



Credit Valley Conservation  
Nottawasaga Valley Conservation  
Toronto and Region Conservation  
Lake Simcoe Region Conservation  
Central Lake Ontario Conservation  
Kawartha Conservation  
Ganaraska Region Conservation  
Otonabee Conservation  
Lower Trent Conservation



## PROGRAM UPDATE 2014

TO: YPDT Executive Steering Team

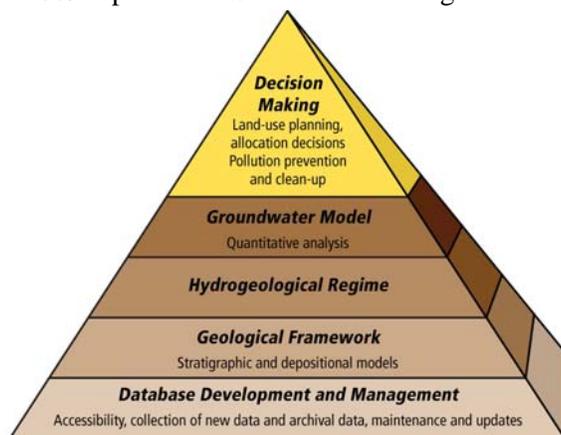
FROM: Steve Holysh & Rick Gerber

DATE: December 18, 2014

RE: **2014 Update – YPDT-CAMC (Oakridges Moraine) Groundwater Monitoring Program**

### Background

The YPDT-CAMC (Oak Ridges Moraine) Groundwater program was initiated in 2001 largely driven by the encroachment of development onto the Oak Ridges Moraine and the recognition that there was an absence of high quality regional environmental data and analyses, particularly with respect to the groundwater resources. Since inception, the program has provided partner agencies with an actively managed water resource related database and the regional geological and groundwater context for on-going day-to-day water resource management activities (e.g. development review, PTTW review, watershed management, etc.). The framework for the program is succinctly summarized in the figure below, taken from the Council of Canadian Academies 2009 report “The Sustainable Management of Groundwater in Canada.”



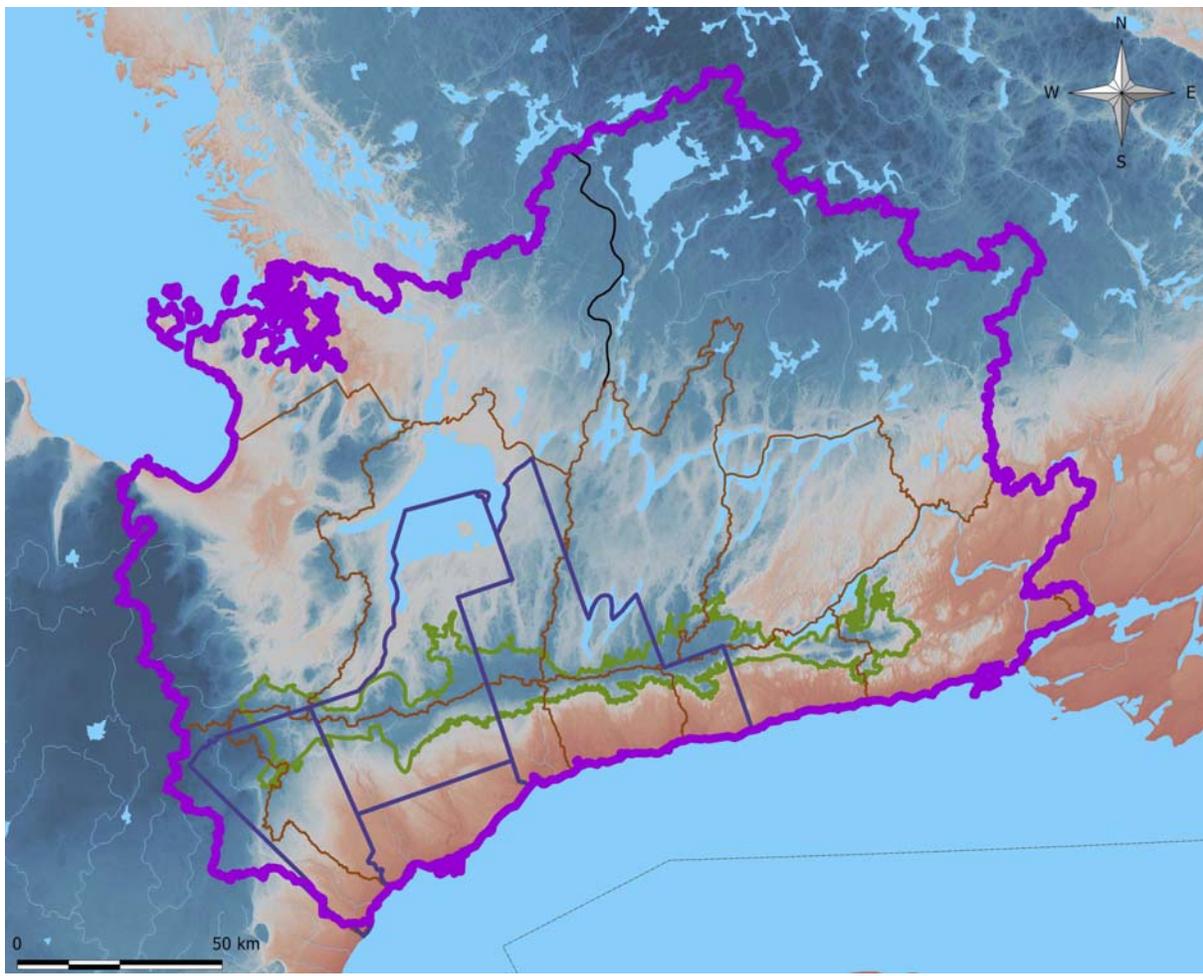
### Mandate

*The mandate of the YPDT-CAMC Groundwater Management Program partnership is to provide a multi-agency, collaborative approach to collecting, analyzing and disseminating water resource data as a basis for effective stewardship of water resources. The YPDT-CAMC Groundwater Management Program is to build, maintain and provide to partnered agencies the regional geological and hydrogeological context for ongoing groundwater studies and management initiatives within the partnership area.*

*As such the program will:*

- *Build and maintain a master database of water related information that is accessible to all partner agencies;*
- *Build and maintain a digital geological construction of the subsurface layers that is accessible to all partner agencies;*
- *Build and maintain a numerical groundwater flow model(s) that can be used to address any number of issues that arise at any of the partner agencies;*
- *Coordinate and lead investigations that will acquire new field data that will strategically infill key data gaps;*
- *Provide technical support to Source Water Protection Teams to ensure that interpretations used in source water are consistent with the regional understanding;*
- *Provide technical support to planning authorities to ensure that Official Plan policies are developed in a manner which makes them consistent with up to date groundwater science as derived from the project; and*
- *Provide technical support to all partnered agencies for addressing other Provincial legislation.*

Further information regarding the program can be found at [www.oakridgeswater.ca](http://www.oakridgeswater.ca).



Program area - Note that for data management purposes the program area comprises the entirety of three SWP Regions: 1) Credit/Toronto/Central Lake Ontario; 2) Lake Simcoe - Southern Georgian Bay; and 3) Lower Trent. Focus of work is largely directed to the GTA municipalities (York, Peel, Durham, Toronto) and their associated CAs.



## **Review – 2014 (Detailed Summary)**

2014 proved to be a busy year with significant advancements particularly focused on the numerical modelling and database aspects of the program. With respect to modelling, the program saw the hiring of Mason Marchildon, a water resources engineer with expertise in surface and groundwater modelling. The database continued to grow in 2014 with advancements made in a QA/QC process and database updates that included Environment Canada meteorological data, as well as updates to groundwater levels, chemistry and pumping records. Two meetings were held with the technical steering committee in March and November to provide updates on various aspects of the program as well as to receive input on future directions for the project. Program staff liaised with various external agencies (e.g. Ontario Geological Survey, Town of Richmond Hill, Ministry of the Environment, Toronto Transit Commission, Trent University, University of Waterloo) on various technical hydrogeological facets of the program.

### **1. Database**

Program staff have continued to build upon the comprehensive hydrological database that has served as the foundation for groundwater work across the study area. A database training session was held in May to introduce agency hydrogeological staff to logger water level management through Sitefx.

Over the course of 2014, over 13,000 new wells have been added to the database (including an update of the MOECC WWIS data) and over 300 new documents have been added to the library. With respect to the temporal data some 500,000 new water quality analyses, 130,000 pumping records, nearly 9 million water levels and 1.6 million climate records were added to the database. An updated and improved version of the MOECC's Permit To Take Water (PTTW) database was also recently incorporated and work will be ongoing in 2015 to link the Permits to the wells that are actually being pumped.

With the database synchronization process that has been developed over the past three years technical staff at four of the partner agencies (Peel Region, York Region, Central Lake Ontario CA, and Nottawasaga Valley CA) are now able to directly input data to their copy of the database at agency offices. Data is incorporated, via the web (encrypted communication channel), into the master database at the program's Downsview offices on a regular basis. Other agencies have been provided with various forms of the database (e.g. standalone SQL, Access, Excel (summary of key data)).

With a scheduled SQL software update (to SQL 2014), plans are underway to expand this data integration service to more agencies in 2015. In preparation, the database has been slightly revised (i.e. improved relationships between tables, removing specific fields from replication, etc.) to better handle synchronization issues that have arisen with recent versions of Microsoft SQL Server. This should improve the efficiency of the replication process and reduce the time necessary to synchronize large data transfers (e.g. logger imports).

The program's extensive database manual (approximately 800 pages) continues to be refined as new procedures and management aspects related to database management are integrated into the management of the database.

In order to improve access to the program's data, files and website, in 2014, program staff have implemented Sharepoint, Web, Database, file-sharing, backup and fail-over servers in a virtual environment. This allows for a standard backup system across all servers as well as flexible optimization of hardware and software without a large investment in multiple computers and the degree of hands-on support they would require.

### **2. Modelling**

With the retention of modelling expertise into the program in spring of 2014, staff have been able to review over 30 groundwater flow models that have been prepared for different partner agencies by consultants over the past five years. Funding for the modelling projects was either provincial (Source Water Protection, Lake Simcoe Protection Plan) or municipal (wellhead capture zones, updates to previously constructed models, etc.). The overview consisted of an inventory of the files needed to successfully run the models so that they can be re-run and used into the future. Where files were missing or corrupt, recommendations were put forward to correct the problem by interacting with the consultants involved in the original project. The overview revealed that in most – but not all - cases complete model files were provided to the partner agency and YPDT staff were able to successfully run the model.

The modelling sub-committee met in 2014 and will meet again early in 2015 to provide continued direction to the program. As per the direction of this committee, the YPDT program hosted a very successful one-day symposium in November entitled “The Future of Source Water Protection Modelling.” Over 70 people attended the symposium which consisted of presentations from “clients” (York, Guelph, Waterloo, LSRCA); “the province” (MNR and MOECC); and “practitioners” (YPDT, Earthfx, Golder, S.S. Papadopoulos, Matrix Environmental, Aquanty, and U of Waterloo). An informed discussion followed the technical presentations. Plans are underway to summarize and circulate the results of the session and to determine future directions for the program.

### **3. Other Program Initiatives**

2014 also saw contributions on a number of other initiatives:

**Website** – With the support of staff from Central Lake Ontario Conservation Authority in 2014 staff have revamped the program’s website and moved the hosting of the website from an external provider to servers at the program’s Downsview offices. The database has been re-designed to provide ready access – by partner agency staff - to the program’s report library and to the vast store of temporal data (e.g. water levels, chemistry, climate data, streamflows, etc.). Cross-section generation capabilities displaying various subsurface data sets are also being made available, initially to partner agencies, but perhaps in the longer term to consultants as well. The look of the website has been updated and adjusted to be displayed in any number of platforms (e.g. computer, tablet, mobile phone, etc.).

**Chemistry Review** – the program has been fortunate to have temporarily (for a one year period) seconded an additional staff member, Mezmore Haile-Meskale from the Ministry of Environment and Climate Change (MOECC). With his background in groundwater chemistry, Mezmore is reviewing, analysing and interpreting the expansive groundwater chemistry database (over 18,000 water quality analyses from 2025 individual wells) to elucidate trends or patterns to assist in further interpretation of the groundwater flow systems in the program study area. In addition, as part of the Greenbelt supported Oak Ridges Moraine/Greenbelt land Report card project to prepare baseline environmental data for the “2015 Review” staff have also reviewed the groundwater chemistry from the perspective of using two parameters (chloride and nitrate) to more broadly characterize the quality of the associated groundwater resources.

**Field Work** – Staff continue to monitor a suite of approximately 20 wells to help in charactering specific hydrogeological settings that have been identified across the study area. Also, support was offered to the NVCA and LSRCA staff to assist in the rehabilitation of two recently drilled monitoring wells that had silted up.

**PTTW** – Early in 2015, staff assisted Peel Region in obtaining a PTTW for the community of Palgrave.

**Climate Change and Ecological Flows** – as part of the task of considering the future use of the available groundwater flow models, staff are exploring and contributing climate change, climatic data collection (Community Collaborative Rain Hail and Snow Network (CoCoRhas) and ecological flows discussions at the partner agencies.

**Isotope Project** – in collaboration with the University of Waterloo and York Region, staff continue to collaborate on a project to collect samples across the program study area for isotopic analyses. Results will be used to assist in groundwater flow system delineation with a view to providing independent field checks on numerical groundwater flow models.

#### **Communications**

- Authored a paper entitled “Groundwater knowledge management for southern Ontario: An example from the Oak Ridges Moraine” that was published in the Canadian Water Resources Journal (Vol 39, No.2, - Summer 2014).
- Three papers presented at the 2014 Latornell Conference: i) Quality Assurance and Quality Control for Groundwater Data; ii) Uses of Groundwater Monitoring Data; iii) Source Water Protection modelling: Technical Considerations For the Path Moving Forward.
- Presented a paper at the 2014 CWRA Conference in Hamilton Ontario entitled “A Practical Risk-Analysis Approach for Extreme Rainfall Events in Urban Areas.”
- Contributed to a paper “Spatiotemporal patterns of baseflow metrics for basins draining the Oak Ridges Moraine, southern Ontario, Canada.” – to be published in an upcoming Canadian Water Resources Journal.
- Contributed to the chapter on Ontario in “Canada’s Groundwater Resources” a new textbook led by the Geological Survey of Canada, that provides an overview of the country’s groundwater.

#### **4. Liaison with External Agencies**

In 2014 staff met and corresponded with various external agencies on behalf of the partners. These include:

- **Ontario Geological Survey** – provided access to various wells as part of their ongoing Southern Ontario groundwater chemistry study;
- **Ministry of the Environment and Climate Change** – i) exchanges on database issues; ii) meeting with retiring Central Region staff member (Ross Hodgins) to incorporate vast knowledge source into YPDT Program; involvement in the Great Lakes Water Quality Agreement by contributing to the report on the Status of Groundwater Resources in Urban Areas;
- **Geological Survey of Canada** – attended and presented at the 3<sup>rd</sup> National Workshop on Groundwater and provided input on GSC renewed program in Southern Ontario;
- **City of Ottawa** – provided overview and direction to the City as they prepare to replicate some aspects of our program across the Ottawa area;
- **Toronto Transit Commission** – provide input and data for proposed Scarborough Subway extension;
- **Ministry of Natural Resources** – met in Peterborough to exchange ideas and information with respect to overall water resources management; agreed to take over subscriptions to several modelling and groundwater software applications that MNR was no longer utilizing;
- **Town of Richmond Hill** – providing technical expertise regarding development proposals in sensitive area of artesian pressures on the flank of the Oak Ridges Moraine;
- **Hydro One** – providing technical oversight with respect to the construction of a long term monitoring well on the Oak Ridges Moraine in the Town of Clarington;
- **Trent University** – along with Ganaraska CA, provided technical support to Trent University students who, as part of a senior level study, reviewed and input chemistry data from the eastern parts of the moraine into the database;

#### **5. Budget Summary**

The four senior partners (City of Toronto, Regional Municipalities of York, Peel and Durham) contributed \$175,000 in 2014 (Total of \$700,000). In addition LSRCA, through SWP provided an additional \$35,000 to the program in 2014 to prioritize and assist with the review of the many groundwater flow models across the Lake Simcoe Watershed. The budgeted expenses for the 2014 are summarized in Table 1.

Note:

- part of the annual staff cost allocation was budgeted against Source Water Protection (i.e. additional wages/benefit costs will be shifted to the program as SWP work drops off);
- Computer/Software costs include computer server costs and EFX software upgrades;
- Consultant costs include 2012 through 2014 website hosting costs.

<b>Program Component</b>	<b>2014 Budget</b>
Staff Costs (Wages + Benefits)	\$525,000
Office Costs + Disbursements	\$51,000
Computer + Software Costs	\$53,500
Consultant Costs	\$50,000
Contingency Allocation/Carryover	\$20,500
<b>Total</b>	<b>\$700,000</b>

The program was completed on budget in 2014 and no budget increase is projected for 2015.