

**GREAT LAKES DRINKING WATER SOURCE  
PROTECTION: A COMPARISON OF ONTARIO  
AND NEIGHBOURING GREAT LAKES  
JURISDICTIONS**



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# Table of Contents

1. Introduction and Purpose .....	2
2. Ontario’s Legislative and Policy Framework .....	2
<b>Part One: Comparison of Ontario with Other Jurisdictions.....</b>	<b>10</b>
3. United States Federal and State Source Protection Initiatives.....	10
3.1 U.S. Federal Legislation and Policy .....	10
3.2 State Source Water Assessment Programs .....	13
3.3 Strengths and Weaknesses of the U.S. Framework .....	15
4. State Source Water Protection Initiatives .....	17
4.1 Introduction.....	17
4.2 Illinois .....	18
4.3 Indiana.....	22
4.4 Michigan .....	25
4.5 Minnesota.....	30
4.6 New York State.....	34
4.7 Ohio.....	36
4.8 Pennsylvania .....	38
4.9 Wisconsin.....	43
5. Quebec Legislative and Policy Framework .....	44
6. First Nations Drinking Water Source Protection.....	47
7. Lessons from the U.S. Federal and State Programs, Quebec and Ontario’s Clean Water Act.....	52
7.1 Aspects of Ontario’s Approach that May be Applicable to Other Jurisdictions.	52
7.2 Aspects of Neighbouring Jurisdictions’ Approaches that May be Applicable to Ontario .....	59
<b>Part Two: Protecting the Great Lakes as a Drinking Water Source .....</b>	<b>65</b>
8. Great Lakes and International Source Protection Considerations .....	65
8.1 Great Lakes Governance and Institutions .....	65
8.2 The International Boundary Waters Treaty of 1909 and the International Joint Commission .....	67
8.3 Great Lakes Water Quality Agreement.....	68
8.4 Canada Ontario Agreement.....	73
8.5 The Great Lakes Regional Collaboration .....	74
8.6 Great Lakes Charter Annex and the Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement .....	75
9. Conclusion and Recommendations for Great Lakes Source Protection .....	81
Appendix I - Assessment Protocol for Great Lakes Sources .....	84
Appendix II - Bibliography.....	89
Appendix III - Comparison of Ontario Source Protection Framework with other Jurisdictions .....	95

## **1. Introduction and Purpose**

Source water protection is becoming an increasingly important focus in the quest to safeguard the quality and quantity of our drinking water. Many jurisdictions have chosen to put in place legislation and policy measures to promote source protection as the first line of defence in a multi-barrier approach to safe drinking water. The term “source water” means untreated water from lakes, rivers, streams or underground aquifers that supply drinking water.

Ontario recently enacted the *Clean Water Act*, a comprehensive legislative package, designed to protect rivers, lakes and groundwater that supply the province with drinking water. Ontario’s *Clean Water Act, 2006* (CWA) passed third reading in October, 2006, and was proclaimed in force in July 2007.

The CWA is designed to protect existing and future sources of drinking water from contamination or depletion. It lays out a formal process for identifying threats to drinking water sources. Local multi-stakeholder source protection committees will create plans to manage and reduce the threats. These source protection plans must take into consideration a number of Great Lakes agreements, including the Great Lakes Water Quality Agreement, the Great Lakes Charter, the Canada-Ontario Agreement and the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. Furthermore, certain portions of the plans dealing with the Great Lakes as well as significant threats will prevail over official plans and zoning by-laws in the case of conflict.

The purpose of this report is to compare Ontario’s drinking water source protection framework with source protection initiatives in each of the 8 Great Lakes States and Quebec and analyze the nature, strengths and weaknesses of the different jurisdictions. This comparative analysis will examine aspects of programs in Great Lakes’ jurisdictions that may be applicable in Ontario and aspects of Ontario’s approach that may be relevant to other Great Lakes’ states and provinces.

In addition, the report will also look at the Ontario, Quebec and US approaches to source protection in the Great Lakes and St. Lawrence River, the opportunities to incorporate source protection principles into international agreements and to integrate international obligations into domestic source protection programs.

## **2. Ontario’s Legislative and Policy Framework**

In 2006, Ontario passed the *Clean Water Act*, a piece of legislation dedicated exclusively to protecting sources of drinking water. More specifically, the *Clean Water Act* is focused on the protection of the *quality and quantity of existing and future* sources of drinking water in parts of Ontario where Conservation Authorities (CAs) exist.

Both surface water and groundwater drinking water sources are included, with a particular emphasis placed on four types of vulnerable areas within the source waters: significant groundwater recharge areas, highly vulnerable aquifers, surface water intake protection zones, and wellhead protection areas.

For each source protection area or region, there are three primary documents that must be prepared under the *Clean Water Act* (CWA) – the terms of reference; the assessment report which characterizes the watershed, sets out the water budget, identifies vulnerable areas and drinking water threats and categorizes the risks associated with these threats; and the source protection plan, which sets out policies intended to reduce the significant drinking water threats.<sup>1</sup>

In addition, the first 5 regulations have been promulgated under the CWA – the Source Protection Areas and Regions, Source Protection Committees, Terms of Reference, Time Limits and Miscellaneous. Further regulations are under development, including the Source Protection Assessments and Source Protection Plans regulations, which when available will be posted on the Environmental Bill of Rights registry for public comment.

### ***Scope***

In terms of its scope, the *Clean Water Act* applies primarily to municipal sources of drinking water within source protection areas or regions. However, non-municipal systems such as private wells and First Nations may also become part of the process.

To be included under the terms of reference, private wells or intakes, grouped in "clusters" of six or more, can be nominated by a municipal council or added by the Minister. Drinking water sources serving First Nations may be added by a band council resolution followed by a regulation passed by the Lieutenant Governor in Council.

As in most jurisdictions, single individual private wells are not covered.<sup>2</sup> Nor are large tracts of central and northern Ontario where there are no Conservation Authorities (CAs) present. However, the Minister may by regulation create new source protection areas in central and northern Ontario. This can be done either 1) by designating a non-CA person or body to serve as the source protection authority, or 2) by entering into an agreement whereby a municipality would agree to prepare a focused source protection plan. At this time, the regulation on Source Protection Areas and Regions has established two additional source protection areas pursuant to the first option, and none pursuant to the second.

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<sup>1</sup> Ontario has defined source protection areas as the 38 areas over which Conservation Authorities have jurisdiction. Under the CWA, the Source Protection Areas and Regions Regulation outlines the 38 source protection areas and two new areas. The 32 are grouped into 11 regions and 8 remain as stand alone areas for which source protection plans must be developed.

<sup>2</sup> The Ministry of Environment has recently strengthened requirements of Ontario's Wells Regulation to protect drinking water quality of individual private wells.

In parts of Ontario that are covered by the CWA, a watershed-scale organizational structure has been adopted. The boundaries selected for the source protection areas and regions are roughly the same as existing Conservation Authority boundaries, which are, in turn, based upon natural watershed delineations.<sup>3</sup> Accordingly, there will be one source protection plan prepared per watershed. This framework should assist local municipalities in bridging political borders when implementing the Act. The Conservation Authority acts as the source protection authority and is responsible for establishing the source protection committee.

As noted above, the provisions of the CWA aim to protect both the quality and quantity of drinking water sources. The CWA will address concerns on water quantity through water budgeting and risk management measures that are aimed at municipalities that need to reduce their intake/use.

The scope of the CWA includes not only existing drinking water systems, but also future or “planned” systems. The Act allows municipalities to protect water that may be needed within the next 25 years. “Planned” systems, as defined in the regulations, are those that have already received approval or been identified as the preferred solution under the Ontario *Environmental Assessment Act* or those serving a First Nations reserve. To protect water sources or areas for future water use under the *Clean Water Act*, a municipality must conduct an environmental assessment to identify the preferred source of water.

### ***Public involvement***

The CWA contains transparency provisions and opportunities for public involvement. The public will have the opportunity to comment on the proposed terms of reference that will guide the assessments and protection plans. Subsequently, the public will be asked to comment on the proposed assessment report after it has been prepared by the source protection committee, and on the proposed source protection plan prior to approval.

Additionally, source protection committees which are responsible for developing the terms of reference, source water assessments and protection plans must include members of the public. The Source Protection Committees Regulation specifies that one-third of the members of the source protection committees should include, in particular, “environmental, health and other interests of the general public.”<sup>4</sup> Source protection committees are multi-stakeholder committees, usually with 16 members, the other 1/3 being municipal and 1/3 from sectors such as agriculture or industry.

### ***Paramountcy***

The CWA contains many important provisions regarding its integration with other laws, and generally provides that, in the case of conflict with another statute, regulation or

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<sup>3</sup> The jurisdiction of the Conservation Authorities is set out in Section 13.1 of the *Conservation Authorities Act*, 2006.

<sup>4</sup> Source Protection Committees regulation, section 2, para. 3.

instrument, the more protective provision will prevail. Moreover, if conflicts arise, the significant threat policies or designated Great Lakes policies within a source protection plan will prevail over official plans and zoning by-laws, and the CWA will prevail over the *Nutrient Management Act* and any regulations or instruments created under it. These provisions help to clarify the role of the CWA within Ontario's water protection regime, and establish the framework necessary to ensure the consistent implementation of the CWA.

### ***Source Water Assessments***

A key focus of the *Clean Water Act* is the development of local, science-based source water assessments, upon which source protection plans will be based. The Ministry of Environment has produced a Guidance Module for the assessment of drinking water sources within each source protection area.<sup>5</sup> The module contains comprehensive guidance on watershed characterization, groundwater and surface water vulnerability analysis, issues evaluation and threats inventory, water quality risk assessment and water budget and water quantity risk assessment.

Source protection committees will be responsible for mapping groundwater sources and delineating surface water intake protection zones in their watershed areas. The vulnerability of both groundwater and surface water sources of drinking water will be determined as part of the assessment process.

In addition, assessments of existing problems and potential threats to drinking water will consider pathogens, historical land uses and chemicals. Contamination problems and threats will be evaluated and prioritized based on a hazard rating. A risk assessment will characterize threats as significant, moderate, low or negligible risk to drinking water sources. It will determine which ones need immediate action, which ones require monitoring to ensure that they do not become significant and which ones do not present any risk.

In the assessment reports, source protection committees will also consider the quantity of water and develop a water budget for each watershed. Water budgets will require an estimate of the quantity of water flowing through a watershed, the pathways and networks of water supplies and the sustainability of water sources. Water budgeting will help identify sub-watersheds and local communities that may not be able to meet current or future water supply demands from existing or planned supplies.

### ***Source Protection Plans***

The CWA sets out several mandatory elements that each source protection plan must contain. First, and most importantly, each plan must set out policies intended to ensure that activities cease to be, or do not become significant drinking water threats.

Source protection plans should include:

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<sup>5</sup> Ministry of the Environment, Guidance Modules, October 2006.

1. The most recently approved assessment report.
2. Policies intended to achieve the following objectives for every area identified in the assessment report as an area where an activity is or would be a significant drinking water threat:
  - i. Ensuring that the activity never becomes a significant drinking water threat.
  - ii. Ensuring that, if the activity is being engaged in, the activity ceases to be a significant drinking water threat.
3. Policies intended to assist in achieving every target established under section 85 for the source protection area, if the Minister has directed under subsection 85 (6) that a report be prepared that recommends policies that should be set out in the source protection plan to assist in achieving the target.
4. Policies governing,
  - i. the monitoring, in every area that is identified in the assessment report as an area where an activity is or would be a significant drinking water threat, of the activity, and
  - ii. the monitoring, in every area that is identified in the assessment report as an area where a condition is a significant drinking water threat, of the condition.
5. Policies governing,
  - i. the monitoring of an activity in an area, if the area is identified in the assessment report as a vulnerable area, the activity is listed in the assessment report as an activity that is or would be a drinking water threat, subparagraph 4 i does not apply and the monitoring of the activity is advisable to assist in preventing the activity from becoming a significant drinking water threat, and
  - ii. the monitoring of a condition in an area, if the area is identified in the assessment report as a vulnerable area, the condition is listed in the assessment report as a condition that is a drinking water threat, subparagraph 4 ii does not apply and the monitoring of the condition is advisable to assist in preventing the condition from becoming a significant drinking water threat.
6. Policies governing monitoring to assist in implementing and in determining the effectiveness of every policy set out in the source protection plan under paragraph 3.
7. Policies governing the monitoring of a drinking water issue identified in the assessment report, if the monitoring of the drinking water issue is advisable.
8. Any other matter required by the regulations.<sup>6</sup>

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<sup>6</sup> The Clean Water Act, 2006, Section 22 (2).

Where an approved source protection plan is in effect, its implementation is mandatory and a variety of tools will be used to implement the plan, including both existing programs and new instruments available under the CWA.

Existing programs that will be used to implement source protection plans include land use planning regulations such as official plans and bylaws. Municipalities must amend their official plans and zoning by-laws to conform with source protection plans. In addition, after a source protection plan is in place, municipalities or planning authorities can not undertake any activity that conflicts with a source protection plan.

### ***Implementation Tools***

The CWA provides new tools to address problems identified in the source water assessments. Within the source protection plans, the source protection committees may designate certain activities, areas and land uses for prohibition, regulation and restriction. The source protection committees have the flexibility to decide which priority activities (if any) should be subject to prohibition, or “regulation” via risk management plans.

Activities, as prescribed through regulation, which are determined to be a significant threat to drinking water in a wellhead protection area or an intake protection zone can be prohibited. For existing activities, the prohibition would apply 180 days after the source protection plan came into effect.

Risk management plans are a new instrument provided to municipalities with authority over water production, treatment and storage to establish conditions for activities that pose a significant threat to drinking water within a wellhead protection area or an intake protection zone. The conditions can be negotiated by a municipality with a landowner. If a risk management plan cannot be negotiated, then under Section 58 it may be imposed by order on a landowner.

The CWA is not prescriptive about what type of requirements should be included in a risk management plan. However, the risk management official must be satisfied that the activity will not be a significant drinking water threat if it is engaged in at that location in accordance with the plan. Once the risk management plan has been agreed to or been imposed, it is mandatory for the person to comply with the plan.

Another important provision of the *Clean Water Act* is the requirement for monitoring high risk activities. The source protection authorities are responsible for preparing and submitting annual reports that:

- Describe the measures that have been taken to implement source protection plans, including those measures that have been taken to address significant and potential drinking water threats;
- Describe the results of any monitoring programs;



- Evaluate the extent to which objectives in the source protection plans are being achieved; and,
- Provide any other information prescribed by the regulations.

The source protection plans may also be required to include Great Lakes policies, as discussed below. Additionally, the plans may set out policies governing incentive programs, and education and outreach programs, as well as policies governing the risk management plans.

### ***Great Lakes provisions***

The CWA includes a number of provisions relating specifically to the Great Lakes, many of which are at the discretion of the Minister. For example, the Minister is given the option to form a Great Lakes advisory committee, commission Great Lakes reports from the source protection authorities, and establish water quantity or water quality targets for the Great Lakes.

In addition to these provisions, the CWA states that if a source protection area contains water that flows into the Great Lakes and into the St. Lawrence (as defined by O.Reg 287/07), the terms of reference for the preparation of an assessment report and source protection plan is required to consider existing agreements related to the Great Lakes

Also, under section 22(2) of the CWA, the source protection plans are required to include policies “intended to assist in achieving” certain Great Lakes targets if the Minister so directs. Under section 22(4), selected Great Lakes policies may be given greater enforceability by declaring them as “designated” Great Lakes policies in the source protection plan.

The Guidance Modules for the technical work of a source protection assessment report also contain provisions related to the assessment of threats in the Great Lakes and Great Lakes connecting channels<sup>7</sup>. At a minimum, two zones will be drawn around each Great Lakes intake. The zones signify the areas that are most vulnerable to contamination, and an inventory of threats will be prepared within the zones.

The first zone is set according to a circle with a fixed radius of 1 km (minimum) (0.62 miles) around the intake, and may intersect the shoreline. The second zone takes into account additional influences, such as streams, rivers, and land areas that directly feed into the surface waters of the first zone. It can also include such direct threats as storm sewer watersheds, drainage tile areas, industrial outfalls, etc. The second zone extends for a minimum two-hour time of travel (TOT)<sup>8</sup> distance upstream. It also extends on land to the greater of either 120 meters or the limit of the Regulated Areas. Regulated areas are areas designated by the Conservation Authorities under the *Conservation Authorities Act* where certain land uses are restricted. They include areas such as flood

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<sup>7</sup> Including the St. Clair River and St. Lawrence River.

<sup>8</sup> TOT depends, in turn, on the minimum emergency response time required by each individual water treatment plant operator.

plains, wetlands or shorelines that are at significant risk for loss of life or property damage.

For intakes located in connecting channels, the first zone is mapped as a semi-circle that extends 1 km *upstream* of the intake and 100 m *downstream* of the intake. The second zone extends further upstream for a distance that is dependant on maximum current flows and site-specific TOT calculations.

When delineating zones, the minimum distances listed in the Guidance Modules provide a starting point, but teams are expected to refine their calculations for each intake according to factors such as its particular location, physical features, and surrounding environment.

Once the zones have been set, vulnerability scores will be assigned to each. The vulnerability scores reflect the comparative likelihood that a contaminant will reach the intake. Factors that can affect the vulnerability ranking include the depth of the intake, the distance of the intake from shore, the size of the lake, the water flow, and human-made contaminant pathways.

### ***Funding***

The CWA is one of the few provincial statutes that provides for the establishment of a funding program within the legislation -- the Ontario Drinking Water Stewardship Program under Section 97. The purpose of the program is to provide funding to those persons who will be required to act to reduce local threats, and for education and outreach activities.

Beginning in 2007, \$7 million was made available through this program each year for the next four years to “protect water sources from contamination.”<sup>9</sup> Of these funds, \$5 million was intended to support early actions to protect municipal wellheads and surface water intakes. Priority was to be given to decommissioning of wells, septic system inspections, runoff protection, pollution prevention audits and land conservation measures.<sup>10</sup> The remaining \$2 million is for education and outreach.

In addition, the Ministry of Environment has spent approximately \$88 million to support technical work on source water assessments being carried out by the municipalities, Conservation Authorities and their partners.

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<sup>9</sup> <http://www.ontariobudget.ca/english/chpt1e.html>

<sup>10</sup> Ministry of the Environment, The Clean Water Act Funding for Early Actions, August 2007.

## Part One: Comparison of Ontario with Other Jurisdictions

### 3. United States Federal and State Source Protection Initiatives

#### 3.1 U.S. Federal Legislation and Policy

In 1974, the United States put in place national legislation, called the *Safe Drinking Water Act* (SDWA), to safeguard the country's public drinking water supplies.<sup>11</sup> During the same period in the 1970s, major legislation such as the *Clean Air Act*, the *Clean Water Act* and the *Resource Conservation and Recovery Act* were passed in order to address discrete environmental problems of concern to the U.S. public.

The *Clean Water Act*, amended in 1977, established a framework of water protection and programs designed to protect water quality in general. The *Clean Water Act* set up the basic structure for regulating discharges of pollutants into surface waters, including water quality standards for contaminants, and a system of permits for point source discharges. It also funded the construction of sewage treatment plants, and includes parts of the Great Lakes Water Quality Agreement of 1978. The *Clean Water Act* addresses non-point source pollution but does not deal with groundwater.

The SDWA was directed more specifically at the protection of drinking water quality. The original SDWA focused on treatment as the means to provide safe drinking water, and established national health-based standards for contaminants in drinking water. Most states were given primacy for carrying out the provisions of the SDWA.

The SDWA was the first legislation to introduce the idea of the protection of drinking water sources. Through amendments to the SDWA, the U.S. mandated activities to protect, first, groundwater in 1986 and then, ten years later in 1996, all sources of drinking water. The SDWA applies to more than 160,000 public water systems, but does not cover private wells that serve less than 25 people.

The 1986 amendments to the Safe Drinking Water Act that addressed the protection of groundwater sources of drinking water required states to develop wellhead protection programs that would include the following elements:

- delineate wellhead protection areas;

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<sup>11</sup> Environmental Protection Agency, "Safe Drinking Water Act: Basic Information". Available at [www.epa.gov/safewater/sdwa/basicinformation.html](http://www.epa.gov/safewater/sdwa/basicinformation.html)

- identify sources of contamination;
- develop management approaches and contingency plans;
- plan for new wells; and,
- ensure public participation in the program.<sup>12</sup>

States were required to submit plans to the U.S. Environmental Protection Agency describing how they would protect ground-water sources of drinking water. This program was known as the Wellhead Protection Program. Although all states were required to develop wellhead protection programs, states could establish wellhead protection programs for communities as voluntary or mandatory programs. The EPA also encouraged tribes, who are not subject to this legislation, to implement drinking water protection programs by providing publications and staff resources to assist them.

In the 1996 reauthorization of the SDWA, amendments were passed that expanded the national focus on source protection. The revised SDWA required states to evaluate *all* sources of drinking water, including both ground and surface water supplies. The goal of the source water assessment program was to provide for the “protection and benefit of public water systems”.<sup>13</sup>

### ***Scope***

Public water systems in the U.S. are defined as systems that supply drinking water for human use to 15 or more service connections or to 25 or more persons for at least 60 days a year. A public water supply may be a community water supply which serves 15 or more services connections used by year-round residents or at least 25 year-round residents, such as a municipality, a subdivision or a nursing home.

A public water supply can also be defined as a non-community water supply. There are two types of non-community water supplies – non-transient that serves at least 25 of the same people over six months of the year such as hospitals, schools or factories, or transient that serves all other public water systems such as restaurants, gas stations, churches, parks and campgrounds.

### ***Source Water Assessments***

States were required to establish a source water assessment program (SWAP). This included, as a first step, describing how they would conduct their assessments and submitting the proposed programs to the U.S. Environmental Protection Agency (EPA) for approval. After EPA approval, assessments were to be completed within two years, with a possible 18 month extension. This is similar to the time frame Ontario has allocated for water characterization and assessment work. Public participation was required in the development of the SWAPs.

For the assessments, states were required by May 2003 to:

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<sup>12</sup> Section 1428, *Safe Drinking Water Act* 1986 amendments.

<sup>13</sup> Section 1453, *Safe Drinking Water Act* 1996 amendments.

- identify the areas that supply public drinking water;
- compile an inventory of contaminants by identifying and listing potential sources of contamination that could adversely affect the quality of source water;
- assess the susceptibility of the water supply to contamination; and,
- inform the public of the results.

All public water supplies, community and non-community, had to be assessed under the requirements of the SDWA.

### ***Funding***

The EPA intended to build the source water protection program on the Wellhead Protection Program already established under the SDWA and on U.S. *Clean Water Act* programs, particularly those designed for watershed protection. There was no single source of funding for source water protection planning and implementation. Rather, a variety of program funding from the federal, state and local levels was drawn on for source protection activities.

Under the 1996 SDWA amendments, significant funding was made available to states through the U.S. Environmental Protection Agency for infrastructure improvements.<sup>14</sup> The Drinking Water State Revolving Fund established a loan program that would be managed by the states to finance infrastructure improvements according to the priorities, policies and laws within each state. They had the option to use this funding for source water protection activities that would include loans to communities for assessments, wellhead protection activities or land acquisition and conservation easements.

Although not necessarily directed at the protection of drinking water sources, federal funding to improve water quality was also available under the *Clean Water Act*. The *Clean Water Act* authorized the Clean Water State Revolving Fund to finance projects to protect the quality of surface and groundwater, specifically point sources (section 212), nonpoint sources (section 319) and estuary (section 320) projects. Programs that relate to the quality of drinking water supplies include the Nonpoint Source Program, National Estuary Program, the Total Maximum Daily Load Program (TMDL) which establishes the total pollutant loading for waters without violating water quality standards, and the National Pollution Discharge Elimination System (NPDES).

Through the Clean Water State Revolving Fund, states were able to fund nonpoint source projects to protect drinking water, particularly through the use of Section 319(h) grants. These included purchase of land or easements, wetland protection and restoration, remediation of contamination from leaking underground storage tanks, agricultural best management practices for crop and small animal operations, and upgrading and replacement of septic systems.

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<sup>14</sup> United States Environmental Protection Agency, “Using the Drinking Water State Revolving Fund for Source Water Protection Loans”, Office of Water, Publication EPA 816-F-01-039..

### *U.S. Source Water Collaborative*

In order to promote source water protection efforts beyond the assessment process, eighteen national groups in the United States including both governmental and non-governmental groups have come together to form the Source Water Collaborative to promote their commitment to safe drinking water at the source.<sup>15</sup> These groups have signed a mission statement that commits them to share information with each other on best practices in Source Protection through regular meetings and quarterly meetings. They have a 2007 pamphlet “Advice Worth Drinking”. Their work is aimed at improving decision-making on community planning, land-use and stewardship to protect drinking water.

The Source Water Collaborative has a very simple and accessible website that Ontario could use as a model for information dissemination on source protection. This website [www.protectdrinkingwater.com](http://www.protectdrinkingwater.com) not only offers contacts to all member groups working on source protection, it offers the public portals to access information that are extremely user friendly, simple and designed for different sectors and concerns. These sectors are: Public, Policy makers, Planners, Water system, Farmer, Developer or business, or Not sure. This site has resources for source protection training, information on low impact development and smart growth, technical assistance, assistance for municipalities and planners and financial tools.

## **3.2 State Source Water Assessment Programs**

Under U.S. legislation, states with primacy are required to implement federal statutes and may also put into place stricter provisions if they wish. As a result, every state has met the minimal requirements of the Safe Drinking Water Act’s source water program, but the elements of the programs undertaken by individual states vary considerably.

As a result of two separate federal mandates to evaluate drinking water sources, some states established separate programs for groundwater and for surface water protection, while others integrated both into a single source protection program. In addition, because states were first given a mandate to evaluate groundwater sources of drinking water, wellhead protection programs are more developed in every state and impose more requirements on drinking water suppliers than surface water protection programs.

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<sup>15</sup> U.S. environmental groups, the Clean Water Fund, the Campaign for Safe and Affordable Drinking Water and the Clean Water Network have also partnered to promote drinking water source protection and assist communities with the challenge of moving beyond the assessments “to real protection of drinking water sources. To this end they hold training conferences for leaders and activists, offer conference follow-up technical assistance, provide an assistance Fund that gives small (up to \$2,000) community grants for source protection projects, and has developed a source water stewardship guide and toolkit in 2003 called *Source Water Stewardship: A Guide to Protecting and Restoring your Drinking Water*. These can be found on their web site [www.cleanwaterfund.org/sourcewater/](http://www.cleanwaterfund.org/sourcewater/).

Although states approached their responsibilities to do source water assessments in different ways, four elements were required of every program. The EPA developed a Guidance document to assist states with their programs.

- First, states had to delineate and map the boundaries of the protection area for every source of drinking water, including those for major cities and towns as well as those supplying water to schools, restaurants or other public facilities.

For groundwater systems, states had to identify a source water protection area around a wellfield. Some states used a fixed radius to determine these areas while others did more detailed studies to determine groundwater flow and identify recharge areas.

For surface water systems, protection areas included the watershed upstream of the water intake pipes. The entire watershed area up to the state boundaries had to be delineated and mapped, but the inventory of potential pollution sources could be more or less detailed depending on their proximity to the intakes.

- Second, states were required to create an inventory of potential sources of contamination.

States generally listed facilities within the source protection area that had the potential to release contaminants into the water supply. Types of pollutant sources included: industrial point sources, agricultural sources, atmospheric deposition, leaking underground or above ground storage tanks, landfills, residential or commercial septic systems, mining activities, contaminated sediments and runoff from farms, streets and lawns and sludge disposal sites.<sup>16</sup>

- Third, states had to determine the susceptibility of the water supply to contamination based on the identification of potential pollution sources.

In doing their susceptibility analysis, states were encouraged to consider factors such as sand and gravel excavations which expose the water table, utility rights of way using pesticides, locations of stormwater discharges, hydrogeological parameter values and other hydrogeological, soil or chemical characteristics that determine the likelihood of groundwater contamination.<sup>17</sup>

In some cases, states identified specific contamination sources or individual chemicals that they regarded as priorities for potential contamination. Other states, however, ranked the vulnerability of the water sources as high, medium or low depending on the possible contamination sites in the vicinity.

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<sup>16</sup> For the complete list, see Appendix E of the Environmental Protection Agency's State Source Water Assessment and Protection Programs Final Guidance, August 1997.

<sup>17</sup> For the complete list of "Factors to consider when doing an adequate contamination source inventory and adequate susceptibility analysis", see Appendix F of the Environmental Protection Agency's State Source Water Assessment and Protection Programs Final Guidance, August 1997. It includes additional factors for surface water intakes.

- Fourth, states were mandated to provide the assessment results to the public.

The original intent of the Source Water Assessment Programs was to release all the assessment results to the public in order to stimulate planning for protection of drinking water sources. However, states approached this requirement in different ways – some making summaries available over the Internet, others releasing the information to individuals only upon request. Some information was provided to the public through the annual Consumer Confidence Reports, delivered each year to customers of any public water system. The findings of the assessment reports were intended to be the basis of source protection plans. However, source protection plans were never made mandatory under the *Safe Drinking Water Act* and only some states proceeded to the next stage of source protection planning.

### 3.3 Strengths and Weaknesses of the U.S. Framework

An important consideration in understanding the evolution of the U.S. source protection programs and their limitations is the history of their development and the unexpected interruption of the intent of these programs by the terrorist attack on New York City on September 11, 2001.

The U.S. Source Water Assessment Program (SWAP) that was established under the SDWA intended that States would follow up the assessments with source water protection plans. As the EPA Assistant Administrator wrote to the states in his letter accompanying the guidance documents:

It is the clear desire of Congress and the expectation of EPA that the required source water assessments will lead to local source water protection programs that will help prevent contamination of drinking water supplies.<sup>18</sup>

However, the *Safe Drinking Water Act* did not mandate the development of source protection plans or their implementation. This is unlike Ontario's *Clean Water Act*, which requires that plans be developed and implemented.

Instead, the SDWA established a State Source Water Petition Program, which was voluntary for the states. This program was set up to encourage states to develop incentive-based voluntary management measures to reduce or eliminate drinking water threats that were identified in the assessments.

It was expected that local action would be taken to protect source water based on the assessments. A major requirement under the SDWA of source water assessments was that finished assessments should be made public. The government anticipated that the

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<sup>18</sup> Bob Perciasepe, Assistant Administrator, EPA, Letter Accompanying the EPA's Response to Major Issues for the National Guidance on State Source Water Assessment and Protection Programs, August 5, 1997.



public and local community officials would act on the information provided to them by following up with source water protection plans.

However, after the attacks on September 11, 2001 which occurred before states had completed their assessments, security concerns took precedence over widespread distribution of drinking water information. The federal direction shifted from promoting this information to restricting it, and states decided either to publish only summaries of assessments or to make assessments available on a very restricted basis. Concern was particularly high over the possibility that the geographical locations of drinking water intakes would be made public.

As a result, the assessments were made public in a very limited way and the opportunity for communities to use the information to develop plans to protect drinking water sources was not fully realized. An evaluation of the program by the U.S. Environmental Protection Agency in 2005 found that the use of assessments was limited at the local level.<sup>19</sup>

This evaluation also found that although source water assessment and protection programs showed initial promise, there were obstacles to their success. One of the major barriers to implementing source water protection identified in this report was the lack of long-term secure and consistent funding. Most states relied on the Drinking Water State Revolving Fund to fund their programs, but because it required an annual renewal by Congress, it was not a secure source of funding. If Congress decided not to renew it, states could be forced to cut source water protection programs.

Another funding gap was identified in the evaluation – the lack of funding for work on surface water sources. In the United States, 67 per cent of the population relies on surface water. Yet, the DWSRF funds for the original Wellhead Protection Program were limited to use for groundwater protection projects. No corresponding funding for surface water protection projects was available.

The other significant barriers identified by the EPA were:

- the level of State source water protection staff was not sufficient to reach all communities in need of assistance (i.e. state facilitators were needed to stimulate local participation in source water protection planning and implementation but protection programs were understaffed);
- the lack of State enforcement capability countered current and future protection benefits (i.e. states found it difficult to enforce measures to prevent contamination);
- the lack of environmental program coordination put water quality at risk (i.e. environmental officials have difficulty coordinating activities with other departments such as those overseeing underground storage tanks);

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<sup>19</sup> Office of Inspector General, U.S. Environmental Protection Agency, Evaluation Report, “Source Water Assessment and Protection Programs Show Initial Promise, but Obstacles Remain”, March 28, 2005.

- there was uneven cooperation with federal agencies varying by agency and location.

The barriers identified in this report are consistent with the information given in interviews by the source protection office managers in the Great Lakes States. Funding has been slowly drying up at the federal level and many states have downsized their source protection offices and programs. Without adequate staff, states have not been able to follow up the assessment work with the same level of commitment and further protection planning.

In summary, the initial promise of the U.S. source water protection programs faltered after the initial source water assessment work because of the absence of a mandated program for following up the assessments with source protection planning and implementation, the lack of secure and sustained federal funding for the program, and the aborted intention of building public support and cooperation in the planning and implementation of source water protection programs.

## **4. State Source Water Protection Initiatives**

### **4.1 Introduction**

In response to the SDWA amendments, the eight Great Lakes states have completed source water assessments for all groundwater and surface water supplies in their states. It was anticipated by the U.S. EPA that the source water assessments would lead to source protection planning and implementation of these plans.

However, without a regulated and federally funded mandate, each state has developed its own legislative and policy approach to source protection planning and implementation. In some states, there has been relatively little follow up to the assessments while, in others, regulations requiring protection plans have been put in place.

Generally, programs for wellhead protection are more developed than programs for surface water sources of drinking water. All states have wellhead protection programs as a result of the federal Wellhead Protection Program. However, only Indiana and Minnesota have legislated wellhead protection programs that require protection plans for existing wells.<sup>20</sup> Wisconsin requires wellhead protection plans for new wells.

With respect to surface water sources, only Michigan, Minnesota and Ohio have taken initiatives to promote the development and implementation of plans by communities using surface water supplies for drinking.

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<sup>20</sup> Many of the state regulations respecting wells are found in state administrative codes which are a compilation of general and permanent state regulations that have the force of law. Administrative codes present a collated version of the regulations by subject matter, incorporating all additions and deletions.

The approaches taken by the eight Great Lakes States to source water protection are described in the following sections, arranged in alphabetical order by state. Although other federal and state laws contribute to improvements in water quality, the focus of each section is the source water protection programs as they exist in each state.

## 4.2 Illinois

The Bureau of Water in the Illinois Environmental Protection Agency is responsible for source water protection programs in the state. To understand Illinois' approach to protecting drinking water sources, it is necessary to view it as three separate but inter-related pieces. The three are the Source Water Protection Program of 1996, the Wellhead Protection Program of 1992 and the state-initiated *Illinois Groundwater Protection Act* of 1987.

### Source Water Assessments

As required by the Source Water Protection Program, Illinois fulfilled its obligations under the SDWA to undertake assessments of all sources of public drinking water supplies – both ground and surface water. Assessments now are done only for new wells.

Assessments of surface water sources were distributed to water suppliers and to local officials. Summaries of the assessments done for community water supplies were made available to the public over the Internet and members of the public who wanted complete assessments had to obtain them from local water supply officials.

### *Source Protection Programs*

While it is possible that some source water protection activities are underway for surface water supplies, there is no responsibility for local officials to report to the Bureau of Water, and Illinois has not put in place any formal program that either encourages or requires the development of plans for the protection of surface water sources of drinking water.

The focus of planning and protection programs in Illinois has been the development of protection practices for underground sources of drinking water. The Wellhead Protection Program, mandated by the SDWA, is integrated into the broader goals of the state's groundwater protection program. In 1987, Illinois adopted a comprehensive Wellhead Protection Program through the passage of the *Illinois Groundwater Protection Act (IGPA)*.<sup>21</sup> The Act was adopted in response to contamination threats that highlighted the need to strengthen groundwater protection. The Wellhead Protection Program is a key element of the IGPA.

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<sup>21</sup> Groundwater Section, Bureau of Water, Illinois Environmental Protection Agency, The Illinois Wellhead Protection Program Pursuant to Section 1428 of the Federal Safe Drinking Water Act (SDWA), October 1992.

The IGPA mandates a partnership between the State and local governments to carry out the wellhead protection program. It provides regulations for wellhead protection such as setback zones and well site surveys (contaminant inventories).

One of the key provisions for protection of wellheads in the IGPA is the requirement for minimum setback zones around wells. The minimum zone is 200 feet (60 meters) in radius for any type of water supply well or potential sources or routes of contamination. For community water supply wells in vulnerable geologic formations, the zone is 400 feet (122 meters).

In addition, communities have the authority to establish a maximum setback zone up to 2,500 feet (762 meters) in exceptional cases. Maximum setback zones are established by determining the lateral area of influence of the well under normal operating conditions using pumping tests and estimation techniques, as set out in regulations pursuant to the *Illinois Environmental Protection Act*.

The IGPA also sets up procedures for the development and adoption of regulated recharge areas. If communities in their “needs assessment” identify hazards beyond the boundaries of the setback areas, it may be necessary to regulate a larger area that includes the recharge area for the community well.

As part of its program to protect groundwater sources of drinking water, Illinois’ regulations govern specific existing and new activities within wellhead protection zones and regulated recharge areas. Regulations for existing activities cover facilities or units that are within setback zones or regulated recharge areas that may pose a threat to drinking water. They include provisions for phasing out operations such as road oil storage, landfills or special waste disposal units within three years after a setback zone is established. There are also provisions for other potential threats such as pesticide or fertilizer storage units.<sup>22</sup> Communities may establish more stringent rules if they choose.

New facilities for waste, underground storage tanks, pesticides, fertilizers, road oil or de-icing agents are generally prohibited although it is possible for an owner to secure a waiver from the owner of the well and the Illinois EPA that allows construction.<sup>23</sup>

Furthermore, the regulations include groundwater monitoring provisions, including sampling and reporting requirements. If a groundwater parameter is exceeded, the owner or operator must take corrective action. Indiana will waive certain monitoring provisions if specific threats around a wellhead are removed.

The Act also established a well site survey program or contaminant inventory carried out by the Illinois Environmental Protection Agency. The surveys include a “hazard review” of potential sources of contamination and the possible routes of contamination that may

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<sup>22</sup> Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 615, Existing Activities in a Setback Zone or Regulated Recharge Area.

<sup>23</sup> Title 35: Environmental Protection, Subtitle F: Public Water Supplies, Chapter I: Pollution Control Board, Part 616, New Activities in a Setback Zone or Regulated Recharge Area.

pose a risk to the water supply. In addition to the work done by the Agency, communities are authorized to conduct comprehensive surveys with more detailed identification of pollution threats, referred to as “groundwater protection needs assessment”.

Outside of the authority of the Act, Illinois established, as part of the Wellhead Protection Program, the prioritization of permits and enforcement actions for activities within the wellhead protection areas.

#### **4.2.1 Approach to Great Lakes Assessments** **Case Study: Chicago, Illinois**<sup>24</sup>

Chicago, Illinois, is an example of a major Great Lakes City whose assessment is typical of the assessments done for Great Lakes’ communities under the Source Water Assessment Program. Serving a population of nearly 3 million people, Chicago relies on Lake Michigan as a source of drinking water.<sup>25</sup> All eight Great Lakes States have communities that use the Great Lakes to supply drinking water, although Pennsylvania has only one.

For Great Lakes’ communities taking drinking water from the Great Lakes, the EPA set up a work group with the eight states to develop a protocol for the source water assessments. This Protocol was intended to ensure a co-ordinated approach. (See Appendix I.)

The work group included representatives of the Great Lakes States, water utilities with intakes on the Great Lakes, U.S. EPA Region V and other parties. In 2002, they decided on an Assessment Protocol for Great Lakes Sources which would guide the States in developing a consistent procedure while allowing enough flexibility to take into account the variability and site-specific concerns of the different sources. It was recognized that some intakes extend far enough into a lake to receive no shoreline effects from specific contaminant sources while others with intakes closer to the shore do.

The work group agreed on the concept of a “critical assessment zone” around each Great Lake intake. Potential sources of contamination within this zone would determine the sensitivity of the drinking water. Connecting river sources were to have zones defined 2000 feet (609 meters) upstream from the intake. The sensitivity of the Great Lake drinking water source could include major contaminant sources outside the Critical Assessment Zones.

The two factors that were judged to affect the sensitivity of Great Lakes intakes were the

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<sup>24</sup> Illinois Environmental Protection Agency, Division of Public Water Supplies, Groundwater and Source Water Protection Section, “Source Water Assessment Program Fact Sheet: Chicago”, prepared in cooperation with U.S. Geological Survey, November 2003.

<sup>25</sup> Illinois Environmental Protection Agency, Source Water Assessment Program, “Chicago: Facility 0316000, Cook Country”, November 2003.

length of the intake pipeline and the water depth of the intake structure.

For intakes that were judged not to be impacted by potential shoreline contaminants, assessments of Great Lakes' communities were to reference sources such as the information from the U.S. EPA's Great Lakes National Program Office, the Great Lakes Mass Balance Studies, Remedial Action Plans for Areas of Concern and the Lakewide Management Plans. Some of these studies included contaminants from air deposition. Total Maximum Daily Loads were also to be referenced.

The shallower, near shore intakes were considered to be more sensitive to shoreline influences than the off shore, deep intakes. Sensitivity of the intakes to contaminants was calculated by multiplying the length of the intake pipe by the water depth. This calculation was intended to be a tool to prioritize assessment activities and assist with susceptibility determinations after taking potential contaminant sources into account.

The Illinois Environmental Protection Agency defined "susceptibility" as "the likelihood for the source water(s) of a public water system to be contaminated at concentrations that would pose a concern". Chicago's shore intakes were considered to be highly sensitive and critical assessment zones were delineated as 3,000 feet (914 meters) around each shore intake.

Studies of water quality, sediments and biota that were used to determine source water quality showed that all 63 miles of the Illinois shore was designated as Full Support for aquatic life and Full/Threatened for public water supply. The determination that the shoreline was Full/Threatened as a water supply was based on phenol levels that exceeded the water quality standard.

Potential sources of contamination included point sources and non-point sources. Point sources were identified as landfill sites, including those undergoing cleanups, discharges which are given permits under the National Pollutant Discharge Elimination System (NPDES), hazardous waste sites, leaking underground storage tanks and facilities reporting under the Toxic Release Inventory rules. Nonpoint-derived parameters of concern included waterborne pathogens, fecal coliforms, nitrogen, phosphate and herbicides.

As well, one of Michigan's Areas of Concerns defined by the Great Lakes' Water Quality Agreement, the Grand Calumet River, was identified as a source of contaminants – particularly PCBs, PAHs and heavy metals, originating from both point sources and non-point sources.

Illinois considers all surface water sources of drinking water to be susceptible to potential pollution problems. For Chicago, shoreline point sources were not considered to be an immediate threat, but the combination of land use, the proximity of the Chicago River, the Indiana industrial area and potential barge traffic were identified as contributing to the susceptibility of the drinking water supply.

The assessment concluded that “one of the best ways to ensure a safe source of drinking water is to develop a program designed to protect the source water against potential contamination on the local level”. An example of a proven best management practice designed to improve the public’s awareness of their potential negative impact on the environment was the identification and stencilling symbols like fish on storm water drains within a watershed.

According to the Illinois DEP, Chicago has not developed a Source Water Protection Plan.

### 4.3 Indiana

The Indiana Department of Environmental Management (IDEM) is responsible for the state’s Source Water Protection Programs. Source water assessments were completed for all ground and surface sources of drinking water in the state. To formalize Indiana’s commitment to protecting groundwater, Indiana passed the 1989 *Ground Water Protection Act*. The Act establishes regulations that protect groundwater sources of public drinking water.<sup>26</sup>

Indiana is one of only two states that have built on the federally-mandated assessment program and introduced legislation that requires all community public water systems to develop plans to protect groundwater sources.

Of 4,500 public water supply systems using groundwater in Indiana, about 900 are community systems. Groundwater supplies approximately 60 per cent of Indiana’s drinking water.<sup>27</sup>

Indiana also has several large communities that use surface water supplies, including Gary, Michigan City and East Chicago which draw their drinking water from Lake Michigan. Assessments were conducted by the U.S. Geological Survey and provided to the water suppliers. However, community water systems using surface water are not required to follow up the assessments by developing plans, and there are no formal programs encouraging voluntary source protection planning.

#### Wellhead Protection Rule

In 1997 Indiana passed a Wellhead Protection Rule that is administered by the Ground Water Section of the IDEM.<sup>28</sup> Indiana’s Wellhead Protection Rule puts the onus on the community public water supplier to develop and implement protection plans with the Department taking responsibility for reviewing and approving them. Where non-

<sup>26</sup> Indiana Department of Environmental Management, Indiana Wellhead Protection Guidance Document. Pg.4. Accessible at [www.in.gov/idem/programs/water/swp/whpp/index.html](http://www.in.gov/idem/programs/water/swp/whpp/index.html)

<sup>27</sup> Ibid. pg. 1.

<sup>28</sup> 327 IAC (Indiana Administrative Code) 8.4-1 Wellhead Protection.

community water systems develop wellhead protection plans, the state will endorse the program if it is consistent with the community plans.

The wellhead protection program consists of two phases.

The first phase, Phase I, requires all communities with public water systems to develop a plan to protect the areas around their existing wells or wellfields.<sup>29</sup> These are known as Phase I plans.

The minimum requirements include:

- 1) The establishment of a local planning team to guide the development and implementation of the plans;

Local planning teams must have representation from parties “that may be affected by the development and implementation” of the Wellhead Protection Plan. No specific representation or size of committee is referred to in the Rule. Guidance suggests that local planning teams include members representing a local environmental conservation group, neighbourhood association, community service organizations, or concerned citizens. The formation of the local planning team must be announced in the newspaper with the largest circulation in the local area.

- 2) The delineation of the wellhead protection area;

Communities may delineate the wellhead protection area by using any one of 5 different methods. These include using a fixed radius method if approved by the IDEM, hydrogeologic/geomorphic mapping, analytical, semi-analytical or numerical flow/solute transport methods which contributes water to a well and through which contaminants are likely to move through and reach the well over a specified period of time. The minimum criteria are a time of travel threshold of five years for modelling wellhead protection areas or a radius of 3,000 feet (914 meters) when using the fixed radius method in Indiana.<sup>30</sup> However, Indiana encourages communities to delineate protection areas beyond the minimum criteria for greater protection.

Under previous rules for drinking water protection, Indiana required radii of either 100 (30 meters) or 200 feet (60 meters) around all wellheads to be designated as sanitary setback areas. Within these sanitary setback areas, activities that might contaminate drinking water are prohibited or controlled.

- 3) Identification and inventory of potential contaminant sources, including a map;

This inventory must contain a complete list of sources, the type of activity performed at the site, chemicals stored or handled on-site and whether the facility is regulated by local

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<sup>29</sup> Indian Department of Environment, Indiana Wellhead Protection (Guidance Document). Accessible at [www.in.gov/idem/programs/water/swp/whpp/index.html](http://www.in.gov/idem/programs/water/swp/whpp/index.html)

<sup>30</sup> Ibid. III-1.



state or federal agencies. Both regulated and unregulated potential sources of contamination within the delineated area should be identified.

4) Development of a management plan for potential contaminant sources;

Management plans must indicate how a community intends to manage the wellhead protection area. This would include measures to prohibit the storage and mixing of chemicals other than those used for drinking water or pesticides regulated by the pesticide review board; provisions to prevent unauthorized access to the wellhead; monitoring for contaminants associated with identified potential sources of contamination; identification of abandoned wells; notification of property owners, mineral owners and leaseholders that they are located within a groundwater protection area; establishment of a public education program; and, posting of wellhead protection signs along major thoroughfares at the perimeter of the wellhead protection area.

5) and, development of a contingency plan.

Contingency plans would include, among other features, plans to train local responders, identification of alternative sources of water and procedures to notify critical water users in an emergency.

These wellhead protection plans must be submitted and approved by the IDEM. Although there are no legislated requirements for implementing the wellhead protection plans, the planning process requires communities to consider the management of wellhead areas and develop strategies for protection. More than 750 Phase I plans have been reviewed and approved.<sup>31</sup>

The second phase, Phase II, is the requirement for community water systems to report to the IDEM on the implementation of the first phase of their work, and to update their management strategy.

Large communities of 50,000 or more people are required to report back on the implementation of their plans within 5 years, medium-sized communities between 3,300 and 50,000 report back within 7 years and smaller communities of less than 3,300 report back within ten years. After a Phase II plan is approved, regular updates are required every 5 years for the life of the water supply. This reporting is required whether the plans are implemented or not.

According to the IDEM, 5 or 6 communities are scheduled to report back on their Phase I work in the coming year, and this will give the state the opportunity to learn more about what communities are doing and whether they are acting on the implementation.

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<sup>31</sup> Personal Communication, Jim Sullivan, Indiana Dept. of Environmental Management, Ground Water Section, June 7. 2007.

## New Wells

For new wells, Indiana requires the approval of a well site before a construction permit is granted.<sup>32</sup> Wellhead protection is incorporated into the well site approval process.

If a new well is proposed in an already established wellhead protection area, the application must include a description of the site in relation to the wellhead protection area.

For a new well in a wellfield area that is located in a separate wellfield away from all other wells, a community water supplier must apply for a construction permit and submit information including a delineated wellhead protection area, identification of potential sources of contamination, and a schedule for developing a Phase I Wellhead Protection Plan.

A community water supplier must not allow any new potential sources of contamination to locate within the sanitary setback area.<sup>33</sup> Sanitary setback areas are generally either owned, or controlled by the water supplier through lease or use agreements. Where the delineated capture zone for groundwater wells goes beyond the sanitary setback area and is not necessarily controlled by the water supplier, the water supplier must work with fire departments and other local authorities to protect drinking water. Indiana encourages local ordinances or overlay zoning in the designated protection zone. For example, Indianapolis has instituted a local ordinance which prohibits the installation of new underground tanks in its delineated zone.

Other state regulations require that no solid waste landfills be located within 3,000 (914 meters) feet of a well and that no sources of bacteriological contamination be located within 200 feet (60 meters) of a well or wellfield.

## Funding

The state funds 7 full-time staff to implement the wellhead/source water protection program. They assist communities, review and approve plans as well as promote collaborative efforts between organizations, the private sector and different levels of governmental agencies. Currently there are no grants or monetary assistance programs aimed specifically at communities with wellhead protection plans, though access to other assistance programs such as Brownfield assessment and household hazardous waste collection grants is available.

## 4.4 Michigan

Michigan's Source Water Assessment Program is the responsibility of the Source Water Protection Unit of the Water Bureau of the Michigan Department of Environmental

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<sup>32</sup> Section 327 IAC 8-4.1-12.

<sup>33</sup> Section 327 IAC 8-4.1-13.

Quality (DEQ). Michigan has no mandatory source protection planning requirements. However, the state has active non-regulatory groundwater and surface water protection programs that promote planning. It is one of the few states to set up a program with dedicated staff for protecting surface water intakes.

Michigan's wellhead protection program was developed in response to the 1986 SDWA amendments. Nearly one half of the Michigan population uses groundwater for drinking. The wellhead protection program is a voluntary program which helps local communities using groundwater to develop wellhead protection plans to protect their wells.

## Funding

Communities who have been involved in this program have been motivated by the availability of grants from the state. To be eligible for these grants, communities must provide matching funds. Public water suppliers who choose to participate in the program are required to develop a local wellhead protection plan consistent with state guidelines and to report to the Michigan DEQ on their programs. The Wellhead Protection Program has at least 172 approved plans.

There are seven elements required under the Michigan Wellhead Protection Program:

- The identification of individuals responsible for the development, implementation and long-term maintenance of the Wellhead Protection Program. Partnerships are encouraged between local, township, county, regional and state agencies and organizations because "ground water knows no political boundaries". The team must include the water supply superintendent and a representative of the municipality. In addition, Michigan suggests that other representatives be from the local health department, local fire department, business and industry, agriculture, education, planning, an environmental group and/or the general public. Scoring in the grant process is based to a certain degree on the strength of the team;<sup>34</sup>
- The identification of the area of groundwater contributing the public water supply well. Michigan requires a hydrogeologic study to identify the surface and subsurface area surrounding a water well or well field, supplying a public water system, based upon a ten-year time of travel;
- An inventory of potential sources of contamination. As a minimum, this must include a check list of known sites of environmental contamination identified by state and federal legislation, such as leaking underground storage tanks, Superfund sites, sites of environmental contamination (201 sites of Act 451), and oil and gas contamination sites. As well, other sites of concern must be identified;
- A management plan. Examples of elements include: abandoned well search and/or closure; zoning ordinances for wellhead protection; facility inspection or hazardous material survey program; information to businesses concerning state and county requirements; environmental permits checklist for new businesses;

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<sup>34</sup> Michigan Department of environmental Quality, An Overview of Michigan's Wellhead Protection Program.

strategic monitoring within the wellhead protection area; inter-agency coordination and communication; and, identification of partnerships or agreements with county or state agencies which will help implement the local program. Management plans should attempt to minimize land use activities which pose a significant threat, motivate landowners within the protected areas to take steps to reduce threats, and provide education to residents, businesses and industries;

- A contingency plan, including a response protocol, methods for handling emergencies, particularly chemical spills, and a plan for providing an alternative water supply;
- A procedure for siting new wells. Communities siting new wells are strongly encouraged to develop wellhead protection plans at the time of construction; and,
- A public education program.

These elements are described in the legislation governing the grant allocation process. Points are awarded to communities in the competition for grants based on their descriptions of how they will address these requirements. They are also provided in a checklist which must be returned to the Michigan DEQ for program approval.

Another feature of the Michigan Wellhead Protection Program is the use of a tritium analysis to determine the vulnerability of a ground water system. The tritium analysis is used to estimate the recharge time of the groundwater system and susceptibility of the system to contamination. Levels below one tritium unit indicate that the aquifer is not vulnerable.

Michigan also has the voluntary Surface Water Intake Protection Program that encourages communities that draw from surface water supplies to develop plans. There are 60 sources of surface drinking water in Michigan, most on Lake Michigan and several on rivers. Surface water intakes supply about 50 per cent of the population.

The Surface Water Intake Protection Program is based on the seven basic program elements of the Wellhead Protection Program, described above. The protection area is designated as an Intake Protection Area for surface water systems. It is the same zone described in the source water assessments completed under the SDWA.

The assessments identified the approximately 10 communities with river intakes as more vulnerable to pollutants than communities with water intakes on lakes. Consequently, the DEQ worked with them first to encourage the development of protection plans. Since there was no federal funding available for protection planning for surface waters, the communities that did participate were driven by concerns for public health. The three communities drawing on surface water sources that have approved source protection plans are: the City of Adrian that is part of the River Raisin watershed, the City of Alpena on Lake Huron, and Ira Township. Ira Township on Anchor Bay in Lake St. Clair has already completed and published their Source Water Protection Plan (see next case study).

Michigan's Surface Water Intake Protection Program recognizes that activities within a watershed can affect drinking water sources. As in many U.S. states, Michigan has active watershed councils. Watershed councils are public service organizations made up of representatives of local governments, environmental groups and interested individuals to promote the improvement of water quality in specific watersheds. They are often funded by state and federal grant programs.

However, the Source Water Protection Unit of the DEQ has found that watershed councils do not always consider drinking water protection in their program implementation. The DEQ has been trying to coordinate protection activities with local watershed councils.<sup>35</sup> They encourage watershed councils to include drinking water issues in watershed management plans, and they encourage communities developing source water protection plans to include watershed or storm water issues such as storm water discharge and beach monitoring. They also encourage crossover memberships such as representation from watershed councils on the local source water intake protection teams and participation of the municipality in the watershed council.

Michigan also has 13 degraded areas on the Great Lakes, in addition to two binational areas. These areas are known as Areas of Concern, identified by the U.S. and Canadian federal governments pursuant to the Great Lakes Water Quality Agreement. At least five of these, including the Detroit River, have identified restrictions on drinking water or taste and odour problems as one of the 14 identified beneficial uses that has been impaired.<sup>36</sup> However, Michigan has not integrated programs for restoring Areas of Concern with its Source Water Protection Program.

#### **4.4.1 Protection Planning for a Small Surface Water Supply Case Study – Ira Township (St. Clair River)**

Ira Township has a small population of approximately 7,000 people. It takes its drinking water from Anchor Bay which is part of Lake St. Clair.<sup>37</sup>

Lake St. Clair is fed by the St. Clair River from Lake Huron, and by some minor tributaries. As a result, Ira Township's drinking water is highly susceptible to the chemical spills from the numerous industries located upstream along the U.S. and Canadian sides of the St. Clair River. Michigan has 14 community water supplies along the St. Clair River that serve about half the state's population.

Motivated by concern for the integrity of their drinking water supply, Ira Township

<sup>35</sup> River Raisin Watershed Council, "Source Water Intake Protection Program". Accessible at [www.riverraisin.org/features/swipp](http://www.riverraisin.org/features/swipp)

<sup>36</sup> U.S. Environmental Protection Agency, Great Lakes Areas of Concern. Accessible at [www.epa.gov/glnpo/aoc/](http://www.epa.gov/glnpo/aoc/)

<sup>37</sup> Ira Township, Ira Township Source Water Protection Program Plan, August 25, 2005.

participated in the Surface Water Intake Program of the Michigan DEQ and is one of the first communities to develop a Source Water Protection Program Plan. Its plan was made public on August 25, 2005.

The Plan was developed in accordance with the Michigan Department of Environmental Quality's Water Bureau guidance. One of the first goals of the plan is to increase public and government awareness of the need for reliable early warning detection and notification systems. The source protection plan focuses on protecting Ira Township from the impacts of potential spills by reducing the opportunities for impacts, but does not consider strategies to address the upstream facilities responsible for the threat.

The Plan follows the model established by the Michigan Wellhead Protection Program. It includes the following elements:

- It identifies the source water protection team, which is made up of the Township Supervisor, the Dept. of Public Works Superintendent and Foreman. Upon approval of the plan by the Michigan DEQ, this core group will be expanded to invite representatives of the Health Dept., Farm Bureau, Planning Commission, local school system, industrial and commercial representatives, and a representative from local environmental organizations. The expanded Team would be responsible for periodically reviewing the document and developing action items to achieve the program goals.
- The Plan recognizes that Anchor Bay, Lake St. Clair and the St. Clair and Detroit Rivers are the subject of "much interest regarding water quality and source water protection". Although the expanded source water protection team is not yet meeting regularly, regional cooperation has been underway for several years. Ira Township already participates in regional meetings on water quality that include a number of other interested groups, including the Southeastern Michigan Council of Governments, which promotes watershed and source water protection for Lake St. Clair. However, the regional meetings do not include any cross-border representatives.
- The Plan contains a delineation of a source water protection area for the Anchor Bay Intake water supply source based on the U.S. Geological Survey and DEQ defined source water area. The Critical Assessment Zone was defined using the Great Lakes Protocol. The Ira Township Source Water Protection Program focuses on facilities and potential spills to this zone, and looks for opportunities to reduce their impact on drinking water.
- Potential contamination sources are identified. These are derived from regulatory databases and include point sources such as hazardous or solid waste sites, storm sewer outfalls and industrial discharges. They also include non-point sources including urban and agricultural runoff and drainage ditches.
- The Plan sets out four separate management strategies. The first is an

infrastructure approach which will involve developing hydraulic models to understand flows within Lake St. Clair in order to develop a better understanding of how to protect drinking water. In addition, local municipalities, county, state and federal agencies plan to implement a real-time monitoring system to be installed at selected water treatment plants in order to provide advance warning of spills or pollution events. The second is the development of a public education plan that will improve reporting of illicit discharge, promote water stewardship and raise awareness of house and yard storm water pollutants. The third strategy is regulatory and involves adopting the Source Water Protection Plan into the Township's Master Plan. Ira Township is a zoned community with a Master Plan that controls development for the township. Adoption of the Source Water Protection Plan into the Master Plan will give regulatory status to the elements of the plan. The fourth strategy is a review of contaminant sources and an outreach program for facility operators of potential contaminant sources.

- The Plan sets out contingency plans for intake shut-downs and alternate water supplies.
- It addresses how a new source for the water system would be evaluated. New intakes would be sited along the Bay within the Critical Assessment Zone already identified. As a result, the Plan would only need updating.
- The last section describes the Public Education Plan that would encourage public participation and enhance awareness of water quality issues. The Township acknowledges that the current Public Education Plan is more focussed on watershed issues, and indicates that, based on funding, messages to the public would be more directly related to drinking water issues and that efforts would be made to tie the two concepts together and strengthen the message for both programs.

## 4.5 Minnesota

The Minnesota Department of Health has the responsibility for source protection programs in Minnesota. Minnesota is considered to be the leader, certainly among the Great Lakes States, in the initiation and design of source water protection programs.

Its well-developed source water protection program is directed primarily at groundwater protection, although it has also done preliminary work on surface water intake protection. In order to consolidate its ground water protection laws, in November 1997 the state of Minnesota adopted a Rule for wellhead protection (Minnesota Rules, Parts 4720.5100 to 4720.5590).<sup>38</sup> The state believed there were advantages of state-wide regulations, such as setting consistent standards, technical criteria and a similar level of review for all wells in the state.

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<sup>38</sup> In the United States, the term “rule” is used to apply to what in Canada is known as a “regulation”.

The requirements of the wellhead protection program are well-defined in the legislation, and the program is supported by qualified staff members at the Minnesota Dept. of Health (DOH) that provide technical help and guidance, including 8 planning staff and 6 hydrogeologists. In addition, the Minnesota Rural Water Association has a Source Protection Planner who also assists communities.

Communities are phased into the wellhead protection program based on a list developed by the Minnesota DOH of the most vulnerable wells, based on water chemistry, well construction and geological data. When a public water system is notified by the DOH that it must begin to develop a wellhead protection program, a planner and hydrogeologist are assigned to the public water supply when it enters the program. The level of support given by DOH staff depends on the needs of the community. For new wells, the public water supplier must do a wellhead protection plan once a well is in service.

The development of a wellhead protection plan in Minnesota consists of two phases:

Phase One is the detailed identification of the recharge area and a statement of vulnerability. If a community has a population of less than 3300 people, the state provides a hydrogeologist to identify the recharge area. Communities with more than 3300 people must hire their own consultants to do the necessary hydrogeological studies. The regulations require a delineation of the wellhead and recharge area based on the amount of water, the boundaries of the aquifer and the flow conditions. A computer model that is as accurate as possible is created of the recharge area, and this area becomes the drinking water supply management area. The state then assigns a vulnerability rating to the wellhead protection area.

Phase Two is the identification of potential contaminant sources and the development of a wellhead protection action plan. The responsibility for this phase lies primarily with the public water supplier. The public water supplier must identify a person to coordinate the development and implementation of the protection plan. They are also required to notify local governments within the protection area of their intention to develop a plan and meet with them at least once during its development. The public water supplier is also required to ensure that there is a public participation process in place during this phase although Minnesota's legislation does not specify the scope and extent of the participation.<sup>39</sup> Generally, they create a team of community members to assist in this phase of the program.<sup>40</sup>

During Phase Two, both the potential contaminants and their location in relation to the system are first investigated. For vulnerable water systems, all land use activities are considered. The public water supplier must develop maps of contaminant sources, and identify "problems and opportunities" for both land and water use, including goals.

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<sup>39</sup> Part 4720.5300, subpart 6.

<sup>40</sup> Personal communication, Dave Neiman, Source Protection Planner, Minnesota Rural Water Association, June 6, 2007.



Emergency response programs and water quantity considerations are also included in the plans. An implementation strategy is developed that outlines what actions the water supplier will take such as working with landowners to reduce potential contaminant threats, what actions require the cooperation of local, state or federal agencies, and what commitments have been made to the water supplier.

Once plans are completed, the DOH reviews them, as do other state agencies. For each plan, there is a public comment period and a public hearing. Water suppliers are then expected to implement the plan over a 10 year period. They are also required by law to evaluate progress and address management strategies every 2 ½ years, although they are encouraged to do it annually.

Minnesota has about 900 municipal community systems and between 6,000 and 7,000 non-transient, non-community systems, which are required to do wellhead protection plans. About 250 systems have programs underway, and an estimated 150 are in the implementation stage as of June 2007. The state's goal, which they have not reached, was to have all public water suppliers where groundwater is used as a drinking water source to have some level of protection implemented by 2006.

#### Surface Water Source Protection

In addition, Minnesota has taken some steps towards surface water protection work. Although planning to protect surface water is voluntary for public water suppliers, many of Minnesota's 24 surface water systems have shown interest in developing protection plans. A guidance document, "Recommendations and Guidance pertaining to the Development and Implementation of Source Water Protection Plans for Public Water Supplies Relying on Surface Waters", has been prepared in order to define Minnesota's approach to source water protection for surface water intakes.

Currently, a major source protection project is underway for the Upper Mississippi River, involving the communities of St. Cloud, St. Paul and Minneapolis (see next case study). State involvement in source protection planning for other communities with surface water intakes has been put on hold until this pilot project is further along so that the experience can be applied to other surface water intakes.

#### Great Lakes

Minnesota has few communities drawing drinking water from the Great Lakes. Duluth is the largest city in Minnesota using Lake Superior as a water supply. For communities on the Great Lakes, source water assessment areas were defined as three distinct "nested" areas – 1) the inner emergency response area based on the critical assessment zone established by the "Great Lakes Protocol", 2) the outer source water management area designed to protect people from long-term health effects (including the potential for future land use development that may have an impact on the water supply), and 3) the entire Lake Superior watershed.

It was determined that the susceptibility of any surface water, including Lake Superior, was high because there was “no practical means of preventing all potential contaminant releases into surface waters”.<sup>41</sup> In its final comments on using the assessment, the DOH wrote that the assessments prepared for Duluth and for other communities along the shore of Lake Superior could be used to bring communities together to begin the development and implementation of a basin-wide approach to implementing source water protection measures.<sup>42</sup>

#### **4.5.1 Protection Planning for a Large Watershed Area** **Case Study – Upper Mississippi River Source Water Protection Project**

This project is considered to be one of the most ambitious source water protection projects for surface water supplies underway in the United States. It has been described as “a first attempt in Minnesota, and perhaps in the country, to implement source protection at a watershed level among several water suppliers who share a common source water resource”.<sup>43</sup> The project is funded by the Minnesota Pollution Control Agency.

Although many Minnesota communities using surface water supplies have shown interest in developing protection plans, the Upper Mississippi River Source Water Protection Project will pioneer the development of source protection planning for surface water supplies in the state of Minnesota. Three communities – St. Paul, Minneapolis and St. Cloud -- have joined together in a coordinated effort to build on the source water assessments, wellhead protection plans and previous watershed work to develop a source water protection plan for the Mississippi River.

This project is being done in two parts. The first part of the source water protection plan is the delineation of the source water protection area and drinking water management area. The project started with the original source water assessments for the three communities, but water suppliers enlarged the source water protection area to ensure greater source water protection. The larger source water protection area is now based on contiguous watersheds which lead into the Mississippi River. It takes in the entire Mississippi River watershed.

The “Composite Source Water Protection Area” for these communities includes nearly 7,700 square miles (20,000 square kilometers), and covers both surface water supplies and wells. Although source water assessments have been done for communities that use surface water supplies and for communities that use wells within the planning area, these are small site specific assessments and leave vast tracts of land within the new source water protection area unassessed. Because of the difficulties in planning for such a large

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<sup>41</sup> City of Duluth, Minnesota, Source Water Assessment, June 2002, prepared by the Minnesota Dept. of Health.

<sup>42</sup> Ibid. p.7.

<sup>43</sup> Great Lakes Regional Water Program, “Source Water Protection”. Accessible at [www.uwex.edu/ces/regionalwaterquality/FocusAreas/drinkingwater/sourcewater.htm](http://www.uwex.edu/ces/regionalwaterquality/FocusAreas/drinkingwater/sourcewater.htm)

area, the source water protection plan will establish contaminant and geographic priorities within each watershed area. Contaminants priorities in St. Cloud's plan, for example, were identified on the basis of their presence at high levels in source water, the limitation of water treatment, contaminant concentrations that could contribute to disinfection byproducts, lack of monitoring data and lack of knowledge regarding sources and health effects. St. Cloud prioritized contaminants as high, medium and low priorities.

The second part of the source water protection plan will include a contaminant source inventory and management strategy to address contamination threats. It will also identify data elements that are important to consider in managing source water. These include precipitation, geology, soils, water resources, land use, public utilities, surface and groundwater quantity and quality.

A limitation of the EPA guidelines for source water assessment was the use of existing data for the assessment of drinking water sources. Many potential contaminant sources in the United States are not documented. This could include underground storage tanks. For this reason, the Project will work closely with local levels of government who know the geography of their communities and can identify potential problems.

As of October and November 2007 respectively, both St. Paul and St. Cloud have released Part II of their Source Protection Plans for a 60 day public review process. The plans include many detailed strategies for protecting source water such as public awareness campaigns, stormwater management in high priority areas including buffer or filter strips, improvements in agriculture management practices through reducing chemical use, developing spills notification procedures and training tank owners. *For more information, the Upper Mississippi River Source Water Protection Project has a website at [www.umrswpp.com](http://www.umrswpp.com)*

## **4.6 New York State**

New York State has completed source water assessments for all public water supplies in the state as mandated by the federal *Safe Drinking Water Act*. Responsibility for the source water assessment program was given to the New York State Department of Public Health who are responsible for drinking water quality, rather than the Department of Environmental Conservation. The assessments, or summaries of them, are available upon request.

However, New York State has not followed up the assessment program with a program for source protection planning, either for wellheads or surface water sources of drinking water. The Dept. of Public Health adopted a position that source water protection planning was a voluntary effort on the part of communities.

New York State did have a voluntary wellhead protection program that assisted municipal community water programs with the development of protection for their

groundwater supplies, but this program is not very active at the present time. For new wells, approvals must be given by the Department of Health under the Public Water Supply Permit Program. Wells are not approved unless a zone of a minimum 200-foot (60 meters) radius is protected through direct ownership of the land or the acquisition of protection easements. In this zone, activities such as highways, facilities with state discharge permits or other activities with the potential to pollute the well are prohibited.

In June 2005, the New York Rural Water Association released a study which evaluated its own demonstration project to encourage water suppliers and communities to use source water assessment data for planning and which assessed the awareness of the source water assessment program in New York.<sup>44</sup> The Association chose the region around the state capitol of Albany to set up meetings and discuss source water assessments for public systems including both ground and surface water.

In their individual meetings, the Rural Water Association discovered that water systems and communities had some familiarity with source water assessments but were unaware that the assessments were intended to spur local drinking water protection efforts. Nor did they understand the nature of their source sensitivity or the types of contaminants that they faced. Mailings of source water assessments to local officials were limited in the amount of information provided and did not provide an opportunity for dialogue.

All water systems had limited resources and often source water protection was not the highest priority. The Rural Water Association concluded that individual meetings were an effective way to improve awareness of local source protection issues.

### *Source Protection Plans*

New York State Department of Health, however, does have a unique law for protecting drinking water supplies, which has been in place for more than 100 years. The Watershed Rules and Regulations, authorized under provisions of Section 1100 of the New York State Public Health Law, allow local water supply officials and public health engineers to develop plans for protecting drinking water that can be approved by the state Public Health Department and become legally binding.

Communities that are interested in protecting their drinking water supplies propose to the State Dept. of Health rules that would restrict activities that might harm the integrity of their drinking water supply. Watershed rules and regulations often incorporate state regulations, but they may also introduce rules that are stricter than state regulation. They must be approved by the New York State Department of Health. Watershed rules and regulations can be compared to source protection planning in other jurisdictions. However, many of the communities in New York State with watershed rules and regulations have not updated them for many years, and there is no state requirement for this type of planning or for updating.

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<sup>44</sup> New York Rural Water Association, Final Report, Application of SWAP for Local Source Water Protection Awareness: A Demonstration Project, June 2005.

These laws are primarily useful where several municipalities are involved and local zoning ordinances cannot be applied to the whole area. New York City is the most well-known example of a municipality with Watershed Rules and Regulations,<sup>45</sup> but more than 200 communities in New York State have adopted them. Syracuse is another example of a community with Watershed Rules and Regulations for Lake Skaneateles, the City's drinking water source, located in 3 different counties.

In cases where a municipality has control over its drinking water source, the Public Health Dept. recommends that the quicker process of zoning be used.

The process for approving or updating these plans may take as long as two years and involves the opportunity for public comment. However, one benefit to communities is authorizing local agencies to enforce these rules. For example, the Rules and Regulations for the City of Auburn allow the Mayor and Council or anyone charged with responsibility for the public water supply to make regular inspections to ensure compliance with the rules and to serve notices for violations. Violations must be reported to the Department of Health.

## **4.7 Ohio**

The Division of Drinking and Ground Waters of the Ohio Environmental Protection Agency is responsible for source water protection programs, and has completed assessments for over 5400 public water supplies in Ohio.

Ohio merged its Wellhead Protection Program and Source Water Protection Program into one Drinking Water Source Protection Program, directed at promoting planning for the protection of all drinking water sources, both groundwater and surface water. Although all drinking water source protection is voluntary, staff members of the Ohio EPA are active in promoting the development of plans by providing technical assistance and doing outreach. Staff members meet with the operators of public water systems and encourage them to participate in the program.

The elements of source water protection plans that are emphasized by Ohio include: public education; contingency planning, including drinking water shortage planning; strategies to protect source water from local specific contaminant sources; and, in some cases, monitoring of ground water before treatment. Protected areas around sources have already been delineated by the state in the assessments, and contaminant inventories developed.

The Ohio EPA has developed two guidance documents for initiating source water protection at the local level. In November 2006, the state published "Developing Source Water Protection Plans for Public Drinking Water Systems Using Inland Surface Waters". Although the document applies primarily to surface water based public water suppliers for cities, villages and other populated areas using inland surface water systems,

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<sup>45</sup> New York City's Watershed Rules and Regulations are available on the Internet at <http://www.nysefc.org/home/index.asp?page=287>

portions are also relevant to Lake Erie systems and Ohio River systems which were assessed differently from inland water systems. Another guidance document, “Developing Local Drinking Water Source Protection Plans” was published in July 2003 for public water systems using ground water. After communities have developed plans, they are reviewed and endorsed by the Ohio EPA.

Several examples of protection efforts are used by the Ohio EPA to demonstrate what can be accomplished with plans. The City of Dayton, with two wellfields supplying its drinking water, has used an incentive based program to address pollution sources called the “Risk Point Buy Down” program to stimulate protection. A fund of up to \$10 million has been created from a surcharge on the city’s water customers. Businesses may qualify for conditional grants from this fund if owners are willing to make a 97 per cent reduction in their maximum daily inventory of regulated substances and sign a conservation easement agreeing to maintain this level. Businesses that take measures to reduce the risk to groundwater are eligible for zero interest loans, even if they do not decrease their inventories of regulated substances.

Another example used to promote ordinances as a way of addressing contaminant sources is the City of Lancaster, also dependent on groundwater for drinking. To control primarily petroleum and chemical storage, the city instituted a zoning ordinance that prohibited certain activities in an inner management zone and throughout the larger protected area. Existing facilities are now considered non-conforming and must register with the City. The ordinance also provides for inspections and penalties.

The biggest challenge for the Ohio EPA, however, is persuading communities to develop plans. So far, about 80 communities have developed plans. Without the legislative stick of mandatory source water protection planning, the Ohio EPA has created some incentives for creating plans. System operators are given credits for continuing education for attending training sessions on how to develop plans and for doing them. In addition, communities with endorsed plans receive higher priority for low-interest loans from the Ohio EPA. Ohio is currently surveying all operators of water supply systems in order to measure the success of implementing the Source Water Protection Program.

Although Ohio has not put in place legislation to require planning, the state did revise its Administrative Code to strengthen source water protection. Under the Administrative Code, the state has placed restrictions on certain activities within drinking water source protection areas. For example, the application, storage or stockpiling of sewage sludge cannot be done in a protected drinking water area for community groundwater systems. And, underground injection wells for existing motor vehicle waste must be closed by 2007 in any area near a drinking water source.

Ohio EPA has also set up an educational initiative called SWEET (Source Water Environmental Education Teams) with the Department of Soil and Water Conservation to raise public awareness about the importance of source water protection. Under this program trained teams of educators go to community festivals, schools and civic

meetings and educate the public through groundwater simulator models and other materials.

Ohio has about 130 surface water systems, including about 24 communities drawing their drinking water from Lake Erie. None of the Great Lakes communities have developed source water protection plans, although oil and gas wells and shipping were identified as a major concern.

## 4.8 Pennsylvania

The responsibility for source water protection programs resides with the Bureau of Water Supply Management in the Department of Environmental Protection (DEP) in Pennsylvania.

Pennsylvania has built an active wellhead protection program that is the cornerstone of the Source Water Assessment and Protection Program required under the SDWA.<sup>46</sup> Although the Wellhead Protection Program is voluntary, many communities have developed, or are in the process of developing wellhead protection plans.

In addition to the Wellhead Protection Program, Pennsylvania also has a voluntary program for surface water supplies relies on voluntary initiatives driven by communities. For both these programs, the state provides technical, financial and educational assistance. The DEP approves wellhead protection plans that meet the standards of its program.

Although Pennsylvania does not mandate source protection planning, it does regulate certain features of the Wellhead Protection Program, including the definitions of wellhead protection and wellhead protection areas, permitting and operation requirements for new community water system wells, a three-tiered approach for wellhead protection areas, and the minimum elements of the Wellhead Protection Program that are necessary for State approval.<sup>47</sup> These regulations are found in the Pennsylvania Safe Drinking Water Regulations.

The Wellhead Protection Program has seven minimum elements that must be part of a community's program for the DEP to approve the program. These are set out in the regulations, and they are:

- 1) The formation of a steering committee and the designation of responsibilities;
- 2) Public participation;
- 3) The delineation of a wellhead protection area;
- 4) The identification of contaminant sources;

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<sup>46</sup> Department of Environmental Protection, Pennsylvania, "The Wellhead Protection Program in Pennsylvania: An Overview (March 2006). Accessible at

[www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/SrceProt/Source/](http://www.dep.state.pa.us/dep/deputate/watermgt/wc/Subjects/SrceProt/Source/)

<sup>47</sup> Ibid.

- 5) The development of management approaches;
- 6) Contingency planning; and,
- 7) New water supply protection.<sup>48</sup>

Wellhead protection areas are defined as 3 different zones -- Zone I is the 100 to 400 foot radius (30 to 120 meter) protected zone immediately surrounding a well; Zone II is the ½ mile (.8 km) radius encompassing the part of the aquifer through which water is diverted to a well or flows to a spring; and, Zone III is the zone beyond Zone II that contributes surface and groundwater to Zones I and II.<sup>49</sup> The delineation of the wellhead protection area must be done by the water supplier, the local municipalities and/or the planning agencies with jurisdiction over the source.

Suggested management approaches for wellheads, as identified in the regulation, are purchase of the wellhead protection area by the water system, municipal ordinance or regulations on future potential sources of contamination or establishing design standards for existing potential sources of contamination, transfer of development rights to land outside the protected area and a groundwater monitoring network.

With respect to management of threats to drinking water sources, Pennsylvania recognizes the problems of multiple jurisdictions with land use authority within a planning area. In the event that a wellhead protection area includes more than one municipality, a coordinating government or authority has to be designated to develop and monitor the management approaches. The authority may be a planning commission, county government, or other designated body, which is supported by all involved municipalities. Regional local government liaison contacts are also designated to work with local governments and the DEP on wellhead protection issues and jurisdictional issues.<sup>50</sup>

More than 150 public water systems and municipalities have undertaken the development of wellhead protection programs, although not all of them have been able to meet the DEP's strict standards. Approximately 17 per cent of the state's population is served by ground water systems.<sup>51</sup>

An incentive for communities to develop approved wellhead protection plans is that they are eligible for a waiver from monitoring for certain synthetic chemicals if the Department determines that their proposed management measures will protect the water supply.

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<sup>48</sup> 25 Pennsylvania Code Chapter. 109.713. Wellhead Protection Program.

<sup>49</sup> Ibid. Section 109.1 Definitions.

<sup>50</sup> Pennsylvania Wellhead Protection Program. Accessible at [www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/SrceProt/source/Final\\_WHPP.htm](http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/SrceProt/source/Final_WHPP.htm)

<sup>51</sup> Pennsylvania Wellhead Protection Program,. Accessible at [www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/SrceProt/source/Final\\_WHPP.htm](http://www.dep.state.pa.us/dep/deputate/watermgmt/wc/Subjects/SrceProt/source/Final_WHPP.htm)



For all new or expanded wells constructed since 1995, the DEP requires the water supplier to own or control through a deed restriction the Zone I wellhead protection area so that they may prohibit activities that threaten water quality or quantity. They are also required to discontinue the storage, use or disposal of any potential contaminants in Zone I and to eliminate the storage of fossil fuel, except for emergency power.<sup>52</sup> However, wellhead protection plans are not required unless the water supplier decides to develop a wellhead protection program that meets DEP's minimum requirements.

Public participation is also an essential element for the approval of wellhead protection plans. In Pennsylvania, the League of Women Voters sponsored workshops to promote the concept of wellhead protection, and the DEP has used its website and other public forums to inform the public about groundwater protection. Comment and review periods after the publication of wellhead protection plans are required under the Safe Drinking Water Regulations.

### *Surface Water*

Similar minimum requirements are recommended for Pennsylvania's surface water protection program. This program is called the Watershed Protection Program. Most surface water sources of drinking water in Pennsylvania are rivers or streams. Although Pennsylvania borders Lake Erie, only one community in the state, Erie City, draws water from the Great Lakes. There are no perceived pollutant threats to this community, and no source protection plan has been developed.

The Watershed Protection Program is funded by the state's Growing Greener Grant program and administered by the DEP, available to a municipality or group of municipalities, or a community water system.<sup>53</sup> Pennsylvania recommends that watershed protection plans detail the provisions of the local program including a schedule for implementation, describe how sources will be protected and document the financial resources necessary to implement the plan.<sup>54</sup> The resources are included as part of the municipality or water supplier's commitment to management and can include in-kind services, dedicated funding (water rate), or taxes for fees dedicated to watershed protection.

Like the delineations of the wellhead protection areas, watersheds over 100 square miles (160 sq km) serving public water supplies are segmented into 3 tiers for the inventory and susceptibility analysis. Zone A is ¼ mile (.4 km) wide on either side of the river or stream from an area ¼ mile downstream of the intake to a 5-hour time of travel upstream. Zone B is a 2 mile (3.2 km) wide area on either side of the river or stream extending upstream to a 25-hour time of travel, and Zone C is the remainder of the watershed. The delineation will be refined by consideration of river hydraulics.

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<sup>52</sup> 25 Pennsylvania Code Chapter 109.603. Source Quality and Quantity.

<sup>53</sup> Pennsylvania Dept. of Environmental Protection, Fact Sheet: Source Water Protection Grants. Accessible at

<sup>54</sup> Pennsylvania DEP, Source Water Protection, Grant Program Supplemental Instructions (Wellhead or Watershed Protection), January 2001, Appendix C – Minimum Elements for Local WSP Programs, p. 27.

Contaminant source inventories can be done for the whole watershed, or they can be segmented by documenting all potential sources in Zone A as described above, all significant potential sources in Zone B and information from available databases and land uses in Zone C.

For non-point sources and microbiological contaminants, analyses will be done for each surface water intake based on existing water quality data for the drinking water source and the drainage basin and on physical characteristics. Assessments for stream impairment and TMDL determinations will identify critical areas.

An important aspect of Pennsylvania's source water protection programs is the availability of funding for communities who want to develop protection plans under the Growing Greener grant program.

Growing Greener grants are described as the "largest single investment of state funds in Pennsylvania's history to address Pennsylvania's critical environmental concerns of the 21<sup>st</sup> century".<sup>55</sup> It will invest \$1.3 billion through 2012, and is partially financed by the permanent dedication of a new \$4/ton municipal waste disposal fee. Both wellhead protection plans and watershed protection plans are eligible for one-time grants of \$50,000 and \$200,000 respectively. Regional watersheds that are considered priorities for Growing Greener grants include watershed improvement activities in the Great Lakes Basin, including source protection activities.<sup>56</sup>

#### **4.8.1 Watershed Source Protection Planning and Implementation** **Case Study - Schuylkill Action Network, Pennsylvania**

The Schuylkill River in southeastern Pennsylvania has been an important regional source of drinking water for over two centuries. Approximately 1.75 million people in the watershed receive drinking water from the Schuylkill River and its tributaries. Philadelphia, at the bottom of the system, is the largest community taking drinking water from this source.

A major effort is underway to protect the Schuylkill River as a drinking water source. This effort developed directly out of the work done on the source water assessments for the River, and has resulted in the creation of a source water protection plan. Within the Great Lakes states, it is one of the most ambitious endeavours to address the multiple sources of contamination of a river that is an important surface drinking water supply.

In response to the 1996 SDWA amendments requiring source water assessments, the

<sup>55</sup> Pennsylvania DEP, Growing Greener, "What is Growing Greener?" Accessible at [www.depweb.state.pa.us/growinggreener/](http://www.depweb.state.pa.us/growinggreener/)

<sup>56</sup> Pa. DEP, Growing Greener I and II, Watershed & Flood Protection Grant Application Package Deadline: April 13, 2007, p.4.

Schuylkill River Source Water Assessment Partnership, led by the Philadelphia Water Department, undertook to do a broad source water assessment identifying water supply protection priorities in the Schuylkill River watershed. The Partnership also included the Pennsylvania Department of Environmental Protection, the Philadelphia Suburban Water Company and the Pennsylvania Water Company. In the course of doing the assessment, three working groups were created to address the most significant sources of potential contamination to the river – acid mine drainage, agriculture and stormwater. The assessment found that approximately one-third of the river was impaired. Many recommendations were made for improving and protecting the quality of drinking water taken from the Schuylkill River.

In addition, a Report on the State of the Schuylkill Watershed found degradation in many of the streams that supply the Schuylkill River. The report noted that decision-making within the watershed ecosystem was fragmented, and that the future health of the watershed depended on watershed planning initiatives that extended beyond municipal and county boundaries.

In order to address the problems, the Philadelphia Water Department asked the federal Environmental Protection Agency to help in putting together a group of stakeholders that would work to protect the Schuylkill River as a drinking water source. This led to the formation of Schuylkill Action Network (SAN), a collaborative involving more than 100 organizations.

To fund their work, the Philadelphia Water Department and the Partnership for the Delaware Estuary obtained a Targeted Watershed Grant from the EPA which enabled SAN to conduct specific source protection activities. The grant provided \$1.15 million of federal funds that leveraged an additional \$1.49 million from other sources. Local organizations were funded to implement projects such as abandoned mine drainage remediation, stormwater management improvements, agricultural improvements and educational pilots.

Currently, SAN is composed of five workgroups, two support teams, a Planning Committee and an Executive Steering Committee. In addition to the three original workgroups established under the assessment, two groups have been added – the Pathogens Workgroup and the Watershed Land Protection Collaborative. The Watershed Land Protection Collaborative was elevated to full workgroup status in order to make explicit the connection between land and water management. The meetings and membership of the workgroups are open to anyone. The two support teams are the Education/Outreach Team and the Data/Monitoring Team.

The Planning Committee has now developed a strategic Plan to guide SAN activities from 2007 to 2010. These activities will “address current and past threats to drinking water sources and watershed health and protect it from new stressors”. An important feature of the work of the SAN is the integration of work in the region to improve watershed health with efforts to improve drinking water quality and reduce the need for treatment.

One of the principal challenges they are facing, however, is securing sustainable financing to continue their protection activities when the EPA 3- year grant runs out. *For more information, the Schuylkill Action Network has a website at [www.schuylkillactionnetwork.org](http://www.schuylkillactionnetwork.org)*

## 4.9 Wisconsin

In Wisconsin, the Dept. of Natural Resources (DNR) Bureau of Drinking Water and Groundwater was responsible for assessing the 11,000 groundwater systems and 20 surface water systems in the state. Unlike other states, Wisconsin has no communities that depend on rivers for their drinking water supplies. Most communities use groundwater, and the few that use surface water draw their drinking water from Lake Michigan, Lake Superior or Lake Winnebago.

Wisconsin's source protection activities have focussed on groundwater protection. The assessments that were undertaken by the DNR included regional groundwater flow models in 15 counties. Technical assistance was provided by the U.S. Geological Survey. Groundwater systems in problematic hydrogeological settings such as karst features were addressed by a technical advisory system.

In 1992, Wisconsin introduced regulations mandating source protection for all new wells.<sup>57</sup> Under Wisconsin law, new wells cannot be put into service until the DNR approves its wellhead protection plan. Protection plans must include:

- Identification of the recharge area for the proposed well;
- Identification of the zone of influence for the proposed well;
- Identification of the groundwater flow direction;
- An inventory of existing potential sources of contamination within a ½ mile (.8 km) radius of the well and an assessment of existing potential sources of contamination within the recharge area of the well;
- Establishment of a wellhead protection area for the proposed well, encompassing at a minimum the portion of the recharge area equivalent to a 5 year time of travel to the well;
- A public education program for wellhead protection;
- A water conservation program;
- A contingency plan for providing safe water in the event of a contamination incident; and,
- A management plan based on the assessment of alternatives for addressing potential sources of contamination, describing local ordinances, zoning requirements, monitoring program and other local initiatives proposed for the wellhead protection area. At a minimum, the management plan must address

<sup>57</sup> Wisconsin Administrative Code NR. 811.16.

maintaining the separation distances established in the well siting portion of Wisconsin's Administrative Code, such as 600 feet (180 meters) between a well and gas or oil fuel storage tanks.

This applies to all new wells brought into service since 1992. About 300 wellhead protection plans have been done for new wells.

These elements are also the template for Wisconsin's voluntary wellhead protection program. Wisconsin encourages, but does not require, communities whose municipal wells were set up before May 1992 to develop a wellhead protection plan. In addition to the staff of the DNR, the Wisconsin Rural Water Association provides 2 staff members to assist with the development of protection plans. The DNR estimated that "a couple of hundred plans" had been developed but the voluntary plans are reviewed less rigorously than those plans done for new wells.<sup>58</sup>

For surface water sources of drinking water, there is no voluntary program. Communities were encouraged by the DNR after the assessments were finished to consider doing them but none have.<sup>59</sup>

The Surface Water Delineation Technical Advisory Committee determined how source water areas for public water systems using surface sources would be delineated for source water assessments. For intakes on Lake Michigan and Lake Superior, each intake or intake cluster included at least one locally discharging watershed. Generally, Wisconsin regards the large areas which could be potential sources of contamination to these intakes as being difficult for protection planning.

## ***5. Quebec Legislative and Policy Framework***

The development of a Quebec water policy began in 1997 with a Symposium on Water Management that brought together a group of experts in the field of water. In 1998 the Quebec Minister of the Environment announced that public hearings would be held on water management in Quebec, using the symposium proceedings as a prime reference document. Subsequently, the Commission on Water Management, established by the Bureau d'audiences publiques sur l'environnement, held hearings throughout Quebec and released its consultation report in 2000.<sup>60</sup>

As a result of these extensive consultations, the Quebec government introduced in 2002 a comprehensive Water Policy, which included ambitious goals for managing almost every

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<sup>58</sup> Personal Communication, Dave Wellhead Protection Program Coordinator, Source Water Assessment Program, Wisconsin DNR, June

<sup>64</sup> Personal Communication, Jeff Helmuth, Source Water Assessment Program Coordinator, Wisconsin Dept. of Natural Resources, June 7, 1007.

<sup>60</sup> The Bureau d'audiences publiques sur l'environnement (BAPE) carries out consultations for the Quebec Minister of Sustainable Development, Environment and Parks on major environmental projects or issues.

aspect of water in the province including source protection.<sup>61</sup> It included five orientations, which are primarily the responsibility of the Quebec Minister of Sustainable Development, Environment and Parks in concert with other provincial Ministries:

1. Water governance reform;
2. Integrated management of the St. Lawrence River;
3. Protection of water quality and aquatic ecosystems;
4. Continued clean-up and improved management of water services; and,
5. The promotion of water-related recreotourism activities.<sup>62</sup>

Each orientation included a series of actions and a number of commitments on behalf of the Quebec government to put these actions into effect. Some of these orientations are related both directly and indirectly to source water protection. In addition, progress reports were promised every five years.

Under Orientation One, for example, the government committed itself to creating integrated watershed-based management and providing financial and technical support for establishing 33 watershed agencies. Watershed level work to clean up aquatic ecosystems was also one of the main provisions of Orientation Four where the government promised a strategy for cleaning up waterways at the watershed level. This was to include reducing emissions from industry, municipalities and agriculture.

Orientation One also pledged to establish Quebec's jurisdiction and powers over water by strengthening Quebec's participation in international organizations concerned with the Great Lakes-St. Lawrence River Basin. This led to Quebec's participation in the discussions with Ontario and the eight Great Lakes States that resulted in the 2005 Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement.

Quebec also undertook, as part of its water governance reform, to conduct a groundwater inventory of Quebec's major aquifers. However, according to the Quebec non-governmental organization Eau Secours, work has been slow on this part of the plan, and Quebec has done an inventory of aquifers in only one of the 33 priority watershed areas.<sup>63</sup>

Quebec's Water Policy addresses issues pertaining to the Great Lakes Basin in several different aspects. Under Orientation Two, Quebec aimed to improve the water quality of the St. Lawrence River through the integration of management activities between the Quebec government, the Canadian government and local riverside communities. As part of the St. Lawrence Action Plan developed between Quebec and Canada in 1989, 14 Zones of Primary Intervention (ZIPs) were created where local committees worked on Ecological Remedial Action Plans comparable to the Remedial Action Plans in place for

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<sup>61</sup> Quebec Ministry of Sustainable Development, Environment and Parks, "Water. Our Life. Our Future: Quebec Water Policy", 2002. Accessible at [www.menv.gouv.qc.ca/eau/politique/index-en.htm](http://www.menv.gouv.qc.ca/eau/politique/index-en.htm)

<sup>62</sup> Ibid. p.13.

<sup>63</sup> Coalition Québécoise pour une gestion responsable de l'eau – Eau Secours!, Bilan 2004-2005 de la mise en oeuvre de la politique nationale de l'eau (novembre 2002), mars 2005.

the Areas of Concern in the Great Lakes themselves. One of the proposed actions for protecting the St. Lawrence River as a source of drinking water was to prepare a strategy to protect surface water intakes.

In the Water Policy, the Quebec government also committed to pursuing a new Canada-Quebec Agreement concerning the management of the St. Lawrence River. A previous agreement, the Canada-Quebec St. Lawrence Vision 2000 Agreement, expired in March 2003. A new agreement was supposed to work towards the development, maintenance and restoration of the river as a drinking water source, and for shipping and tourism.

Orientation Three is the most directly related to source water protection, at least for surface water sources. In Orientation Three, Quebec identified two important action plans – first, to ensure safe, quality drinking water, and second, to protect aquatic ecosystems. To ensure safe quality drinking water, Quebec included a commitment to develop by 2004 a strategy for protecting surface sources of drinking water.<sup>64</sup> These measures were to be similar to measures instituted in the United States, Ontario, Nova Scotia and New Brunswick. The strategy would help reduce the risks of contamination of surface drinking water sources, determine the vulnerability of drinking water intakes and identify priority actions for improving the raw water.

Acknowledging the lack of measures to protect surface sources of drinking water, Quebec's strategy for surface water sources was intended to complement Quebec's drinking water regulations. A progress report on the Water Policy was released in November 2007, indicating that the strategy document on surface water source protection that was promised as part of the Water Policy had not been done.<sup>65</sup>

### *Groundwater Protection*

Although Quebec has not yet formulated its laws or policies for the protection of surface waters, it does have regulations for protecting groundwater that are similar in some aspects to wellhead protection programs in the United States. Quebec's Groundwater Catchment Regulation under the provincial *Environmental Quality Act*, includes provisions for protecting groundwater.<sup>66</sup>

In addition to setting out rules for the way in which new wells must be constructed, the regulation “promotes the protection of groundwater” with provisions for both quality and quantity aspects of groundwater.

It establishes mandatory protection areas for wells that supply spring water, mineral water or groundwater to more than 20 people where the flow rate of the well is greater

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<sup>64</sup> Quebec Ministry of Sustainable Development, Environment and Parks, “Water. Our Life. Our Future: Quebec Water Policy”, 2002, p. 46. Accessible at [www.menv.gouv.qc.ca/eau/politique/index-en.htm](http://www.menv.gouv.qc.ca/eau/politique/index-en.htm)

<sup>65</sup> Développement durable, Environnement et Parcs Québec, *Mise en Oeuvre de la Politique Nationale de L'Eau du Gouvernement du Québec*, Bilan Annuel 2005-2006, November 2007.

<sup>66</sup> Quebec Groundwater Catchment Regulation, *Environment Quality Act*, c. Q-2, r. 1.3.

than 75 cubic metres per day.<sup>67</sup> The owner of a well that provides potable drinking water from a groundwater source must establish an immediate protection area with a radius of at least 30 metres from the catchment work.<sup>68</sup> The boundaries must be secured by a fence, and within this protected area, any activity, facility or deposit of materials likely to contaminate groundwater is prohibited.

The owner must also have:

- a plan showing the location of the “supply area”;
- a plan showing the location of the bacteriological and virological protection areas as determined by migration times;
- an assessment of the vulnerability of the groundwater area within this plan; and,
- an inventory of activities within the bacteriological and virological protection areas that could affect the microbiological quality of groundwater. The inventory would include activities such as wastewater treatment systems or facilities for storing or spreading animal waste or farm compost.

Unlike the U.S. source protection programs which include a wide range of microbiological and chemical parameters that must be considered in every inventory, Quebec has limited its inventory to microbiological concerns.

The Groundwater Catchment Regulation also includes special provisions for farming areas. These include a prohibition on spreading municipal sludge, animal waste, compost and fertilizers in protected groundwater areas.

## **6. First Nations Drinking Water Source Protection**

In Ontario as in other parts of Canada, contamination of First Nations drinking water remains a chronic problem. Many communities cannot yet rely on the basic protection of adequate water and wastewater treatment systems. First Nations drinking water has been the subject of several recent studies -- the Auditor General of Canada’s Report in 2005 followed by the 2006 Report of the Expert Panel on Safe Drinking Water for First Nations. These two reports focused on the lack of legislation governing water quality on reserves in comparison with provincial laws that protect drinking water for other Canadians.

When this level of fundamental protection for First Nations is lacking, it makes it difficult to begin to pursue source protection without addressing other barriers in a multi-

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<sup>67</sup> Spring and mineral water are both defined in Quebec’s Regulation respecting bottled water (c. Q-2, r.5) as water that comes from a water-bearing formation without passing through waterworks used for public distribution, and is bacteriologically pure and contaminant free. Spring water differs from mineral water in that the mineral salts content does not exceed 1,000 milligrams per litre and a number of ions and substances such as ammonia, silver, and arsenic, for example, are lower than certain levels set out in the regulation.

<sup>68</sup> Groundwater Catchment Reg., Chapter III, Protection Areas, Division I, General.



barrier approach. Although Ontario is not responsible for drinking water on reserves, the *Clean Water Act* does contain provisions for First Nations to play a role in drinking water protection and has stimulated discussions on the federal level on how to engage First Nations in this planning.

Under the CWA, First Nations' drinking water systems within or adjacent to source protection areas can be brought into the source water protection framework through the passing of a band council resolution. In addition, up to three seats are reserved on source protection committees for representatives for First Nations that wish to participate. However, many First Nations in northern Ontario where there are no Conservation Authorities, and therefore no regional planning areas, will not be included in Ontario's source protection framework under the Clean Water Act.

### ***Canadian Federal Government Responsibilities***

First Nations primarily rely on funding from Indian and Northern Affairs Canada (INAC) and Health Canada for the management and improvement of their drinking water systems. These federal departments share the responsibility for drinking water with First Nations.

The First Nations Water Management Strategy group with Environment Canada is examining the challenges and options for source protection planning in northern Ontario where most reserves are located within the Great Lakes watershed. There are 69 First Nations communities in the North. Of these, two have no community water supply and rely on individual wells or surface water. Of the community systems, 3 are supplied by municipalities, 17 rely on groundwater and the remaining 48 use surface water.

As there are no Conservation Authorities in the far North, this area has not been part of the first phase of Ontario's source protection watershed planning. In many northern areas, First Nations are the primary stakeholder.

The Strategy group have contracted the Ontario First Nations Technical Services Corporation to build awareness among First Nations of source protection and to hold discussions at the community and sub-watershed level. The first phase of this work, the Northern Information Gathering Project, identified 72 communities in February and March 2006, and spoke to their leaders and technical staff. This work was done to determine "*how will First Nations be involved in watershed-based planning described in the proposed Clean Water Act*".

Three options were described in the initial report:

1. Reject direct participation in the Ontario process. Develop a parallel First Nation process on the First Nations' timetable;
2. Full collaboration with the Ministry of the Environment as "participants/stakeholders" in the provincial process; or,

3. Form a “First Nation Conservation Authority” and assume the control, authority and responsibility of the lead agency in Source Water Protection Planning.<sup>69</sup>

Respondents agreed that all options would require years to put in place. Other conclusions from this information gathering were: communities would need to be educated and involved; technical expertise would need to be available; and resources for travel over great distances and staffing would need to be provided. In the North, threats to drinking water come from resource extraction operations, mining and forestry at a scale not found in southern Ontario. These threats would require technical studies and unique protections. There was an even split between those that thought that the First Nations should manage the process and those that preferred a partnership between the Province and First Nations.

This report makes it clear that there is a need for education on source protection in the North and a need to define the path forward for the participation of First Nations. .

### ***Provincial Challenges for Addressing First Nations’ Needs within Current Source Protection Areas***

Ontario’s request that First Nations become involved in drinking water source protection and other Great Lakes initiatives comes at a sensitive time in the evolution of governance relations between the provincial and federal governments and within First Nations. Many First Nation Communities are within existing source protection areas and have long been involved in efforts in areas such as the Grand River and the St. Clair River to protect their drinking water.

Unsettled claims to large portions of the underwater beds of the Great Lakes as well as to some lands within the surface and groundwater boundaries of the Basin, fishing and harvesting rights, and continuing exclusion from “nation to nation” negotiations have created tensions. Recent court decisions on duties to accommodate and consult First Nations have required more rigour and First Nations communities in the Great Lakes are now insisting on their rights being honoured as a prerequisite for their involvement.

The initial exclusion of U.S. Tribes and Canadian First Nations from negotiations for the Great Lakes Charter Annex led to the first gathering of the Great Lakes Tribes and First Nations in decades. After the Ministry of Natural Resources started providing resources, Ontario First Nations began to participate in both international work with the Resource Body implementing the Charter Annex and in Ontario on an Advisory Committee to the province’s negotiators. Efforts are underway to articulate working agreements with First Nations leadership groups to establish guidance for their involvement in future provincial initiatives.

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<sup>69</sup> Northern Information Gathering Project: Source Water Protection Planning in Northern Ontario, Remote Communities, watershed and Treaty Area Levels – Challenges and Options, Report on Stage 1, conducted for Environment Canada (Ontario), March 31, 2006, p.6.

Another challenge for Ontario is the incorporation of Aboriginal Traditional Knowledge into the source protection assessment and planning processes. A recent report from the Office of the Chiefs of Ontario highlights the importance of Aboriginal Traditional Knowledge in decisions governing water and watersheds and the lack of consideration of this knowledge in source protection planning.<sup>70</sup> The report found that “federal and provincial legislation concerning SWP [source water protection] has shown itself to be too restrictive, inflexible, and exclusionary to warrant any meaningful attempt to incorporate aboriginal traditional knowledge into its decision-making process”. The Chiefs of Ontario point out that funding tied to source protection legislation is primarily for science-based technical activity and no funds are available for capacity building on source water protection.

In the same report, First Nations indicate that if they participated in source protection committees or consultations, they would be treated as a stakeholder or community group, rather than involved in nation to nation decision-making. They believe that to ensure the health of waters and consideration of aboriginal tribal knowledge, decisions on the management of water must take place on a nation to nation level.

Great Lakes source protection efforts may be able to address this need to have a more holistic approach to source protection since it will address issues on a larger scale and will begin to look at broader integrated solutions. While others in the Great Lakes have recently come to realize the importance of integrating water quantity and quality and all other stresses on the ecosystem, Aboriginal Traditional Knowledge has always taken a holistic view of taking care of water. The incorporation of this wisdom should be an objective of the source protection process, and First Nations representatives on source protection committees will likely bring this perspective to the process.

### ***U.S. Tribes and Source Protection***

Only four Great Lakes States have Tribes within the Great Lakes Basin due to the expropriation of native lands and the creation of reservations. These are Michigan, New York, Wisconsin and Minnesota.

Federal and state regulations, including the U.S. *Safe Drinking Water Act*, do not apply to tribal lands in the United States. However, the EPA provides assistance to tribes on issues like drinking water protection. The U.S. EPA encourages Tribes to do Source Water Protection Programs, with the same elements that are included in state programs. The EPA has developed a Tribal workbook, entitled *Protecting Drinking Water: A Workbook for Tribes*, which provides step-by step instructions on how to develop a workplan and complete a source water assessment. This workbook offers both a simplified and a detailed approach and is easily accessible on line. US EPA staff have developed training based on the workbook and encourage Tribes to inform their

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<sup>70</sup> Chiefs of Ontario, “Aboriginal Traditional Knowledge and Source Water Protection: First Nations’ Views on Taking Care of Water”, March 2006, prepared by Giselle Lavalley for the Chiefs of Ontario and Environment Canada.

communities of the results of the assessments and to involve them in implementation decisions.

EPA Regional offices have set aside funds for tribal source water activities. These funds are primarily used to support technical circuit riders that are both trainers and water management consultants. Other funds may also be accessed by Tribes from Tribal Pesticide grants and *Clean Water Act* funds for source protection work.

In the 6 Great Lakes States in EPA Region V, there are 80 community water systems serving approximately 30 tribes in Minnesota, Wisconsin and Michigan. All tribes have done source water assessments, primarily of groundwater sources of drinking water, and many of them are currently working on source protection plans. Assessments and plans are submitted to the EPA for informational purposes and the EPA endorses, but does not “approve,” them. There has been a high level of involvement of the tribes in the Great Lakes States in source water protection activities.

## **7. Lessons from the U.S. Federal and State Programs, Quebec and Ontario's Clean Water Act**

Governments around the Great Lakes, particularly provincial and state governments, have all recognized their vested interest in protecting sources of drinking water. Ontario has enacted the most recent legislation and has put in place a comprehensive statute that governs all aspects of source protection.

However, in Ontario the activities mandated under the *Clean Water Act* are still in the initial stages. In this respect, it is difficult to make direct comparisons with programs in neighbouring jurisdictions. Rather, it should be understood that although many states do not have as far-reaching legislation, some are farther along in the sequential stages of source protection, which generally include assessment, planning and implementation of plans.

Therefore, the elements of Ontario's approach that could be applied to other jurisdictions are those regulatory elements that are not present in U.S. legislation. On the other hand, the on-the-ground experience that states have gained in carrying out their programs may be valuable to Ontario.

For a detailed comparison of Ontario's programs with those of other jurisdictions, see Table I in Appendix I of this report.

### **7.1 Aspects of Ontario's Approach that May be Applicable to Other Jurisdictions**

#### ***1. Ontario has made source water assessments and source protection planning mandatory.***

Ontario has put in place legislation that requires source assessment, source protection plans *and* implementation of plans in contrast to the U.S. *Safe Drinking Water Act* which requires only source water assessments.

Experience in the United States generally demonstrates that legislated programs have resulted in a greater level of source protection activity. As a result of the *Safe Drinking Water Act* requirements that source water assessments be undertaken and that wellhead protection programs be put in place, every Great Lake state has assessed both ground water and surface sources of drinking water. In the case of this legislated requirement, all assessments were done.

Although all states have some type of wellhead protection program, the lack of U.S. federal legislation mandating source protection planning and implementation of plans has resulted in less follow-up to source water assessments than anticipated. Assessments were supposed to stimulate protection planning but the response has been uneven.

Consequently, state programs for source protection vary dramatically from one state to another around the Great Lakes. New York State did not put any source protection programs in place that would promote planning and implementation, while Minnesota, Indiana and Wisconsin have regulated wellhead protection. Several states – Ohio, Michigan and Pennsylvania – have created voluntary wellhead protection programs. Where regulated programs exist in the Great Lakes' States, more source protection planning has been accomplished.

Although Quebec's Water Policy promotes the concepts of watershed management and source water protection, Quebec does not have source protection legislation comparable to Ontario's *Clean Water Act*.

Ontario's legislation mandates both source protection planning and implementation. By requiring these elements in law, Ontario has established a more regulated source protection regime that is likely to result in a more effective program.

### ***2. Ontario requires assessments and planning for both ground and surface water sources of drinking water.***

Although the U.S. *Safe Drinking Water Act* required all sources of drinking water to be assessed, generally only wellhead protection programs have been created in Great Lakes' states. Only a few states have programs for surface water sources. This is, in part, due to the historical development of the source water protection program, but it also reflects the fact that ground water was poorly protected in the United States before programs to address protection were required. There is also an assumption that surface water is subject to monitoring and treatment requirements and, therefore, it is less urgent to protect surface water intakes.

In contrast, Ontario has recognized the importance of planning to protect all sources of drinking water – both surface water and ground water. By requiring assessments and plans for both in the same time frame, Ontario will have a more comprehensive framework in place at the end of 2012 when plans are due.

Ontario's legislative framework includes groundwater and surface water and will likely contribute valuable knowledge about their interaction. The U.S. federal legislation required assessments of all sources of water but did not require planning or implementation for their protection. Most state programs, where they are legislated, apply only to the protection of groundwater sources of drinking water. Quebec's limited groundwater protection legislation governs only microbiological sources of contamination and does not address other potential threats.

### ***3. Ontario requires implementation of source protection plans.***

The requirement that plans be implemented has been a challenge for those Great Lakes' states where plans are mandatory for wellhead protection. Indiana has chosen to make

plans mandatory but only reporting on the plans is required. Communities are expected to implement the plans but there are no legislative requirements that compel the implementation. In Minnesota, where the most comprehensive state legislation is in place in the Great Lakes states, the public water supplier must begin implementation of the plan no later than 60 days after department approval of the plan.<sup>71</sup> To determine whether plans have been implemented, Minnesota also requires reporting. Ontario has taken a different approach for the implementation of plans where policies in source protection plans apply once a plan is in effect. Municipalities must also amend their official plans and zoning by-laws to conform with the significant threat policies and designated Great Lakes policies set out in the source protection plan.

#### ***4. Ontario has created new tools that give more force to source protection plans.***

One of the major difficulties in the development of locally-based planning in Indiana and in other U.S. states is the problem of minimizing threats to drinking water once they have been identified. For example, a leaking underground storage tank may be within a wellhead protection zone but the water supplier does not have the authority to stop the owner of the tank from threatening the area with potential contamination.

In many U.S. jurisdictions, management techniques include recommendations that water suppliers inform landowners or businesses that they are located within a protected drinking water area. In some instances, such as Wisconsin, state guidance suggests that water suppliers work with owners of potential sources of contamination to ensure proper materials handling and disposal methods.

In contrast, Ontario's risk management provisions in the *Clean Water Act* provide the municipalities with the opportunity to initiate risk management plans with owners of potential sources of contamination in vulnerable areas. If the owner and the municipality cannot come to agreement on the necessary protection measures, the CWA goes further and allows the municipality to impose these measures, and order compliance with the risk management plan.

This is a unique and important tool for controlling sources of contamination that has been created in Ontario but which is not a provision in any U.S. federal or state legislation.

#### ***5. Ontario has chosen watershed areas as source protection planning areas.***

Generally, source water assessments and plans in the Great Lakes states do not extend to watershed areas. Only in rare instances such as the Schuylkill River or the Upper Mississippi River are more watershed-based initiatives underway which take into account the impacts of all potential threats over larger areas as part of the source protection planning efforts.

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<sup>71</sup> Minnesota Rule 4720.5560

As Michigan and other states have found, source protection planning is not being integrated with the watershed protection plans developed by independent watershed councils which are funded by state and federal governments. The U.S. has many active watershed groups that, similar to Conservation Authorities, work to improve the quality of watershed areas within a state. However, protection plans for individual watersheds focus on habitat protection, rather than on drinking water issues. In Michigan, the state source protection office is trying to co-ordinate the work of source protection planning teams with the watershed protection councils, and encouraging crossover of membership.

The Schuylkill Action Network (SAN) found that decision-making within their watershed ecosystem was fragmented and that the cumulative and significant impacts of activities within the watershed needed to be understood in order to protect the river as a source of drinking water. They concluded that while municipalities are capable of making good decisions within their own jurisdictions, it is difficult for them to consider watershed and other concerns beyond their own boundaries. To overcome fragmentation, SAN based their source protection planning on the watershed around the Schuylkill River.

This perspective has also been adopted by Ontario. Ontario has provided for the integration of efforts across entire watersheds and the coordination of individual municipal efforts by basing the source protection areas on watershed boundaries and investing in technical support from local watershed-based Conservation Authorities. Conservation Authorities already have watershed planning expertise and work along watershed rather than municipal boundaries. Ontario's decision to set up source water planning areas, based on watersheds, will enable planning, decision making and coordination to take place on a watershed scale.

One rationale for watershed-based source protection planning is that it can look at the ecosystem as a whole and evaluate the cumulative impacts of multiple sources. Ontario's watershed-based approach will be an opportunity to estimate the cumulative impacts of significant sources of potential point and nonpoint sources of pollution in the watershed. However, it is not clear yet whether this will be a regulatory requirement. At the very least, Ontario's approach will offer the co-benefits of identifying significant pollution sources that may have ecosystem impacts beyond the threat to drinking water.

***6. Ontario has chosen to give the Clean Water Act paramouncy over conflicting legislation.***

Paramouncy is a critical piece of Ontario's source water protection program. It is a highlight of the Ontario legislation, and is absent in state legislation where source protection programs exist.

Although some state legislation prohibits or regulates activities within wellhead protection areas, there are no states where legislation gives source protection concerns paramouncy over other legislation in the event of a conflict. Thus, implementation of protection plans can be challenging for water suppliers who must rely on local ordinances, education and persuasion of owners to protect drinking water sources.



In contrast, Ontario has made source protection of drinking water the most important consideration, with source protection plans taking precedence over official plans and zoning bylaws adopted by municipalities where there are conflicts, and the CWA itself prevailing over other provincial legislation where its provisions are more protective than other legislative provisions. This clarifies the status of source protection plans and their ability to restrict activities that threaten drinking water.

***7. Ontario has made water quantity considerations a required element in source water assessments.***

Ontario has also been more far-sighted than most states, Quebec and the U.S. federal program in requiring consideration of water quantities in the assessment of drinking water sources. In particular, the assessment reports being prepared in Ontario are required to include a water budget that quantifies the existing and anticipated amounts of water being taken, and describes any water shortages that may exist. Water quantity is generally not a required element of source protection planning in the U.S., although one state, Minnesota, requires an evaluation of water quantity as part of a public water supplier's wellhead protection plan, and another, Illinois, has established regulations for particular groundwater recharge areas.

***8. Ontario has established a funding program within the Clean Water Act.***

Adequate funding of source protection programs is fundamental to their success, and Ontario has made initial commitments to support this program.

Funding has emerged as a major problem in the United States. The 1996 amendments to the *Safe Drinking Water Act* provided significant funding to the States to undertake source water protection assessments and wellhead protection programs. As the spectre of Milwaukee where in 1993 about 100 people died from drinking contaminated water recedes, complacency about drinking water has set in. The events in Milwaukee took place just before the 1996 SDWA amendments that mandated source water assessments and set up funding to ensure their success.

This source of funding is running out now, and Great Lakes states are finding other sources of funding or downscaling their programs. The lack of federal funding has been cited by many states as the reason why source water assessment work has not been aggressively followed up with planning and implementation. States generally provide technical and financial support, although the water supplier is primarily responsible for the costs of source protection planning and implementation, whether the program is voluntary or mandatory.

Ontario is just starting its source protection program, and has already funded many of the requisite assessment activities. There is also an annual, provincial grant of money to the Conservation Authorities to help cover the costs of their roles in source protection programs. To date the province has committed \$88 million to the CA's and other partners. The Ontario *Clean Water Act* has also introduced a financial assistance

program of \$7 million each year for four years for landowners, farmers and other persons who are affected by this Act, as well as for education and outreach programs.

This initial funding has been important in the early stages of the program. It is unclear what financial resources will be necessary throughout the stages of the program and whether the municipalities, who will bear some of the burden to implement the CWA, will have difficulty financing their responsibilities. This may be of particular concern to smaller municipalities.

***9. Ontario has emphasized the use of science as the basis of source protection.***

Ontario has emphasized the importance of science-based source protection in its framework, and this will contribute to a better understanding of water quality and water quantity issues in the province and in the Great Lakes.

This is another difference between the way in which source water assessments were approached in the United States and the way it is being approached in Ontario. In the United States, states were only required to use available information in assessing drinking water sources. However, some states, as part of their wellhead protection programs, have required extensive technical work as the basis of their planning and management decisions. In some cases, states used fixed radii to delineate wellhead protection areas but in others, delineation of the aquifers through hydrogeological studies, studies of geological formations, and other information were used.

Similarly, Ontario has provided \$32 million in grants for research, including groundwater studies, in order to ensure that assessment work is grounded in solid scientific knowledge.

***10. Ontario has made public involvement an important part of its source protection framework.***

In the U.S., the public was involved in each state in the initial development of how the assessment work would be done but the assessment work itself was done by government departments or contractors. It was anticipated that the public would become involved in source protection planning after the assessment work was completed, but the lack of promotion of drinking water assessments crippled the potential efficacy of that initiative.

In states which have established source protection programs for wellheads or surface water intakes, there are requirements that, as a first step in the process, the local public water supplier establish a team to oversee planning and implementation. The critical members of these teams are the public water supplier and the municipality. It is generally recommended, however, that these teams include a representative from an environmental group. In Ontario, there is the option for source protection authorities to include environmental representatives on the source protection committees.

There are also legislated public comment opportunities in both Ontario legislation and in the source protection frameworks adopted by the Great Lakes states. Great Lakes states

often require the public water supplier to include as one element of the source protection plan details of how the water supplier will engage the public as the plan is developed. This would include opportunities for the public to review and comment on the plan. It is seen as a vital method of ensuring public acceptance of the plan and its implementation. With the same intent, Ontario has provided for a public review of the terms of references, the proposed assessment reports and the proposed source protection plans, when they are completed.

### ***11. Ontario has required source protection plans to consider Great Lakes Agreements.***

Ontario has put into the *Clean Water Act* important provisions for considering Great Lakes-related agreements as part of the source protection planning process. This could potentially address threats to the Great Lakes which are outside of Ontario's jurisdiction and outside of watershed-based planning areas.

Source protection committees are required to consider whether a Remedial Action Plan or Lakewide Management Plan applies to the relevant watershed when framing the terms of reference or scope of their source protection work. Similarly, the U.S. Great Lakes Protocol designed for Great Lakes' communities encourages the assessments to consider general Great Lakes water quality and trends within the assessment area and to use Remedial Action Plans and Lakewide Management Plans to inform the assessments.

However, since the U.S. SDWA does not require protection planning or implementation of plans, any action taken to plan for protecting Great Lakes drinking water sources has been done by individual communities, rather than by legislated design. The limits of the source protection planning programs in the U.S. demonstrate the need for a higher-level international agreement that will ensure a consistent Basin-wide approach to source protection. This is discussed in greater detail in the next section.

### ***12. Ontario has created opportunities for collaborative work around the Great Lakes***

In Great Lakes states, work on source protection planning for surface water intakes is only in very initial stages of development. The Great Lakes are considered to be less threatened than groundwater or river sources of drinking water in most states.

In contrast, Ontario has emphasized their protection and has shown leadership in making their protection as a drinking water source an important concern in the Clean Water Act. As a result, collaborative efforts have arisen in response to the source protection mandate. For example, in Lake Erie four Conservation Authorities have formed the Lake Erie Source Protection Region. This cooperation allows Conservation Authorities to share knowledgeable staff and maximize their resources. Also, nine municipalities and five Conservation Authorities around Lake Ontario formed the Lake Ontario Collaborative to share the technical work involved in preparing assessments and threats and issues inventories for intakes along the Lake. This is an important example of Great Lakes'

municipalities working together to evaluate the problems and threats to drinking water in one of the Great Lakes.

## **7.2 Aspects of Neighbouring Jurisdictions' Approaches that May be Applicable to Ontario**

### ***1. Mandated source water assessments have provided the states with the basis on which to build source protection plans.***

Federally mandated source water assessments have been used by all Great Lakes States to build source protection planning efforts. As a result, Great Lakes States have established wellhead protection programs and some have introduced surface water protection programs. Minnesota is widely regarded as the leading Great Lakes' jurisdiction with respect to source protection. Minnesota has put in place regulations that require all municipal drinking water systems using groundwater to put in place wellhead protection plans and to implement them. In addition, Minnesota has already developed guidance for protecting surface water sources of drinking water. Indiana and Wisconsin have also put in place regulations that require mandatory plans for wellhead protection. Other states, Michigan, Ohio and Pennsylvania have voluntary programs for both wellhead protection and surface water protection. New York has its historic Watershed Rules and Regulations which can be used for protecting drinking water sources, and Illinois has a Groundwater Protection Act into which its wellhead protection program is nested.

These jurisdictions have faced many of the challenges in developing guidance and approving plans that could benefit Ontario. Although Ontario's approach in many ways goes beyond the legislative frameworks of neighbouring jurisdictions, the practical experience that has been developed by other states could be of use to Ontario.

Ontario could convene discussions with other source protection specialists in state governments on the lessons learned as individual communities face the challenges of drawing up plans and putting them into effect. As well, guidance material that has already been produced by these States could be used to help inform Ontario's guidance materials on the assessment report and source protection plan.

### ***2. Some communities have already gained experience with watershed-based source protection planning.***

In at least three Great Lakes states, watershed-based source protection planning is underway, although none of them are in the Great Lakes watershed. These initiatives developed in areas where cities taking their water from surface water sources wanted to protect their drinking water from the threat of existing and future contamination. They also represent models of inter-jurisdictional cooperation.

Pennsylvania's Schuylkill Action Network (SAN) has already assembled a collaborative involving more than 100 organizations interested in developing and implementing a

protection plan for the Schuylkill River. A structure of working groups, support teams, a planning committee and an executive committee all participate in activities and planning to address the major contamination problems in the Schuylkill River and the watershed that surrounds it. The Watershed Land Protection Group, for example, is developing a model for preserving land based on its importance in drinking water protection.<sup>72</sup>

Similarly, in Minnesota the Upper Mississippi River Source Water Protection Project, the communities of St. Cloud and St. Paul have recently developed strategic plans for protecting their drinking water supplies. In the Upper Mississippi River, as in Ontario, both surface and groundwater sources of drinking water are included in the planning process. In the Upper Mississippi River area, public water suppliers argued for including larger land areas because they realized that controlling diverse activities over a large area was key to protecting the water supply.

Another example is New York City where work to protect the drinking water supply area has been ongoing for years. The New York City Watershed Memorandum of Agreements has established numerous programs including land acquisition, regulation of activities in the watershed and many watershed protection and partnership programs.

Ontario could benefit from an examination of the structure, the goals and activities, and the strategic planning that has already been done in these communities with respect to watershed planning. Both projects could offer source protection committees ideas and approaches for addressing threats to drinking water sources.

The committee structure set up by the Schuylkill Action Network that addresses specific problems within their watershed may be of particular interest to source protection committees as they begin their assessment work and assign responsibilities for particular issues of concern in watersheds.

***3. U.S. jurisdictions have used a range of existing tools for source protection planning that could also be applied in Ontario.***

States have used a variety of existing state and municipally-based tools to further source protection plans. Some municipal water suppliers have put in place ordinances (bylaws) that prohibit or restrict certain activities, incentives to polluters to reduce their activities or have used land acquisition to protect drinking water. Source protection plans being approved by state officials have included many creative new approaches to source protection using existing tools.

In Ohio, the City of Dayton, for example, has used an incentive based program to encourage polluting businesses to cut back on their discharges of regulated substances. Grants are available from a fund created by a water surcharge to businesses if they make significant reductions in their pollution and agree to maintain it

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<sup>72</sup> Watershed Land Protection Collaborative. Accessible at [www.schuylkillactionnetwork.org/](http://www.schuylkillactionnetwork.org/)

Land acquisition is an important tool widely used in the U.S., advocated by groups such as the Lands for Public Trust as a permanent means of source protection. It is one of the significant programs in New York City's efforts to avoid filtration of its drinking water supply. The City's land acquisition program buys, or obtains Watershed Conservation Easements on, strategic properties in the watershed through a willing seller process.<sup>73</sup> This may be a useful strategy for Ontario and municipalities to consider, especially in vulnerable areas where source water is in close proximity to development.

Ontario should consider consulting the source protection plans developed by individual municipalities in states such as Minnesota, Ohio, Michigan, Indiana or Wisconsin for documents that are examples of best practices.

***4. Contingency plans for drinking water supplies are part of source protection planning.***

In the United States unlike Ontario, contingency planning is an important element in source water protection plans. Under the *Safe Drinking Water Act*, the states must establish contingency plans for drinking water systems. These are considered necessary for a timely and effective response to any interruption of the public water supply caused by contamination or mechanical failures.

Many of the Great Lakes states have included contingency planning in the source protection frameworks. In Minnesota, for example, source water protection plans for wells must include contingency plans. Illinois takes a different approach, working with communities to develop emergency response procedures and establishing its own State Emergency Response Procedures for a state-wide drinking water emergency.

Ontario has emergency response capabilities at the provincial level and municipalities have also developed emergency response plans for drinking water problems. However, these considerations have not been identified as a mandatory element in source protection plans. Ontario could advise source protection committees to consider incorporating emergency response planning into their source protection plans.

***5. Public education is an important component of U.S. source protection programs.***

Ohio has created a network of state and local government officials knowledgeable about source water protection. They are organized into 39 teams, known as Source Water Environmental Education Teams (SWEET). They provide information and demonstrations on source water protection to drinking water source protection teams, municipal meetings and community events.

In addition, most states include public education as an essential element in the management strategies of all source protection plans.

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<sup>73</sup> New York City Memorandum of Agreement, Article II, No. 60, January 21, 1997. Accessible at [www.nysefc.org](http://www.nysefc.org)

Ontario could consider the formation of provincial teams that would be available for similar outreach and education work around source protection, particularly for helping source protection committees understand some of the technical aspects of assessments.

***6. Minnesota and Indiana have made considerations of water quantity an element in source protection planning, while Wisconsin has made water conservation a required element.***

Minnesota requires as part of its regulated wellhead protection planning that public water suppliers address water quantity issues. These include information on surface water quantity including high, mean and low flows, permitted withdrawal, a list of lakes and streams for which protected levels or flows have been established, a description of known water-use conflicts, including those caused by groundwater pumping. Information on groundwater must include a list of wells covered by permits including the amounts of water taken, the type of use and aquifer source, a description of known well interference problems and land use conflicts and a list of state environmental bore holes.

Wisconsin requires public water suppliers, in applying for permission to build new wells, to include conservation in their wellhead protection plans. It is suggested that the programs include promotion of water saving fixtures, water loss surveys, off peak water sprinkling, alternate day sprinkling or other methods of reducing the demand for water, although none of these are mandatory elements.

Ontario has also made water budgeting a critical element of its source protection planning. Minnesota and Wisconsin's experience with communities that have already implemented protection plans may be useful to inform Ontario's source protection committees as they develop water budgets and consider conservation programs.

***7. Ohio has put in place continuing education for owners and operators of water treatment facilities as an incentive to develop source protection plans.***

Ohio has used education credits for operators taking courses on source protection planning as a way to encourage more public water suppliers to develop source protection plans.

Ontario could integrate source protection planning into the certification and upgrading programs offered to its water treatment plant operators.

***8. Pennsylvania has developed innovative taxes to pay for environmental activities including source protection activities.***

Although Ontario has made commitments to funding source protection activities, the U.S. states have found that the cost and responsibility of developing source protection plans can be a hardship for the communities and that they are, therefore, reluctant to do the work. This undermines the vitality of state programs. Where no legislation requires source protection planning, states have tried to encourage planning using funding as an incentive.

Pennsylvania has implemented its Growing Greener grant program to fund source protection planning, partially financed by a tax on municipal waste disposal.

Although provincial and municipal funds may be available for source protection in the initial stages, Ontario may want to explore other funding mechanisms for later stages where communities, particularly smaller ones, face challenges in funding their source protection implementation activities.

***9. States have state regulations that prohibit certain activities within wellhead areas.***

Strong regulations in several Great Lakes' states prohibit or restrict potential sources of contamination in wellhead protection areas, such as pesticide storage or use of underground storage tanks. These regulations alleviate the burden on municipalities and smaller communities for enacting zoning bylaws to restrict activities that threaten drinking water in wellhead protection areas. They also make it easier for private water suppliers who do not have the ability to impose zoning bylaws to protect sources of drinking water. In states with source protection planning programs, these state regulations are incorporated into protection plans.

In Illinois, for example, the state prohibits activities in wellhead areas that might put drinking water at risk. Regulations apply to new activities and existing activities. Existing sources of contamination that are prohibited are given 3 year time frames for their phase out. The restriction or prohibition of certain activities around wellheads and in regulated recharge areas strengthens the framework for groundwater protection in the state.

Similarly, Ohio has rules that prohibit land application or storage of biosolids in areas around community water supplies. There are also state restrictions on animal feeding operations, underground storage tanks, construction and demolition landfills, industrial solid waste landfills, and underground injection wells for motor vehicle waste.

Ontario's prohibitions and risk management tools will help municipalities control similar activities in areas identified as vulnerable, but Ontario could consider adopting provincial prohibitions or restrictions on certain activities in vulnerable source water areas, particularly where source protection assessments identify similar threats in source protection areas across the province.

***10. Minnesota offers technical expertise and funding for small communities.***

In Minnesota, larger communities are required to do their own hydrogeological studies as part of their wellhead protection plans. However, for communities of less than 3300 people, Minnesota provides a hydrogeologist to delineate the recharge area. Minnesota has a large staff, 8 planners and 6 hydrogeologists that are part of the source protection unit at the Department of Health. In addition, the Minnesota Rural Water Association also provides technical support for small and rural communities. This commitment of



support and resources has enabled Minnesota to extend its wellhead protection program to non-community water supplies which are smaller and more difficult to assess.

Ontario has provided considerable funding for technical support in the source protection areas. Minnesota's model of providing hydrogeological and technical support staff for smaller communities could be considered for more rural, northern and remote areas outside of the source protection areas as Ontario moves forward with its program.

## **Part Two: Protecting the Great Lakes as a Drinking Water Source**

### ***8. Great Lakes and International Source Protection Considerations***

Implementing source protection effectively for the largest shared source of freshwater in the world is a major challenge. The efforts now beginning in the Great Lakes could offer other governments a new way forward to put long-term plans in place based on watershed source protection goals.

The most obvious frontier for this planning is the more than 100 water bodies crossing the borders between Canada and the United States. Disputes within these watersheds have the potential to develop and intensify in a water-scarce world. Collaborative source protection planning could give jurisdictions sharing international waters a new framework for protection that would assist in the hard decisions they will most certainly face in the future.

#### **8.1 Great Lakes Governance and Institutions**

The Great Lakes, their tributaries and groundwater are an important source of drinking water for nearly 40 million people living in Ontario and in the eight Great Lakes' States. The quality and quantity of water in the Great Lakes is the responsibility of many governments and several institutions. The governments involved include the U.S. and Canadian governments, the eight state governments, Tribes and First Nations, Ontario and Quebec.

The other increasingly important level of government in the Great Lakes Basin is local government, which has been given considerable responsibility in both countries for drinking water protection. Increased urbanization has been identified as one of the growing threats to the waters of the Great Lakes so the inclusion of municipalities is key to controlling those risks. Ontario's *Clean Water Act* provisions for watershed source protection planning have the potential to give upstream municipalities within the watershed a voice and role for the first time in their responsibilities for Great Lakes drinking water protection and decision-making that were not provided in previous arrangements.

To coordinate the protection of the Great Lakes across jurisdictional divides, several important agreements are in place – the Boundary Waters Treaty Act of 1909, the Great Lakes Water Quality Agreement, the Canada-Ontario Agreement, the Great Lakes Charter and the more recent Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. The periodic review of these national and international

agreements, which pre-date the *Clean Water Act*, provides the potential to incorporate watershed-based source protection into their goals and activities.

In both countries, source protection efforts are underway. However, these activities are being undertaken at a state, provincial or local level without yet being sufficiently integrated into a larger effort to protect the entire Great Lakes Basin and its watersheds as a critical source of drinking water.

Ontario's source water protection legislation requires the terms of reference (a workplan for the assessment report and source protection plans), in areas where water flows into the Great Lakes, to consider international agreements related to the Great Lakes. The Great Lakes Protocol used by U.S. communities to do their drinking water assessments considered some Great Lakes' programs enshrined in the Great Lakes Water Quality Agreement such as Remedial Action Plans. However, states were not required by law to incorporate international agreements into their source protection work.

Strengthening source protection provisions in international agreements could lead to improvements in the Great Lakes as a drinking water source for both countries. As well, key elements of the agreements and their implementing programs could be more effectively integrated into local source protection programs. Source protection has the potential to integrate ground and tributary water into Great Lakes Basin protection regimes which have largely overlooked this part of the ecosystem in the past. The distinct legal roles and responsibilities are not well understood by the general public, the media, and sometimes by politicians.

One unintentional peril of source protection could be the creation of another plethora of institutions in the Great Lakes and the jurisdictional gridlock that their sheer numbers can cause. Considerable confusion is created already by the number of actors in play with responsibilities for aspects of Great Lakes protection. The lack of progress on conservation and protection set out in Great Lakes agreements has led to several initiatives this year to examine "governance" in the Great Lakes and how it might be improved. For example, in January 2007 a report, "Great Lakes Governance and Institutions", was submitted to the Committee overseeing the review the Great Lakes Water Quality Agreement by Canadian and U.S. representatives. Another report, "Water Governance in Transition: Utility restructuring and water efficiency in Ontario" prepared by the University of British Columbia's Program on Water Governance, looks at restructuring municipal governance to enable improved water conservation outcomes. A report recommending reforms to Great Lakes' governance by Great Lakes United "A Way Forward Strengthening Decision-Making and Accountability under the Great Lakes Water Quality Agreement" was released in January 2008. Other work by US and Canadian academics on governance in the Great Lakes St. Lawrence River ecosystem is also underway.

## 8.2 The International Boundary Waters Treaty of 1909 and the International Joint Commission

The first major agreement on the Great Lakes was the Boundary Waters Treaty of 1909. This agreement defines boundary waters “as the waters from main shore of the lakes rivers and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters which in their natural channels would flow into such lakes, rivers and waterways, or waters flowing from such lakes, rivers and waterways, or the waters of rivers flowing across the boundary”. This treaty sets out the hierarchy of use for domestic and sanitary purposes, navigation, power and agricultural and commerce purposes, conditions on diversions and obstructions of flows, and in Article IV requires that boundary waters and waters flowing across the Boundaries “shall not be polluted on either side to the injury of health or property on the other”.

The Treaty established the International Joint Commission (IJC) and gave it the powers “to have jurisdiction over and pass upon all cases involving the use or destruction or diversion of the waters” including the pollution provisions included in Article IV. It allows the IJC to adjudicate boundary waters matters between the two countries and if asked by the two countries to conduct special references.

With in the context of source protection, it is significant to note that although domestic and sanitary use has the highest priority in this agreement, the tributaries running into the Great Lakes and the groundwater portion of the ecosystem do not fall within the jurisdiction of the Commission under the Treaty.

The IJC in its report “The IJC and the 21<sup>st</sup> Century” has made recommendations on reorganization of the governance for transboundary waters shared between Canada and the US along watersheds. They recommended in this 1997 report that ecosystem-based international watershed boards be created in transboundary waters. In a June 2005 report, *A Discussion Paper on the International Watersheds Initiative*, they focused on strengthening the capacities of the Commission’s existing boards to anticipate and respond to watershed issues. One of the three watersheds targeted for this initiative was the Rainy and Namakan Lakes shared between Ontario and Minnesota.

Ontario’s *Clean Water Act* gives the Minister of the Environment the discretion to appoint an Advisory Committee on Great Lakes Source Protection. In order to coordinating activities with the International Joint Commission and their water boards, Ontario should consider including representatives of the IJC on the Advisory Committee. This would ensure that the IJC can begin to anticipate and respond to potential transboundary problems within the Great Lakes and act proactively with local communities to avoid disputes. This experience could help them in other watersheds. This might in turn help promote Ontario’s source protection efforts as a model for other jurisdictions.

### 8.3 Great Lakes Water Quality Agreement

The Great Lakes Water Quality Agreement of 1972, amended most recently in 1987, was intended to address many problems that will also now be considered as part of Ontario's source protection framework. The Agreement aims to "restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem" and includes tributary waters. Under the Agreement, Canada and the United States committed to working with the States and Provinces towards the elimination or reduction of toxic substances and the virtual elimination of all persistent toxic substances, financing the construction of waste water treatment plants and ensuring adequate control of all sources of pollutants – including point and non-point sources. However, the achievement of these goals has proven elusive.

Although governments point to successes in improving some parts of the Great Lakes, generally the prognosis has been mixed. Despite the emphasis on virtual elimination, governments have been unable to effectively reduce or eliminate many of the toxic chemicals slated for elimination. A recent permit to a BP refinery by the state of Indiana exemplified the lack of commitment to this goal on the part of some states. The permit generated considerable controversy because it allowed increased discharges of mercury into Lake Michigan.<sup>74</sup> Mercury compounds are listed in Annex II of the GLWQA as toxic substances. Both countries have agreed to work towards virtual eliminating them from the Great Lakes.

Ontario's source protection framework could accelerate their progress on toxic use reduction goals in Article II of the GLWQA. The Minister could designate a policy as set out in Section 22 of the CWA that all hazardous polluting substances listed in Appendix 1 to the GLWQA found to be discharged to Source Protection Areas in the Great Lakes receive priority for action.

The need to introduce source water protection provisions has also been brought forward in the extensive review of the existing Agreement. In the summer of 2006 an Agreement Review Committee was established to synthesize the findings and recommendations from nine working groups that had been reviewing the Great Lakes Water Quality Agreement. An unprecedented 350 government and non-governmental reviewers from both Canada and the U.S. participated in examining the Agreement from the perspective of five themes: its purpose and scope, outdated elements, pressing issues and emerging threats, accountability, and implementation.

The report "*Review of the Canada-U.S. Great Lakes Water Quality Agreement*" suggested that the "Agreement should highlight, emphasize and facilitate watershed planning as an effective approach to achieving the purpose of the Agreement."<sup>75</sup> More specifically, the report recommended that binational watershed policies be linked with

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<sup>74</sup> Chicago Tribune, "BP Dumps mercury in lake", July 27, 2007.

<sup>75</sup> Agreement Review Committee. Review of the Canada U.S. Great Lakes Water Quality Agreement; Report to the Great Lakes Binational Executive Committee, Volume 1, Sept. 2007 p.3..

local implementation efforts in creating a consistent planning process across the Great Lakes basin.<sup>76</sup>

A number of working groups were established to make recommendations to the Agreement Review Committee on revising the GLWQA. New and emerging issues significant to the waters of the Great Lakes ecosystem were given to the Special Issues Working Group. Several of their findings are relevant to this examination of source protection. Foremost is the conclusion that “newer approaches, such as watershed management planning, should be strengthened for achieving the purposes of the Agreement”.<sup>77</sup>

With respect to source protection in particular, the Special Issues Working Group recommended that:

- The Agreement should name source protection as one of its primary goals;
- The Agreement should charge the Parties to set specific binational targets for source water protection;
- The Agreement should commit the Parties to developing an overarching, Basin-scale framework to support the local development and implementation of watershed-based source protection initiatives; and,
- The Agreement should commit the Parties to identify innovative source water protection programs, and developing mechanisms for sharing best practices in source protection among Great Lakes Basin jurisdictions.<sup>78</sup>

The report goes on to say that “‘fishable, swimmable and drinkable’ has long been recognized as the encapsulation of a vision for the Lakes. Yet, the Agreement does little to address the “drinkable” goal. Source Protection - protecting the waters of the Great Lakes Basin, including aquifers as well as surface water - is the first barrier in a multi-barrier approach to drinking water protection.”<sup>79</sup>

Another group, the Review Working Group on Groundwater Issues, made some key findings about the inadequacy of groundwater protection in the Agreement.<sup>80</sup> Some groundwater experts who participated in this Working Group estimated that the groundwater resources of the Great Lakes are likely as large as Lake Michigan. Additionally, the sources of the headwaters of most Great Lakes tributaries are under the influence of groundwater and their flows and health are dependent on replenishment from groundwater.

This Working Group concluded:

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<sup>76</sup> *Ibid.*

<sup>77</sup> Final Review Working Group Reports to ARC, Volume 2, Special Issues Working Group, December 18, 2006, p.293,

<sup>78</sup> *Ibid.* p. 298.

<sup>79</sup> *Op. cit.* p. 296.

<sup>80</sup> Final Review Working Group Reports to ARC, Volume 2, Review Working Group H, December 18, 2006,

“Annex 16 and Article 1 (of the GLWQA) does not integrate groundwater adequately into the definitions of the Great Lakes System or the Great Lakes Ecosystem”.<sup>81</sup>

Consequently, the Agreement does not mandate pollution prevention (source protection) for groundwater equivalent to protections given to surface and tributary waters. Groundwater protection has long gone unrecognized in this Agreement as an integral part of Great Lakes protection. Source water protection could play a major role in overcoming this neglect, particularly the requirement to do water budgets for source water protection plans. Information gathered for the water budgets should result in better understanding of the contribution of groundwater to the overall health of Ontario tributaries flowing into the Great Lakes. Integration of new information arising from the scientific work set out in the *Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement* with source protection data could also improve knowledge about groundwater drinking water sources and their interaction with surface water sources within the ecosystem (see section 8.6).

In light of the current 2007 review of the Agreement, the progress of Ontario and the states in advancing source protection work should be taken into consideration and integrated into the next version of the Agreement.

### ***Important Provisions of the Great Lakes Water Quality Agreement***

The previous revision of the Great Lakes Water Quality Agreement in 1987 (GLQWA) came at a time when there was concern about the health implications of pollution in the Great Lakes. Abnormalities and reproductive failures in fish and bird populations in the Great Lakes were well documented by scientific researchers. Public concern was at an all-time high. There was a need for new results-based programs to clean up the hot spots around the Lakes.

In cooperation with state and provincial governments, Canada and the United States agreed under Article IV to develop and implement Remedial Action Plans (RAPs) for 43 of these hot spots known as “Areas of Concern” (AOCs). They also agreed to develop and implement Lakewide Management Plans (LaMPs) to address critical pollutants in all five Great Lakes. These Plans, described in Annex II of the GLQWA, were intended to incorporate an ecosystem approach to restore and protect beneficial uses in Areas of Concern or in open lake waters. AOCs were evaluated based on a list of possible impairments of beneficial uses. One of the impairments of beneficial uses, which was identified in some of the AOCs, was “restrictions on *drinking water consumption*, or taste and odour problems”.

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<sup>81</sup> Ibid. p. 291.

### ***Remedial Action Plans***

Remedial Action Plans were to be developed in three phases. Stage 1 was to identify problems leading to impaired uses. Stage 2 was to produce a detailed remedial action plan, and implement it, and Stage 3 was delisting.

While the RAP rallying cry was “swimmable, drinkable, fishable”, very little attention was paid by RAPs to drinking water protection at the source. Although the aesthetics of taste and odour were concerns, most RAP groups relied on drinking water treatment systems to guarantee the safety of their drinking water.

A large stigma was attached to being an Area of Concern in the Great Lakes. The goal of being “delisted” as an Area of Concern obscured the goal of permanent clean-up for towns like Collingwood which were tourist destinations. Several months after Collingwood was delisted, they experienced a cryptosporidia outbreak. This led to recognition that the Town’s drinking water treatment system was not adequate for removing pathogens but ironically did not impact their status as a RAP success. Eventually, Collingwood did build an adequate drinking water treatment plant.

There are lessons that Ontario can draw from the RAP process which could assist them in their source water protection plans. For instance, RAP groups considered direct discharges into the Lakes and harbours within the boundaries of the AOC as well as the contaminated sediments lining the bottoms of all but one AOC. However, the narrow geographical definition of these Areas of Concern ruled out pollutants flowing down the tributaries into the Great Lakes. RAP groups struggled to get land uses, non-point sources and activities beyond the water’s edge included as part of their planning, with varying degrees of success.

Similarly, in Ontario it will be a challenge for the source protection committees to maintain a strict focus on a drinking water source protection agenda, especially as it pertains to the Great Lakes where an ecosystem approach has been pioneered. A healthy ecosystem depends on the health of all its elements, and as a result, many around the committee tables will find it hard to narrow their concerns. Mechanisms will need to be developed to ensure that there is integration of source protection with other efforts such as habitat restoration and protection.

Both the RAPs and the Ontario source protection planning processes are designed to broadly engage representational stakeholders in scoping, evaluating and planning protection. Groups like Great Lakes United made extraordinary efforts to form networks of RAP stakeholders so that information and best practices could be shared. It will be necessary for Ontario to provide resources to committees that allow their continued involvement in implementation. Many RAP stakeholders who invested over a decade in shaping these plans were disenfranchised when the resources did not materialize to implement their preferred options for clean-up. While many of those stakeholders have struggled to remain involved, many are contributing from the outside, rather than from within the implementation process as they had expected at the outset. Continued public



engagement in the implementation of source protection plans will be essential to the continued government support that will be needed to have these plans completed.

Likewise, adequate resources for source protection committees to share their work regularly with each other and the general public will result in greater buy-in of, and long term commitment to, the resulting source protection plans. Sharing goals, outcomes and decisions could contribute to greater efficiencies and shorten the time it takes to roll out the plans. Because source protection is seen as a positive new approach involving every community and its framework is well established, it is unlikely that the process will have conflicting objectives that hindered the RAPs. It is expected that some source protection planning policies will benefit RAP implementation.

### *Lakewide Management Plans*

The emphasis of the Lakewide Management Plans was the reduction of loadings of critical pollutants to the lakes, as defined in the GLWQA. Plans were to include:

- a definition of the threat to human health or aquatic life from critical pollutants;
- an evaluation of their concentrations, sources and pathways;
- steps to determine how to develop information on load reductions;
- the determination of load reductions necessary to meet the objectives of the GLWQA;
- an evaluation of remedial measures in place and the identification of additional necessary remedial measures, including a schedule;
- a process for evaluation; and
- a description of the monitoring activities and a process for identifying the absence of a critical pollutant in open lake waters.

Status reports on the lakes indicate that there is continuing concern about the overall health of the ecosystems of each Great Lake that will impinge upon the quality of raw water withdrawn for drinking water:

- Lake Michigan Lakewide Management Plan 2006 Status Report, prepared by the EPA, showed that there were continued beach closures during beach season; a critical layer of the aquatic food web continued to disappear; the number of aquatic nuisance species increased to 180; and mercury in fish was a prevalent problem.
- In Lake Erie, chlordane, PAHs and lead continue to be found at above acceptable levels, and algal blooms, large die-offs of fish, and new invasive species have been reported.
- Lake Ontario faces problems of invasive species, rapid urbanization, emerging chemicals of concern, fish and wildlife diseases, type E botulism and harmful algal blooms.
- In Lake Huron, there was no definition of critical pollutants, determination of chemical sources, or assessment of problems and identification of their causes.

- Lake Superior was the only lake to develop a load reduction schedule as required by the Agreement. This was likely because it was the most pristine of the Great Lakes and selected to be a zero discharge demonstration area. As a result, the Lake Superior LaMP reported a decrease in mercury releases, dioxin, PCBs and pesticides.

The LaMPs provide a binational structure for monitoring, evaluating and protecting the individual Great Lakes, based on an ecosystem approach. Although these plans present a picture of the Great Lakes and the activities taking place on each lake, unlike source protection programs there are no requirements for the development of a plan. Nor are there management strategies that would emphasize preserving the lakes as a drinking water source, although there are numerous conditions within the Lakes that are having an impact on the surface water sources of Great Lakes' drinking water.

In contrast, pursuant to the Ontario source protection initiative several Canadian municipalities around Lake Ontario have coordinated their efforts on a lake-wide basis. Municipalities, utilities and Conservation Authorities from Niagara around Lake Ontario to Prince Edward County have formed a partnership called the Collaborative Study to Protect Lake Ontario Drinking Water. They received funding from the provincial government in support of their source protection technical study.

Under this collaboration, research and monitoring of the physical, chemical and biological characteristics of both the nearshore and open waters of Lake Ontario is carried out by Environment Canada scientists and supported by Ministry of Environment scientists on behalf of the municipalities. Phase I of their work is a detailed analysis of existing information, the identification of hazards and threats, and the preliminary delineation of Intake Protection Zones for all Lake Ontario municipal drinking water intakes. Research efforts are particularly focussed on the inshore area of the western basin that is affected by rivers and outfalls and is a source of drinking water to 5 million people. The goal is "to ensure the long-term, proactive and strategic protection of Lake Ontario-based drinking water supplies".

The Lake Ontario Collaborative stands out as an example of a cooperative approach to assessing the Lake as a drinking water source, and should be a model for the communities on other Great Lakes. It is more comprehensive than the assessment work done for individual Great Lakes' communities on the U.S. side of the border under the Great Lakes Protocol, and it improves on the Lakewide Management Plans by including a drinking water source protection focus. The Collaborative establishes the groundwork for a coordinated binational effort on drinking water.

## **8.4 Canada Ontario Agreement**

The latest Canada Ontario Agreement Respecting the Great Lakes Ecosystem (COA) was signed in June 2007 by federal Canadian departments and Ontario government ministries. This agreement is a contract between the federal government and Ontario that sets out

each government's responsibilities for implementing the provisions of the GLWQA in work plans and cost sharing. The latest COA sets out their 3 year Great Lakes commitments.

There are four Annexes (sections) in this Agreement. Annex 3 recognizes that the waters of the Great Lakes Basin provide drinking water for most people in Ontario. It also recognizes that drinking water source protection is a preventive approach which works at the watershed level to protect drinking water while supporting other lake- and basin-wide environmental initiatives.

For the first time, COA contains commitments from the Canadian and Ontario governments to protect sources of drinking water. If these commitments are also included in the next Great Lakes Water Quality Agreement, protection of source water will be elevated to an international concern. A decision on whether or not to revise the GLWQA is expected in 2008.

Included among COA's strengthened source protection commitments is Annex 3, Goal 6. The goal is to "make significant progress towards the development and implementation of locally-created, science-based source protection plans to identify and mitigate risks to drinking water sources in the Great Lakes Basin." As a means of reaching this goal, both governments aim to provide source protection committees with data sets, studies and expertise to identify and assess threats, consider the risks associated with wastewater in setting priorities for infrastructure programs, and strengthen Great Lakes' protection through binational mechanisms. The two governments have also agreed to support shared research and promote collaboration among source protection committees to identify threats in the multiple basin watersheds. (Other source protection commitments in COA are Ontario-only.)

If COA is successful at prompting the integration of source protection in the future GLWQA, commitments to funding and resources for planning and implementation would be made not only by Canada and Ontario but would also be made by the U.S. federal government and the states.

## **8.5 The Great Lakes Regional Collaboration**

In May of 2004 U.S. President George W. Bush signed an Executive Order: Establishment of Great Lakes Interagency Task Force and Promotion of a Regional Collaboration of National Significance for the Great Lakes. The Executive Order acknowledged that "over 140 Federal programs help fund and implement environmental restoration and management activities throughout the Great Lakes Basin. These activities would benefit substantially from more systematic collaboration and better integration of effort. To this end, the Federal government will partner with the Great Lakes States, tribal and local governments, communities, and other interests to establish a regional collaboration to address nationally significant environmental and natural resource issues involving the Great Lakes.

The Executive Order went on to set up a Task Force made up of all the lead Federal Agencies responsible for the Great Lakes that would report to the President through the Chairman of the Council on Environmental Quality. A Report to the President was required by May 31, 2005 summarizing the activities and recommendations of the Task Force in advancing policy on collaboration including with Canada, the Provinces and bi-national bodies, consistent Federal policies, out-come based goals, information exchange, coordinated government action, coordinated Federal scientific research, coordinated government development and implementation and support to member agencies on the Taskforce.

After extensive discussions, the federal Great Lakes Interagency Task Force, the Council of Great Lakes Governors, the Great Lakes Cities Initiative, Great Lakes tribes and the Great Lakes Congressional Task Force moved to convene a group now known as the Great Lakes Regional Collaboration (GLRC) which also included non-governmental groups. This group worked collectively after extensive consultation of over 1,500 stakeholders on a strategy vision. The [Great Lakes Regional Collaboration's Strategy to Restore and Protect the Great Lakes](#) was released at Summit II in Chicago on December 12, 2005.

It is significant that for the first time this Strategy is now gives the U.S. Great Lakes an agreement comparable to the Canada Ontario Agreement that sets out a shared plan between levels of government. It has an overarching emphasis on human health, tribal interests and emphasis on research and monitoring. Focus areas of the strategy are in the areas of, aquatic invasive species, habitat conservation and species management, near-shore waters and coastal areas (Coastal health), areas of concern, non-point sources, toxic pollutants, sound information base and representative indicators, and sustainability.

This Strategy has not placed an emphasis on drinking water source protection although the outcome of its implementation could result in cleaner waters in the Great Lakes. This may be because the U.S. has relied on the provisions of their *Clean Water Act* of 1977 as their main legislative tool to protect drinking water.

## **8.6 Great Lakes Charter Annex and the Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement**

The Great Lakes Charter of 1985 was a non-binding agreement between the Great Lakes States and Provinces to improve their collective management and use of the waters of the Great Lakes and prevent impacts from harmful withdrawals. Commitment to this agreement had languished during the period when there were high water levels in the system.

In the late 1990s concerns were growing about a number of Great Lakes water quantity issues as Lake levels were becoming lower. There was recognition that the major legal protections in place, the international *Boundary Waters Treaty of 1909* and the U.S.

*Water Resources Development Act*, did not include protections for all of the ecosystem, particularly the growing pressures on groundwater.

The Great Lakes States, Ontario and Quebec undertook in the Great Lakes Charter Annex of 2001 to negotiate a binding framework for sustaining the Great Lakes. After four years of hard negotiations, two Agreements, *The Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement* (the Agreement) was signed, and *The Great Lakes-St. Lawrence River Basin Water Resources Compact* (the Compact) was put in place in December 2005.

The Great Lakes Commission, anticipating issues that would be raised during these negotiations, undertook research into the state of science and understanding of the impacts of lower lake levels on the ecosystem.<sup>82</sup> Their research found that there were very little documented impacts on the individual or cumulative impacts of lower lake levels. As well, there was little understanding of the interactions and relationships between ground and surface water and little knowledge of the extent of the groundwater resources within the Great Lakes. A new science strategy to fill in these knowledge deficits was called for in the Agreement. Information gathered for the water budget module of the assessment report has the potential to begin to define the extent and sustainability of groundwater resources in the Ontario portion of the Great Lakes and promote better understanding of low water levels impacts.

The Agreement set out the international obligations for all ten parties, including the eight Great Lakes States and two provinces. Ontario and Quebec committed to implement their obligations in provincial laws. The Compact set up a cooperative management structure among the U.S. States that must be passed by all eight State governments and Congress into laws. Compact arrangements have long been used in the U.S. to set out co-management of shared waters among states. Compacts, condoned by U.S. Congress, have long been in place to manage waters in the arid U.S. southwest and have resulted in strong and innovative water conservation practices.

Ontario played a unique role in the Great Lake Charter Annex negotiations and the Province's laws and practices distinguished it from other Great Lakes jurisdictions. Ontario had acted after 1985 on Great Lakes Charter recommendations to put in place a permit to take water system that tracks all water user sectors requesting volumes over 50,000 litres a day (usage of a small to medium size farm). Only one other State, Minnesota, tracks such low volumes, and there was no appetite among the other Great Lakes States to enshrine trigger levels in the Agreement and in their state programs that would track volumes less than 379,000 litres a day. During the course of the negotiations, Ontario improved their water permitting system to require reporting on volumes of return flow from allowable uses. This tracking will start to bring important information to the water budget exercises required by the source protection process on

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<sup>82</sup> The Great Lakes Commission is a public agency established by the Great Lakes Basin Compact in 1955 to help its member states and provinces speak with a unified voice and collectively fulfill their vision for a healthy, vibrant Great Lakes - St. Lawrence River region. The Commission coordinated the drafting of the original Great Lakes Charter in 1985.

how much of the water permitted for use is returned to the watershed and how much is consumptive use.

Ontario was the second jurisdiction following Minnesota to pass the Agreement provisions, by amending the *Ontario Water Resources Act*. This enshrines into law the main provisions of the Agreement -- a virtual ban on diversions, a basin-wide environmental standard for water uses, better conservation measures and an increased role for science in decision-making.

Some of the undertakings in the Agreement come into force immediately and do not need to wait for passage by all jurisdictions. The most imminent of these is the establishment of regional water conservation goals and objectives in a document which has now gone out for consultation. The environmental community and the Great Lakes Mayors have expressed disappointment that there are no targets and time tables for tangible reductions in water use with in the Basin in this document.

The Great Lakes-St. Lawrence Cities Initiative has launched their voluntary water conservation framework which is challenging Great Lakes municipalities to reduce water use by 15% below 2000 levels by 2015. This work should be integrated by municipalities participating in source protection and by each of the source protection committees within the Great Lakes when they are considering water budgets. Ontario has the potential to continue to demonstrate leadership in this regard for the other reluctant jurisdictions by adopting tangible targets and timetables.

It will also be important that the Province's conservation efforts extend to conserving and renewing natural flows and not be limited to water efficiency measures within the pipes and infrastructure. It is likely that as data are developed from water budgets required in watershed source protection plans that water wasting practices and instances of over allocation will come to light. Source protection plans should address how to save water and increase the resiliency of source waters through conservation in their plans. Data generated through the assessments and through all Great Lakes research efforts should be posted in a database that is accessible to both the broader Great Lakes community as well as the source protection community.

Such a data base could also track other important information required by the Agreement that would be important to source protection such as return flow data, cumulative impacts of water withdrawals, and consumptive uses of Great Lakes waters. It would also be helpful for source protection plans to stress best practices in water conservation where they find them.

Another initiative generated by the Agreement negotiations in 2000 in the Great Lakes is the Water Use and Supply Project jointly undertaken by Environment Canada and the Ontario Ministries of Natural Resources, Environment and Conservation Ontario. This study intended to serve as a basis for reacting to water supply challenges and provide baseline information on water supply, use and demand at a sub-basin level and to make projections for the future, including the impacts of climate change. Their study area

covers the Great Lakes, Ottawa and upper St. Lawrence River watersheds will calculate water supplies based on precipitation, evaporation, stream discharge and a base flow index. These sub-basin studies should be aggregated to the source protection watershed areas to inform their work. As this system is GIS based it should be accessible to members of source protection committees.

The Agreement requires the development of a science strategy to address our knowledge deficit by improving our understanding of ground and surface water interaction in the region that may include the boundaries and recharge rates of groundwater aquifers in the Great Lakes. This is an opportunity to bring together water quality and quantity in a way that will benefit each source protection plan by informing their water budget requirements and leading to a better understanding and control of the fate of contaminants in the Great Lakes. The water budgets required in the source protection plans could be integrated with the conservation plans of the Charter Annex to anticipate and prevent future shortages and conflicts among users within watersheds.

The standard of public discourse and involvement in Ontario's efforts on the Agreement have raised expectations of both the stakeholders as well as the government representatives involved regarding consultations on complex, multifaceted issues. Source protection promises to be a similar exercise in its complexity and duration. The Ministry of Natural Resources commissioned the Canadian Environmental Law Association to document this unique collaboration in a report, *Rethinking public Consultation from the Inside Out* - "a risk worth taking".

Many participants interviewed for the report identified the potential renegotiation of the Great Lakes Water Quality Agreement as well as source protection planning as upcoming opportunities that might benefit from a similar approach. This approach involved stakeholders in policy considerations and discussions traditionally reserved for government. The Water Advisory Panel, set up for the Annex negotiation, consists of fifty municipal, provincial, public interest and sectoral associations who are continuing to meet to carry out the implementation of the Agreement.

While Ontario was a leader in the Great Lakes in many of their water management practices, it is also more affected by some of the restrictions in the Agreement. The Agreement defines intrabasin water diversions (withdrawals from one Great Lake watershed to another) as being equivalent to diversions because their harm to the environment is equivalent. Historically, intrabasin diversions in Ontario have been allowed. The cities of Kitchener, Waterloo, and London have made it known that they would like to secure further water supplies for growth from pipelines to the Great Lakes outside of their watersheds. Hamilton is considering plans to pipe water away from Lake Ontario up across the escarpment to the Kitchener area. A controversial EA is underway in York Region which will re-plumb the region's water and sewer systems in a way that might reduce flows back to Georgian Bay.

While there are requirements for most diversions to return water diverted back to the Great Lakes, there are exceptions that could allow these intrabasin diversions to avoid the

return flow provisions. Because Ontario has four of the Great Lakes within its boundaries, it is seen as being able to take greater advantage of these exceptions than some other Great Lakes jurisdictions. Many consider these exceptions to be antithetical to the original intent of the Agreement to protect the integrity of the whole ecosystem. Because source protection areas include several watersheds, care needs to be taken that source protection plans consider the watershed boundaries of each Great Lake so as not to be in conflict with Agreement intents.

The exclusion of municipalities from the Agreement negotiations, as well as from other agreements such as the Great Lakes Water Quality Agreement, is a weakness of previous Great Lakes policies. There will be impacts on municipalities from the provisions of both of those agreements as there will be from source protection but municipalities have not had a direct role in their framing. They have, however, been allocated significant responsibility in their implementation that will require allocation of staff and fiscal resources to carry out. Financial assistance should be given to municipalities for their role in source protection planning and implementation.

In the eleventh hour of the negotiations on the Agreement, U.S. municipalities realized that provisions under consideration would prohibit them from fulfilling future growth plans. Many of these municipalities in counties near the boundaries of the Great Lakes in the U.S. had planned to move from current groundwater sources of drinking water to Great Lakes surface water so that their future growth would not be limited by their water supply. Although Ontario objected, a last minute revision was made to include these whole counties within the Compact and gave them rights to Great Lakes water. This means that the US Great Lakes states are less likely to consider limiting growth in areas of drinking water vulnerability that need source protection because they can move from vulnerable areas to new surface water sources from the Lakes.

Ontario's *Clean Water Act* is one of the first legislative initiatives in North America that has paramount provisions that limit development to protect drinking water sources. While the intent is not to limit growth, these provisions are likely to stimulate some of the continent's first discussions about the limits to growth in a water-scarce world. Other Ontario efforts are the *Oak Ridges Moraine Conservation Act, 2001*, the *Greenbelt Act, 2005* and the *Places to Grow Act, 2005* which compel planners to consider water availability and quality prior to approvals.

Whole areas in the Great Lakes are abandoning relatively cleaner groundwater sources of drinking water for the promise of unlimited quantities of Great Lakes water. This trend led to the last minute provisions to the Agreement which allowed all municipalities within a straddling county to have the same rights to Great Lakes water as communities within the watershed. Source protection has the potential to produce actual data on both the quantity and the quality of water that should lead to better informed decision-making in Ontario in the future. It should also lead to best practices in the Basin which might provide examples to the States of alternative approaches to growth and drinking water. The Agreement has provisions for the Regional Body, made up of representatives of the Governor of each state and the Premiers of the two provinces, to review the water



management practices of other Great Lakes jurisdictions every five years. This will provide Ontario with the tools to promote their drinking water source protection plans as best practices to their counterparts.

Lessons can be drawn from one troubling development late in the Agreement negotiations. There was last minute pressure from the U.S. States to expunge all but one reference to climate change in the Agreement. While this was done because the Chair of the Congressional Committee likely to approve the U.S. Compact believed that climate change was a hoax, it will negatively impact the ability of the Agreement to address climate change uniformly in the Great Lakes. This creates another opportunity for Ontario to show leadership by making sure that source protection planning is put through a climate change lens. Pollution Probe and the Canadian Water Resources Association have published *Mainstreaming Climate Change in Drinking Water Source Protection Planning in Ontario* in March 2006. This report provides general guidance for the layperson as well as technical and practical recommendations to build climate change into watershed characterizations, hydrological models and water budgets required for source protection planning. Their recommendations should inform source protection from the start.

## **9. Conclusion and Recommendations for Great Lakes Source Protection**

Ontario has put in place a strong source protection regime under the *Clean Water Act*. This is, however, just the beginning of a long process that will take many years before its effectiveness can be evaluated. Because 1/3 of Canadians draw their water from the surface waters of the Great Lakes, the success of source protection will ride on how successfully the source protection plans are integrated with plans to protect the sources within the Great Lakes themselves.

Ontario's source protection work has the potential to enhance water quality and water quantity goals historically established in the Great Lakes St Lawrence River ecosystem in numerous international and State and Provincial arrangements and programs. The *Clean Water Act* provides Ontario with an opportunity to promote and enhance source water protection at an international level by being the first Great Lakes jurisdiction to comprehensively implement source protection plans. As we have set out in this report, there is no current parallel emphasis on source protection implementation in the US Great Lakes States. The States' and federal Agendas are focused on the passage and appropriations for The Great Lakes Regional Collaboration's Strategy to Restore and Protect the Great Lakes through Congress.

We offer the following recommendations based on our analysis of the provincial and international setting as described in Part Two:

- 1) *Ontario should use all its powers under the Clean Water Act to ensure that the Great Lakes receive the maximum quality and quantity improvements by taking a leadership role in defining a structure for coordinating and integrating Great Lakes' protection efforts with source protection efforts. More specifically, we recommend that:***
  - The Minister should appoint an Advisory Committee on the Great Lakes early in the process to guide Ontario on the best way to carry out source protection in the Great Lakes and to integrate work on the surface sources with the watershed work within the Great Lakes.
  - The Minister should designate a policy as set out in Section 22 of the CWA that all hazardous polluting substances listed in Appendix 1 to the GLWQA found to be discharged to Source Protection Areas in the Great Lakes receive priority for action. This list should be updated to add other hazardous substances in use in individual watersheds. By doing this, Ontario's source protection framework could accelerate Ontario's progress on toxic use reduction goals in Article II of the GLWQA.

- The Minister should commission Great Lakes reports from source protection committees that assess the cumulative contributions of all existing and potential sources of contamination in the watersheds of the Great Lakes Basin to the Great Lakes.
  - The Minister should establish water quantity targets that would further the goals of the Great Lakes St. Lawrence River Basin Sustainable Water Agreement.
- 2) *Ontario should continue to encourage the federal governments to enshrine source protection in the next version of the Canada-U.S. Great Lakes Water Quality Agreement. More specifically, we concur with the Source Protection Workgroup reviewing the Agreement that:*
- The Agreement should name source protection as one of its primary goals.
  - The Agreement should charge the Parties to set specific binational targets for source water protection.
  - The Agreement should commit the Parties to developing an overarching, Basin-scale framework to support the local development and implementation of watershed-based source protection initiatives.
  - The Agreement should commit the Parties to identify innovative source water protection programs, and developing mechanisms for sharing best practices in source protection among Great Lakes Basin jurisdictions.<sup>83</sup>

*3) Ontario and the federal government should communicate their source protection efforts within the Great Lakes Basin to Quebec, the U.S. EPA and Great Lakes' state governments. Ontario should also share the data collected under its source water protection program to further international cooperation in restoring, conserving and maintaining the Great Lakes. In addition, this data should be made widely accessible to the public and Great Lakes Community in a web portal which could demonstrate the value of source protection.*

*4) Ontario should ensure that broader drinking water issues related to the Great Lakes are incorporated into the work of the RAPs and LaMPs early in the process and to integrate work on the service sources with the watershed work within the Great Lakes.*

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<sup>83</sup> Final Review Working Group Reports to ARC, Volume 2, Special Issues Working Group, December 18, 2006, p.293.

*5) Ontario should promote the creation of a lake-wide source protection collaborative for each of the Great Lakes using the model of the Lake Ontario Collaborative. These collaboratives should work with source protection offices in the appropriate Great Lakes states.*

*6) Ontario should integrate its work on water quantity and water budgets under the source protection framework with its commitments on conservation planning, data collection, and the development of a science strategy under the Great Lakes St. Lawrence River Sustainable Water Agreement.*

*7) Ontario should ensure that climate change is one of the factors taken into consideration under its source protection program, and inform the rest of the Great Lakes community of its findings.*

*8) Ontario should ensure that its source protection work in the Great Lakes is adequately funded through the planning and implementation phases so the advantages of source protection are evident to future decision makers in the Region.*

*9) Much of the Northern Great Lakes in Ontario are not yet covered by Source Protection because they do not fall within Conservation Authority jurisdiction. There are however significant drinking water supplies for these northern communities, which include many First Nations. Source protection activities in the north will need to be carried out in close cooperation with the federal government, First Nations and other communities to ensure there is parity with source protection activities in the south.*

## **Appendix I - Assessment Protocol for Great Lakes Sources**

August 17, 2000

### **Introduction**

Recently there has been concern over the protection of the nation's drinking water sources. This issue has been debated nationally and eventually was addressed in federal legislation. In 1996 when the federal Safe Drinking Water Act was reauthorized, legislation was added that requires source water assessments be performed on all sources of public drinking water supplies. The assessments must consider the vulnerability of these public drinking water sources. Assessments of intakes that extend into the Great Lakes present a unique challenge in determining the scope and magnitude of these assessments with limited resources. The intakes for some of these sources extend far enough into a lake to receive no effects from specific shoreline contaminant sources (except possibly air borne contaminants) while others closer to shore do. To provide guidance on how source water assessments should be performed, it will be necessary to address this very basic premise. USEPA may be able to give some assistance by providing access to data bases, developing screening methods and area wide monitoring for general contaminants, general lake responses to airborne contaminants, and other area wide general assistance.

A workgroup from the Great Lakes States has been organized to develop these parameters. This workgroup includes representatives of the Great Lakes States, water utilities with intakes on the Great Lakes, USEPA Region V and other interested parties. There should be consensus among the states and USEPA on the make up of the group. USEPA and the Region V states met on June 16, 1999 to develop a mission statement and a final draft of this protocol. The Region V states concurred on the protocol at a workgroup meeting on August 17, 2000. The following mission statement defined the intent of the workgroup.

*The mission of the Great Lakes Protocol Workgroup is to develop a consensus amongst the states for a consistent procedure allowing the flexibility necessary to properly conduct source water assessments of our Great Lakes drinking water sources. This flexibility will take into account the variability of these sources and site-specific concerns for determination of source sensitivity and susceptibility.*

### **Initial Survey**

An initial survey will be performed at each Great Lakes source to assess local source water impacts. Any criteria or studies that were performed to locate the intake should be reviewed. Senior operators and the plant superintendent at the treatment plant plus other local officials should be interviewed to gain knowledge of the raw water quality fluctuations. Past water quality records from files or existing databases would need to be reviewed and also any data collected through the Information Collection Rule (ICR). Bacteriological quality, alkalinity and turbidity levels are good indicators of localized impacts. If this review indicates that only minor fluctuations occur in raw water quality compared to the lake's background quality, the source is probably not impacted from localized contaminants and the assessment would parallel a general water quality assessment of the total lake with some consideration for potential emergency spills.

The "Great Lakes Surface Water Assessment Survey" form developed with this protocol can be utilized as a screening tool to assist in determining localized impacts. The initial survey should be used to assist with determining procedures to follow in conducting the survey. The assessment procedures will depend upon the type of local impacts, the availability and quality of local data, weather conditions, runoff, etc.

**Critical Assessment Zone**

To provide some continuity for assessing the Great Lakes intakes, the concept of a "Critical Assessment Zone" (CAZ) around each intake was developed. The two factors used for this zone which effect the sensitivity of Great Lakes intakes are the perpendicular distance from shore or length of the intake pipeline (L) in feet and the water depth (D) of the intake structure in feet. The shallower, near shore intakes are more sensitive to shoreline influences than the off shore, deep intakes. The factor for sensitivity (S) can be calculated by the formula:

$$L \times D = S$$

Generally, S values less than 25,000 represent highly sensitive intakes while S values greater than 125,000 indicate lower sensitivities. This degree of sensitivity can be used by the states as a tool to prioritize assessment activities and assist with the susceptibility determination after taking contaminant sources into account.

The intake's degree of sensitivity combined with information obtained from the survey form and local data such as intake construction, lake bottom characteristics, localized flow patterns, thermal effects and benthic nepheloid layers can be used to complete a sensitivity analysis. The benthic nepheloid layer is a zone of suspended sediment kept suspended by the interactions of current and sedimentation. The layer's characteristics around an intake depend on sediment density, water temperature, bottom currents and animal activity.

The following columns represent Great Lakes intakes with high, medium and low sensitivities. A CAZ is defined as the area from the intake structure to the shoreline and inland. This area includes a triangular water surface and a land area encompassed by an arc from the endpoint of the shoreline distance on either side of the on shore intake pipe location. The shoreline distance (SL) is measured in feet in both directions from the intake pipe location on shore while the distance inland (DI) in feet is determined by subtracting the submerged intake pipe length (L) from the critical assessment zone radius (R). The drawing, which follows, illustrates an example of the Critical Assessment Zone.

Note:  $\sqrt{\quad}$  indicates square root of parenthesized calculations.

Sensitivity Value	Critical Assessment Zone	Shoreline Distance	Distance Inland
<25,000	3,000 foot radius	$SL = \sqrt{(3000^2 - L^2)}$	$DI = 3000 - L$
25,000-125,000	2,000 foot radius	$SL = \sqrt{(2000^2 - L^2)}$	$DI = 2000 - L$
$L > 2000$	$SL = 0$	$L > 2000$	$DI = 0$
>125,000	1,000 foot radius	$SL = \sqrt{(1000^2 - L^2)}$	$DI = 1000 - L$
$L > 1000$	$SL = 0$	$L > 1000$	$DI = 0$

Along with the sensitivity analysis, an initial inventory should be completed by a combination of a simple survey form followed by an on site interview.

Attached to this document is a survey form the states could use to conduct this interview.

## **Completing the Assessment**

If the assessment indicates the intake is not impacted by potential shoreline contaminants, the assessment should reference general Great Lakes water quality and trends within the source water assessment area. This information has been compiled by several sources such as the U.S. EPA's Great Lakes National Program Office (GLNPO) and the Great Lakes Mass Balance Studies done by the USEPA, the States, and USGS. GLNPO has conducted water and sediment modeling activities using National Oceanic and Atmospheric Administration 5 kilometer grids, which should be useful for modeling potential spill scenarios from sources such as pipelines, and for assessing tributary impacts. Another source could be the Remedial Action Plans for Great Lake Areas of Concern and the Lakewide Management Plans. Some of these sources address contaminants brought forth by air deposition. Total Maximum Daily Loads (TMDLs) should also be referenced, if available.

For systems where the initial survey indicates a potential for shoreline impacts, the assessment becomes more difficult and site specific. The next step would be to provide a delineation of the area that contributes potential impacts through the use of local data and/or the "Critical Assessment Zone" concept. It would then be necessary to assess the impacts in the area and their relative impact on the quality and treatability of the raw water. If a river or stream that discharges into the lake near the intake causes a significant impact, a partial watershed assessment of that river or stream would be necessary. These impacts may not be continual, but may arise only as a result of certain events such as a specific wind direction and intensity, or a river or stream discharge into the lake at a certain flow level. The USEPA BASINS software and USGS SPARROW software may provide data for this determination. There may also be impacts from certain thermal or seasonal conditions. These issues are site specific and will require extensive review of the water quality records and in depth interviews with plant personnel.

If the water quality impact is due more to a general lake condition, such as proximity to a shallow bay, wind direction or localized current patterns, the degree of these impacts must be assessed. Interviews with the plant personnel with extensive experience at the plant would be essential. Once the impacts are categorized, assessments must be made for each impact. For example, if a shallow bay causes water quality impacts, these impacts should be noted along with the change in water quality anticipated and the degree and frequency of change. If the quality change results from an algae bloom, the conditions that promote the bloom should be listed, along with the resulting water quality changes and the degree and frequency of the changes. Each impact should be listed in the narrative portion of the assessment.

If the impact results from a discharge on the shoreline, runoff from the shoreline, local tributary or location of a facility near the intake, these potential impacts should be listed and assessed. It may be necessary to delineate an additional area extending beyond the CAZ, determine the impacts in this area and then assess these impacts. This could become complex depending upon the shoreline assessment. If the impact were from runoff, it would first have to be assessed to determine the degree of impact due to the volume and concentration of contaminants in the runoff. Is the runoff significant? If it were, the potential makeup of the runoff would need to be assessed. For example, is the runoff from farmland? If so, the time of the year would be critical. If it were urban runoff, the types of commercial and industrial establishments in the area would be important. These assessments will be complex and must be designed so they can be altered and expanded, as more information becomes available. The assessment must be dynamic in nature and be designed to be expanded in the future.

Many bays and tributary mouths in urban or industrialized areas hold deposits of sediment contaminated by metals and organic toxicants. Records of EPA and State environmental management agencies, as well as the U.S. Army Corps of Engineers Harbor Dredging Programs should be evaluated to determine whether an increase in turbidity due to material suspended in such sites might pose a risk.

Wind direction, thermal effects and local current patterns affect many intakes. The affects may be due to a shallow bay, or proximity to a shallow bay, where the bottom sediments are resuspended into the intake water column or it may direct shoreline runoff over the intake. These impacts can be surveyed by delineating an additional area that contributes water to the general area and checking the potential contaminants in the area. Extensive interviews with plant personnel and review of historical records will be necessary. Once the impact has been determined, the assessment of the impact must be made.

Remote sensing, including aerial photography and satellite imagery, can be extremely revealing both in analyzing a history of events and near real time tracking of tributary and near shore phenomena. Three-dimensional hydraulic models can be valuable tools for use in areas where they have been developed.

To complete the assessment, the susceptibility determination should include a general map of the area, the sensitivity analysis, delineation of the contributing areas, and listing of the locations of the various contaminant sources.

Before public release of the completed assessment, it should be reviewed with the water supplier for agreement of its contents.

### **Spill Assessments**

Large volumes of materials are transported on the Great Lakes by shipping. Some of these materials are toxic in nature and are subject to accidental spillage during transit and loading. Ships also pose potential risks to intakes through accidental spills of fuel and lubricants. When doing vulnerability assessments of the intakes, this traffic should be considered. If ships pass in close proximity to an intake, or if there is a nearby commercial loading facility or harbor, procedures should be established by the water supplier to react to spills from these ships. It would not be possible to predict many specific contaminants from general shipping, but proximity of a particular industry serviced at a local harbor would indicate heightened risk potentials for specific products or supplies. Procedures could be developed for reaction to families of contaminants, such as volatile organic chemicals, pesticides, etc. Previous spills in the vicinity, if any, should be reviewed and assessed. The water supplier should have a contingency plan for guidance in an emergency.

Spills along lakeshores or connecting river shorelines should also be assessed along with potential spills from pipelines, docking facilities, railroad lines, etc. For example, there are numerous chemical plants along the St. Clair River, which connects Lake Huron to Lake St. Clair. These potential sites should first be identified and located on a map if the initial survey indicates there may be impacts from these areas. Procedures then should be developed for assessing and reacting to these types of emergencies. Where possible on the connecting rivers, modeling of the river flows could be used to assess potential impacts on intakes. In these cases, the specific contaminant would normally be known and this information could be used in the assessment.



For intakes located close to the lakeshore lines, again the areas that could significantly impact the intake should be delineated. Potential spill sources in these areas such as industries; disposal facilities, highways, railroads; pipelines, etc. should be located, mapped and assessed. Depending upon the type of potential risk, the specific contaminant may be identifiable, but this may not always be the case. These spills should be considered differently from the routine discharges that may exist. A spill is a unique event, and emergency reaction would be necessary to deal with the potential impact.

Surveys of fixed facilities, pipelines, highway and rail corridors and shipping routes have generally been completed and may be obtained by contacting the local emergency planning committee or the area planning committee. These two groups should have inventories of oil and hazardous materials at fixed facilities and along transportation routes.

### **Potential Treatment Impacts**

The impacts from treatments at the intake should also be included in the assessments. Continual treatment for zebra mussels may cause development of other impacts on the finished water quality. Short-term treatments or impacts such as intake cleaning, dredging, construction, etc should also be included in the assessment.

### **Summary**

An outline of the general methodology to be used for Great Lakes intakes should be a main part of the source water assessment program for states in the Great Lakes Region. Due to the unique nature of each intake, each assessment will be site specific. Assessments of the Great Lakes water quality in general have been done by various agencies and these efforts should be referenced not duplicated. The site-specific assessments, if done in close cooperation with the treatment plants and local surface water protection agencies, become valuable tools to future operations and planning.

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**Appendix III - Comparison of Ontario Source Protection Framework with other Jurisdictions**

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
<b>Responsible Agency</b>	<b>Ministry Of Environment</b>	<b>Minister Of Sustainable Development , Environment And Parks</b>	<b>Environment -al Protection Agency</b>	<b>Environmental Protection Agency (Bureau Of Water)</b>	<b>Dept. Of Environment -al Management</b>	<b>Dept. Of Environment -al Quality (Drinking Water &amp; Environment -al Health Section)</b>	<b>Dept. Of Health (Drinking Water Protection Section)</b>	<b>Dept. Of Public Health (Bureau Of Water Supply)</b>	<b>Environmental Protection Agency (Division Of Drinking And Ground Waters)</b>	<b>Dept. Of Environmental Protection (Division Of Drinking Water Management)</b>	<b>Dept. Of Natural Resources (Bureau Of Drinking Water And Groundwater)</b>
<b>Scope of Source Water Protection Program</b>	Source protection planning for all municipal systems within watershed areas, but generally limited to where Conservation Authorities exist; Private wells not covered. Smaller, non-municipal “clusters” can be included by municipal	Limited source protection provisions for spring water, mineral water or groundwater catchment areas serving more than 20 people; surface water sources of drinking water and private wells not covered	Under Safe Drinking Water Act, all states must conduct assessments for public water systems (both surface and groundwater) with 15 or more service connections or serving 25 or more people for 60 days/year; Private wells not covered	Illinois Groundwater Protection Act applies to all community and private wells.	Each well or wellfield providing groundwater to a community public water supply system must develop a wellhead protection plan; Private wells not covered	Voluntary source protection planning is done by communities primarily on groundwater for designated source protection areas; several communities are also developing surface water protection plans	Wellhead protection plans must be done by all community and nontransient noncommunity (serving 25 people over 6 months each year) public water systems; large pilot surface water system over Upper Mississippi River watershed underway; Private wells not covered	Wellhead and surface water protection is voluntary for communities; , individual communities, most notably New York City and Syracuse, have set up surface water protection programs under Watershed Rules & Regulations	Source protection plans are based on source protection areas delineated in assessments for both ground and surface public water supplies; Private wells not covered	All community ground and surface water systems are eligible for grants to develop source water protection programs; Private wells not covered	Only new municipal wells are required to have source protection plans (this includes community systems serving at least 15 service connections used by year-round residents or serving at least 25 year round residents, which are owned by a city, village, town, county, utility district, federal, state, county or



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	council or Minister.										municipally owned institution for congregate care or correction; or a privately owned water utility serving the same groups)
Water Profile	Drinking water mostly supplied by surface water sources; 70% of Ontario's 12 million people rely on surface water drawn from Great Lakes	Drinking water mostly supplied mostly by surface water sources; 45% of 7.2 million people in Quebec rely on St. Lawrence River for drinking water; 35% rely on lakes and rivers, and 20% on groundwater	Not applicable (N/A)	Illinois relies more on surface water sources, which supply 80% of its population of almost 13 million; Northeastern Illinois, the major water consuming area, relies heavily on Lake Michigan; just over 20% of the public water supplies are drawn from groundwater systems.	Indiana relies more on groundwater sources for drinking water, which supplies 60% of its 6 million people, while surface water supplies 40%.	Surface water sources supply 50% of the Michigan's population of 10 million with drinking water, while groundwater supplies the other 50%.	Minnesota relies primarily on groundwater sources for drinking water with more than 70% of the state's 5 million people using groundwater, and 30% using surface water sources of drinking water.	66% of New York's 19 million people rely on surface water, while 33% rely on groundwater.	Ohio relies more on surface water, which supplies 60% of the population of 11 ½ million with drinking water, while 40% depend on groundwater.	In Pennsylvania, surface water supplies about 84% of the population of 12 ½ million with drinking water; 16% rely on groundwater.	Wisconsin relies primarily on groundwater which serves 70% of the state's 5 million people; surface water systems supply 1.5 million people, or 30% of the population.
Wellhead Protection Programs Plans	Mandatory – Clean Water Act requires planning for all sources of	Mandatory for delineating protection area – Environmenta	Safe Drinking Water Act made it mandatory for states to	Wellhead protection is nested within the Illinois Groundwater	Mandatory for all community water supplies to establish a wellhead	Voluntary – with incentives of matching funding;	Mandatory for all public water supplies to implement a wellhead	Voluntary, but no active state program; water suppliers and/or local officials	Voluntary – active technical support and guidance from state	Voluntary – active technical support and guidance from state; state funding and	Mandatory for new wells only (since 1992); voluntary for existing wells –

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	drinking water	l Quality Act	establish wellhead protection programs and to conduct source water assessments for ground and surface water sources of drinking water, but did not mandate source water plans	Protection Act; Act and regulations establish minimum setback zones for public and private wells, extensive monitoring requirements, regulations on existing and new activities in wellhead zones, and establishes priority groundwater planning regions and regulated recharge areas; , Wellhead protection planning is; wellhead protection planning is voluntary; vulnerability waiver program for groundwater monitoring is used by the state	protection plan; new wells must submit plans before state approval; Indiana Administrative Code, Wellhead Protection Rule	acceptance of grants requires development of plans; grants also give priority to communities that pass a local ordinance related to the development and implementation of a wellhead protection program	protection plans – Minnesota Rules, Parts 4720.5100 to 4720.5590	may elect to do protection planning; new wells subject to procedures in Public Water Supply Permit Program that allow wells to adopt a wellhead protection plan; plans may include Watershed Rules and Regulations. (Section 1100, Public Health Law)		waiving monitoring requirements are used as incentives	Chapter NR 811, Wisconsin Administrative Code

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				as an incentive for developing plans							
Technical requirements for determining wellhead protection areas	Delineation for wellhead protection areas is based on four zones: Zone A – pathogen/security prohibition zone (100 m. radius); Zone B – Pathogen Management Zone (2 year time of travel capture zone); Zone C – DNAPL/contaminant protection zone (5 year time of travel capture zone); Zone D – secondary protection zone (25 year time of travel capture zone)	Radius of 30 metres from wellhead; for wellheads bacteriological protection area is 100 metre radius and virological protection area is within 200 metre radius; or protected area may be different if the vulnerability of groundwater was assessed using the DRASTIC method or a hydrogeological study shows a natural protective barrier		Delineation is in two phases; under Phase I all public water supply wells are delineated by using the fixed radius method, the distance criteria and a threshold of 1,000 foot (Phase I applies to all confined aquifers and non-community wells; under Phase II wells using unconfined aquifers are delineated using analytical models, numerical models or hydrogeological mapping, based on a 5 year time of travel or flow	Delineation determined by 1 of 5 methods: - the analytical method; the numerical flow/solute transport model methods; the semi-analytical method; hydrogeological methods or fixed radius, if approved by the department	Requires a hydrogeological study based on a ten year time of groundwater travel or one-mile radius for low tritium well fields	Delineation determined by: - the hydrogeologic setting used to characterize the aquifer, including ten year time of travel, the location and influence of flow boundaries using existing information, a calculation of a daily volume of water, identification of the groundwater flow field; and, a calculation of the aquifer transmissivity	For assessments, wellhead areas were delineated by two zones: 1) inner well zone based on a calculated fixed radius of a minimum of 500 feet; 2) outer well zone with a modified arbitrary fixed radius based on an estimate of groundwater flow (up to one mile)	Delineation includes a description of regional and local geology, main sources of aquifer recharge, identification of aquifer as confined, unconfined or semi-confined; all significant and active pumping centers in the area, all hydrogeologic boundaries, potentiometric map of the aquifer, well logs for public water supply, and a discussion of the sources of information on the aquifer. Boundaries are based on a 5	Wellhead protection area consists of 3 zones; Zone I – immediate protective area surround a well which can be a 100-400 foot radius depending on aquifer characteristics; Zone II – ½ mile radius around a source unless more detailed delineation is approved; Zone III – zone beyond Zone II that contributes surface and groundwater to Zones I and II; wellhead protection plans may use Zones I and II to delineate the wellhead protection area; however, for	Delineations of wellhead areas is at a minimum the portion of the recharge area equivalent to a 5 year time of travel to the well, or it may be determined by hydrogeologic investigation through 4-steps -- calculation of direction of groundwater flow, zone of influence, recharge area and wellhead protection area. Wisconsin also conducted regional hydrogeologic modeling (“advanced delineations”) in certain areas of the state

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				boundaries. Where the zone of capture exceeds the fixed radius of Phase I, it will be added to the wellhead protection zone.					year time of travel	carbonate and fractured bedrock aquifers, it must be shown to be adequately protective or rigorous delineation must be performed; delineations must also include a description of the local hydrogeologic setting and a formulation of a conceptual groundwater flow model	
Contaminant Inventory	Inventories will include : 1) issues and concerns that affect water in a vulnerable area with priority given to those that pose the greatest danger to human health, and 2)	Owners of a groundwater supply must have an inventory of the works and activities located in the protected supply area which might alter the microbiological quality of		The Illinois EPA conducted contaminant source inventories in all Phase I wellhead protection areas; further identification of contaminant sources beyond Phase I will be done by state	Communities must complete an inventory of past, present and proposed activities that may pose a threat within wellhead area. Guidance document (Tables IV.1 and IV.2)	Contaminant inventories included unregulated and regulated, known and potential sources of contamination ' known included storage tanks, Superfund sites, sites of	Minnesota does not name specific contaminant sources in its rule, but potential contaminant sources are listed in the guidance for surface water intake planning; the state does	Contaminant inventories include federally regulated raw water chemicals under SDWA, contaminants regulated under the Surface Water Treatment Rule, as well as those regulated under	Potential significant contaminant source inventories include all regulated facilities in the wellhead protection area, and sources of concern identified in the	Public water suppliers doing a wellhead protection plan should identify all man-made sources that may adversely impact public health or prevent compliance with the SDWA; a list of common sources that should be included	Municipal water suppliers must conduct contaminant inventories that include existing potential contamination sources within ½ mile radius of the well and an assessment of existing potential sources of

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	<p>activities that pose a risk to drinking water such as landfills, hazardous waste generation, and land application of manure; 3) assign a hazard score that reflects the likelihood of a contaminant 2002 Water Policy contaminating a drinking water source and the severity of its impact 4) an inventory of constructed preferential pathways through which contaminants can reach a</p>	<p>the water; this would include wastewater treatment systems, works or sites for the storing or spreading of animal waste or farm compost, yards or feedlots</p>		<p>and local governments co-operatively; Inventories include “potential routes” (structures or operations, such as drainage wells or mining operations which can serve as pathways), “potential primary sources” or “potential secondary sources” (structures or operations which are points of origin for contaminants).</p>	<p>outline potential contaminant sources, including agricultural, commercial, industrial, residential and waste management, and recommended inventory procedures including outreach programs, windshield surveys, site inspections and records reviews.</p>	<p>environmental contamination such as hazardous waste generators and landfill sites, and oil and gas contamination ; potential sources included agricultural operations, commercial facilities, manufacturing and industrial facilities and utility companies. Abandoned wells were also listed. Inventories updated every 5 years</p>	<p>require contaminant inventories to describe all land parcels and land-use information as part of the contaminant inventory</p>	<p>the state’s drinking water regulations and ambient water quality standards; additional chemicals considered of concern by the DOH were also inventoried.</p>	<p>source water assessment program; Ohio has provided a checklist for water suppliers of potential significant contaminant sources and linked them to chemicals of concern; these include on-site, commercial, industrial, agricultural and municipal sources such as storage tanks, pest control companies, demolition areas, dry cleaners, and animal feedlots.</p>	<p>in the plan includes agricultural, commercial, industrial, residential and others such as hazardous waste landfills, highway spills, municipal incinerators, landfills, sewer lines, open burning sites, recycling facilities, road de-icing operations, road maintenance depots, storm water drains, and transfer stations</p>	<p>contamination within the recharge area of the well; a Public Water Supply Potential Contaminant Use Inventory Form lists 64 potential contaminants to be inventoried</p>

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	drinking water source										
Vulnerability Analysis	Groundwater – identify and map Well Head Protection Areas, HVAs, and SGRAs and assign a vulnerability score for each according to its susceptibility to becoming contaminated (this would reflect surrounding environmental conditions, available data and horizontal and vertical TOT through the subsurface). Surface water – delineate surface water intake	Vulnerability of groundwater may be assessed by applying DRASTIC method (see Pennsylvania) ; all groundwater is considered vulnerable in a farming area, as described in the regulations		Vulnerability analysis is not identified as a component of Illinois’ wellhead protection program; however counties and municipalities may conduct a “groundwater protection needs assessment” which identify and locate the potential contaminant sources, and evaluate the hazard associated with them; this assessment includes taking into account containment measures, the soils, proximity	Vulnerability analysis is not identified as part of the wellhead protection program requirements; however, potential sources of contamination may be judged on the concentration and volume of substances stored, proximity to water wells, operational procedures, maintenance, closure status, the design and age of the facility and local hydrogeologic	Vulnerability analysis is not identified as a component in Michigan’s source protection programs	A well is vulnerable if: the well water contains 10 mg/l or more nitrate plus nitrite nitrogen; the well water contains quantifiable levels of pathogens or of chemical compounds that indicate groundwater degradation; the well water contains one tritium unit or more; or an enriched tritium analysis of the well water has not been done in the past 10 years and information on well construction is not available, or	Susceptibility analysis is based on: the potential for the water supply to draw water contaminated by inventoried sources at concentrations that would threaten human health, the hydrogeologic and hydrologic factors, intake or well location and integrity, unique characteristics of the contaminants, characteristics of potential contaminant sources and the prevalence of contaminant sources in the assessment area.	Susceptibility analysis is based on an understanding of the hydrogeologic setting; review of water quality data; and summary of the potential significant contaminant sources.	Susceptibility analysis is based on DRASTIC method: D for Depth to groundwater, R for aquifer Recharge, A for Aquifer media, S for Soil permeability, T for Topography, I for Impact of the vadose zone and C for hydraulic Conductivity; the higher the DRASTIC score, the more vulnerable the groundwater	Assessments consist of: an inventory of potential sources of contamination; an assessment of well construction; pesticide susceptibility; industrial chemical use; vulnerability to volatile organic compounds, ethylene, dibromide, asbestos and coal tar; presence, thickness and continuity of hydrogeological barriers; type of bedrock; permeability of soil; presence of naturally occurring inorganics or radionuclides; presence of

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	protection zones using modelling and local site characteristics			of sources and routes, as well as the nature, rate of flow, direction of flow and proximity of groundwater	vulnerability.		the geological material from the land surface to where the groundwater enters the public water supply well is fractured bedrock, solution weathered bedrock, sandstone bedrock, unconsolidated material or a combination of these materials (Minnesota Rules 4720.5550)				microbial, nitrate and inorganic contaminant sources; connectedness of a well to surface water; and age of well.
Management tools for implementing wellhead protection	Communities can use existing programs such as land use planning tools to regulate future land uses (zoning by-laws, official plans,	Quebec's Regulations prohibit animal waste storage facilities and other farm-related activities within specific distances of a	General tools for all states include: wellhead protection ordinances (including time of travel delineations, overlay methods, exclusive use	State uses regulations prohibiting or regulating activities in setback zones, technology control regulations, overlay zoning for groundwater planning areas,	State rules govern immediate sanitary setback area by well permits; within larger wellhead protection area, water supplier must	Communities can use facility inspections, land use regulations, operational policies, best management practices, public information	No new tools for managing activities in wellhead protection areas are identified; the state has identified guidance documents outlining wellhead	Water suppliers or local officials may do protection planning, by using Watershed Rules and Regulations, zoning controls, local or county ordinances or non-regulatory	Ohio Rules contain drinking water protection provisions that prohibit certain polluting activities such as land application of sewage sludge in wellhead protection areas;	Regulations require that for new or expanding community water systems the supplier must own or control by deed restriction or other means Zone I of the wellhead protection area; for planning in	Wisconsin regulates separation distances between wellheads and certain potential sources of contamination, including fuel oil tanks, septic, cemeteries, gasoline storage

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	site controls) and stormwater management systems; however, new tools created under CWA include prohibitions and risk management plans which are negotiated between property owners and risk management officials; risk management plans set out measures a property owner will take to eliminate the threat of a potential source to contaminate drinking water	wellhead	zones), property purchase through capital or bond fund programs, easements, restrictive covenants, deed restrictions, leasing of land and recharge area acquisition; zoning ordinances, subdivision regulations, site plan reviews, design standards. and public education.	and pollution prevention program for businesses and residences within groundwater recharge areas; State also uses prioritization of permits and enforcement to protect groundwater; local governments can use zoning ordinances to protect wellhead areas, and state will intervene in local areas if they don't	identify abandoned wells not in compliance, provide owners and operators of identified potential sources of contamination a copy of wellhead protection plan, notify property owners, mineral owners and leaseholders of record, and educate the public and owners of potential sources of contamination about available methods for preventing contamination ;	and education. Michigan advises communities to incorporate wellhead protection into the community's Master Plan which will facilitate zoning provisions, local site plan reviews, environmental permits review for new businesses, or local standards for facilities in the wellhead protection area.	protection measures that public water suppliers can use	approaches Watershed rules and regulations provide communities with a method to put in place restrictions on activities in watershed areas that are stricter than state regulations; watershed rules limit specific activities, set requirements for existing operations and facilities and prohibit certain potential contaminant sources from locating within specifically defined areas; these rules are approved by the state DOH	other tools include local zoning ordinances, purchase of land or development rights, or by obtaining easements, deed restrictions or restricted covenants; economic development (such as Dayton's Risk Point Buy Down program), and public education	wellhead protection areas in general, water suppliers may use zoning, subdivision control, health regulations, design/operating standards, transfer of development rights, implementation of best management practices, technical/financial assistance, purchase or donation of property and land trusts, household hazardous waste collection programs, public education and groundwater monitoring	tanks, wastewater lagoons, salt storage and pesticide or fertilizer handling areas, which are included in management plans; other tools for water suppliers are local ordinances, zoning requirements to control land uses, public education and monitoring.



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					communities use local ordinances to put in place groundwater rules						
Surface Water Protection Plans	Mandatory for all surface water sources of drinking water – Clean Water Act. The technical studies and development of the plan funded.	No program in place yet. However, Quebec government has made a commitment to develop a strategy for protecting surface sources of drinking water (2002 Water Policy): strategy has not yet been released	Federal Safe Drinking Water Act does not mandate source water protection plans, but does require states to complete source water assessments for ground and surface sources of drinking water	No program in place yet	No program in place yet	Voluntary – no funds but active government support	Voluntary – with active technical and staff support; guidance document for protecting surface water intakes is available	No new program is in place yet, but Watershed Rules and Regulations have been used by large communities to protect surface water waters as a drinking source.	Voluntary – active technical support and guidance from state;	Voluntary – active technical support and guidance from state; promoted through funding incentives	No program in place yet
Mandatory aspects	For source protection, each region must prepare terms of reference, an assessment report	Wellhead protection areas must be delineated, and owners of wells supplying more than 20		The Illinois Groundwater Protection Act establishes minimum (200 to 400 feet) and maximum setback zones	Under Indiana’s Wellhead Protection Rule, Phase I requires all community water	After Michigan completed mandatory assessments, no mandatory planning programs	Minnesota requires public water suppliers to develop wellhead protection plans and implement them. Plans	After New York completed mandatory assessments, no mandatory planning programs were put in place.	After Ohio completed mandatory assessments, no mandatory planning programs were put in place.	After Pennsylvania completed mandatory assessments, no mandatory planning programs were put in place.	Wisconsin put in place regulations to cover source protection planning only <i>for new wells</i> . The owner or agent of all new municipal

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	(including water budget), and source protection plan. Source protection committee may prohibit or restrict land uses or activities; once a source protection plan is approved, the CWA requires mandatory implementation; to comply with approved plans, municipalities must amend official plans and zoning by-laws, and municipalities or planning authorities can not undertake any activity that conflicts with	persons must protect the water from bacteriological and viral threats; regulations prohibit certain farming activities within protected areas		(generally up to 1,000 feet) for community water supply wells, extensive monitoring requirements, prohibited and restricted activities in wellhead protection areas and regulated recharge areas.	suppliers to prepare wellhead protection plans: by establishing a local planning team; delineating a wellhead protection area; doing an inventory and map of potential sources of contamination; developing management strategies with a timetable for implementation, a description of public participation and education; and developing a contingency plan.	were put in place.	must include 5 steps: form a community planning team; identify the land area to be protected; identify land uses and possible sources of protection; implement ways to prevent contamination; and develop and alternative water supply for contamination problems. Public water suppliers are required to manage an inner wellhead management zone of 200 feet around a wellhead by maintaining isolation distances and implementing protection	Individual communities may enact Watershed Rules & Regulations under New York State Public Health Law, which proscribe rules for drinking water sources including larger watershed areas.	Ohio does have recommended elements which must be included for state endorsement of protection plans; Ohio regulations restrict some activities in drinking water protection areas.	However, there are minimum elements for local watershed protection programs that municipalities or community water systems must meet if they receive grants. For wellhead protection, they must delineate protection area, do enhanced contaminant source inventories and develop management or planning strategies such as ordinances. For watershed protection, they must do public education and watershed management activities such as ordinance development.	water wells must develop wellhead protection plans; elements include identification of the recharge area, zone of influence, groundwater flow direction, an inventory of existing potential contamination sources within 1/2 mile radius, establishment of a wellhead protection area, a public education program, a water conservation program, a contingency plan, a management plan; Wisconsin law also requires specific distances between certain potential contaminant sources and wellheads.

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
	<p>a source protection plan. The source protection committees may designate activities that are significant drinking water threats and prohibit or regulate them by risk management plans that are binding on a landowner or business; source protection authorities must report annually on the implementation of plans, monitoring programs and the progress being made in achieving source</p>				<p>Phase II requires regular reporting (5, 7 or 10 years depending on system size) on the plans to document implementation and update management strategy. Plans are mandatory for new wells before the state approves them.</p>		<p>measures for potential contaminant sources. Plans must be implemented over a 10 year period.</p>				

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	protection goals.										
Public Participation	Provincial legislation requires public comment on source protection committees' proposed terms of reference, assessment report and source protection plans prior to provincial approval; one-third of source protection committee should represent environment, health or general public interests. Source	No provisions for public participation in source protection under Environmental Quality Act; owner of water supply must comply with	Limited public access to source water assessments for security reasons; states were responsible for ensuring public involvement in developing methodology for source water assessments; states responsible for carrying out all groundwater and surface water assessments; assessments must be made available to the public.	The public was involved in the development of the Illinois Groundwater Protection Act; a Groundwater Advisory Council, appointed by the Governor and composed of public, industry and local government representatives, advises the state on groundwater protection and priority protection planning regions. Regional groundwater protection committees include at least 3 members of	The law requires that community water suppliers (municipal or private) form local planning teams to develop and implement wellhead protection plans; teams must include at least one person affected by the development and implementation of the plan; the formation of a local planning team must be advertised in the largest	For communities that initiate both wellhead and surface water protection planning, public water suppliers set up local teams which may include: local health department, fire dept. business, agriculture, education, planning, an environmental group, the general public. The state scores and awards grants according to the number	The law requires the public water supplier to set up community planning teams to develop the source water protection program; communities are encouraged to include local citizens representing different interests; public water suppliers are also required to ensure that there is a process for public participation during the development and implementation of a plan; the public water	The DOH encourages public involvement in source water protection activities, although it is unknown to what extent communities have undertaken planning. DOH requires public comment when communities seek to establish Watershed Rules and Regulations for their water supply, although this applies primarily to surface water supplies. While DOH is responsible for the wellhead	In developing a source water protection plan, the public water supplier must set up a drinking water source protection team. The state encourages the water supplier to have a team representing; at a minimum, local decision makers, water supply staff and emergency response teams; also local watershed groups suggested. When plans are finished, they are endorsed by the state. Implementation is done through	The DEP encourages community water suppliers to set up local steering committees representing diverse interests to assist the water operator in developing plans. The state guidance indicates that the plan should demonstrate that adequate opportunities for public participation were in place throughout the project; water suppliers should also indicate how the final plan will be accessible to the public. Source protection grants for wellheads and	Plans required by Wisconsin law for new wells are developed by the owner of the municipal water system but no public participation is mandated or suggested as part of the planning process. A public education program is a required element of the planning strategy for source protection.

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
	protection committee meetings must be open to the public.			the public with an interest in groundwater protection; in addition, where wellhead protection plans are done, community water suppliers are responsible for developing and implementing them, but the involvement of local stakeholders is voluntary.	circulation newspaper within planning area. Phase I plans, submitted to the state for review, must include a summary of the efforts of the planning team to involve the public in decisions on source water protection strategies.	and inclusion of representatives from these groups. Pollution prevention plans may be developed by community leaders, usually water personnel of the public water supply, and written by team members, consulting firms or non-profit organizations such as Rural Water. In the plans, responsibility for the tasks and implementation are identified.	supplier must hold a public information meeting after the wellhead protection area is delineated and the vulnerability assessment is approved by MDH; a public hearing is required when the plan is submitted to the state MDH. All public water suppliers must implement wellhead protection measures.	protection program, regional, county and municipal governments are responsible for planning and land use controls. New wells, as part of the Water Supply Permit Program, may be required by the DOH to adopt a groundwater protection program.	voluntary actions, incentives such as tax breaks, local ordinances and public education, carried out by the water supplier, the municipality and/or the planning team.	watersheds are available only to municipalities, groups of municipalities or community water system owners.	

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
Great Lakes Provisions	Terms of reference must consider existing federal and provincial agreements – the Great Lakes Water Quality Agreement, the Canada-Ontario Agreement, the Great Lakes Charter, and others that may be prescribed by regulations; Minister can set water quality and quantity targets for watersheds that drain into the Great Lakes, and can establish advisory committee(s)	No legislative consideration of Great Lakes agreements	Great Lakes protocol created for assessments	Great Lakes Protocol used in assessments; in addition, the Illinois Pollution Control Board has Lake Michigan Basin numerical standards that protect beneficial uses of Lake Michigan including as a public water supply.	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments	Great Lakes Protocol used in assessments

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
	to provide advice on the use of the Great Lakes as a drinking water source										
Intake Protection Zone Delineation	Two intake protection zones Zone 1 fixed radius around intake of not less than 1 km; Zone 2 based on 2 hour minimum time of travel estimate for spills	Not applicable	Critical Assessment Zone was calculated based on a formula $L \times D = S$ where the sensitivity of the Great Lakes intakes are based on two factors – the length of the intake pipeline and the water depth of the intake structure (see Great Lakes Protocol)	All Great Lakes States followed the Great Lakes Protocol to calculate critical assessment zones	Critical Assessment Zone calculated by Great Lakes Protocol formula	Critical Assessment Zone calculated by Great Lakes Protocol formula	DPH recommends source water protection areas for public water supplies relying on lakes be delineated using a 3-tiered approach; 1) an inner management emergency area, based on the volume of water likely to be pumped in the short time needed to respond to an emergency; 2) an outer source water management area where impacts from point and	Critical Assessment Zone calculated by Great Lakes Protocol formula	Critical Assessment Zone calculated by Great Lakes Protocol formula	Critical Assessment Zone calculated by Great Lakes Protocol formula (note: only 1 community water supply using Great Lakes)	Critical Assessment Zone calculated by Great Lakes Protocol formula; also intakes or intake clusters on Lakes Superior and Michigan were assigned individual protection areas included at least one locally discharging watershed

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
							nonpoint sources of contamination can be minimized by preventive management, 3) the entire watershed area above the water intake(s)				
Paramourncy	In case of conflict, Clean Water Act takes precedence over other provincial statutes, regulations, or instruments where it provides greater protection to the quality and quantity of water.	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions over other statutes, although regulations apply state-wide and are phased in to protect wellhead protection areas	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions	No paramourncy provisions
Strengths	Comprehensive program that addresses both groundwater	Regulations delineate protection zones around wellheads and	Early introduction of mandatory source water assessments	State regulations restrict or prohibit new and existing activities around	Mandatory program in place; program will force	State support for voluntary source protection planning,	Most comprehensive wellhead protection program in	Using the Watershed Rules and Regulations, communities	Ohio has actively promoted source protection plans and developed	Growing Greener grants provided significant funding for source water protection	Mandatory wellhead protection plans include water conservation



JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
	and surface water sources of drinking water, and requires both source water assessments and mandatory implementation of plans; provisions in Act that allow for the regulation of “significant” drinking water threats through risk management agreements; inclusion of requirement to consider Great Lakes’ agreements in source water protection framework.	limit potential bacteriological and viral threats to drinking water	for both groundwater, and then surface water, under Safe Drinking Water Act	wellheads; state regulates recharge areas and establishes groundwater protection zones; in addition, Illinois developed a website with the US Geological Survey to provide drinking water quality and analyses to the public; created a right to know provision that gives property owners the right to know if they live near polluted sites and gives state officials powers to order cleanups	consideration of measures to protect wellhead areas	particularly for surface water sources; Michigan is trying to integrate watershed planning with local source protection planning.	Great Lakes States, and most rigorous state requirements including 10 year time of travel for delineating wellhead protection area, the identification of expected changes to land and water supply in the wellhead protection area; Minnesota is also one of the only states to, develop a surface water source protection planning program	can establish community-initiated rules and regulations over large watershed areas, including agreements across multiple jurisdictions, and can enforce them through local delegates.	guidance for surface water protection planning; Ohio also has an active outreach and education program called SWEET (Source Water Environmental Education Teams) where EPA and other state and local government officials form teams and offer training and public education.	programs, including both groundwater and surface water sources	considerations and contingency plans
Weaknesses	Possible lack of coverage under the Act for non-	Lack of detailed requirements for	Lack of mandatory requirements for either	Lack of mandatory requirements for wellhead	Management tools for prohibiting or restricting	Lack of mandatory requirements for planning	No new tools for implementing source	No mandatory wellhead protection or surface water	Lack of mandatory requirements for planning	Lack of mandatory requirements for planning	Lack of mandatory requirements for surface water

JURISDICTION	ONTARIO	QUEBEC	U.S. FEDERAL	ILLINOIS	INDIANA	MICHIGAN	MINNESOTA	NEW YORK STATE	OHIO	PENNSYLVANIA	WISCONSIN
	municipal water systems	assessments; no mandatory planning requirements for protecting groundwater or surface sources of drinking water	source water plans or plan implementation; no consideration of broader Great Lakes water quality problems affecting drinking water	protection planning and no program for surface water protection	activities within wellhead protection area are weak; communities have little leverage in forcing landowners or businesses to control sources of contaminants.	and implementation	protection plans	protection planning or implementation; assessments not being used; information going out of date			protection planning; lack of public participation provisions