Liquid Assets —
Monitoring Water Quality in Ontario

Appendix

December 2001

SUSTAINABLE Toronto

Canadian Institute for
Environmental Law and Policy
www.cielap.org

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1.0 Introduction

Groundwater is being depleted all over the world. The World Watch Institute commented in their "State of the World 2000" report that several countries (mainly non-affluent) are facing groundwater deficits of over billions of cubic meters per year. In areas in India, water tables are decreasing at an alarming rate of 0.6 to 0.7 meters per year. It is worse in China, where water tables are disappearing at 1-1.5 meters per year and demand is still increasing[1]. So, how does any of this relate to a water rich country like Canada, particularly in Ontario where the water appears to flow endlessly? Since July 2000, the Ontario Ministry of the Environment (MOE) has issued over 100 permits to take water from groundwater sources. A quick calculation of these permits showed that the combined amount of groundwater taken was approximately 200 billion litres: enough water to fill more than 53,000 Olympic-sized swimming pools. Such a level of water extraction may be sustainable but to accurately predict a sustainable level, MOE must have adequate knowledge about the state of groundwater in the province of Ontario.

In Ontario, over 2 million people rely upon groundwater as their primary source of drinking water[2]. Approximately 90% of the rural population depends upon it for domestic uses[3]. It has been repeatedly stated over the past twenty years that Ontario's groundwaters have been poorly managed. The absence of groundwater monitoring, management, and protection may have contributed to the contamination of over 1300 farm water-wells[4], a series of *E. coli* outbreaks, exacerbated water shortages, and continuous free water takings from groundwater sources without the proper understanding of their implications.

The 1994/1995 Environmental Commissioner's Report provided a framework regarding sustainable groundwater management. The Ontario Environmental Commissioner had outlined several factors that should be included in a comprehensive groundwater strategy noting the need for:

1. an economic assessment of the value of groundwater resources, including current and replacement value;
2. a strong emphasis on preventing contamination;
3. an establishment of specific groundwater protection zones;
4. an assistance to regional or municipal governments to develop controls to restrict activities that may contaminate groundwater;
5. a focus on priority candidate regions;
6. a publicly accessible inventory of groundwater resources;
7. a long-term monitoring network of water level for major aquifer systems;
8. an inventory of current and past sources of contamination and evaluation of their potential effect on health and ecosystems;
9. a program to control the effects of contaminated sites;
10. a focus on the cumulative effects of agriculture, septic systems, lawn chemicals and municipal systems on groundwater; and
11. a publicly accessible data management system, including water-well records, monitoring information, complaints, inspections and enforcement, and information about contamination and remediation.[5]

Although these elements could provide the foundation for the sustainable management of Ontario's groundwater resources, Ministry of the Environment (MOE) capacity to operationalize the framework may be limited due to a number of reasons.

The purpose of this research paper is to investigate MOE's capacity to create and deliver a sustainable management framework for groundwater by examining several (MOE-specific and external to MOE) facets of groundwater management:

1. Calculations of sustainable yields for groundwater taking.
2. The number of reports published on groundwater
3. The state of groundwater databases
4. Number of monitoring and protection programs and policies implemented over the years.
5. The number of staff dedicated to groundwater
6. Future initiatives

1.1 Background
Who is Responsible for Groundwater Management?

There are two pieces of legislation focused on groundwater protection: the *Ontario Water Resources Act* and the *Environmental Protection Act*. As it is the Ontario Ministry of the Environment (MOE) that administers the two acts, it is the governmental agency that has the power to manage groundwater. Prior to 1993, the Drinking Water Section under the Environmental Monitoring and Reporting Branch was the only group responsible for groundwater[6]. Between 1993 and 1994, a Groundwater Management Unit was formed but the group was subsumed into the Water Monitoring group. Presently, there exists a Groundwater Unit, which is part of the Water Monitoring group and it deals with provincial initiatives for groundwater management.

The five MOE regional offices (Northern, Central, Eastern, West-Central, and Southwestern) are currently responsible for both delivering programs to protect groundwater quality and quantity, as well as issue permits to take water[7] .

There are other ministries (both federal and provincial) that are responsible, to varying extents, for groundwater quality and quantity in Ontario. Table 1.1 summarizes the groundwater responsibilities of various ministries who are involved with various aspects of groundwater.

Table 1.1: Groundwater Responsibilities of Various Ministries in Ontario and Canada[8]

Ministry/Agency	Programs
Ministry of the Environment	➤ Drinking Surveillance Program monitors 180 municipalities. ➤ Permit to Take Water Program ➤ Monitoring also occurs at most landfill sites, mine sites, radioactive waste deposits. ➤ Water Well Information Systems
Agriculture Canada	➤ Since 1987 monitors pesticides in drinking water "Farm Groundwater Quality Survey, 1992"
Ministry of Natural Resources	➤ Database of wells with information on lithology, E-logs ➤ Petroleum Resources Data System
Ministry of Northern Development and Mines	➤ Stratigraphic and Geochemical data from boreholes ➤ Reconnaissance Till Sampling Program
Environment Canada	➤ Municipal Water Use Database
Ministry of Agriculture, Foods, and Rural Affairs	➤ Controls pesticide use
Ministry of Municipal Affairs and Housing	➤ Responsible for septic systems and municipal planning.

There are other pieces of legislation that affect groundwater management[9]:

- Lakes and River Improvement Act
- Pesticides Act
- Environmental Bill of Rights
- Conservation Authorities Act
- Municipal Act
- Petroleum Resources Act
- Ontario Building Act and Code
- Planning Act
- Federal Fisheries Act

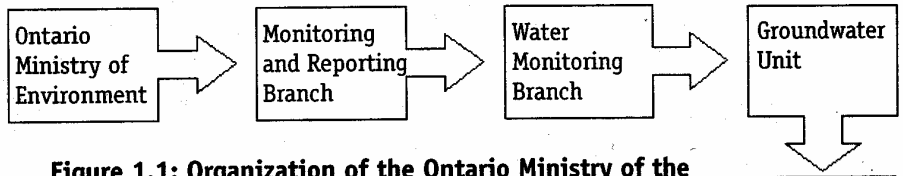


Figure 1.1: Organization of the Ontario Ministry of the Environment with Respect to Groundwater Management

Source: Ontario Ministry of the Environment webpage.

2.0 Results of Indicators

2.1 Sustainable Yield for Groundwater Taking

The Ontario Ministry of the Environment controls the amount of water taken from ground sources by issuing permits through the Permit To Take Water (PTTW) program, which sets out several general terms and conditions to the proponent. Often times, the director will attach special conditions to the water taking specifying monitoring requirements, such as records with the amount of water extracted. These records would be required for a situation where an interference (i.e. adjacent wells are affected by the water taking) could occur, or where data is needed for water management or planning studies[10]. However, anecdotal evidence suggests that due to the lack of resources, the MOE does not permit staff to follow up on the data[11]. Furthermore, there has not been any evidence of internal or external reporting regarding the accumulative effects of water takings that could be found on the MOE website or in Groundwater Unit's informal library.

One of MOE's newest pieces of legislation, referred to as the *Water Taking and Transfer Regulation, 1999*, prohibits the transfer of water from Ontario's major water basins. Accordingly MOE agents issuing Permits To Take Water (PTTW) must take into account:

- Protection of the natural functions of ecosystems.
- the effects of ground and surface water takings on other users of the water;
- the concerns of others who may be affected by the PTTW; and
- the Great Lakes Charter, an international agreement protecting water resources in the Great Lakes Basin.

In addition to these guidelines to the PTTW, MOE has created their Statement of Environmental Values which expresses an "ecosystem approach" to environmental management.

It states,

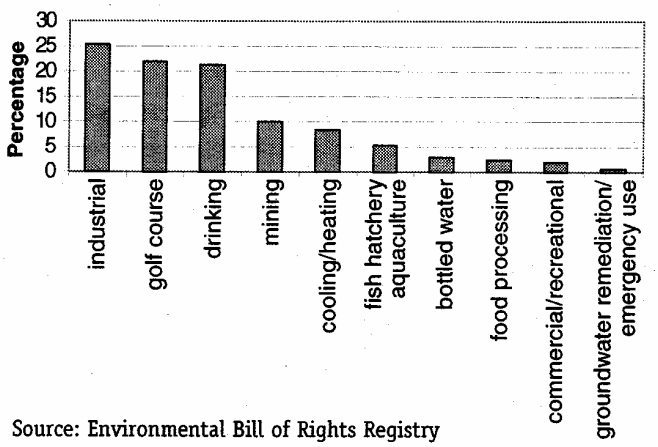
> "The Ministry will adopt an ecosystem approach to environmental protection and resource management. This approach views the ecosystem as composed of air, land, water, and living organisms, including humans, and the interactions among them.
>
> When making decisions, the Ministry will consider: the cumulative effects on the environment; the interdependence of air, land, water and living organisms; and the interrelations among the environment, the economy and society."[12]

However, several comments posted on the EBR registry have accused the government of not using the "ecosystem approach" as expressed in their Statement of Environmental Values, or the powers to refuse permits on several conditions set out by the *Water Taking and Transfer* regulation. The EBR registry was used to calculate the number of water taking permits issued from July 2000 to July 2001. Unfortunately, the registry is not a reliable database to measure the exact amount of water extracted. Only water takings that are more than 50,000 litres per day need to be registered and there are exemptions such as most municipal water takings; takings for irrigation of crops; and takings of less than one year in length [13]. The Permit To Take Program completely ignores the vast number of active individual wells that take water everyday.

In spite of its deficiencies, the EBR registry can still be utilized (albeit in a limited way) to describe the amount of water that has been removed from ground sources. As mentioned earlier, from July 2000 to July 2001, the Ontario Ministry of the Environment granted over 200 billion litres of groundwater to be taken in the next two to ten years as posted on the Environmental Bill of Rights (EBR) registry. Figure 2.1.1 shows the percentage of water taken for the various uses of water (e.g. industrial, bottled water, drinking, etc).

The majority of extractions were for industrial purposes (25%). This was followed by golf course irrigation at 22% and water for consumption (21%). Although it would appear that more water was allocated to golf course irrigations than for drinking purposes, rarely do municipal withdrawals, which are, in general, greater than industrial uses[14]. Moreover, about

Figure 2.1.1: Percentage of Groundwater Extraction by Use between July 2000 and 2001



Source: Environmental Bill of Rights Registry

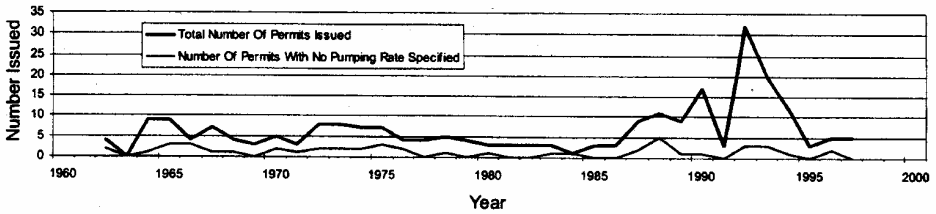
9% percent of the permits issued were for bottled water companies, which constitute about 3% of the total extraction from July 2000 to 2001. This translates into approximately 5.6 billion litres of water overall. Are these water takings sustainable? What fraction of the annual groundwater recharge is being extracted? What is happening to local water tables?

In October 1999, Artemesia Water Ltd (AWL) requested a Permit To Take Water for 483,840 litres a day for 365 days a year by MOE. The Ministry granted the permit despite the 2485 comments that were sent asking the Ministry to decline it. During the tribunal hearing regarding the request to "Leave to Appeal", a process whereby MOE decisions on granting permits/certificates can be appealed by the public, a farmer testified that the region had been experiencing a drought for two years, leading to a loss (for 23 of the area's farmers) of $520,056. Furthermore, 17 residents whose wells were adjacent to the company site had complained of their wells running dry. Nevertheless, the board had denied the applicants' "Leave to Appeal" the Ministry Director's decision on the permit (i.e. AWL was still allowed to take water), most likely due to the extra conditions laid out to AWL for monitoring their extractions[15].

There were other similar cases that gave rise to MOE adding extra conditions onto the proponent when issuing the permit, such as monitoring groundwater levels. However, due to the fact that the monitoring only occurs during the extraction process, there is little background knowledge of what the groundwater levels were prior to the water taking. Such information would further help MOE make decisions to grant or decline requests for permits. An additional problem of MOE action to shortages is the claim by residents regarding the length it takes MOE to respond to interference occurrences after it is initially reported. Thus negative impacts may occur if the response time is too long and the company is not told not to stop taking water right away.

Further grievances with the Permits To Take Water Program have to do with administration. In most cases, the permits are filed away in paper form and slowly computerized. Although this may appear to be an insignificant problem, it becomes complicated when Conservation Authorities or municipalities request MOE to provide them with the number of permits issued for a certain waterbody or watershed. Without a complete database, the MOE agents need the permit number or the address of the proponent to track down the paper forms. Some Conservation Authority agents have taken upon themselves to update the files. Figure 2.1.2 shows the Credit Valley Conservation Authority's efforts to update the number of permits issued for the Credit Watershed until 1997[16].

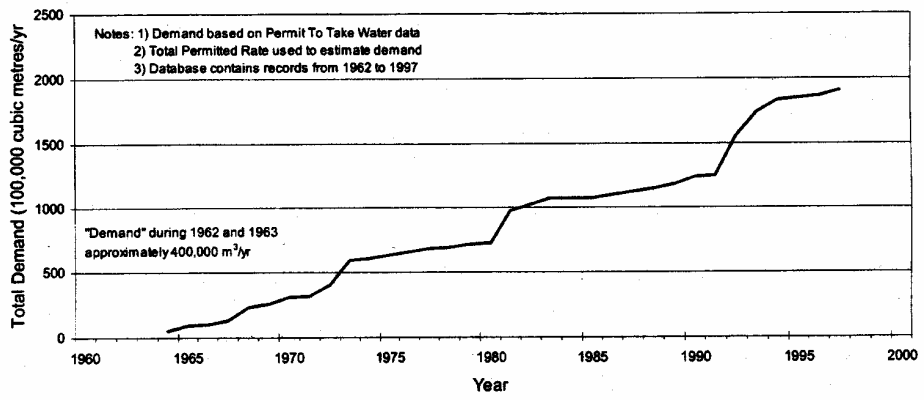
Figure 2.1.2: Water Taking Permits Issued Within the Credit River Watershed



Source: Credit Valley Conservation Authorities' *Water Report* [page 11]. Online document available at http://www.creditvalleycons.com/aboutcvc/images/1999H20report.pdf

Using this information, the Credit Valley Conservation Authority was able to calculate that there has been a five-fold increase in the amount of water demand since 1962. They have illustrated the trends in Figure 2.1.3.

Figure 2.1.3: Total Water Demand Within the Credit River Watershed



Source: Credit Valley Conservation Authorities' *Water Report* [page 11]. Online document available at http://www.creditvalleycons.com/aboutcvc/images/1999H20report.pdf

The Grand River Conservation Authority (GRCA) has also taken the initiative to update the number of permits around their watershed. In 1998, a staff member of the GRCA went to the MOE West-Central Regional office and entered all the paper files for the Permits To Take Water from 1984 into a computerized database[17]. The database is able to categorize the permits into source of taking, purpose, and location and allowd the GRCA to plot all the permits onto a map of the Grand River watershed[10].

2.2 The number of reports published on Groundwater

The most comprehensive reports regarding groundwater were done prior to 1987. Between 1970 and 1986, MOE and the Ontario Water Resources Commission produced 14 **groundwater probability maps**, which covered 11 counties and two regional municipalities. The maps included information on depth to water; well yields of bedrock and overburden aquifers; flow patterns, and some water quality data. Furthermore, eight maps of major aquifers in Southern Ontario were published between 1973 and 1978 as part of the **Major Aquifers in Ontario Map Series**. Two of them covered the entire Lake Ontario Drainage Basin; the others provided information on Guelph-Amabel and the Guelph-Lockport aquifers, the Alliston and the Oak Ridges aquifer complexes.

There were 22 **Water Resources Reports** published between 1969 and 1982 on surface and groundwater. These reports provided information on various drainage basins in Ontario; the reports ceased in 1982.

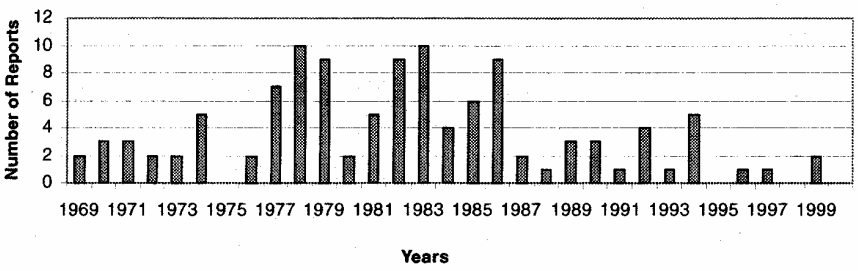
Contractors are required to fill out a form regarding information on water wells when they are constructed. These files were compiled into a series of groundwater reports called the **Water Resources Bulletins**. The last published report was compiled in 1981. To replace the paper files, MOE created the **Water Well Information Systems** (WWIS), a database for all the wells in Ontario.

Between 1981 and 1986, MOE studied 26 areas in the province to produce **Susceptibility of Groundwater to Contamination** maps. These maps are based on the presence or absence of shallow aquifers, the permeability of surface materials, and groundwater use. All these factors are rated on a high/low system.

There have been a variable number of Ministry reports on groundwater since the early 1980s. Furthermore, these more recent reports are mostly guidelines regarding the use of groundwater.

Figure 2.2.1 illustrates the estimated number of groundwater reports released between 1969 and 2000. Between 1995 and 2000 there have been only five reports published including those highlighting regulation changes affecting groundwater. The most comprehensive report since 1982 was done in 1997.

Figure 2.2.1: Approximate Number of Reports Produced by MOE Pertaining to Groundwater in Ontario from 1969 to 2000



Source: MacRitchie et al (1994) bibliography, MOE publications website, and the Groundwater Unit's resource centre.

"The Hydrogeology of Southern Ontario" (1997)

The most recent publication speaking to the state of groundwater in Ontario was produced in 1997 titled *The Hydrogeology of Southern Ontario*[18]. It is a compilation of studies done prior to 1992 with the help from the Water Well Information System (see section 2.3.4) and computer mapping databases (e.g. GIS) and programs (e.g. RAISON). When a well for water extractions is constructed several parameters must be measured such as type of water found in well, yield, materials, and location. All these parameters are transferred into the WWIS and it has become a powerful data-collecting tool for certain purposes.

MOE used the WWIS to locate water wells to describe characteristics of southern Ontario hydrogeologic units. However, *The Hydrogeology of Southern Ontario* does not indicate what criteria were used to select the wells.

The report provides hydraulic parameters of various bedrock and overburden units, and the geologic conditions which groundwater flow systems operate. It tries to assess the occurrence, quality and quantity of groundwater in Southern Ontario by:

- compiling, analyzing, and interpreting existing information on physiography, geology, topography, drainage, and climate;
- determining the hydraulic parameters of important hydrogeologic units;
- identifying geologic conditions under which various groundwater flow systems operate;
- evaluating long-term groundwater recharge and discharge for selected watersheds; and finally,
- assessing groundwater quality from samples taken when the wells was first constructed.

Eighteen hydrogeological units were used to measure the specific capacity and transmissivity distributions for bedrock and overburden wells.

1. Precambrian Hydrogeologic unit
2. Nepean-March-Oxford Hydrogeologic unit
3. Rockcliffe hydrogeologic unit
4. Ottawa Group hydrogeologic unit
5. Simcoe Group Hydrogeologic unit
6. Billings-Carlsbad-Queenston Hydrogeologic unit
7. Blue Mountain-Georgian Bay Hydrogeologic unit
8. Queenston Hydrogeologic unit
9. Cataract Group Hydrogeologic unit
10. Dyer-Wingfield-St. Edmund Hydrogeologic unit
11. Clinton Group Hydrogeologic unit
12. Amabel-Lockport-Guelph Hydrogeologic unit
13. Salina hydrogeologic unit
14. Bass Island Hydrogeologic unit
15. Bois Blanc Hydrogeologic unit
16. Detroit River Group Hydrogeologic unit
17. Dundee Hydrogeologic unit
18. Hamilton Group hydrogeologic unit
19. Kettle Point Hydrogeologic unit

The results indicate that Bois Blanc, Detroit River Group, Salina, Bass Island, Dundee, and Amabel-Lockport-Guelph hydrogeologic units were the highest yielding units although values for the water yield were not presented.

2.3 Groundwater Databases/Monitoring

There are a number of databases that deal with various aspects of groundwater, such as water level monitoring, quality measurements, the number of groundwater contaminations, and enforcements. In this section of the paper, these databases will be discussed and how they have changed over the years.

2.3.1 Water Level Monitoring

Prior to 1984, there was a water level monitoring network in Ontario that was stored on computer until 1981 and on paper until 1984[19]. Afterwards, the regional offices were responsible for continuing to monitor groundwater levels if they wished to do so. In 1993, the Southwestern, West Central and Central Regions continued to monitor groundwater with several observation wells[20]. Currently, the Southwestern region reported that their database has many gaps and they are unsure as to the usefulness of the data for any long-term trends; also, their equipment for monitoring is out of date[21]. Although the West-Central region still has the observation wells, they no longer monitor groundwater[22]. The Eastern Region also reported having 12 observational wells but only three are functional[23]. There is no indication that they are being used.

Most of the observation wells are used for case-by-case incidences. If any historical data needs to be compiled, all the municipalities that use groundwater sources need to be contacted as the provincial government has not monitored groundwater since 1983[24].

2.3.2 Groundwater Quality Databases

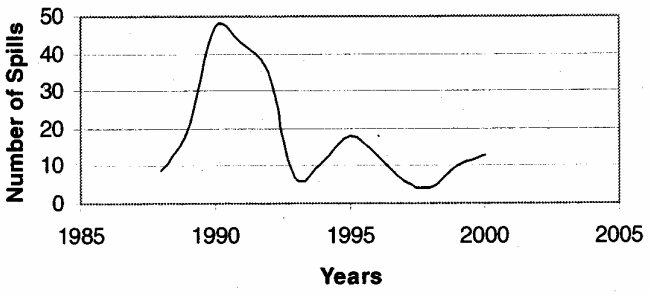
The only database that deals with quality is the **Drinking Water Surveillance Program**. Although it is not specific to groundwater, it does monitor some of those municipalities that receive their water supply from groundwater. It monitors for over 180 biological parameters.

There are approximately 399 municipal waterworks that use groundwater. The Drinking Water Surveillance Program only covers the water operations of 44 municipalities.

2.3.3 Databases Recording Contaminations, Complaints, Investigations, and Approvals

The provincial database on all complaints and violations under the MOE is recorded and put into the **Occurrence Report Information System** (ORIS). Hypothetically, complaints and violations related to groundwater can be obtained from this database[25]. A sample of what ORIS is used for is to record the number of spill reported that occurred in the past few years that might have contaminated groundwater. This is shown in Figure 2.3.3.1[26].

Figure 2.3.3.1: Number of Spills Reported that May Have Contaminated Groundwater from 1988 to 2000



Source: Personal correspondence with personnel at the Spill Action Centre.

Some regional offices also developed databases on their own to track complaints, investigations, and approvals. In 1993, Environment Canada reported that the Eastern Region (Kingston) had one of the most elaborate databases[27]. It recorded all field activities including investigations into complaints, interference of water supplies, and site assessments. When this information was followed up in 2001, however, the groundwater unit (technical support staff) did not know anything about this database. Thus it is an example of the loss of institutional memory when employees leave their position and a lack of co-ordination and communication.

2.3.4 Water Well Information System

The Water Well Information System (WWIS) has become one of the most used databases in groundwater management. When a well is constructed the licensed contractor must fill out "Form 9", the well record. This record is posted onto the WWIS. The information contains:

- the date the well was constructed
- types of materials
- type of water found in the well
- casing and open hole description
- screen description
- pumping test results
- final status of well

- water use
- method of construction
- location
- plugging and sealing record (if they apply)

This is not a monitoring database. The owner of the well does not have to re-check the water quality or require another pumping test. In addition, if the owner wants a water quality check after a few years, the results are not updated into WWIS. Nevertheless, MOE has used WWIS to describe groundwater availability and quality in Ontario. Furthermore, WWIS is an instrumental tool for the new Provincial Groundwater Monitoring Network. This program will be discussed in greater detail in "Future Initiatives".

2.4 Programs and Policies Implemented by MOE in the Last Few Years to Monitor and/or Protect Groundwater

For the past few years, MOE has implemented a number of programs and policies that are meant to control and/or protect groundwater resources. Most of these initiatives do not only pertain to groundwater resources but to surface water as well; the following is a list of Ministry initiatives designed to protect groundwater (some of which have already been considered):

- Permit To Take Water (PTTW) program
- Pesticides Monitoring in Well Water
- Drinking Water Surveillance Program (DWSP)
- Water Taking and Transfer Regulation (WTTR)
- Provincial Groundwater Monitoring Network (PGMN)
- Occurrence Reporting Information System (ORIS)
- Adverse Water Quality Reports (AWQR)
- Provincial Water Protection Fund (PWPF)
- OSTAR –SuperBuild fund

Not all of these programs are active today. Some of them have been discontinued most likely due to a lack of continued funding or a loss of political interest. This section of this paper will discuss the Pesticides in Water Wells, Adverse Water Quality Reports, the Provincial Water Protection Fund, and OSTAR (Ontario Small Town and Rural) fund are discussed. Other programs were or will be discussed in other sections.

In 1985, MOE established a Provincial Pesticides Monitoring Network. Its purpose was to assess the impact of the agricultural chemicals on groundwater supplies in Ontario. It monitored for triazine groups, metachlor, alachor, and carbamates. The last paper written for this program was published in 1991.

The Adverse Water Quality Reports were a new initiative by the government which started in 2000. It requires that each regional office post violations on the web. Now Ontarians have access to information regarding violators of governmental regulations/ policies; before, they had to request them through the Freedom of Information department.

The Provincial Water Protection Fund was established in 1996 for municipalities to conduct various water studies and to improve water works management. According to the Association of Municipalitites of Ontario (AMO), the Provincial Water Protection Fund was a significantly lower provincial funding program for waterworks than previous programs. The largest allotment of the fund was provided in 1996 with $96,000,000 and it steadily declined until the last year of funding $37,000,000 in 1999[28]. Part of the total funding in 2000 was alloted to groundwater management studies ($4.3 million) and 34 municipalities took advantage of the funding listed below[29]:

1) Burford (County of Brant)
2) Municipality of Centre Hastings
3) Town of Larder Lake
4) Town of Strathroy
5) Town of Wasaga Beach
6) The Corporation of Loyalist Township
7) Town of Erin
8) Village of Merrickville-Wolford
9) Town of Milton
10) Township of North Grenville
11) Township fo Centre Wellington
12) County of Oxford
13) Township of Eldon
14) Corporation of the County of Huron
15) Township of Ottonabee-South Monaghan
16) Untied Counties of Leeds and Grenville
17) AEMOT Study Area
18) Stratford Public Utility Commission

19) Township of North Wellington
20) Town of Minto
21) Town of Orangeville
22) Town of Exeter
23) Perth County
24) Victoria County
25) Township of Mapleton
26) Township of Mulmur
27) Township of East Garafraxa
28) Township of Amaranth
29) Township of Norfolk
30) United Counties of Prescott and Russell
31) United Counites of Stormont, Dundas, and Glengarry
32) Township of East Luther-Grand Valley
33) Town of Shelburne
34) Town of Mono

Many of these municipalities are still finalyzing the reports. However, the Village of Merrickville-Wolford and the County of Oxford have completed theirs and are available on the Web at http://village.merrickville-olford.on.ca/gwm/Final%20Rpt.pdf and http://www.county.oxford.on.ca/groundwater/, respectively.
In November 2001, the new Minister of the Environment, Elizabeth Witmer, declared an additional $10 million to municipalities and conservation authorities for further studies. The list of the new initiatives is available on the Ministry's website at http://www.ene.gov.on.ca/envision/news/111401mb2.htm. Some of the municipalities, which had funding in 1998, are on the new list as well. This either means that the municipalities are doing another study or they require additional funds to complete the old one.

The OSTAR (Ontario Small Town and Rural) fund was established by the SuperBuild Corporation in 2000 slated to last for approximately five years to help small municipalities invest and improve infrastructures. SuperBuild Corporation was created in December 1999 for the purpose of improving infrastructure through partnerships between the public and private sectors and direct funding[30] . The first round of funding for OSTAR was allotted in 2000 with an emphasis on infrastructure improvement particularly for water and wastewater works. There was also a small section allotted for groundwater studies. Unfortunately, SuperBuild Corporation is unsure what the emphasis will be for the next round because the government has not announced it yet.

The lifespan of policies and/or programs is varied – some survive changing governmental parties while others are discarded regardless of their importance. Table 2.4.1 summarizes the commencement and ending (if applicable) of each of the programs listed in the beginning of this section.

Table 2.4.1. Programs/Policies by MOE for Groundwater Management

Program/Policy	Commencement	End	Total Number of Years Active
Permit to Take Water	1962	Ongoing	41
Provincial Pesticide Groundwater Monitoring	1985	1989	4
Drinking Water Surveillance Program	1986	Ongoing	15
Water Taking and Transfer	1999	Ongoing	2
Occurrence Reporting Information Systems	1988	Ongoing	13
Adverse Water Quality Reports	2000	Ongoing	1
Provincial Water Protection Fund	1996	2000	4
OSTAR (groundwater)	1999	2000	1

2.5 Number of Staff Dedicated to Groundwater

The number of staff dedicated to groundwater management has fluctuated significantly in the past years. Generally the staff titles at MOE are hydrogeologists, groundwater leaders, environmental officers, and water well records clerks.

In order to track the changes in staff numbers, several methods were used. The Canadian Institute for Environmental Law and Policy (CIELAP) produced a series of reports called *Ontario's Environment and the Common Sense Revolution*, which followed the changes in staff number for the past five years. In addition, the governmental telephone directories also indicated the number of staff changes over a longer period of time.

Presently, there are 35 staff in MOE in the central and regional offices who deal with groundwater issues. This number also includes those people who have been hired on a short-term period (e.g. those who work on program implementation). In the central office, the numbers have fluctuated from as low as four to as high as nine people since 1985.

Table 2.5.1 shows the number of staff who were related to water management that have been cut in 1996. These numbers do not include a further reduction of 153 in 1997 that occurred in all fields in the Ministry.

Table 2.5.1 MOE Water-Related Staff Reductions in 1996

Area	Number of Positions in 1995	Number of Eliminated positions	Percentage Cutback
Water and Drinking Water	113	48	42
Groundwater and Hydrogeology	28	15	53
Watershed Management	12	3	25
Wastewater	15	5	33
Total	168	71	42

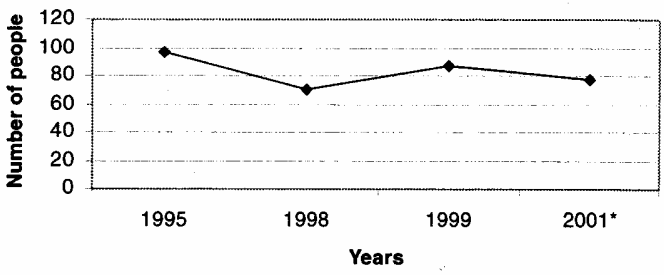
Source: CIELAP's *Common Sense Revolution: Fourth Year* report.

These large staff reductions seem most obviously related to the 45% decrease in operating budget experienced by MOE from 1996 to 1999[31].

At a time when development and the population in Ontario are growing fairly quickly, MOE requires an adequate number of staff to effectively carry out the Ministry's mandate for an "ecosystem approach". Severe staff reductions seem to have rendered the organization unable to sustainably manage water resources. For example, staff are unable to keep up with computerization of permits to take water so that MOE can readily track up the number of permits for certain water bodies. This knowledge, if available, would have an impact on the number of permits granted.

Staff reductions also have a significant impact in the area of enforcement and prosecutions. In comparison to 1995 numbers, the size of the Investigation and Enforcement Branch has declined about 20% since 1995. Figure 2.5.1 shows the number of people in this sector of MOE in 1995, 1998, 1999, and 2001. The numbers for the first three years were taken from the CIELAP's 2000 report[32] and the 2001 number was taken from the MOE on-line telephone directory.

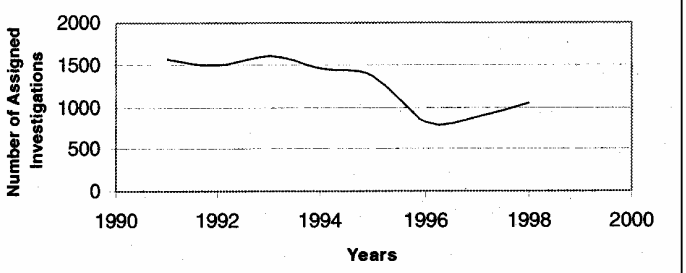
Figure 2.5.1: Population of the Investigation and Enforcement Branch



*2001 data came from the On-line MOE Telephone directory at http://www.infogo.gov.on.ca/paceweb/owa/intergtd_en.min_list?IN_GTD_SERVICE=GTD

The number staff in the Investigation and Enforcement Branch would foreseeably affect the number of investigations that could occur. Figure 2.5.2 shows the number of assigned investigation that has taken place since 1991 to 1998[33].

Figure 2.5.2: Assigned Investigations from 1991 to 1998



Source: Personal corespondence with personnel at the Ministry of the Environment.

As illustrated in both figures (2.5.1 and 2.5.2), the relationship between the two factors is quite close. In fact, the 25% reduction of people in the Investigation and Enforcement Branch between 1995 and 1998 is closely followed by a 28% drop in the number investigation in that period as well.

2.6 Future Initiatives: An ambient groundwater-monitoring program in partnership with the Conservation Authorities

By the year 2003, the province wants to establish approximately 400 observation wells that will record both water quality and quantity data. Each Conservation Authority will have approximately 10 observational wells set up for monitoring purposes.

Within the next three years several steps must be taken to implement the monitoring network.

1) MOE will identify vulnerable watersheds that will be monitored.
2) They will plot all the wells in Ontario using the Water Well Information System.
3) The ministry will choose the wells located around the desired monitoring area.
4) Conservation Authorities will go out to the field and investigate the choosen wells to see whether they are suitable.
5) Finally, both MOE and Conservation Authorities will instrument the suitable wells.

Presently, twenty-four Conservation Authorities have signed a Memorandum of Understanding with MOE[34]. According to the document, the MOE has the responsibility to:

- design the Provincial Groundwater Monitoring Network in consultation with the C.A. and local municipalities;
- provide standards and criteria for and fund, aquifer and hydrogeological mapping where required;
- consult with Technical Committee regarding acquisition of hydrogeological mapping, laboratory analytical services and equipment requirement;
- administer contracts for aquifer and hydrogeological mapping;
- confirm necessary well site locations in consultation with the C.A. and local municipalities and provide and oversee the installation of monitoring equipment
- fund initial, comprehensive laboratory analysis in year 1;
- identify water quality parameters for long term monitoring in consultation with the C.A. and local municipalities;
- fund development of project data base and information management systems;
- fund the acquisition of necessary equipment such as well data logging and data transmission equipment as required and maximize provisions for long term equipment warrantees;
- through the Information Management Sub-Committee establish protocols for data and information management;
- undertake provincial level data analysis and reporting;
- chair the Project Steering Committee, the Information Management Sub-Committee and the local Technical Committees;
- develop protocols for sampling/monitoring;
- provide for necessary staff training, e.g. sampling and equipment maintenance;
- communicate provincial network details to stakeholders;

- conduct periodic project audits; and
- provide technical assistance to C.A. as needed.

In turn, the Conservation Authorities have agreed to:

- participate in and agree to the design of the groundwater monitoring network;
- participate in and agree to the selection of well sites and development of sample analysis parameters;
- communicate network details to local stakeholders;
- negotiate access to and maintain equipment at well sites;
- be responsible for protection of well site integrity;
- collect data and water quality samples and process in accordance with established protocol including submission to the provincial quality database;
- collect samples for comprehensive water quality analysis (year 1);
- subsequent to the initial comprehensive analyses, collect samples and fund analyses by accredited laboratories of water quality parameters;
- undertake local level data analyses and reporting;
- act as liaison with watershed municipalities where necessary to facilitate implementation;
- participate as a member of the local Technical Committee;
- ensure project staff are trained;
- participate with MOE on project communication initiatives and audits; and
- maintain and operate the equipment subsequent to year 1 for the duration of the agreement.

The MOU is a six-year contract starting at the date of signing. However, either party can unilaterally cancel the agreement by providing six months notice in writing to the other party or any period of time if both parties agree to terminate.

The $6 million dollars allocated to the program is for capital costs only. It also includes the salaries of the three additional personnel hired on contract to implement the program at MOE. The Conservation Authorities have received no additional funding but have agreed to use the Municipal Levy to pay operating costs. It is unclear what will occur after the six-year contract has ended but the Groundwater Unit and Conservation Authorities are optimistic it will continue.

There are some uncertainties within the program. It is yet unclear whether biological parameters will be measured but at the moment they will be recorded twice a year. Chemicals to be analyzed will include minerals and metals, particularly in the northern watersheds. It is also unclear whether 10 monitoring wells are sufficient to provide a representative picture of the various groundwater resources within each Conservation Authority.

The hope of this program to the Groundwater Unit and the Conservation Authorities is that the data will help in the formulation of policies regarding groundwater management.

3.0 Discussion and Conclusions

The track record of the Ontario government in the past concerning groundwater issues has not been positive. They are still operating some programs without the appropriate background knowledge (e.g. Permit To Take Water program) as to the long term effects on the resource. These poor practices can be attributed to major cutbacks in staff and funding and there has been little evidence of any recovery. Most of the civil servants in the Groundwater unit are very dedicated but overworked individuals who have positive attitudes, particularly towards the new Provincial Groundwater Monitoring Network. However, without the political will to support their enthusiasm there is little chance that much will improve.

Some of the Conservation Authorities have taken upon themselves to fill the gap in groundwater knowledge by initiating their own programs (such as water balance studies). They also work in cooperation with Ministry of the Environment to help implement programs at their own expense or to improve outdated filing systems.

Without a doubt, much of the hopes for achieving sustainable management practices are riding on the Provincial Groundwater Monitoring Network (PGMN) and as yet uncommitted funding from the government for further groundwater management studies. However, as noted earlier, the government has demonstrated their lack of commitment by pulling funding away after only a few years in place. As for the PGMN, it is hard to conclude whether the new program will result in better overall management. Although they have started to implement it, there has not been any substantial funding for it. The Ministry is relying upon the Conservation Authority to pick up a good portion of the costs.

During the next few years, MOE's actions will have to be monitored with respect to groundwater issues before one can conclude that they are on the path to adopting sustainable visions and practices. It is *vitally* important that the public expresses their concern for the way the government has conducted groundwater management in the past. During the drought of 1998 induced by low precipitation and the Walkerton tragedy, some Ontarians have experienced what some less economically affluent countries experience every day. This province cannot afford to ineffectively manage groundwater any longer.

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