Summary of Proposed Amendments to the Trent Source Protection Plan and Assessment Report – King's Bay Drinking Water System

Pursuant to Section 34 of Ontario Regulation 287/07 of the Clean Water Act

2024-07-17

The City of Kawartha Lakes is revising the Wellhead Protection Area (WHPA) for the King's Bay Drinking Water System (DWS) due to the installation of a new well. These upgrades have resulted in the Proposed Amendments to the Trent Source Protection Plan (SPP) and Assessment Report (AR) (last updated and approved DATE) listed below and summarized and highlighted in yellow on the following pages. A strike-through indicates that text is to be removed.

List of Proposed Amendments

SPP

1. Summary of Amendments (second page): Updated.
2. Appendix 2: Updated Policy Applicability Map (to be provided).
3. Appendix 5: Updated to include consultation activities for the Proposed Amendments. (to be updated with dates after consultation process).
4. Explanatory Document to be updated.

AR: Volume 1

1. Table 5.1-2: Updated well depth.
2. Section 5.2.2.2.4: King's Bay Wellhead Protection Area Studies Update
3. Section 5.2.2.2.8: King's Bay Wellhead Protection Area Studies Update
4. Table 5.2-6: Updated Summary of City of Kawartha-Lakes Drinking Water Systems Table
5. Table 5.2-7: Updated Vulnerability Scores
6. Table 5.3-7: Updated King's Bay Water Quality Standards Exceedances
7. Table 5.4-3: Updated Number of Significant Drinking Water Threats

AR: Volume 2

8. Appendix F, Groundwater Systems: Water Quality Risk Assessment, Vulnerability Assessment: Updated list of background reports
9. Appendix G, Section 34 Amendment Approval Letter (To be added after approval)

AR: Volume 3

10. Updated King's Bay Mapping 5-4a-c

Table 5.1-2: Summary of Wells and Water Treatment Systems for Existing Municipal Residential Groundwater Systems in the Trent Source Protection Areas

System Name	Well(s)								Water Treatment System	
	Location	No. Wells	Depths (m)					GUDI Status	Disinfection	Other Available Treatment Details
			1	2	3	4	5			
Kawartha-Haliburton Source Protection Area										
Canadiana Shores	North side of Lake Scugog	3	13.4	23.2	20.1	NA	NA	Yes	Sodium hypochlorite	Dual media (anthracite/silica sand) gravity filters, 1micron absolute filtration,
Janetville	Janetville	3	36.5	50	51	NA	NA	No	Sodium hypochlorite	Iron sequestration (sodium silicate)
King's Bay	West side of Lake Scugog	~~4~~3	17.4	17.4	17.7	18.3~~NA~~	NA	No	Sodium hypochlorite	
Manorview	Bethany	2	24.4	25	NA	NA	NA	Yes	UV irradiation	Cartridge filtration
Mariposa Estates	West side of Lake Scugog	2	15.5	25.2	NA	NA	NA	No	Sodium hypochlorite	Nitrate removal softening system

System Name	Well(s)								Water Treatment System	
	Location	No. Wells	Depths (m)					GUDI Status	Disinfection	Other Available Treatment Details
			1	2	3	4	5			
Omemee	Omemee	2	9.5	9.1	NA	NA	NA	No	Sodium hypochlorite	Iron sequestration
Pleasant Point	North side of Lake Scugog	2	15.2	17.1	NA	NA	NA	Yes	UV irradiation	1 micron cartridge filtration

5.2.2.2.4 2024 King's Bay Wellhead Protection Studies Update – *Other sections included for numbering amendments:*

5.2.2.2.4 2024 King's Bay Wellhead Protection Studies Updates

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King's Bay Golf Club Limited c/o Geranium proposed to further develop King's Bay Golf Club site located near Seagrave, in the City of Kawartha Lakes. Ontario. The proposed development is 51.07 ha, of which 5.83 ha will be devoted to the development of the proposed 46 lots for single detached homes. This is in addition to the existing 111 homes in the area of development.

There is currently enough water to supply the existing homes and additional housing. However, as per the municipal requirements, an additional potable water source (a new municipal well) was drilled to provide firm capacity to the site. The proposed residential redevelopment will rely on groundwater as water supply source, consistent with the 111 existing homes in the area of development.

WSP Canada Inc. (WSP) was retained by King's Bay Golf Club Limited to carry out a water supply investigation for the proposed redevelopment. As per the source water protection requirements of the Clean Water Act (2006), a study was initiated by WSP to meet the source water protection requirements, and include delineation of wellhead protection areas, groundwater vulnerability analysis, and threat assessment by including the new supply well (well #4) as a municipal water supply source. This work was undertaken as per 2021 Technical Rules under the CWA.

5.2.2.2.45 Groundwater Vulnerability Assessment

An aquifer vulnerability index method was used to determine groundwater vulnerability for each of the 13 municipal systems in the City of Kawartha Lakes. Each of the 8 or 12 model layers was categorized as either an aquifer or an aquitard according to the designations developed for the Conservation Authorities Moraine Coalition in 2006. The aquifer vulnerability index was calculated as a sum of the thickness of each layer multiplied by a K-Factor of either 1 for an aquifer or 4 for an aquitard.

The presence of transport pathways identified in the WHPAs resulted in modifications to the vulnerability assignments of most of the municipal systems. The majority of the transport pathways identified in the City of Kawartha Lakes systems were private water wells. Transport pathways associated with aggregate extraction were identified in the WHPA for Mariposa Estates. Two criteria were used to trigger an increase in vulnerability rating. If a water well penetrated to within 3 metres of the aquifer, then the vulnerability of the area within 30 metres of the well was increased by one level. Or, if there was a cluster of 6 wells or more within a 100-metre radius, then the vulnerability of the cluster was increased by one level.

The results of the groundwater vulnerability assessments for municipal well systems in the City of Kawartha Lakes are shown on Maps 5-1a through 5-13a. The range of groundwater vulnerability ratings in the WHPAs delineated for these systems is given in Table 5.2-.

5.2.2.2.5~~—6~~ 2019 Pinewood Wellhead Protection Studies Updates

As per the original study (Genivar, March 2010), groundwater (vertical) vulnerability was assessed by calculating Aquifer Vulnerability Index (AVI) based on the CAMC/YPDT regional hydrostratigraphic interpretations.

However, since well #2 and well #3 (upper aquifer wells) were removed from the system, only the AVI values pertinent to the deep aquifer (supporting well #4 and well 35) were considered in the vertical vulnerability assessment over the WHPA footprint.

5.2.2.2.6~~—~~7 2019 Canadiana Shores Wellhead Protection Studies Updates

The replacement well is screened within the same geological unit as the replaced well. Therefore, the aquifer vulnerability mapping remains unchanged due to the replacement well and as such no new delineations are warranted.

5.2.2.2.8 2024 King's Bay Wellhead Protection Studies Updates

As per the consultants (WSP) information, an additional well was needed to satisfy the firm capacity requirements of the new development. In this case, the existing wells have the capacity to meet demands, but redundant capacity is needed. During the consultants' 2021 hydrogeological investigation, it was determined that well TW21-3 (well #4), completed in the King's Bay Aquifer, could be used as a municipal water supply source.

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In order to provide a conservative approach and consistency with existing WHPA development, the pumping rates (in L/day) used to determine WHPA are based on total permitted takings of the existing wells. In this case, 4 scenarios were run with one well off during each scenario as summarized in the following table:

Scenario	Well #1	Well #2	Well #3	TW21-3 (Well #4)	Notes
1	123840	110880	176752	0	Existing wells operating
2	123840	110880	0	176752	TW21-3 replaces Well #3
3	123840	0	176752	110880	TW21-3 replaces Well #2
4	0	110880	176752	123840	TW21-3 replaces Well #1

For this study, the regional scale 3D southwest sub-regional model (Genivar, 2010) was used to develop WHPAs. The model domain encompasses an area of 136.6 km^2. As part of this study, the southwest sub-regional model was refined in the King's Bay area in accordance with field activities (including test well drilling and pumping test). The model was further refined during the model calibration, such that numerical model simulations reasonably reflect the observed field conditions. In general, there were no changes made to the aquifer geometry, stratigraphy and extent, though the hydraulic conductivity of a localized area of the aquifer around the King's Bay wellfield was increased to $5x10^{-4}$ m/s based on the calibration to the pumping test. The value assigned in the original southwest sub-regional model was $2x10^{-4}$ m/s.

To account for some of the uncertainty in the capture zones, a factor of safety was applied. The width and length of the capture zone is increased by 20% to account for some of the uncertainty in the hydraulic characteristics of the aquifer.

The vertical vulnerability assessment was done using the Aquifer Vulnerability Index (AVI) method as per the original assessment. Since there were no changes in the stratigraphy of the conceptual model, the intrinsic vulnerability remained the same.

The WHPAs were overlain with the intrinsic vulnerability to produce vulnerability scoring maps, as per Table 4 in the Technical Rules (MECP, 2021)

Table 5.2-6: Summary of City of Kawartha Lakes Municipal Well Systems

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System	Well	Aquifer Type	Geology	GUDI Status	Groundwater Flow Model
Birch Point	Well #3	confined to semi-confined	overburden	non-GUDI	East Sub-Regional
	Well #4	confined to semi-confined	overburden	non-GUDI	
Canadiana Shores	Replacement Well #1	unconfined to semi-confined	overburden	GUDI	Southwest Sub-Regional
	Well #2	unconfined to semi-confined	overburden	GUDI	
	Well #3	unconfined to semi-confined	overburden	GUDI	
Janetville	Well #3	confined	overburden	non-GUDI	South Sub-Regional
	Well #4	confined	overburden	non-GUDI	
	Well #5	confined	overburden	non-GUDI	
King's Bay	Well #1	confined to semi-confined	overburden	non-GUDI	Southwest Sub-Regional
	Well #2	confined to semi-confined	overburden	non-GUDI	
	Well #3	confined to semi-confined	overburden	non-GUDI	
	Well #4	confined to semi-confined	overburden	non-GUDI	
Manorview	Well #1	semi-confined	overburden	GUDI	South Sub-

System	Well	Aquifer Type	Geology	GUDI Status	Groundwater Flow Model
	Well #2	semi-confined	overburden	GUDI	Regional
Mariposa Estates	Well #2	confined to semi-confined	overburden	non-GUDI	Southwest Sub-Regional
	TW1-03	confined to semi-confined	overburden	non-GUDI	

Table 5.2-7: Vulnerability Scores for City of Kawartha Lakes Municipal Residential Well Systems

System	Well(s)	Method 1	Transport Pathways by WHPA2					Range of Groundwater Vulnerability Ratings by WHPA				Range of Vulnerability Scores by WHPA				
			A	B	C	D	E	A	B	C	D	A	B	C	D	E
Birch Point	All	AVI	-	-	-	-	N/A	High	High	High	High	10	10	8	6	N/A
Canadiana Shores	All	AVI	-	-	-	W	-	Med-high	Low-high	Low-high	Low-high	10	6-10	4-8	2-6	5.6
Janetville	All	AVI	-	-	-	-	N/A	Low	Low	Low	Low	10	6	4	2	N/A
King's Bay	All	AVI	-	-	-	-	N/A	Med-high	Med-high	Med-high	Low~~Med~~-high	10	8-10	6-8	2~~4~~-6	N/A
Manorview	All	AVI	-	-	-	-	-	Med-high	Med-high	Med-high	Low-high	10	10	4-8	2-6	5.6
Mariposa	Well	AVI	-	-	-	-	N/A	Med-	Med-	Med-	Low-	10	8-10	6-8	2-4	N/A

System	Well(s)	Method 1	Transport Pathways by WHPA2					Range of Groundwater Vulnerability Ratings by WHPA				Range of Vulnerability Scores by WHPA				
			A	B	C	D	E	A	B	C	D	A	B	C	D	E
Estates	#2							high	high	high	med					
	TW1-03					W/Q	N/A	Med-high	Med-high	Med-high	Med-high	10	10	6-8	4-6	N/A
Victoria Glen	All	AVI	-	W	W	W	N/A	High	Med-high	Med-high	Med-high	10	8-10	6-8	4-6	N/A
Pleasant Point	Well #1	AVI	-	-	-	W	SUC	Med	Low-med	Low-med	Low-med	10	6-8	4-6	2-4	5.6
	Well #2	AVI	-	-	-	W	D	Med	Low-med	Low-med	Low-med	10	6-8	4-6	2-4	5.6

5.3.2.4 King's Bay

The drinking water issues evaluation for the King's Bay municipal well system is summarized in Table 5.3-7, which lists the water quality parameters that exceeded the primary or secondary benchmarks and indicates whether or not they were considered issues and the rationale for the conclusion. No drinking water issues were identified. No upward trends were noted for the parameters present.

Table 5.3-7: King's Bay Water Quality Standards Exceedances

Parameter	Water Type[1]	Years on Record	Benchmark Exceedances			Standard		Extrapolation		Drinking Water Issue	Rationale
			Exceeds ODWQS	Above detection limit	Above local background level	Value	Type[2]	Trend	Exceed within 50 years		
Schedule 1											
Coliforms	Raw	2003/ 2004	Yes			0 cfu/100 mL	MAC	_	No	No	Rare exceedances in low numbers. Adequate treatment
Coliforms	Treated	2003/ 2004	Yes			0 cfu/100 mL	MAC	_	No	No	Adequate treatment
Schedule 2 & Table 4											
NDMA	Raw	2003/ 2004		Yes		0.009 ug/L	MAC	_	No	No	Rare exceedances in trace concentrations
Turbidity	Treated	2003/ 2004	Yes			5 NTU	OG	_	No	No	Rare exceedances in low numbers
Hardness	Raw		Yes			80 mg/L	OG				Naturally Occuring; frequent exceedance

[1]Indicates if the data on record is for raw (untreated) or treated water; [2]Standard types: MAC=Maximum Acceptable Concentration; AO=Aesthetic Objective; OG=Operational Guideline

Table 5.4-3: Summary of Significant Threats for Groundwater Systems in the Trent Source Protection Areas (Listed by System)

Drinking Water Threats		Minden	Lutterworth Pines	Cardiff	Dyno Estates	Alpine Village	Buckhorn Lake Estates	Norwood	Blackstock	Greenbank	Port Perry	Havelock	Grafton	Colborne	Brighton	Crystal Springs	Keene Heights	Millbrook	Stirling	Fraserville	Birch Point	Canadiana Shores	Janetville	Kings Bay	Manorview	Mariposa Estates	Victoria Glen	Pleasant Point	Pinewood	Sonya	Victoria Place	Woodfield	Woods of Manilla	TOTAL
No.	Prescribed Drinking Water Threats																																	
1	The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act	1						1				1		3					3															9
2	The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage	0	15	2	7	49	16	19	5	17	3	14	1	10	6	1	18	2	96	2	59	20	14	2	35	18		15	10	14	28	10	5	513~~1~~
3	The application of agricultural source material to land					0		0	0	2				4	0	1			10	0			0	2			2		0		1			~~202~~2
4	The storage of agricultural source material					0	0	0	0	0						0	0	0	3				0											3
5	The management of agricultural source material																																	0

Drinking Water Threats		Minden	Lutterworth Pines	Cardiff	Dyno Estates	Alpine Village	Buckhorn Lake Estates	Norwood	Blackstock	Greenbank	Port Perry	Havelock	Grafton	Colborne	Brighton	Crystal Springs	Keene Heights	Millbrook	Stirling	Fraserville	Birch Point	Canadiana Shores	Janetville	Kings Bay	Manorview	Mariposa Estates	Victoria Glen	Pleasant Point	Pinewood	Sonya	Victoria Place	Woodfield	Woods of Manilla	TOTAL
6	The application of non-agricultural source material or biosolids to land								0										1															1
7	The handling and storage of non-agricultural source material or biosolids																		0															0
8	The application of commercial fertilizer to land								0	3													0	1										~~3~~4
9	The handling and storage of commercial fertilizer																																	0
10	The application of pesticide to land					0			0	2					0	1	2		0	1			0	1		8	2		0		1	0		18
11	The handling and storage of pesticide							0	0																									0
12	The application of road salt																																	0
13	The handling and storage of road salt	29																																29
14	The storage of snow	4	1					10				14																						29
15	The handling and storage of fuel	10	5	1	7	1	2	5	0	0	1	5		6		1	0	2	9		9	9	1		2	1		8	4	1	12	1		103
16	The handling and storage of a dense non-aqueous phase liquid	3						5	0			1		8				5	6															28
17	The handling and storage of an organic solvent	1						1						1					1															4

Drinking Water Threats		Minden	Lutterworth Pines	Cardiff	Dyno Estates	Alpine Village	Buckhorn Lake Estates	Norwood	Blackstock	Greenbank	Port Perry	Havelock	Grafton	Colborne	Brighton	Crystal Springs	Keene Heights	Millbrook	Stirling	Fraserville	Birch Point	Canadiana Shores	Janetville	Kings Bay	Manorview	Mariposa Estates	Victoria Glen	Pleasant Point	Pinewood	Sonya	Victoria Place	Woodfield	Woods of Manilla	TOTAL
18	The management of runoff that contains chemicals used in the de-icing of aircraft																																	0
21	The use of land as livestock grazing or pasturing land, an outdoor confinement area, or a farm- animal yard					1		0	0	1				1		0			16	0			0				1				1			21
22	The establishment and operation of a liquid hydrocarbon pipeline.																																	
Total No. Significant Prescribed Drinking Water Threats		48	21	3	14	51	18	41	5	25	4	35	1	33	6	4	20	9	145	3	68	29	15	61 ~~1~~	37	27	5	23	14	15	43	11	5	784 ~~79~~
Total No. Parcels Affected by Significant Prescribed Drinking Water Threats		34	18	2	7	51	18	35	5	21	3	32	1	21	6	3	20	9	121	3	59	24	14	41 ~~1~~	35	25	2	15	10	14	29	10	3	654 ~~1~~
Local Drinking Water Threats																																		
None																																		0
TOTAL (All Significant Drinking Water Threats)																																		
Total No. Significant Drinking Water Threats		48	21	3	14	51	18	41	23	25	4	35	1	33	6	4	20	9	145	3	68	29	15	~~1~~ 6	37	27	5	23	14	15	43	11	5	784 ~~79~~
Total No. Parcels Affected by Significant Drinking Water Threats		34	18	2	7	51	18	35	8	21	3	32	1	21	6	3	20	9	121	3	59	24	14	41 ~~1~~	35	25	2	15	10	14	29	10	3	654 ~~1~~

Note: the total number of affected parcels may be less than the total number of drinking water threats because more than one threat may occur on some parcels

References:

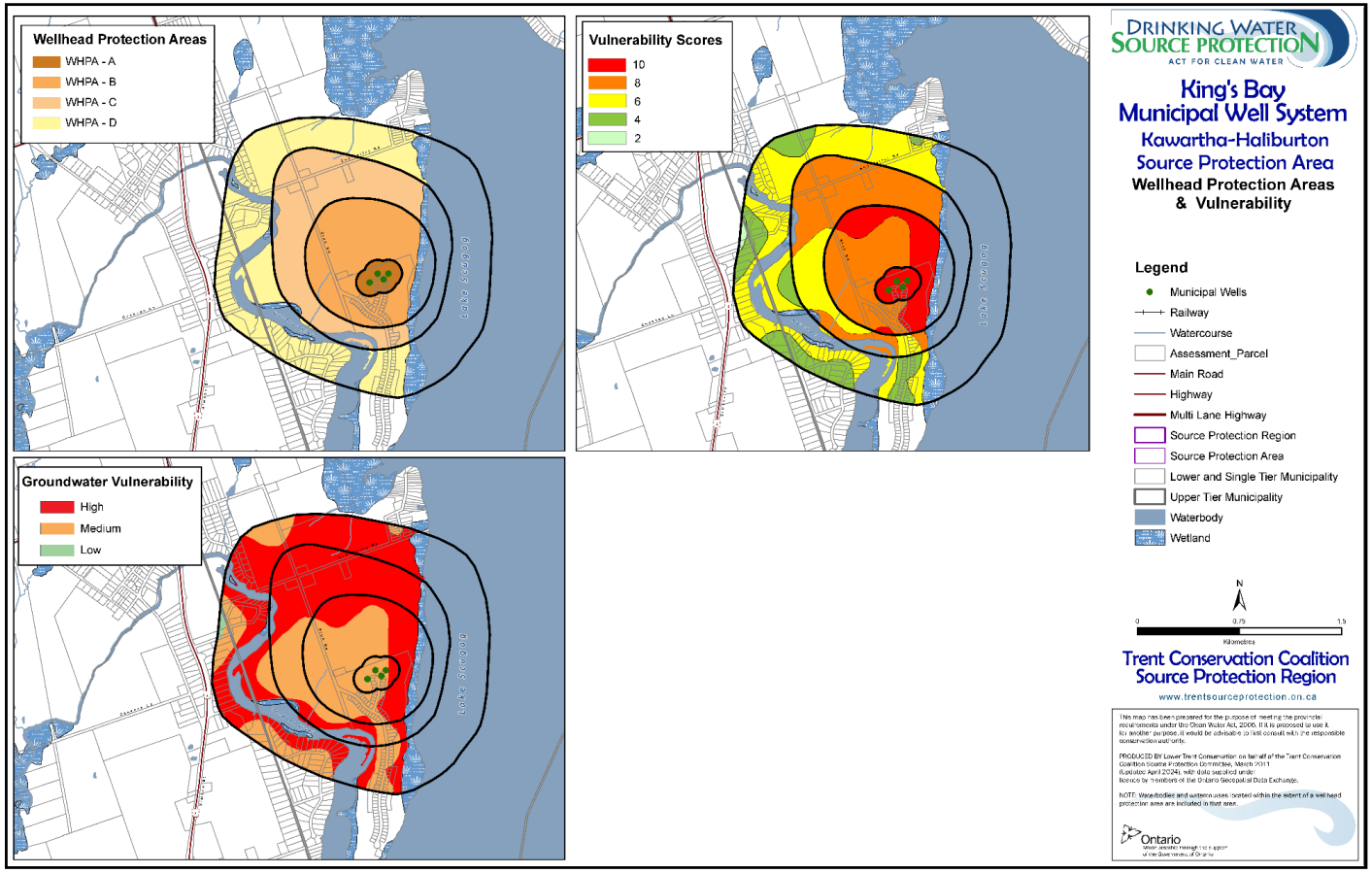
WSP Canada Inc., 2024, Source Protection Vulnerability, Issues and Threats Assessment, King's Bay Golf Course Redevelopment, Seagrave, City of Kawartha Lakes, Ontario, Project Number 19116164 (4400), January 2024

Golder, A Member of WSP, 2022, Water Supply Investigation, King's Bay Golf Course Redevelopment, Seagrave, City of Kawartha Lakes, Ontario, Project Number 19116164, February 2022.

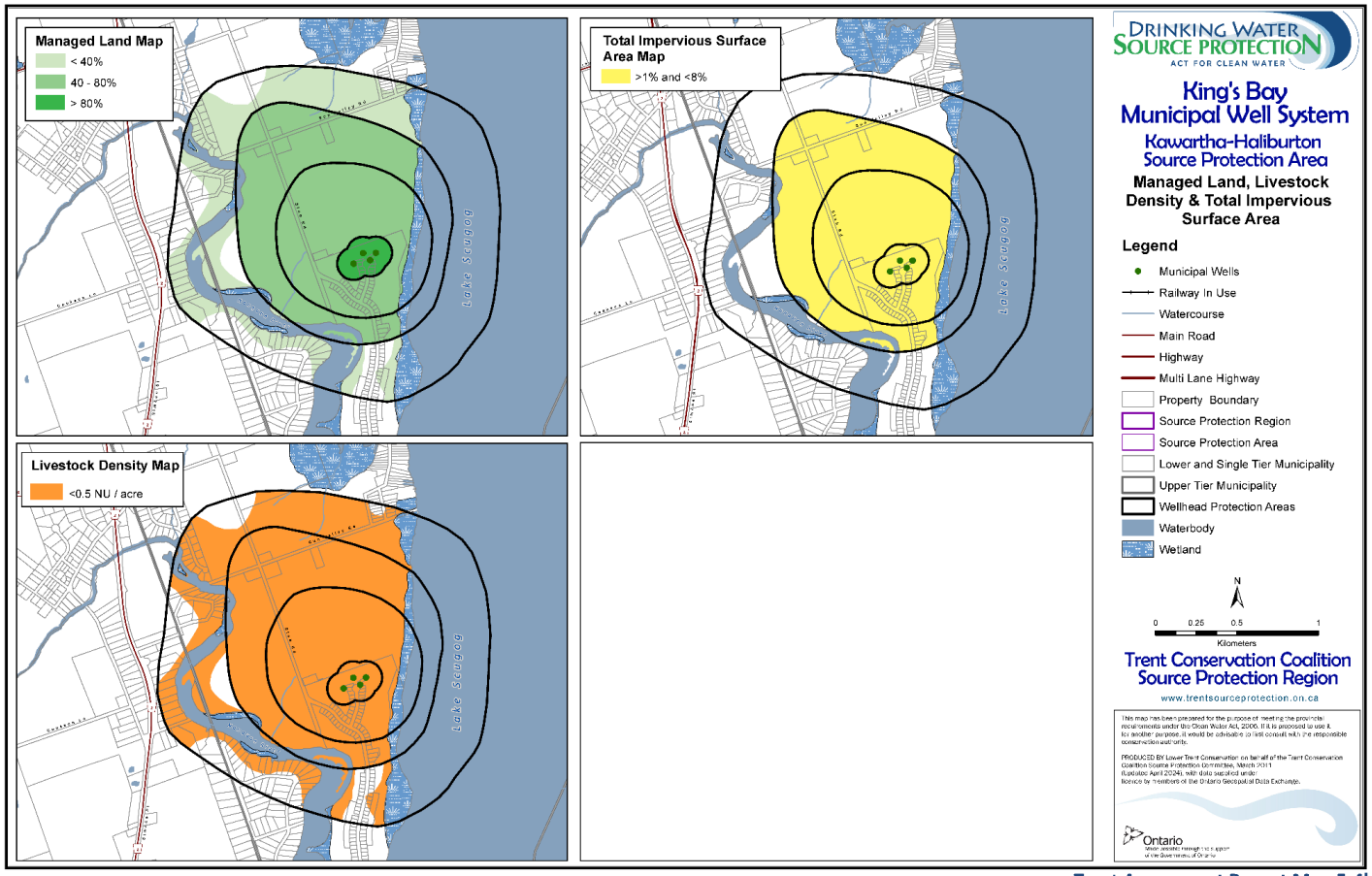
Golder, A Member of WSP, 2021, Geotechnical and Hydrogeological Investigations, King's Bay Golf Course Redevelopment, King's Bay, Township of Mariposa, Ontario, Project Number 19116164 (3000), December 2021.

WSP Canada Inc., 2024, King's Bay Municipal Drinking Water System – Response to Source Water Protection Comments from Kawartha Conservation, Project Number 19116164, January 2024

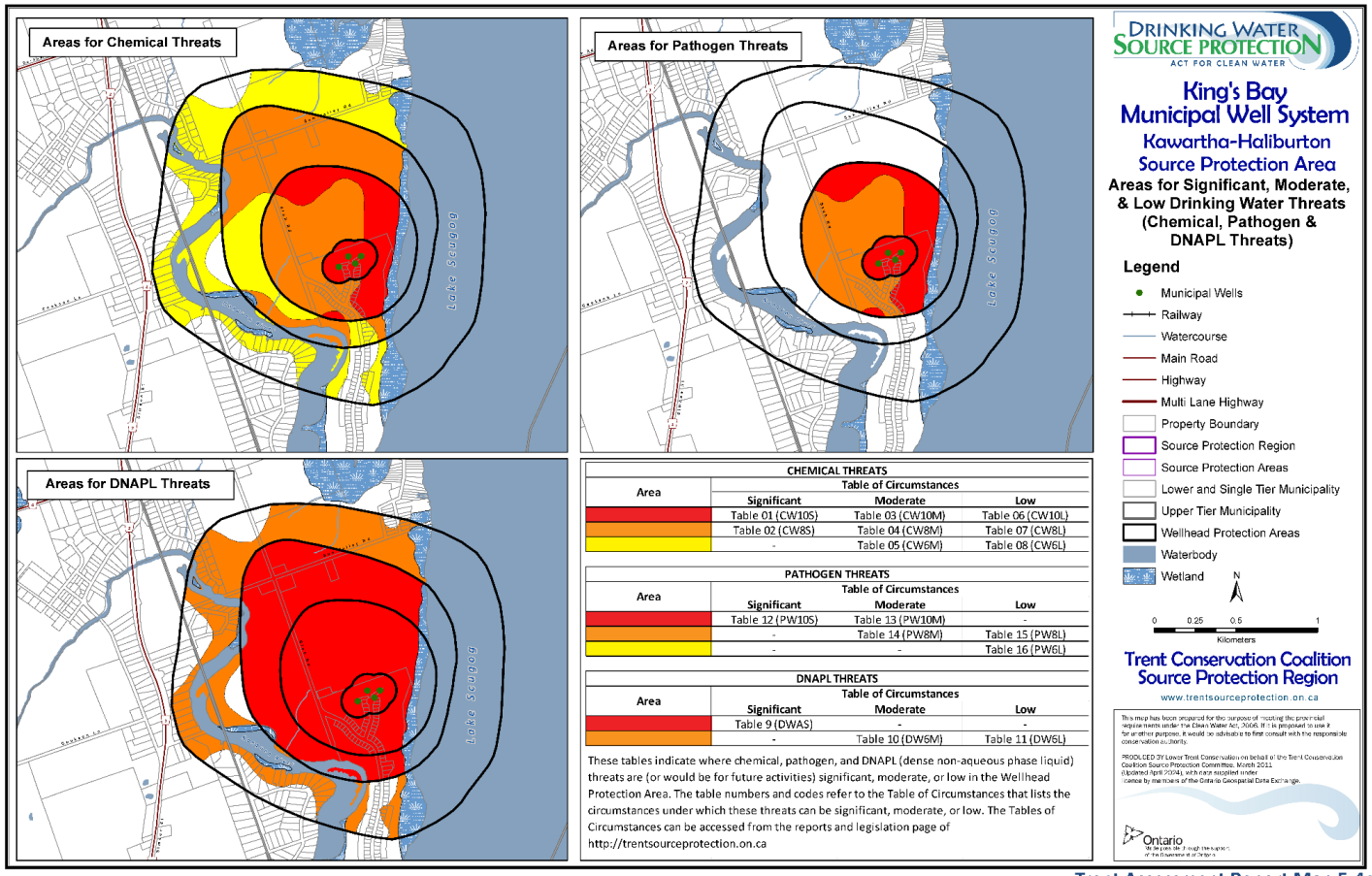
Assessment Report Volume 3 – Updated King's Bay Mapping



Trent Assessment Report Map 5-4a



Trent Assessment Report Map 5-4b



CHEMICAL THREATS

Area	Table of Circumstances		
	Significant	Moderate	Low
	Table 01 (CW10S)	Table 03 (CW10M)	Table 06 (CW10L)
	Table 02 (CW8S)	Table 04 (CW8M)	Table 07 (CW8L)
	-	Table 05 (CW6M)	Table 08 (CW6L)

PATHOGEN THREATS

Area	Table of Circumstances		
	Significant	Moderate	Low
	Table 12 (PW10S)	Table 13 (PW10M)	-
	-	Table 14 (PW8M)	Table 15 (PW8L)
	-	-	Table 16 (PW6L)

DNAPL THREATS

Area	Table of Circumstances		
	Significant	Moderate	Low
	Table 9 (DWAS)	-	-
	-	Table 10 (DW6M)	Table 11 (DW6L)

These tables indicate where chemical, pathogen, and DNAPL (dense non-aqueous phase liquid) threats are (or would be for future activities) significant, moderate, or low in the Wellhead Protection Area. The table numbers and codes refer to the Table of Circumstances that lists the circumstances under which these threats can be significant, moderate, or low. The Tables of Circumstances can be accessed from the reports and legislation page of http://trentsourceprotection.on.ca

DRINKING WATER SOURCE PROTECTION
ACT FOR CLEAN WATER

King's Bay Municipal Well System

Kawartha-Haliburton Source Protection Area

Areas for Significant, Moderate, & Low Drinking Water Threats (Chemical, Pathogen & DNAPL Threats)

Legend

- Municipal Wells
- Railway
- Watercourse
- Main Road
- Highway
- Multi Lane Highway
- Property Boundary
- Source Protection Region
- Source Protection Areas
- Lower and Single Tier Municipality
- Upper Tier Municipality
- Wellhead Protection Areas
- Waterbody
- Wetland

N

0 0.25 0.5 1
Kilometers

Trent Conservation Coalition Source Protection Region

www.trentsourceprotection.on.ca

This map has been prepared for the purpose of meeting the provincial requirements under the Clean Water Act, 2006. If it is proposed to use it for another purpose, it would be advisable to first consult with the responsible conservation authority.

PRODUCED BY Lower Trent Conservation on behalf of the Trent Conservation Coalition Source Protection Committee, March 2011
(Updated April 2014), with base supplied under licence by members of the Ontario Geospatial Data Exchange.

Ontario
We do this job through the support of the Province of Ontario.

Trent Assessment Report Map 5-4c