

Appendix H - Quinte Source Water Data Sources

Assessment Report Data Sources

Information	Data Source	Purpose	Gap/Limitations	Comment/Method of Analysis
Chapter 2: The Quinte Source Protection Region				
Drinking Water System locations	<ul style="list-style-type: none"> • Ministry of the Environment's drinking water system annual compliance reports • Ministry of the Environment's Drinking Water System Program database • Operating authorities 	Locations of intakes and wells and areas served by a drinking water system	Intake coordinates were not accurate in public documents for security purposes	Average annual and average monthly pumping rates are in Chapter 6
Natural Vegetative Cover	<ul style="list-style-type: none"> • Ministry of Natural Resources data of the Natural Heritage Information Centre • Ministry of Natural Resources' Provincial Land Cover Classification 	Land cover extent of woodlands and wetlands	GIS data layer was not sufficient to calculate vegetated riparian areas	Calculated area and percent land cover of wetlands and woodlands by watershed
Aquatic Habitats - fisheries	Quinte Conservation	Location of coldwater, mixed, warm water fisheries; comparison to similar communities not impacted by human activities	Focus of the data source was to location coldwater stream reaches. Unimpacted monitoring stations have not been established	Not all streams have been monitored or classified in the SP region. Establishing unimpacted monitoring stations is being worked on by Quinte Conservation through the Eastern Ontario Biocriteria project.
Aquatic Habitats - macroinvertebrates	Ontario Benthos Biomonitoring Network for Quinte Conservation	Locations and types of macroinvertebrate communities; comparison to similar communities not impacted by human activities	Unimpacted monitoring stations have not been established	Not all streams have been monitored or classified in the SP region. The Hilsenhoff Biotic Index was calculated as a method to measure water quality conditions. Establishing unimpacted monitoring stations is being worked on by Quinte Conservation through the Eastern Ontario Biocriteria project.

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Species at Risk	Ministry of Natural Resources data of the Natural Heritage Information Centre	Describe species within the Source Protection region that are listed in the Endangered Species Act, 2007	Rare species distribution based on 1 km square boxes for species protection	Species name and classification listed, distribution based on 1 km square boxes mapped
Soil Types	Ministry of Natural Resources Ontario Geospatial Data Exchange	Display soil types across the watershed	Data was digitized at a scale that does not contain large amounts of detail	
Stream Temperature Locations/Data	Quinte Conservation	Show average temperature of streams and locations of temperature sampling	Temperature data has only been processed for 2006 and 2007	Not all streams have been monitored.
Surface water quality across watersheds	Ministry of the Environment:• Provincial Water Quality Monitoring Network• Drinking Water Surveillance Program• Lake Partner Program• Great Lakes Index Station Network • Municipal / Industrial Strategy for Abatement program• Benthos Biomonitoring Network program for Quinte ConservationOther:• Bay of Quinte Remedial Action Plan annual Project Quinte reports• Local Health Units	Identify surface water quality problems across the Source Protection Region	Some missing data in time periods	Comparing results to the Provincial Water Quality Objectives reported in the Quinte Source Protection Region Watershed Characterization report. Number of swimming beach closures was an indication of bacteria problems.
Protected Lands	Ministry of Natural Resources Ontario Geospatial Data Exchange	Identify lands that are protected from Development Pressures within the watershed	It is believed there is more crown land in the northern area of the watershed than show by the dataset	

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Populations per Township	Statistics Canada	Identify the population of each township within the Quinte Watershed		Density was calculated using these populations and the area of the township
Physiographic Region	Chapman & Putman 1984 Report, Dillon Consulting	Display physiographic Regions across watershed	Digitized from 1984 paper report. Detail may have been lost	
Overburden Thickness	Dillon Consulting for 2004 Quinte Conservation Groundwater Study	Identify thickness of soil	None	methods can be found in Groundwater Study
Bedrock Topology	Dillon Consulting for 2004 Quinte Conservation Groundwater Study	Display bedrock topology across region	None	Calculated in meters above sea level
Surficial Geology	Ministry of Natural Resources Ontario Geospatial Data Exchange	Display surficial geology across region	None	Also known as quaternary geology
Topography	Ministry of Natural Resource Ontario Geospatial Data Exchange	Identify elevation in meters	Derived from 5m contours	
Groundwater quality across watersheds	<ul style="list-style-type: none"> • Ministry of the Environment's Provincial Groundwater Monitoring Network • Ministry of the Environment's Ontario Water Well Records • municipal and regional hydrogeologic reports 	Identify groundwater quality problems across the Source Protection Region	Some limitations in spatial coverage	Statistical analysis of data to determine average values and typical characteristics of water quality in the different aquifers.
Managed Lands	Agricultural land use mapping, Canada Census Data, aerial photography, municipal zoning bylaws	Threats Assessment	Estimation	Calculation of managed lands for use in threats assessment
Livestock Density	Canada Census Data 2006 by Statistics Canada	Threats Assessment	Estimation	Used for estimation of livestock density in substitute for actual numbers
Impervious Surface	aerial photography from Groupe Alta and the Ontario Road Network	Threats Assessment	Estimation	Calculated area of impervious surfaces for all vulnerable areas by buffering roads and digitizing parking lots from air photos

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Chapter 3: Water Budget				
Conceptual Water Budget				
Climate Data	Canadian Forest Service , Environment Canada	Precipitation & Temperature Maps	None	Calculation of water budget by Thornthwaite
Soil Moisture Holding Capacity	Agricultural Canada & MOE	Calculation of Actual ET	Estimation	Calculation of water budget by Thornthwaite
Bedrock Geology	Ontario Geological Survey	Characterisaiton of watersheds	None	Use in identifying aquifers, and watershed characteristics
Quaternary Geology	Ontario Geological Survey	Runoff / Recharge Estimates & ET	None	Calculation of infiltration factor
Digital Elevation Model	Ministry of Natural Resources	Runoff / Recharge (slope calculations)	None	Calculation of infiltration factor, delineation of subwatershed boundaries
Land Cover	Ministry of Natural Resources	Runoff / Recharge	Needs Updating	Calculation of infiltration factor
Stream Flow Data and Gauge Locations	Water Survey of Canada	Runoff & Derived ET	None	Field truthing of water budget estimates
Permit to Take Water Database	Ministry of the Environment	Water Use		Calculation of water use
Ontario Water Well Records	Ministry of the Environment	Water Use	Spatial accuracy limited	Calculation of water use
Agricultural Water Use	Ministry of Natural Resources (Rob de LEO)	Water Use	estimate	Calculation of water use
Canada Census'01-population	Canada Census by Statistics Canada	Water Use	estimate	Calculation of water use
Location of Rivers & Wetlands	Natural Resources & Values Information System	Determine location of surface water	None	Use in defining hydrologic boundaries
Tier 1				
Same data as listed for Conceptual Water Budget				
Groundwater Levels	Provincial Groundwater Monitoring Network	Calculation of Recharge	Period of Record	Improved estimate of Groundwater Recharge
Consumptive water use factors	Ministry of the Environment	Estimation of water use	Estimate	Improved estimate of Water Use
Municipal Water Use	Municipalities with Drinking Water Systems	Estimation of Water Use	None	Used to assess subwatershed stress

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Quaternary Subwatershed Boundaries	Ministry of Natural Resources	Use in assessing subwatershed stress	None	Boundaries used for water budget in GIS Model
Tier 2				
Same data as listed for Conceptual and Tier 1 water budgets				
Calibration Wells	Quinte Conservation	Static Water Level Measurements	None	Used to calibrate groundwater flow model
Municipal well data	Municipality, Well Records, Engineering Reports	Assessment of Stress	None	Used to evaluate subwatershed stress
Future Growth rates	County of Hastings Official Plan	Assess Future Water Use	Estimation	Predict future municipal water use
Aquifer Properties	Municipal Engineering/Hydrogeology Studies & Reports	Determine Aquifer Properties	Variable conditions	Use in development of the ground water flow model
Ameliasburgh Tier Two Study Area	Quinte Conservation	Study area for Tier Two Surface Water analysis	None	created using LiDAR data and ArcHydro software
Groundwater model study area	Quinte Conservation	Model area for groundwater analysis	None	
Surface Water Model Subcatchments	Quinte Conservation	Assess surface water in Prince Edward County	None	created using 10m DEM and ArcHydro software
Chapter 4: Methodology For Vulnerable Areas & Water Quality Risk Assessment				
Highly Vulnerable Aquifers	Ontario Water Well Records	Aquifer Vulnerability	Spatial Accuracy Limited	Assess aquifer vulnerability using ISI index.
Significant Recharge Areas	Ontario Water Well Records and same data as conceptual water budget for use of GIS model	Determine location of Significant Groundwater Recharge Areas	Spatial Accuracy of well records	Determine location of these areas using the GIS water budget model to delineate areas where more than 55% of water infiltrates.

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Overburden Geology Maps	Ontario Geological Survey	Identify significant groundwater recharge areas	None	Assist in determining the location of significant groundwater recharge areas.
Chapter 5: Groundwater Resources				
Delineation of Wellhead Protection Areas				
Well Locations	Quinte Conservation	Use in Modelling		GPS coordinates recorded by Quinte Conservation
Groundwater levels	Ontario Water Well Records, Municipality	Assess groundwater flow direction & level	Spatial accuracy	3 dimensional numeric groundwater flow model
Climate	Environment Canada	Assess groundwater recharge	Estimate	3 dimensional numeric groundwater flow model
Geology	Ontario Geological Survey	Defining aquifer units	None	3 dimensional numeric groundwater flow model
Aquifer Parameters/well construction	Municipality Engineering & Hydrogeology Studies	Assessment of flow rates	Spatial variation	3 dimensional numeric groundwater flow model
Vulnerability Scores	Ontario Water Well Records, Municipality	Determine lithology	Spatial accuracy	Calculate vulnerability using ISI Method
Identification of Transport Pathways	Ontario Water Well Records, air photos, MNR database for pits, quarries, & mines, municipal records, site inspection.	Determine location of potential transport pathways	Spatial accuracy	Review of records for use in GIS.

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Water Quality Issues	Ministry of the Environment: <ul style="list-style-type: none"> • Drinking Water Information Systems • Drinking Water Surveillance Program • Annual Drinking Water Compliance Inspection Reports Municipalities: <ul style="list-style-type: none"> • Water Treatment Plant Lab Results Data Ontario Clean Water Agency: <ul style="list-style-type: none"> • Drinking Water Systems Regulation O.Reg. 170/03 annual summaries of results Quinte Conservation: funded by Ministry of Natural Resources for Source Protection <ul style="list-style-type: none"> • 2009 Deer Creek and Madoc Creek stream assessment survey 	Issues Approach - issues evaluation in raw water at municipal wells	In general there is a lack of raw water sample results for those systems not participating in the Ontario Drinking Water Surveillance Program.	The Issues Approach 4-step screening process in accordance with TR 114 involving comparison with the Ontario Drinking Water Standards, Objectives, and Guidelines and trend analysis.
Threats Assessment				
Sources of Contamination	Municipal Groundwater Study	Identify Threats	None	Review the groundwater study for indication of activities that may be drinking water threats
Road Salt Application	Municipalities	Identify Threats	None	Inventory of threats using GIS
De-icing Activities	Municipalities	Identify Threats	None	Inventory of threats using GIS
Snow Storage	Regional Groundwater Study, Municipal Information	Identify Threats	None	Inventory of threats using GIS
Storm Water Management Systems	Air Photo Review, Windshield Survey	Identify Threats	None	Inventory of threats using GIS
Landfills – Active	Waste Disposal Site Inventory (MOE)*	Identify Threats	None	Inventory of threats using GIS
	Municipal Information			
Landfills – Closed	Anderson’s Waste Disposal Sites*	Identify Threats	None	Inventory of threats using GIS
	Municipal Information			
Organic Soil-conditioning	Ministry of the Environment	Identify Threats	Spatial Co-ordinates	Inventory of threats using GIS

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Septage Application	Ministry of the Environment	Identify Threats	Spatial Co-ordinates	Inventory of threats using GIS
Hazardous Waste Disposal	MOE Waste Disposal Site Inventory (ERIS)	Identify Threats	None	Inventory of threats using GIS
	Municipal Information			
Liquid Industrial Waste	Waste Disposal Site Inventory (MOE)*	Identify Threats	None	Inventory of threats using GIS
	Municipal Information			
Mine Tailings	Municipal Information	Identify Threats	None	Inventory of threats using GIS
	Ministry of Natural Resource Reports			
Agricultural Operations	Windshield Surveys	Identify Threats	Limited	Inventory of threats using GIS
Historical Activities	Municipal Information, Windshield Survey	Identify Threats	Limited	Inventory of threats using GIS
Fuels/Hydrocarbons	Retail Fuel Storage (TSSA)*	Identify Threats	Limited information on residential heating tanks	Inventory of threats using GIS
	Private Fuel Storage (TSSA)*			
	Municipal Information			
	Windshield Survey			
DNAPLS	Business Directories	Identify Threats	Limited	Inventory of threats using GIS
	Windshield Surveys			
	O.Reg 347 Waste Generators (MOE)*			
Organic Solvents	Business Directories	Identify Threats		Inventory of threats using GIS
	Windshield Surveys			
	O.Reg 347 Waste Generators (MOE)*			
Agricultural Operations	Windshield Surveys	Identify Threats		Inventory of threats using GIS
Pesticides/Fertilizer/Manure	Ontario Pesticide Registry	Identify Threats		Inventory of threats using GIS
Transportation Corridors (Roadways, railways)	Municipal Mapping	Identify Threats		Inventory of threats using GIS
Infrastructure Corridors (sanitary sewers, storm sewers)	Municipal Mapping	Identify Threats		Inventory of threats using GIS
Pipelines	Review of Ontario Base Map topography maps (1:10.000 scale)	Identify Threats		Inventory of threats using GIS
Landuse	Municipal Zoning Bylaws & Official Plans	Assess Landuse/Identify		Assessment of threat activities

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		Threats		
Managed lands	Same as above for Chapter 2	Identify Threats	Estimate	Assessment of threat activities
Livestock Density	Same as above for Chapter 2	Identify Threats	Estimate	Assessment of threat activities
Telephone Surveys	Property Owners in Vulnerable Zones	Identify Threats		Assessment of threat activities
Mail out Surveys	Property Owners in Vulnerable Zones	Identify Threats		Assessment of threat activities
Conditions Assessment				
Location of Contaminated Sites	Quinte Regional Groundwater Study, Bay of Quinte Remedial Action Plan-Inventory of Contaminated Sites	Identify Conditions	Preliminary Screening	Assessment of the location of conditions
Details of Contaminated Sites	Ministry of the Environment - Certificate of Approvals	Identify Conditions	Preliminary Screening	Assessment of the location of conditions
Issues Contributing Area Approach, Madoc Well Supply				
Identify Threats of Issues	Quinte Conservation: • Deer Creek and Madoc surface water quality 2009 and 2010 data. Ontario Ministry of Environment: • Drinking Water Information Systems raw water data. • Provincial Water Quality Monitoring Network data for Deer Creek site Environment Canada: • Report on Microbial Source Tracking in the Madoc area (Edge and Hill 2011).	Madoc Well Supply: Identify Threats and delineate Issues Contributing Area	Preliminary study to narrow the scope of Issues Approach threats identification required samples taken weekly for a longer period of time for at least 8 months of the year (spring to fall).	Identify potential threats of <i>E.coli</i> , Total Coliform, Organic Nitrogen for Madoc Well Supply
Chapter 6: Surface Water				
Bay of Quinte Catchment Area	Quinte Conservation	Total contributing area to Bay of Quinte	None	
IPZ Delineation and Vulnerability Scores				
- intake characterization (depth, off-shore distance, etc.)	Engineering drawings from City of Belleville and Napanee	Source Vulnerability Factor	subjective interpretation of Rule 95	Arbitrarily assignment of the Source Vulnerability Score based on comparison with other intakes

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- intake coordinates	City of Belleville for Belleville and Point Anne Intakes Quinte Conservation for other intakes	Use for IPZ-1 delineation	None	GPS coordinates or GIS shape file
- shoreline limits	Quinte Conservation	IPZ-1 and IPZ-2 delineation	MNR NRVIS water polygon limits use to estimate high water level limits	120 m buffers done in GIS
- instream flow rates in the Bay of Quinte	MOE flow data, Dillon	IPZ-2 instream portion	available MOE historical flows for the Bay of Quinte	IPZ-2 delineation done as per MOE Technical Rules (November 2010)
- instream flow rates in Napanee River	Water Survey of Canada - HYDAT, Dillon	IPZ-2 instream portion	accuracy of HEC-RAS cross-sections for Napanee	IPZ-2 delineation done as per MOE Technical Rules (November 2010)
- Bay of Quinte Bathymetry	NDI	IPZ-2 instream portion	resolution of NDI depth locations	input to HEC-GeoRAS model
- wind statistics	Environment Canada	IPZ-2 instream portion	Trenton airport data was used for all intakes	data analyzed to create 2-hour time series and modify IPZ-2 as per MOE Technical Rules (November 2010)
- storm sewer layouts	City of Belleville and Napanee	IPZ-2 inland portion	Accuracy of the shape files provided by Belleville and Napanee	used to define transport pathways and modify IPZ-2 as per MOE Technical Rules (November 2000)
- landuse data	Provincial Land Cover provided by Quinte Conservation and Quickbird Satellite Images	Area Vulnerability Factor	Raster resolution and accuracy of the maps	Area Vulnerability Factor is derived based on Rules 88-93
- soil data	Canadian Department of Agriculture, Quinte Conservation	Area Vulnerability Factor	Soils maps may not be up to date	Area Vulnerability Factor is derived based on Rules 88-93
- history of water quality concerns at intakes	DWSP, Quinte Conservation, RAP Bay of Quinte, DFO, data from WTPs	Source Vulnerability Factor	Information is limited to available reports	Source Vulnerability Factor is derived based on Rules 94-96

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Water Quality Issues	<p>Ministry of the Environment:</p> <ul style="list-style-type: none"> • Provincial Water Quality Monitoring Network (Napanee Back-up system) • Drinking Water Information Systems • Drinking Water Surveillance Program • Annual Drinking Water Compliance Inspection Reports <p>Municipalities:</p> <ul style="list-style-type: none"> • Water Treatment Plant Lab Results Data • Belleville Utilities Commission Quarterly Reports <p>Ontario Clean Water Agency:</p> <ul style="list-style-type: none"> • Drinking Water Systems Regulation O.Reg. 170/03 annual summaries of results <p>Quinte Conservation: funded by Ministry of Natural Resources for Source Protection</p> <ul style="list-style-type: none"> • 2009 Bell Creek stream assessment survey <p>Bay of Quinte Remedial Action Plan:</p> <ul style="list-style-type: none"> • Department of Fisheries and Oceans Canada data for Project Quinte 	Issues Approach - issues evaluation in raw water at municipal intakes	In general there is a lack of raw water sample results for those systems not participating in the Ontario Drinking Water Surveillance Program. Provincial Water Quality Monitoring Network Data for the two nearest monitoring stations of the Napanee River were used because the Napanee Back-up drinking water systems has no raw water samples.	The Issues Approach 4-step screening process in accordance with TR 114 involving comparison with the Ontario Drinking Water Standards, Objectives, and Guidelines and trend analysis.
Threats Assessment				
Conditions Assessment				
Location of Contaminated Sites	Quinte Regional Groundwater Study, Bay of Quinte Remedial Action Plan-Inventory of Contaminated Sites	Identify Conditions	Preliminary Screening	Assessment of the location of conditions
Details of Contaminated Sites	Ministry of the Environment - Certificate of Approvals	Identify Conditions	Preliminary Screening	Assessment of the location of conditions
Concentration of Contaminants	Environmental & Hydrogeological Studies for Contaminated Sites & Closed Landfills	Assessment of Conditions	None	Assessment of the location of conditions

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Concentration of Contaminants	Environmental & Hydrogeological Studies for closed Zwick's Island Landfill (Belleville) by Golder Associates 2009 and for closed Delhi Park landfill (Picton) by WESA 1989	Data for supplement reports in Appendix I for the assessment of Conditions at the Belleville and Picton Drinking Water Systems to check if nearby intakes detect contaminants	Recent groundwater conditions for Delhi Park landfill is a data gap	Identify groundwater contaminants at sampling sites at Zwick's Island landfill site (Belleville) and closed Delhi Park landfill site (Picton)
Sediment Quality Data	Bay of Quinte Studies reviewed by Biberhofer and Dunnett 2006 at Environment Canada	Assess sediment quality near contaminated sites	None	Assessment of the location of conditions
Sediment Quality Data	Bay of Quinte Studies reviewed by Biberhofer and Dunnett 2006 at Environment Canada	Data for supplement reports in Appendix I for the assessment of Conditions at the Belleville and Picton Drinking Water Systems to check if nearby intakes detect contaminants	None	Identify sediment contaminants at sampling sites near closed Zwick's Island landfill site (Belleville) and closed Delhi Park landfill site (Picton)
Raw Water Quality Data	Ontario Ministry of Environment: • Drinking Water Surveillance Program raw water data for Belleville, Bayside, and Picton Drinking Water Systems	Data for supplement reports in Appendix I for the assessment of Conditions at the Belleville and Picton Drinking Water Systems to check if nearby intakes detect contaminants	Recent (2005 to present) raw water data for Belleville Drinking Water Systems in the Drinking Water Surveillance Program. No data for Trichlorfluoromethane in Picton Drinking Water System raw water.	Identify whether sediment and groundwater contaminants from closed Zwick's Island landfill site (Belleville) and closed Delhi Park landfill site (Picton) are detected in raw water at nearest drinking water system

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<p>Data on Other Potential Sources of Contamination for Picton Drinking Water System</p>	<p>Ontario Ministry of Environment: <ul style="list-style-type: none"> • Provincial Water Quality Monitoring Network data for Marsh Creek site (Picton) 1984 to 2010 <p>Quinte Conservation: <ul style="list-style-type: none"> • Pollution Prevention and Control Plan, Picton storm sewer outlets quality data 2008 and 2009 <p>Corporation of the County of Prince Edward: <ul style="list-style-type: none"> • Picton Sewage Treatment Plant effluent data 2007 to 2009 </p></p></p>	<p>Data for supplement reports in Appendix I for the assessment of Conditions at the Belleville and Picton Drinking Water Systems to check if nearby intakes detect contaminants</p>	<p>No data for Fluoranthene, PCB, Phenanthrene, Silver at Marsh Ck PWQMN site. No data for groundwater contaminants and Arsenic, Fluoranthene, Mercury, PCB, Phenanthrene, Silver at storm sewer outlets. No data for any of sediment and groundwater contaminants at Picton Sewage Treatment Plant effluent.</p>	<p>Identify other potential sources of contamination for raw water at the Picton Drinking Water System</p>
<p>Chapter 7: Climate Change</p>				
<p>Quinte Modelling</p>	<p>Water Survey of Canada - Hydat</p>	<p>Determination of flow statistics</p>	<p>Flow data did not exist for all subcatchments. Flows were used to confirm modelling parameters for gauged catchments and the GAWSER model calculated flows for ungauged subwatersheds.</p>	<p>Flows were used to validate computer models and compare with predicted values. GAWSER model determined outflows from changing inputs.</p>

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	Environment Canada - Meteorological Services of Canada	Rainfall and Temperature Data	Missing precipitation and temperature data were filled in by Schroeter and Associates Data Fill-in Project reported in the Ameliasburgh Tier 2 Water Budget report.	Scenarios were investigated in the GAWSER model with varying precipitation and temperature inputs. Variations were on a percentage basis of actual recorded norms.