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A. DATA SOURCES AND ANALYSIS

A1.1 Data Sources Matrix

To organize the data sources required for preparation of the Assessment Report, 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 watershed region.

The matrix includes 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 Toronto and Region Conservation (TRCA) staff to the Province and the upper tier municipalities. TRCA staff maintains an inventory of the data and metadata received to date.

A1.2 Monitoring Data Sources

TRCA's monitoring networks provide an ongoing source of data that support numerous programs, including Drinking Water Source Protection. TRCA's monitoring databases that are relevant to source water protection planning are summarized in **Table A-1**, which includes data type, status, and spatial coverage and **Table A-2** describes other monitoring databases. TRCA'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:

- Climate (Environment Canada, TRCA, as well as the regional municipalities)
 - Precipitation; and
 - Temperature.
- Surface water (Environment Canada, TRCA)
 - Continuous stream gauges;
 - Low flow measurements; and
 - Surface water quality (Provincial Water Quality Monitoring Network – PWQMN).
- Groundwater (TRCA, municipalities)
 - Water levels; and
 - Quality.

Other monitoring programs, such as aquatic ecosystem studies conducted by the Province and conservation authorities, also contributed to the development the Assessment Report. Surface water quality is important to the overall monitoring of watershed health and is necessary to determine chemical loadings to Lake Ontario, the source of water supply for the majority of the population.

Table A-1: Data Sources for the Assessment Report

Purpose	Boundaries									
Data Sets	Water Resources Information Program (WRIP)	Land Ownership	Watershed (Quaternary)	Municipal Boundaries	Provincial Digital Elevation Model (DEM) - Tiled	Provincial DEM - Tiled (Version 2)	Ortho/DTM DEM	Local DEM (Municipalities - Orthos)	River Cross Sections	
Short Data Description	Identifies the associated Conservation Authorities working cooperatively on Source Water Protection objectives.	Identifies ownership and general use of the land. It includes crown land, private land, and federal land (e.g., Indian Reserves). Indian Reserves and other federal lands were derived from the Ontario Base Mapping (OBM).	A fourth level drainage area. They are subdivisions of tertiary watersheds.	Extents of the following municipal units: 1) Upper Tier Municipalities, 2) Lower Tier Municipalities.	A DEM raster data set that covers the Province of Ontario.	DEM that provides greater elevation information where Digital Terrain Models (DTM), SPOT heights, and constant lake elevations are incorporated.	A DEM generated from the 2002 orthophotography project for Southern Ontario.	DEM products developed independently of federal/provincial government initiatives.	Cross section data that includes depth and position of rivers and streams.	
Purpose	Soils & Geology						Census			
Data Sets	ELC Aggregate Extraction	CANSIS - Ontario Soil Surveys	Geological Survey of Canada (GSC)			Physiography of Southern Ontario	Census of Agriculture	Census of Population		
Short Data Description	Digitized from air photos. Shows the boundary of actual extraction at the time of photography.	Soil surveys generated mainly for agricultural areas across Ontario, all housed within the Canadian Soils Information System (CANSIS). Data are available by county.	Surficial deposit types, material types, and geological features (e.g., drumlins, eskers, hummocky moraine, hummocky glaciofluvial).	Updated surficial geology mapping for the ORM based on new fieldwork and aerial photographic interpretation, complemented by archival field data.	The distribution of bedrock units and geological rock types.	Seamless coverage of bedrock topography and sediment thickness surfaces.	Major physiographic units include, among others, till plains, till moraines, sand plains, kame moraines, and glacial spillways.	Describes the agriculture industry (e.g., number and type of farms, farm operator characteristics, and land management practices). Data are tied to spatial Census Area boundaries.	2006 population and dwelling counts as well as information regarding demographic, social, and economic characteristics. Data are tied to spatial census area boundaries.	
Purpose	Land Cover									
Data Sets	Ecological Land Classification (ELC) Community Series	Southern Ontario Land Resource Information System (SOLRIS)	Evaluated Wetland (Supplemented by Wetland Unit)	Coastal Wetland Monitoring Database	Water Polygon Segment	Oak Ridges Moraine — Wetlands	Environmentally Sensitive Areas (ESA)	Significant Natural Areas	Areas of Natural and Scientific Interest (ANSI)	Zoning By-Law (Muni/City)
Short Data Description	ELC mapping developed by TRCA.	SOLRIS is Ontario-wide ELC mapping to the community series / community class level based on remotely sensed imagery and air photo interpretation.	Lands that are seasonally or permanently flooded by shallow water or are close to the water table surface and have been evaluated under the Ontario Wetland Evaluation process. Wetland units are the geospatial component and contain the basic classification (i.e., marsh, bog, fen, or swamp).	Monitoring water quality, level, and ecology limited to Durham Region.	Wetlands that exist in Water Polygon Segment (GUTs 1802/1803) that have not been evaluated through the Southern Ontario Wetland Evaluation process are unevaluated wetlands.	A dataset of all wetlands within a 2km buffer of the ORM Boundary.	Identifies an area with values that are of local interest and may be designated and managed by a municipality.	Various biological inventories have been undertaken by Conservation Authorities. Often these involve air photo interpretation and field inventories.	ANSIs represent lands and waters that contain important natural landscapes or features that are important for natural heritage, protection, appreciation, scientific study, or education.	Created on paper maps of various scales depending on municipality. Sometimes digitized depending on sophistication of municipality.

Table A-1: Data Sources for the Assessment Report (Continued)

Purpose	Land Cover				Hydrography & Drainage				Groundwater Levels	
Data Sets	Municipal Parcel Assessment Data (MPAC)	Canada Land Inventory (CLI) - NRCan	Land Information Ontario (LIO)	Official Plan (Future)	Waterbody Note: must be supplemented by Water Polygon Segment and Water Line Segment)	Water Virtual Flow	Tile Drains	Municipal Drains	Provincial Groundwater Monitoring Network (PGMN)	Groundwater Elevation (GW Studies)
Short Data Description	Assessment data collected for individual parcels that describe the property type and multiple structures located on the parcel. Data can only be purchased through MPAC or obtained in partnership through municipalities.	Contains land use (1966-88) & land capability for agriculture, forestry, recreation, ungulates, waterfowl, sport fish, etc. up to 14 classes (1968-90).	Types of land units, soils, prime, and classifications developed from soil types and landscape conditions.	Land use designations that provide information on the future development scenario. Sometimes digitized depending on the sophistication of municipality.	Waterbody is a collection of one or more waterbody segments. If an official name exists for a waterbody, it will be recorded on the consolidation, not on each individual segment. Water line segments and water polygon segments are the geospatial components of a waterbody (OBM source with some district updates).	Identifies bodies of water, such as rivers or streams, and is stored in a network format. Virtual segments incorporated to establish directional flow through water features, Water Resources Information Program (WRIP).	Spatial location of tile drains. Tile drains are matched to lots and concessions (cadastral data).	Digitized from the old OMAF paper maps, this coverage is not updated and may be incomplete.	A monitoring network that provides data on groundwater level and groundwater quality for the province.	A groundwater elevation map is developed by collecting numerous measurements of the static water level in an aquifer and interpolating these data points.

Purpose	Climate		Water Withdrawals			Infrastructure — Water				
Data Sets	CA Gauge Stations	Atmospheric Environment Service (AES)	Water Use Assessment (WUA) Database	Water Well Information System (WWIS)	Water Well Information System (WWIS) — Improved	Storm Sewers and/or Combined Sewers and Outflows	Ontario Water Treatment Plants (WTP)	Ontario Sewage Treatment Plants (STP)	Water Structure	Dams
Short Data Description	Meteorological data collected by local municipalities and TRCA.	Provides forecasts and/or warnings of possible weather-related emergencies.	MOECC Permit to Take Water database of permitted water takings (> 50,000 litres/day) from surface and groundwater sources, supplemented with TRCA water use assessment survey data	Georeferenced wells, including groundwater wells, test wells, and abandoned wells.	New and previous spatial and tabular database improvements are being incorporated into the WWIS data.	Conduits for stormwater within municipally serviced areas.	Location of water treatment plants in Ontario based on a compilation of 1997 and 2000 MOECC datasets.	Location of sewage treatment plants in Ontario based on a compilation of 1997 and 2000 MOECC datasets.	Man-made structures inside a waterbody. Minimal descriptive detail provided.	Man-made structures inside a waterbody under MNR jurisdiction.

Purpose	Groundwater Quality					Surface Water Quality			Vulnerability		
Data Sets	Provincial Groundwater Monitoring Network (PGMN)	Water Well Information System (WWIS)	Site Scale Monitoring	Microbiological Sampling & Analysis	OMAF Water Quality Study	Provincial Water Quality Monitoring Network (PWQMN)	Local CA Sampling	Ontario Benthic Biomonitoring Network (OBBN)	Provincial Water Quality Monitoring Network (PWQMN)	Provincial Groundwater Monitoring Network (PGMN)	CA Water Quality Monitoring
Short Data Description	A province-wide monitoring network that provides data on groundwater levels and quality. TRCA has multiple data points for six wells, and baseline data for all 23 wells.	Limited data on water quality provided for some of the wells in the WWIS. Primarily for wells affected by salt, methane, etc.	Varies according to terms of reference for the contaminated site studies (e.g., municipal landfills, petroleum sites, and gas stations).	For health-related water quality incidents that involve microbiological detections. Generally test samples brought in by the public from private wells.	Generally, bottle testing through accredited laboratories. Varies on a site-to-site basis. Available in hard copy only.	Water quality sample collections that are undertaken across the province at approximately two hundred sites.	Local water samples and field/lab tests.	Monitors the state of organisms living in or on the bottom of waterbodies.	Water quality sample collections undertaken across the province at approximately two hundred sites.	Designed to provide good quality data (current and historical) on geological/ stratigraphic groundwater level and groundwater quality for the province.	TRCA collects water samples and conducts some field and lab tests. Samples are sent to an accredited laboratory for additional testing.

Table A-1: Data Sources for the Assessment Report (Continued)

Purpose	Streamflow					Groundwater				
Data Sets	CA Gauge Stations	Water Survey of Canada (WSC)/HYDAT — daily	Water Survey of Canada (WSC)/HYDAT — hourly	Baseflow (CAs/Private)	Enhanced Flow Direction (EFDIR)	CA Mapped Aquifer Recharge/Discharge Areas	3-D Mapping for Aquifer Distribution and Thickness	Water Well Information System (WWIS)	Historical Stream Mapping	Potential Springs in the ORM, Southern Ontario from Aerial Thermography
Short Data Description	Gauge data stored in MS Access database (Envirobase). Conversion to SQL underway.	Daily measures of river flow and records of lake/river levels.	Hourly measures of river flow and records of lake/river levels.	Captured by various methodologies depending on authority (e.g., Panel Method, Culvert Method, or Bucket Method).	A flow-corrected flow direction grid based on mapped hydrography based on the Provincial DEM. A fundamental dataset for ArchHydro and therefore a recommended dataset for Source Water Protection.	Recharge areas are where precipitation readily infiltrates an aquifer. Discharge areas are where groundwater is released to the surface.	The York-Peel-Durham-Toronto Groundwater Management Study team has prepared interpreted surfaces for both aquifers and aquitards.	Georeferenced wells, including groundwater wells, test wells, and abandoned wells. New and previous spatial and tabular database.	Historical stream mapping completed by TRCA staff. Data exists in varying formats.	Data extracted from thermal infrared images showing a contrast in surface temperatures. Warm areas on the thermal image coincide with portions of streams and may indicate significant groundwater discharge locations.

Purpose	Threats & Contaminants				Fisheries Data			
Data Sets	Cemeteries Windshield Survey	Petroleum Wells	Waste Disposal Site	Unserviced Areas	Ontario Stream Assessment Protocol (OSAP)	Aquatic Resource Monitoring Program (ARMP)	Aquatic Resource Area (ARA)	
Short Data Description	A windshield survey was conducted in wellhead protection areas to identify potential contaminant sources, including cemeteries.	LIO class: Petroleum Well. Full details in the Ontario Oil, Gas, and Salt Resources Library.	A site dedicated to the systematic destruction, transformation, burial, or storage of waste material. TRCA staff has updated the information since the initial NRVIS load.	Areas that do not have municipal sewage and/or water services.	Field data such as species, temperature, habitat, geomorphology, and baseflow stored in the HABPROGS database.	Data from a variety of sources regarding past and present conditions of this system. The results of the field program are presented to assess current condition/health of the watershed's aquatic resources.	ARA describes an area of a waterbody (e.g., identifies the thermal regimes for a stream and physical characteristics of the water). ARA Line Segment and ARA Polygon Segment are the geospatial components of the ARA.	Thermal classification of streams and waterbodies.

Table A-2: Monitoring Databases and Data Descriptions

Database Name	Data				
	Type	Format	Period of Record	Coverage Area	Recording/Collection Frequency
Durham Region Coastal Wetlands Monitoring Database	Turbidity	access	2002 – present	8 coastal wetlands	Monthly readings
	Water levels	excel	2003 – present	5 coastal wetlands	Continuous readings
	Water temperature	excel	2003 – present	5 coastal wetlands	Continuous readings
	Sediment quality	access	2002	8 coastal wetlands	5-year rotation collection
	Fish community	access	2003 – present	8 coastal wetlands	Monthly collection
	Invertebrate	access	2003 – present	8 coastal wetlands	Monthly collection
	Submerged plants	access	2003 – present	8 coastal wetlands	Monthly collection
Wetland Evaluation Database	MNR 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
OSAP Bio-Monitoring Database	Ontario Stream Assessment Protocols	access	Initiated 2005	149 sites	variable
Species Database	Terrestrial species attributes	access	2003 – present	Jurisdiction	Seasonal collection
Regional Monitoring Network Databases	Groundwater quality (TRCA/PGMN)	access	2001 – present	23 sites; limited data for all but 6 sites.	1 sample collected per site per year for 6 sites. Additional sites added for 2009.
	Manual groundwater level measurements (TRCA/PGMN)	access	2001 – present	9 sites in 2001, increased to 22 sites currently	Periodic manual measurements to verify hourly data
	Automated groundwater level measurements (TRCA/PGMN)	access	2001 – present	9 sites in 2001, increased to 22 sites currently	Hourly readings
	Surface water quality (TRCA/PWQMN)	access	1965 – present	19 sites	Monthly collection at PWQMN sites; two samples collected per year at TRCA sites;

Regional Monitoring Network Databases	Surface water flows	access	1959 – present depending on station	63 gauges currently in all TRSPA watersheds	Continuous gauges installed and maintained by Water Survey of Canada plus TRCA
	Rainfall and climate stations	access	1936 – present	97 active locations by TRCA, AES, municipalities	Continuous – see Table A-3
	Snow pack	access	1998 – present	12 locations	Bi-weekly – seasonal
	Low flows (TRSPA)	access	2000 - present	68 sites	4 – 6 measurements per index site per year. Additional single year measurements
	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	access	2002 - present	628 water users in TRCA's Water Use Assessment database	As identified
ORMGP Database	Subsurface/well data	access	1950s – present	Jurisdiction	As identified
	Climatic data	access	1960s – present	Jurisdiction	As identified
	Surface water data	access	1960s – present	Jurisdiction	As identified
	PTTW data	access	2002 – present	Jurisdiction	As identified

A1.2.1 Stream Flow Gauging

Stream gauge data are required for water budgets, assimilative capacity studies, water takings, aquatic studies, and recharge and discharge analyses. Total flows, base flows, mean daily flows, and mean monthly flow information is derived from the raw level data and stream section and profile survey information.

There are 63 active or “open” stations (**Table A-**), which include both Environment Canada’s Water Survey of Canada (WSC) and TRCA stations.

A1.2.2 Precipitation/Meteorological Gauging

Monitoring and measuring precipitation is a fairly simple process. One must obtain an accurate sample of the precipitation falling at the location of the gauge and have sufficient spatial coverage throughout the watershed to permit accurate estimates of the volume of water falling on a watershed. This information is currently compared with runoff volumes and quantitative hydrologic forecasting. Two types of climate station measurement locations operate within the watershed rain gauges, and complete climate stations. Some of each are operated and maintained by TRCA, while others are maintained by the Atmospheric Environment Service (AES) or TRCA’s municipal partners. These climate stations, most of which comprise tipping bucket rain gauges, are summarized on **Table A-3**. The data are collected by AES and are available from the Environment Canada website.

A1.2.3 Snow Cover Monitoring

TRCA operates and maintains snow course surveys at twelve locations, with ten measurement sites per location. These locations are identified in **Table A-4**. A snow course location consists of a series of numbered posts driven into the ground 30 metres apart, usually in a straight line. The water content is calculated based on the weight of the snow in a core sampler. One ounce of snow in the sampler contains the equivalent of one inch of water. Snow course measurements are taken twice monthly, from December to May.

A1.2.4 Groundwater Monitoring

In partnership with the MOECC, TRCA operates and maintains a network of 22 groundwater monitoring wells located throughout the watershed (**Table A-6**). Loggers were installed in the monitoring wells from 2000 to 2003 and automatically record water levels and temperature. Dataloggers measure absolute pressure (water pressure + atmospheric pressure), expressed in centimetres of water column.

The data are downloaded and sent electronically to the MOECC Provincial Groundwater Monitoring Information System database (PGMIS). The data are locally exported from PGMIS into the YDPT database using a SITEFX (specialized software) interface. TRCA staff is required to perform QA/QC activities to verify the continued accuracy of the data. Water levels are periodically measured manually to ensure that the automated systems are functioning correctly. QA/QC activities for all TRCA wells have not been completed at this time. Efforts are being made to align non-SWP funded program deliverables to support SWP analytical requirements.

Water samples are collected from selected wells in the fall each year and are analyzed routinely for general chemistry and metals. Baseline water quality samples have been taken from every well in the network. Data from five wells are provided by either the MOECC (Stouffville 700) or York Region (MW-2, 9, and 26; STO-18-87).

Table A-3: TRCA/ Provincial Stream Gauge Network

Location	TRCA ID	WSC ID	Status	Record Length	Operator	Watershed	Easting	Northing	Telemetry
TRCA/City	20	n/a	Closed	1999-2000	Toronto	Highland Creek	641820.0	4846055.8	no
TRCA/City	21	n/a	Closed	1999-2000	Toronto	Highland Creek	642705.9	4846147.0	no
Ganatsckaigon Creek near Pickering	31	02HC114	Closed	1976-81, 2003 - Current	TRCA	Duffins Creek	654195.0	4858433.0	no
Rossland & Harwood – Millers Creek	35	n/a	Closed	Temporary	TRCA	Duffins Creek	657863.4	4860429.4	no
Burdenet Creek – Kennedy and Austin Drive	36	n/a	Closed	2001- 2005	TRCA	Rouge River	636760.0	4858582.0	no
Rossland & Harwood – Millers Creek	59	n/a	Closed	1999	TRCA	Duffins Creek	657074.2	4861183.5	no
SWM Pond Monitoring	60	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
SWM Pond Monitoring	61	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
SWM Pond Monitoring	62	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
SWM Pond Monitoring	63	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
SWM Pond Monitoring	64	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
SWM Pond Monitoring	65	n/a	Closed	2000	Richmond Hill	Rouge River	n/a	n/a	no
Stouffville Creek below Stouffville	72	02HC035	Closed	1974 - 1982	WSC	Duffins Creek	641833.7	4868479.0	no
Reesor Creek near Altona	73	02HC040	Closed	1974 - 1976	WSC	Duffins Creek	643780.4	4868408.9	no
West Duffins near Altona	74	02HC041	Closed	1974 - 1982	WSC	Duffins Creek	645271.1	4868899.9	no
Wixon Creek below Altona	75	02HC046	Closed	1974 - 1982	WSC	Duffins Creek	645849.9	4869092.8	no
Michell Creek below Claremont	76	02HC045	Closed	1974 - 1982	WSC	Duffins Creek	650286.9	4869320.9	no
Major Creek above Green River	77	02HC037	Closed	1974 - 1976	WSC	Duffins Creek	645148.4	4863182.7	no
West Duffins @ Green River	78	02HC026	Closed	63-68, 70-73, 74-88	WSC	Duffins Creek	645867.5	4862709.2	no
Ganatsckaigon Creek near Brougham	79	02HC042	Closed	1974 - 1976	WSC	Duffins Creek	649147.0	4863656.2	no
Urfe near Brougham	80	02HC043	Closed	1974 - 1976	WSC	Duffins Creek	651444.5	4864410.4	no
Brougham @ Brougham	81	02HC044	Closed	1974 - 1976	WSC	Duffins Creek	651918.0	4864533.1	no
West Duffins near Pickering	82	02HC106	Closed	1965 - 1988	WSC	Duffins Creek	654057.7	4856992.0	no
Duffins Creek @ Ajax-west	83	02HC049	Closed	1989-1991	WSC	Duffins Creek	655829.0	4857325.3	no
West Humber @ Highway 7	1	02HC031	Open	1965 - Current	WSC	Humber River	606343.0	4845873.0	yes
Don River @ Todmorden	2	02HC024	Open	1962 - Current	WSC	Don River	632064.0	4838284.0	yes

Location	TRCA ID	WSC ID	Status	Record Length	Operator	Watershed	Easting	Northing	Telemetry
Etobicoke @ QEW*	3	02HC030	Open	1966 - Current	WSC	Etobicoke Creek	616520.0	4828660.0	yes
West Duffins above Green River	4	02HC038	Open	1974 - Current	WSC	Duffins Creek	646170.0	4864102.0	yes
Duffins Creek above Pickering	5	02HC019	Open	1960 - Current	WSC	Duffins Creek	655888.0	4861628.0	yes
Duffins at Ajax	6	02HC049	Open	1989 - Current	WSC	Duffins Creek	656251.0	4856909.0	yes
Mimico @ Islington	7	02HC033	Open	1965 - Current	WSC	Mimico Creek	619394.0	4833768.0	yes
Humber River @ Weston Road*	8	02HC003	Open	1945 - Current	WSC	Humber River	619215.0	4839500.0	yes
Blk Creek @ Scarlett Road	9	02HC027	Open	1966 - Current	WSC	Humber River	620571.0	4836774.0	yes
West Don @ York Mills*	10	02HC005	Open	1945 - Current	WSC	Don River	628585.0	4844255.0	yes
G. Ross Lord Dam	11	n/a	Open	1973 - Current	TRCA	Don River	623798.0	4847711.0	yes
Claireville Dam*	12	n/a	Open	19XX - Current	TRCA	Humber River	610299.0	4843563.0	yes
Little Don @ York Mills	13	02HC029	Open	1964 - Current	WSC	Don River	633243.0	4846331.0	yes
Highland Creek – Morningside Works*	14	02HC013	Open	1956 - Current	WSC	Highland Creek	645529.0	4848842.0	no
East Humber	15	n/a	Open	1999 - Current	Richmond Hill	Humber River	621687.7	4867262.3	no
Lake Wilcox – Inflow	16	n/a	Open	1998 - Current	Richmond Hill	Humber River	625930.5	4867804.3	no
Rouge at Highway 404	17	n/a	Open	1998 - Current	Richmond Hill	Rouge River	630126.5	4859368.2	no
Morningside Creek at Steeles	18	n/a	Open	1998 - Current	Schaeffers	Rouge River	641559.3	4855553.1	no
Morningside Creek at Finch Avenue East	19	n/a	Open	1998 - Current	Schaeffers	Rouge River	643643.9	4853429.6	no
Humber River @ Palgrave	22	02HC047	Open	1981-98, 2002 - Current	WSC	Humber River	594477.0	4864609.0	yes
Cold Creek near Bolton*	23	02HC023	Open	1962 - Current	WSC	Humber River	603013.0	4860225.0	yes
Humber River @ Elder Mills	24	02HC025	Open	1962 - Current	WSC	Humber River	610353.1	4851994.4	yes
East Humber River @ Pine Grove	25	02HC009	Open	1953 - Current	WSC	Humber River	613896.0	4849539.0	yes
East Humber River @ King Creek*	26	02HC032	Open	1965 - 93, 2002 - Current	WSC	Humber River	611487.0	4862025.0	yes
Etobicoke Creek at Brampton	27	02HC017	Open	1957 - Current	WSC	Etobicoke Creek	599945.0	4838374.0	yes
Reesor Creek @ 8 th Concession	28	02HC039	Open	1976 -93, 1997 - Current	TRCA	Duffins Creek	644392.0	4866289.0	no
Brougham Creek @ 5 th Concession	29	02HC044	Open	1974 - Current	TRCA	Duffins Creek	654668.0	4863409.0	no
Urfe Creek @ Rossland Rd	30	02HC043	Open	1974 - Current	TRCA	Duffins Creek	651488.0	4864382.0	no

Location	TRCA ID	WSC ID	Status	Record Length	Operator	Watershed	Easting	Northing	Telemetry
Carruthers @ Bayly Street	32	n/a	Open	2002 - Current	TRCA	Carruthers Creek	660801.0	4857058.0	no
Little Rouge Near Locust Hill*	33	02HC028	Open	1964 - Current	WSC	Rouge River	643313.0	4863176.0	yes
Rouge River near Markham*	34	02HC022	Open	1961 - Current	WSC	Rouge River	641960.0	4857663.0	yes
Upper Humber @ Highway 9	38	02HC057	Open	2005 - Current	WSC	Humber River	589223.0	4869168.0	yes
Centreville Creek near Albion*	39	02HC051	Open	2005 - Current	WSC	Humber River	593558.0	4864120.0	yes
Humber @ Goreway Road	41	n/a	Open	2002 - Current	TRCA	Humber River	604266.0	4846971.0	no
German Mills at Highway 7	44	n/a	Open	2001 - Current	Richmond Hill	Don River	628377.3	4855432.1	no
Taylor Creek	45	n/a	Open	2004 - Current	TRCA	Don River	634709.0	4840084.0	no
Highland Creek – Malvern Branch	46	n/a	Open	2003 - Current	TRCA	Highland Creek	642291.0	4850971.0	no
Little Rouge near Dicksons Hill	48	02HC053	Open	2002 - Current	WSC	Rouge River	637946.0	4865057.0	yes
Pine Creek at Radom	51	n/a	Open	2000 - Current	TRCA	Frenchman’s Bay	653715.0	4854297.0	no
Krosno Creek at Sandy Beach Road	52	n/a	Open	2000 - Current	TRCA	Frenchman’s Bay	654838.0	4854106.0	no
Michell Creek – Claremont CA	53	n/a	Open	2001 - Current	TRCA	Duffins Creek	653691.0	4868213.0	no
East Duffin Creek – Claremont CA	54	n/a	Open	2001 - Current	TRCA	Duffins Creek	653994.0	4868084.0	no
Petticoat Creek Conservation Area		n/a	Open	2001 - Current	TRCA	Petticoat Creek	652003.0	4851818.0	no
Mimico Creek – Wildwood Park	55	n/a	Open	2003 - Current	TRCA	Mimico Creek	610348.0	4840698.0	no
Rouge West – Eglin East	57	n/a	Open	2001 - Current	Richmond Hill	Rouge River	626764.0	4861911.0	no
Lake Wilcox Gauge – outflow	58	n/a	Open	1998 - Current	Richmond Hill	Humber River	624939.5	4867231.3	no
Rouge East	66	n/a	Open	2000 - Current	Richmond Hill	Rouge River	629461.1	4860387.2	no
Don River East @ Thornhill	68	02HC056	Open	2005 - Current	WSC	Don River	625533.0	4853870.0	no
Plunkett Creek	70	n/a	Open	2004 - Current	TRCA	Humber River	612501.0	4848127.0	no
Ganetsekiagon Creek	71	n/a	Open	2003 - Current	TRCA	Duffins Creek	653861.0	4858804.0	no
Beaver Creek at Highway 404	84	n/a	Open	2006 - Current	Richmond Hill	Rouge River	630563.0	4857068.0	no
Spring Creek	89	n/a	Open	2003 - Current	TRCA	Etobicoke Creek	606856.0	4838498.0	no
Etobicoke Creek @ Derry & Dixie	90	n/a	Open	2003 - Current	TRCA	Etobicoke Creek	606743.0	4836865.0	no
Morningside Tributary	91	n/a	Open	2003 – 2004	Schaeffers	Rouge River	642521.8	4854770.0	no
West Don River @ Dufferin & Steeles	93	n/a	Open	2005 - Current	TRCA	Don River	622908.0	4850018.0	tbd
West Duffins @ Highway 7	95	n/a	Open	2005 - Current	TRCA	Duffins Creek	646080.0	4862510.0	n/a
Highland Creek @ Bellamy and Lawrence	97	n/a	Open	2005 - Current	WSC	Highland Creek	642157.0	4845942.0	yes

Location	TRCA ID	WSC ID	Status	Record Length	Operator	Watershed	Easting	Northing	Telemetry
Black Creek @ Steeles	98	n/a	Open	2006 - Current	TRCA	Humber River	619046.0	4848181.0	tbd
Stouffville Dam*	99	n/a	Open	2005 - Current	TRCA	Duffins Creek	640347.0	4870869.0	tbd
Milne Dam	100	n/a	Open	2005 - Current	TRCA	Rouge River	641960.0	4858582.0	tbd
East Don at Highway 7	101	n/a	Open	2006 - Current	Richmond Hill	Don River	624885.0	4854462.0	no
Rouge @ Highway 7	104	n/a	Open	2006 - Current	TRCA	Rouge River	n/a	n/a	tbd
Black Creek at Wilson/401	105	n/a	Open	2006 - Current	TRCA	Humber River	n/a	n/a	tbd

Table A-4: TRCA Climate Stations

TRCA Gauge Name	Owner	Status	Telemetry	Easting (N83)	Northing (N83)	Gauge Type	Historical Record Length	Seasonal / Year Round
Buttonville Airport	AES	open	no	630277.6	4857494.1		1985 - Current	year round
Dufferin Office	AES	open	no	623279.6	4848867.1	Tipping Bucket	n/a	seasonal
Pearson International Airport	AES	open	no	612653.9	4836480.8	Tipping Bucket	1936 - Current	year round
Toronto Island Airport	AES	closed	no	629097.4	4831855.5		1956 - 2006	seasonal
Trinity	AES	open	no	629299.7	4836396.5	Tipping Bucket	n/a	seasonal
Albion	City of Toronto	open	no	614137.2	4844028.6		1979 - Current	year round
Ancaster CC	City of Toronto	open	no	622852.5	4843314.6	Tipping Bucket	1991 - Current	seasonal
Bering	City of Toronto	open	no	618353.4	4832546.9		1979 - Current	year round
Bermondsey Yard	City of Toronto	open	no	635104.7	4842538.2	Tipping Bucket	1991 - Current	seasonal
Booth	City of Toronto	open	no	633339	4834809.1	Tipping Bucket	1979 - Current	year round
Brown	City of Toronto	open	no	629178.7	4836987.9	Tipping Bucket	1979 - Current	year round
Castlefield	City of Toronto	open		623545.7	4841056.8		2001 - Current	year round
Central	City of Toronto	open	no	627251.1	4834978.2	Tipping Bucket	1979 - Current	year round
Church	City of Toronto	open	no	630651.3	4835745	Tipping Bucket	1979 - Current	year round
Cummer Arena	City of Toronto	open	no	630916.8	4850888.5	Tipping Bucket	1991 - Current	seasonal
Downsview Arena	City of Toronto	open	no	620021.4	4841863.2	Tipping Bucket	1991 - Current	seasonal
Earle Bales CC	City of Toronto	open	no	625949.4	4845767.7	Tipping Bucket	1991 - Current	seasonal
Ellesmere Yard	City of Toronto	open	no	639149	4847751.9	Tipping Bucket	1999 - Current	seasonal
Emery Yard	City of Toronto	open	no	616668.9	4846074.3	Tipping Bucket	1991 - Current	seasonal
Finch Yard	City of Toronto	open	no	622658.3	4847208.9	Tipping Bucket	1991 - Current	seasonal
Forest Hill	City of Toronto	open	no	627844.7	4838903.1	Tipping Bucket	1979 - Current	year round
Greenwood	City of Toronto	open	no	634437.2	4837308.6	Tipping Bucket	1979 - Current	year round
Highland Creek Treatment Plant	City of Toronto	open	no	649559.5	4848169.7	Tipping Bucket	1995 - Current	year round
Howard	City of Toronto	open	no	624855.7	4834274.7	Tipping Bucket	1979 - Current	year round
Kew Beach	City of Toronto	open	no	636780.7	4836487.9	Tipping Bucket	1979 - Current	year round
Kimberly	City of Toronto	open	no	637072.9	4838011.3	Tipping Bucket	1979 - Current	year round
Kipling	City of Toronto	open	no	619346.7	4829268		1979 - Current	year round
Main Treatment Plant	City of Toronto	closed	no	642772.9	4841658.7	graduated cylinder	1986 - 2000	year round

TRCA Gauge Name	Owner	Status	Telemetry	Easting (N83)	Northing (N83)	Gauge Type	Historical Record Length	Seasonal / Year Round
Martin Grove	City of Toronto	open	no	614452.3	4837390.7		1979 - Current	year round
Maryvale Public School	City of Toronto	open	no	635790.2	4847340	Tipping Bucket	n/a	seasonal
Mc Nicoll and Kennedy	City of Toronto	open	no	637171.7	4850605.6	Tipping Bucket	n/a	seasonal
Mitchell Field CC	City of Toronto	open	no	627738.1	4848231	Tipping Bucket	1991 - Current	seasonal
Morningside Yard	City of Toronto	open	no	645440.2	4850241	Tipping Bucket	2004 - Current	seasonal
Nashdene Yard	City of Toronto	open	no	640713.7	4853367.9	Tipping Bucket	2004 - Current	seasonal
North Toronto	City of Toronto	open	no	629063.6	4840879.6	Tipping Bucket	1979 - Current	year round
Old Weston	City of Toronto	open	no	623731.4	4836822	Tipping Bucket	n/a	year round
Oriole Yard	City of Toronto	open	no	631427.8	4847403.1	Tipping Bucket	n/a	seasonal
Providence Villa	City of Toronto	closed	no	638261.7	4841414.4	Tipping Bucket	n/a	seasonal
Richview	City of Toronto	open	no	617738.8	4837339.7		1979 - Current	year round
St Augustine Seminary	City of Toronto	open	no	641969.1	4841953.1	Tipping Bucket	n/a	seasonal
Swansea	City of Toronto	open	no	622803.2	4833428.6	Tipping Bucket	1979 - Current	year round
Thornccliffe	City of Toronto	open	no	632870.4	4841783	standard conical	2001 - Current	year round
Toronto Island Airport	City of Toronto	open	no	629562.7	4832199.5	Tipping Bucket	1979 - Current	year round
Toronto Zoo	City of Toronto	open	no	646330.2	4853543.9	Tipping Bucket	1994 - Current	seasonal
Centre and Bathurst	City of Vaughan	open	no	624309	4852488.1	Tipping Bucket	1998 - Current	year round
Islington and Rutherford	City of Vaughan	open	no	612841.2	4852467.7	Tipping Bucket	1998 - Current	year round
Keele and Major Mackenzie	City of Vaughan	open	no	619035	4857312.6	Tipping Bucket	1998 - Current	year round
Cherrywood Transformer Station	Ontario Hydro	open	no	651520.1	4855974.4	Tipping Bucket	n/a	year round
Bramalea Road	Peel Region	open	yes	603433	4841331.7	Tipping Bucket	1995 - Current	seasonal
Britannia Road West	Peel Region	open	yes	603044	4827932.8	Tipping Bucket	1995 - Current	year round
Dixie Road	Peel Region	open	yes	612953.7	4829981	Tipping Bucket	1995 - Current	seasonal
East Avenue	Peel Region	open	yes	616003.3	4825235.1	Tipping Bucket	1995 - Current	seasonal
Falbourne Street	Peel Region	open	yes	606607	4830281.9	Tipping Bucket	1995 - Current	year round
Fir Tree	Peel Region	open	yes	607679.7	4838382.9	Tipping Bucket	1995 - Current	seasonal
Hurontario Road	Peel Region	open	yes	601976.2	4834688	Tipping Bucket	1995 - Current	seasonal
Lakeshore Road	Peel Region	open	yes	612378.5	4816585.9	Tipping Bucket	1995 - Current	year round
Mississauga Valley Blvd	Peel Region	open	yes	610979.2	4828011.4	Tipping Bucket	1995 - Current	seasonal

TRCA Gauge Name	Owner	Status	Telemetry	Easting (N83)	Northing (N83)	Gauge Type	Historical Record Length	Seasonal / Year Round
Old King Road	Peel Region	open	yes	602083.8	4859300.6	Tipping Bucket	1995 - Current	seasonal
Orenda Road	Peel Region	open	yes	601368.4	4839154.6	Tipping Bucket	1995 - Current	seasonal
Queen Street	Peel Region	open	yes	599065.2	4836048.1	Tipping Bucket	1995 - Current	seasonal
Sandalwood Parkway	Peel Region	open	yes	596585	4841188.6	Tipping Bucket	1995 - Current	seasonal
South Common	Peel Region	open	yes	607798.4	4820615.5	Tipping Bucket	1995 - Current	year round
Truscott	Peel Region	open	yes	609298.9	4818451.8	Tipping Bucket	1995 - Current	year round
Williams Parkway	Peel Region	open	yes	604342.6	4844193.6	Tipping Bucket	1995 - Current	seasonal
Wolfedale Road	Peel Region	open	yes	608812.9	4825808.4	Tipping Bucket	1995 - Current	year round
48 th & 16 th	Town of Markham	open	no	638950.8	4861362.1	Tipping Bucket	n/a	seasonal
John Street FH	Town of Markham	open	no	628658	4853147.4	Tipping Bucket	1996 - Current	seasonal
Ruggles Ave	Town of Markham	open	no	626629.1	4854552.8	Tipping Bucket	1996 - Current	seasonal
Unionville FH	Town of Markham	open	no	635881.5	4859568.9	Tipping Bucket	1996 - Current	seasonal
Yonge and King Road	Town of Richmond Hill	open	no	623859.7	4866677.2		n/a	year round
Ajax Works Yard	TRCA	open	no	658832	4855761	Tipping Bucket	2003 - Current	seasonal
Albion Hills CA	TRCA	open	no	593103	4864192	Tipping Bucket	2004 - Current	seasonal
Alex Duff Memorial Pool	TRCA	open	no	627227	4835871	Tipping Bucket	2005 - Current	seasonal
Boyd Field Centre	TRCA	closed	no	611908	4853880	Tipping Bucket	2002 - 2009	seasonal
Bruce's Mill CA	TRCA	open	no	633059	4867308	Tipping Bucket	2002 - Current	seasonal
Centreville Creek	TRCA	closed	yes	593558	4864120	weighing gauge	n/a	year round
Claireville Dam	TRCA	open	no	609964	4844104	Tipping Bucket	2001 - Current	seasonal
Claremont CA	TRCA	open	no	654490	4868058	Tipping Bucket	2002 - Current	seasonal
Don River at York Mills	TRCA	closed	yes	628585	4844255	Tipping Bucket	2003 - 2010	seasonal
Dufferin Reservoir	TRCA	open	no	622278	4854337	Tipping Bucket	2005 - Current	seasonal
Etobicoke Creek near QEW	TRCA	open	yes	616520	4828660	Tipping Bucket	2005 - Current	seasonal
Glen Haffy CA	TRCA	open	no	584023	4865514	Tipping Bucket	2002 - Current	seasonal
Goodwood Pumping Station	TRCA	open	no	644323	4877013	Tipping Bucket	2004 - Current	seasonal
Heart Lake CA	TRCA	open	no	597462	4843636	Tipping Bucket	2002 - Current	seasonal
Kennedy Pump Station	TRCA	open	no	n/a	n/a	Tipping Bucket	2006 - Current	seasonal
King and Albion-Vaughan	TRCA	open	no	603013	4860225	Tipping Bucket	2006 - Current	seasonal

TRCA Gauge Name	Owner	Status	Telemetry	Easting (N83)	Northing (N83)	Gauge Type	Historical Record Length	Seasonal / Year Round
King Creek @ Mill Road	TRCA	open	yes	611487	4862025	Tipping Bucket	2003 - Current	seasonal
Laidlaw Bus Depot	TRCA	open	no	599721	4850072	Tipping Bucket	2005 - Current	seasonal
Lawrence Avenue and Weston Road	TRCA	closed	yes	619215	4839500	Tipping Bucket	2005 - 2009	seasonal
Lloyd Ham Farm	TRCA	closed	no	640652	4864038	Tipping Bucket	2004 - 2005	seasonal
Millers Creek Station	TRCA	closed	no	657300	4862132.9	Tipping Bucket	1999 - 2000	seasonal
Mississauga Works Yard	TRCA	open	no	607991	4838450	Tipping Bucket	2005 - Current	seasonal
Morningside Works Yard	TRCA	open	yes	645529	4848842	Tipping Bucket	2005 - Current	seasonal
Petticoat Creek CA	TRCA	open	no	651703	4851811	Tipping Bucket	2003 - Current	seasonal
Pickering City Hall	TRCA	closed	no	653608	4855270	Tipping Bucket	2001 - 2004	seasonal
Reesor near Highway 7	TRCA	open	yes	643313	4863176	Tipping Bucket	2005 - Current	seasonal
Rouge River at 14 th	TRCA	closed	yes	641960	4857663	Tipping Bucket	2003 - 2007	seasonal
St. Wilfrid School	TRCA	closed	no	654177	4858701	Tipping Bucket	2002 - 2007	seasonal
Stouffville Dam	TRCA	open	no	640347	4870869	Tipping Bucket	2005 - Current	seasonal
Stouffville WPCP	TRCA	closed	no	640881.9	4869846.7	Tipping Bucket	2002	seasonal
Sue Grange Farm	TRCA	open	no	589843	4847840	Tipping Bucket	2005 - Current	seasonal
Town of Caledon Pumping Station	TRCA	open	no	591256	4857875	Tipping Bucket	2002 - Current	seasonal
TRCA Head Office	TRCA	open	yes	619623	4847523	Tipping Bucket	2003 - Current	seasonal
York Pumping Station	TRCA	open	no	622489	4863741	Tipping Bucket	2004 - Current	seasonal
York Region Works Yard	TRCA	open	no	629933	4860292	Tipping Bucket	2004 - Current	seasonal
U of T – Scarborough Campus	University of Toronto	open	no	645464.1	4849498.5	Tipping Bucket	1996 - Current	year round
Humber	York Region	open	no	614285	4846657		2005 - Current	year round
Leslie Pumping Station	York Region	open	no	630165.5	4851895.3	Tipping Bucket	1995 - Current	seasonal
McCowan and 16 th	York Region	open	no	637831.1	4861135.3	Tipping Bucket	1995 - Current	seasonal
Pugsley	York Region	closed	no	626322.5	4859254.6	Tipping Bucket	n/a	seasonal
Stouffville Works	York Region	open	no	641612.8	4871520	Tipping Bucket	1995 - Current	seasonal

Table A-5: Snow Course Locations

Station	Watershed	Location	Record Frequency (Nov-May)	Period of Record
2307	Etobicoke	Heart Lake Conservation Area	Bi-weekly	1998 - Present
2302	Humber	Cold Creek Stream Gauge	Bi-weekly	2003 - 2004
2301	Humber	Albion Hills Farm	Bi-weekly	2004 - Present
2304	Humber	Boyd Conservation Area	Bi-weekly	2004 - Present
2303	Humber	Claireville Dam	Bi-weekly	2005 - Present
2310	Don	G.Ross Lord Park	Bi-weekly	1998 - Present
2309	Rouge	Milne Conservation Park	Bi-weekly	1998 - Present
2308	Rouge	Bruce's Mill Range	Bi-weekly	2004 - Present
2305	Duffins	Claremont Shop	Bi-weekly	2004 - 2009
2312	Duffins	Greenwood Conservation Area	Bi-weekly	1998 - Present
2311	Duffins	Glen Major Forest	Bi-weekly	2005 - Present
2306	Duffins	Stouffville Dam	Bi-weekly	2003 - 2004

Note: Parameters measured at each location include snow depth and water equivalency

Table A-6: Groundwater Monitoring Locations

Watershed	Subwatershed	Well Name	Data Source	Aquifer	Period of Record
Etobicoke	ET04	W021-1	PGMN	Oak Ridges	Jun 01 - Sep 08
		W366-1	PGMN	Oak Ridges	Sep 03 - Aug 07
Humber	HU01	W325-1	PGMN	Scarborough	Sep 03 - Aug 07
	HU03	W367-1	PGMN	Oak Ridges	Sep 03 - Aug 07
	HU06	W075-1	PGMN	Thornccliffe	Oct 01 - Aug 07
	HU08	W061-1	PGMN	Scarborough	Jul 01 - Aug 07
		W060-1	PGMN	Thornccliffe	Jul 01 - Aug 07
	HU10	W327-3	PGMN	Thornccliffe	Jul 03 - Mar 07
		W327-4	PGMN	Scarborough	Jul 03 - Aug 07
	HU11	W329-1	PGMN	Oak Ridges	Sep 03 - Jan 07
		W330-1	PGMN	Thornccliffe	Feb 04 - Aug 07
HU12	W328-1	PGMN	Bedrock	Jul 03 - Jul 07	
Don	DO04	W017-2	PGMN	Scarborough	Aug 01 - Jun 08
Rouge	RO02	Stouffville 700	MOECC	Oak Ridges	Jun 03- Jul 07
	RO03	MW-09	Municipal	Thornccliffe	Jun 00- Aug 07
		MW-02	Municipal	Scarborough	Jun 00- Aug 07
	RO04	W382-1	PGMN	Oak Ridges	Feb 07 - Jul 07
	RO05	W059-1	PGMN	Oak Ridges	Jul 01 - Jul 07
	RO06	MW-26	Municipal	Thornccliffe	Mar 03- Aug 07
	RO07	W006-1	PGMN	Oak Ridges	Jun 01 - Aug 07
Duffins	DU03	W326-2	PGMN	Shallow	Jul 03 – Oct 08
		W326-3	PGMN	Thornccliffe	Jul 03 – Jul 08
		W045-1	PGMN	Scarborough	Jun 01- Aug 07
	DU04	W012-1	PGMN	Shallow	Jun 01- Aug 07
		W011-1	PGMN	Thornccliffe	Jun 01- Aug 07
		W010-1	PGMN	Scarborough	Jun 01- Aug 07

A1.2.5 Surface Water Quality

Chemical and physical characteristics of surface water quality across the TRCA watersheds are monitored through the Provincial Surface Water Quality Monitoring Network (PWQMN). TRCA participates in this program by collecting monthly samples from April through November. The samples are analyzed for a range of water quality indicators, including temperature, Ph, conductivity, turbidity, suspended solids, major ions, nutrients, metals, and pesticides, in order to screen overall water quality. TRCA staff currently monitors 38 PWQMN stations located at watershed and subwatershed outlets (**Table A-6**). Historical data sets have existed for each site extending back to the early 1960s, though significant gaps in the dataset have been identified (**Table A-7**).

Table A-7: Current Surface Water Quality Sites

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
E14.9	06008000702	Etobicoke Creek	606440	4836994	1965	2009	monthly	PWQMN
E2.8	06008000602	Etobicoke Creek	616234	4829016	2002	2009	monthly	PWQMN
M1.4	Mayfield	Etobicoke Creek	595028	4843488	1973	2009	monthly	RWMP
n/a	MM003WM	Mimico Creek	613849	4837916	2006	2009	monthly	City of Toronto
M1.4	06008200302	Mimico Creek	621585	4831713	1994	2009	monthly	PWQMN
HW16.9	06008300202	Humber River	610869	4843350	1966	2009	monthly	City of Toronto
HB5.6	06008301202	Humber River	620488	4836845	1974	2009	monthly	City of Toronto
n/a	HU010WM	Humber River	615027	4844744	2006	2009	monthly	City of Toronto
n/a	HU1RWMP	Humber River	618678	4848311	2006	2009	monthly	City of Toronto
H35.0	06008300902	Humber River	602980	4860243	1969	2009	monthly	PWQMN
H42.5	06008301802	Humber River	596071	4864366	1975	2009	monthly	PWQMN
H2.9	06008301902	Humber River	621663	4834265	1979	2009	monthly	PWQMN
HW22.0	06008310302	Humber River	606385	4845870	2002	2009	monthly	PWQMN
H43.9	06008310402	Humber River	593560	4864112	2002	2009	monthly	PWQMN
HE20.7	06008300402	Humber River	614148	4850423	1965	2009	monthly	RWMP
H23.9	06008302002	Humber River	610386	4851861	1996	2009	monthly	RWMP
DE17.9	06008500302	Don River	628954	4851256	1966	2009	monthly	City of Toronto
DW20.6	06008500402	Don River	622014	4851207	1966	2009	monthly	City of Toronto
n/a	DM 6.0	Don River	634378	4840251	2001	2009	monthly	City of Toronto
n/a	DN008WM	Don River	630236	4850889	2006	2009	monthly	City of Toronto
D4.5	06008501402	Don River	632000	4838576	1979	2009	monthly	PWQMN
Hi2.5	06009400202	Highland Creek	647429	4849056	1972	2009	monthly	City of Toronto
n/a	RG008WM	Rouge River	641985	4857669	1968	2009	monthly	City of Toronto
RL9.0	RG007WM	Rouge River	644300	4857816	1972	2009	monthly	City of Toronto
R4.2	06009701302	Rouge River	648243	4852830	1973	2009	monthly	City of Toronto

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
RL4.1	06009701102	Rouge River	648007	4852511	1973	2009	monthly	PWQMN
RB20.1	06009701802	Rouge River	634680	4861770	2002	2009	monthly	PWQMN
R18.4	97777	Rouge River	634214	4856823	2001	2009	monthly	RWMP
RL17.4	97999	Rouge River	640589	4863887	1972	2009	monthly	RWMP
Du2.4	06010400102	Duffins Creek	657579	4855880	1964	2009	monthly	PWQMN
DuE17.5	06010400802	Duffins Creek	650372	4869299	1972	2009	monthly	PWQMN
DuW5.3	Brock Ridge	Duffins Creek	654656	4857115	1973	2009	monthly	RWMP
DuE6.8	Paulyn Park	Duffins Creek	655458	4859419	1973	2009	monthly	RWMP
DuE15.4	7th Concession	Duffins Creek	653641	4868158	1973	2009	monthly	RWMP
DuW19.3	8th Concession	Duffins Creek	644191	4866462	1973	2009	monthly	RWMP
C2.8	Shoal Point	Carruthers Creek	660850	4856972	2002	2009	monthly	RWMP
n/a	PT001WM	Petticoat Creek	652005	4851804	2009	2009	monthly	RWMP
n/a	FB003WM	Frenchman's Bay	653663	4854406	2009	2009	monthly	RWMP

Table A-8: Historical Surface Water Quality Sites

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
E14.9	06008000702	Etobicoke Creek	606440	4836994	1965	2009	monthly	PWQMN
E2.8	06008000602	Etobicoke Creek	616234	4829016	2002	2009	monthly	PWQMN
E28.2	Mayfield	Etobicoke Creek	595028	4843488	1973	2009	monthly	RWMP
M1.4	06008200302	Mimico Creek	621585	4831713	1994	2009	monthly	PWQMN
HW16.9	06008300202	Humber River	610869	4843350	1966	2009	monthly	City of Toronto
HB5.6	06008301202	Humber River	620488	4836845	1974	2009	monthly	City of Toronto
H35.0	06008300902	Humber River	602980	4860243	1969	2009	monthly	PWQMN
H42.5	06008301802	Humber River	596071	4864366	1975	2009	monthly	PWQMN
H2.9	06008301902	Humber River	621663	4834265	1979	2009	monthly	PWQMN
HW22.0	06008310302	Humber River	606385	4845870	2002	2009	monthly	PWQMN
H43.9	06008310402	Humber River	593560	4864112	2002	2009	monthly	PWQMN
HE20.7	06008300402	Humber River	614148	4850423	1965	2009	monthly	RWMP
H23.9	06008302002	Humber River	610386	4851861	1996	2009	monthly	RWMP
DE17.9	06008500302	Don River	628954	4851256	1966	2009	monthly	City of Toronto
DW20.6	06008500402	Don River	622014	4851207	1966	2009	monthly	City of Toronto
D4.5	06008501402	Don River	632000	4838576	1979	2009	monthly	PWQMN
Hi2.5	06009400202	Highland Creek	647429	4849056	1972	2009	monthly	City of Toronto
n/a	RG008WM	Rouge River	641985	4857669	1968	2009	monthly	City of Toronto
RL9.0	RG007WM	Rouge River	644300	4857816	1972	2009	monthly	City of Toronto
R4.2	06009701302	Rouge River	648243	4852830	1973	2009	monthly	City of Toronto
RL4.1	06009701102	Rouge River	648007	4852511	1973	2009	monthly	PWQMN
RB20.1	06009701802	Rouge River	634680	4861770	2002	2009	monthly	PWQMN
Du2.4	06010400102	Duffins Creek	657579	4855880	1964	2009	monthly	PWQMN
DuE17.5	06010400802	Duffins Creek	650372	4869299	1972	2009	monthly	PWQMN
DuW5.3	Brock Ridge	Duffins Creek	654656	4857115	1973	2009	monthly	RWMP

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
DuE6.8	Paulyn Park	Duffins Creek	655458	4859419	1973	2009	monthly	RWMP
DuE15.4	7th Concession	Duffins Creek	653641	4868158	1973	2009	monthly	RWMP
DuW19.3	8th Concession	Duffins Creek	644191	4866462	1973	2009	monthly	RWMP
C2.8	Shoal Point	Carruthers Creek	660850	4856972	2002	2009	monthly	RWMP
n/a	06008000502	Etobicoke Creek	617474	4827078	3/15/2000	11/10/2000	n/a	(inactive PWQMN site)
n/a	06008301302	Humber River	589218	4869178	4/4/1974	8/29/1974	n/a	(inactive PWQMN site)
n/a	06008301502	Humber River	612730	4842578	4/3/1974	8/2/1974	n/a	(inactive PWQMN site)
n/a	06008301602	Humber River	612740	4842583	4/3/1974	8/2/1974	n/a	(inactive PWQMN site)
n/a	06008310102	Humber River	619195	4839504	3/11/1983	3/11/1983	n/a	(inactive PWQMN site)
n/a	06008310202	Humber River	622835	4832723	3/15/2000	11/10/2000	n/a	(inactive PWQMN site)
n/a	06008500802	Don River	626204	4858973	1/17/1966	1/28/1966	n/a	(inactive PWQMN site)
n/a	06008501802	Don River	632700	4835191	3/15/2000	11/10/2000	n/a	(inactive PWQMN site)
n/a	06010405002	Duffins Creek	652104	4864327	4/8/1980	12/18/1980	n/a	(inactive PWQMN site)
n/a	06010405502	Duffins Creek	655901	4861642	7/31/1995	8/22/1995	n/a	(inactive PWQMN site)
n/a	06010406902	Duffins Creek	647411	4871764	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010407002	Duffins Creek	649002	4872314	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010407102	Duffins Creek	649669	4872547	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010408002	Duffins Creek	641956	4872776	8/17/1995	8/17/1995	n/a	(inactive PWQMN site)
n/a	06010408102	Duffins Creek	649549	4869119	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010408202	Duffins Creek	649398	4869563	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010408302	Duffins Creek	652779	4868123	8/22/1995	8/22/1995	n/a	(inactive PWQMN site)
n/a	06010408402	Duffins Creek	652631	4868535	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010408502	Duffins Creek	653974	4867664	8/21/1995	8/21/1995	n/a	(inactive PWQMN site)
n/a	06010408602	Duffins Creek	645040	4863213	8/18/1995	8/18/1995	n/a	(inactive PWQMN site)
n/a	06010408902	Duffins Creek	646431	4871746	8/18/1995	8/18/1995	n/a	(inactive PWQMN site)
n/a	06010409102	Duffins Creek	657850	4858083	8/23/1995	8/23/1995	n/a	(inactive PWQMN site)

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
n/a	06010409602	Duffins Creek	654966	4864290	8/22/1995	8/22/1995	n/a	(inactive PWQMN site)
n/a	06010409702	Duffins Creek	649874	4859626	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010410202	Duffins Creek	654121	4863860	8/23/1995	8/23/1995	n/a	(inactive PWQMN site)
n/a	06010410302	Duffins Creek	646268	4871461	8/18/1995	8/18/1995	n/a	(inactive PWQMN site)
n/a	06010410402	Duffins Creek	651330	4858408	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010410502	Duffins Creek	651290	4858750	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010410602	Duffins Creek	649310	4859546	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010410702	Duffins Creek	649536	4859455	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010410802	Duffins Creek	640974	4869724	8/17/1995	8/17/1995	n/a	(inactive PWQMN site)
n/a	06010410902	Duffins Creek	650130	4859270	8/24/1995	8/24/1995	n/a	(inactive PWQMN site)
n/a	06010411902	Duffins Creek	646133	4875270	8/30/1995	8/30/1995	n/a	(inactive PWQMN site)
n/a	06010412102	Duffins Creek	646054	4875220	8/30/1995	8/30/1995	n/a	(inactive PWQMN site)
n/a	06008302102	Humber River	613384	4852770	8/28/1995	8/26/1996	n/a	(inactive PWQMN site)
n/a	06008304502	Humber River	603766	4862233	8/30/1995	9/10/1996	n/a	(inactive PWQMN site)
n/a	06008304702	Humber River	616602	4842900	8/29/1995	8/13/1996	n/a	(inactive PWQMN site)
n/a	06008304802	Humber River	610180	4854350	8/29/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06008305602	Humber River	588963	4865305	8/30/1995	8/13/1996	n/a	(inactive PWQMN site)
n/a	06008500702	Don River	626251	4858868	10/28/1965	1/31/1966	n/a	(inactive PWQMN site)
n/a	06008501202	Don River	626297	4857041	10/18/1966	7/6/1967	n/a	(inactive PWQMN site)
n/a	06009701502	Rouge River	645007	4858864	5/31/1973	8/27/1974	n/a	(inactive PWQMN site)
n/a	06009701602	Rouge River	643223	4863213	5/31/1973	8/27/1974	n/a	(inactive PWQMN site)
n/a	06009701702	Rouge River	641079	4863479	5/31/1973	8/27/1974	n/a	(inactive PWQMN site)
n/a	06010401902	Duffins Creek	651842	4858352	5/30/1973	8/28/1974	n/a	(inactive PWQMN site)
n/a	06010404502	Duffins Creek	648371	4860362	5/31/1973	8/11/1974	n/a	(inactive PWQMN site)
n/a	06010405602	Duffins Creek	653089	4861899	7/31/1995	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010405702	Duffins Creek	652568	4862680	7/31/1995	9/18/1996	n/a	(inactive PWQMN site)

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
n/a	06010405902	Duffins Creek	643534	4867490	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406002	Duffins Creek	642308	4867924	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406102	Duffins Creek	641845	4868442	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406202	Duffins Creek	640541	4870158	7/31/1995	8/21/1996	n/a	(inactive PWQMN site)
n/a	06010406302	Duffins Creek	640363	4870808	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406402	Duffins Creek	642564	4870988	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406502	Duffins Creek	643488	4870426	7/31/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406602	Duffins Creek	649466	4870291	8/21/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406702	Duffins Creek	651213	4871964	8/21/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010406802	Duffins Creek	646796	4871550	8/18/1995	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010407202	Duffins Creek	651012	4873017	8/21/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010407402	Duffins Creek	655011	4873614	8/20/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010408702	Duffins Creek	654074	4865349	8/22/1995	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010408802	Duffins Creek	653135	4865003	8/22/1995	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010409002	Duffins Creek	652404	4862624	8/23/1995	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010409302	Duffins Creek	653069	4871623	8/20/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010409502	Duffins Creek	654279	4870602	8/20/1995	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010410102	Duffins Creek	654082	4863872	8/23/1995	9/19/1996	n/a	(inactive PWQMN site)
n/a	06010411002	Duffins Creek	654409	4875238	8/20/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010411102	Duffins Creek	654940	4874386	8/20/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010411702	Duffins Creek	653789	4873989	8/20/1995	9/17/1996	n/a	(inactive PWQMN site)
n/a	06008301102	Humber River	616038	4864531	10/9/1969	11/1/1971	n/a	(inactive PWQMN site)
n/a	06008500602	Don River	626302	4858781	10/28/1965	7/6/1967	n/a	(inactive PWQMN site)
n/a	06008500902	Don River	626179	4859229	10/28/1965	7/6/1967	n/a	(inactive PWQMN site)
n/a	06008501002	Don River	626100	4857427	10/22/1965	9/14/1967	n/a	(inactive PWQMN site)
n/a	06008501102	Don River	627948	4856065	10/28/1965	7/6/1967	n/a	(inactive PWQMN site)

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
n/a	06009701002	Rouge River	646295	4854643	1/3/1974	11/25/1976	n/a	(inactive PWQMN site)
n/a	06010405202	Duffins Creek	654074	4865349	5/20/1980	6/21/1984	n/a	(inactive PWQMN site)
n/a	06009700802	Rouge River	644360	4860778	10/2/1972	12/14/1977	n/a	(inactive PWQMN site)
n/a	06009400102	Highland Creek	649292	4847680	12/3/1964	11/16/1971	n/a	(inactive PWQMN site)
n/a	06009700102	Rouge River	651395	4850769	12/3/1964	11/16/1971	n/a	(inactive PWQMN site)
n/a	06008300802	Humber River	617672	4840818	5/27/1987	8/13/1996	n/a	(inactive PWQMN site)
n/a	06008310002	Humber River	614325	4846472	3/10/1983	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010400302	Duffins Creek	657880	4855149	3/5/1968	12/21/1981	n/a	(inactive PWQMN site)
n/a	06010405102	Duffins Creek	653913	4864162	5/20/1980	8/14/1996	n/a	(inactive PWQMN site)
n/a	06009701202	Rouge River	644760	4854290	5/31/1973	10/23/1990	n/a	(inactive PWQMN site)
n/a	06009700602	Rouge River	644675	4856600	10/2/1972	10/23/1990	n/a	(inactive PWQMN site)
n/a	06008501302	Don River	631739	4837665	10/19/1972	4/25/1991	n/a	(inactive PWQMN site)
n/a	06010404602	Duffins Creek	653836	4860709	2/26/1976	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010404702	Duffins Creek	651480	4864395	2/25/1976	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010404802	Duffins Creek	651902	4864551	2/25/1976	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010404902	Duffins Creek	649429	4863727	2/25/1976	9/18/1996	n/a	(inactive PWQMN site)
n/a	06008301702	Humber River	603801	4849294	3/24/1975	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010401302	Duffins Creek	653832	4856973	6/3/1974	8/21/1996	n/a	(inactive PWQMN site)
n/a	06010401502	Duffins Creek	644396	4866297	6/3/1974	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010401602	Duffins Creek	643796	4868370	6/3/1974	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010401702	Duffins Creek	645289	4868873	6/3/1974	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010401802	Duffins Creek	645880	4869071	6/3/1974	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010402402	Duffins Creek	654210	4858430	6/3/1974	9/18/1996	n/a	(inactive PWQMN site)
n/a	06008000302	Etobicoke Creek	614077	4832624	10/19/1972	5/3/1995	n/a	(inactive PWQMN site)
n/a	06008300502	Humber River	603030	4860055	5/17/1965	10/4/1988	n/a	(inactive PWQMN site)
n/a	06008500502	Don River	626351	4856895	5/14/1965	10/4/1988	n/a	(inactive PWQMN site)

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
n/a	06009700502	Rouge River	650103	4852075	3/21/1972	5/4/1995	n/a	(inactive PWQMN site)
n/a	06010401402	Duffins Creek	646168	4864128	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010402002	Duffins Creek	644692	4870837	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010402102	Duffins Creek	646302	4871380	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010402202	Duffins Creek	652724	4860564	5/30/1973	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010402302	Duffins Creek	653796	4858867	5/30/1973	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010402602	Duffins Creek	654730	4859199	5/30/1973	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010402802	Duffins Creek	654742	4863433	5/30/1973	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010403002	Duffins Creek	652116	4869152	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010403102	Duffins Creek	653924	4869775	5/30/1973	9/18/1996	n/a	(inactive PWQMN site)
n/a	06010403202	Duffins Creek	654107	4871923	5/30/1973	9/17/1996	n/a	(inactive PWQMN site)
n/a	06010403402	Duffins Creek	644924	4869877	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010403602	Duffins Creek	644292	4872860	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010403802	Duffins Creek	646461	4867229	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010404002	Duffins Creek	646689	4865062	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010404102	Duffins Creek	646831	4864721	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010404202	Duffins Creek	645404	4864593	5/30/1973	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010404302	Duffins Creek	647636	4861003	5/31/1973	8/21/1996	n/a	(inactive PWQMN site)
n/a	06009700202	Rouge River	639919	4858770	6/22/1966	10/23/1990	n/a	(inactive PWQMN site)
n/a	06010400502	Duffins Creek	655769	4857366	3/29/1972	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010400602	Duffins Creek	655901	4861642	10/10/1972	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010400702	Duffins Creek	654615	4865754	10/10/1972	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010400902	Duffins Creek	650006	4859275	10/10/1972	8/14/1996	n/a	(inactive PWQMN site)
n/a	06010401002	Duffins Creek	646069	4862567	10/10/1972	8/21/1996	n/a	(inactive PWQMN site)
n/a	06010401102	Duffins Creek	640971	4869738	10/10/1972	8/21/1996	n/a	(inactive PWQMN site)
n/a	06010401202	Duffins Creek	640012	4872146	10/10/1972	8/14/1996	n/a	(inactive PWQMN site)

MOECC Station ID	TRSPA ID	Creek/Watershed	Easting	Northing	First	Last	Frequency	Operator
n/a	06008200202	Mimico Creek	615334	4836534	10/19/1972	4/22/1997	n/a	(inactive PWQMN site)
n/a	06008301002	Humber River	610184	4862206	9/26/1969	8/14/1996	n/a	(inactive PWQMN site)
n/a	06008500202	Don River	626387	4846114	8/18/1965	12/2/1993	n/a	(inactive PWQMN site)
n/a	06008200102	Mimico Creek	622480	4831009	10/28/1964	11/1/1994	n/a	(inactive PWQMN site)
n/a	06008300702	Humber River	616066	4858668	3/4/1966	8/15/1996	n/a	(inactive PWQMN site)
n/a	06009701402	Rouge River	642465	4855862	5/31/1973	9/30/2003	n/a	(inactive PWQMN site)
n/a	06010400202	Duffins Creek	655089	4863548	6/22/1966	8/20/1996	n/a	(inactive PWQMN site)
n/a	06010700102	Carruthers Creek	661492	4855140	12/3/1964	12/15/1994	n/a	(inactive PWQMN site)
n/a	06008300602	Humber River	615862	4857805	11/22/1965	8/14/1996	n/a	(inactive PWQMN site)
n/a	6008301402	Humber River	602514	4852850	4/17/1974	3/29/2005	n/a	(inactive PWQMN site)
n/a	06008500102	Don River	633282	4834411	12/3/1964	5/2/1995	n/a	(inactive PWQMN site)
n/a	06008300102	Humber River	623155	4832250	10/28/1964	9/7/1996	n/a	(inactive PWQMN site)
n/a	06008000102	Etobicoke Creek	617345	4827245	10/28/1964	4/21/1997	n/a	(inactive PWQMN site)
n/a	06009900102	Petticoat Creek	648912	4855136	5/31/1973	6/23/2009	n/a	(inactive PWQMN site)
n/a	06008300302	Humber River	613365	4848426	5/17/1965	8/24/2004	n/a	(inactive PWQMN site)

A1.2.6 Low-Flow Stream Flow Surveys

TRCA is working with the Ministry of Natural Resources and Forestry, and the Ministry of the Environment and Climate Change on the Low Water Response Program. This program monitors rainfall and streamflow within the creeks of TRCA's watersheds. The TRSPA as the lead authority has also undertaken a stream baseflow assessment program. The main objective of this work is to obtain baseflow information to help develop a long-term baseflow monitoring network using a predetermined distribution of measurement sites. These data are also necessary for model calibration in water budgeting exercises, a necessary component for Source Water Protection activities.

Table A-8 lists the index sites where streamflow measurements are taken annually. A more comprehensive list of sites (about 1,200 locations) has been surveyed once. The annual index field program measures flows taken over spring/summer/fall seasons. Field flow measurements are generally taken at stream crossings and stream gauge stations. These measurements represent a significant source of information that supports aquatic studies, groundwater discharge, and water budgets, including numerical model calibration.

A1.2.7 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. TRCA'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 because:

- 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.

The Ontario Stream Assessment Protocol (OSAP) contains a series of standardized methodologies for identifying sites, evaluating benthic macroinvertebrates, fish communities, physical habitat and water temperatures in wadeable streams (**Table A-10**). The OSAP provides standardized methods that ensure data repeatability. Use of these standard methodologies allows data to be shared, used for multiple purposes and stored in a common database.

Table A-9: Low Flow Index Monitoring Stations

Site	Easting	Northing	Watershed	Site	Easting	Northing	Watershed
EC 25	595030	4843482	Etobicoke	lwd001	633779	4841028	Don
EC 67	605451	4839049	Etobicoke	lwd026	624132	4848401	Don
EC 79	614246	4830169	Etobicoke	TM006	637716	4839714	Don
EC 92	613603	4833331	Etobicoke	UED001	629393	4850780	Don
M01	602629	4843968	Mimico	HC006	648955	4848711	Highland
M06	610152	4841553	Mimico	HC009	648186	4847729	Highland
HUM 109	611768	4850621	Humber	HC012	648280	4848525	Highland
HUM 148	600520	4859203	Humber	HC015B	645315	4848697	Highland
HUM 168	593288	4865289	Humber	HC027	642188	4845973	Highland
HUM 194	613001	4844691	Humber	HC028	643541	4849404	Highland
HUM 200	616442	4842859	Humber	pc001	652135	4851859	Petticoat
HUM 38	613762	4849493	Humber	pc007	648910	4855139	Petticoat
HUM 400	619657	4838490	Humber	fb001	652968	4853997	Frenchman's Bay
HUM 401	616953	4845252	Humber	fb002	653014	4854040	Frenchman's Bay
HUM 402	612498	4848107	Humber	fb003	653701	4854105	Frenchman's Bay
HUM 44	612652	4854670	Humber	fb005	654858	4854068	Frenchman's Bay
HUM 45	611575	4855280	Humber	br001	635017	4859709	Rouge
HUM 57	611473	4862014	Humber	bz001	634113	4859369	Rouge
HUM 58	610175	4862204	Humber	lt004	648190	4852787	Rouge
HUM 66	620482	4836847	Humber	lt048	638689	4867409	Rouge

Site	Easting	Northing	Watershed	Site	Easting	Northing	Watershed
HUM 86	621670	4834267	Humber	lw003	647926	4852541	Rouge
HUM 90	619004	4836885	Humber	mb001	639724	4858841	Rouge
HUM 93	618284	4840148	Humber	ur001	632876	4856526	Rouge
HUM 95	616192	4841813	Humber	D-001	643487	4870429	Duffins
MH072	602683	4860817	Humber	D-065	650373	4869303	Duffins
MH183	593893	4864607	Humber	D-076	653977	4867670	Duffins
WH003	608572	4845382	Humber	D-139	655895	4861650	Duffins
WH004	608964	4845503	Humber	D-146	650016	4859280	Duffins
WH023	604959	4846240	Humber	D-147	653808	4858869	Duffins
WH024	604204	4846973	Humber	D-148	654736	4859204	Duffins
WH999	606250	4846807	Humber	D-158	641854	4868446	Duffins
GM001	630785	4851296	Don	C 08	657977	4863340	Carruthers
LD006	632912	4839805	Don	C 11	659516	4860768	Carruthers
LE004	635426	4841131	Don	C 13	660848	4856971	Carruthers

Table A-10: TRCA Ontario Stream Assessment Protocol (OSAP) Monitoring Sites

Site	Easting	Northing	Watershed	Site	Easting	Northing	Watershed
CC001WM	661121	4855576	Carruthers	HL011WM	637340	4849639	Highland
CC002WM	660268	4858861	Carruthers	HU001WM	612659	4854231	Humber
CC003WM	658930	4863523	Carruthers	HU002WM	607384	4857019	Humber
DF001WM	657593	4855822	Duffins	HU003WM	621589	4834352	Humber
DF002WM	657173	4857428	Duffins	HU004WM	619540	4836843	Humber
DF003WM	654508	4856983	Duffins	HU005WM	618707	4838788	Humber
DF004WM	653852	4858725	Duffins	HU006WM	622420	4838204	Humber
DF005WM	654763	4858973	Duffins	HU007WM	617985	4840192	Humber
DF006WM	655883	4860987	Duffins	HU008WM	617238	4841693	Humber
DF007WM	653744	4860811	Duffins	HU009WM	616778	4842969	Humber
DF008WM	652736	4860492	Duffins	HU010WM	614924	4844734	Humber
DF009WM	650000	4859273	Duffins	HU011WM	612842	4847385	Humber
DF010WM	649124	4859367	Duffins	HU012WM	614003	4847239	Humber
DF011WM	645848	4862667	Duffins	HU013WM	606253	4845918	Humber
DF012WM	646124	4864111	Duffins	HU014WM	605098	4848563	Humber
DF013WM	644206	4866417	Duffins	HU015WM	602928	4847895	Humber
DF014WM	641811	4868439	Duffins	HU016WM	601851	4847187	Humber
DF015WM	645280	4868850	Duffins	HU017WM	593632	4846522	Humber
DF016WM	643456	4870436	Duffins	HU018WM	608561	4849985	Humber
DF017WM	644287	4872830	Duffins	HU019WM	609690	4851277	Humber
DF018WM	654862	4863414	Duffins	HU020WM	615016	4857089	Humber
DF019WM	653999	4867721	Duffins	HU021WM	612371	4856262	Humber
DF020WM	650275	4869239	Duffins	HU022WM	609765	4859761	Humber
DF021WM	654678	4873462	Duffins	HU023WM	610233	4861996	Humber
DN001WM	631839	4837534	Don	HU024WM	611315	4861789	Humber

Site	Easting	Northing	Watershed	Site	Easting	Northing	Watershed
DN002WM	634764	4840068	Don	HU025WM	620131	4866530	Humber
DN003WM	638455	4841069	Don	HU026WM	603015	4860198	Humber
DN004WM	639755	4842299	Don	HU027WM	603591	4861940	Humber
DN005WM	634766	4842278	Don	HU028WM	601793	4861776	Humber
DN006WM	632976	4846513	Don	HU029WM	598529	4859919	Humber
DN007WM	630918	4848580	Don	HU030WM	597058	4859635	Humber
DN008WM	630235	4850873	Don	HU031WM	593659	4860857	Humber
DN009WM	630745	4853913	Don	HU032WM	592216	4858545	Humber
DN010WM	629293	4854276	Don	HU033WM	594115	4864598	Humber
DN011WM	626278	4858242	Don	HU034WM	592783	4865359	Humber
DN012WM	633790	4841000	Don	HU035WM	588848	4864881	Humber
DN013WM	632679	4842241	Don	HU036WM	591433	4868401	Humber
DN014WM	631615	4842129	Don	HU037WM	587110	4868549	Humber
DN015WM	628077	4844774	Don	HU038WM	583289	4867522	Humber
DN016WM	622615	4850449	Don	MM001WM	622398	4831011	Mimico
DN017WM	621256	4852568	Don	MM002WM	617833	4834609	Mimico
DN018WM	618451	4854086	Don	MM003WM	613832	4837911	Mimico
DN019WM	618574	4856472	Don	MM004WM	609794	4841708	Mimico
DN020WM	628121	4853039	Don	MM005WM	608657	4840085	Mimico
DN021WM	626437	4853013	Don	PT001WM	651987	4851798	Petticoat
DN022WM	623729	4855642	Don	PT002WM	649492	4854411	Petticoat
DN023WM	624573	4856474	Don	PT003WM	649025	4855400	Petticoat
EC001WM	617505	4827026	Etobicoke	PT004WM	647273	4856586	Petticoat
EC002WM	615805	4829373	Etobicoke	RG001WM	648483	4852831	Rouge
EC003WM	615445	4832002	Etobicoke	RG002WM	647983	4852454	Rouge
EC004WM	613846	4833123	Etobicoke	RG003WM	645361	4852367	Rouge

Site	Easting	Northing	Watershed	Site	Easting	Northing	Watershed
EC005WM	610140	4835534	Etobicoke	RG004WM	643432	4853479	Rouge
EC006WM	607745	4835482	Etobicoke	RG005WM	641511	4855511	Rouge
EC007WM	607099	4836727	Etobicoke	RG006WM	644736	4854274	Rouge
EC008WM	603544	4836301	Etobicoke	RG007WM	644249	4857809	Rouge
EC009WM	605493	4838941	Etobicoke	RG008WM	641983	4857650	Rouge
EC010WM	600414	4843094	Etobicoke	RG009WM	640592	4858859	Rouge
EC011WM	599030	4838985	Etobicoke	RG010WM	639829	4858986	Rouge
EC012WM	595142	4843473	Etobicoke	RG011WM	640693	4863593	Rouge
EC013WM	592816	4844601	Etobicoke	RG012WM	637631	4866976	Rouge
EC014WM	592483	4843057	Etobicoke	RG013WM	637131	4865731	Rouge
FB001WM	652478	4854437	Frenchman's Bay	RG014WM	637095	4866273	Rouge
FB002WM	652737	4853827	Frenchman's Bay	RG015WM	635052	4859699	Rouge
FB003WM	653655	4854367	Frenchman's Bay	RG016WM	634341	4859301	Rouge
FB004WM	654975	4853937	Frenchman's Bay	RG017WM	633024	4859990	Rouge
HL001WM	649487	4848106	Highland	RG018WM	631467	4862594	Rouge
HL002WM	647813	4848741	Highland	RG019WM	633477	4865486	Rouge
HL003WM	644806	4847677	Highland	RG020WM	633873	4856414	Rouge
HL004WM	644561	4848686	Highland	RG021WM	632687	4856699	Rouge
HL005WM	642727	4849327	Highland	RG022WM	629166	4860184	Rouge
HL006WM	642794	4850383	Highland	RG023WM	629445	4860190	Rouge
HL007WM	640119	4850188	Highland	RG024WM	627595	4860793	Rouge
HL008WM	641439	4852384	Highland	RG025WM	626888	4863281	Rouge
HL009WM	641804	4845601	Highland	RG026WM	627881	4863600	Rouge
HL010WM	641345	4846335	Highland				

A1.2.8 Coastal Wetland Monitoring

The Durham Region Coastal Wetland Monitoring Project is designed as a long-term program that will assess the health of 15 wetlands along the north shore of Lake Ontario in Durham Region (**Table A-10**). Five of these wetlands are in TRSPA’s jurisdiction.

To standardize the collection of biological and physical data among the partner organizations, a Methodology Handbook was developed by Environment Canada and the Central Lake Ontario Conservation Authority and fieldwork began in the spring of 2002.

Water levels in the Great Lakes have been recorded by the Canadian Hydrographic Service since 1860. These data show that levels in Lake Ontario have varied by up to two metres since that time. In 1958, however, lake level regulation was implemented, which moderated levels. While lake levels still fluctuate, they do not do so to the extent that occurred prior to regulation.

Table A-11: Durham Region Coastal Wetland Monitoring Project locations

Site Number	Wetland
1	Rouge River Marsh
2	Frenchman’s Bay Marsh
3	Hydro Marsh
4	Duffins Creek Marsh
5	Carruthers Creek Marsh

The Durham Region Coastal Wetlands Project monitors both physical features and biological communities. The following physical features or aspects are observed within the Coastal Wetland Monitoring Program:

- **Water Quality** - Measure various water quality parameters, including turbidity (clarity of water), conductivity, nitrogen, and phosphorus;
- **Water Levels** - For wetlands that can be cut off from Lake Ontario due to the formation of a barrier beach, measure water levels throughout the vegetation growing season (May to October);
- **Sediment Quality** - Collect recently deposited sediments to analyze for various contaminants including pesticides, metals, PCBs and PAHs;
- **Bathymetry** - Map wetland basin topography to reveal contours;
- **Watershed Vegetation** - Ecological Land Classification to Community Series level summarized for each wetland’s watershed;
- **Land-use Change in Adjacent Uplands** - Compare current land use in 1000-meter zone around wetland with expected land use according to municipal and regional Official Plans. Obtain percentages of change for each land use category; and
- **Land-use Change in Watershed** - In conjunction with Watershed Management Plans, compare current land usage with expected land usage according to municipal and regional Official Plans Sediment and Nutrient Loading Computer modelling incorporating a Digital Elevation Model (DEM). This step is to be completed when technology becomes available.

The following biological communities are observed within the Coastal Wetland Monitoring Program:

- **Birds**—Survey marsh breeding bird communities using the Marsh Monitoring Program methodology;
- **Amphibians**—Survey amphibian communities using the Marsh Monitoring Program methodology;
- **Fish**—Survey wetland fish community using electrofishing boat;
- **Macroinvertebrates**—Sample wetland macroinvertebrates by sweep-netting through water column;
- **Wetland Vegetation**—Use Ecological Land Classification to define vegetation communities at each wetland and surrounding 500 metres;
- **Submerged Plants**—Sample submerged aquatic vegetation using 20 randomly placed quadrants; and
- **Identifying Key Habitats**—Over time, identify and track habitats associated with species at risk (i.e., endangered, threatened, or of special concern).

A1.3 Information Management System

One of the key elements of any monitoring program is the data that are collected. As such, the storage, security and retrieval of the data are extremely important. In 2001, the TRCA contracted a consultant to develop a relational database (TRCA Envirobase) to house all of the various environmental data collected through this and other programs of the TRCA. This relational database also has the ability to link various data sets that are currently available. Updates to the relational database have been completed in subsequent years including the addition of a sediment quality and fluvial geomorphology component.

Additional customization of the TRCA's database structure along with data entry is on-going. Changes to the corporate IT/Network structure in the near future will enable more effective sharing and use of the relational database by staff. In 2005-06, a review of the existing database and data requirements specific to the Source Protection Planning process was undertaken. Based on this review, the following specific actions have been initiated and/or completed:

- Identify the data input/output routine and developed the data input/output template;
- Update the database model with the addition of data requirements;
- Upload new water quality data from various sources (i.e., MOECC, City of Toronto, private laboratories);
- QA/QC check and data update, including identification of duplicate records;
- Development and design of a new database model to integrate the datasets; and
- Design of a user-friendly interface application to allow staff to query the data quickly.

TRCA has developed an internal GIS system based on the ARC GIS platform to access the information in Envirobase as well as the other datasets. This system has been populated with layers for such features as (but not limited to):

- High resolution aerial photography;
- Watercourses;
- Land use;
- Transportation network;
- TRCA property;
- Topography;

- Physiography;
- Surficial Geology;
- Hydrology;
- Wetlands;
- Aquatic habitat and species data; and
- Terrestrial Natural Heritage data.

Source protection funding from the MOECC has permitted the TRCA to expand its GIS capabilities, and begin migration to the ARCHYDRO platform. This platform has added capabilities to incorporate hydrologic information and calculations into the GIS environment.

A1.4 Methods of Analysis

The Assessment Report includes a description of the local watershed area that 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 and will occur wherever possible to enhance the available data.

The watershed features include 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 to determine whether the water quality is improving, deteriorating, or remaining constant.

The current water use was inventoried, as were 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 TRSPA 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 Source Protection Areas (*Toronto and Region Conservation Authority, March, 2007*). Workshops involving the Conservation Authority and municipal partners were held in late 2006 and early 2007 to review the contents of earlier versions of these reports. The most recent versions include edits and updates that are the result of the comments provided. The Province has established a panel to review the Watershed Characterization Reports. Comments from this review panel were received on January 8, 2008, and were incorporated into the final Assessment Report.

A1.5 Surface Water Quality Data Analysis and Reporting

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

- Exploratory analysis;

- Statistical analysis; and
- Reporting results.

A1.5.1 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.

A1.5.2 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.

A1.5.3 Reporting Results

The third step involves the use of graphics such as maps and boxplots to present selected results in a format 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.

A1.6 Groundwater Quality Data Analysis and Reporting

A1.6.1 Data Compilation

Groundwater quality data may be available from a wide variety of sources, including

- The Provincial Groundwater Monitoring Network (PGMN);
- Private well sampling;
- Municipal water sampling programs;
- Health departments; and
- Other groundwater studies.

Data Analysis

The assemblage and integration of information that will provide an understanding of groundwater quality on 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);
- 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.

A1.6.2 Analysis of Trends at Each Monitoring Well

Time versus concentration plots can help determine whether levels of water quality are changing. 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 (e.g., packages built into Excel) can be used to determine if there is a trend.

Alternatively, the data can be visually interpreted to determine whether there is a trend. Trends usually 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 (i.e., concerns, known contamination), the parameters typical for those impairments can also be evaluated through time-concentration plots to determine whether the trends are increasing or decreasing. 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. By doing this, we can identify areas where water quality is influenced by surface activities, including precipitation, and therefore may be more vulnerable to surface activities.

A1.6.3 Aquifer Characterization

Groundwater quality data was also analyzed on a 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 whether 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 whether water samples are of a similar nature, and potentially of similar origin.

A1.7 Limitations: Data, Assumptions, and Methods

Database management that relates to the structure or approach were developed for each of the conservation authority partners and the CTC Source Protection Region to manage data. Currently, a three-database system is being considered within the overall database management system. This system includes:

- Internal relational databases that house aquatic ecosystem and stream survey information conducted by CLOSPA;
- The ORMGP (Oak Ridges Moraine Groundwater Program) database that includes subsurface information (e.g., boreholes, wells, water levels, chemistry); and
- The contaminant inventory database, to be provided by the Province.

Data that are undergoing refinement have been identified for source protection planning purposes and are summarized in **Table A-12** and **Table A-13**.

Table A-12: Data Gaps

Component	Data Set Name or Source	Data Problem	Comment
GIS Database	TRCA/external data sources	Requires update	Internal GIS data, grids, shape file reorganization. Metadata tracking system to be developed.
Rating Tables within Hydrologic Database	TRCA - Engineering department hydraulic data	Requires update	Updated for WSC sites annually.
Integrated Hydrologic Database	TRCA's hydrologic data	Requires update	Data currently exists in various formats. Need to develop a consistent format and relational database to maintain data relating to climate, rating curves, water levels, streamflow, spot baseflow, and water quality measurements.
Oak Ridges Moraine Groundwater Program (ORMGP) Hydrogeologic Database	Various data sources	Requires update	Not all monitoring locations or data entered—continually being updated with various data sets. Database management required. Multi-user access to be applied over a networked environment.

Table A-13: Knowledge Gaps

<p>Continued groundwater level and chemistry monitoring and analysis involving both PGMN wells and municipal partner monitoring wells (where data are provided).</p> <p>Low-flow streamflow surveys (quality and quantity) to characterize discharge zones and associated water quality. These surveys are also useful to delineate zones that may be impacted by human activities.</p> <p>Overland and streamflow travel time studies to be able to address possible spills response protocol and actions.</p> <p>Enhance the continuous streamflow gauge network and update data regarding discharge to streams.</p> <p>Update and verify outdated or missing water use data including Permit to Take Water (PTTW) information.</p> <p>Development of acceptable water use targets to protect both the resource and the aquatic ecosystem.</p> <p>Need for additional water quality monitoring sites.</p> <p>Need for additional climatic sites/data monitoring.</p> <p>Development of the ESRI ArcHydro data model.</p> <p>Overland and streamflow travel time studies to be able to address possible spills response protocol and actions.</p>
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A1.7.1 Filling Data Gaps

Future watershed planning work will aim to develop and refine the overall database management system using the following methods:

- Preparing and refining land classification maps;
- Monitoring and analyzing groundwater level and chemistry involving both PGMN wells and municipal partner monitoring wells;
- Reviewing low-flow streamflow surveys (quality and quantity) to characterize discharge zones and associated water quality and to delineate zones that may be impacted by human activities;
- Reviewing overland and streamflow travel time studies to be able to address possible spills response protocol and actions;
- Enhancing the continuous streamflow gauge network and updating data regarding discharge to streams;
- Enhancing the coverage of climate data;
- Updating and verifying outdated or missing water using data including Permit to Take Water (PTTW) information; and
- Preparing a contaminant source database and associated risk to drinking water provided by each potential source.

Priority gaps that need to be addressed as part of ongoing watershed planning initiatives include:

- Further development and promotion of programs, such as the Rural Clean Water Program, that support well upgrades and abandonment, nutrient management best management practices, and land restoration initiatives on private lands—all efforts that help remove potential pathways for contaminants;
- Need for additional water quality monitoring sites;
- Need for additional streamflow monitoring and climatic sites;
- Development of the ESRI ArcHydro data model; and
- Further estimates of water surplus (Thorntwaite methodology).

A1.7.2 Method Limitations

Knowledge gaps relate to analysis and tool development to estimate and/or refine the water quality and quantity estimates and understand how the surface and groundwater flow systems operate. These tools enable us to predict the impact of potential future changes, such as increased municipal supply from groundwater due to climate change.

Priority knowledge gaps that need to be addressed include:

- Refinement of aquifer characterization and flow system understanding, including the orientation of bedrock valley systems and significant area recharge and discharge mapping;
- Development of surface water modelling capabilities;
- Refinement of a three-dimensional groundwater flow modelling tool;
- Refinement of the interaction of the surface water and groundwater flow models;
- Development of acceptable water use targets to protect both the resource and the aquatic ecosystem; and
- Development of methodology and tools to provide spills response analysis that will involve all pathways, including overland flow, stream travel, and groundwater flow, including the unsaturated zone transport.