WATERSHED CHARACTERIZATION

Figures

Tables

B1 METHODOLOGY AND GAPS

B1.1 DATA RESOURCES MATRIX

To organize the data sources required for the watershed characterization, the Province has developed an Excel file called the Source Water Protection (SWP) Data Requirements Matrix. The matrix is intended to:

- Provide a complete list of available data sets for SWP;
- Help inventory and evaluate local data;
- Help identify data gaps;
- Facilitate data request process; and
- Facilitate communications around data between neighbouring conservation authorities and their SWP region.

Included in the matrix are data set names, data descriptions, data access, data sources and links to metadata. The file also includes a list of data sources required to build particular maps. Requests for data have been made by Credit Valley Conservation (CVC) through SWP activities to both the Province and local municipalities. An inventory is being maintained of the data and metadata received to date.

B1.2 MONITORING DATA SOURCES

CVC's monitoring networks provides an ongoing source of data sets that support numerous programs, including SWP planning. The source water protection process involves developing an understanding of the flow system (surface water and groundwater), cataloguing the various potential contaminant sources, and assessing the risk that these potential contaminants pose to the water supply resources on a watershed basis.

CVC's monitoring databases that are relevant to source water protection planning are listed in **Table B1-1**, which includes data type, status, and spatial coverage. CVC's monitoring network incorporates both provincial and federal monitoring partnership programs. This monitoring network collects information pertaining, but not limited to, the following data types:

- Streamflow (Stream gauges and low flows);
    - Quantity – Environment Canada HYDAT and conservation authority; and
    - Quality – conservation authority and Provincial Water Quality Monitoring Network (PWQMN).
- Climate;
- Groundwater; and
    - Quantity (water levels); and
    - Quality (Provincial Groundwater Monitoring Network – PGMN).
- Groundwater monitoring networks operated by municipal partners related to the municipal well areas.

Other monitoring programs, such as aquatic ecosystem studies conducted by the Province and conservation authorities, contribute knowledge to the development of a SWP plan.

Table B1-1 and **Table B1-2** provides additional detail on CVC's data sets and monitoring databases, while **Table B1-3** provides a review of the most recent CVC driven research studies. The information obtained from the various monitoring systems, external data sources, and plethora of study reports have been applied to the various analyses, as required, and prescribed within the *Technical Rules (2009) and* supporting the MOECC Bulletins.

Table B1-1: CVSPA Data Sets

Municipality/ Organization	Dataset	Description
CVC	Water Quality, Baseflow, Ecology	The CVC database has been designed so that many of the tables containing information common to all disciplines monitored as part of the Integrated Water Monitoring Project are contained within one central database (called ENVIROBASE). Data maintained in this database includes surface water quality, geomorphology, and ecologic monitoring. The database has not been updated with data collected by CVC for programs other than the IWMP.
CVC	Hydrology Data	The CVC currently maintains its hydrologic data (climate, streamflow) in various spreadsheets.
CVC	Geology / Hydrostratigraphy	CVC has standardized on the ORMGP database to maintain its geology and hydrogeology data.
Peel Region	Geology / Hydrostratigraphy	Peel Region uses the ORMGP database to maintain geology/hydrogeology data.
Peel Region	Water Level and Water Quality Monitoring Data	ORMGP database/Peel Region managed database for electronic water level and water chemistry data records for public supply and observation wells. Includes daily minimum and maximum water levels and daily water flows at public supply wells collected automatically via the System Control and Data Acquisition System (SCADA). Manual and automatic water level data available for observation wells. Annual water quality reports are available on Region's website.
Peel Region	PTTW	Peel Region currently has a PTTW database contained within the ORMGP database.
Halton Region	Geology and Hydrogeology	Halton Region developed a database of geologic and hydrogeologic information in the 1990's, when their Aquifer Management Plan and numeric flow models were being developed. It is updated whenever new data becomes available. Recently, the format of the database was modified to be consistent with ORMGP database.
Halton Region	Water Level and Water Quality Monitoring	The Region also maintains a database of municipal and private production and monitoring wells including water levels and pumping information collected across Halton Region. The Region is currently working towards the addition of water quality information to this database.
Halton Region	Surface Water Assessment	The Region carried out a surface water assessment in the 1990's, in the 1990's, and the resulting flow rates are provided in the Halton Aquifer Management Plan.
Halton Region	PTTW	Halton Region completed a water use assessment as part of the MOECC funded Groundwater Studies Program. The findings were compiled in a database.
Town of Orangeville	Pumping Rates, water levels, and water quality data.	The Town of Orangeville maintains their hydrogeologic and hydrologic monitoring data in Excel spreadsheet format, with some historical data stored in hard copy format.

Table B1-2: Monitoring Databases and Data Description

Database Name	Data				
	Type	Format	Period of Record	Coverage Area	Recording/Collection Frequency
Wetland Evaluation Database	MNRF Evaluation reports	paper	2005	15 wetlands	5 year rotation
ARMP Bio-Monitoring Database	Water Quality Index values (WQI), status and system type	excel	1996 – 2004 (terminated)	ARMPS per watershed	One collection per site per ARMP
	Water temperature	excel	1996 – 2004 (terminated)	ARMPS per watershed	One collection per site per ARMP
OBBN Bio-Monitoring Database	TBD - Reference Condition Approach (RCA)	TBD	Initiated 2005	OBBN sites TBD	TBD
	TBD - Stream Morphology	TBD	Initiated 2005	OBBN sites TBD	TBD
Species Database	Terrestrial species attributes	access	2003 - present	Jurisdiction	Seasonal collection
Water Monitoring Network Databases	Groundwater quality (CVSPA/PGMN)	access	2002 - present	14 sites	2 samples collected per site per year
	Groundwater static measurements (CVSPA/PGMN)	access	2002 - present	14 sites	2 readings per site per year
	Groundwater continuous levels (CVSPA/PGMN)	access	2002 - present	14 sites	Continuous readings
	Surface water quality (CVSPA/PWQMN)	access	1964 - present	16 sites	Monthly collection at PWQMN sites; twelve samples collected per year at CVSPA sites;
	Surface water levels	access	1959 – present depending on station	10 locations + 3 in 2005	Continuous
	Surface water flows	access	1959 – present depending on station	5 locations	Continuous
	Rainfall	access	1999 - present	7 locations	Continuous
	Snow Pack	access	1980 - present	4 locations	Bi-monthly-seasonal
	Humidity	access	2001 - present	2 locations	Continuous
	Barometric Pressure	access	2001 - present	2 locations	Continuous
	Wind Speed/Direction	access	2001 – present	2 locations	Continuous
	Air Temperature	access	2001 - present	7 locations	Continuous
	Rainfall	access	1959 - present	7 locations	Continuous
	Low flows (CVSPA)	access	2000 - present	67 sites	4–6 measurements per site per year
	Low flows (ORMGP)	e:DAT	2002	46 sites	1 measurement per site
	Stream Morphology	e:DAT	2002	46 sites	1 measurement per site
	Site locations	access	Current	All sites	As added/removed
	Field notes	excel	2001 - present	Most sites	As required
PTTW Database	Potential contaminant threats, locations and attributes	TBD	2002 - present	83 active sites	As Identified
ORMGP Database	Subsurface/well data	access	1950's - present	Jurisdiction	As identified
	Climatic data	access	1960's - present	Jurisdiction	As identified
	Surface water data	access	1960's - present	Jurisdiction	As identified
	PTTW data	access	2002 - present	Jurisdiction	As identified

Table B1-3: CVSPA Studies and Research

Name of Study	Year Completed
Alton and Caledon Joint Servicing Strategy	2007
Caledon Creek and Credit River (Subwatersheds 16 and 18) Study	1999
Cheltenham Servicing and Settlement Management Plan	2008
Churchville Tributary (Subwatershed 8b) – Existing Conditions and Headwater Diversion Assessment Study	1999
Clean Up Rural Beaches Plan	1994
Credit River Water Budget Study	2006
Credit River Water Management Strategy – Phase I	1990
Credit River Water Management Strategy – Phase II	1992
Credit River Water Quality Strategy – Phase 1 Report	2003
Credit Valley (Huttonville Creek (7), Springbrook Creek (8a), Churchville Tributary (8b) Subwatersheds Study	2003
East Credit (Subwatershed 13) Subwatershed Study	2002
East Credit River (Subwatershed 13) – Phase 1, III?	2008
Gateway West Subwatershed Study (Subwatershed 4,6,9)	1999
Gateway West Subwatershed Study Update	Ongoing
Headwaters of the Credit River (Subwatershed 19) Study	1997
Inglewood Settlement Servicing and Master Plan (SSMP)	1999
Island lake Water Budget - Phase I, II	2006
Mississauga Storm Water Quality Control Study	1995
Orangeville (Subwatershed 19) Update	Ongoing
Shaw Creek (Subwatershed 17) – Phase I, II, III, IV	Ongoing
Silver Creek (Subwatershed 11) Subwatershed Study	2003
Spills Response Protocol	Ongoing
West Credit (Subwatershed 15) Subwatershed Study	1998

B1.2.1 Integrated Watershed Monitoring Program (IWMP)

The CVC has implemented the Integrated Watershed Monitoring Program (IWMP). This program aims to protect and improve water quality, water quantity, biological diversity, and biological productivity in the Credit Valley Source Protection Area (CVSPA).

The IWMP focuses on a diverse range of monitoring parameters that act as indicators of ecosystem health. Integrating expertise from such disciplines as meteorology, hydrogeology, hydrology, terrestrial, fluvial geomorphology, water quality, and biology allows for many facets of the environment to be simultaneously analyzed. IWMP establishes the linkages between the issues affecting the source protection area (SPA) and its overall health. Fish are considered to be the integrator of all the water indicators. The intent of the IWMP is to detect environmental changes (both spatially and temporally) within the watershed over time.

The CVC has established over one hundred and fifty IWMP monitoring stations within the SPA. These are shown in **Figure B1-1** and **B1-2**, respectively. Within any single monitoring location, the number of parameters measured varies between fish species, substrate size, *E. coli* count, groundwater gradient, flow etc.

Streamflow Gauging

There are five gauging stations maintained and monitored by the CVC, and an additional one is monitored, or has been monitored for some period of time, by the Water Survey of Canada (WSC). These are shown in **Table B1-4** and **Figure B1-1**, respectively.

Table B1-4: Surface Water Gauge Details, CVC Gauge Network Stations

Gauge	Station	Status	Gross drainage area	Period of record (Regulation)
02HB013	Credit R. near Orangeville	Active	62.2 km^2	1967 - 2003
02HB019	Alton Branch Above Alton	Discontinued	59.5 km^2	1983 - 1991
501170005	Shaw's Creek at MNRF/Bruce Trail(CVC)	Active	71.9 km^2	2001-present
02HB001	Credit R. near Cataract (CVC)	Active	205 km^2	1912 - 2003
02HB031	West Credit R. in Hillsburgh	Active	Unevaluated	2005- present
02HB020	Erin Branch Above Erin	Active	32.3 km^2	1983 - 2003
501150001	West Credit R.at Belfountain (CVC)	Active	100 km^2	2001-present
501200005	E Credit R.at Caledon Rail Trail (CVC)	Active	49.2 km^2	2001-present
02HB018	Credit R. at Boston Mills	Active	402 km^2	1982 - 2003
501200011	Credit R. at Cheltenham Parkette	Not active	423.9 km^2	2001-present
02HB024	Black Creek below Acton	Active	18.9 km^2	1987-Present
501120004	Credit R.at Glen Williams (CVC)	Active	483.5 km^2	2001-present
501100001	Black Creek u/s 8th line (CVC)	Active	79.2 km^2	2001-present
02HB008	West Branch At Norval	Active	127 km^2	1960 - 2003
02HB025	Credit R. at Norval	Active	615 km^2	1988 - 2003
02HB026	Mississauga Golf Course	Discontinued		1988 – 2003
02HB030	Cooksville Creek, Mississauga	Active	Unevaluated	2005- present
02HB029	Credit R. at Streetsville	Active	Unevaluated	2005- present
02HB002	Credit R. at Erindale	Discontinued	795 km^2	1945 - 1993

Low Flows

Flow measurements have been conducted on the main branch of the Credit River and at various other tributaries for many years, and from this data, baseflow estimates have been estimated (Singer *et al.,* 1994).

In addition, spot baseflow measurements have been collected on both a subwatershed-scale (as part of subwatershed studies) and a watershed-scale, as part of the IWMP (**Figure B1-1**).

Precipitation/Meteorological Gauging

Precipitation monitoring/measurements is a fairly simple process undertaken by obtaining an accurate sample of the precipitation falling at the location of the gauge and having sufficient spatial coverage throughout the CVSPA to permit accurate estimates of the volume of water falling on a sub-watershed.

This information is currently compared with runoff volumes and quantitative hydrologic forecasting. The monitoring sites are shown on **Table B1-5** and **Figure B1-2**, respectively.

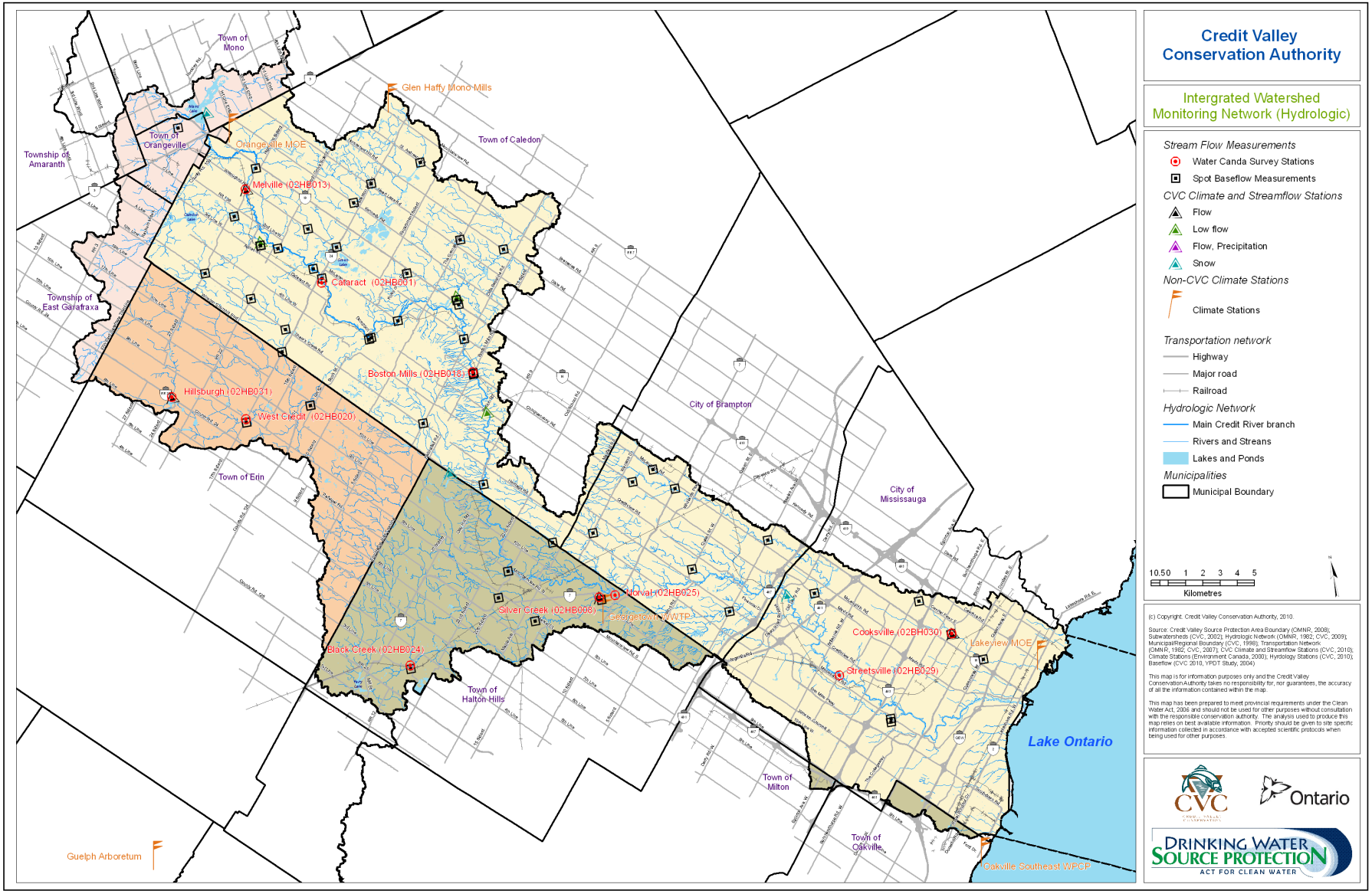

Figure B1-1: Integrated Watershed Monitoring Program (IWMP) Network Hydrologic Station

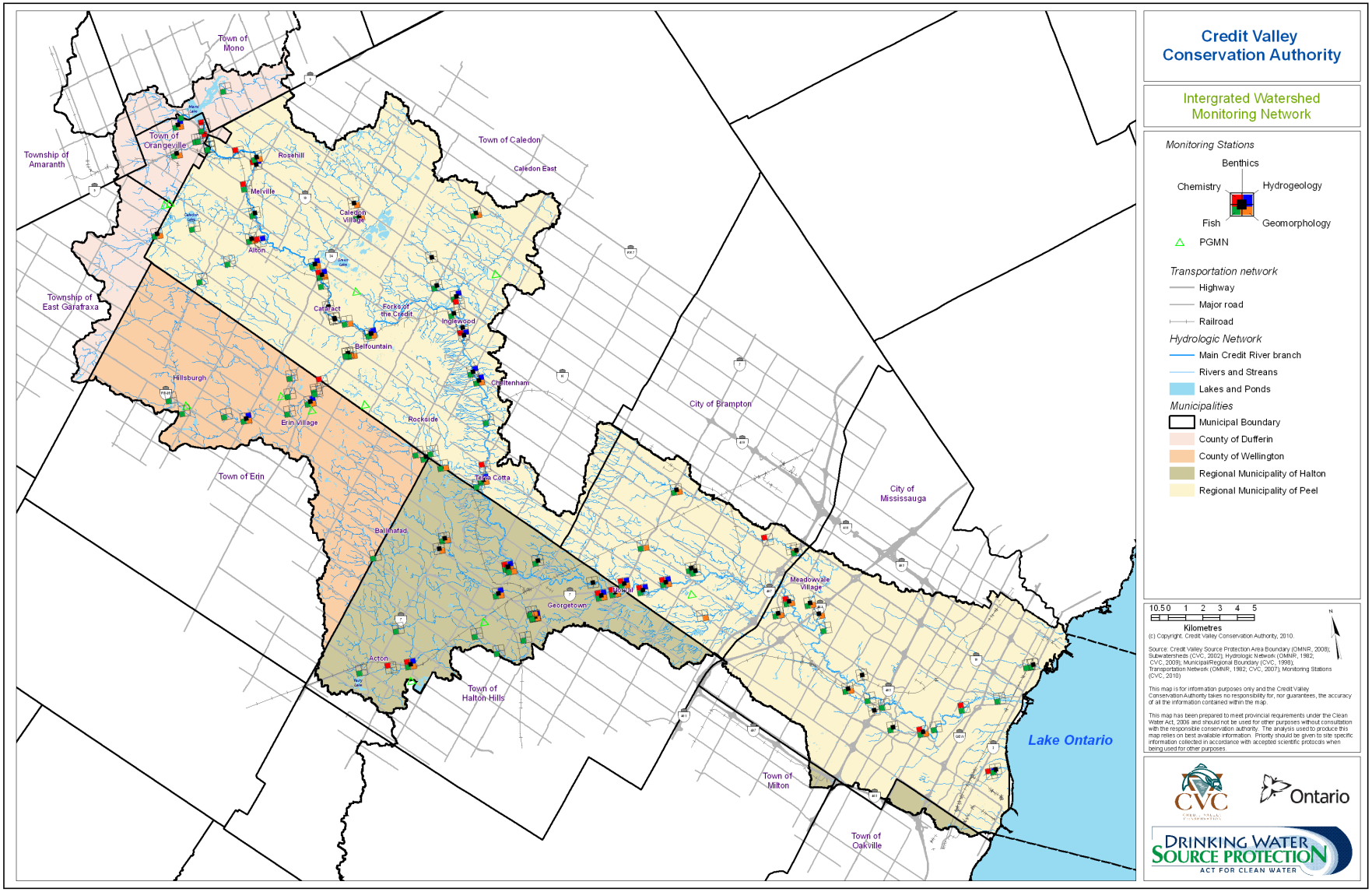

Figure B1-2: Integrated Watershed Monitoring Program (IWMP) Network - Hydrogeology, Geomorphology, Chemistry

Table B1-5: Meteorological Station Details, CVSPA and AES Stations

Site ID	Station Location	Sub-Watershed
501050002	Fletcher's Creek d/s Steeles Ave	5
501090001	Credit River u/s Old Derry Road	9
501090002	Credit River d/s Hwy 7 Norval	9
501100002	Black Creek d/s Third Line	10
501100004	Black Creek at Acton Sewage Treatment Plant	10
501110001	Silver Creek u/s Hwy 7, Norval	11
501110005	Silver Creek d/s Mountainview Road	11
501120004	Credit River at Glen Williams	12
501120008	Credit River at Terra Cotta	12
501150002	W. Credit River at Winston Churchill Blvd	15
501180005	Credit River at Beach Road Side Road	18
501190004	Credit River at Orangeville Dam	19
501190005	Credit River at Hwy 10 North Crossing	19
501190006	Credit River at Melville	19
501190007	Credit River at Hwy 10 South Crossing	19
501210004	Sheridan Creek @ Rattray Marsh (Meadowwood)	21
Additional Surface Water Quality Monitoring Stations (CVC)		
501090003	Credit River u/s Dundas St (Erindale Park)	9
501090009	Credit River at Mississauga Golf Club	9
501130009	E. Credit River u/s of Hwy 10	13
501170005	Shaw's Creek at MNRF/Bruce Trail, Alton	17
501180003	Credit River d/s Hwy 24	18
501190033	Credit River d/s Mill Creek	19
501200004	Credit River at Inglewood, E. side McLaughlin Road	20

Snow Cover

Snow course data have been collected in the CVSPA for many years. Each year the mean of the 10 points (both snow depth and equivalent water content) are collected for the period December 1st to April 15th, and are reported to the MNRF as part of the province-wide network. Additional snow course information is available from adjacent conservation authorities. The monitoring sites are shown on **Table B1-6** and **Figure B1-1,** respectively.

Table B1-6: Snow Course Station Details, CVSPA Stations

MNRF No.	Snow Course Name	Elevation (m amsl)	Latitude	Longitude	Available Period of Record
1201	Belfountain	366	43 48	80 01	1975 – 1991
1202	Monora (Orangeville)	427	43 56	80 06	1971 – 1988
1203	Terra Cotta	343	43	79 57	1963 – 1974
1204	Hillsburgh	480	43 48	80 10	1973 – 1974
1205	Meadowvale	166	43 38	79 44	1985 – 2003
1206	Orangeville Reservoir				1989 – 2006
1207	Belfountain 2	366	43 48	80 01	1990 – 1992
1208	Meadowvale 2	166	43 38	79 44	2003 – 2006

Surface Water Quality

The PWQMN surface water quality monitoring program operates as a partnership between the CVC and the Province of Ontario under the guidance of the MOECC. The CVC provides monthly water quality samples to the MOECC for provincially designated locations throughout the CVSPA. This data is then incorporated into a provincial database that is owned and managed by the MOECC and provided to the CVC for use in its data library. In 2002, the CVC began sampling seven additional stations at municipal boundaries, and added metals to the parameter list at the four upper stations near Orangeville. These stations and metal parameters are meant to complement the PWQMN and begin to fill in spatial and parameter data gaps. The monitoring sites are shown on **Table B1-7** and **Figure B1-1**, respectively.

Table B1-7: PWQMN Surface Water Monitoring Details

Site ID	Station Location	Sub-Watershed
501050002	Fletcher's Creek d/s Steeles Ave	5
501090001	Credit River u/s Old Derry Rd	9
501090002	Credit River d/s Hwy 7 Norval	9
501100002	Black Creek d/s Third Line	10
501100004	Black Creek at Acton Sewage Treatment Plant	10
501110001	Silver Creek u/s Hwy 7, Norval	11
501110005	Silver Creek d/s Mountainview Rd	11
501120004	Credit River at Glen Williams	12
501120008	Credit River at Terra Cotta	12
501150002	W. Credit River at Winston Churchill Blvd	15
501180005	Credit River at Beach Road Side road	18
501190004	Credit River at Orangeville Dam	19
501190005	Credit River at Hwy 10 North Crossing	19
501190006	Credit River at Melville	19
501190007	Credit River at Hwy 10 South Crossing	19
501210004	Sheridan Creek @ Rattray Marsh (Meadowwood)	21
Additional Surface Water Quality Monitoring Stations (CVC)		
501090003	Credit River u/s Dundas St (Erindale Park)	9
501090009	Credit River at Mississauga Golf Club	9
501130009	E. Credit River u/s of Hwy 10	13
501170005	Shaw's Creek at MNRF/Brce Trail, Alton	17
501180003	Credit River d/s Hwy 24	18
501190033	Credit River d/s Mill Creek	19
501200004	Credit River at Inglewood, E. side McLaughlin Rd	20

Groundwater

The CVC monitors groundwater levels, and groundwater quality with the MOECC as part of the provincial groundwater monitoring network (PGMN). In light of increasing stresses from a variety of natural and anthropogenic factors, the MOECC initiated the development of a PGMN partnership with a number of conservation authorities across the province.

The PGMN program consists of water level and water quality data collection from a number of instrumented groundwater wells within each conservation authority. Data generated from this network provides supporting background information for such decision-making processes as drought response, scientific modelling, water policy development, and land use planning. There are fourteen PGMN wells at nine different sites throughout the CVSPA, as shown in **Table B1-8** and **Figure B1-2**, respectively.

Table B1-8: Provincial Groundwater Monitoring Network Sites

Well ID	Name	Subwatershed	Type	Aquifer
W0000018-1	Orangeville	17	Bedrock	Amabel/Lockport
W0000026-1	Erin 6	15	Bedrock	Amabel/Lockport
W0000064-1	Acton	10	Bedrock	Amabel / Lockport
W0000019-1	Orangeville	17	Overburden	Glaciofluvial ice contact deposits
W0000028-4	Georgetown	10	Deep	Glaciofluvial channel deposits
W0000028-2	Georgetown	10	Shallow	Glaciofluvial channel deposit
W0000038-1	Caledon	18	Deep	Sandy Till
W0000020-1	Huttonville	6		Glacio-lacustrine sand
W0000163-2	Robert Baker	12	Deep	Sandy Till
W0000165-2	Warwick	13	ORM Shallow	Glaciofluvial ice contact deposits
W0000164-2	Hillsburgh	15	Shallow	Glaciofluvial channel deposits
W0000163-3	Robert Baker	12	Shallow	Sandy Till
W0000165-3	Warwick	13	ORM Deep	Glaciofluvial ice contact deposits
W0000164-3	Hillsburgh	15	Deep	Glaciofluvial ice contact deposits

Biological Monitoring

Biological sampling measures ecological effects, whereas sampling for chemical and physical parameters measures stressors (i.e., environmental contamination). Though source water protection technical guidelines do not directly link the assessment and protection of drinking water to biological assessment, it is recognized that the various components of the watershed are closely linked. Protecting source water is important to the biological health of the watershed and biological indicators are fundamental in protecting source water. CVSPA's biological surveys involve sampling creatures, such as benthic macroinvertebrates and fish, found living within the aquatic environment. Benthic macroinvertebrates make good health indicators of aquatic ecosystems for a number of reasons:

- They generally have limited mobility, which makes them vulnerable to many creek stresses that may occur;
- They have short life cycles;
- They are easily collected and identified; and
- Their spatial distribution across the watershed is good.

Historically, CVSPA's aquatic biological sampling has followed the BioMap protocol (Griffiths, 1998). Sampling was undertaken as part of the Aquatic Resource Management Plan (ARMP) activities for all sub-watersheds.

B1.2.2 Benthic Macroinvertebrates

CVC joined the Ontario Benthos Biomonitoring Network (OBBN) in 2003, and have installed 49 benthic macroinvertebrate monitoring stations in the CVSPA, as part of the IWMP. OBBN sites are closely linked to the PWQMN sites (**Figure B1-1**). This provincial network allows CVSPA to follow a standardized methodology, share resources and offer technical support.

To date, the CVC has conducted benthic macroinvertebrate sampling at five candidate reference (minimally-impacted) sites in the CVSPA. The data collected from these sites are currently being reviewed in order to establish their suitability as reference sites for the OBBN database.

Macroinvertebrates are collected using a "kick and sweep" method and samples are identified to lowest practical taxonomic level. Stations are ranked on the basis of community composition using a variety of metrics, such as the Hilsenhoff Biotic Index, species richness, and the percent composition of sensitive species. Each station is classified as "excellent", "good", "fair", or "poor".

The complete list of metrics used to calculate the ranking of a station as well as its definition and its direction of response to disturbance is found in **Table B1-9**. To calculate a score for each station, all index scores were transformed to percentiles (of the index score for all stations). This was done to make all indices equal in terms of weighting, i.e., the index percentile will always be between 0 and 1. For each station, all index percentiles were added to yield a total score. These scores were then ordered from highest to lowest and rankings ("excellent", "good", "fair", or "poor") were assigned to each station based on natural thresholds in the scores.

Table B1-9: Summary of Benthic Invertebrate Parameters

Index	Definition	Direction of Response to Disturbance
EPT taxa	Number of taxa encountered belonging to the groups: Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly).	Decrease
% EPT	Proportion of the sample represented by Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) taxa. These taxa are generally considered to be sensitive to pollution.	Decrease
% Dominance	Proportion of the sample represented by the most dominant taxa.	Increase
% Oligochaeta	Proportion of the sample represented by oligochaete worms.	Increase
% Chironomidae	Proportion of the sample represented by chironomid taxa (midge fly larvae).	Increase
% Isopoda	Proportion of the sample represented by isopod taxa (sow bugs).	Increase
Shannon's (h) Diversity Index	A measure of diversity that accounts for both abundance and evenness in a sample.	Decrease
Hilsenhoff Biotic Index (HBI) (Hilsenhoff, 1987)	A measure of organic enrichment based on species tolerance values.	Increase
Taxa Richness	The number of taxa.	Decrease

B1.3 Information Management System

Sources of information (details and descriptions) identified through source water protection activities are to be tracked through CVC's current information management system (IMS). IMS is an updatable and searchable database that contains metadata related to reports, documents and correspondence. Folders are assigned IMS numbers (ID #) and updated information related to a particular folder is linked using the same IMS number as the parent folder.

The database is searchable by keyword, municipality, watershed, name, address, municipality number, permit number, date/owner, and Folder ID number or Attachment ID number. Information added to the database may contain a description of the report or data. Folders may be linked or cross-referenced by ID number's. CVC's IMS is regularly backed up and the database is accessible through the LAN by an IMS interface loaded on each workstation. Centralized updates or edits to IMS are typically required to maintain standardization of format within the system. IMS directly links digital files though the local area network. Hard copies of information are tracked in IMS to facilitate accessibility either within individual office cabinets or in the main administrative file location.

B1.4 Methods of Analysis

The watershed characterization is a description of the local watershed area and was developed by compiling all the available information about the area. It will include topics such as watershed features, the water quality, the wells and intakes that draw drinking water, and the natural and human-made influences. Maps were produced to provide a visualization of the watershed. This information gathering process will be iterative and continuous wherever possible to enhance the available data.

The watershed features including topography, physiography, geology, hydrology (surface water flow system) and hydrogeology (groundwater flow system), ecology, naturally vegetated areas, and climate. This information provides the background necessary for a more in-depth analysis in subsequent phases of the Assessment Report, including the Water Budget and Stress Assessment, the Vulnerability Analysis and the Summary of Threats and Issues.

The water quality conditions and long-term trends in the watershed were identified. Maps and graphics are used to illustrate these trends. The objective was to describe the quality of surface water and groundwater using existing information and determine if the water quality is improving, deteriorating or remaining constant.

The current water use was inventoried, as well as historical takings, to illustrate where most of the water is going and at what times during the year. The inventory estimated population growth in the watershed area, which has a significant impact on future water demands.

The SPA also identified land use activities that are known to pose a threat to the quality or quantity of drinking water to determine human and ecological impacts.

A Watershed Characterization Report has been prepared for the CVSPA (Credit Valley Conservation, 2007). Workshops were held in early 2007 with conservation authority and municipal partners to review the contents of earlier versions of the report. The report was then re-drafted to include edits and updates emanating from the comments provided. Comments from the review were incorporated into the final Assessment Report.

B1.5 Surface Water Quality Data Analysis and Reporting

The analysis and reporting of surface water quality data were accomplished in three steps:

Step One - Exploratory analysis: The first step involves plotting water quality observations to visually examine the attributes of the data (e.g., outliers and data entry errors). Each water quality observation is represented as a single point or dot. The y-axis (the dependent axis) is the concentration of a water quality parameter and the x-axis (the independent axis) is time, usually represented as months or years. Specifically, a plot of water quality results against time allows for the:

- Observation of seasonal and annual trends;
- Identification of anomalous results and potential errors;
- Comparison of results to water quality criteria (e.g., Provincial Water Quality Objectives, Canadian Water Quality Guidelines);
- Observation of changes in water quality over time;
- Identification of missing periods of record (data gaps); and
- Identification of biases introduced by the timing of water quality measurements.

Step Two - Statistical analysis: The second step in the analysis of surface water quality data involves the selection and application of statistical tests to establish the significance of differences, trends and relationships that were identified in the exploration of the data.

Step Three - Reporting results: The third step involves the use of graphics such as maps and boxplots to present selected results in a format that is consistent with the information needs and technical knowledge of the target audience. Results that are selected for reporting should describe the prevailing surface water quality conditions in the watershed.

B1.6 Groundwater Quality Data Analysis and Reporting

B1.6.1 Data Compilation

Groundwater quality data may be available from a wide variety of sources, including the PGMN, private well sampling, municipal water sampling programs, health departments and other groundwater studies.

B1.6.2 Data Analysis

The assemblage and integration of information for providing an understanding of groundwater quality on a watershed basis can be performed a number of ways, including the assemblage of GIS layers, the construction of binary plots, the construction of maps and cross sections, the construction of vertical and horizontal iso-chemical contour maps, the construction of groundwater quality diagrams (e.g., Durov, Piper, Stiff, Rose, etc.), the construction of chemical concentration versus time plots, the preparation of tables that compare water quality concentrations to water quality criteria (e.g., Ontario Drinking Water Standards, Provincial Water Quality Standards) and the use of statistical methods. Parameters that exceed the standard can be highlighted, as some parameters naturally exceed water quality standards. Naturally elevated parameters can be present due to the geological materials in the area, the recharge environment or other factors.

B1.6.3 Analysis of Trends at Each Monitoring Well

Time versus concentration plots are a useful tool to determine if changes in water quality are occurring. Time-concentration plots are generated from water quality data for one parameter, usually in one monitoring well, with time across the x-axis, and the concentration for that parameter along the y-axis. Statistical trend analysis packages (for example packages built into Excel) can be used to determine if there is a trend. Alternatively, the data can be visually interpreted to determine if there is a trend. Trends can occur over a longer term, though there may be a blip or short-term spike in concentration indicating a short-term event, such as a spill or controlled release into the environment. Trends can also occur seasonally or cyclically. Seasonal or cyclic trends occur where water quality fluctuates through seasons or through wet or dry years.

Where water quality impairments have been identified in a watershed (concerns, known contamination) the parameters typical for those impairments can also be evaluated through time-concentration plots to determine if there are increasing or decreasing trends. Trend analysis can provide an indication of contamination, changes in groundwater recharge, a connection to surface water, or general changes within an aquifer. Significant increasing or decreasing trends should be identified in the individual monitoring wells. This can be used to identify areas where water quality is influenced by surface activities, including precipitation, and therefore may be more vulnerable to surface activities.

B1.6.4 Aquifer Characterization

Groundwater quality data was also analyzed on a sub-watershed basis to look for larger-scale trends in water quality. Monitoring wells from similar aquifer units can be grouped to determine the typical maximum, minimum and average water quality ranges for the aquifer units. Where little information is available to determine if monitoring wells are in the same aquifer, water quality data can be compared through Piper diagrams, Stiff diagrams, Rose diagrams and other geochemistry tools to determine if water samples are of a similar nature, and potentially of similar origin.

B1.7 LIMITATIONS: DATA, ASSUMPTIONS AND METHODS

Watershed characterization was undertaken in as precise a manner as the data sources permit. Uncertainty in the characterization is due to lack of in-depth data in the following areas:

B1.7.1 Geology – Bedrock Valleys

Bedrock valleys have been identified as hosting several municipal supply groundwater aquifers. However, the valley infill sediments and the hydrostratigraphy within these buried valleys have not been extensively studied, and these features are not fully understood in most areas. They require additional analysis to understand the water budget within these features and to more accurately identify the recharge areas supplying water to these valleys for a source water protection perspective.

The analysis of buried valleys in the vicinity of Acton and Georgetown formed part of the focus of the Tier 3 water budget study undertaken for the Town of Halton Hills.

B1.7.2 Human Characterization – Population Growth

The CVC's municipal partners need to update and modify their official plans to be consistent with the Province's Places to Grow and Greenbelt legislation. This legislation will have an impact on population growth, the distribution of population growth, and future water demands.

B1.7.3 Surface Water

Infiltration Practices for Urban Runoff

Stormwater management practices, particularly those that allow infiltration could be possible sources of groundwater contamination. A review of the practices should be conducted as input to risk assessment. Analysis of the locations of stormwater infiltration practices should be assessed, and water quality should be analyzed within any lined or unlined ponds located within municipal well capture zones.

Wetlands and Groundwater / Surface Water Interactions

The CVC should further its efforts in understanding groundwater/surface water interactions and discharge areas in wetlands through modelling, streamflow and wetland monitoring programs, and the fisheries and benthic monitoring programs. Studies should try to identify and validate (field monitoring program) discharge areas, and rank them with respect to the volume of discharge and its role in supporting aquatic and terrestrial resources.

Waste Water Treatment Plant Effluent

At present, CVC does not have consistent water chemistry results for waste water treatment plant effluent. This information should be collected in a more systematic manner to allow for a more complete assessment of current surface water monitoring data, and the identification of additional sources of chemical constituents.

B1.7.4 Groundwater

Monitoring

Presently there is no defined process in place for groundwater level and quality monitoring data management on a watershed basis. This process could include data collected by municipalities, developers, and industry throughout the watershed.

An integrated watershed-based groundwater monitoring program could be implemented to develop a consistent approach to monitor and understand water quality and quantity in recharge areas, areas of high vulnerability, and WHPAs.

Brownfields, Landfills, and Contaminated Sites

The CVC does not have a complete database of brownfields, landfills, and/or contaminated sites located within the watershed boundaries. This database should be compiled in cooperation with municipal partners and the provincial government.

Biosolids and Nutrient Management Mapping

The land areas subject to current and historical biosolids and manure spreading are not well defined. Mapping of these areas would require surveys and cooperation with rural landowners and the feasibility of completing this successfully is not known.

B1.7.5 Groundwater Quality

Monitoring Data

Generally speaking, there is a clear lack of monitoring infrastructure (hence data) in the following locations:

- Broader landscape - there is limited data within the wider areas of the watershed (i.e., ecological and significant groundwater recharge areas), not being used for municipal supplies;

- Highly vulnerable aquifers - there is limited information as to the current water quality within areas of high aquifer vulnerability in the watershed, other than within some capture areas of municipal wells;
- Capture areas of several municipal wellfields; and
- Southern watershed - groundwater is not utilized for municipal supply in the extensively developed southern areas of the watershed. Therefore, monitoring well (PGMN) coverage is relatively sparse in these areas.

It is therefore a challenge to undertake spatial characterization of groundwater quality with the desired level of accuracy.

With the exception of municipal systems, quality sampling has occurred over a limited period of time, so it is also a challenge to discern temporal trends.

Integrated Data Management

Several of the CVC's municipal partners have implemented groundwater quality monitoring programs, but there is no defined process to share this data.

The CVC and its municipal partners would collectively benefit by having an integrated groundwater monitoring database in place. Managing this process should involve the collection and management of all groundwater data that is not considered legally privileged and confidential.

B1.8 REFERENCES

Credit Valley Conservation. (2007). Interim Watershed Characterization Report for the Credit River Watershed. Dated February 28, 2007.

Griffiths, R.W. (1998). *Sampling and evaluating the water quality of streams in southern Ontario*. Ministry of Municipal Affairs and Housing, Planning Policy Branch, Toronto, Ontario.

Singer, S., Cheng, T., Emami, S, Hassan, H., Scafe, M., Sheikh, G., Whitehead, B., and Zaia, W. (1994). Groundwater Resources of the Credit River Watershed. Ministry of the Environment. 48 p.

B2 QUALITY ASSURANCE/QUALITY CONTROL

B2.1 BACKGROUND

This appendix includes the methodology for preparation of the Watershed Characterization chapter of the Assessment Report. It includes quality assurance and quality control procedures that were adhered to, sources of all data reported, and the purposes that the data was used for.

The data and mapping in the Watershed Characterization Report were the result of compilations of existing watershed information available to CVC as of late 2009. The work was heavily dependent on the technical work and reporting for watershed plans completed under the IWMP and other programs. CVC minimized duplication of efforts by seconding key technical staff on an as-needed basis from the watershed planning tasks to the source water protection effort. Key areas of overlap included:

- Natural Heritage;
- Land Use;
- Physiography and topography;
- Hydrology and hydrogeology; and
- Surface water and groundwater quality.

The main goal of CVC's source water protection staff was to take the outputs of watershed plans in these key areas and make the data and mapping as consistent as possible across the entire CVC jurisdiction. This was a significant challenge because most data collection, mapping, and analysis had been conducted on a watershed basis, and significant edge mapping issues were identified. The maps and analysis included in the Watershed Characterization Report represent CVC's best efforts to date on maintaining consistent, geo-referenced data across both political and watershed boundaries.

B2.2 QUALITY ASSURANCE/QUALITY CONTROL

Document Preparation

The first step in quality assurance involves collecting reliable data. The CVC uses qualified field staff that have been trained in the use of the sophisticated field instruments now available such as real-time chemistry analysers and electro-magnetic flow meters. CVC's field staff follow provincially accepted protocols such as the Hinton Low Flow measurement protocol and Ontario Stream Assessment Protocol.

CVC employs qualified professional planners, engineers, and scientists to review and analyze the field data. Expert consultants and provincial agency experts (i.e., Ministry of Natural Resources and Forestry) for specialized functions such as remote sensing and modelling supplement this staff. In addition, federal (i.e., Geological Survey of Canada) and provincial (i.e., Ontario Geological Survey) experts have been consulted in the preparation of geologic layers and mapping.

The spatial data have been reviewed along with the associated metadata by CVC's GIS staff to ensure that the information provided is represented accurately on the individual maps.

Internal Review

CVC technical staff, as part of the routine regional monitoring program and watershed planning processes, has reviewed the pertinent data sets used in the preparation of this report. In addition,

supervisors have reviewed this document to ensure data from other projects have been properly incorporated. Senior staff has reviewed the report for logic and consistency.

External Review

The final step in CVC's quality assurance/quality control (QA/QC) process is external review, by both the public and partners. The draft version of this report was issued to municipal staff for review, and a two-day workshop was conducted in September 2006 to facilitate receipt of review comments. This report includes revisions to the draft report suggested by both the internal and external review teams.

Knowledge and Data Gaps

Significant efforts have been made by all levels of government and the CVC to collect and interpret environmental data for our watersheds. However, in the development of this report, data and knowledge gaps with respect to watershed characterization have been identified. It is important that these gaps be identified now so that the required information can be obtained in a timely manner.

B2.3 Municipal Water Systems – Abstraction

Table B2-1 shows the maximum annual abstraction rates for each of Peel Region's intakes on Lake Ontario. The data reflect the maximum allowable abstraction per the permit (PTTW) issued by the MOECC. Average monthly and annual pump rates for each system are also reported in the tables.

Table B2-1: Region of Peel: Arthur P. Kennedy and Lorne Park Water Treatment Plants (Lake Ontario) – Pump Rates (2009) Average day Rates m^3/ d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg Ann
Arthur P. Kennedy	404.1	358.5	372.13	387.3	410.4	455.5	468.6	461.4	429.8	306.3	305.8	307.3	393.8
Lorne Park	182.9	174.0	206.6	190.0	207.2	210.6	201.1	201.2	201.0	196.6	184.5	190.6	200.6

Source: Public Works, Peel Region

Table B2-2 to **Table B2-5** show the maximum annual abstraction rates for each municipal groundwater system. The data reflect the maximum allowable abstraction per the permit (PTTW) issued by the MOECC. Average monthly and annual pump rates for each system are also reported in the tables. Monthly rates reflect average daily pumping rates, and show seasonal variation in demand, while average annual rates report average daily pumping rates for the year.

Table B2-2: Town of Orangeville and Town of Mono Water Supply – Pump Rates (2008 Average day Rates – m^3/ d)

Well	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg. Ann.
Orangeville													
Well 2A	0	0	0	354.7	355.2	481.6	723.9	748.2	763	0	0	0	**286**
Well 5	1847.9	1689.2	1481.3	489.2	373.8	1095.7	2576.4	2788.9	2202.4	2583.2	2422.8	1975.1	**1797**
Well 5A	1591.2	2451.1	2671.7	1577.2	2003.7	1610.2	343.7	577.7	1257.9	1734.8	1739	1245.7	**1562**
Well 6	1766.5	14.7	187.3	2169.6	2224.5	2108.7	2111.3	1726.1	1194.9	543.7	817.4	1369.9	**1358**
Well 7	1095.9	1082.5	1067.9	1094.7	1032.8	896.8	330.9	0	348.4	528.1	624.3	974.9	**755**
Well 8B	122.1	272.9	253.9	261.2	317.1	292.4	262	399.7	463.9	475.2	528.5	538.4	**349**
Well 8C	119.6	203.9	236.2	242.5	193.5	217.9	209.2	109.4	3.5	6	6.5	4.8	**129**
Well 9A	576.8	675.8	814	336.3	0	2.9	0	0	0	0	0	0	**199**
Well 9B	8.3	1.3	1.5	305.4	733.7	515	591.6	644.1	724.8	776.9	0	0	**360**
Well 10	12.3	63.2	27.2	39.1	59.2	780.7	474.5	0	0	0	0	0	**121**
Well 11	945.6	1060.6	1034.7	1069.7	1058.5	1033.5	1063.3	865.1	884.4	611.7	717.3	928	**939**
Well 12	548.3	813.6	709.2	980.3	611.8	202	540.5	901	916.1	1147.8	1101.4	901.5	**781**

Well	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg. Ann.
Mono – Coles													
PW-1	75.4	106.9	60.7	83.4	93	79.3	92.8	84.9	81.5	80	63.4	71.2	**81**
PW-2	0.7	0.7	1	0.7	1	1.2	0.6	1.3	0.8	0.6	0.5	0.8	**1**
Mono – Island Lake													
Well 1	99.9	59.8	110	109	141	130.8	138.7	134.7	119.4	126.5	115.7	123.4	**118**
Well 2	3.2	3.7	4.8	6.1	5.5	5.5	4.3	5.4	5.5	3.5	5.9	4.9	**5**
Mono – Cardinal Woods													
Well MW 1	10.7	7.9	6.7	7	9.4	6.7	14.5	6.5	9.8	6.6	6.1	7.2	**8**
Well MW 3	193.3	200.7	195.6	213.5	246.3	253.4	258.7	259.1	288.3	312.2	224.4	228.1	**240**
Well MW 4	Well MW-4 was not connected to the Cardinal Woods water system until 2009.												

Source: Orangeville Water Works, Town of Orangeville

2009 data not available at time of data compilation

Well 2A seasonal operation only; Apr. 1 to Sep. 30, as per PTTW.

Well 7 out of service for pump replacement, Jul. 10 to Sep. 17.

Wells 9A/9B offline due to PTTW expiry on Oct. 31.

Well 10 offline starting Jul. 25 to facilitate construction of new raw water connecting watermain

Table B2-3: Town of Erin: Erin and Hillsburgh Water Supply – Pump Rates (2009 Average day Rates – m3/ d)

Well	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg Ann
Erin													
Well E7	439	463	407	437	538	530	587	417	587	489	476	623	**499**
Well E8	450	498	465	422	448	579	441	494	402	428	436	335	**449**
Hillsburgh													
Well H2	44	76	58	63	64	72	92	56	67	134	127	48	**75**
Well H3	141	145	142	126	156	159	158	138	139	6	71	128	**125**

Source: Water Superintendent, Town of Erin

Table B2-4: Town of Halton Hills: Acton and Georgetown Water Supply – Pump Rates (2009 Average day Rates – m^3/ d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg Ann
Acton													
Georgetown													
Davidson	1258.0	1276.0	1252.0	1352.0	1462.0	920.0	864.0	916.0	1302.0	1318.0	1452.0	**935.0**	**1192**
Fourth Line	820.0	777.0	770.0	676.0	847.0	590.0	543.0	506.0	537.0	621.0	696.0	**443.0**	**652**
Princess Anne 5 & 6	4491.0	5214.0	5069.0	4980.0	6246.0	6677.0	6525.0	5314.0	6124.0	6270.0	6609.0	**7292.0**	**5901**
Lindsay Ct Well 9	5401.0	4152.0	3877.0	3703.0	4071.0	4087.0	4223.0	4293.0	4299.0	3079.0	5235.0	**5680.0**	**4342**
Cedarvale	3508.0	4058.0	4290.0	4317.0	4395.0	4715.0	4710.0	4759.0	4736.0	4352.0	1422.0	**0.0**	**4115**

Source: Source Protection Coordinator, Halton Region

Table B2-5: Region of Peel – Alton, Caledon Village, Inglewood and Cheltenham Water Supply – Pump Rates (2009 Average day Rates – m^3/d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg Ann
Alton													
Well 3	106.9	107.8	84.3	127.5	186.3	112.3	124.8	146.5	182.0	78.7	142.5	89.5	**124.1**
Well 4	133.9	117.1	80.2	116.1	156.4	275.7	228.9	178.9	125.9	179.2	111.1	163.1	**155.5**
Caledon Village													
Well 3	398.9	265.4	269.0	308.8	304.7	261.6	400.3	344.7	397.5	406.7	332.1	270.5	**330.0**
Well 4	229.5	370.1	356.9	363.4	440.2	496.1	497.7	437.3	546.7	416.9	299.9	307.8	**396.9**
Inglewood													
Well 2	126.5	182.9	198.1	195.7	246.8	159.0	444.2	304.9	463.7	168.2	251.7	228.6	**247.5**
Well 3	186.0	141.4	92.9	141.6	158.9	309.2	103.8	203.8	161.1	193.4	89.1	108.3	**157.5**
Cheltenham													
Well 1 & 2	201.6	189.5	222.5	237.2	266.4	302.1	310.2	278.6	284.3	218.1	184.5	196.6	**241.3**

Source: Public Works, Peel Region

B2.4 SURFACE WATER QUALITY- CREDIT RIVER

The analysis of water quality parameters is discussed in **Section 2.4.5** of the Assessment Report. **Table B2-6** to **Table B2-16** provide supporting data for the trends in dissolved oxygen, phosphorus, nitrate, chloride, bacterial, aluminium, copper, nickel, iron and zinc as described in the report. The monitoring network is shown in **Figure B1-1**.

Table B2-6: Summary of DO Results from available diurnal survey data (1998-2003)

Tributary	Watercourse / Reach(s)	Results	Comment
Upper Zone	Shaw's Creek (Mississauga Road to Credit River)	Minimum DO levels well above PWQO.	Results are indicative of a healthy dissolved oxygen regime through this reach.
Upper Zone	West Credit River (Hillsburgh to Credit River)	Minimum DO levels well above PWQO for late June survey and above, but approaching, PWQO in late August Survey.	Results are generally indicative of healthy dissolved oxygen regime.
Middle Zone	Silver Creek (From Niagara Escarpment to Credit River)	Minimum dissolved oxygen levels were well above the PWQO except for a portion of Silver Creek that flows through a flat, silt/clay substrate reach downstream of the Niagara Escarpment.	Results are generally indicative of healthy dissolved oxygen regime. The higher sediment oxygen demand and low gradient flows through the lower reach may be naturally lowering the DO, although agricultural runoff may also be playing a part.
Middle Zone	Black Creek (Just upstream of confluence of Silver Creek)	Minimum DO levels well above PWQO.	Results are indicative of a healthy dissolved oxygen regime through this reach.
Middle Zone	Fletcher's Creek (Highway 7 to Credit River)	Above the 407, minimum DO levels were below the PWQO and downstream of the 407, the minimum DO levels were approaching the PWQO.	The low dissolved oxygen levels are likely caused by a combination of agricultural and urban runoff, and potentially the loss of baseflow where the reaches have become more stagnant during dry weather flows.

Table B2-7: Percent Violation of Selected Metals to the PWQO from 1998-2003

Parameter	Credit R. at Beechgrove Sideroad 20	Credit River at Hwy 24	W. Credit R. at Erin-Caledon Townline	Credit R. at Highway 7	Credit R. at Old Derry Rd.	Credit River at Miss GC	Fletcher's Creek at Steeles Ave	Sheridan Creek u/s Rattray Marsh
Aluminum	11.7	37.5	3.4	33.9	37.9	66.7	87.9	53.4
Copper	0.0	0.0	0.0	0.0	3.4	13.3	20.7	39.7
Iron	0.0	0.0	0.7	11.7	13.2	35.3	1.3	2.7
Nickel	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	0.6	12.5	0.0	0.0	0.6	20.0	13.1	7.4

Table B2-8: Summary of Trend Analysis for available Metal Data from 1998-2003

Station Name	Aluminum	Copper	Iron	Nickel	Zinc
Credit R. at Beechgrove Sideroad 20	Increasing	Increasing	Increasing	Decreasing	Increasing
Credit R. at Hwy 24	Decreasing	No Trend	Decreasing	No Trend	No Trend
W. Credit R. at Erin-Caledon Townline	Decreasing	Increasing	Decreasing	Decreasing	Decreasing
Credit R. at Hwy 7	Increasing	Increasing	Increasing	Decreasing	Increasing
Credit R. at Old Derry Rd.	Increasing	Increasing	Increasing	Decreasing	Increasing
Credit R. at Mississauga GC	Decreasing	No Trend	Decreasing	Decreasing	No Trend
Fletcher's Creek at Steeles Ave	Increasing	Increasing	Decreasing	Decreasing	Increasing
Sheridan Creek u/s Rattray Marsh	Increasing	Decreasing	Increasing	Decreasing	Increasing

Table B2-9: Total Phosphorus (mg/L) for various percentiles, compared with violations and PWQO of 0.03 mg/L

Phosphorus (mg/L)	Credit R. at Orangeville Dam	Credit R. at Highway 10 N Crossing	Credit R. at Highway 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	0.024	0.084	0.064	0.072	0.032	0.011	0.018	0.016
10th	0.012	0.0469	0.04	0.0406	0.02	0.006	0.01	0.008
25th	0.018	0.062	0.05	0.056	0.026	0.008	0.012	0.011
75th	0.032	0.116	0.088	0.092	0.0445	0.016	0.0275	0.024
90th	0.048	0.1744	0.12	0.12	0.06	0.022	0.0584	0.0584
90-75	0.016	0.058	0.032	0.028	0.016	0.006	0.031	0.034
PWQO	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**
Total # of Meets	265	10	10	12	51	102	94	93
Total # of Exceedances	103	180	323	472	57	5	21	24
% Violations	27.99	94.74	97.00	97.52	52.78	4.67	18.26	20.51

Phosphorus (mg/L)	Black Creek at Acton STP	Black Creek at Glen Lawson	Silver Cr. at Mountainview	Silver Creek at Highway 7	Credit R. at Highway 7	Fletcher's Creek at Steeles	Credit R. at Derry Rd.	Sheridan Creek u/s Rattray Marsh
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	0.044	0.06	0.018	0.036	0.020	0.072	0.02	0.024
10th	0.024	0.04	0.008	0.018	0.010	0.026	0.01	0.013
25th	0.0305	0.0485	0.012	0.0255	0.016	0.0425	0.014	0.018
75th	0.0635	0.074	0.036	0.06	0.032	0.124	0.033	0.044
90th	0.1283	0.0846	0.0622	0.075	0.065	0.184	0.0848	0.093
90-75	0.065	0.011	0.026	0.015	0.033	0.060	0.052	0.049
PWQO	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.030**	**0.03**
Total # of Meets	23	4	69	46	86	16	78	63
Total # of Exceedances	66	114	31	70	30	91	29	44
% Violations	74.16	96.61	31.00	60.34	25.86	85.05	27.10	41.12

Table B2-10: Nitrate-Nitrogen percentiles, compared with violation and CWQG of 2.93 mg/L

Nitrate Nitrogen (mg/L)	Credit R. at Orangeville Dam	Credit R. at Highway 10 N Crossing	Credit R. at Highway 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	0.10	1.50	1.36	1.37	1.02	1.77	0.92	0.87
10th	0.03	0.56	0.62	0.56	0.65	1.31	0.54	0.52
25th	0.05	1.02	1.01	0.91	0.79	1.56	0.67	0.65
75th	0.25	2.01	1.79	1.88	1.32	2.02	1.25	1.23
90th	0.60	2.48	2.28	2.37	1.68	2.47	1.54	1.43
90-75	0.34	0.48	0.49	0.49	0.36	0.45	0.29	0.20
Guideline (N03-N)	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
Total # of Meets	368	257	261	407	100	88	114	100
Total # of Exceedance	0	18	6	12	0	2	0	0
% Violations	0	6.55	2.25	2.86	0	2.22	0	0

Nitrate Nitrogen (mg/L)	Black Creek at Acton STP	Black Creek at Glen Lawson	Silver Cr. at Mountainview Rd.	Silver Creek at Highway 7	Credit R. at Highway 7	Fletcher's Creek at Steeles Ave	Credit R. at Derry Rd.	Sheridan Creek u/s Rattray Marsh
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	1.70	1.89	1.69	5.55	1.65	1.40	1.56	1.39
10th	0.88	0.73	1.07	2.56	1.23	0.83	1.14	0.66
25th	1.07	1.24	1.37	3.49	1.39	0.99	1.33	1.03
75th	2.79	2.85	2.23	7.50	1.99	2.36	1.89	1.88
90th	3.99	4.74	2.72	9.52	2.26	3.46	2.24	2.33
90-75	1.20	1.89	0.50	2.02	0.27	1.11	0.35	0.44
Guideline (N03-N)	2.93	2.93	2.93	2.93	2.93	2.93	2.93	2.93
Total # of Meets	61	157	78	13	101	85	96	90
Total # of Exceedance	19	50	5	88	1	15	1	2
% Violations	23.75	24.15	6.02	87.13	0.98	15	1.03	2.17

Table B2-11: Chloride 75th and 90th percentiles, compared with violation and NOEC of 252 mg/L

Chloride	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	59.2	163.0	148.5	153.0	77.5	38.8	51.5	51.3
10th	36.9	98.6	92.0	96.7	52.0	31.3	37.1	40.0
25th	44.2	129.0	114.0	118.0	64.5	35.8	44.0	44.3
75th	80.2	206.0	182.0	186.0	94.8	41.8	59.9	59.4
90th	94.6	270.4	234.0	226.7	126.0	44.9	69.6	67.9
90-75	14.4	64.4	52.0	40.7	31.2	3.1	9.6	8.5
StdDev	26.05	85.01	66.28	66.65	31.74	17.92	15.28	13.89
NOEC	252	252	252	252	252	252	252	252
Total # of Meets	375	297	317	450	118	108	122	118
# of Exceedances	0	46	18	34	0	0	0	0
% Violations	0	13.41	5.37	7.02	0	0	0	0
Chloride	**Black Creek at Acton STP**	**Black Creek at Glen Lawson**	**Silver Cr. at Mountainview Rd.**	**Silver Creek at Hwy 7**	**Credit R. at Hwy 7**	**Fletcher's Creek at Steeles Ave**	**Credit R. at Derry Rd.**	**Sheridan Creek u/s Rattray Marsh**
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	122.0	187.0	94.4	160.5	72.7	186.5	74.8	325.0
10th	79.8	118.4	60.0	89.4	53.9	91.5	52.2	147.0
25th	98.8	146.0	76.9	116.8	62.5	119.5	64.4	221.0
75th	172.5	237.5	112.0	199.0	79.4	253.3	83.5	502.5
90th	208.0	268.4	129.9	234.5	91.7	407.1	95.8	865.8
90-75	35.5	30.9	17.9	35.5	12.4	153.9	12.3	363.3
StdDev	55.41	60.37	45.07	56.39	21.69	385.86	20.72	617.85
NOEC	252	252	252	252	252	252	252	252
Total # of Meets	87	102	97	112	118	80	112	33
# of Exceedances	4	17	3	4	0	28	0	74
% Violations	4.40	14.29	3.00	3.45	0.00	25.93	0.00	69.16

Table B2-12: Copper concentration 75th and 90th percentiles compared with percent violation and PWQO of 5.0 µg/L

	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	0.33	3.37	2.37	3.01	0.88	0.37	0.62	0.64
10th	0.10	1.43	0.80	2.69	0.30	-0.03	0.11	0.00
25th	0.19	2.48	1.73	2.81	0.56	0.17	0.39	0.41
75th	0.46	4.20	2.89	3.23	1.15	0.54	0.94	0.96
90th	0.58	5.63	3.33	3.35	1.48	0.74	1.33	1.46
90-75	0.12	1.43	0.44	0.12	0.34	0.19	0.38	0.50
PWQO (5 µg/L)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Total # of Meets	17.0	13.0	16.0	15	79.0	68.0	86.0	85.0
# of Exceedances	0.0	4.0	0.0	0	0.0	0.0	0.0	1.0
% Violations	0.0	23.5	0.0	0.0	0.0	0.0	0.0	1.2
	Black Creek at Acton STP	**Black Creek at Glen Lawson**	**Silver Cr. at Mountainview Rd.**	**Silver Creek at Hwy 7**	**Credit R. at Hwy 7**	**Fletcher's Creek at Steeles Ave**	**Credit R. at Derry Rd.**	**Sheridan Creek u/s Rattray Marsh**
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	1.22	2.49	1.39	3.72	1.21	2.97	1.41	4.44
10th	0.69	1.59	0.85	2.29	0.64	1.80	0.78	2.71
25th	0.95	2.03	1.03	2.86	0.92	2.10	0.98	3.29
75th	1.65	2.96	1.85	4.49	1.59	3.98	1.84	5.66
90th	3.24	4.15	3.01	5.86	2.82	6.68	2.46	7.76
90-75	1.59	1.20	1.16	1.37	1.23	2.70	0.62	2.10
PWQO (5 µg/L)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Total # of Meets	63.0	78.0	67.0	63.0	78.0	62.0	74.0	46
# of Exceedances	16.0	2.0	3.0	16.0	1.0	15.0	3.0	30
% Violations	20.3	2.5	4.3	20.3	1.3	19.5	3.9	39.47

Table B2-13: Zinc concentration 75th and 90th percentiles compared with percent violation and PWQO of 20 µg/L

	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	0.89	18.00	13.65	15.30	4.91	1.42	1.89	1.74
10th	-0.03	12.96	9.87	8.62	2.88	0.55	1.10	0.93
25th	0.50	15.20	11.08	11.00	3.74	0.95	1.31	1.32
75th	1.68	20.90	13.10	17.40	5.33	2.87	2.72	2.49
90th	1.67	21.74	20.40	17.46	7.34	3.40	4.00	3.90
90-75	-0.01	0.84	7.30	0.06	2.01	0.53	1.29	1.41
StdDev	0.86	5.36	4.88	5.27	2.49	1.89	2.31	1.67
PWQO	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Total # of Meets	15	9	12	14	79	68	86	73
# of Exceedances	0	6	2	1	0	0	0	0
% Violations	0	40	14.3	6.7	0	0	0	0

	Black Creek at Acton STP	Black Creek at Glen Lawson	Silver Cr. at Mountainview Rd.	Silver Creek at Hwy 7	Credit R. at Hwy 7	Fletcher's Creek at Steeles Ave	Credit R. at Derry Rd.	Sheridan Creek u/s Rattray Marsh
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	4.82	7.07	2.76	7.96	2.58	11.35	2.69	10.00
10th	2.64	4.77	1.25	4.98	1.70	5.70	1.75	4.52
25th	3.16	5.50	1.86	6.76	2.07	7.45	2.23	5.50
75th	10.49	7.44	3.97	9.77	3.18	18.30	3.36	18.80
90th	19.86	12.66	7.23	12.72	5.44	36.25	5.78	34.40
90-75	9.37	5.22	3.26	2.96	2.26	17.95	2.42	15.60
StdDev	10.33	3.56	4.69	6.35	2.70	19.98	4.86	22.46
PWQO	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Total # of Meets	52	74	64	71	75	66	77	58
# of Exceedances	6	1	2	4	0	16	1	19
% Violations	10.3	1.3	3.0	5.3	0	19.5	1.3	24.7

Table B2-14: Iron concentrations 75th and 90th percentiles compared with percent violation and PWQO of 300 µg/L

	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	37.2	229	148	212	105	36.85	92.45	84.65
10th	15.3	151.2	124.5	176.8	62.34	20.96	50.45	54.15
25th	31.25	158.5	133	189.5	77.45	25	73.8	68.325
75th	100.75	281.5	189	256	144	54.85	153.75	154
90th	135.2	326.8	262.5	357.8	209.4	73.22	271	318.3
90-75	34.45	45.3	73.5	101.8	65.4	18.37	117.25	164.3
StdDev	83.46	86.54	56.29	75.77	134.31	57.41	157.69	330.05
PWQO	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**
Total # of Meets	14	11	14	12	76	67	81	68
# of Exceedances	1	4	0	3	3	1	5	10
% Violations	6.67	26.67	0.00	20.00	3.80	1.47	5.81	12.82
	Black Creek at Acton STP	**Black Creek at Glen Lawson**	**Silver Cr. at Mountainview Rd.**	**Silver Creek at Hwy 7**	**Credit R. at Hwy 7**	**Fletcher's Creek at Steeles Ave**	**Credit R. at Derry Rd.**	**Sheridan Creek u/s Rattray Marsh**
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	514	409	137.5	75.10	92.4	336	114	84.95
10th	231.8	268	60.3	44.80	59.34	157	73.68	32.75
25th	294.5	318.25	73.55	54.65	71.4	210	87.6	45.15
75th	729	511	251	142.75	174.5	500	197	190.25
90th	836	695	653.6	281.80	327	829.8	353.8	525.50
90-75	107	184	402.6	139.05	152.5	329.8	156.8	335.25
StdDev	277.57	310.38	325.15	305.72	137.35	476.75	316.03	396.18
PWQO	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**
Total # of Meets	16	17	56	73	69	34	66	61
# of Exceedances	43	63	14	7	10	43	11	15
% Violations	72.88	78.75	20	8.75	12.66	55.84	14.29	19.74

Table B2-15: Aluminum concentrations 75th and 90th percentiles compared with percent violation and PWQO of 75 µg/L

	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
50th	14.0000	121	81.1000	124.0000	37.7000	16.0000	32.8500	36.2500
10th	9.0098	61	47.1100	59.2600	15.8200	9.3060	18.0500	19.2700
25th	10.4250	79	58.1250	75.6000	20.5500	11.2500	24.3750	25.0000
75th	27.5250	201	129.2500	150.5000	54.6000	21.6000	69.2000	75.6750
90th	54.5920	268	214.9000	209.6000	96.6800	35.0100	133.5000	181.3000
90-75	27.0670	67.9000	85.6500	59.1000	42.0800	13.4100	64.3000	105.6250
PWQO (µg/L)	**75**	**75**	**75**	**75**	**75**	**75**	**75**	**75**
Total # of Meets	21	6	10	6	67	64	65	58
# of Exceedances	2	17	12	17	12	4	21	20
% Violations	8.70	73.91	54.55	73.91	15.19	5.88	24.42	25.64
	Black Creek at Acton STP	**Black Creek at Glen Lawson**	**Silver Cr. at Mountainview Rd.**	**Silver Creek at Hwy 7**	**Credit R. at Hwy 7**	**Fletcher's Creek at Steeles Ave**	**Credit R. at Derry Rd.**	**Sheridan Creek u/s Rattray Marsh**
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
50th	26.1000	27.0000	50.3500	53.3500	47.0000	207.0000	62.6000	78.15
10th	13.0400	13.1700	19.0800	33.2600	25.3400	59.8200	31.3400	31.05
25th	17.4000	18.9750	28.0250	40.3000	35.5000	108.0000	45.5000	41.175
75th	38.9000	44.5500	101.3750	82.8500	100.8500	345.0000	117.0000	221.5
90th	114.6000	76.7000	178.2000	188.2000	205.0000	542.8000	232.6000	368.5
90-75	75.7000	32.1500	76.8250	105.3500	104.1500	197.8000	115.6000	147.0000
PWQO (µg/L)	**75**	**75**	**75**	**75**	**75**	**75**	**75**	**75**
Total # of Meets	51	70	46	56	54	10	46	37
# of Exceedances	8	10	24	24	25	67	31	39
% Violations	13.56	12.5	34.29	30	31.65	87.01	40.26	51.32

Table B2-16: *E coli* concentration geomeans compared with percent violation and PWQO of 100 cfu/ 100mL

	Credit R. at Orangeville Dam	Credit R. at Hwy 10 N Crossing	Credit R. at Hwy 10 S Crossing	Credit R. at Melville Dam	Credit R. at Beechgrove Sideroad	W. Credit R. at Erin-Caledon Townline	Credit R. at Terra Cotta	Credit R. at Glen Williams
	6007601902	6007600602	6007602402	6007602302	6007601802	6007601502	6007601002	6007601302
Geomean	7	44	55	53	42	29	41	36
PWQO	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total # of Meets	76	71	65	61	76	72	46	79
# of Exceedances	25	38	34	39	25		18	20
% Violations	24.75	34.86	34.34	39.00	24.75	20.88	28.13	20.20
	Black Creek at Acton STP	**Black Creek at Glen Lawson**	**Silver Cr. at Mountainview Rd.**	**Silver Creek at Hwy 7**	**Credit R. at Hwy 7**	**Fletcher's Creek at Steeles Ave**	**Credit R. at Derry Rd.**	**Sheridan Creek u/s Rattray Marsh**
	6007600502	6007600802	6007602202	6007600402	06007600302	6007601602	6007601702	06006800102
Geomean	33	33	84	102	72	872	63	541
PWQO	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Total # of Meets	46	80	41	46	65	6	62	7
# of Exceedances	54	20	40	54	36	94	34	84
% Violations	54.00	20.00	49.38	54.00	35.64	94.00	35.42	92.31

B2.5 GROUNDWATER QUALITY – WIDER WATERSHED

The analysis of water quality parameters within the wider areas of the watershed is discussed in **Section 2.4.6** of the Assessment Report. **Table B2-17** to **Table B2-24** provide supporting data for the trends in inorganic constituents as described in the report. The data is based upon the PGMN monitoring network, which is shown in **Figure B1-2**.

Table B2-17: PGMN Well - Orangeville

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Sep-05	
	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1
Parameter																
INORGANICS																
Conductivity	438	558	448	529	437	569	444	571	440	506	448	507	437	509	334	393
Total Dissolved Solids	285	363	295	335	253	370	263	351	313	362	290	335	278	NA	226	264
Fluoride (F-)	0.44	0.47	0.5	0.5	0.45	0.52	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	ND	ND
Hardness (CaCO3)	238	297	230	280	195	282	230	300	230	300	240	280	250	260	209	230
Total Ammonia-N			0.09	0.07									NA	0.08	0.1	0.09
Dissolved Inorganic Carbon (C)	50.2	50.8	45	45	50.7	49	51	46	49	51	NA	NA				47.4
Total Kjeldahl Nitrogen (TKN)	0.05	0.05	0.2	0.2	0.05	0.05	0.6	0.3	0.2	0.2	0.7	0.2	0.9	0.2	0.7	0.3
Dissolved Organic Carbon	0.7	0.9	0.6	0.5	0.1	0.1	0.4	0.4	0.6	0.6	1	0.4	0.4	0.4	0.5	0.5
Orthophosphate (P)			ND	ND	NA	NA	ND	ND			ND	ND	ND	ND	ND	2
pH	8.16	8.12	7.7	7.7	8.14	8.36	8.2	8.2	8.2	8.2	8.2	8.1	8.2	8.2	8.21	8.22
Total Phosphorus	0.33	0.020	0.012	0.010	0.02	0.07	0.059	0.013	ND	ND	0.3	0.06	5	ND	0.34	0.03
Reactive Silica (SiO2)	7.7	7.1	16	15	7.6	7.12	16	14	16				17	15	17	17
Dissolved Sulphate (SO4)	22.3	93.5	23	67	23.8	121	23	97			21	55	20	69	18.6	26
Alkalinity (Total as CaCO3)	211	206	212	206	206	202	209	202	209	207	209	207	227	219	186	207
Dissolved Chloride (Cl)	9.9	8.7	10	9	9.9	6.4	10	7			8	7	9	7	5	7
Nitrite (N)	0.005	0.005	ND	ND	0.005	0.005	ND	0.01			ND	ND	ND	ND	ND	0.01
Nitrate (N)			ND	ND	0.05	0.05	ND	ND			ND	ND	ND	ND	ND	0.1
RCAP CALCULATIONS																
Bicarb. Alkalinity (calc. as CaCO3)			211	205	NA	NA	206	199	206	204	206	205	223	216	184	204
Carb. Alkalinity (calc. as CaCO3)			1	ND	NA	NA	3	3	3	3	3	3	3	3	3	3
METALS																
Dissolved Aluminum (Al)	0.0003	0.0001	ND	ND	0.00077	0.00024	0.007	ND	ND	ND	ND	0.007	ND	ND	ND	ND
Dissolved Antimony (Sb)	0.0003	0.0003	ND	ND	0.00048	0.00047	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Arsenic (As)	0.0052	0.0028	0.005	0.004	0.00502	0.00426	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.0038	0.004

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Sep-05	
	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1	Shallow W019-1	Deep W018-1
Dissolved Barium (Ba)	0.0632	0.0588	0.057	0.054	0.058	0.0596	0.061	0.063	0.058	0.061	0.064	0.058	0.066	0.061	0.063	0.062
Dissolved Beryllium (Be)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Bismuth (Bi)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Boron (B)	0.018	0.0261	0.02	0.03	0.018	0.0267	0.02	0.02	0.017	0.024	0.016	0.022	ND	ND	0.02	0.03
Dissolved Cadmium (Cd)	0	0	ND	ND	0.00001	0.00002	ND	ND	ND	ND	ND	ND	NA	NA	ND	ND
Dissolved Calcium (Ca)	56.1	74.2	54	68	40.2	65.9	54	74	54	71	55	66	ND	ND	52	51.6
Dissolved Chromium (Cr)	0	0.0001	ND	ND	0.0001	0.0001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Cobalt (Co)	0.0002	0.0002	ND	ND	0.00016	0.00027	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Copper (Cu)	0	0.0001	ND	ND	0.0002	0.0005	ND	ND	ND	ND	ND	ND	0.51	0.19	ND	ND
Dissolved Iron (Fe)	0.3	0.1	0.5	0.1	0.592	0.204	0.6	0.1	0.58	0.15	0.44	0.13	ND	ND	0.46	0.19
Dissolved Lead (Pb)	0	0.0013	ND	0.0009	0.00001	0.00111	ND	0.0005	ND	0.0008	ND	ND	0.005	ND	ND	ND
Dissolved Lithium (Li)			0.005	ND	NA	NA	NA	NA	ND	ND	0.006	0.007	25	24	ND	0.006
Dissolved Magnesium (Mg)	23.7	27.2	24	27	22.9	28.6	24	27	23	29	24	27	0.021	0.013	22	28.4
Dissolved Manganese (Mn)	0.0175	0.0143	0.019	0.014	0.0187	0.015	0.019	0.015	0.019	0.014	0.016	0.012	0.001	0.001	0.019	0.01
Dissolved Molybdenum (Mo)	0.0013	0.0017	0.001	0.002	0.0012	0.0016	0.001	0.001	1	0.002	0.001	0.002	ND	ND	0.0013	0.001
Dissolved Nickel (Ni)	0.0001	0.0002	ND	ND	0.0001	0.0004	ND	ND	ND	ND	ND	ND	ND	1	ND	ND
Dissolved Selenium (Se)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Silver (Ag)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Sodium (Na)	6.66	6.92	6.7	7.5	6.56	6.66	6.8	6.5	6.2	7.6	6.6	7	6.1	6.3	6.4	6.5
Dissolved Strontium (Sr)	0.32	0.975	0.30	0.77	0.321	1.08	0.32	0.91	0.31	0.69	0.34	0.67	0.31	0.74	0.29	0.377
Dissolved Tin (Sn)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Titanium (Ti)	0.0006	0.0018	ND	ND	0.0004	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Vanadium (V)	0	0	ND	ND	0.00066	0.00101	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Zinc (Zn)	0.0004	0.0041	ND	ND	0.0004	0.0055	ND	ND	ND	ND	ND	ND	ND	0.007	0.0086	ND
LEGEND																
Levels Not Detectable	ND															

Table B2-18: PGMN Well - Warwick

Parameter												
Hardness (CaCO3)	**Oct.09**	**May.09**	**Oct.08**	**May.08**	**Sep.07**	**May.07**	**Sep.06**	**Sep.05**	**Sep.04**	**Sep.03**	**May.03**	**Sep.02**
Shallow Well CaCO3	887	330	653	430	880	480	620	413	571.7		447.7	356
Deep Well CaCO3	141	150		150	160	140	150	140	140.2		139.5	45.3
Lower ODWS Standard Limit	80	80	80	80	80	80	80	80	80	80	80	80
Upper ODWS Standard	100	100	100	100	100	100	100	100	100	100	100	100
Dissolved Chloride (Cl)												
	Oct.09	May.09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
Shallow Well Cl	1500	470	1720	640		670		374	535	651		286
Deep Well Cl	141	140		130	140	140	0.81	136	132	129		114
AO Standard	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**
Sodium (Na)												
	Oct.09	May.09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
Shallow Well Na	704	390	666	430	530	370	330	184	200	260	201	143
Deep Well Na	92.8	100		96	100	100	93	96.9	97.1	89.3	101	54.8
ODWS Standard	200	200	200	200	200	200	200	200	200	200	200	200
AO Standard	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Nitrate (NO3)												
	Oct 09	May 09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
Shallow Well NO3		1.2	3.37			2.2	1.5	0.5	0.8	0.8	0.4	0.5
Deep Well NO3			0.05						1.4	1.4	0.2	
ODWS Standard	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**
Total Phosphorus (TP)												
	Oct.09	May.09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
Shallow Well P (TP)	0.31	8.3	7.9	7.5	8	1.1	3.6	1.72				2.01
Deep Well P (TP)	0.02	0.014	0.02	0.01			0.03					0.021
Total Dissolved Solids (TDS)												
	Oct.09	May.09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
Shallow Well TDS	3110	1310	2830	1470	1620	1690	1580	1130	1244			
Deep Well TDS	482	479	489	395	438	493	408	394	370			
AO Standard	500	500	500	500	500	500	500	500	500	500	500	500

Parameter												
Hardness (CaCO3)	Oct.09	May.09	Oct.08	May.08	Sep.07	May.07	Sep.06	Sep.05	Sep.04	Sep.03	May.03	Sep.02
LEGEND												
Data Missing	DM											
Levels Not Detectable	ND											
Data Not Tested	NA											
Exceedance of AO Standards												
Exceedance of ODWS Standards												

Table B2-19: PGMN Well - Hillsburgh

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Fall 2005	
	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3
Parameters																
INORGANICS																
Conductivity	575	587	569	581	518	525	2750	765	562	629	596	632	622	618	598	558
Total Dissolved Solids	374	382	370	380	337	341	1470	395	366	418	391	397	NA	NA	905	467
Fluoride (F-)	0.08	0.08	ND	ND	0.1	0.08	ND	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Hardness (CaCO3)	251	277	290	280	DM	269	430	150	310	310	310	310	310	300	291	288
Total Ammonia-N			0.12	ND									NA	NA	0.08	0.07
Dissolved Inorganic Carbon (C)	56.3	55.9	52	50	56.8	55	71	38	59	59	NA	NA			64.2	0.6
Total Kjeldahl Nitrogen (TKN)	0.18	0.05	4	0.4	3.08	0.06	7	1	0.8	0.3	3	0.4	8	2	1.6	0.6
Dissolved Organic Carbon	1	0.7	0.9	0.9	0.9	0.6	3	0.8	0.9	0.8	5.7	0.9	0.9	1.4	1.2	1.1
Orthophosphate (P)			ND	ND	NA	NA	ND	ND			ND	0.02	ND	ND	ND	ND
pH	7.91	7.94	7.7	7.6	8.04	8.08	8.1	8.2	8.1	8.2	8.1	8.1	8.1	8.1	8.2	8.2
Total Phosphorus	0.56	0.02	3.6	0.012	7.63	0.02	7.5	0.01	0.3		1.7	ND	0.06	1.3	2.5	0.92
Reactive Silica (SiO2)	5.28	3.94	11	9.1	5.22	4.06	8.6	12	11	8.5			12	9.3	12	8.8
Dissolved Sulphate (SO4)	25.2	21.2	31	24	28.1	24.9	37	5			26	23	27	22	32	24
Alkalinity (Total as CaCO3)	239	234	241	236	191	198	281	162	218	243	240	248	273	257	256	235
Dissolved Chloride (Cl)	18.7	31	17	27	24.2	29.4	640	130			26	31	29	34	38	35
Nitrite (N)	0.005	0.005	ND	ND	0.005	0.005	ND	ND			ND	ND	ND	ND	ND	ND
Nitrate (N)			4.9	4.9	5.56	5.29		ND			5	5.8	4.9	5.8	3.2	4.3
RCAP CALCULATIONS																
Bicarb. Alkalinity (calc. as CaCO3)			240	235	NA	NA	278	160	215	241	237	245	270	254	253	231
Carb. Alkalinity (calc. as CaCO3)			1	ND	NA	NA	4	2	3	3	3	3	3	3	3	4
METALS																
Dissolved Aluminum (Al)	0.0003	0.0004	ND	ND	0.00096	0.00039	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Fall 2005	
	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3
Dissolved Antimony (Sb)	0.0004	0.0003	ND	ND	0.00051	0.00049	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Arsenic (As)	0.0017	0.0002	0.001	ND	0.00141	0.00026	ND	ND	0.002	ND	0.001	ND	ND	ND	ND	ND
Dissolved Barium (Ba)	0.0915	0.0377	0.086	0.039	0.101	0.0393	0.059	0.46	0.1	0.044	0.098	0.044	0.094	0.045	0.069	0.038
Dissolved Beryllium (Be)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Bismuth (Bi)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Boron (B)	0.0911	0.0156	0.08	0.02	0.106	0.0172	ND	0.4	0.02	0.015	0.12	0.014	ND	ND	0.15	0.01
Dissolved Cadmium (Cd)	0	0	ND	ND	0.00003	0.00004	ND	ND	ND	ND	ND	ND	90	87	ND	ND
Dissolved Calcium (Ca)	69.4	77.1	81	80	DM	75.2	150	31	86	89	86	87	ND	ND	75.1	75.5
Dissolved Chromium (Cr)	0.0006	0.0002	ND	ND	0.0002	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Cobalt (Co)	0.0002	0.0002	ND	ND	0.0002	0.00024	ND	ND	ND	ND	ND	ND	0.002	0.002	ND	ND
Dissolved Copper (Cu)	0.0006	0.001	0.001	0.001	0.0011	0.001	0.002	ND	0.002	0.001	ND	ND	300	150	0.005	0.005
Dissolved Iron (Fe)	0	0.03	ND	ND	0.007	0.008	ND	0.2	ND	ND	ND	ND	ND	ND	0.39	0.06
Dissolved Lead (Pb)	0.001	0.0004	ND	ND	0.00009	0.00042	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Lithium (Li)			ND	ND	NA	NA	NA	NA	ND	ND	0.007	ND	21	21	ND	ND
Dissolved Magnesium (Mg)	18.8	20.5	22	20	DM	19.6	14	17	22	22	24	23	0.003	ND	25	21.7
Dissolved Manganese (Mn)	0.0064	0.0002	0.003	ND	0.00103	0	0.009	0.027	ND	ND	0.005	ND	ND	ND	0.053	ND
Dissolved Molybdenum (Mo)	0.0004	0.0003	ND	ND	0.0005	0.0003	ND	0.005	ND	ND	ND	ND	ND	ND	0.002	ND
Dissolved Nickel (Ni)	0.0002	0.0003	ND	ND	0.0031	0.0003	0.001	ND	ND	ND	ND	ND	21	8	ND	ND
Dissolved Selenium (Se)	0.0003	0.0002	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Fall 2005	
	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3	Shallow W164-2	Deep W164-3
Dissolved Silver (Ag)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND
Dissolved Sodium (Na)	11.8	16.1	12	17	DM	16.6	430	96	15	19	18	20	21	18	22	19.5
Dissolved Strontium (Sr)	0.14	0.115	0.14	0.13	0.146	0.121	0.43	2.3	0.15	0.13	0.16	0.13	0.15	0.13	0.15	0.113
Dissolved Tin (Sn)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Titanium (Ti)	0.0006	0.0006	ND	ND	0.0005	0.0005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Vanadium (V)	0.0003	0.0002	ND	ND	0.00061	0.0006	0.001	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Zinc (Zn)	0.005	0.01	0.006	0.009	0.0074	0.0106	ND	ND	0.007	0.011	0.008	0.022	0.01	0.017	0.023	0.006
LEGEND																
Data Missing	DM															
Levels Not Detectable	ND															
Data Not Tested	NA															
Exceedance of AO Standards																
Exceedance of ODWS Standards																

Table B2-20: PGMN Well - Erin

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03	May-03	Sep-02
	W026-1	W026-1	W026-1	W026-1	W026-1	W026-1	WO26-1	W026-1	W026-1			W026-1
Parameter												
INORGANICS												
Conductivity	794	689	746	696	804	514	765	705	602			
Total Dissolved Solids	516	445	485	369	469	340	445	465	376			428
Fluoride (F-)	0.06	ND	0.04	ND	ND	ND	ND	3.4				0.07
Hardness (CaCO3)	342	290	293	290	380	240	360	298	280.2			325
Total Ammonia-N		ND					0.02	0.1	ND			
Dissolved Inorganic Carbon (C)	71.1	56	71.1	51	71	NA		71.8				61
Total Kjeldahl Nitrogen (TKN)	0.05	0.2	0.05	0.4	0.2	0.3	0.2	0.2	0.13			0.03
Dissolved Organic Carbon	0.9	1.8	1.3	1.2	0.7	2.5	2.6	1				0.4
Orthophosphate (P)		ND	NA	ND	0.13	0.02	ND	ND				
pH	8.09	7.7	8.05	8.1	8.1	8.2	8	8.27	7.92			
Total Phosphorus	0.02	0.007	0.02	0.004	ND	0.02	0.02	ND				0.002
Reactive Silica (SiO2)	3.9	6.4	3.76	6.1	8.7		9.4	7.8	3.03			4.3
Dissolved Sulphate (SO4)	31.4	28	30.3	26	42	18	41	33.6	28.3			47.4
Alkalinity (Total as CaCO3)	289	247	287	218	286	207	307	283				
Dissolved Chloride (Cl)	73.6	56	60.8	73	66	31	58	55.6	45.5			28.4
Nitrite (N)	0.005	ND	0.005	ND	ND	ND	0.02	ND	ND			
Nitrate (N)		1.6	2.35	0.9	2.5	0.9	2.6	ND	1.7			
RCAP CALCULATIONS												
Bicarb. Alkalinity (calc. as CaCO3)		245	NA	215	282	204	304	278	236			
Carb. Alkalinity (calc. as CaCO3)		1	NA	3	4	3	3	5				
METALS												
Dissolved Aluminum (Al)	0.0002	0.016	0.00023	ND	ND	ND	ND	ND				0.0003
Dissolved Antimony (Sb)	0.0004	0.0015	0.00046	ND	ND	ND	ND	ND				0.00042
Dissolved Arsenic (As)	0.0003	ND	0.00026	ND	ND	ND	ND	ND				0.0002
Dissolved Barium (Ba)	0.0541	0.042	0.0551	0.049	0.047	0.026	0.049	0.041	0.039			0.0579
Dissolved Beryllium (Be)	0	ND	0	ND	ND	ND	ND	ND				-0.00002

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03	May-03	Sep-02
	W026-1	W026-1	W026-1	W026-1	W026-1	W026-1	WO26-1	W026-1	W026-1			W026-1
Dissolved Bismuth (Bi)		0.004	NA	NA	ND	ND	ND	ND				
Dissolved Boron (B)	0.037	0.03	0.0191	0.02	0.047	0.023		0.02	0.023			0.014
Dissolved Cadmium (Cd)	0	ND	0.00003	ND	ND	ND	ND	ND				0.00003
Dissolved Calcium (Ca)	91.7	80	72.8	77	98	66	95	80.5	76.8			81.6
Dissolved Chromium (Cr)	0.0002	ND	0.0002	ND	ND	ND	ND	ND				0.0023
Dissolved Cobalt (Co)	0.0002	ND	0.00022	ND	ND	ND	ND	ND				0.0001
Dissolved Copper (Cu)	0.0006	0.001	0.0007	ND	ND	0.002	ND	0.005	0.0009			0.0007
Dissolved Iron (Fe)	0.01	ND	0.018	ND	ND	ND	0.02	ND	ND			0.002
Dissolved Lead (Pb)	0.0005	ND	0.00061	ND	ND	ND	ND	ND	ND			0.00058
Dissolved Lithium (Li)		ND	NA	NA	ND	ND	ND	ND				
Dissolved Magnesium (Mg)	27.5	23	27.1	25	33	19	30	27.6	21.4			29.4
Dissolved Manganese (Mn)	0.0007	ND	0.00018	ND	ND	ND	ND	ND	ND			0.00051
Dissolved Molybdenum (Mo)	0.0011	0.002	0.0012	0.001	0.001	ND	0.001	ND				0.00138
Dissolved Nickel (Ni)	0.0006	ND	0.0008	ND	ND	ND	ND	ND	ND			0.0009
Dissolved Selenium (Se)	0.0002	ND	0	ND	ND	ND	ND	ND				0
Dissolved Silver (Ag)	0	ND	0	ND	ND	ND	ND	ND				0.00001
Dissolved Sodium (Na)	42.9	32	36	25	42	19	31	30	21.9			12.8
Dissolved Strontium (Sr)	0.147	0.12	0.149	0.13	0.16	0.1	0.16	0.143	0.124			0.149
Dissolved Tin (Sn)		0.002	NA	NA	ND	ND	ND	ND				
Dissolved Titanium (Ti)	0.001	ND	0.0007	ND	ND	ND	ND	ND				0.0009
Dissolved Vanadium (V)	0.0001	ND	0.00151	ND	ND	ND	ND	ND	0.0011			0.0002
Dissolved Zinc (Zn)	0.0164	0.011	0.018	0.018	0.021	0.011	0.018	0.014	0.015			0.0018
LEGEND												
Data Missing	DM											
Levels Not Detectable	ND											
Data Not Tested	NA											
Exceedance of AO Standards												
Exceedance of ODWS Standards												

Table B2-21: PGMN Well – Robert Baker (ORM)

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Sep-05		Sep-04	
	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-3	Deep W163-2	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3
Parameter																		
INORGANICS																		
Conductivity	591	655	553	651	528	626	642	661	621	664	635	684	623	669	573	619	583	627
Total Dissolved Solids	384	426	360	420	343	407	382	393	403	461	405	439	NA	NA	418	412	350	360
Fluoride (F-)	0.0800	0.06	ND	ND	0.07	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Hardness (CaCO3)	360	379	300	380	266	364	360	380	360	400	380	390	360	400	354	377	332.6	352.6
Total Ammonia-N			0.08	0.020									0.34	NA	ND	ND	0.24	0.04
Dissolved Inorganic Carbon (C)	78.3	86.8	64	76	77.4	89	83	88	81	92	NA	NA			83.5	90.4		
Total Kjeldahl Nitrogen (TKN)	0.11	0.05	0.7	0.2	0.51	0.05	2	0.3	2	0.2	2.1	0.2	4	0.4	0.7	0.3	0.21	0.11
Dissolved Organic Carbon	3	1.3	3.3	1.2	4.2	1.4	5.2	1.3	3.8	1.2	4.6	1.5	2.8	1.4	3.2	1.2		
Orthophosphate (P)			ND	ND	NA	NA	ND	ND			ND	0.01	ND	ND	2	ND		
pH	7.75	7.83	7.7	7.6	8.14	8.2	8.2	8.3	8.1	8	8.1	8.1	8	8	8.11	8.2	7.91	7.78
Total Phosphorus	0.67	0.02	0.37	0.011	1.65	0.02	0.34	0.008			2.4	0.02	0.06	0.31	1.27	0.05		
Reactive Silica (SiO2)	6.5	5.86	14	13	6.68	6.1	14	13	2.2	ND			14	14	15	13	5.95	5.51
Dissolved Sulphate (SO4)	20	17.8	14	19	23.9	19.8	29	20			26	20	27	21	30.9	9	28.1	16.70
Alkalinity (Total as CaCO3)	312	360	300	352	284	356	332	364	13	12	331	369	347	386	324	365		
Dissolved Chloride (Cl)	1.8	1.7	2	2	1.4	1.6	3	2	327	360	3	2	3	2	2	2	3.4	2
Nitrite (N)	0.005	0.005	ND	ND	0.006	0.005	ND	ND			ND	ND	ND	ND	0.03	ND	ND	ND
Nitrate (N)			ND	ND	0.05	0.05	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND
RCAP CALCULATIONS																		
Bicarb. Alkalinity (calc. as CaCO3)			298	350	NA	NA	327	358	323	357	327	365	344	382	320	359	305	350
Carb. Alkalinity (calc. as CaCO3)			1	1	NA	NA	5	6	4	3	4	4	3	4	4	6		
METALS																		
Dissolved Aluminum (Al)	0.0006	0.0002	ND	ND	0.00104	0.00016	0.006	ND	0.021	ND	0.057	ND	0.008	ND	ND	ND		
Dissolved Antimony (Sb)	0.0004	0.0003	ND	ND	0.00051	0.00040	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Arsenic (As)	0.0014	0.0026	0.002	0.002	0.00170	0.00301	0.001	0.002	ND	0.002	ND	0.002	ND	0.002	0.0011	ND		
Dissolved Barium (Ba)	0.0590	0.123	0.060	0.120	0.05860	0.13	0.061	0.12	0.06	0.13	0.06	0.13	0.065	0.13	0.06	0.113	0.062	0.12
Dissolved Beryllium (Be)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Bismuth (Bi)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND		

	Oct-09		May-09		Oct-08		May-08		Sep-07		May-07		Sep-06		Sep-05		Sep-04	
	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3	Shallow W163-3	Deep W163-2	Shallow W163-2	Deep W163-3	Shallow W163-2	Deep W163-3
Dissolved Boron (B)	0.0104	0.0101	0.01	0.01	0.0107	0.0105	ND	0.01	ND	0.01	0.012	ND			0.013	ND	0.008	0.01
Dissolved Cadmium (Cd)	0	0	ND	ND	0.00004	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Calcium (Ca)	103	102	83	100	67.5	0.097	100	100	100	110	110	110	100	110	167	94.5	93.6	95.5
Dissolved Chromium (Cr)	0.0005	0	ND	ND	0.0001	0.0005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Cobalt (Co)	0.0004	0.0003	ND	ND	0.00047	0.00033	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Copper (Cu)	0.0022	0.0003	0.002	ND	0.0023	0.0003	0.003	ND	0.001	ND	0.001	ND	0.002	ND	0.0011	0.005	ND	ND
Dissolved Iron (Fe)	0.08	1.63	0.4	1.3	0.139	1.18	0.2	1.1	0.13	1.4	0.12	1.4	120	8.1	10.1	1.13	0.61	1.24
Dissolved Lead (Pb)	0.0001	0	ND	ND	0.00006	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Lithium (Li)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Magnesium (Mg)	24.9	30.1	23	31	23.8	29.6	27	30	26	31	27	31	26	32	32	32.6	24	27.7
Dissolved Manganese (Mn)	0.128	0.231	0.17	0.21	0.127	0.196	0.18	0.2	0.17	0.22	0.13	0.24	0.1	0.23	0.12	0.201	0.143	0.203
Dissolved Molybdenum (Mo)	0.0008	0.0007	ND	ND	0.0008	0.0006	ND	ND	ND	ND	ND	ND	ND	0.001	ND	ND		
Dissolved Nickel (Ni)	0.0007	0.0005	ND	ND	0.0008	0.0004	0.001	ND	ND	ND	ND	ND	ND	ND	0.012	ND	ND	ND
Dissolved Selenium (Se)	0.0002	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Silver (Ag)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Sodium (Na)	6.48	1.84	3.3	1.9	5.62	2.02	5.8	2.5	6.1	3.1	5.6	2.9	10	4.7	5.8	4.3	4.4	5.5
Dissolved Strontium (Sr)	0.116	0.126	0.11	0.13	0.118	0.134	0.13	0.14	0.12	0.15	0.13	0.15	0.12	0.16	0.12	0.151	0.12	0.173
Dissolved Tin (Sn)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Titanium (Ti)	0.0005	0.0004	ND	ND	0.0004	0.0007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Dissolved Vanadium (V)	0.0002	0.0001	ND	ND	0.00184	0.00136	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0011	0.0008
Dissolved Zinc (Zn)	0.0078	0.0013	0.007	ND	0.009	0.0017	0.014	ND	0.012	ND	0.01	ND	0.013	0.007	0.013	ND	0.025	ND

Table B2-22: PGMN Well - Georgetown

GEORGETOWN WELLS																
	Oct-09		May-09		Oct-08		May-08		May-07		Sep-06		Sep-05		Sep-04	
	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2
Parameter																
INORGANICS																
Conductivity	2420	556	2460	606	4300	578	2650	735	655	2760	673	3190	612	2830	599	2472
Total Dissolved Solids	1770	362	1590	390	2100	376	1360	415	374	1690	417	NA	NA	2640	386	1850
Fluoride (F-)	0.06	0.08	ND	ND	0.05	0.09	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hardness (CaCO3)	955	255	920	280	983	240	1000	320	330	950	320	1300	300	1220	316	1025
Total Ammonia-N			0.04	ND								0.04	NA	0.24	ND	ND
Dissolved Inorganic Carbon (C)	89.2	55.70	76	52	21.2	52.10	62	58	60	NA	NA					
Total Kjeldahl Nitrogen (TKN)	0.05	0.05	0.40	0.20	0.18	0.11	0.40	0.50	0.2	0.6	0.2	0.8	0.3	1.3	0.4	0.03
Dissolved Organic Carbon	0.5	0.90	0.90	1.10	0.6	0.90	0.60	1	0.9	0.8	1	0.8	0.9	0.8	1	
Orthophosphate (P)			ND	ND	NA	NA	ND	ND		ND	ND	ND	ND	ND	ND	
pH	7.62	7.97	7.50	7.70	7.87	8.32	7.90	8.1	8	7.8	8.1	7.6	8.1	7.78	8.1	7.66
Total Phosphorus	1.21	0.02	1.20	0.017	0.93	0.02	0.016	ND	ND	0.3	0.02	0.66	0.05	0.75	0.15	
Reactive Silica (SiO2)	8.04	3.10	14	6.9	7.32	3.06	14	6.80	6.6			17	7.3	11	5	6.89
Dissolved Sulphate (SO4)	37.70	24.70	39	35	42.40	52.3	36	61		35	34	39	40	25.5	30.90	35.40
Alkalinity (Total as CaCO3)	354	229	348	246	86.70	212	310	236	240	377	250	322	248	219	234	
Dissolved Chloride (Cl)	660	31.60	570	35	736	37.30	610	56		670	44	852	45	998	41.20	712
Nitrite (N)	0.0050	0.005	ND	ND	0.005	0.005	ND	ND		ND	ND	ND	ND	ND	ND	ND
Nitrate (N)			0.60	1.2	0.65	1.29	0.7	1.80		0.7	1.7	0.9	1.7	ND	ND	0.7
RCAP CALCULATIONS																
Bicarb. Alkalinity (calc. as CaCO3)			347	245	NA	NA	308	233	237	374	247	321	245	217	231	342
Carb. Alkalinity (calc. as CaCO3)			1	1	NA	NA	2	3	2	2	3	1	3	1	3	
METALS																
Dissolved Aluminum (Al)	0.0002	0.0003	ND	ND	0.00009	0.00029	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Antimony (Sb)	0.0005	0.0004	ND	ND	0.00048	0.00043	ND	ND	ND	ND	ND	ND	ND	ND	ND	

GEORGETOWN WELLS																
	Oct-09		May-09		Oct-08		May-08		May-07		Sep-06		Sep-05		Sep-04	
	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2	Deep W028-4	Shallow W028-2
Dissolved Arsenic (As)	0.0012	0.0002	ND	ND	0.00231	0.00012	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Barium (Ba)	0.214	0.0746	0.19	0.084	0.228	0.0822	0.2	0.1	0.09	0.21	0.094	0.29	0.092	0.222	0.085	0.215
Dissolved Beryllium (Be)	0	0	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Bismuth (Bi)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	
Dissolved Boron (B)	0.013	0.0193	0.01	0.02	0.0143	0.019	ND	0.02	0.022	ND	0.016			0.01	0.02	0.006
Dissolved Cadmium (Cd)	0	0	ND	ND	0.00001	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Calcium (Ca)	321	67.9	310	74	326	0.0639	340	87	88	320	84	440	84	378	78.9	347
Dissolved Chromium (Cr)	0.0001	0.0001	ND	ND	0.0001	0.0007	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Cobalt (Co)	0.0017	0.0001	ND	ND	0.0006	0.00018	ND	ND	ND	ND	ND	ND	ND	0.001	ND	
Dissolved Copper (Cu)	0.0008	0.0009	ND	ND	0.0011	0.0009	ND	0.001	ND	0.001	ND	0.002	0.001	0.004	0.004	0.0006
Dissolved Iron (Fe)	3.7	0.07	1.0	ND	0.491	0.006	0.6	ND	0.062	0.95	ND	270	12	0.34	0.02	0.49
Dissolved Lead (Pb)	0.0003	0	ND	ND	0.0001	0.00001	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0007
Dissolved Lithium (Li)			0.011	ND	NA	NA	NA	NA	ND	0.017	ND	0.015	ND	0.012	ND	
Dissolved Magnesium (Mg)	37.2	20.9	37	22	40.9	19.4	39	25	27	35	26	47	23	46.4	22.6	38.6
Dissolved Manganese (Mn)	0.0539	0.0005	0.033	ND	0.0238	0.00029	0.028	ND	0.002	0.03	ND	0.06	ND	0.128	0.01	0.009
Dissolved Molybdenum (Mo)	0.0008	0.0003	ND	ND	0.0001	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Nickel (Ni)	0.0124	0.0003	0.004	ND	0.001	0.0002	ND	ND	0.003	ND	ND	ND	ND	0.011	ND	ND
Dissolved Selenium (Se)	0.0001	0.0001	ND	ND	0	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Silver (Ag)	0	0	ND	ND	0.00001	0	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Sodium (Na)	140	18.7	130	22	143	21.7	130	27	28	120	26	160	23	138	21	120
Dissolved Strontium (Sr)	0.707	0.153	0.69	0.17	0.781	0.166	0.7	0.2	0.2	0.74	0.19	0.9	0.18	0.876	0.185	0.751
Dissolved Tin (Sn)			ND	ND	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	
Dissolved Titanium (Ti)	0.0018	0.0006	ND	ND	0.0015	0.0019	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dissolved Vanadium (V)	0	0.0002	0.001	ND	0.00212	0.00116	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Zinc (Zn)	0.0009	0.0004	ND	ND	0.001	0.0004	ND	ND	ND	ND	0.009	0.008	ND	ND	ND	0.007

Table B2-23: PGMN Well - Acton

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03
	W064-1	W064-1	W064-1	W064-1	W064-1	W064-1	W-064-1	W064-1	W064-1	W064-1
Parameter										
INORGANICS										
Conductivity	750	771	756	795	807	824	799	799	826	861
Total Dissolved Solids	478	500	492	487	451	502	547	587	576	570
Fluoride (F-)	0.07	ND	0.07	ND	0.1	ND	ND	ND		0.06
Hardness (CaCO3)	431	410	417	440	470	460	470	441	447	484
Total Ammonia-N		0.06					NA	ND	0.03	
Dissolved Inorganic Carbon (C)	78	67	76.6	78	79	NA				82.4
Total Kjeldahl Nitrogen (TKN)	0.05	0.3	0.13	0.8	0.3	0.4	0.3	0.3	0.16	0.11
Dissolved Organic Carbon	1.7	1.1	1.7	1.6	1.5	1.2	1.5	1.1		2.1
Orthophosphate (P)		ND	NA	ND	ND	ND	ND	2		
pH	8.06	7.7	7.88	8.1	8.1	8	8	8.12	7.91	803
Total Phosphorus	0.020	0.010	0.02	0.005	ND	ND	ND	ND		0.02
Reactive Silica (SiO2)	3.2	5.8	3.2	5.9	6.8	6.1	7.9	6.3	2.25	2.06
Dissolved Sulphate (SO4)	107	110	118	110	106	109	103	111	119	125
Alkalinity (Total as CaCO3)	307	305	310	307	322	323	341	328		337
Dissolved Chloride (Cl)	10.6	11	12.2	15	14	15	13	10.5	9.8	9.5
Nitrite (N)	0.037	0.07	0.113	0.15	0.13	0.15	0.09	ND	0.1	0.022
Nitrate (N)		0.4	1.31	1.7	1.7	2.4	2.4	3.7	3.5	3.13
RCAP CALCULATIONS										
Bicarb. Alkalinity (calc. as CaCO3)		304	NA	303	318	320	337	324	332	
Carb. Alkalinity (calc. as CaCO3)		1	NA	4	3	3	4	4		
METALS										
Dissolved Aluminum (Al)	0.0002	ND	0.00034	ND	ND	ND	ND	ND		0.0003
Dissolved Antimony (Sb)	0.0005	ND	0.00064	ND	ND	ND	ND	ND		0.0109
Dissolved Arsenic (As)	0.0006	ND	0.00064	ND	ND	ND	ND	ND		0.0005
Dissolved Barium (Ba)	0.0665	0.047	0.0603	0.049	0.07	0.057	0.067	0.049	0.042	0.039
Dissolved Beryllium (Be)	0	ND	0	ND	ND	ND	ND	ND		0.00003
Dissolved Bismuth (Bi)		ND	NA	NA	ND	ND	ND	ND		

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03
	W064-1	W064-1	W064-1	W064-1	W064-1	W064-1	W-064-1	W064-1	W064-1	W064-1
Dissolved Boron (B)	0.0147	0.01	0.0132	0.01	0.014	0.016		0.01	0.006	0.011
Dissolved Cadmium (Cd)	0	ND	0.00003	ND	ND	ND	ND	ND		-0.00001
Dissolved Calcium (Ca)	125	120	120	120	140	130	NA	124	133	0.139
Dissolved Chromium (Cr)	0.0002	ND	0.0003	ND	ND	ND	ND	ND		0.001
Dissolved Cobalt (Co)	0.0011	0.0013	0.00143	0.0017	0.0013	0.0013	0.0037	0.0015		0.00089
Dissolved Copper (Cu)	0.0004	ND	0.0009	ND	ND	ND	ND	ND	ND	0.0011
Dissolved Iron (Fe)	0.13	ND	0.086	ND	0.098	0.08	0.06	0.05	ND	0.007
Dissolved Lead (Pb)	0.0003	0.0007	0.00073	0.0011	ND	0.0006	0.0017	ND	0.002	0.00469
Dissolved Lithium (Li)		ND	NA	NA	ND	ND	ND	ND		
Dissolved Magnesium (Mg)	28.9	28	28.6	31	31	31	32	35.3	27.9	0.0331
Dissolved Manganese (Mn)	0.0323	0.053	0.0392	0.061	0.081	0.05	0.067	0.057	0.064	0.109
Dissolved Molybdenum (Mo)	0.0009	ND	0.001	0.001	0.001	0.001	0.001	0.001		0.00005
Dissolved Nickel (Ni)	0.0069	0.009	0.0087	0.009	0.01	0.009	0.009	0.012	0.011	0.014
Dissolved Selenium (Se)	0.0001	ND	0	ND	ND	ND	ND	ND		0.001
Dissolved Silver (Ag)	0	ND	0	ND	ND	ND	0.0002	ND		-0.00001
Dissolved Sodium (Na)	4.08	4.2	4.06	4.5	4.5	4.5	4.5	4.7	4.3	0.005
Dissolved Strontium (Sr)	0.295	0.18	0.251	0.21	0.29	0.24	0.26	0.2	0.171	0.152
Dissolved Tin (Sn)		ND	NA	NA	ND	ND	ND	ND		
Dissolved Titanium (Ti)	0.00023	ND	0.0009	ND	ND	ND	ND	ND		0.0003
Dissolved Vanadium (V)	0.0001	0.001	0.00169	ND	ND	ND	ND	ND	ND	0.00008
Dissolved Zinc (Zn)	0.0861	0.12	0.109	0.12	0.12	0.11	0.11	0.145	0.157	0.0159
LEGEND										
Data Missing	DM									
Levels Not Detectable	ND									
Data Not Tested	NA									
Exceedance of AO Standards										
Exceedance of ODWS Standards										

Table B2-24: PGMN Well - Caledon

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03	May-03	Sep-02
	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1
Parameter												
INORGANICS												
Conductivity	565	572	548	542	555	566	546	500				
Total Dissolved Solids	368	380	356	298	321	365	NA	324				299
Fluoride (F-)	0.06	ND	0.06	ND	ND	ND	ND	ND				0.04
Hardness (CaCO3)	221	220	240	230	260	240	240	226				243
Total Ammonia-N		ND					NA	ND				
Dissolved Inorganic Carbon (C)	44.5	41	49.2	46	46	NA		46.3				43
Total Kjeldahl Nitrogen (TKN)	0.05	0.2	0.05	0.3	0.1	0.2	0.4	0.2				0.05
Dissolved Organic Carbon	0.9	0.4	0.3	0.5	0.4	0.5	0.3	0.5				0.4
Orthophosphate (P)		ND	NA	ND		ND	ND	ND				
pH	8.11	7.7	8.11	8.2	8.1	8.1	8.1	8.21				
Total Phosphorus	0.02	0.021	0.02	ND	ND	ND	0.07	0.03				0.002
Reactive Silica (SiO2)	4	8.8	4.2	8.4	8.9		9.4	10				4.04
Dissolved Sulphate (SO4)	13.4	13	14.7	13		14	15	20.2				24.5
Alkalinity (Total as CaCO3)	192	195	186	178	189	193	200	183				
Dissolved Chloride (Cl)	60.2	60	61.3	55		58	57	54.5				49.4
Nitrite (N)	0.005	ND	0.005	ND		ND	ND	ND				
Nitrate (N)		0.8	0.61	0.4		0.5	0.5	0.4				
RCAP CALCULATIONS												
Bicarb. Alkalinity (calc. as CaCO3)		194	NA	175	187	191	197	180				
Carb. Alkalinity (calc. as CaCO3)		ND	NA	3	2	3	3	3				
METALS												
Dissolved Aluminum (Al)	0.0006	ND	0.00064	ND	ND	0.008	ND	ND				0.0013
Dissolved Antimony (Sb)	0.0003	ND	0.00046	ND	ND	ND	ND	ND				0.00064
Dissolved Arsenic (As)	0.0002	ND	0.00008	ND	ND	ND	ND	ND				0.0003
Dissolved Barium (Ba)	0.0491	0.051	0.0528	0.051	0.05	0.051	0.051	0.047				0.0515
Dissolved Beryllium (Be)	0	ND	0	ND	ND	ND	ND	ND				0.00003
Dissolved Bismuth (Bi)		ND	NA	NA	ND	ND	ND	ND				

	Oct-09	May-09	Oct-08	May-08	Sep-07	May-07	Sep-06	Sep-05	Sep-04	Sep-03	May-03	Sep-02
	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1	W038-1
Dissolved Boron (B)	0.0136	0.01	0.0131	0.01	0.012	0.012		0.017				0.008
Dissolved Cadmium (Cd)	0	ND	0	ND	ND	ND	ND	ND				0
Dissolved Calcium (Ca)	65.4	67	70.5	69	75	73	70	63.1				77.8
Dissolved Chromium (Cr)	0.0002	ND	0.0011	ND	ND	ND	ND	ND				0.0024
Dissolved Cobalt (Co)	0.0001	ND	0.00017	ND	ND	ND	ND	ND				0.00005
Dissolved Copper (Cu)	0.001	ND	0.0005	ND	ND	ND	ND	ND				0.0004
Dissolved Iron (Fe)	0	ND	0.006	ND	ND	ND	2.3	ND				0.001
Dissolved Lead (Pb)	0	ND	0	ND	ND	ND	ND	ND				0.00003
Dissolved Lithium (Li)		ND	NA	NA	ND	ND	ND	ND				
Dissolved Magnesium (Mg)	14.1	14	15.6	15	17	15	16	20				11.8
Dissolved Manganese (Mn)	0.0003	ND	0	ND	ND	ND	ND	ND				0.00017
Dissolved Molybdenum (Mo)	0.0003	ND	0.0002	ND	ND	ND	ND	ND				0.00026
Dissolved Nickel (Ni)	0	ND	0.0001	ND	ND	ND	ND	ND				0.0005
Dissolved Selenium (Se)	0.0001	ND	0	ND	ND	ND	ND	ND				0.001
Dissolved Silver (Ag)	0	ND	0	0.0006	ND	ND	ND	ND				0.00001
Dissolved Sodium (Na)	28.6	28	25.1	27	29	27	27	26.4				10.8
Dissolved Strontium (Sr)	0.111	0.11	0.119	0.11	0.11	0.12	0.11	0.11				0.11
Dissolved Tin (Sn)		ND	NA	NA	ND	ND	ND	ND				
Dissolved Titanium (Ti)	0.0004	ND	0.0006	ND	ND	ND	ND	ND				0.0006
Dissolved Vanadium (V)	0.0002	ND	0.00097	0.002	0.001	ND	ND	ND				0.00062
Dissolved Zinc (Zn)	0.0005	ND	0.0006	ND	ND	ND	ND	ND				0.0031
LEGEND												
Data Missing	DM											
Levels Not Detectable	ND											
Data Not Tested	NA											
Exceedance of AO Standards												
Exceedance of ODWS Standards												

B2.6 GROUNDWATER QUALITY - MUNICIPAL WATER SUPPLIES

The analysis of select inorganic water quality and organic parameters in municipal raw groundwater is discussed in **Section 2.4.6** of the Assessment Report. **Table B2-25** to **Table B2-30** provide supporting data for the trends in inorganic constituents as described in the report. The data is based upon the information received from the municipal well network, which is presented in **Figure 2.6** of the report.

Table B2-25: 2009 Municipal Water Quality – Inorganic parameters

Community	Well	Na	Cl	NO_3
Acton	4th line	6.6	12.8	2.9
	Davidson 1	15.8	31.4	4.8
	Davidson 2	13.2	27.2	4.5
	Prospect Park 1	46.7	101.3	0.1
	Prospect Park 2		72.5	ND
Alton	Well 3	70	140	1.9
	Well 4	40	75	1.1
Caledon Village	Well 3	38	25	0.1
	Well 4	40	75	1.1
Erin	Well E7	6.0	7.0	.15
	Well E8	7.0	4.0	ND
Hillsburgh	Well H2	12	18	1.1
	Well H3	11	2.0	ND
Georgetown	Cedarvale 1A	60.6	134.5	1.2
	Cedarvale 3A	59.4	130.5	1.4
	Cedarvale 4/4A	70.5	161.8	0.2
	Lindsay Court 9	36.3	63.3	2.6
	Princess Anne 5	57.4	122.8	4.0
	Princess Anne 6	51.3	114.9	3.6
Inglewood	Well 1/2	38	50	2.0
	Well 3	18	25	ND
Cheltenham	Well 1	20	48	ND
	Well 2	20	52	ND
Orangeville	Well 2A	24.5	56	3.0
	Well 3			
	Well 4			
	Well 5	25.5	50	4.8
	Well 5a	41.5	85	4.1
	Well 6	42	94.5	ND
	Well 7	5.7	18.5	ND
	Well 8b	5.8	15.0	0.2
	Well 8c	4.9	9.5	0.3
	Well 9A	85	170	3.2
	Well 9B	93	180	3.1
	Well 10	96	172	ND
	Well 11	17.3	53.6	ND
	Well 12	7.8	12.5	0.5
Mono Card Wds	MW -1	29.5	62.5	0.4
	MW-3	46.5	101.0	1.4
Mono Coles	PW-1	8.1	ND	ND
	PW-2	4.5	ND	ND
Mono Island Lake	Well 1	30.0	22.5	ND
	Well 2	48.5	35.5	ND

ND – Non detect

***Groundwater Quality (Inorganic)* – Temporal Trends**

Table B2-26: (ctd) Orangeville and Mono – Chloride, Nitrate, Sodium: 1982-2008

		1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002		2004	2005	2006	2007	2008
		Chloride																										
Orangeville	Well #2A				24.8		18.3				31.0	27.6	19.4	24.6	28.4							27.9	39.3	42.0	41.7	46.0	53.0	56.0
Orangeville	Well #3		5.8	2.2	6.0		4.5				13.0	13.5	9.0	15.1	17.3													
Orangeville	Well #4		21.4	44.0	54.2		53.8				44.0	43.7	55.1	57.7	65.5			97.8	90.6									
Orangeville	Well #5A		51.6	20.6	25.0		27.0					51.8	44.0		57.8			58.2				19.4	22.2	44.3	64.4	69.5	39.5	50.0
Orangeville	Well #5		27.0	42.8	54.2		49.8				48.0	60.1		52.6					57.2			63.8	73.9	71.4	76.3	77.5	86.0	85.0
Orangeville	Well #6		2.4	31.2	2.0		5.0				7.9	11.7	11.6	12.5	10.9							38.6	40.9	53.3	55.7	70.5	79.0	94.5
Orangeville	Well #7						3.6				4.6	5.5	6.7	5.4	6.0			7.8	8.0	8.4		8.9	11.2	11.3	12.8	14.0	16.0	18.5
Orangeville	Well #8A										2.8	4.4	8.7	9.3	9.9							21.3	33.0	18.1	60.3	57.0		
Orangeville	Well #8B										2.5	4.1	8.0	4.9								22.2	21.6	39.7	35.9	21.5	12.0	15.0
Orangeville	Well #8C											3.2	3.0	3.6	4.0							12.8	8.4	11.2	13.1	11.0	11.0	9.5
Orangeville	Well #9A							13.0											67.2	53.0	84.6	84.9	103.6	125.0	152.0	171.0	140.0	170.0
Orangeville	Well #9B							13.0													91.2	88.6	94.5	110.0	142.5	181.0	163.3	180.0
Orangeville	Well #10																				153.0	105.7	119.9	122.7	139.9	186.5	155.0	172.0
Orangeville	Well #11																		6.2	10.2	23.6	27.9	25.2	29.6	34.7	39.0	46.0	53.8
Orangeville	Well #12																										12.0	12.5
Mono	Cardinal Woods MW-1												31.5										67.0	49.5	51.5	55.5	58.0	62.5

Mono	Cardinal Woods MW-2												60.8													
Mono	Cardinal Woods MW-3																							93.5	96.0	93.5	101.0
Mono	Coles Sub. Well PW-1							1.0					16.6										1.0	1.0	1.5	1.0	1.0	ND
Mono	Coles Sub. Well PW-2																						1.0	1.0	1.5	1.0	1.0	ND
Mono	Island Lake Well #1																							15.0	20.0	27.0	26.5	22.5
Mono	Island Lake Well #2																							27.0	27.7	48.0	46.5	35.0
ND= Not detectable																												
		Nitrate																										
Orangeville	Well #2A				2.6		0.9				0.9	1.7	1.8	1.8	1.9							1.9	1.8	1.9	2.8	2.4	2.6	3.0
Orangeville	Well #3		0.1	0.1			0.1				0.1	0.0	0.0	0.0	0.0													
Orangeville	Well #4		0.1	0.1	0.1		0.1				0.1	0.0	0.0	ND	0.0			0.1	BDL	0.0	BDL				-			
Orangeville	Well #5A		3.8	3.9	2.8		3.6					4.5	4.3		4.1			4.2				4.7	4.8	4.4	4.9	5.1	5.8	4.8
Orangeville	Well #5		3.9	4.2	3.9		4.0				5.0	4.6		4.2					4.1			4.8	3.8	4.3	4.8	5.2	4.6	4.1
Orangeville	Well #6		0.1	4.1	0.1		0.1				0.1	0.0	0.0	0.0	0.1							ND	ND	0.1	ND	ND	ND	ND
Orangeville	Well #7						0.0				0.1	0.0	0.0	0.0	0.0			BDL	0.1	0.0		ND	ND	ND	ND	ND	ND	ND
Orangeville	Well #8A										0.0	0.0	0.0	0.0	0.1							ND	ND	ND	ND			
Orangeville	Well #8B										0.1	0.1	0.0	0.1								0.3	0.1	0.1	0.1	0.1	0.2	0.2
Orangeville	Well #8C											0.1	0.1	0.1	0.2							0.2	0.3	0.3	0.2	0.2	0.2	0.3

Orangeville	Well #9A																	2.7	2.0	2.6	2.2	2.2	2.5	2.9	2.8	2.6	3.2
Orangeville	Well #9B																			2.7	2.4	2.4	2.7	2.6	2.9	2.9	3.1
Orangeville	Well #10																	BDL	0.0	BDL	0.3	ND	ND	ND	ND	ND	ND
Orangeville	Well #11																BDL		0.0	0.0	ND	ND	ND	ND	ND	ND	ND
Orangeville	Well #12																									0.2	0.5
Mono	Cardinal Woods MW-1												0.4									0.5	0.4	0.4	0.4	0.4	0.4
Mono	Cardinal Woods MW-3																							1.4	2.1	1.2	1.4
Mono	Coles Sub. Well PW-1																					ND	ND	ND	ND	ND	ND
Mono	Coles Sub. Well PW-2																					ND	ND	ND	ND	ND	ND
Mono	Island Lake Well #1																						ND	ND	ND	ND	ND
		Sodium																									
Orangeville	Well #2A				10.0		8.7				12.7	13.2	11.3	11.4	13.2							13.2	16.0	17.5	17.7	18.3	22.5	24.5
Orangeville	Well #3		4.0	3.6		2.9					5.1	5.1	5.4	5.7	6.3										-			
Orangeville	Well #4		11.0	18.1	23.5		24.8				18.1	19.4	27.4	24.0	27.4			42.8	41.2	28.6	22.4				-			
Orangeville	Well #5A		15.6	9.5	9.2		13.5					22.9	21.0		27.5			27.4				10.0	9.4	22.5	32.8	34.8	20.0	25.5
Orangeville	Well #5		23.0	19.0	23.0		23.9				20.0	25.6		28.0					28.8			32.6	33.0	34.5	36.5	35.8	45.0	41.5
Orangeville	Well #6		3.5	14.3	3.0		3.4				4.0	5.3	5.4	5.8	4.9							13.6	16.5	23.0	26.1	29.6	34.5	42.0

Orangeville	Well #7						4.3				2.8	3.5	3.2	3.2	3.3					3.6		4.3	4.0	4.3	4.9	5.0	5.1	5.7
Orangeville	Well #8A										2.7	3.2	4.1	4.7	4.9			3.6	3.4			11.0	14.2	8.7	26.0			
Orangeville	Well #8B										2.8	3.2	3.6	3.4								10.1	8.4	16.5	15.5	8.1	5.5	5.8
Orangeville	Well #8C											3.2	3.4	3.3	3.2							5.6	5.7	5.8	6.4	5.7	4.5	4.9
Orangeville	Well #9A																		33.8	28.0	42.6	46.2	56.3	62.0	72.1	78.7	68.0	85.0
Orangeville	Well #9B																				45.2	46.0	53.0	62.5	73.1	88.9	76.0	93.0
Orangeville	Well #10																			52.8	58.6	50.4	62.0	61.5	68.3	84.7	67.0	96.0
Orangeville	Well #11																		4.0	5.2	8.2	10.9	10.2	10.1	12.1	12.9	14.3	17.3
Orangeville	Well #12																										8.8	7.8
Mono	Cardinal Woods MW-1												17.5										29.0	22.5	23.0	24.5	24.0	29.5
Mono	Cardinal Woods MW-2												34.7															
Mono	Cardinal Woods MW-3																								46.5	47.1	48.5	46.5
Mono	Coles Sub. Well PW-1							5.8					27.1										6.0	6.0	7.0	7.3	6.5	8.1
Mono	Coles Sub. Well PW-2																						4.0	4.0	4.5	4.3	3.7	4.5
Mono	Island Lake Well #1																							20.0	20.0	31.6	35.5	30.0
Mono	Island Lake Well #2																							29.0	31.3	53.5	54.5	48.5
ND= Not detectable																												

Table B2-27: Erin – Chloride, Nitrates and Sodium: 1991-2008

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Chloride																						
Erin Well E7										4.6	4.6	4.8	4.8		4.8	5.6	5.9	5.8	7.7	6.0	6.4	6.7	6.4
Erin Well E8							2.5			3.6	2.2	2.8	2.4	3.8	3.0	3.0	3.2	3.8	3.7	3.3	4.4	5.0	3.6
Bel-Erin Subdv. TW#1						44.7								65.4	69.6	62.2	60.5	62.0					
Bel-Erin Subdv. TW#2						45								65.4									
Hillsburgh Heights (H2)								5.4					34.0	10.8	12.0	14.2	14.5	14.8	15.5	16.1		18.5	17.8
Glendevon (H3)													1.0	1.0	1.0	1.2	1.4	1.7	1.9	1.3		2.6	2.0
	Nitrate																						
Erin Well E7											BDL	0.13	0.125		0.19	0.125	0.11	0.16	0.26	0.4	0.1	ND	0.1
Erin Well E8												0.01	BDL		0.19	0.006	BDL	0.01	0.01	ND	ND	ND	ND
Bel-Erin Subdv. TW#1					1.9									0.81	1.17	1.84	1.96	1.8					
Bel-Erin Subdv. TW#2					1.8									0.81									
Hillsburgh Heights (H2)													0.875	1.14	1.24	1.25	1.24	1.21	1.24	1.2	1.2	1.1	1.1
Glendevon (H3)													BDL	BDL	BDL	BDL	BDL	BDL	0.01	ND	ND	ND	ND
	Sodium																						
Well E7	13.5									5.94	5.8	5.6	5.8		6.92	6	6	6.2	6	6.2	6.2	6.4	6.2
Well E8							5.26			4.6	4.4	4.4	4.4		6.06	4.8	4.8	5	4.6	4.6	4.8	5.0	5.0
Bel-Erin Subdv. TW#1						22.5								31.8	38.2	36.8	37.4	34.8					
Bel-Erin Subdv. TW#2						23.9								31.8									
Hillsburgh Heights (H2)													9.2	9.4	9.6	10.8	10.6	10.4		10.6		11.6	11.8
Glendevon (H3)													9.6	9.4	10	10	10.2	10.6	10.2	10.2		10.2	10.4

Table B2-28: Halton Hills - Chloride, Nitrates and Sodium: 1996-2008

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Chloride																						
4th Line		9.1	17.2	12.6	18.6	11.5	9.3	11.4		14.3	10.3	11.8	4.4	8.6	16.7	22.0	12.4	16.7	19.1	18.0	14.7	10.0	12.8
Davidson #1		15.4		12.2	23.1	18.9	19.4	15.4		24.2	21.7	18.9	29.9	23.9	28.1	42.0	48.5	50.9	42.0	39.2	36.7	26.4	31.4
Davidson #2															27.2	35.8	33.5	37.2	36.0	34.8	28.9	25.6	27.2
Prospect Park #1											53.8	52.0	55.5	69.3	66.7	63.9	62.5	66.2	80.5	100.2	100.7	96.3	101.3
Prospect Park #2																			73.2	74.3	70.6	68.1	72.5
Cedarvale #1 / 1A	49.6	43.8	56.8	54.9	70.7	67.6	66.3	67.5		103.0	100.0	106.0	109.0	117.0	111.0	114.0	114.5	101.2		124.5	124.5	135.6	134.5
Cedarvale Well #3/3A	72.9	64.0	68.6	66.9	77.9	61.3	64.7	62.8							114.5	100.0	100.3	114.6	118.1	104.0		119.0	130.5
Cedarvale Well # 4/4a	63.6	50.0	71.9	80.5	77.4	81.9	84.9	87.5							115.5	126.0	132.5	143.7	137.3	138.0	132.8	138.0	161.8
Lindsay Court Well #9											44.6	49.4	63.8	77.4	75.4	60.7	59.8	71.8	71.1	71.9	71.6	67.5	63.3
Princess Anne Well #5	48.2	53.0	51.3		61.1	65.0	60.7	62.6		70.2	67.3	69.0	73.2	73.6	89.0	103.0	93.0	96.1	109.0	109.0	106.3	113.5	122.8
Princess Anne Well #6															84.4	92.2	93.4	91.5	99.6	102.0	100.6	105.0	114.9
	Nitrate																						
4th Line		1.7	1.7	2.6	2.0	1.4	1.5	1.8		1.7	0.8	3.2	1.7	0.7	1.3	1.7	1.6	2.0	2.8	2.2	3.0	2.4	2.9
Davidson #1		2.2		2.4	2.7		1.9	2.4		2.5	4.1	4.9	1.7	2.5	2.1	6.4	6.4	4.6	6.1	4.4	5.2	4.2	4.8
Davidson #2															2.0	6.4	5.5	3.6	5.3	4.1	4.9	4.1	4.5
Prospect Park #1																			0.0	0.0	0.1	0.1	0.1
Prospect Park #2																			0.0	0.1	0.0	0.1	
Cedarvale Well #1/1A	0.1	1.1	1.3	1.3	1.0	0.4	0.6	0.5		0.9	2.1	0.7	0.5	1.2	0.5	0.7	0.7	0.4		1.3	1.4	1.3	1.2
Cedarvale Well #3/3A	0.4	1.1	1.2	1.7	0.8	0.6	0.7	0.7							0.6	1.1	1.2	1.3	1.5	1.5		1.9	1.4
Cedarvale Well #4a	0.6	1.2	1.4	0.4	0.4	0.4	0.4	0.4							0.7	0.5	0.6	0.7	0.6	0.9	1.0	0.5	0.2
Lindsay Court Well #9											1.7	3.0	1.9	1.7	1.8	1.9	1.8	2.1	2.2	2.6	3.0	2.6	2.6
Princess Anne Well #5	3.2	3.2	4.6		2.9	2.4	2.0	2.1		3.2	3.5	4.7	4.0	2.3	1.7	3.2	4.1	3.7	3.8	4.4	4.2	4.2	4.0
Princess Anne Well #6															2.9	2.7	3.3	3.2	3.7	3.8	3.4	3.6	3.8

	Sodium																						
4th Line										5.9	3.9		4.1	4.4	6.7	7.7	6.2	6.9	4.5	6.8	6.5	5.2	6.6
Davidson #1										10.9	7.6	9.1	13.6	10.9	10.4	16.3	21.4	24.5	12.9	17.5	17.5	11.9	15.8
Davidson #2								No data							10.2	13.8	13.2	16.7	12.3	14.3	13.1	11.5	13.2
Prospect Park #1											23.1	22.4	26.1	27.6	31.5	28.4	30.2	29.1	31.8	37.1	44.2	46.6	46.7
Prospect Park #2																			33.2	33.1	35.0	32.7	34.0
Cedarvale Well #1/1A	20.1	20.0	23.8		23.7	27.0	26.2	29.7		39.8	40.9	48.9	46.7	47.1	46.5	43.7	48.9	43.9		51.9	56.0	52.8	60.6
Cedarvale Well #3/3A	32.0	29.8	33.4		28.9	24.8	26.2	27.7							51.8	40.8	44.1	44.6	46.4	46.5		48.5	59.4
Cedarvale Well #4a	27.4	27.7	33.0	37.5	29.7	32.3	36.9	41.0							51.1	50.7	58.8	62.8	56.3	60.0	59.4	61.3	70.5
Lindsay Court Well #9											19.4	23.6	27.1	30.3	34.8	30.8	30.1	30.0	34.3	34.5	36.6	35.5	36.3
Princess Anne Well #5	22.7	23.7	27.2		24.2	27.7	28.8	30.7		31.0	33.0		36.4	34.0	35.6	45.7	47.4	41.9	47.2	47.2	48.7	52.8	57.4
Princess Anne Well #6															33.4	39.1	46.9	40.0	41.3	43.2	45.2	48.0	51.3

Table B2-29: Caledon – Sodium, Nitrates and Chloride: 1982-2008

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Sodium																										
Alton Well 3						5.0	9.6		15.2	56.9		42.1								38.0			68.8	69.0	78.5	96.1	71.7
Alton Well 4					30.3	4.8	5.2		7.5	10.1	5.4	23.0											24.1	44.0	61.5	52.9	40.2
Caledon Village Well 3		7.5	7.7	18.1	8.6		8.8		9.4	10.9	10.0	12.6								28.8		27.9	33.8	33.0	42.3	38.2	37.2
Caledon Village Well 4							8.8		9.6	10.5	11.4	13.3							7.3	7.6	7.5	7.5	8.5	8.5	8.9	9.4	8.5
Cheltenham Well 1																									22.8	23.3	20.8
Cheltenham Well 2																			14.4	15.7	14.3	15.1		18.0	15.9	21.1	19.0
Inglewood Well 2	11.8	11.3			11.9	13.2	17.3		21.3	17.1	18.4	16.9												30.0	25.5	35.1	37.0
Inglewood Well 3																			14.8	13.9	11.8	13.1	14.7	32.0	16.7	18.6	15.1
	Nitrate																										
Alton Well 3							0.5		1.3	2.8	0.8	2.9								1.6			3.9	3.1	3.7	4.8	1.9
Alton Well 4					2.4		0.3		0.8	0.8		1.5											0.9	1.9	3.0	2.2	1.1
Caledon Village Well 3		0.6	1.8	0.5	0.4		0.5		0.4	0.4	0.4	0.3								0.3		0.1	0.3	0.2	0.0	0.0	0.1
Caledon Village Well 4							0.5		0.5	0.4	0.3	0.3							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cheltenham Well 1																											
Cheltenham Well 2																			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Inglewood Well 2	0.6	0.4			0.7	0.7	0.8		0.6	0.6	0.5	0.6								0.0	0.0	0.0	0.0	1.1	0.0	0.0	2.1
Inglewood Well 3																			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Chloride																										
Alton Well 3						4.8	15.3		31.0	141.9	35.5	77.4								75.5			190.0	143.0	133.5	171.0	138.0
Alton Well 4					57.0	3.9	5.1		12.5	18.3	7.9	43.0											152.0	106.0	106.5	87.5	74.9
Caledon Village Well 3		17.1	16.7	16.0	17.7		18.8		22.8	26.8	20.8	30.0								62.7		63.2	72.8	69.5	74.5	71.4	75.5
Caledon Village Well 4							18.5		22.9	25.3	29.4	30.4							9.6	11.6	12.0	12.3	14.0	13.0	14.3	14.7	15.3
Cheltenham Well 1																									50.9	50.7	45.6
Cheltenham Well 2																			47.6	47.4	45.4	47.5		49.2	45.5	50.6	55.4
Inglewood Well 2	26.6	25.7			27.3	32.1	43.2		57.9	45.9	49.5	49.9												63.9	53.3	70.4	75.7
Inglewood Well 3																			22.8	22.0	21.9	22.2	25.6	23.4	26.1	25.4	26.2

Bacteriological

Table B2-30: 2009 Summary of Microbiological Testing at Municipal Supplies (Drinking Water Systems Regulation O Reg. 170/03, 2009

Municipality	Well	Microbiological Testing			
		Exceedance	Range of *E. Coli* cfu/100mL	Range of Total Coliform cfu/100mL	Range of HPC cfu/1mL
Acton		Yes	0-6	0-16	n/a
Alton	Well 3	No	0	0	0-38
Alton	Well 4	No	0	0	0-3
Caledon Village	Well 3	No	0	0	0-2
Caledon Village	Well 4	No	0	0	0-10
Cheltenham	Well 1	No	0	0	0
Cheltenham	Well 2	No	0	0	0
Erin	Well 7 & 8	No	0	0	0-320
Hillsburgh	Well 2 & 3	No	0	0	0-130
Georgetown		No	0	0	n/a
Inglewood	Well 2	No	0	0	0-12
Inglewood	Well 3	No	0	0	0-5
Orangeville	Well 2A	No	0	0	0-11
Orangeville	Well 5 & 5A	No	0	0	0-5
Orangeville	Well 6	No	0	0	0-7
Orangeville	Well 7	No	0	0	0->200
Orangeville	Well 8B & C	No	0	0	0->200
Orangeville	Well 9A & B	No	0	0	0-11
Orangeville	Well 10	No	0	0	0-7
Orangeville	Well 11	No	0	0	0-360
Orangeville	Well 11	No	0	0	0-360