

APPENDIX – S (SPRINGWATER)

GENIVAR CONSULTANTS LP (FORMERLY JAGGER HIMS) TECHNICAL MEMORANDUMS

Springwater:

- Technical Memorandum O1 - Drinking Water Issues Evaluation

DILLON CONSULTING LIMITED: WELL HEAD TIME OF TRAVEL CAPTURE ZONE PEER REVIEW EVALUATION RESULTS

- Dillon Consulting Limited WHPA Peer Review Report Memo
- Wellhead Time of Travel Capture Zone Peer Review Evaluation Results
 - Table 1: Elmvale
 - Table 2: Hillsdale

Date: August 5, 2010
To: Don Goodyear, P.Geo. – South Georgian Bay Lake Simcoe Protection Region
From: Sarah Dignard/Lloyd Lemon, P.Geo.
Project No.: 071948.10
Subject: Drinking Water Issues Evaluation – Springwater
Township of Springwater

OBJECTIVE:

To document the Drinking Water Issues Evaluation for the groundwater supply for the Township of Springwater in the South Georgian Bay Lake Simcoe Source Protection Region.

OVERVIEW:

Work has been completed to meet the requirements of Technical Rules 114 through 117 of the Technical Rules: Assessment Report, *Clean Water Act, 2006* as provided by the Ontario Ministry of the Environment on December 12, 2008, and as amended in November 2009. The Drinking Water Issues Evaluation portion focuses on identifying recurring water quality impacts or situations with a possibility of impacting drinking water sources in the short-term. This work results in a preliminary list of identified issues.

The approach for the Drinking Water Issues Evaluation is described in more detail in “Technical Memorandum A5 - Drinking Water Issues Evaluation Methods”. The steps included:

- Step 1:** Assemble Available Data
- Step 2:** Review Data and Identify Potential Drinking Water Issues
- Step 3:** Evaluate Drinking Water Issues
- Step 4:** Identify Contributing Area for Drinking Water Issues
- Step 5:** Prepare List of Drinking Water Issues

Municipal Wells and Aquifers

The Township of Springwater Water Supply consists of several individual water works, including the groundwater wells at the Anten Mills Water Supply, the Del Trend Water Supply, the Elmvale Water Supply, the Hillsdale Water Supply, the Midhurst Water Supply, the Minesing Water Supply, the Phelpsston Water Supply, the Snow Valley Highlands Water Supply and the Vespra Downs Water Supply.

Anten Mills Water Supply

The Anten Mills Water Supply serves the Community of Anten Mills in the Township of Springwater. The system services 70 residential units. Raw water is obtained from three drilled wells. Well #1 is comprised of a 150mm steel casing drilled to a depth of 66.4 metres with a 150mm screen extending from 66.4 metres to 65.9 metres. Water is obtained via a submersible pump rated at 6.9 L/sec. Well #2 is comprised of a 150mm steel casing drilled to a depth of 66.1 metres with a 150mm screen extending from 66.1 metres to 69.5 metres. Water is obtained via a submersible pump rated at 6.4 L/sec. Well #3 is comprised of a 219mm diameter steel casing drilled to a depth of 67 m. Water is obtained via a

submersible pump rated at 15.15 L/s. Well 1 is permitted to pump at a maximum rate of 290 L/min (418 m³/day), Well 2 is permitted to pump at a maximum rate of 250 L/min (360 m³/day), and Well 3 is permitted to pump at a maximum rate of 909 L/min (780 m³/day). The wells can operate up to a maximum combined taking of 1,558 m³/day from the system. Raw water is treated with sodium hypochlorite. The system services a population of approximately 650.

Del Trend Water Supply

The Del Trend Water Supply obtains its water from three drilled wells located adjacent to the pumphouse. The system services a population of approximately 611. Well #1 is comprised of a 150mm steel casing extending to a depth of 68.6 metres below ground level. The screen extends from 68.6 metres to 73.2 metres. Well #2 is comprised of a 200mm steel casing extending to 64 metres below ground level. A 200mm screen extends from 64 metres to 68.6 metres. Well #3 is comprised of a 200mm steel casing extending to 61.3 metres below ground level. A 200mm screen extends from 61.3 metres to 71.3 metres. Each well is equipped with a submersible well pump which delivers a maximum flow of 5.63 L/sec for wells 1 and 2, and 9.1 L/sec for well #3. Wells 1 and 2 are permitted to pump at a maximum rate of 324 L/min (467 m³/day) and Well 3 is permitted to pump at a maximum rate of 546 L/min (786 m³/day). The wells can operate up to a maximum combined taking of 1,074 m³/day from the system. Raw water is treated with sodium hypochlorite and sodium silicate for iron and manganese sequestration.

Elmvale Water Supply

The Elmvale Water Supply obtains its water from two 300mm steel cased drilled wells drilled to depths of 54.3 metres and 56.6 metres respectively. Screens with 0.51 mm openings were set from 48.1 to 54.3 metres below ground in Well #1, and from 48.8 to 56.6 metres in Well #2. Each is equipped with vertical turbine pumps with a maximum pumpage rate of 26.5 L/sec. Wells 1 and 2 are permitted to pump at maximum rates of 1,600 L/min (2,273 m³/day). The wells can operate up to a maximum combined taking of 4,546 m³/day from the system. The system services approximately 955 units. Raw water is treated with sodium hypochlorite.

Hillsdale Water Supply

The Hillsdale Water Supply obtains its water from three drilled wells. Well #1 is comprised of a 150 mm diameter 97.5 m drilled well into bedrock. Well #2 is comprised of a 150 mm diameter 26.5 drilled well into an overburden aquifer. Well #3 is comprised of a 200 mm diameter 27.43 m deep drilled well into the same overburden aquifer as well #2. Well 1 is permitted to pump at a maximum rate of 654 L/min (285 m³/day), Well 2 is permitted to pump at a maximum rate of 342 L/min (493 m³/day) and Well 3 is permitted to pump at a maximum rate of 456 L/min (657 m³/day). The wells can operate up to a maximum combined taking of 1,434 m³/day from the system. The Hillsdale Water Supply system services approximately 333 units, including residential units, several businesses and a public school. Raw water is treated with sodium hypochlorite.

Midhurst Water Supply

The Midhurst Water Supply obtains its water from four drilled wells with 150 mm steel casings, that are located at three separate sites. Wells #2 and #3 are located adjacent to the Idlewood pump house and are equipped with submersible well pumps capable of pumping 7.7 L/sec and 33.3 L/sec. Well #4 is located adjacent to the Greenpine pump house and is equipped with a submersible well pump capable of pumping 22.7 L/sec. Well #2 is permitted to pump at a maximum rate of 430 L/min (622 m³/day), Well 3 is permitted to pump at a maximum rate of 2,000 L/min (2,900 m³/day), Well #4 is permitted to pump at a maximum rate of 1,360 L/min (2,000 m³/day), and Well #5 is permitted to pump at a maximum rate of 1,140 L/min (1,068 m³/day). The wells can operate up to a maximum combined taking of 6,479 m³/day from the system. Raw water is treated with sodium hypochlorite and sodium silicate for iron sequestration.

Minesing Water Supply

The Minesing Water Supply obtains its water from four drilled wells with 150 mm steel casings. Well #2 is drilled to a depth of 35.7 m and is equipped with a submersible well pump capable of pumping at a rate of 3.79 L/sec. Well #3 is drilled to a depth of 35.1 m and is equipped with a submersible pump capable of pumping at a rate of 3.79 L/sec. Well #4 is drilled to a depth of 38.1 m and is equipped with a submersible well pump capable of pumping at a rate of 4.78 L/sec. Wells 2 and 3 are permitted to pump at a maximum rate of 227 L/min (327 m³/day) while Well 4 is permitted to pump at a maximum rate of 287 L/min (412 m³/day). The wells can operate up to a maximum combined taking of 739 m³/day from the system. Well 1 was only recently connected to the system and limited information was provided on this well. Raw water is treated with sodium hypochlorite. The system services an estimated population of 627.

Phelpston Water Supply

The Phelpston Water Supply obtains its water from two drilled wells. Well #1 comprises of a 200 mm diameter, 40 m deep well equipped with a submersible pump rated at 6.3 L/s. Well #2 comprises of a 150 mm diameter, 47 m deep well equipped with a submersible pump rated at 7.5 L/s. Well 1 is permitted to pump at a maximum rate of 380 L/min (547 m³/day) while Well 2 is permitted to pump at a maximum rate of 455 L/min (655 m³/day). The wells can operate up to a maximum combined taking of 1,202 m³/day from the system. Raw water is treated with sodium hypochlorite. The system services the a population of 270 (90 units) at the Shamrock Meadows Subdivision in the Community of Phelpston.

Snow Valley Highlands Water Supply

The Snow Valley Highlands Water Supply consists of four wells: Well #1, Well #2, Well #3, and Well #4. Wells #1 and #2 were constructed in 1988 and 1989, respectively. The Snow Valley Highlands Water Supply was drilled into a confined sand/gravel aquifer, encountered at a depth of 50 m below ground level (bgl). Well 1 was drilled to a depth of 66.3 mbgl and screened from 59.4 mbgl to 65.5 mbgl. Well #2 was drilled to a depth of 67.4 mbgl and screened from 60.9 mbgl to 67.1 mbgl. Well #3 was drilled to a depth of 72.5 mbgl. Well #4 was drilled to a depth of 72.5 mbgl. Well #1 is permitted to pump at a maximum rate of 786 L/min (1,132 m³/day). Well #2 is permitted to pump at a maximum rate of 1,044 L/min (1,503 m³/day). Well #3 is permitted to pump at a maximum rate of 1,135 L/min (1,634 m³/day) and Well #4 is permitted to pump at a maximum rate of 1,135 L/min (1,634 m³/day). Raw water is treated with sodium hypochlorite and sodium silicate for iron and manganese sequestration.

Vespra Downs Water Supply

The Vespra Downs Water Supply obtains its water from two drilled wells located at 13 Parr Blvd and supplies water to homes along Parr Blvd. The wells are identified as Well #1 and Well #2 and are equipped with a submersible well pump and flow meter. Wells #1 and #2 were constructed in 1993 and 1991, respectively. The Vespra Downs Water Supply was drilled into a confined sand/gravel aquifer, encountered at a depth of 57 m below ground level (mbgl). Well #1 was drilled to a depth of approximately 70.4 mbgl and screened from 58.2 mbgl to 64.3 mbgl. Well #2 was drilled to a depth of approximately 60.7 mbgl and screened from 57.6 mbgl to 60.7 mbgl. Wells #1 and #2 are permitted to pump at maximum rates of 313 L/day (450 m³/day). The production wells can operate up to a maximum combined taking of 900 m³/day. Raw water is injected for disinfection with sodium hypochlorite and sodium silicate is injected for iron sequestering. The system services an estimated population of 540 (12 units).

Step 1: Assemble Available Data

The data sources that were reviewed to identify potential issues included:

- Anten Mills Water Supply Annual Report (2003, 2004, 2005, 2006);
- Amended Certificate of Approval for Anten Mills Water Supply (2004);
- Permit To Take Water at Anten Mills Water Supply (2005);
- Anten Mills Water Facility Monthly Process Data Report (2005, 2006);
- Anten Mills Laboratory Report (2005);
- Del Trend Water Supply Annual Report (2003, 2004, 2005, 2006);
- Amended Certificate of Approval for Del Trend Water Supply (2007);
- Permit To Take Water at Del Trend Water Supply (2007);
- Del Trend Water Facility Monthly Process Data Report (2005);
- Del Trend Laboratory Report (2005, 2006);
- Del Trend Subdivision Water Supply Drinking Water System Inspection Report (2006);
- Elmvale Water Supply Annual Report (2003, 2004, 2005, 2006);
- Elmvale Wastewater Treatment Plant Annual Operating Report (2006);
- Certificate of Approval for Elmvale Water Supply (2003);
- Permit to Take Water at Elmvale Water Supply (2001);
- Elmvale Water Facility Monthly Process Data Report (2005, 2006);
- Elmvale Laboratory Report (2005);
- Elmvale Water Supply Drinking Water System Inspection Report (2006);
- Hillsdale Water Supply Annual Report (2003, 2004, 2005, 2006);
- Certificate of Approval for Hillsdale Water Supply (2006);
- Permit to Take Water at Hillsdale Water Supply (2004);
- Hillsdale Water Facility Monthly Process Data Report (2005, 2006);
- Hillsdale Laboratory Report (2005);
- Hillsdale Water Supply Drinking Water System Inspection Report (2006);
- Midhurst Water Supply Annual Report (2003, 2004, 2005, 2006);
- Certificate of Approval for Midhurst Water Supply (2005);
- Permit to Take Water at Midhurst Water Supply (2005);
- Midhurst Water Facility Monthly Process Data Report (2005);
- Midhurst Laboratory Report (2005, 2006);
- Midhurst Water Supply Drinking Water System Inspection Report (2006);
- Minesing Water Supply Annual Report (2003, 2004, 2005, 2006);
- Minesing Water Facility Monthly Process Data Report (2005, 2006);
- Minesing Laboratory Report (2005);

- Phelpston Water Supply Annual Report (2005, 2006);
- Certificate of Approval for Phelpston Water Supply (2004);
- Permit to Take Water at Phelpston Water Supply (2007);
- Phelpston Water Facility Monthly Process Data Report (2005, 2006);
- Phelpston Laboratory Report (2005);
- Phelpston Water Supply Drinking Water System Inspection Report (2007);
- Snow Valley Water Supply Annual Report (2003, 2004, 2005, 2006);
- Certificate of Approval at Snow Valley Drinking Water System (2007);
- Permit to Take Water at Snow Valley Water Supply (2006);
- Snow Valley Water Facility Monthly Process Data Report (2005, 2006);
- Snow Valley Laboratory Report (2005);
- Snow Valley Highlands Water Supply Annual Report (2005, 2006);
- Snow Valley Highlands Wastewater Treatment Plant Annual Operating Report (2006);
- Snow Valley Highlands Water Facility Monthly Process Data Report (2005, 2006);
- Snow Valley Highlands Laboratory Report (2005);
- Snow Valley Highlands Well Supply Drinking Water System Inspection Report (2006);
- Sunnidale Water Supply Annual Report (2006);
- Sunnidale Water Facility Monthly Process Data Report (2005, 2006);
- Vespra Downs Water Supply Annual Report (2007, 2008);
- Watershed Characterization Report; and
- Operator Interview.

Ms. Jen Bitten, Process and Compliance Technician of the Georgian Bay Hub for the Ontario Clean Water Agency, was interviewed to obtain operator insight into potential issues identified in the published data as well as identifying potential issues that may not have been identified in published data to date.

Step 2: Review Data and Identify Potential Drinking Water Issues

A set of tables (O1 series of tables) have been prepared to document a series of potential issues from the raw and treated water at the Township of Springwater as identified from various data sources. The O1 series of tables relate to the well systems as follows:

Table Number	Township of Springwater Water Works	Water Type	Water Source
O1-1A	Anten Mills	Raw	Well #1
O1-1B			Well #2
O1-1C			Well #3
O1-1D		Treated*	
O1-2A	Del Trend	Raw	Well #1
O1-2B			Well #2

Table Number	Township of Springwater Water Works	Water Type	Water Source
O1-2C			Well #3
O1-2D		Treated*	
O1-3A	Elmvale	Raw	Well #1
O1-3B			Well #2
O1-3C		Treated*	
O1-4A	Hillsdale	Raw	Well #1
O1-4B			Well #2
O1-4C			Well #3
O1-4D		Treated*	
O1-5A	Midhurst	Raw	Well #2
O1-5B			Well #3
O1-5C		Treated (Well #2 and #3)	
O1-5D		Raw and Treated	Well #4
O1-5E		Raw and Treated	Well #5
O1-6A		Minesing	Raw
O1-6B	Well #3		
O1-6C	Well #4		
O1-6D	Treated*		
O1-7A	Phelpston	Raw	Well #1
O1-7B			Well #2
O1-7C		Treated*	
O1-8A	Snow Valley Highlands	Raw	Well #1
O1-8B			Well #2
O1-8C		Treated (Well #1 and #2)	
O1-8D		Raw	Well #4
O1-8E		Treated (Well #3 and #4)	
O1-9	Vespra Downs	Raw and Treated	Well #1 and Well #2

* The treated water data collected may reflect the use of any or all wells in that particular water system.

Tables O1-1 through O1-9 are designed to document:

- 1) The source reports or data that result in the identification of a parameter as a potential Drinking Water Issue;
- 2) Results of comparison of observed parameter concentrations to relevant benchmarks and situations where:

Parameter concentrations exceed the primary benchmark established by the Ontario Drinking Water Quality Standard (ODWQS);

- a. Parameter concentrations exceed a locally established benchmark value (typically a background concentration);
 - b. Parameter concentrations exceed the established method detection limit (MDL) [typically applied for organic chemical parameters];
- 3) Professional judgment on the reliability of the data based on the number of measurements and the relative consistency of the observed occurrence;
 - 4) The nature of observed trends in parameter concentrations;
 - 5) Input from local System Operators and other Stakeholders as to the significance of the parameter as a Drinking Water Issue;
 - 6) Whether treatment is in place for the observed parameters and its effectiveness; and
 - 7) The nature of the source of the parameter listed as a potential issue.

Trends were determined through graphing municipal water supply system water quality data. Parameters listed on the preliminary list of drinking water threats for each well have been assessed graphically for trends. The available data has been provided between 2003 and 2008. In the case of most parameters for the Springwater Water Supply, there was insufficient data available to establish a trend.

Step 3: Evaluate Drinking Water Issues

The O1 series of tables have been developed to identify Drinking Water Issues in accordance with the “Decision Process for Identification and Evaluation of Drinking Water Issues” as presented in Figure A5-1 of “Technical Memorandum A5 - Drinking Water Issues Evaluation Methods”.

The positive or negative responses entered in the O1 series of tables correspond to the steps in the decision process. Professional judgment was built into the decision process in the evaluation of data reliability to identify anomalous conditions and in the consideration of operational insights. Trend analysis was used to identify parameters that are projected to exceed the ODWQS within approximately 50 years. The O1 series of tables also allow for the identification of the source of the potential Drinking Water Issue, whether treatment is in place, and its effectiveness.

For each of the water works systems, all of the parameters identified in the O1 tables are not considered to be Drinking Water Issues. Parameters common to most systems in the Township of Springwater that were removed from consideration include:

- Coliforms and E.Coli are typically absent but can be observed on rare occasions in low numbers. The presence of coliforms and E.Coli in the raw water is not persistent or indicative of deterioration of raw water quality. Disinfection is in place and is effective.
- Other organic parameters present in trace concentrations, such as benzene, monochlorobenzene, 1,2-dichloroethane, carbon tetrachloride and vinyl chloride originate from unknown sources but are not considered to represent Drinking Water Issues as these compounds are rarely observed, do not show increasing trends, and concentrations are well below ODWQS values.
- Other organic parameters are present in trace concentrations at Hillsdale, Anten Mills, Del Trend and Elmvale, such as 1,1-dichloroethylene, alachlor, aldrin and dieldrin, carbaryl, carbofuran, cyanazine, temephos, terbufos, bendiocarb, bromoxynil, dimethoate and prometryne. These parameters are associated with herbicides, pesticides and insecticides but specific source has not been identified. The systems that identified these parameters are within areas used specifically for agriculture. They are not considered to represent Drinking Water Issues as these compounds are observed rarely, do not show increasing trends, and concentrations are well

below ODWQS values. Reduction of pesticide and herbicide use in the contributing watershed would be beneficial to the drinking water quality.

- The rare to occasional exceedances of turbidity ODWQS values are associated with instances of system maintenance or power failures. This parameter is not considered to result in the deterioration of the water quality.
- Organic parameters such as trihalomethanes, are present in trace concentrations in treated water as byproducts of disinfection by chlorination. Concentrations are typically well below ODWQS values and do not display increasing trends.

Step 4: Identifying Contributing Area for Drinking Water Issues

No parameters were identified as Drinking Water Issues at the Springwater Water Supply.

Step 5: Prepare List of Drinking Water Issues

No parameters were identified as Drinking Water Issues at the Springwater Water Supply.

LAL/SJD:nah

Table O1-1B

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
Community: Anten Mills
Drinking Water Source: Well #2
Issues Review Date: October 20 2009

Information Sources: Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment				
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Confirm Presence						Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation					
												Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)	Anomalous Circumstance													Data Reliable				
Pathogens																																		
Background Bacteria				Y				Y				Y				Y	Y	N		Y				N							Y	Y	Y	
Coliforms				Y				Y				Y				Y	Y	N		Y				N						Y	Y	Y		
E. Coli				Y				Y				Y				Y	Y	N		Y				N					Y	Y	Y			

Table O1-2A

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Del Trend
 Drinking Water Source: Well #1
 Issues Review Date: October 20 2009

Information Sources: Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From								Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue			Treatment					
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Confirm Presence						Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural			Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation					
												Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)	Anomalous Circumstance													Data Reliable				
Pathogens																																		
Background Bacteria				Y				Y					Y	Y	N	Y			Y			N										Y	Y	Y

Table O1-2C

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
Community: Del Trend
Drinking Water Source: Well #3
Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment												
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence			Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing	Constant/Uncertain			Will Exceed ODWQS within 50 Years	Natural	Threat (Known)		Threat (Unknown)	In Place	Effective Mitigation											
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)											Rarely (<5%)															
Pathogens																																									
Background Bacteria				Y				Y				Y				Y	Y	N	Y			N																	Y	Y	Y
Coliforms				Y				Y				Y				Y	Y	N	Y			N																	Y	Y	Y
E.Coli				Y				Y				Y				Y	Y	N	Y			N																	Y	Y	Y

Table O1-2D

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Del Trend
 Drinking Water Source: Treated Water
 Issues Review Date: October 20 2009

Information Sources: Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment				
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Confirm Presence						Trend Reviewed	Increasing	Reducing	Constant/Uncertain			Will Exceed ODWQS within 50 Years	Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation				
												Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)	Anomalous Circumstance													Data Reliable			
Pathogens																																	
Background Bacteria					Y			Y								Y	Y	N	Y					N		NO					Y	Y	Y
Coliforms					Y			Y								Y	Y	N	Y					Y		NO					Y	Y	Y
Chemicals																																	
1,2-dichloroethane					Y					Y						Y	Y	N	Y					N		NO				Y			
Alachlor					Y			Y		Y						Y	Y	N	Y					N		NO				Y			
Aldrin + Dieldrin					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Bendiocarb					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Benzene					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Bromoxynil					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Carbaryl					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Carbofuran					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Carbon Tetrachloride					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Cyanazine					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Dimethoate					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Monochlorobenzene					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Prometryn					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Temephos					Y			Y		Y						Y	Y	N	Y					N		NO			Y				
Trihalomethanes					Y			Y		Y	Y					N	Y	N	Y					N		NO		Y		Y			
Vynil Chloride					Y			Y		Y						Y	Y	N	Y					N		NO				Y			

Table O1-3A

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Elmvale
 Drinking Water Source: Well #1
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment									
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence			Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing	Constant/Uncertain			Will Exceed ODWQS within 50 Years	Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation									
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)															Rarely (<5%)								
Pathogens																																						
Background Bacteria				Y				Y				Y			Y	Y	N	Y			Y				N													

Table O1-3B

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
Community: Elmvale
Drinking Water Source: Well #2
Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment												
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Confirm Presence					Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation													
												Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)													Anomalous Circumstance	Data Reliable											
Pathogens																																									
Background Bacteria				Y				Y						Y	Y	N	Y			Y					N																

Table O1-3C

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Elmvale
 Drinking Water Source: Treated Water
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue			Treatment					
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence				Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing			Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation		
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)																
Pathogens																																
Background Bacteria					Y			Y			Y				Y	Y	N	Y			Y				N		NO			Y	Y	Y
Chemicals																																
1,2-dichloroethane					Y				Y		Y				Y	Y	N	Y			Y			N		NO			Y			
Alachlor					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Aldrin + Dieldrin					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Benzene					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Bromoxynil					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Carbaryl					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Carbofuran					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Cyanazine					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Monochlorobenzene					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Prometryn					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Temephos					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			
Trihalomethanes					Y			Y		Y			Y		N	Y	Y	Y			Y			N		NO		Y				
Vinyl Chloride					Y			Y		Y					Y	Y	N	Y			Y			N		NO			Y			

Table O1-4A

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Hillsdale
 Drinking Water Source: Well #1
 Issues Review Date: October 20 2009

Information Sources:

Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From								Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment							
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence					Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural			Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation									
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)	Anomalous Circumstance													Data Reliable								
Pathogens																																						
Coliforms				Y				Y				Y			Y	Y	N	Y			Y				N						NO			Y	Y	Y		

Table O1-4B

Evaluation of Drinking Water Issues

Municipality:
Community:
Drinking Water Source:
Issues Review Date:

Township of Springwater
Hillsdale
Well #2
October 20 2009

Information Sources:

Watershed Characterization:
Annual Water Quality Reports: 2003-2006
Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment									
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence				Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural			Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation											
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)													Anomalous Circumstance	Data Reliable									
Pathogens																																							
Background Bacteria				Y				Y				Y				Y	Y	N	Y			Y		N				NO				Y	Y	Y					

Table O1-4C

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Hillsdale
 Drinking Water Source: Well #3
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From								Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue Treatment																	
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence				Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural	Treatment																				
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)							Anomalous Circumstance			Data Reliable	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation													
Pathogens																																											
Background Bacteria				Y				Y				Y				Y	Y	N	Y			Y				N												NO			Y	Y	Y

Table O1-5D

Evaluation of Drinking Water Issues

Municipality:
Community:
Drinking Water Source:
Issues Review Date:

Township of Springwater
 Midhurst
 Well #4 and Treated Water
 October 20 2009

Information Sources:

Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment						
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence			Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation							
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)															Rarely (<5%)						
Pathogens																																				
Background Bacteria				Y	Y			Y	Y			Y				Y	Y	N			Y		N									Y	Y	Y		
Coliforms				Y				Y				Y			Y	Y	N				Y		N								Y	Y	Y			

Table O1-6A

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Minesing
 Drinking Water Source: Well #2
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue			Treatment					
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence			Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation				
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)															Rarely (<5%)			
Pathogens																																	
Background Bacteria				Y				Y				Y			Y	Y	N				Y		N		NO			Y	Y	Y			
Coliforms				Y				Y				Y		Y	Y	N				Y		N		NO			Y	Y	Y				

Table O1-6B

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Minesing
 Drinking Water Source: Well #3
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment																																			
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence			Anomalous Circumstance	Data Reliable	Trend Reviewed	Increasing	Reducing	Constant/Uncertain			Will Exceed ODWQS within 50 Years	Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation																																			
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)															Rarely (<5%)																																		
Pathogens																																																																
Background Bacteria				Y				Y				Y				Y	Y	N				Y					N																										Y	Y	Y									
Coliforms				Y				Y				Y				Y	Y	N				Y					N																																			Y	Y	Y

Table O1-6C

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
 Community: Minesing
 Drinking Water Source: Well #4
 Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2003-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability						Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment													
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence				Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation														
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)													Anomalous Circumstance	Data Reliable												
Pathogens																																										
Background Bacteria				Y				Y				Y				Y	Y	N		Y			N																	Y	Y	Y
Coliforms				Y				Y				Y				Y	Y	N		Y			N																	Y	Y	Y

Table O1-7A Evaluation of Drinking Water Issues
Municipality: Township of Springwater
Community: Phelpsston
Drinking Water Source: Well #1
Issues Review Date: October 20 2009

Information Sources:
Watershed Characterization:
Annual Water Quality Reports: 2005-2006
Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From							Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue					Treatment								
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Confirm Presence				Trend Reviewed	Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years			Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation									
													Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)													Anomalous Circumstance	Data Reliable							
Pathogens																																					
Background Bacteria				Y				Y				Y				Y	Y	N			Y		N						NO				Y	Y	Y		
Coliforms				Y				Y				Y			Y	Y	N			Y		N						NO				Y	Y	Y			

Table O1-7C

Evaluation of Drinking Water Issues

Municipality: Township of Springwater
Community: Phelpsston
Drinking Water Source: Treated Water
Issues Review Date: October 20 2009

Information Sources:
 Watershed Characterization:
 Annual Water Quality Reports: 2005-2006
 Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends					Operational Consideration	Drinking Water Issue	Source of Issue Treatment									
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Confirm Presence					Trend Reviewed	Increasing	Reducing	Constant/Uncertain			Will Exceed ODWQS within 50 Years	Natural	Source of Issue			Treatment				
												Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)									Anomalous Circumstance	Data Reliable	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation		
Pathogens																																
Background Bacteria					Y			Y			Y				Y	Y	N	Y			Y		N				NO			Y	Y	Y
Chemicals																																
Trihalomethanes					Y				Y		Y	Y			N	Y	Y			Y		N			Y	NO		Y				
Turbidity					Y			Y			Y			Y	Y	N	Y			Y		N			Y	NO		Y				

Table O1-8D

Evaluation of Drinking Water Issues

Municipality:
Community:
Drinking Water Source:
Issues Review Date:

Township of Springwater
Snow Valley Highlands
Well #4
October 20 2009

Information Sources:

Watershed Characterization:
Annual Water Quality Reports: 2005-2006
Interview (person/title/date): Jen Bitten / Process and Compliance Technician / October 16, 2009

Parameter	Identified From						Compare Water Quality Data to Benchmarks				Confirm Data Reliability					Evaluate Trends				Operational Consideration	Drinking Water Issue	Source of Issue Treatment											
	Watershed Characterization	Operator Interview	Annual Water Quality Reports	Raw Water Quality Data	Treated Water Quality Data	PGMN Data	Other	Raw Water Quality Exceeds ODWQS	Treated Water Quality Exceeds ODWQS	Above Detection Limit	Above Local Background	Sufficient Data	Persistent (Always, <90%)	Majority of Tests (40-90%)	Occasionally (5 - 40%)	Rarely (<5%)	Anomalous Circumstance	Data Reliable	Trend Reviewed			Increasing	Reducing	Constant/Uncertain	Will Exceed ODWQS within 50 Years	Natural	Threat (Known)	Threat (Unknown)	In Place	Effective Mitigation			
Pathogens																																	
Coliforms					Y			Y				Y				Y	Y	N	Y			Y		N									



July 29, 2010

Lake Simcoe Region Conservation Authority
120 Bayview Parkway
Newmarket, Ontario
L3Y 4X1

Attention: Mr. Don Goodyear, Source Protection Manager

WHPA Peer Review Report

Dear Mr. Goodyear:

Dillon Consulting Limited (Dillon) was retained by the Lake Simcoe Region Conservation Authority (LSRCA) to conduct Peer Reviews of well head protection area (WHPA) mapping for 86 municipal groundwater systems. These systems are located in the South Georgian Bay Lake Simcoe Source Protection Region. External management of the project was conducted by Mr. Dave Ketcheson, P.Eng of Azimuth Environmental Consulting Inc. The results of the peer review are issued in the form of digital spreadsheet files that are attached to this letter. The project scope and peer review methodology is summarized in the letter herein.

PROJECT SCOPE

LSRCA retained Dillon to conduct a 'high level' peer review of the WHPAs that were largely delineated as part of previous WHPA or regional groundwater studies, at a time prior to the finalization of the Director Rules. In general, WHPA delineation was based on an assortment of different model types, including fixed radius, 2-D analytical solutions and numerical 3-D flow modeling. In general, more sophisticated models were applied to those systems where more data was available. The focus of the peer review was on whether the methodologies were consistent with those outlined in the Director Rules, rather than a more traditional technical modeling critique. Evaluations also identified critical issues or deficiencies that would have implications on subsequent steps in the source protection process, so that these may be addressed as part of the Assessment Report. The review also identifies long-term opportunities for improvement in subsequent rounds of the process, recognizing the various levels of effort applied in WHPA delineation across the region (i.e., analytical vs. numerical methods), and the availability of data in the various WHPA settings.

Peer reviewers were Rob Kell, M.A.Sc., P.Eng, P.Geo.; Jeff Hachey, M.Sc. and Darin Burr, M.Sc. P.Geo, all hydrogeologists with Dillon.

...continued

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**Dillon Consulting
Limited**



Evaluation of the WHPAs was performed in a systematic fashion following a “score card” approach. The score card contained both objective and subjective criteria that were evaluated for each system. This template approach enabled reviewers to maintain a level of consistency during the reviews, and was suited to the “high level” nature of the evaluation. The criteria that were evaluated is listed below:

Objective Criteria	Subjective Criteria
Was modeled pumping rate appropriate?	Complexity of geological Setting
Were approved models and methods used?	Appropriateness of Flow Model
	Reasonableness of input parameters
	Adequate incorporation of natural flow field
	Model Calibration
	Incorporation of Uncertainty

For each criterion, a score between 1 and 10 was awarded. In general, a score <5 for any of the criteria would be given if a critical concern was identified that would either significantly affect the reliability of the WHPAs, or is a contravention of the elements of the Directors Rules. An exception for this rule would be the evaluation of the uncertainty criterion. Failure to adequately incorporate uncertainty into the model results was not deemed a requirement of the Director Rules and therefore would not necessarily cause the system to “fail”. Details on conditions that would cause an unacceptable evaluation at the criteria level are presented in the score card sheets.

All systems were given a “pass”, “fail” or “conditional pass” result, depending upon the analysis results. A “pass” ranking was given for those systems where the methodology was generally consistent with the Director Rules, and no critical deficiencies were noted. A “conditional pass” was granted, where the potential for considerable uncertainty in the results existed, but either little data was available to improve the accuracy of the results, or it was the reviewer’s opinion that the uncertainty on the results would not significantly alter the enumeration of land parcels that may contain significant threats.



Following criteria scoring, the individual scores were weighted, and summed to produce an overall system score (between 1 and 10) for the WHPA delineation. Higher the score, the more favorable are the results of the evaluation. Please note that this scoring is a relative ranking between the systems, and is not to be interpreted as any type of marking. For example, a score of 6 does not mean a 60% mark, but rather is a system whose delineated WHPAs are deemed more conservatively robust (in lieu of available data) than a system that receives a score of 5. Theoretically, a system evaluated via fixed radius that is very conservative could receive a higher system score than a detailed numerical model result that is not conservative, as the risk of under-representing the area where significant threats may be lower.

RESULTS

The results of the evaluation are presented on digital Excel™ spreadsheets for each system, and are grouped by township or separated municipality name. Rationale for the individual criteria evaluations, along with the criterion scores, overall system scores and recommendations for future improvement are presented on the individual sheets.

LIMITATIONS

This report was prepared exclusively for the purposes, project and site location(s) outlined in the report. The report is based on information provided to, or obtained by Dillon Consulting Limited ("Dillon") as indicated in the report, and applies solely to site conditions existing at the time of the assessment. Although a reasonable assessment was conducted by Dillon, Dillon's assessment was by no means exhaustive and can not be construed as a certification or acceptance of the reviewed reports. Rather, Dillon's report represents a reasonable review of available information within an agreed work scope, schedule and budget. Further review and updating of the peer review reports will be required as local and site conditions, and the regulatory and planning frameworks, change over time.

This report was prepared by Dillon for the sole benefit of our Client. The material in it reflects Dillon's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Lake Simcoe Region Conservation Authority
Page 4
July 29, 2010



CLOSURE

We appreciate the opportunity to work with LSCRCA on this assignment. If you have any questions about this report, please contact the undersigned.

Yours sincerely,

DILLON CONSULTING LIMITED


Darin Burr, M.Sc., P.Geo.
Project Manager

DTB:amb
Encl.

WELL HEAD TIME OF TRAVEL CAPTURE ZONE PEER REVIEW EVALUATION RESULTS

GENERAL

System Name: Elmvale
Reviewed Report: North Simcoe Groundwater Study, WHPA-Township of Springwater, Appendix J
Terms of Reference: Ontario Ministry of the Environment and Energy, 2001; Groundwater Studies, 2001/2002, Technical Terms of Reference, November 2001.
Model Type: US EPA WhAEM2000
Score: 7.3
Pass: Yes
Critique Ref: Sent to Client_Peer Review Score Card Results_050810_1

System Characteristics

Hydrogeological Complexity Low, overburden aquifer confined by 25 m of till
 Spatial variability in Aquifer Vulnerability Low within capture zone area
 Known water Quality Issues None

EVALUATION RESULTS

Criterion		Awarded Score	General Comments	Comments / Recommendations	
				Critical Deficiencies	Long-term opportunities
Objective Criteria					
1. Were reasonable pumping rates used and documented?		10	Modelled at 960 m3/day, which is the same as the PTTW Average. It is noted that Well #1 and Well #2 have a max day permit of 2273 m3/day.	None	Determine committed population requirements to ensure that it is within permitted rate. Confirm with municipality that modelled rates represent likely conditions. Should pumping regime change, then model should be updated.
2. Were rule-approved models and methods used?		Pass	2-D Analytical Solution is permitted by technical rules	None	Perform continuous updating and verification of the model data
Subjective Criteria					
3a. Is geological setting complex?	10	8	Low complexity. Aquifer is well confined, regional extensive to east, west and north, with an estimated aquitard (till and lacustrine clay) thickness of 25 m. Aquifer not expected to extend south. Wells are under artesian conditions	None	Confirm thickness of aquitard to the east, as Section B-B' (Figure 3.2.2) shows that it may thin
3b. Is Geological Model / Understanding Adequate for assessment method selected?	10	7	Model based primarily on water well records and geological mapping. Confined nature of system allows a simple conceptual model to be adequate.	None	
4. Is Flow Model Complexity Appropriate?	10	6	Yes - 2D analytical flow model used, which is deemed adequate, as regional groundwater flow direction appears predictable based on the confined nature of the aquifer, and the regional increase in potentiometric surface elevations to the east (recharge area), which appears consistent with topography. It is noted in the report that the confined aquifer is not believed to be hydraulically connected to surface water (Wye River).	None	Considering the moderate size of system, an updated 3-D numerical model would be recommend in the future. A model would allow the influence of nearby Orr lake (which appears to be at a higher elevation than Elmvale) to be assessed.
5. Are model input parameters (recharge, porosity, K) reasonable?	5	8	Generally yes - Parameter values based on pumping tests (IWS, 1989). Values appear reasonable. Recharge is conservative at 100 mm/year	None	

6. Was natural flow field adequately incorporated into model? (Numerical Model)	10	N/A		None	
7. Was natural flow field adequately incorporated into model? (Analytical Model)	10	8	Generally Yes - Analytical model results use natural flow field as input. The accuracy of this model type is highly dependant on correctly mapping gradient directions, which are generally predictable in this setting as a results of the increase in topography to the east. No boundary condition effects applicable for this model solution	None	
8. Was the Model Calibrated?	5	7	2-D Analytical model cannot be calibrated; however, actual data (potentiometric surface) is used in analysis.	None	
9. Was Uncertainty considered in the analysis?	5	7	Uncertainty was used to calculate all capture zones. Method included increasing width and length of capture zones by 20% to account for variations in K, and the direction of capture zone by 5 degrees to account for changes in flow field	None	A more rigorous sensitivity analysis could be performed by varying values of input parameters into model
10. What is the Uncertainty?		High	Designation not provided in report, but Dillon recommends that it be assessed as high	None	Uncertainty could be reduced using a calibrated flow model that incorporates sensitivity analyses.

WELL HEAD TIME OF TRAVEL CAPTURE ZONE PEER REVIEW EVALUATION RESULTS

GENERAL					
System Name:	Hillsdale Well Supply				
Reviewed Report:	North Simcoe Groundwater Study, WHPA-Township of Springwater, Appendix J; Springwater Capture Zone and Equipotential Review (Golder, 2010)				
Terms of Reference:	Ontario Ministry of the Environment and Energy, 2001; Groundwater Studies, 2001/2002, Technical Terms of Reference, November 2001.				
Model Type:	Fixed Radius				
Score:	5.5				
Pass:	Yes				
System Characteristics					
Hydrogeological Complexity	Low in confined bedrock aquifer, and moderate in confined overburden aquifer.				
Spatial variability in Aquifer Vulnerability	Low, generally low to medium vulnerability				
Known water Quality Issues	None that exceed health related ODWS				
EVALUATION RESULTS					
Criterion		Awarded Scored	General Comments	Comments / Recommendations	
				Critical Deficiencies	Long-term opportunities
Objective Criteria					
1. Were reasonable pumping rates used and documented?		5	Hillsdale receives its water from 2 wells. Text of report states modelled rate was 343 m3/day for Well 1 and 179 m3/day for Well 2, which is higher than the total 2002 average usage of 263 m3/day. The PTTW max is 943 m3/day for Well 1 and 491 m3/day for Well 2. The future rate was based on applying a max day factor of 2.75 to the maximum permitted yields. Lower score given because of lack of information on future growth requirements.	None	Determine committed population requirements to ensure that it is within permitted rate. Confirm with municipality that modelled rates represent likely conditions. Should pumping regime change, then model should be updated.
2. Were rule-approved models and methods used?		Pass	Fixed radius is an approved methodology. Model incorporated recharge, which is not specified in technical guidance; however, MOE (R. Vantfoort, July 7/10 email) states that approach is	None	Update model at least to 2-D.
Subjective Criteria					
3a. Is geological setting complex?	10	7	Well 1 is a 100 m deep bedrock well; while Well 2 is a 24 m deep overburden well. Bedrock is at a depth of 96 m, with a 1 mbgs static. Well 2 taps a regionally extensive confined aquifer. Both	None	
3b. Is Geological Model / Understanding Adequate for assessment method selected?	10	5	Sufficient geological information is present for the fixed radius method. Few wells in area so geological understanding is limited.	None	
4. Is Flow Model Complexity Appropriate?	10	5	Report states that there is a lack of water levels data for both systems, and therefore mapping of a regional gradient with confidence was not possible. The report does show potentiometric surfaces for the two aquifers based on the available data. The fixed radius method assumes that there is no	None	Improve delineation of natural flow field around well field through construction of monitoring wells and hydrogeological investigations. This information can be used to redefine capture zones using a calibrated 3D numerical model. Hydrogeological information on aquifers should be obtained via longer term pumping tests.
5. Are model input parameters (recharge, porosity, K) reasonable?	5	7	Aquifer thickness was taken from Jagger Hims (1995). Porosity of 0.1 was assigned to the bedrock, and a value of 0.3 assigned to the overburden. Recharge value is very low (10	None	

			mm/yr) for the bedrock aquifer, and moderate (100 mm/year) for the overburden. Both values are		
6. Was natural flow field adequately incorporated into model? (Numerical Model)	10	N/A		None	
7. Was natural flow field adequately incorporated into model? (Analytical Model)	10	5	The report states that the natural gradient cannot be mapped because of lack of data (very few wells in bedrock and overburden aquifer). Nevertheless, the potentiometric surfaces in the report show a possible ambient gradient to the east for the overburden wells, and to the southeast for the	None	Characterize the overburden and bedrock flow system in bedrock. Perhaps use topography as a surrogate for estimating the overburden gradient direction.
8. Was the Model Calibrated?	5	5	Fixed radius model is not a calibrated approach. A pass mark is given as we agree it is difficult to define a gradient based on the poor data available.	None	
9. Was Uncertainty considered in the analysis?	5	5	Uncertainty is considered critical. Limited uncertainty analysis was performed through the application of a 20% shape factor increase; however, end result is not considered conservative relative to concerns identified.	None	
10. What is the Uncertainty?		High	Designation not provided in report, but Dillon recommends that it be assessed as high	None	