

# Threats Factsheet - LIVESTOCK



## OVERVIEW

Now is a great time to start managing your operation so that it does not pose a threat to drinking water sources. The drinking water source that landowners are most likely to impact by their actions is their own. This fact alone should be an encouragement to implement best management practices. Drinking Water Source Protection has been studying local municipal drinking water systems in order to learn where the water that contributes to these systems comes from. The activities that take place in some contributing areas can have an impact on the groundwater or surface water quality.

This factsheet outlines the different threats that might pertain to livestock farmers. It also provides examples of measures that may help manage these threats. Other threats will be covered in other landowner factsheets in this series. If you are in a vulnerable area and there are significant threats on your property, based on the Assessment Report, you will be contacted by the local Drinking Water Source Protection office. Policies will be developed for all significant threats. Information on the threats list and the Assessment Report can be found in “Threats Factsheet - General” and on [www.waterprotection.ca](http://www.waterprotection.ca).

The material in this factsheet is a summary of legislation. The reader should refer to the complete *Clean Water Act* and associated regulations for full details. Please note that other legislation outside of the work of the *Clean Water Act* may apply to your property. It is suggested that you consult with other regulatory agencies relevant to your operation.

## WHAT ARE THREATS?

A threat is an activity that has a harmful effect, or the potential to have a harmful effect, on the quality or quantity of drinking water sources. The Ministry of the Environment for the Province of Ontario created a list of 21 threats, two of which are quantity threats and the rest are quality threats.

## THE THREATS COVERED IN THIS FACTSHEET

The following Quality Threats will be covered in this factsheet with details from the Threats Tables, Provincial Risk Management Measures Catalogue (RMMC) suggestions and best management practices:

3. The application of agricultural source material to land.
4. The storage of agricultural source material.
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.

The complete Provincial Table of Drinking Water Threats (Threats Tables) can be found on the Ministry of the Environment website at: <http://www.ene.gov.on.ca/en/water/cleanwater/cwa-technical-rules.php>

More detailed information on managed lands, livestock density and threats can be found in Chapter 4 of the Assessment Report for your Source Protection Area. To see specific maps for the drinking water system closest to your property use this link: <http://www.waterprotection.ca/par/par.htm>. Select your watershed, then choose the maps for the municipality where the property lies and the municipal wells that are nearby.

**THREAT 3. The application of agricultural source material to land.**

Agricultural source materials can include manure, bedding, washwater, yard runoff, and similar organic products that contain nutrients (see O.Reg. 267/03 s. 1(1) under the *Nutrient Management Act*). These are useful and valuable resources, but they can become contaminants if applied in excess of what the crop can use or in a way that allows it to saturate the soil profile and leach into the groundwater or to run off into surface water. “Solid manure should be spread when the soil is dry and completely thawed. In ideal situations, tilling should follow within 24 hours.” (Source: “Best Management Practices: A First Look - Effective Manure Application”, Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA))

“Managed land is land to which nutrients, such as agricultural source material, fertilizer and non-agricultural source material, are applied. It includes, but is not limited to, cropland, fallow land, improved pasture, golf courses, sports fields, and lawns. Managed lands have two subsets:

- agricultural managed land
  - areas of cropland, fallow and improved pasture that may receive nutrients
- non-agricultural managed land
  - golf courses, sports fields, lawns, and other built-up areas that may receive nutrients (primarily commercial fertilizer)”

(Source - “Technical Bulletin: Managed Lands and Livestock Density”, Ministry of the Environment)

The following is a summary of the chemical threats that are significant for vulnerable areas:

- Column 1 - the agricultural source material is applied to land located in a vulnerable area and the managed land map shows a managed land percentage for the applicable area
- Column 2 - the livestock density map shows a livestock density for the applicable area that is sufficient for annual application of agricultural source materials at a certain rate
- Column 3 - under the circumstances from Column 1 and 2 if the application may result in a product listed in this column, it is a significant threat

**Table 1: Managed Lands and Livestock Density Circumstances**

<b>Column 1 -Managed land %</b>	<b>Column 2 -Livestock Density for area that it is sufficient to annually apply ASMs at rate of:</b>	<b>Column 3 -Application may result in presence of this element in groundwater or surface water</b>
Less than 40%	More than 1.0 NU/acre	Nitrogen or Phosphorus
At least 40% not more than 80%	At least 0.5 but not more than 1.0 NU/acre	Nitrogen or Phosphorus
	More than 1.0 NU/acre	Nitrogen or Phosphorus
More than 80%	Less than 0.5 NU/acre	Nitrogen or Phosphorus
	At least 0.5 but not more than 1.0 NU/acre	Nitrogen or Phosphorus
	More than 1.0 NU/acre	Nitrogen or Phosphorus

The application of agricultural source material can also be a pathogen threat, whereby agricultural source material is applied to land in any quantity and the application may result in the presence of one or more pathogens in groundwater or surface water.

By managing your nutrient units so that they are being applied at a rate and placement that is beneficial for your managed land, you can make use of agricultural source material while protecting groundwater and surface water.

Having the manure tested for its nutrient content is a great way to learn more about its composition and the benefits that it will add to your crop. Soil testing should be partnered with manure testing to allow you to make the best management decisions for each individual field. Commercial fertilizer can be expensive; nutrients from manure can give your crops what they need to yield a good return.

There should be a 16 metre buffer for liquid manure and 9 metre buffer for solid manure between the area of application and any surface water bodies. (Source: “Infosheet 17 Manure Use and Management”, OMAFRA)

Manure application should be planned for optimal growth periods for the area where it is applied. If you are going to be spreading agricultural source material on land, it is important to make sure your tile drainage system (if applicable) is working properly. The application may result in increased nutrient loads leaving tile drains. Applying large volumes of liquid agricultural source material can result in the nutrients finding paths to the groundwater or getting into the field tile and finding its way to outlet into surface water. Working up the soil, applying to dry soils and applying at low rates are good ways to avoid contaminating water supplies. Rain can influence the movement of nutrients, so manure should be applied while keeping in mind that soil texture and slope can affect movement in the field. Manure should not be applied to snow-covered or frozen ground. Frozen soil cannot receive or contain the nutrients. Manure can easily run off with snowmelt into nearby surface water sources because there is not an actively growing crop to take advantage of the nutrients. If applied nutrients run off into surface water, they will not be available for your spring crops and may pose an environmental risk.

The following excerpt and tables are taken from a Nutrient Management Guide available to Ontario landowners and is associated with NMAN software.

### **Importance of Calibrating Spreaders**

Knowing the desired application rate is meaningless if the equipment is not set up to apply at the desired rate. Table 2 below distinguishes between the densities of different types of manure. Calibrating manure application equipment is essential. Several methods can be used to measure spreading rates. Weighing a load of manure and measuring the areas which the load covers is one method of estimating rate. Solid manure can be weighed by placing plastic sheets on the ground or liquid manure by using straight-walled pails for measuring depth of application. Overlap should also be considered, especially in irrigation systems. Drive over the sampling area, then weigh or measure the manure collected in that area. Refer to Table 3 on the next page, which gives an estimate of application.

**Table 2: Densities of Different Types of Manure**

<b>Manure Type</b>	<b>Weight per Cubic Foot</b>	<b>Weight per bushel</b>
Liquid	62.4 lbs	80 lbs
Semi-solid	60 lbs	76 lbs
Thick solid	50 lbs	64 lbs
Light solid	35 lbs	45 lbs

**Table 3: Measuring How Much Manure Was Applied**

Solid Manure Calibration using a 40" x 48" sheet (plastic garbage bag or feedbag)		Liquid Manure Calibration using a straight walled pail	
Pounds of Manure (per sheet)	Application Rate (tons/acre)	Depth of Manure (inches in pail)	Application Rate (gallons/acre)
1	1.6	1/10	2,265
2	3.2	1/8	2,825
3	4.8	1/4	5,650
4	6.4	3/8	8,500
5	8.0	1/2	11,325
7	11.2	5/8	14,150
10	16.0	3/4	17,000
15	24.0	1	22,650

Keeping records of your manure sample tests, soil tests, field applications, and quantities is valuable for tracking your nutrient use as a best management practice. Having a nutrient management plan is a positive best management practice that will allow you to evaluate and manage your agricultural source material.

Tile drains and their outlets should be observed on a regular basis. Flow from tile outlets will be affected by weather, as well as the rate of manure application, soil type, soil conditions, and type of manure being applied. Tiles should be checked prior to application to observe any baseline flow (ideally none). Check again 20-30 minutes after application. If the rate of application is greater than 20,000 gal/hr, the tiles should be checked every hour. If the rate is less than that, they should be checked every time the total volume applied equals 20,000 gallons. It is also important to check tile flow and colour after the first rainfall following application. Written records on all applications and visual observations during this period should be kept as part of due diligence measures.

Runoff may have solid and liquid components. Urine, wash water and contaminated water typically make up the liquid portion, while the solid portion consists of manure, bedding, feed and soil.

**Table 4. Constituents Contained in Runoff**

Nutrients	Micro-organisms	Compounds
Nitrates <sup>1</sup>	bacteria <sup>3</sup> , e.g., <i>E. coli</i>	organic
Phosphorus <sup>2</sup>	parasites	inorganic
Potassium	viruses	

Notes on Table 4:

- 1 Although the long-term effects of nitrates on human health are not known, it is not a good practice to drink water containing nitrates. The recommended maximum acceptable concentration of nitrate as stipulated by Ontario Drinking Water Standards is 10 mg/L.
- 2 Phosphorus increases algae growth in surface water. When the algae dies and decays in surface water, it uses up oxygen, resulting in potential fish kills.
- 3 Pathogenic bacteria such as *E. coli* can cause disease in humans and livestock when they get into drinking water supplies.

Source: Agdex#: 720/400 Publication Date: 01/2010 Order#: 10-005 Last Reviewed: 01/2010 History: Replaces OMAFRA Factsheet Handling Runoff From Outside Livestock Areas and Solid Manure Storages, Order No. 05-027

Written by: R.P. Stone - Engineer/OMAFRA

## **THREAT 4. The storage of agricultural source material.**

This threat is associated with both chemical and pathogen threats for vulnerable areas.

The storage of agricultural source material may be a significant drinking water threat if:

- your property is in a vulnerable area,
- you are storing agricultural source material in a permanent nutrient storage facility or on a temporary field nutrient storage site,
- you have sufficient weight or volume of manure stored annually on a farm unit to sufficiently apply at a rate of more than 0.5 nutrient units per acre of the farm units, and
- a spill of the material may result in the presence of nitrogen or phosphorus in groundwater or surface water

Best management practices to manage this threat include ensuring that all eavestroughs or sources of runoff are diverted away from storage areas. Covered storage is ideal so that rainfall and other precipitation does not increase the total quantity of material and the storage capacity can be maximized. Berms that keep clean water away from storage areas can be a low cost, effective means to maximize storage while avoiding any mixing of clean water and manure. Any tile drains that are located near buildings to remove or divert water away need to be solid and not perforated tile; otherwise, a shut off valve or treatment system would need to be installed for this water. Space should be allocated for 200 - 240 days of storage. Storage should contain the material and any runoff or have a system in place to manage the runoff from the storage area. Runoff control may include a vegetated filtration strip or other engineer-specified treatment facility, a cover to eliminate runoff, a storage facility, or a flow path in some situations.

If a spill from your storage facility could result in the presence of one or more pathogens in groundwater or surface water and you are in a vulnerable area, this is a circumstance that would be a significant threat. Manure contains pathogens. Ensure that your storage is able to contain all agricultural source material to avoid any spills to groundwater or surface water.

On January 1, 2011, a number of items will be changed in the Nutrient Management Act, so it is important that you consult the most current version of the regulation before undertaking any changes or constructing a new storage facility.

The following are some measures that have been included in the Risk Management Measures Catalogue (RMMC) to manage this threat:

### **Establish buffer zone**

A buffer zone is established to ensure the location of storage facilities are a minimum distance away from a water body or watercourse, and the tank is not located over any existing piping or drainage system. This is to prevent the contamination of surface water and groundwater as a result of leaks, spills, and/or runoff.

### **Manure storage barrier ratings - Temporary field storage; Clean Water Diversion; Covers**

Temporary field storage with one barrier. Store manure according to *Nutrient Management Act* regulations on soils with limited permeability, at regulated setback distances with practices put in place to eliminate or reduce contaminated runoff (clean water diversion, covers), away from tile drainage, with infrequent use of the same site.



## Washwater management - Washwater storage and handling and washwater treatment

- Adequately sized secure containment with associated BMPs (reuse, minimize washwater, cleanup prior to washing, chemical adjustment etc.) - can be separate or with liquid manure storage system and washwater treatment
- Vegetated Filter Strips (VFS) with a pre-treatment sediment tank, properly sized and designed; vegetation harvested
- Chemical agents used in conjunction with VFS (potentially higher efficiencies during non-growing season)
- Treatment trench (as surface water barrier, groundwater barrier)

## THREAT 21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.

This threat is associated with both chemical and pathogen threats for vulnerable areas.

Review the tables below by reading Column A for your land use, Column B for the nutrient units generated, and Column C for the contaminant. If these circumstances apply to your operation, then you have a significant threat.

**Table 5. Grazing**

Column A - Land Use	Column B - The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate of:	Column C - Land use may result in the presence of this element below entering groundwater or surface water
Grazing or pasturing land	At least 0.5 and not more than 1NU/acre	Nitrogen or Phosphorus (total)
	More than 1 NU/acre	

**Table 6. Outdoor Confinement**

Column A- Land Use	Column B -The number of animals confined in the area at any time is sufficient to generate agricultural source material at a rate of:	Column C -Land use may result in the presence of this element below entering groundwater or surface water
Outdoor confinement	120-300 NU/Ha of the area annually	Nitrogen or Phosphorus(total)
	More than 300 NU/Ha of the area annually	

There are many measures that can be employed to protect groundwater and surface water from nitrogen and phosphorus. Many can be found in OMAFRA – BMP publications, the RMMC and other resources. Wherever possible and applicable, fencing of livestock out of watercourses and having a fenced off riparian buffer (trees, shrubs and native plant species) on stream banks will aid in protecting surface water and groundwater. Alternative watering systems for pastured cattle that keep them out of watercourses is beneficial to the watercourse and the health of livestock.

The following are some measures selected from the RMMC for grazing and confinement style operations to mitigate risks to groundwater and surface water.

## **Improve the design and maintenance of on-farm subsurface tile drainage systems**

Well-designed and properly maintained subsurface tile drainage systems can have substantial environmental benefits, such as:

- Better water quality as water from surface runoff may contain higher concentrations of soil bound fertilizers or pesticides
- Plants in well drained soils have better nutrient uptake thus reducing the amount of nutrients leaching into the ground
- Minimize the percolation of nutrient and pesticides contaminated water to groundwater.

Enhancing the use of subsurface tile drainage within source water protection areas (especially at wellhead protection zones A and B) can minimize surface drainage impacts.

## **Manure production management barrier ratings - Management of housing and bedding**

Management of housing and bedding with 5 barriers:

- Slatted floors
- All-in/all-out systems and liquid feeders
- Total barn confinement system vs outdoor confinement area
- Bedding type (straw, sand, sawdust, etc.) and amount
- Separation of calf manure from main manure storage and application to a low risk area or composting prior to application

## **Manure and runoff treatment barrier ratings - Runoff management - Collection and treatment**

Runoff management - collection and treatment with 4 barriers:

- Collection and treatment with manure system (pathogen treatment rating will be same as manure treatment rating)
- Collection and treatment through Vegetated Filter Strip System with appropriate setbacks and management including harvesting
- Collection and treatment through constructed wetlands with appropriate setbacks and management
- Collection and treatment through Permanently Vegetated Areas (flow path) with appropriate setbacks and management

## **Livestock yards and livestock transfer sites, and outdoor confinement areas**

Confinement area and runoff, manure and yard snow management with 8 barriers:

- Paved yard plus roof and clean water diversion and bedding (no runoff) plus frequent scraping of manure and prevention of yard snow if possible
- Paved yard plus clean water diversion and bedding to minimize runoff plus secure containment of runoff plus frequent scraping of manure and minimizing yard snow
- Paved yard plus clean water diversion and bedding to minimize runoff plus frequent scraping of manure and minimizing yard snow (to manure storage) plus runoff collection and treatment through an engineered vegetated filter strip with pre-treatment

- Paved yard plus clean water diversion and bedding to minimize runoff plus frequent scraping of manure and minimizing yard snow plus runoff collection and treatment through an engineered constructed wetland
- Paved yard plus clean water diversion and bedding to minimize runoff plus frequent scraping of manure plus runoff collection and treatment through a permanently vegetated area (if allowed under regulations)
- Permanent outdoor confinement area on unpaved surface but with roofed, paved high traffic areas (e.g. feeding) plus absence of tile drainage systems or secure containment of tile water along with surface runoff plus frequent scraping of manure and yard snow
- Permanent outdoor confinement area on unpaved surface but frequently rotating high traffic areas (e.g. feeding) plus absence of tile drainage systems or secure containment of tile water along with surface runoff plus frequent scraping of manure and yard snow
- Permanent outdoor confinement areas not in use during the non-growing season at times of high hydrologic risk

Additional images that show examples of these types of systems can be found at:

[http://www.omafra.gov.on.ca/english/landuse/mds\\_p8.htm](http://www.omafra.gov.on.ca/english/landuse/mds_p8.htm)

### **Enhancing on-farm denitrification for nitrate-N**

Nitrate-N is a major concern for both groundwater and surface water sources. Farm drainage is the main source of nitrate-N. Enhancing on-farm denitrification can help to alleviate this problem. This can be achieved by:

- Implementing wetland restoration areas, denitrifying ponds, or a managed riparian zone where drainage water could be treated to remove excess nitrate-N before discharge into drainage ditches or streams
- Constructing control structures to manage soil, water and water table level. This can help to have a water table close to the ground surface during the non-cropping season, which helps to develop an anaerobic condition for denitrification
- Using alternative cropping systems that contain perennial crops to reduce nitrate-N losses
- Applying the correct rate of N at the right time
- Improving the management of animal manure
- Denitrification should be implemented on farms that have properly designed and managed drainage systems that have the capacity to minimize or avoid the percolation of contaminated water (nitrates, pesticides, pathogen, etc.) to groundwater.

### **Sensitive feature protection and buffers**

- Usage of Filter Strips and Riparian Zones
- Sensitive feature protection includes grassed waterways (minimum 1 in 10 year storm design)
- Sensitive feature protection with critical source area planting
- Sensitive feature protection with P-index
- constructed or natural barriers for nutrients, contaminants or surface water runoff, such as vegetated buffer strips



The following chart identifies the components of a Nutrient Management Strategy (Strategy), Nutrient Management Plan (NMP) and a Non-Agricultural Source Materials Plan (NASM Plan). Non-agricultural source materials can include pulp and paper biosolids, sewage biosolids, food processing wastes, anaerobic digestion output, and similar materials applied to land as nutrients (see O.Reg. 267/03 s. 1(1) under the *Nutrient Management Act*).

	<b>Component</b>	<b>Included in a Strategy</b>	<b>Included in a NMP</b>	<b>Included in a NASM Plan</b>
Operational Information	Description of the Operation	Yes	Yes	Yes
	Agreements	Yes	Yes	Yes
For Farm Units	Farm Unit Declaration Form	Yes	Yes	Yes
	Farm Unit Sketch	Yes	Yes	Yes
Inventory and Description of Prescribed Materials	List of Prescribed Materials (generated and received)	Yes	Yes	Yes
	Analysis of Nutrient Content or use of Table 2 information *	No	Yes	Yes
Destination and Storage	Destinations	Yes	No	No
	Agricultural Source Material Storage Facilities	Yes	Yes	No
NASM Plan	NASM Storage Facilities	Yes	Yes	Yes
Contingency Plan	Contingency Plan	Yes	Yes	Yes
Sign-off Form	Sign-off Form	Yes	Yes	Yes
Field Information	Field Properties	No	Yes	Yes
	Field Sketches	No	Yes	Yes
	Soil Samples and Analysis	No	Yes	Yes
Crop Information	Crop Rotation and Yields	No	Yes	Yes
	Tillage Practices	No	Yes	Yes
Nutrient Application Information	Commercial Fertilizer Application	No	Yes	Yes
	Application of Prescribed Materials	No	Yes	Yes
	Agronomic and Crop Removal Balance for Nitrogen	No	Yes	Yes
	Agronomic and Crop Removal Balance for Phosphorus	No	Yes	Yes
	Common Land Application Setbacks/Limits	No	Yes	Yes
	Demonstration of Adequate Land Base	No	Yes	Yes
	Information on a Regulated Mixed Anaerobic Digestion("AD") Facility	Yes	Yes	Yes

\*From the Nutrient Management Tables document as amended from time to time, prepared by the Ministry of Agriculture, Food and Rural Affairs and the Ministry of the Environment for the purposes of the NASM Odour Guide and the Nutrient Management Protocol. Source: [http://www.omafra.gov.on.ca/english/nm/regs/nmpro/nmpro04\\_09.htm#table4-2.1](http://www.omafra.gov.on.ca/english/nm/regs/nmpro/nmpro04_09.htm#table4-2.1)  
For more information:Toll Free: 1-877-424-1300 Local: (519) 826-4047 E-mail: [ag.info.omafra@ontario.ca](mailto:ag.info.omafra@ontario.ca)

## **Pathogen Threats related to Threat #21**

The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard can also pose a pathogen threat.

Scenario A. The use of land as livestock grazing or pasturing land for one or more animals where the land use may result in the presence of one or more pathogens in groundwater or surface water.

Scenario B. The use of land as an outdoor confinement area or a farm animal yard for one or more animals where the land use may result in the presence of one or more pathogens in groundwater or surface water.

The Risk Management Measures Catalogue endorses the following pathogen risk management measures.

### **Manure production management barrier ratings - Management of herd health**

Management of herd health with 3 barriers:

- Vaccination (e.g. 58% reduction in specific pathogens)
- Antibiotics as treatment (high dose) (e.g. 98% reduction in specific pathogens)
- On-farm food safety programs

More best management practices can be found in the Best Management Practices – Manure Management book (OMAFRA).

#### ***Restricting Access***

Cattle should be restricted from accessing watercourses.



***Best Management Practices***

Fencing to restrict cattle access to banks or watercourses is a best management practice.



Photo source:  
Ontario Cattlemen's Association

Manure handling equipment will assist in even application of agricultural source material.



***Proper Storage***

Storage with a berm at the entryway and a roof can keep snow and rain out of manure storage area.

## Funding Programs Available to the Agricultural Community

**Environmental Farm Plan:** An excellent way to take inventory of your farm activities is to complete an Environmental Farm Plan. There is cost-sharing through this program that can provide funds for on-farm projects. The Environmental Farm Plan is administered by Ontario Soil and Crop Improvement Association. Contacts for these programs locally can be found at [www.ontariosoilcrop.org](http://www.ontariosoilcrop.org).

**Ontario Drinking Water Stewardship Program:** Early Response Program administered by Drinking Water Source Protection will be available to landowners with significant threats. Eligible projects must be risk management measures in the Ministry's Provincial Risk Management Measures Catalogue. To access this catalogue use the following URL: <http://maps.thamesriver.on.ca/swpCAMaps/rmc/disclaimer.aspx>. For more information, contact Drinking Water Source Protection at 519-470-3000 or 1-877-470-3001.

**Municipal or County programs:** Check with your county or municipality. They may have a program available for clean water projects.



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"Threats Factsheet - Livestock" is one in a series of Commodity Best Management Practice factsheets related to the Drinking Water Source Protection program. These factsheets give an overview of potential drinking water threats and circumstances that are significant. Also included are some possible measures to manage these circumstances. Visit [www.waterprotection.ca](http://www.waterprotection.ca) to view them online or visit your local OMAFRA office for a copy.

Titles in the Threats Factsheet series: General; Row Crop; Livestock; Horticulture; Chemical & Fuel.

This factsheet was prepared for the Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Region. This region covers the Saugeen Valley and Grey Sauble watershed regions, as well as the Municipality of Northern Bruce Peninsula.



Drinking Water Source Protection  
Saugeen, Grey Sauble, Northern Bruce Peninsula Source Protection Region  
RR4, 237897 Inglis Falls Road  
Owen Sound, ON N4K 5N6  
519-470-3000 or 877-470-3001  
[www.waterprotection.ca](http://www.waterprotection.ca)   [mail@waterprotection.ca](mailto:mail@waterprotection.ca)