CIELAP BRIEF ON **DRINKING WATER**

Drinking Water Quality in the Grand River Watershed

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Drinking Water Quality in the Grand River Watershed

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1.0 Introduction

Assessing the quality of Ontario's inland waters has not been a high priority for the Ontario government during the last decade. The Ministry of the Environment has seen large reductions in its professional staff and surface water quality monitoring program, including a 67% reduction in the number of sampling stations since 1995. Moreover, it has not released reports to the public on the state of the aquatic environment in inland waters since 1990. Some Conservation Authorities have attempted to fill the analysis and reporting vacuum caused by the MOE contraction and have released several State of the Watershed reports. In spite of this, significant data gaps remain. Routine measurements include a number of standard parameters but organic contaminants (for example, pesticides and organic chemicals) are not measured (Molot et al., 2001). The Ontario government, therefore, is probably not in a position to determine whether current policies, statutes, regulations and water quality guidelines are adequately protecting environmental health. Since environmental health is synonymous with public health, this is cause for concern.

Following the Walkerton tragedy in May 2001, the provincial government enacted several new drinking water regulations to ensure the safety of drinking water and improve reporting practices to public health authorities. This report capitalizes on this new source of organic contaminant data by reviewing drinking water data reported by water treatment facilities in the Grand River Watershed. Only treated waters are tested under the new drinking water guidelines, and not untreated source (or ambient) water. Nevertheless, it was felt that a survey of this type might shed some light on the state of ambient waters because of the acute shortage of ambient water quality data.

2.0 Grand River Watershed

The Grand River watershed is the largest catchment in southwestern Ontario, draining 6,734 km^2. The Grand River's headwaters originate in the highlands of County of Dufferin, and flow south to Lake Erie, discharging near Dunnville. More than 800,000 people live in the watershed. The Grand River Watershed, from south to north, includes the following municipalities (some of them partially): County of Dufferin, County of Wellington, County of Perth, Regional Municipality of Waterloo, County of Oxford (Blandford-Blenheim district), County of Brant, City of Brantford, City of Hamilton, Six Nations of the Grand River, Mississauga's of the Credit and Haldimand County. The main drinking water source for the northern municipalities, the counties of Dufferin, Perth and Wellington, is groundwater. In contrast, all southern regions use surface water from Grand River. The only exceptions are the City of Hamilton region which takes water from Lake Ontario, and and the town of Dunnville which takes water from Lake Erie and only in emergencies utilizes water from the Grand River.

A brief introduction to the current relevant drinking water legislation in Ontario is given below followed by a discussion of the existing treatment facilities and how their owners inform the public of the quality of the supplied water.

3.0 Drinking Water Legislation in Ontario

3.1. Ontario Water Resources Act (OWRA)

In Canada, the Provincial Government plays a primary role in drinking water protection. In 1950, Ontario passed the major existing water Act: **Ontario Water Resources Act (OWRA)**, which applies to both ground and surface water. It covers different environmental issues (such

as pollution, water intakes, wastewater, drinking water and etc.) but mostly protects water from pollution through discharge of polluting materials. Therefore, in response to the recent tragedy in Walkerton, a new Regulation was passed. It is known as Drinking Water Protection Regulation (**Ont. Reg. 459/00** – July, 2002).

Ontario Regulation 459/00 is made under the authority of OWRA and concerns larger waterworks and creates legally binding standards for drinking water quality. The new regulation makes other practices previously covered by directives and manuals part of a mandatory regime. The regulation sets out requirements for taking sample and testing drinking water, moreover only licensed operators at the waterworks may perform operational tests. In addition, only a laboratory accredited for this purpose can conduct health-related parameter tests and the results must be provided to the Ministry of Environment. There must be regular and frequent sampling of treated water for microbiological contaminants, chlorine residuals, turbidity, volatile organics and other health-related parameters. Certain levels of chlorine for disinfection are prescribed, but there is a permit for a variance process to review the amount of chlorine used. This regulation was originally titled "Drinking Water Protection", but later was changed to "Drinking Water Protection-Larger Waterworks".

The second Regulation was filed on December 19, 2001 and is known as **Ont.Reg.505/01**: "Drinking Water Protection-Smaller Waterworks Serving Designated Facilities".

On 14th January, 2003 a **new regulation** was posted on the Environmental Bill of Rights Registry for 60 days consultation with the public. Although Regulations 459/00 and 505/01 are relevant and emphasize treatment, monitoring and reporting requirements in the province, there are still many gaps and inadequacies that need to be addressed. The new regulation will replace the two previous regulations: 459/00 and 505/01. It tends to be more comprehensive,

expanding the scope and imposing additional requirements. It will be made under the authority of the new Safe Drinking Water Act, 2002.

3.2. Safe Drinking Water Act

The new **Safe Drinking Water Act** is a response to the recommendations made from the Commissioner Denis O'Connor after the Walkerton tragedy. The act provides legislative authority to implement 50 of the 93 recommendations made by Justice O'Connor in his Part Two Report of the Walkerton Inquiry. The purpose of this Act is to gather together all relevant legislation and regulations related to the distribution and treatment of drinking water. The citizens of Ontario have the right to consume safe drinking water and through control and regulation of drinking water systems and drinking water testing they have to receive a guarantee that their health is protected and further health hazards are prevented. The new Safe Drinking Water Act has been approved by the Legislature in 2002, but has still not been proclaimed. The Ministry of Environment is preparing new regulations which will make the Safe Drinking Act more comprehensive. The Act may be proclaimed by the end of 2003.

3.3. Other Provincial Legislation Relating to Water Quality

The Environmental Protection Act, Environmental Assessment Act and the Environmental Bill of Rights are few more provincial environmental and water oriented legislations. The first is the main Act that controls the pollution: it defines regulatory amount of prohibiting contaminants that can be discharged into water. The second is an environmental planning statute while the Environmental Bill of Rights provides the public an opportunity to review proposed policies and participate in environmental decision making.

4.0 Survey of Drinking Water Treatment Plants

4.1. Surface Water Treatment Plants

This survey of drinking water treatment plants (WTP) in the Grand River Watershed shows that all municipalities comply with the new regulation. Every municipality website contains water quality reports, if the facilities are covered by Ont. Reg. 459. There are four surface WTP in the study area (Fig. 1 and Tab.1), the Holmedale WTP (City of Brantford), Manheim (Region of Waterloo), Dunnville Water Treatment Plant (County of Haldimand) and Ohsweken Treatment Plant (Six Nations of the Grand River). They typically serve the needs of an entire municipality.

Holmedale WTP in Brantford is a conventional treatment plant which utilizes water from the Grand River via the Homedale Canal. The treatment process consists of screening, coagulation, flocculation, sedimentation, chlorination, filtration, chloramination and fluoridation (Class IV WTP facility). The capacity of the treatment plant supplies water up to 100ml/d to a population of 87,000 people.

The Manheim WTP provides 22% of the required drinking water in the Regional Municipality of Waterloo. It is a conventional treatment plant and therefore the same treatment steps as above apply. In addition, ozone is added to control the taste and the odour, to assist the disinfection and to oxidize naturally occurring organic compounds. Biofiltration is also used to remove organic compounds.

The Dunnville Water Treatment Plant takes surface water from Lake Erie and in emergencies it will also take from the Grand River. It is a conventional treatment plant, which treats chlorinated raw water pumped 7 km from the Dunnville industrial lowlift pumping station.

The latter is located on the shore of Lake Erie at the mouth of Grand River. The plant design capacity is 14.5 x 1000 m^3/day.

The Ohsweken Treatment Plant serves the need of Native peoples living in Six Nations of the Grand River. Information is not available online and will only be made available with special approval from their Council Board.

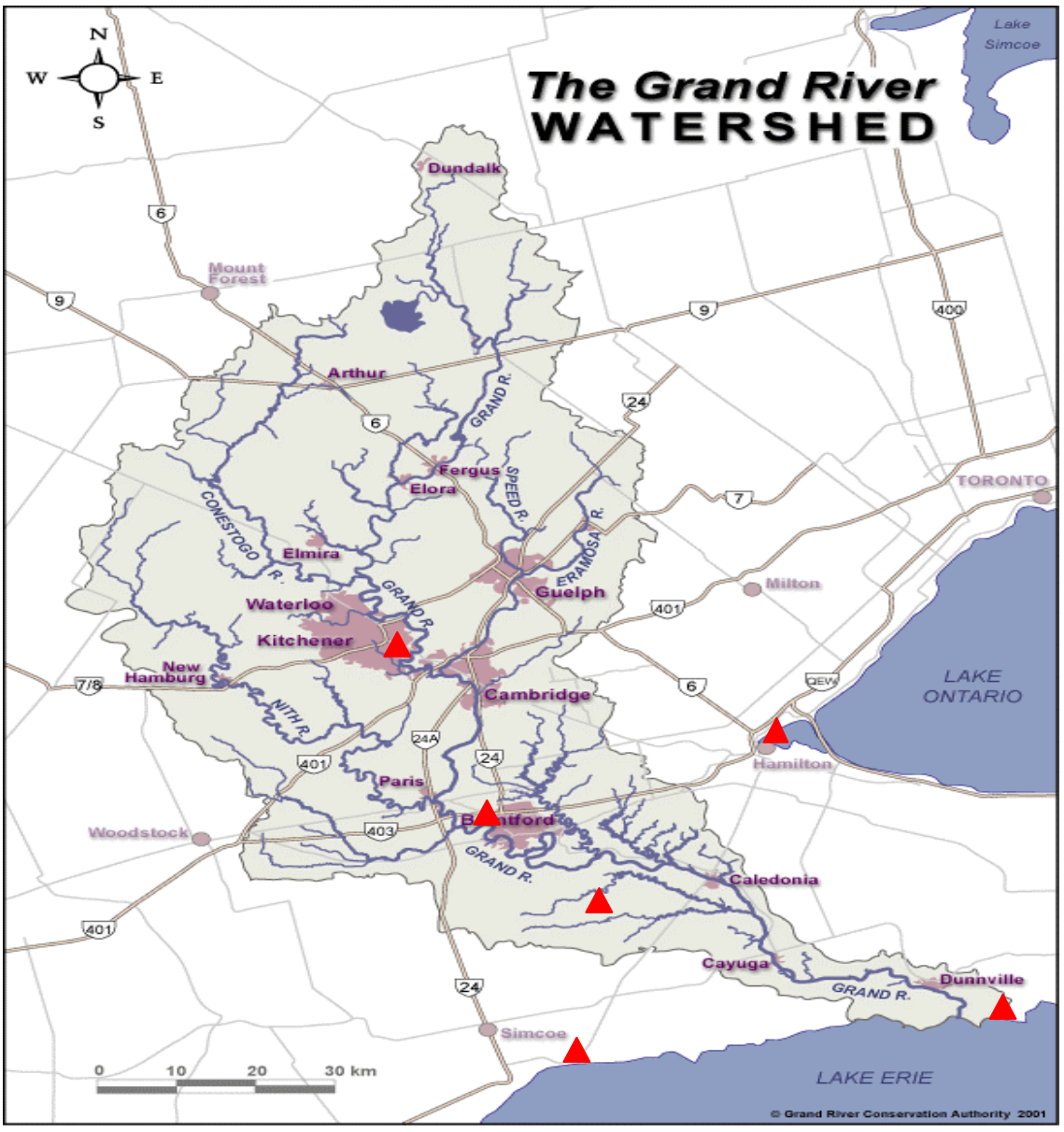

Fig.1 Water Treatment Plants within the Grand River Watershed and its vicinity

4.2 Other Water Treatment Facilities

In addition to the few surface water treatment plants there are several groundwater treatment facilities. Those that are covered by Ont. Reg. 459 are included in this report (see Tab.1). For simplicity an overview by regions is presented.

4.2.1 County of Dufferin

County of Dufferin utilizes groundwater as a source of drinking water. The following townships from the County belong to the Grand River Watershed: Amaranth, East Garafraxa, East Luther Grand Valley and Melancthon. Every township has its own municipality and the division of public services can provide information on the water quality. The Ontario Clean Water Agency can also provide relevant information regarding water quality in the region. The facilities are in general are very small and are not required to provide quarterly reports. No 'breakouts' of the systems are reported in recent years.

4.2.1 County of Wellington

The entire County of Wellington, similar to County of Dufferin, derives its drinking water from groundwater wells. Within the study area are the town of Erin as well as the following townships: Centre Wellington, Guelph-Eramosa, Mapleton, Puslinch, Wellington North. The Ontario Clean Water Agency is responsible for drinking water quality. In addition, more information with respect to water quality issues can be obtained from the County Engineer, Gordon J. Ough. No breakouts of the systems are reported in recent years. The facilities are not required to provide quarterly reports.

4.2.2 City of Guelph

City of Guelph has its own administrative structure. Guelph Waterworks provides its costumers and communities with disinfected groundwater, which is of high quality and is

extracted from the natural, underground bedrock formation known as the Amabel aquifer. Arkell Spring Grounds, an extensive well field outside Guelph's southeast border in Puslinch Township provides 60% of the water. The remaining 40 % of Guelph drinking water is pumped from 12-13 operating (in total 23 wells are available) wells situated throughout the city. To comply with the new Drinking Water Protection Regulation, the City of Guelph increased the amount of chlorine added to the water to the prescribed amount. More than two hundred regulated substances are subject to mandatory measures, including all major parameter groups (biological, chemical-organic/inorganic and radionuclides). Through the years the Guelph waterworks did not exceed any health-related Ontario Drinking Water Standards (ODSW). Quarterly water quality reports for the Guelph waterworks are available online and if more questions Doug Standehl can be contacted.

4.2.3 County of Perth

Groundwater is the primary source of drinking water in the entire County of Perth. A part from Perth East (Perth East Township) belongs to the study area – Grand River Watershed and consists of two water supply systems Shakespeare and Milverton. The first uses water from one well and has a capacity of 546 m^3/day and supplies 28 households. The second is the largest system (utilizes two wells) for the whole County and has a total capacity of 1,273 m^3/day, supplying 512 households. Both water systems fulfill the requirements of Ont. Reg. 459 and therefore they have to prepare and publish quarterly reports. Those reports are not available on the website of the division, even though they are suppose to. However, the Manager of the Public Works for Perth East division, Glenn Schwendinger, was contacted and he promised to provide those reports for this project.

In 2001, the First Phase of Groundwater Study was completed and the results showed that throughout the County the water quality tends to be very good. The raw water samples

complied with the provincial guidelines and the only parameters that were above acceptable concentrations were related mainly with aesthetics and taste, such as iron and hardness. It was reported that through the Perth County, fifty percent of bacterial samples collected by the Health Unit showed some traces of bacterial contamination. The most likely reasons for were well contamination and bacterial growth in the homes piping system. Therefore, it was recommended in the report that the owners of the wells be made aware of best management practices with respect to the well water quality and that they are responsible for ensuring the highest quality drinking water.

In 2002, the Ministry of Environment recognized the importance of the groundwater and therefore funds were provided for a new comprehensive study. Perth County was of the few counties across Ontario where groundwater studies took place. The Perth Groundwater Study has its own webpage, where more information can be found. "The groundwater study aims to characterize groundwater flow systems, identify areas susceptible to contamination, determine the County's groundwater demands and make groundwater management recommendations to ensure there is enough safe groundwater for future generations" (3). The study deadline was December of 2002, therefore the final report and results are still not published.

4.2.4 Regional Municipality of Waterloo

The entire Regional Municipality of Waterloo is within the Grand River watershed. There are two sources of water: 20 % is taken from Grand River and the remaining 80 % comes from groundwater. The region has one surface water treatment plant - WTP Manheim (water from Grand River is pumped to the station), 14 groundwater treatment plants as well as 126 wells.

Mr. Tim Walton and Ms. Olga Vrentzos are the both water quality specialists with the Regional Municipality of Waterloo, which can provide information in addition to the water

quality reports. These reports together with other information on water supply and quality issues are published on the websites of every one of the following municipalities: cities of Kitchener, Cambridge and Waterloo and the Townships of North Dumfries, Wellesley, Wilmot and Woolwich. The Cities within the Regional Municipality of Waterloo utilize both surface and groundwater, while the Townships rely entirely on groundwater sources. Brief information about the water supply system by community follows.

URBAN SYSTEMS

City of Kitchener

The City of Kitchener uses water from the Manheim Reservoir, which mixes surface water from Manheim WTP with groundwater from different Manheim wells, as well as groundwater from the following points: Greenbrook Water Treatment Plant, the Strange Street Pumping Station and the Parkway Pumping Station. The 4th quarterly report for 2002 from the City of Kitchener shows higher values, according to the ODWS, of turbidity and sodium (as health-related parameters) and total manganese, aluminum, chloride and hardness (as non-health related parameters.)

City of Cambridge

City of Cambridge receives its water from the Middleton Pumping station and the main water source is groundwater. There are three groundwater treatment plants: Pinebush, Shades Mills and Turnbull. However, the Toyota plant treats blended water, which comes from the Freeport Tank, where both groundwater and surface water from the Kitchener system enters. For the last quarter of 2002, several exceedances in the following parameters were found: health related: chlorine, turbidity, sodium; non-health related: total iron, total manganese, chloride and hardness.

City of Waterloo

The City of Waterloo water supply system uses groundwater and surface water to provide water to its citizens. The water comes from Mannheim Reservoir, the William Street Pumping Station, the Erb Street Reservoir and Well W10 on Fischer-Hallman Road. The following parameters were exceeded during the 4th quarterly water quality report for 2002:
health related parameters (chlorine, turbidity, and sodium) and non-health related parameters (total iron, total manganese, chloride, and hardness). It is also reported that during the same quarter the microbiological sampling frequency was affected due to a shut off for maintenance of a system well, W06A.

RURAL SYSTEMS

Township of North Dumfries

The Township of North Dumfries includes the following communities: Ayr, Branchton Meadows and Rosevilleand and Lloyd Brown. Each one except Lloyd Brown has its own groundwater treatment plant to remove iron and manganese and to assure appropriate disinfection. Lloyd Brown relies on two municipal wells and in accordance with the new regulations, it disinfects (chlorination). The Township operates and maintains all distribution systems except Ayr which is managed by the Ontario Clean Water Agency (OCWA) on behalf of the Township. The Regional Municipality of Waterloo does not include water quality data from Ayr in its quarterly reports.

Township of Wellesley

The Township of Wellesley governs St. Clements, Wellesley and Linwood, which utilize groundwaters. St. Clements and Wellesley have their own groundwater treatment plants (each supplied from 2 wells) for iron and manganese removal as well as disinfection. Linwood has

two separate groundwater supply systems: Linwood system and Eastgate Meadows system, both properly disinfected.

Township of Wimot

Within the Township of Wilmot there are two groundwater treatment plants: New Hamburg and Foxboro Green. The first provides chlorinated water free of iron and manganese to the divisions of Baden and New Hamburg, while the second supplies its namesake village. A few more communities (Mannheim Village, New Dundee, Shingletown and St. Agatha) have their own separate municipal wells, which are properly disinfected.

Township of Woolwich

Township of Woolwich is the last that belongs to the Regional Municipality of Waterloo. Within the village of Conestogo there are two well systems: Golf Courses and Conestoga Plains. Elmira and St. Jacobs receive water from the City of Waterloo's distribution system. Heidelberg, Maryhill and West Montrose, have their own groundwater treatment plants, all chlorinating the water and removing manganese and iron from it. The first two towns own two wells each, while the last has four wells.

4.2.5 County of Oxford

The County of Oxford relies on groundwater for its drinking water supply. The Blandford-Blenheim division from the Oxford County is in the Grand River Watershed and therefore the following waterworks are only subject of this project: Bright (4 wells), Drumbo (3 wells), Plattsville (2 wells) and Princeton (2 wells). The owners of the latter facilities published on-line quarterly reports. The Oxford Groundwater Study shows that the groundwater in Oxford County is considered as generally good quality water. All wells tap a shallow overburden

aquifer and according to the study they have high incidences of total coliform and *E. coli*. Also, there is a concern that the shallow aquifer (with higher levels of chloride and nitrate) is sensitive to contaminant sources such as fertilizers, septic waste and road salt. The County of Oxford has adapted a "multiple barriers" approach to assure a safe municipal water supply. More on that issue can be found on their website. The Coordinator, Linda Truscott, can be contacted.

Bright

The third quarterly report of the last year (July-Sept, 2002) shows no total coliforms and *E. coli* bacteria, but there was one high test result for background bacteria, as well as higher turbidity (because of higher iron concentration) and sodium levels. Sodium levels are reported as 51.6 mg/l, above the maximum 20.0 mg/l level for consumers on a sodium restricted diet. The MOE and Oxford County Board of Health were notified. In the fourth quarterly report of the last year no bacterial problems were reported, but the other problems were still present.

Drumbo

The report from the July-Sept, 2002 doesn't show any adverse bacterial or chemical results. A few minor problems were reported which were rapidly rectified and the authorities notified. For example, in Drumbo higher arsenic concentrations were detected and all concentrations were above IMAC. The results were immediately reported to the Ministry of Environment (MOE) and the Oxford County Board of Health (OCBH). In addition, it was reported that there was a one day failure in the chlorine pump, which resulted in one day with lower chlorine residuals at the pumphouse and in the distribution system. The problem was immediately repaired and at the same time additional bacteria samples were taken to assure that the water reach the consumers with the desired quality. The authorities were notified of

the problem. Also, higher iron concentrations were detected depending which wells are in use.

The latest published online report (Oct-Dec, 2002) shows excellent water quality. No adverse bacterial or chemical results appear. Moreover chlorine residuals and turbidity levels are also within the acceptable range.

Plattsville

In Plattsvile for the time period July-Sept, 2001 apart from the higher iron and sulfates concentration, as well as one day lower chlorine residuals no other problems in the water quality were detected. The daily turbidity tests were within the acceptable range.

For the time period Oct-Dec, 2002 again no adverse bacterial or chemical results are reported. In addition there were no problems with the chlorine residuals or turbidity levels. The only concerns remain the sulphates at 992 mg/l (compared to the Ontario standard maximum value of 500 mg/l). They are not a health threat but can cause taste and odour problems and may have a laxative affect on people not accustomed to the water.

Princeton

The Princeton Countryside Manor Water system for the time period July-Sept, 2001 reported 10 adverse results in the total coliform or background bacteria. There was no presence of *E. coli* bacteria. Between 17 and 24th August, 2002 the Oxford County Board of Health for this facility issued a "Boil Water Advisory". The MOE and OCBH were notified. Later on, on Sept, 7th, 2002 an excess of chlorine in the system was detected, which was due to pipe breakage. Slightly higher turbidity and bacterial tests were probably the result of this problem. Again, the responsible authorities were informed and the system was flushed.

In the fourth quarterly report for the last year there were no problems detected with the bacterial samples. The only problem seems to be higher iron levels with an average of 1.7mg/l, which is much above the acceptable value 0.3 mg/l, as well as higher sodium levels.

4.2.6 County of Brant

The entire County relies on groundwater for most of the community's water requirements and the following waterworks belong to the study area: Airport, Cainsville, Mount Pleasant, Paris and St. George. Quarterly reports are available on the County of Brant's website and if there are additional questions regarding the water quality in the region the contact person is Alex Davidson, the Water Division Manager.

Airport Waterworks System

The Airport water supply system comprises one well with well pumping station, a storage reservoir, a high lift pump station with two supply pumps, two fire pumps, one emergency supply pump, disinfection facilities, a chemical storage tank and the distribution system.

According to the last quarterly report (Sept-Dec, 2002) the automated alarm systems at the Airport Pumping station were activated thrice due to higher turbidity in the treated water at the station. The MOE Spills Action Center and the Brant County Health Unit were informed. The investigations revealed that the first was due to power failures, where the second was result of activation of an extra duty pump which switches on, when an increase in water demand occurs. The duration of the problem was short and the turbidity recovered its normal values. The third case was most probably due to air bubbles passing through the turbidity analyzer. The turbidity analyzers used in the entire County are reported to have very high

sensitivity, and because of that even very small air bubbles may activate the alarm. The same type of problems was reported in the previous quarterly reports as well.

Another problem was also described in the 4th quarterly report for the last year. A bacterial sample taken was reported as adverse. According to the regulations the necessary institutions were notified. Immediately, upstream and downstream of the site were sampled and the results showed no bacterial presence, moreover the chlorine residuals were also according to the standards. Apart of this, no adverse results were detected for the 4th quarter in 2002 for the Airport Waterworks for the microbiological and chemical (inorganic, organic, including pesticides) tests. Thus the Airport Waterworks complied with Ontario drinking water regulations.

Cainsville Waterworks System

The Cainsville water supply system serves approximately 100 homes and commercial/industrial units. It consists of a storage tank, which receives water from the Holmedale surface water treatment plant and distribution system. The 1st , 3rd and 4th quarterly reports for 2002 showed no confrontation with the Ontario Reg.459/00 and the Ontario Drinking Water Standards. The 2nd report showed that on June 14, 2002 a notification for total coliform bacteria was send. New samples up and downstream of the site were taken. The results of the tests were negative, which means that there was a false alarm, most probably some errors related to sampling handling or lab error.

Mount Pleasant Waterworks System

The Mount Pleasant water supply system compromises 2 groundwater wells located in 2 side-by-side pumping stations, reservoir, high-lifted pumps, a bulk water supply station and the distribution system. It supplies mainly Mount Pleasant area.

Several automatic alarms were reported for the 4th quarter of the last year but none of them were related to water quality problems. The sodium concentration for 2002 was within the Ontario Drinking Water Standards, but exceeded 20.0 mg/l, which is above the level for consumers on a sodium restricted diet. Therefore the Brant County Health Unit was notified. Apart of that, all results of the microbiological and chemical tests comply with Ontario drinking water regulations.

Paris Waterworks System

The Paris waterworks system serves the residential, commercial and industrial customer needs of Paris area. Paris obtains groundwater through 2 well fields. Because of the higher sensitivity of the turbidity analyzers, the automated system set off a few alarms, which were due to either a power failure, activation of an extra duty pump or bubbles in the water. Apart of this, no adverse results for the microbiological and chemical (inorganic and organic, including pesticides) tests were detected during the past 2002 for the Paris Waterworks. The system complies with the Ontario Regulations and Standards for water quality.

St. George Waterworks System

St. George Waterworks system consists of 3 wells located in one pump station, disinfection facilities, storage tanks and distribution system. It serves approximately 1,200 people and local industries. Few alarms for elevated turbidity were registered through the whole 2002 year due to the high sensitivity of the turbidity analyzers. The problems have been eliminated for few seconds. On December 27, 2002 there was an alarm at the St. George Pumping Station, which indicates low level of chlorine in the treated water. Remedial actions were taken, no water was further supplied to the customers and process of drawing water back toward the water distribution system was initiated until the chlorine residuals observed were with satisfying values. The bacteriological tests indicated no background, total coliforms and

E. coli bacteria. The cause of the incident was reported to be: "non-optimal chlorinator pump primer set points". Apart of this, no adverse results for the microbiological and chemical (inorganic and organic, including pesticides) tests were detected during the past 2002 for the St. George Waterworks. The system complies with the Ontario Regulations and Standards for water quality.

4.2.7 City of Brantford

The City of Brantford owns and operates the Holmedale water treatment plant. They also prepare and publish quarterly water quality reports. The treatment plant takes water from the Grand River at the Holmedale Canal.

The third quarterly report for the last year showed a very high quality for drinking water. The microbiological and chemical (inorganic and organic) tests were performed, according to the Ministry of Environment guidelines and regulations. The report shows that one positive sample for coliforms (out of 568 microbiological samples) and two samples exceeded 200 background colonies per 100 ml. No *E. coli* bacteria were detected. Actions were taken immediately and re-sampling was initiated to double check the water quality at the corresponding location. The new results were negative.

In recent years the City of Brantford implemented a flushing program with extensive replacement of old pipes. The improvement showed: for example, both turbidity and chlorine residual levels have significantly improved and both were within the acceptable levels. No low chlorine residual was reported. Also, no exceedance of inorganic contaminant limits was detected during this time period. The sodium concentration is within the aesthetic objectives, but because some of the consumers may be on sodium restricted diets, the owner of the plant

informed the Brant County Medical Officer. Water softening increases the sodium level in drinking water. No exceedance of standards for volatile organic parameters, pesticides or PCBs during this quarter was detected.

4.2.8 Six Nations of the Grand River

There is lack of information available online regarding the Six Nations of the Grand River water supply. Ohsweken takes water from Grand River. The manager stated that a special request must be submitted and approved by the Council of the Six Nations of the Grand River, before information about the treatment plant can be provided.

4.2.9 Haldimand County

Dunnville

The Dunnville water treatment plant receives water from Lake Erie through an intake, which is positioned at the Port Maitland Raw Water Low Lift Pump Station. First, the water is pre-chlorinated with sodium hypochlorite and then pumped to the Dunnville water treatment plant. Two industries are supplied with industrial quality water, both located in Port Maitland. The capacity of the treatment plant is 14,500 m^3/d and serves approximately 5,250 residential, commercial and industrial consumers. No adverse results from the microbiological and chemical tests were detected for the 3^{rd}, 4^{th} quarter of 2002.

Central Water Supply

Central Water Supply receives water from Lake Erie and provides water to approximately 5,000 industrial and residential consumers from the Lake Erie Industrial Park, Jarvis, Townsend, Hagersville and the New Credit Reserve. The last two belongs to the Grand River Watershed and therefore the Central Water Supply is of interest in this report. The water is

treated in the Nanticoke Water Treatment Plant which has a capacity of 300,000 m^3/d. During the 4th quarter there were no adverse samples apart the one on 24th Dec.2002, which showed a bacterial presence. Re-sampling on the same day showed no bacterial presence. No adverse water samples were reported during the 3rd quarter during the 2002. During the second quarter 3 samples for total coliforms exceeded acceptable limits for Hagersville, Lake Erie Industrial Park and Townsend. Re-sampling reported zero for bacteria for all three systems. The 1st quarterly report for 2002 shows higher chlorine residual values from 0.04-0.81, where the acceptable values suppose to be less than 0.05 mg/l

Caledonia and Cayuga Water Supply Systems

The Caledonia and Cayuga water supply systems provide water to Caledonia and Cayuga communities. Water is received from the City of Hamilton's Woodward Water Treatment Plan, which takes and treats water from Lake Ontario. Water is pumped to the Caledonia reservoir, and pre-chlorinated before entering the reservoir. Chlorination ensures that water retains free and total chlorine residuals to meet the requirements throughout the Caledonia-Cayuga distribution system. The Cayuga reservoir is at the end of the main. Both storage facilities are equipped with automatic online analyzers for monitoring the turbidity and chlorine levels. They are connected to an alarm system, which activates when undesired results are measured. The Caledonia waterworks services approximately 7,675 residential, commercial and industrial users; where the Cayuga waterworks, including the transmission line customers, services approximately 1,650.

Operation staff reported the following adverse samples during the last year. During the 4th quarter of the last year, there was one report for total coliform in the Cayuga reservoir. Re-sampling showed no presence of bacteria. During the 2nd quarter there was one adverse sample for total coliform in the Caledonia Distribution System. After actions were taken the problem was eliminated. The first quarterly report shows one adverse free chlorine sample at

the Cayuga reservoir. Proper adverse sample protocol was immediately executed and the re-sampling result met the guidelines. No bacterial presence was detected during the time an adverse free chlorine sample was taken.

5.0 Conclusions

Communities in the northern part of the Grand River basin rely mainly on groundwater, while in the south several communities also utilize surface water from the Grand River, Lake Erie and Lake Ontario. The overall quality of treated drinking water in the Grand River basin appears to be good at present, with a few exceptions. All drinking water treatment facilities complied with current legislation and provided safe, potable water to their consumers. If any problems were detected, proper remedial actions were taken according to existing emergency protocols. Most communities with the exception of the Six Nations of Grand River and Perth East have posted drinking water quality information on their websites. Most of the communities also have their water quality quarterly reports available at the municipal library. The Manager of the Perth East Public Waterworks made reports available for this project.

It should not be concluded, however, that the quality of untreated water from which drinking water is drawn meets Canadian Water Quality Guidelines for Freshwater Aquatic Life without direct testing of "source" waters. Unfortunately, the lack of data on bacteria and organic contaminant levels in untreated "source" waters throughout the province remains a serious issue.

References

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4. Proceedings from "Rethinking on Water-Global Best Practices" – an international forum, March 10th and 11th, 2003, Toronto
5. Public Report on the Walkerton Inquiry, the Events of May 2000 and Related Issues. Part I, A Summary; 18th Jan, 2001
6. www.walkertoninquiry.com - official website of the public inquiry
7. www.ene.gov.ca - Ministry of Environment webpage

Appendix 1

Drinking Water Treatment Plants and Water Works in the Grand River Basin

County of Dufferin (Townships of Amaranth, East Garafraxa, East Luther Grand Valley and Melancthon) Ontario Clean Water Agency (519) 941 1938
groundwater wells

Wellington County (Town of Erin, Townhip of Centre Wellington, Township of Guelph-Eramosa, Township of Mapleton, Township of Puslinch, Township of Wellington North) P.Eng. Gordon J. Ough, - County Engineer (519) - 837-2600, ext. 228 gordo@county.wellington.on.ca or Ontario Clean Water Agency (519) 941 1938
groundwater wells

City of Guelph Doug Standehl Tel: (519) 837-5627, Fax: (519) 822-8837 Email: waterworks@city.guelph.on.ca Waterworks, 59 Carden Street, Guelph, Ontario, N1H 3A1	
City of Guelph (reports available)	**groundwater waterworks**

County of Perth East Glenn Schwendinger (ext. 234) - **Manager of Public Works;** gschwendinger@pertheast.on.ca Theresa Campbel (ext.236) - Secretariat Public Works; tcampbell@pertheast.on.ca 519-595-2800 (phone), 1-888-712-0618 (toll free), 519-595-2783 (fax)	
Township of Perth East (reports available)	**groundwater**, two water supply systems (Milverton & Shakespeare)

Appendix 1: contd.

Region of Waterloo Water Quality Specialists: Mr. Tim Walton; 519-571-6230; watim@region.waterloo.on.ca; Ms. Olga Vrentzos; 519- 571- 6204 http://www.region.waterloo.on.ca	
City of Kitchener (reports available)	**WTP – Manheim - surface water from the Grand River** WTP – Greenbrook - **groundwater**
City of Cambridge (reports available)	Exclusively **groundwater**. Toyota Treatment Plant (**blend of groundwater and surface water** from the Kitchener system) Pinebush, Shades Mills and Turnbull - **groundwater** treatment plants:
City of Waterloo (reports available)	water received from the Mannheim Reservoir, the William Street Pumping Station, the Erb Street Reservoir and Well W10 on Fischer-Hallman Road.
Township of North Dumfries (reports available)	*Ayr, Branchton Meadows and Roseville – **groundwater** treatment plants* Each has 2 wells that supply water to their respective treatment plants. *Lloyd Brown community - 2 wells*
Township of Wellesley (reports available)	*St. Clements and Wellesley – **groundwater** treatment plants* Each has 2 wells that supply water to their respective treatment plants. *Linwood - 2 groundwater supply systems:* Linwood and Eastgate Meadows
Township of Wilmot (reports available)	*Baden and New Hamburg* receives water from the New Hamburg **groundwater** treatment plant. *Foxboro Green* - groundwater treatment plant *Mannheim Village, New Dundee, Shingletown and St. Agatha- own wells*
Township of Woolwich (reports available)	*Conestoga Golf Course & Conestoga Plains – own wells* *Elmira & St. Jacobs* - pipeline from the City of Waterloo's distribution system. *Heidelberg, Maryhill and West Montrose – **groundwater** treatm.plants.* First two have 2 wells that supply water to their respective treatment plants, the last 4.

County of Oxford Township of Blandford Blenheim Linda Truscott - Water & Wastewater Operations Coordinator Tel. (519) -421-2203 ext. 226 , Fax (519) - 421-2207, 1-866-537-7778; County of Oxford Water & Wastewater Services 394 Dundas St., Woodstock, ON. N4S 1B7 http://www.county.oxford.on.ca/publicworks/waterreports/	
Bright waterworks (reports available)	**groundwater (4 wells)** 56 Wilson Street (Pt Lot 24, Conc. 1) (pumphouse & res.) 72 Cuthbertson St. (Pt lot 1 Conc.) (Well 4)
Drumbo waterworks (reports available)	**groundwater (3 wells)** 35 Station St. (PH & Well 3)(Pt. Lot 13, Conc. VII) 807115 Oxford Road 29 (Well 2) Lot 12, Conc.VI I) 135 Wilmot St N (Well 1 TBA)(Lot 12, Conc. VII, Oxf.Rd. 3)
Plattsville waterworks (reports available)	**groundwater (2 wells)** # 926689 Oxford Road 42 (Wells 1&2 # 876749 Hofsteder Road (standpipe)
Princeton waterworks (reports available)	**groundwater (2 wells)** 71 Cowan St. Princeton

Appendix 1: contd.

County of Brant	
Alex Davidson - Water Division Manager Tel. (519) 449 2451, alex.davidson@county.brant.on.ca County Administrative Building 1249 Colborne Str. West, Highway 53; Mount Vernon Mailing Address: P.O.Box 160, Burford, Ontario N0E 1A0 http://www.county.brant.on.ca/pages/departments/publicworks/waterreport.html	
Airport Waterworks (reports available)	groundwater – 1 well 9 Airport Road (near the Brantford Airport)
Cainsville Waterworks (reports available)	surface water from the Holmedale WTP 27 Ewart Avenue
Mount Pleasant Waterworks (reports available)	groundwater 320 Maple Avenue (1 km north of Mont Pleasant road)
Paris Waterworks (reports available)	groundwater; 2 well fields: Gilbert (4 wells) and Telfer (3wells) Gilbert : 600 m east of Grand River Street North Telfer : West River Road (3km east of Grand River Street North)
St. George Waterworks (reports available)	groundwater – 3 wells Main Street North; 60 Church Street

City of Brantford	
Chuck Boyd– Plant Superintendent; Patrick Halevy – Water Quality Chemist tel. 519 753-8106 Brantford Water Treatment Plant 324 Grand River Avenue, N3T 5W9, Brantford, Ontario. http://www.city.brantford.on.ca	
City of Brantford (reports available)	**Holmedale WTP - surface water from the Grand River**

Six Nations of the Grand River	
Dale Bombarry – Director of Public works Tel. (519) 445 4242; Fax: (519) 445 4763 P.O. Box 5000, Ohsweken, Ontario N0A 1M0	
Ohsweken	**Ohsweken WTP - surface water from the Grand River**

Appendix 1: contd.

Haldimand County Environmental Services Ed Martin C.E.T., Manager Warren Wight C.E.T., Technical Assistant Tel: (905) 318-5962, ext. 156; Fax: (905) 772-3779 e-mail: wwight@haldimandcounty.on.ca **http://www.haldimandcounty.on.ca/physical/water_quality.asp**	
Dunnville (Waterworks No.: 220003555) (reports available)	**surface water** (Lake Erie) Dunnville surface WTP - lake Erie, in emergencies also from the Grand River
Central Water Supply* (Waterworks No.: 210001558) (reports available)	**surface water** (Lake Erie through Nanticoke WTP) Hagersville and New Credit receives water from this supply system, water from Nanticoke Water Treatment Plant through Lake Erie (*New Credit belongs to the Missisaugas of the credit region)
Caledonia and Cayuga Water Supply Systems (Waterworks No.: 260004566) (reports available)	**surface water** (Lake Ontario through Hamilton's Woodward WTP) Caledonia reservoir: north of Caledonia on the West side of Highway # 6 Cayuga reservoir: north end of Cayuga on Highway #54.

Appendix 2

CD-rom contents:

A. Final Report – doc file

B. Water Quality Quarterly Reports

1. City of Brantford
2. City of Guelph
3. City of Brant
4. County of Oxford
5. County of Perth (Perth East)
6. Haldimand County
7. Region of Waterloo