravelly clay banks, limestones, shales and sandstones, dry alkaline soils	
Astragalus pectinatus	Narrow Leaved Milk				*	Alkaline clay, sandy flats, alluvial soils, along roads	
Astragalus striatus	Ascending Purple Milk Vetch				*	Rock crevices with favourable water regime, eastern slopes, poor, drained soil	
Atriplex nuttallii	Nuttall's Atriplex, Salt, Sage		*	*		Dry alluvial flats, eroded slopes, saline and alkaline clay soils	
Bidens cernua	Nodding Beggar-Ticks		*	*		Shoreline, very wet soil	

Campanula rotundifolia	Bluebell, Harebell				*	Open woods, open rocky barrens	
Castilleja lutescens	Yellow Indian Paintbrush				*	Dry slopes and open coniferous forests	Endangered species
Castilleja miniata	Red Indian Paintbrush, Common Red Paintbrush				*	Open woods, meadows, thickets, grassy slopes, clearings, gravel bars and roadsides	
Chenopodium capitatum	Strawberry Blite			*	*	Forests and forest clearings and margins. Thin, stony soil	
Chrysopsis villosa	Hairy Golden Aster				*	Sandy or rocky areas, dry river bottoms, hillsides, open fields and meadows, and along roadsides.	
Cleome serrulata	Bee Plant, Stinking Clover				*	Dry, poor, well-drained, sandy soil, roadsides, waste areas, overgrazed pastures, fllow fields, meadows, rangeland	
Corydalis aurea	Golden Corydalis				*	Open prairies and hillsides, along streams and rocky banks, open woodlands, disturbed sites (along roads, in clearings,and around gravel or sand pits)	
Delphinium glaucum	Tall Larkspur			*	*	Dry, deep loamy soils, meadows, thickets, stream banks, around springs and in moist meadows and open woods.	Most abundant where the snow pack persist
Disporum trachycarpum	Fairy Bells			*		Moist woods, wooded slopes, often by streams	
Dodecatheon conjugens	Shooting Star			*		Well-drained soils, moist to moderately dry, rich soil	
Dodecatheon pulchellum	Saline Shooting Star			*	*	Meadows and open woodlands, dry conditions	
Dryas drummondii	Yellow Dryad, Yellow Mountain Avens				*	Dry gravely slopes, river bars, roadsides	May form carpet-like coverings along gravel washes and river banks Excellent for erosion control
Epilobium angustifolium	Fireweed; Great Willow Herb			*		Disturbed ground, cut-over or burned forests and swamps, clays, loams, sandy loams	Tolerant of a wide variety of soils
Epilobium ciliatum	Northern Willow-Herb			*		Shores, stream banks, marshes, wet meadows, springs, seepage areas, ditches	

Erigeron caespitosus	Tufted Fleabane				*	Poor well-drained soils, dry eroded areas	Very drought tolerant once established
Erigeron compositus	Compound Fleabane				*	Eroded hillsides, sandy open places	
Erigeron glabellus	Smooth Fleabane			*		Open moist woods, meadows	
Erigeron philadelphicus	Philadelphia Fleabane			*		Sand,clay, growing in large stands in fields, roadsides and waste places	
Erigeron speciosus	Showy Fleabane			*		Well-drained light, loamy, sandy soil, moist open woods	
Eriogonum flavum	Yellow Umbrella Plant				*	dry clay hilltops, valleys	
Eurotia lanata	Winter Fat				*	Grows in sandy, or clay alkaline soils, usually high in calcium	
Fragaria virginiana	Wild Strawberry			*		Fields, open spaces, woodland edges	
Gaillardia aristata	Gaillardia, Blanketflower				*	Well-drained soil, dry areas, or on upper slopes, disturbed areas, roadsides	
Galium boreale	Northern Bedstraw			*		Shores, gravely or rocky banks, streamsides, roadsides	
Gaura coccinea	Scarlet Butterfly Weed				*	Dry prairies, open wooded hillsides, roadsides, and in stream valleys, on a variety of soils	
Gentianella amarelle	Gentian, Felwort, Northern Gentian			*		Meadows and moist areas in general, foothills to alpine zone	
Geranium richardsonii	Wild White Geranium			*		Woodlands, forest openings, grasslands, meadows, and riparian areas such as stream terraces and stream margins. Loam, sandy loam, and clayey loam soils derived from shale and limestone.	Moderately drought tolerant.
Geranium viscosissimum	Sticky Purple Geranium			*		Meadows, open sites in sagebrush shrubland, roadsides, creek banks, meadows, coniferous forest Medium-dry to moist or even wet soils	
Geum aleppicum	Yellow Avens			*		Swamps, low ground, moist woods and thickets	
Geum macrophyllum	Large Leaf Avens			*	*	Meadows, moist woods and streambanks from low to middle elevations	

Geum rivale	Purple Avens, Water Avens			*		Damp, shady places, marshes, beside streams edges of hedge-lined fields bordered by ditches	
Geum triflorum	Old Man's Whiskers/Prairie Smoke				*	Dry, open woodlands, loamy sand	
Glycyrrhiza lepidota	Wild Licorice			*		Moist habitats lakeshores, roadsides, riverbanks, depressions, discharge areas and waste areas. Well-drained sandy loam soil	
Grindelia squarrosa	Gumweed			*		Disturbed sites, roadsides, in dry soil dry areas, grows on moist soils that lack other vegetation	
Gutierrezia sarothrae	Broomweed				*	Dry soils of open areas, plains, roadsides. Can grow under poor growing conditions	Drought tolerant
Habenaria hyperborean	Green Orchid			*		Bogs, moist meadows, damp woods	
Haplopappus spinulosus	Spiny Iron Plant				*	Dry, sandy or gravelly soil of open prairies, pastures and roadsides	Drought tolerant
Hedysarum boreale	Northern Sweet Vetch				*	Dry calcerous gravel, clay, grassy slopes	
Hedysarum sulphurescens	Yellow Sweetvetch				*	Open forested areas, plains to subalpine	
Helianthus annuus	Common Annual Sunflower				*	Well-drained soil, eroded slopes, waste areas, roadsides, grows well in poor soil and with dry conditions	
Helianthus laetiflorus var. *subrhomboideus*	Rhomic-Leaved Sunflower				*	Well drained soil, especially dry sand and poor clay soils, sand, loam, gravel	
Helianthus nuttallii	Common Tall Sunflower			*		Bottomland, meadows, slough margins, wet roadsides and other moist places	
Heracleum lanatum	Cow Parsnip			*		Woodlands, forest openings, grasslands, and riparian areas such as wet meadows, stream terraces, floodplains, and stream and lake margins	Moderately good for erosion control
Heuchera cylindrica	Sticky Alumroot				*	Dry, rocky ledges/soils, streambanks	
Lathyrus ochroleucus	Cream Coloured Vetchling, Cream Coloured Pea Vine			*		Moist, open woods and thickets, coulees, and in clearings	Excellent for erosion control
Liatris punctata	Dotted Blazing Star				*	Dry, open, upland sites, especially in sandy	

						soil	
Lilium philadelphicum	Western Wood Lily			*	*	Acidic sandy or shallow rocky soil of meadows, open woods	
Linnaea borealis	Twinflower			*		Moist cool shady woods, decaying wood	
Linum lewisii	Wild Blue Flax, Lewisii Wild Flax				*	Dry open ridges and slopes usually on dry, well-drained soil	
Linum rigidum	Yellow Flax				*	Sandy and light soils in grassland habitat	
Lithospermum ruderale	Wolly Gromwell. Western Gromwell, Stone Seed			*		Dry open forests and grasslands. Sandy, loamy or clay soils	
Lomatium dissectum	Mountain Wild Parsley			*	*	Open, often rocky slopes and dry meadows	
Lomatium macrocarpum	Long Fruited Parsley			*	*	Open rocky hills and plains	
Lupinus sericeus	Flexile Lupine, Silky Lupine				*	Dry, rocky sites on gentle to steep slopes and in open woods. Sandy, loamy, sandy-loam, and clayey-loam soils	Useful in the rehabilitation of disturbed areas
Lygodesmia juncea	Skeletonweed				*	Prairies and plains, especially in sandy soils	
Lysimachia ciliata	Fringed Loosestrife			*		Swamps, shores, wet thickets, moist woods	
Maianthemum canadense	Wild Lily Of The Valley			*		Moist or dry woods, in humus-rich slightly acid soils	
Malvastrum coccineum	Scarlet Mallow			*		Roadsides, railway grades and other disturbed places	
Mentha arvensis	Wild Mint			*		Arable land, heaths, damp edges of woods, marshy grounds	Flood tolerant
Mitella nuda	Bishop’s Cap			*		Moist forests, streambanks, wooded swamps, mossy thickets, rich woods	
Monarda fistulosa	Wild Bergamont, Horse Mint			*		Dry hills, shady banks, woodlands edges, dry thickets, clearings, roadsides	
Oenothera biennis	Yellow Evening Primrose			*	*	Dunes, roadsides, railway banks, often in sandy soils	
Orthilia secunda	One-Sided Wintergreen			*	*	Damp coniferous woods and on damp rock ledges	
Orthocarpus luteus	Owl’s Clover				*	Dry meadows, upland prairie, sometimes	

						found in open woodlands	
Oxytropis campestris	Locoweed				*	Rocky, gravelly, open or partially shaded areas in valleys, sandy loam to clay loam soils	Excellent soil builder and has high erosion control capabilities
Oxytropis deflexa	Reflexed Locoweed				*	Substrate ridges, dry, gravel, sand with low organic content	
Oxytropis monticola	Late Yellow Locoweed				*	Rocky, gravelly, open or partially shaded areas in valleys, sandy loam to clay loam soils	Excellent for erosion control
Oxytropis sericea	Early Yellow Locoweed				*	Open, well-drained north-facing slopes, sandy loam soils	Does not tolerate waterlogged soils
Oxytropis splendens	Showy Locoweed				*	River gravels, grasslands and open forests	
Oxytropis viscida	Viscid Locoweed				*	Rocky, gravelly, open or partially shaded areas in valleys, sandy loam to clry loam soils	
Parnassia palustris	Grass Of Parnassia			*		Marshes, bogs and wet shady places	
Penstemon confertus	Yellow Beardtongue			*		Fairly moist open or wooded places, meadows or by streams, dry sandy pinewoods	
Penstemon nitidus	Smooth Blue Beardtongue				*	Very dry rocky, eroded or gravelly soils. Grows in poor soil	
Penstemon procerus	Slender Blue Beardtongue			*		Dry plains, prairies, open or wooded slopes, meadows, slough margins	
Perideridia gairdneri	Squaw Root			*	*	Woodland, dry and wet meadows	
Petalostemon purpureus	Purple Prairie Clover				*	Dry plains, prairies, hillsides, open woodlands, shaded ravines, and roadsides. Fine to course soils	Valuable for erosion control due to its deep, fibrous, branching root system
Petasites palmatus	Palm-Leaved Coltsfoot, Palmate-leaved coltsfoot			*		Low woods, glades, damp clearings swamps, along the sides of streams, swamps	
Petasites sagittatus	Coltsfoot, Arrow-leaved Coltsfoot			*		Wet meadows, bogs	
Physaria didymocarpa	Twin Bladderpod				*	River gravel, rocky flats, gravelly prairies, dry	

						hillsides, and roadsides	
Polygala senega	Seneca Snakeroot			*	*	Rocky hills and woods on dry and mainly calcareous soils	
Potentilla anserine	Silverweed		*	*		Ditches, lake shores, river flats, moist calcareous soils	
Potentilla arguta	White Cinquefoil			*		Clay, rocky material, sand to loam soils, woods, prairies, moist places	
Potentilla gracilis	Graceful Cinquefoil			*	*	Sandy loam, open rocky areas, grasslands, meadows, moist open woodlands	
Potentilla hippiana	Woolly Cinquefoil				*	Wide range of soil composition and texture. Dry soils open grassland sagebrush, often on saline soils	
Potentilla palustris	Marsh Cinquefoil			*		Marshes, bogs, acid fens and wet heaths	
Potentilla pensylvanica	Prairie Cinquefoil			*	*	Prairie, along the shores of ponds and lakes, generally in limestone soils.	
Primula incana	Mealy Primrose			*		Moist alkaline meadows, stream banks, moist meadows, marshy ground and shores	
Psoralea esculenta	Indian Breadroot			*	*	Rocky woods and prairies, dry banks. On calcareous soils	
Pyrola asarifolia	Common Pink Wintergreen			*		Wet soils of bogs, stream courses, mostly in shady areas and especially in coniferous woodlands	
Ranunculus cymbalaria	Seaside Crowfoot, Buttercup		*			Wet meadows, sandy or muddy shores, marshes, ditches, often in alkaline places	
Ranunculus glaberrimus	Shining Leaved Buttercup			*	*	Sandy or loamy well drained soils, open areas, sagebrush, meadows, grasslands to rocky soil in conifer forests	Low potential for erosion control
Ranunculus gmelinii	Yellow Water Crowfoot		*	*		Wet meadows, shallow water or drying mud, swamps, marshes, ponds, shores of rivers	
Ranunculus macounii	Macoun's Buttercup		*	*		Heavy, wet clay soils also found in sand or gravel when moisture is adequate. Streams, swamps,	Colonizes disturbed areas. It can dominate disturbed riparian areas,

						ponds, seepage areas	
Ranunculus pedatifidus var *affinis*	Northern Buttercup			*	*	Slopes, ridges, dry, or moderately well drained areas, moist meadows	
Ranunculus sceleratus	Cursed Crowfoot		*	*		In and by slow streams, ditches and shallow ponds of mineral rich water and muddy bottoms, avoiding acid soils	
Ratibida columnifera	Prairie Cone-Flower				*	Well-drained, neutral to slightly alkaline soil sandy loam, loam, and clayey loam soils Thin, rocky, gravelly and sandy soils, roadsides	
Rumex maritimus	Golden Dock			*		Bare muddy ground by lakes, reservoir margins, dried up ponds, damp grassy places (occasionally). Deep fertile moderately heavy soil, humus-rich, moisture-retentive, well-drained	
Rumex occidentalis	Western Dock			*		Moist and swampy areas, summer-drying meadows	
Rumex triangulivalvis	Narrow-Leaved Dock		*	*		Streamsides, river banks rich soils, cultivated fields and disturbed areas	
Rumex venosus	Wild Begonia				*	Dry sandy soils, dunes, roadsides	
Sagittaria latifolia	Broadleaf Arrowhead		*			Muddy shallow water	
Senecio canus	Prairie Groundsel, Wooly Groundsel				*	Arid, open and often rocky or sandy places	
Sisyrinchium montanum	Blue Eyed Grass			*		Widespread, moist places, open meadows, lowlands	
Sisyrinchium sarmentosum	White Blue-Eyed Grass				*	Meadows and small openings which fill with snow and water in winter and spring	Occasional invader
Sium suave	Water Parsnip		*			Meadows, wet thickets, muddy banks	
Smilacina racemosa	False Solomon's Seal			*	*	Rich moist woods	
Smilacina stellata	Star-Flowered Solomon's Seal			*		Moist open or sandy locations, thickets and open forests on gently sloping benches adjacent to streams	
Solidago canadensis	Canada Goldenrod				*	Roadsides and fence lines, in dry open fields, and in open woods or damp meadows that dry out every year, avoiding acid soils	

Solidago missouriensis	Missouri Goldenrod, Low Goldenrod			*	*	Clearings, thickets dry, open places on the slopes of valleys, on plains, gravels and rocky slopes	Useful for revegetation of disturbed areas
Solidago mollis	Velvety Goldenrod				*	Dry or drying prairies, open woods, frequently found along fence rows	
Solidago rigida	Stiff Goldenrod				*	Dry or gravelly open woods, thickets and prairies. Medium to coarse soils	
Solidago spathulata	Rocky Mountain Goldenrod				*	Gravelly open ground, grasslands	
Sphaeralcea coccinea	Scarlet Mallow, Scarlet Globemallow				*	Dry grassland prairies, roadsides	Invades disturbed areas
Stachys palustris	Marsh Hedge Nettle, Hedge Nettle			*		By streams and ditches, also in swamps and fens. Occasionally found on arable land	
Thalictrum dasycarpum	Tall Meadow Rue		*	*		Low moist ground, ravines, streambanks, thickets, roadsides, meadows, streambank	
Thalictrum venulosum	Veiny Meadow Rue (Western Meadow Rue)			*		Woody or bushy thickets, dry grassy meadows, dark Chernozemic soils	
Thermopsis rhombifolia	Golden Bean				*	Dry soil, dry sandy grasslands, roadsides	
Triglochin palustris	Slender Arrow-Grass		*	*		Marshes, usually amongst tall grass, shores, bogs	
Urtica dioica	Stinging Nettle		*	*		Moist sites along streams, coulees, and ditches, in woodland clearings, and in disturbed areas	May be tolerant of heavy metals
Vicia americana/sparsifolia	Wild Vetch, American Vetch			*	*	Dry areas, swampy woods and borders, mixed forests, and clearings. Sandy, clayey, medium-textured soils	Useful for revegetating roadsides and in critical-site stabilization and beautification
Viola adunca	Early Blue Violet			*	*	Damp banks and edges of meadows in most forest communities	
Viola canadensis	Western Canada Violet			*		Low, moist shady woods and meadows	
Viola nuttallii	Yellow Prairie Violet				*	Sandy, arid prairies, grasslands, among sagebrush	
Zigadenus elegans	White Camas, Death Camas, Mountain Deathcamas			*	*	Crevices and ledges of north-facing dolomite banks, meadows, stream banks and woods in moist soil	Extremely toxic plant to humans and animals if injested. Toxicity can vary in a plant according to season, parts, stage of growth. Can absorb toxic substances, (herbicides,

							pesticides, pollutants) from the water, air, and soil
Zizia aptera	Heart-Leaved Alexanders, Meadow Parsnip			*		Moist to dry prairies, limestone, mesic river shores, and fields showing low to intermediate levels of disturbance.	

APPENDIX H

Restricted and Noxious Weeds in Strathcona County*

Common Name	Botanical Name	Description
Canada thistle (Creeping thistle, field thistle)	*Cirsium arvense*	A creeping perennial with flowers that can be pink, purple or white. Leaves are alternate and vary in size and shape depending on the plant. Most often they have spiny, toothed margins and stems can be over a metre in height.
Field Scabious (Blue buttons, knautia)	*Knautia arvensis*	A pale purple to blue flowers in dense heads composed of numerous, tube-shaped florets. Stems can grow up to 1.3 metres tall and are sparsely branched. Very often the entire plant (including the flower buds) is covered in short, stiff hairs. The leaves are opposite and deeply divided into 5-15 narrow segments.
Leafy Spurge (Wolf's milk, leafy euphorbia)	*Euphorbia esula*	A creeping perennial with clusters of cup-like flowers are greenish yellow in colour and are found at the end of the stems and branches. Leaves are alternate to spirally arranged, hairless and attach directly to the stem. Seedlings and mature plants both contain a milky juice that can cause skin irritation.
Ox-eye daisy (White daisy, field daisy)	*Chrysanthemum leucanthemum*	The flowers are white with yellow disc florets in the center. Flowers are 2-6 cm in diameter and found at the end of the stems. All parts of the plants have a strong, unpleasant odour and stems can grow as tall as 1 m. Stems are usually unbranched, hairless, and leaves have wavy to lobed margins and are not fernlike like scentless chamomile. The base of the leaves clasp the stem and the leaf size and width are reduced as you travel up the stem.
Perennial Sow Thistle (Creeping sow thistle, field milk thistle)	*Sonchus arvensis*	The deep yellow flowers are similar to dandelion and usually 2.5 - 5 cm across. Below the flower heads, the stem will have yellow hairs. Stems can grow up to 1.5 m and leaves are found mainly at the base.
Scentless Camomile (False chamomile, scentless mayweed)	*Matricaria perforata Merat*	It has white, daisy like flowers 2-3 cm in diameter that are solitary on the ends of the stems. The leaves are alternate, very finely divided and fern-like. Stems can grow from 15 cm to over 1 m tall and have numerous branches.
Tall Buttercup (Meadow buttercup, tall crow-foot)	*Ranunculus acris*	The bright yellow flowers are waxy, with 5 petals and are approximately 2.5 cm in diameter. Stems can grow to a height of 1 m.

Common Name	Botanical Name	Description
CommonTansy (Golden buttons, Parsley fern)	*Tanacetum vulgare*	Tansy flowers look like small yellow buttons grouped together in flat-topped clusters. There can be 20 - 200 flower heads per plant. The leaves are deeply divided into toothed segments that are dotted with small glands. It is an aromatic plant with somewhat woody stems forming dense patches. Clumps of tansy can grow as tall as 1.5 - 2 metres.
Toadflax (Yellow toadflax Butter-and-eggs, wild snapdragon)	*Linaria vulgaris Hill*	It has yellow flowers that resemble snapdragons. Stems can grow up to 1 metre tall and are rarely branched. Leaves are alternate to spirally arranged, narrow and hairless with smooth margins.
White Cockle (White campion, evening lychnis)	*Silene alba (Mill)*	Flowers are white, showy and fragrant and open in late afternoon or evening and close in the morning. The flowers have 5 notched petals with an obvious tubed calyx with 10 - 20 prominent veins that surrounds the flower. The plant is hairy, including both sides of the leaves, the calyx, and stems and plant height can be up to 1 metre.
Cleavers	*Galium aparine and Galium spurium*	Cleavers are annuals or winter annuals with very weak four-sided stems covered with prickly hairs. The plant can grow up to two metres in length. Leaves: whorls of six to eight narrow leaflets covered with prickle-like hairs. Flowers: tiny, greenish-white flowers are very inconspicuous
Purple Loosestrife** (Lythrum salicaria)	*Lythrum salicaria*	An herbaceous wetland perennial that reproduces and spreads mainly by seeds, but will also spread by pieces of stem or root. It has pink-purple flowers attached to the stem in a dense spike. The plant is tall (1-2 metres) with usually square stems. The leaves are smooth, tongue-like and are attached to the stem in an opposite to a spiral arrangement.

* For a complete list of controlled weeds in Alberta refer to the Weed Control Act – Weed Regulation Schedule 1

** Purple Loosestrife in addition to being a noxious weed is restricted in Alberta meaning efforts have been made to eradicate it from the province.

APPENDIX I

STORM SEWER MANHOLE INSPECTIONS

STRATHCONA COUNTY, ENVIRONMENTAL OPERATIOINS
WATER & WASTEWATER SERVICES

Manhole inspections and data acquisition for the storm sewer system will address two significant issues. First and foremost it will address the requirements of the proposed Infrastructure Management System. In other words, what do we have, where is it and what condition is it in. The information gathered will allow the completion of an IMS database, which will be used, in conjunction with the CCTV inspections that have and will be conducted, to plan future maintenance and rehabilitation projects. Secondly it will allow us to complete the mapping for the storm sewer system.

To address the IMS requirements we need to know the following;

1. What do we have?
   - Type of Structure
   - Material of Construction
   - Type of Cover
   - Flow Control or No Flow Control Structures
   - Depths and Sizes
   - Direction of Flow

2. Where is it?
   - Sub-basin
   - Street or Road Priority
   - Location Specifics
   - Public or Private

3. What condition is it in?
   - Structural Condition
   - Service Condition

The inspection report form is used to record the specifics of the inspections as well as a place to make remarks or recommendations. The information from these forms will be entered into the IMS database. To ensure the validity of the information, it is imperative that every effort be made to complete the requirements of the project. To assist in this process the following pages have been provided as a guide for collecting the required information.

MANHOLE INSPECTION REPORT FORMS

Most information that will be reported on the inspection form is self-explanatory and will be discussed at the project orientation. As the project progresses the following pages will provide a reminder of these discussions. They will also provide specific instructions on how some of the data is to be collected. Please be sure the information you are entering can be read. Print if required.

Header Information

Road Priority

This information is available on the maps. Road priorities are highlighted as follows:

Priority 1 – in Pink
Priority 2 – in Blue
Priority 3 – in Green

If the structure being inspected is located on or within that roadway, record the appropriate priority number in the space available. By default, any roadway or location not so highlighted becomes a Priority 4 and should be recorded as such.

Condition Rating

This rating, 1 thru 5, will provide a quick indicator of the overall condition of the structure being inspected. The rating and a brief description are as follows:

1 – New or next to new, in good shape, no rehabilitation required
2 – Good condition with little to minimal rehabilitation required
3 – Fair condition. Minor cracking, mortar missing at joints, some mineral buildup, sump or channel in acceptable condition. Minor rehabilitation work required.
4 – Poor condition. Cracking and fractures, mortar missing at joints, leaking joints, mineral buildup, sump or channel in poor condition, evidence on voids or susidence starting to form, cracked frames. Rehabilitation work required.
5 – Unacceptable condition. Major cracks and fractures, broken pipe, leaking joints, no sump bottoms or channels, voids and surface subsidence, broken frames, roadway or sidewalk damage. Major rehabilitation or replacement required.

Asset ID#

This number will be allocated at a later time. Please leave this space empty.

Relative Location

If appropriate, the street name or address (if available) should be recorded here. If not located on a street, enter a brief description of the location (i.e. rear of 241 Village Drive, corner

of Birch and Conifer, underwater in Village on the Lake, in drainage channel west of Village Drive).

Inspection Date

Enter the date of the inspection.

Sub Basin

Enter the letter of the Sub Basin as shown on the map in which the structure is located. Be sure which side of the boundary the structure you are inspecting is on before recording the Sub Basin identification. (FYI - A Sub Basin contains all infrastructure that pertains to a drainage area or stormwater lake – in other words, all flows in the Sub Basin end up at the same place)

Manhole/CBMH/CB No.

Enter the identification number of the structure you are inspecting. The format to be used is Sub Basin…MH#…and CB# if applicable (i.e. A57 for manhole or CBMH #57 in Sub Basin A, … A57b for CB#b that is attached to manhole A57). This information is available off the map. If for some reason, there is no identification number, leave this space blank and indicate in the space for remarks at the bottom of the page that the structure is not identified or noted on the map. Make a drawing on the back of the page to indicate the relative location to known structures. If for some reason the structure does not appear to be where it is supposed to be, do not assume that it does not exist. There is a possibility that it is buried. Every effort, including a quick minicam job should be done to verify its location or its non-existence. This information is critical to the IMS system.

Inspector

Enter the name of the person responsible for conducting the inspection. One name only is required in this space.

Report Information

Ownership

Indicate if the structure being inspected is privately owned or publicly owned. Most of the inspections being conducted will be on public property. We may at sometime in the future be requested to provide inspections for privately owned systems (i.e. those located on condo or commercial sites).

Location

Indicate the location of the structure being inspected using the appropriate checkbox.

Manhole Cover & Frame and Type

Indicate the condition of the cover and frame being inspected using the appropriate checkbox. In the space provided, indicate the type of cover & frame that is being inspected. The

reference materials include drawings for the most commonly used covers & frames along with their identification (i.e. F39 Grate, F39, F36, F35a, F38, K2).

Grade Rings

Indicate the condition of the grade rings in the structure being inspected using the appropriate checkbox.

Manhole Material

Indicate the material used in the construction of the structure being inspected using the appropriate checkbox.

Type of Manhole

Indicate the type of structure being inspected using the appropriate checkbox. The following provides a brief description of each structure:

- A manhole (MH) typically is situated on the mainline, has no sump and may or may not have ladder rungs.
- A catch basin manhole (CBMH) is a manhole that has a sump, is typically located on the mainline and may or may not have ladder rungs.
- A catch basin (CB) has a sump and is connected to a manhole of CBMH by a catch basin lead. It is typically smaller in diameter than a MH or CBMH.
- A Catch Inlet is a structure that is located directly on the main or a lead, has no sump and no ladder rungs for entry.
- Inlet or Outlet structures are typically located at surface level to allow water to drain into the storm system or out of the system. It may, at times serve both purposes (i.e. and inlet/outlet structure located at a dry pond). This structure is typically a flared end concrete structure at ground level. May also be under water in a stormwater lake and therefore would not be able to be inspected.

Flow Control Structures

Indicate if the structure being inspected contains a flow control device by checking the appropriate box. If no flow control device is present, check N/A (not applicable). The flow control device is designed to limit the amount of flow entering the storm system through that particular structure. Typically located on structures adjacent to commercial properties. Good examples of these structures exist in the storm structures at Millenium Place.

Rungs

Indicate the condition of the ladder rungs by using the appropriate checkbox. If there are rungs broken or missing, indicate how many. If no rungs are provided, check N/A (not applicable – this would typically be used for CB's or catch inlets)

Cone

Indicate if the cone is eccentric or concentric, it's condition or if there is no cone, check N/A (not applicable).

Barrel and Bench

Indicate their condition by using the appropriate checkbox.

Channel

Indicate the condition of the channel by using the appropriate checkbox. It there is a sump, use that checkbox, measure the depth of the sump and enter the depth in the appropriate space. The depth of the sump will be measured from the bottom of the structure to the water level (if no water in CB then depth of sump would be the invert level of the lead leaving the CB).

Meaurements

Drawings have been provided as a quick reminder for the measurement requirements. This information is critical in confirming, adding to or correcting the existing infrastructure data. It has happened in the past, that the information we have has proven to be incorrect or missing. To ensure the information in the IMS database is viable, as the old saying goes, measure twice if you are not sure. Most of the measurements that need to be taken will require and entry into the structure itself. Follow the procedures outlined for Confined Space Entry.

Depth of MH, CBMH or CB

Depth is measured from the bottom of the structure (invert of channel or bottom of sump) to the rim of the frame and cover. Record this measurement in the appropriate space.

Diameter of MH, CBMH or CB

Measure the diameter of the structure being inspected and record on the appropriate line.

Upstream Pipe and Downstream Pipe

When inspecting a MH or CBMH on the mainline, four pieces of information are required to be entered onto the report form.

1) Line identification can be obtained from the map. The identification of the line consists of the Sub-basin, the upstream MH# and the downstream MH# and is always recorded in that order, with the flow. (i.e. you are in Sub-basin C, the upstream MH# is 62… the structure being inspected is MH# 63…therefore the identification of the Upstream Pipe No. is C62C63. Same goes for the Downstream Pipe No…. the downstream MH# is 64…therefore it would be identified as C63C64). FYI – the identification of the main line and associated information is critical as it must match up with CCTV inspections that have or will be conducted. It will be used to confirm pipe material and sizes to start with.
2) Measure the diameter of the pipe coming into the manhole and also leaving the manhole. Be sure to measure the diameter of the barrel of the pipe, not the bell opening.
3) Record the type of material that is used in the construction of the pipe entering the manhole and also leaving the manhole. If you can see a different pipe material used when looking into the line, note this in the remarks column (i.e. concrete changes to PVC down the pipe).

4) Measure the distance from the rim of the frame and cover to the invert of the pipe entering the manhole and also the pipe leaving the manhole. Make every attempt to be as accurate as possible by using a level to be sure your measuring equipment is perpendicular to the surface.

CB Leads

When CB's are present, either singly or in multiples, each one has been identified. When inspecting the MH or CBMH they are connected to, five pieces of information with regards to the CB lead can be entered onto the report form.

1) Lead identification can be obtained from the map. The identification of the lead consists of the CB# and the MH# and is always recorded in that order (with the flow). (i.e. you are at CB# A57a and the lead goes to A57… the CB Leads No. would be A57aA57. Same goes for multiple leads. You are at A57a and it connects to A57b then (with the flow) the CB Lead No. would be A57bA57a). FYI – the identification of the CB Lead and it's associated information is critical as it must match up with the CCTV inspections that have or will be conducted. It will be used to confirm pipe sizes, materials and lead lengths to start with.
2) Measure the diameter of the CB lead coming into the manhole. Be sure to measure the diameter of the pipe and not the bell of the pipe.
3) Record the type of material that is used in the construction of the CB lead where it enters or leaves the structure. If you can see a different type of material used along the lead length, record this information in the remarks (i.e. concrete changes to PVC down the pipe).
4) For the length of the CB lead, measurements can be taken along the surface. Measure from the center of the CB to the center of the MH or CBMH. Record this information in the appropriate space for that particular CB lead. The report form has space for up to six CB leads for any particular MH or CBMH.
5) Measure the distance from the rim of the frame and cover to the invert of the pipe entering the manhole. Make every attempt to be as accurate as possible by using a level to be sure your measuring equipment is perpendicular to the surface.

In addition, there is a small circle on the report form. This circle represents the structure you are inspecting. Facing North, indicate on the drawing the positioning of the lines entering and leaving the structure. If the structure is a MH, CBMH or catch inlet (if appropriate), place an arrow in the center of the circle that indicates the direction of flow corresponding to the mainline. For CB's, a direction of flow arrow will only be required in those circumstances when two or more CB's are connected together before going to a MH or CBMH.

ADDENDUM

Storm Sewer Manhole Inspections

Important issues to remember:

1 – all measurements for pipe length, invert depth and depth of sump are measured in meters.

2 – all measurements for pipe diameter and manhole diameter are measured in millimeters to the nominal pipe size.

3 – Nominal pipe sizes for both pipe diameters and manhole diameters(metric from corresponding inches).

2”	-	50 mm
3”	-	75 mm
4”	-	100 mm
6”	-	150 mm
8”	-	200 mm
10”	-	250 mm
12”	-	300 mm
14”	-	350 mm
16”	-	400 mm
18”	-	450 mm
20”	-	525 mm
24”	-	600 mm
27”	-	675 mm
30”	-	750 mm
36”	-	900 mm
41”	-	1050 mm
48”	-	1200 mm

4 – When identifying both mainlines and lead, be sure to use the full identification…… A263bA263a (for a lead for example).

5 – Be sure to identify all components in the circle drawing on the report form.

6 – Condition rating is for “structural condition”. If there is a service condition such as a sump full of debris or a line that is plugged, please request the flusher crews to clean them.

7 – Use the notation “u” for those criteria in which the answer is “unobtainable”.

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