Township of Georgian Bay
MUSKOKA

WATER QUALITY MONITORING PROGRAM

Volunteer Manual

Township of Georgian Bay

2026

Bluewater Biosciences

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Introduction

For the past 25 years, the Township of Georgian Bay has supported a community-based, volunteer-driven water quality monitoring program for both coastal Georgian Bay and its Inland Lakes. In 2026, the program will expand in both geographic scope and the range of data collected. The key objective of the program is to evaluate the extent to which shoreline development and overall human activity in the region has impacted key water quality parameters, and to generate the data and tools needed to inform meaningful updates to governance and management practices.

This document provides all the information needed to volunteer in the program including step-by-step instructions on collecting and analyzing water for bacterial (Total Coliforms and E. coli), chemical (Total Phosphorus) and physical (water clarity and temperature) parameters.

Thank you to all our volunteers, both those returning from previous years and those who have recently joined us. We truly appreciate your time, enthusiasm, and commitment to monitoring and protecting the waters of Georgian Bay and the Inland Lakes.

Water Quality Parameters

Summary Table of Parameters Monitored:

Parameter	**Sources**	**Provincial Guideline**	**Georgian Bay Water Quality Objective (GBWQO)**	**Elevated levels indicate:**
Total Coliform	Wildlife, wetlands, vegetation/soil			Naturally occurring, biological activity
E. coli	Sewage, fecal sources from agriculture, wildlife, boat discharge	< 200 MPN/100mL	< 10 MPN/100mL	Fecal contamination, decline in recreational water quality
Total Phosphorus	Sewage, storm water, agriculture, soaps, fertilizers	< 20 µg/L	< 10 µg/L Georgian Bay < 15 µg/L Inland Lakes	Eutrophication (excessive algae and plant growth) harmful to fish
Clarity	Sewage, storm water, agriculture, soaps, fertilizers, boat activity, shoreline disturbances			Eutrophication, shoreline erosion
Temperature				Climate change

Equipment:

A Volunteer Manual and data sheets will be provided to each volunteer.

The following equipment will be provided:

 **ColiPlates™**	 **Incubator**	 **UV Light**	**Sample Bottles**	 **Gloves**
 **Incubator Temp Control**	 **Digital Thermometer**	 **Secchi Disk**	 **Phosphorus Sample Bottles**	 **Waterproof Sharpie**

Volunteers are expected to provide:

- A cooler large enough to hold all samples
- Ice packs

Monitoring Design

Sampling Sites

Sampling sites should be distributed around the lake (river/waterbody) and should focus on those areas with the greatest potential for water quality impairment. These tend to be areas where sources of contaminants are concentrated such as those with high density development, impermeable/unnatural shorelines, recreational areas, marinas, etc.

A suitable **control site** should also be selected. Ideal control sites would have no development or human activity (if this is possible) within the surrounding area. These sites are necessary for providing comparative data and information on background bacterial levels.

For regions continuing in the program from previous years, please sample the same sites as before. For new regions (Twelve Mile Bay, Wah Wah Taysee, Cognashene, Go Home Bay and Port Severn) sampling sites will need to be determined and will be discussed during the training session.

Once sampling sites have been determined they should be clearly identified on a map along with GPS coordinates. Please use the standard sample ID format (for example HH01 would be used for Honey Harbour Site 1). The sites should remain consistent for future years to provide a comparable and long-term database.

Sampling Schedule:

Sampling Dates (window)	Sampling	TP Drop off no later than
May 17 – 31	EC + TP	June 15th
June 15 – 30	EC	
July 15 – 31	EC + TP	August 4th
August 15 – 31	EC	
September 15 – 30	EC + TP	October 1st

Sampling Timing

Chemical and bacterial testing in developed areas is most informative after a major rainfall event and gives insight into the impact of storm water runoff in near-shore waters. Clearly identify these event-related samples on the data sheet for later interpretation.

In high density resident/cottage and recreational areas such as parks, campsites, beaches and boat anchorage bays and marinas, testing is often most effective immediately following peak usage times, such as Sunday or Monday mornings (if possible, please include these days). Samples should be collected in the morning before **10 a.m.** as solar radiation can kill bacteria.

Sample Collection

Sample Bottles

500mL plastic (i.e. laboratory grade Nalgene sample bottles which can withstand boiling water) sampling bottles have been provided for phosphorus and bacterial sample collection. Each bottle should be labelled with the sampling site ID number and always re-used for the same site. Use the waterproof sharpie provided. Please sterilize the bottles after use by placing them in boiling water for several minutes and air-dry on a clean rack. Seal bottles with lids and set aside for the next sampling date.

Sampling Preparation:

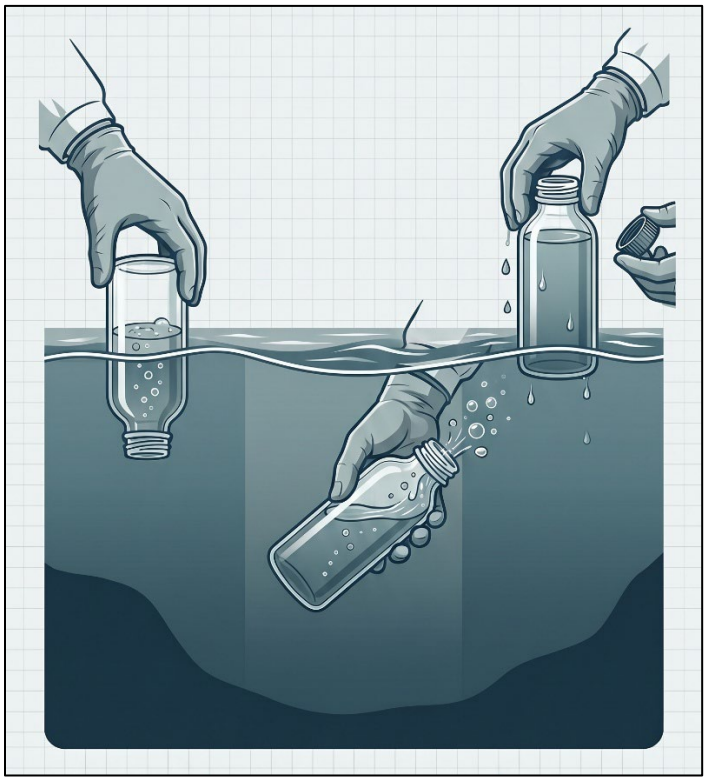
1. Before setting out by boat, make sure you have all the required safety equipment in your boat and your Pleasure Craft Operator Card.
2. Make sure you have all the equipment you need, including data sheets (fill out top portion of the data sheet).

3. Consult the map of your sampling area, plan out your route in advance and arrange your sampling bottles accordingly.
4. Approach each site using the determined GPS coordinates.
5. Please be careful not to stir up bottom sediment with the boat, coasting to the sample site location and using an anchor, if necessary, due to wave/wind action.
6. Using the digital thermometer on the shady side of the boat, record water temperature on data sheet.
7. Collect water samples and record Secchi depths (as described below) on data sheet.

Sampling Procedure:

Please ensure that anyone who is touching the bottles and caps has clean hands (and arms), rinsing at each site to remove any sunscreen and soap/lotion to avoid sample contamination (gloves may be worn if preferred). The sample bottle should be rinsed out several times using water at the sampling site prior to collecting the water sample. The water sample should be collected from just below the water surface (around elbow depth) but not including the surface film on the water.

Grip the bottle at the base and plunge it in a downward motion, using the "plunge and sweep" method as described below, (bottle going into the water top down) into the water to a depth of 9-15 inches.



Plunge and Sweep Method

1. Plunge the sample bottle mouth-down vertically into the water to prevent surface film from entering the bottle.
2. Tilt and sweep the submerged bottle forward, allowing the air to escape and the water to fill the bottle from desired depth.
3. Raise the filled bottle vertically out of the water column to complete the collection process.

Total Phosphorus Sample Collection:

1. Prepare phosphorus bottles by labeling them with each site number. The TP bottles have preservative in them (0.5 ml of 50% nitric acid), please do not rinse these bottles.
2. Rinse 500 mL sample bottle with water at the site several times. Collect a water sample using the plunge and sweep method. **Use the sample bottles for TP collection first.**
3. Pour water into the Phosphorous sample bottle, please be careful not to touch the inside of the bottle or cap. Fill to the 'fill line' (shoulder of bottle) and screw the lid on tightly.
4. Place the samples in a cooler while sampling and store them in a fridge until they can be delivered to the TGB office.

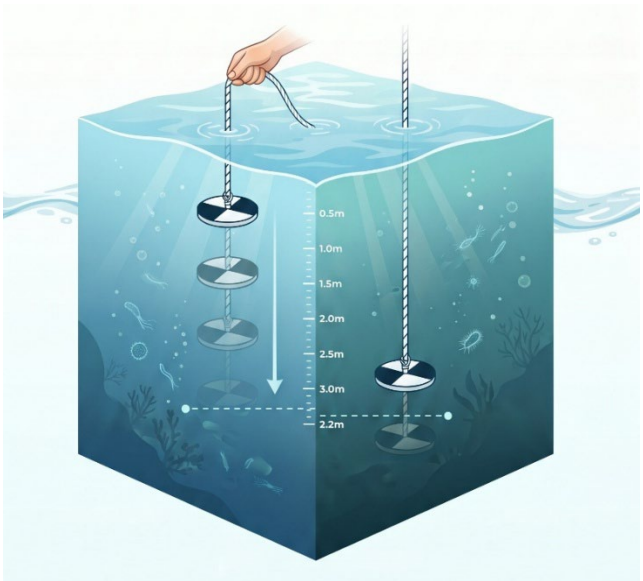
Bacterial (Total Coliform and E. coli) Sample Collection:

1. After collecting the phosphorus sample use the same 500 mL sample bottle to collect water for bacteria for each site, using the plunge and sweep method and screw the lid on tightly. Please be careful not to touch the inside of the bottle or cap
2. Place the samples in a cooler while sampling and store them in a fridge until they are analyzed. After collecting bacterial water samples, please make sure to analyze them promptly, as they should not be stored for more than 24 hours.

Measuring Water Clarity

Secchi depth measurements can be taken to measure water clarity and is the standard method for determining water clarity in freshwater lakes. Water clarity provides an indirect measure of nutrient loading into lakes, since low nutrient levels result in less phytoplankton bloom, and therefore greater water clarity. Conversely, higher nutrient levels often result in reduced water clarity. The nutrients of concern are phosphates and nitrates from septic systems, fertilizer runoff and use of soaps and detergents.

The Secchi Depth Procedure:



The Secchi Depth Procedure

1. Remove sunglasses.
2. Lower disk on attached rope into water on the shady side of the boat.
3. Lower disk until you can no longer distinguish between the white and black portions, record this depth (Depth 1 on data sheet) as indicated on the rope.
4. Lower the disk a little further. Slowly raise the disk until it just becomes visible again and record this depth (Depth 2 on data sheet).
5. The Secchi Depth is the average of these depths (Depth 1+ Depth 2) ÷ 2.

Data Sheet and Additional Observations:

Complete the data sheet including all of the information for each site as shown on the Sample Data Sheet in the Appendix.

Record any other factors or conditions that may influence sample results such as cloudy water, visible waterfowl, or any unusual activity in the area such as construction on the shoreline or presence of 'live-abord' boats.

Bacterial Analysis with ColiPlate™

Filling the ColiPlate:

1. Keep each sample refrigerated until you are about to fill the ColiPlate.
2. Plug in incubator and bring it up to 35° C (95°F) – 37° C (98.6° F). Start this process at least one hour before samples are loaded. Place the thermometer on the bottom of the incubator in a position that can be easily seen through the viewing window (HovaBator Incubator). If you are provided with a temperature control, use this to maintain the temperature.
3. Remove samples from the fridge.
4. Match each sample with a ColiPlate by writing the site name or number on the ColiPlate label.
5. Wash your hands thoroughly and use gloves if preferred.
6. Remove the ColiPlate lid. Shake the water sample vigorously before opening the lid (this distributes the bacteria in the water sample). Gently pour a small stream of sample water onto the plate, running the stream along each row of wells so that water enters each well. When all wells are full and excess sample water remains on the plate, gently tap the side of the ColiPlate to dislodge any air bubbles which may remain in the bottom of some wells. To ensure all wells are full, view the plate at eye level and top up any wells which are not full.
7. To remove excess water from the ColiPlate and in between wells, tilt the plate on an angle and drain off. In fact, the ColiPlate can be carefully tilted to a 90° angle to assist the draining of water, while keeping the sample water in each of the 96 wells. Use a paper towel or tissue (using a new one for each plate) to wick away the last few drops of water at the low corner of the plate (and around the plate if needed). Viewing the surface of the plate at eye level should reveal that all wells are full, that the surface water on each well has a concave shape, and that no excess water remains on the surface (or in between the wells) of the plate. If any wells remain unfilled, top up with a little more sample and drain off excess. **Proper drainage of water in and in between the wells of the ColiPlate is very important and ensures that cross contamination does not occur.**

Tip: If you are having difficulty draining the ColiPlate, so that when replacing the lid on the plate, water is spreading overtop the wells, you can incubate the plates without the lid on. Make sure you place the labeled lid next to the plate (or some other labelling method) so it can be identified after incubation.

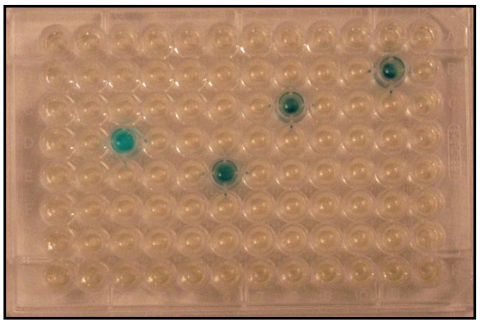
ColiPlate Incubation:

1. When all ColiPlates are filled place them into the incubator, making sure you can observe the temperature. ColiPlates can be stacked, however be careful not to overload by stacking the plates too deep, this can affect airflow.
2. Replace the lid of the incubator and allow the temperature to re-stabilize to 35 - 37° C. This may take close to an hour.
3. Note the time when the temperature re-stabilized.
4. Incubate for 24 hours from stabilization time.
5. Inspect the incubator several times to ensure it is remaining at the appropriate temperature and adjust if necessary. If you are using a temperature controller, set for 36° C.
6. After 24 hours remove the ColiPlates from the incubator.

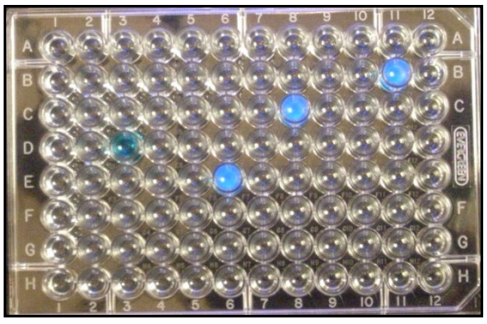
NOTE: Do not incubate for longer than 30 hours. The media in the CoiPlate contains a reagent which inhibits the growth of non-Coliform bacteria, which becomes increasingly ineffective after that time, resulting in potential false positives.

ColiPlate Enumeration:

1. Place the incubated ColiPlate on a white surface and count the number of wells which turned blue. This is the positive reaction for Total Coliforms. There will be different tones of blue depending on the strength of the bacterial colony in each well. Count ALL blue, blue/green and greenish wells as one count each, regardless of the intensity of the colour change. Refer to the MPN Table to determine the Most Probable Number for Total Coliforms in 100mL of sample water. Record number of blue positive wells and MPN in Data Sheet.
2. Place the incubated ColiPlate on a black (dark) surface in reduced light and observe under a long wavelength UV light. Count the number of wells that turned blue and were fluorescent under the UV light. This is the positive reaction for E. coli. Do not count wells with fluorescence that are not also blue – they must be blue and fluorescent. Refer to the MPN table to determine the Most Probable Number for E. coli in 100 mL of sample water. Record number of positive blue and fluorescing wells and MPN in Data Sheet.



1) Four positive wells for Total Coliforms or 11 cfu's Total Coliforms/100mL (taken from MPN table)



2) Three positive wells (fluorescing) for *E. coli* or 8 cfu's *E. coli*/100mL (taken from MPN table)

ColiPlate Clean up and Disposal:

1. Please rinse out ColiPlates and lids well. Exposed ColiPlates do not contain toxic or pathogenic materials and can be rinsed and drained in a sink. Clean the sink well after use. Once they are rinsed and excess water is removed from the wells, they can be placed in a closed box and returned for recycling.
2. Please return used ColiPlates and lids to the Township of Georgian Bay Municipal office. There is a bin behind the office where they can be placed.

Quality Control

Quality control measures are an important component of all water monitoring programs. The QC methods to be used will be discussed further at the training session.

This may include:

Field Blank (Bacteria): use sterilized distilled water to ensure that the sample bottles are being sterilized properly, the bottles are being handled correctly and that the appropriate procedures are being followed to process samples using the ColiPlate technique. Label the bottle and ColiPlate as 'Field Blank' and follow the same procedures as the other water samples.

Field Duplicate (Bacteria): use the same sample water (using a full 500 mL sample bottle) from a pre-selected site and fill two ColiPlates (one for the site and one for the field duplicate). Record and compare the results of the duplicate sample. While the results should be similar, bacteria are not evenly distributed in water (even after shaking the sample), and tend to clump together or onto particles, so there may be a small difference in counts.

Field Blank (Phosphorus): use deionized water as a field blank and pour into 500 mL sample collection bottle. Pour into phosphorus bottle (clearly labeled as 'field blank') and refrigerate with all other phosphorus samples, to be delivered to the TGB office.

Field Duplicate (Phosphorous): use the same sample water (using a full 500 mL sample bottle) from a pre-selected site and fill two phosphorous bottles (clearly labeled with site ID and 'field duplicate') and refrigerate with all other phosphorus samples, to be delivered to the TGB office.

Travel Blank (Phosphorous): use a phosphorus bottle with pre-filled deionized water (to be provided). Open and close the lid and refrigerate with all other phosphorus samples, to be delivered to the TGB office.

Submission of Data

Transfer all information on the data sheet (s) to the excel spreadsheet provided and email to kim.schiefer@bluewaterbiosciences.com.

Please provide the completed spreadsheet after each sampling event. This will allow any issues with the results to be identified and addressed promptly as opposed to waiting until the end of the sampling season.

Sample Area: Honey Harbour

Date	*May 29, 2026*	**Sample Time**	*9:30 am*
Volunteer	*Allie Smith*	**Analysis Date & Time**	*May 30 at 11 am*
Rainfall in last 24 hours (heavy, moderate, light, none)	*heavy*	**Air Temp.**	*18 ° C*

Site Specific Data:

Site ID	Water Temp	Weather (cloudy, windy)	Secchi Depth 1	Secchi Depth 2	Blue wells/TC	Blue wells & Flor. /EC	MPN TC	MPN EC
HH01	*16° C*	*Full sun, windy*	*1.9*	*2.1*	*19*	*3*	*55*	*8*
HH02	*15° C*		*1.8*	*2.0*	*32*	*6*	*102*	*16*

Comments: *12 live-aboard boats anchored within bay at HH02.*

Bluewater Biosciences Incorporated

COLIPLATE™-400

INTENDED USE The ColiPlate™-400 is a rapid, convenient and accurate test for quantitative measure of total coliforms and *E. coli.* The test is designed to meet regulatory guidelines for surface water, recreational water, processing water and wastewater. The ColiPlate enables quantification of coliforms and *E. coli* density ranging between ca. 3 to 2,400 cfu/ 100 mL in a single test unit without dilution. The distinctive blue/green coloration of positive tested samples enables analysis of brownish, turbid or rust filled waters.

TEST PRINCIPLE AND FEATURES The ColiPlate test utilizes the proven X-Gal and MUG techniques to detect viable coliforms and/or *E. coli* bacteria. The ColiPlate contains selective media to provide nutrients to stimulate the growth of coliforms and *E. coli.* The media also contains inducers and chromogenic/fluorogenic substrates. These substrates react with specific enzyme indicative of coliforms (beta-D-galactosidase) and *E. coli* (beta-D-glucoronidase) to provide color change to blue/green and fluorescence by coliforms and *E. coli* respectively. Test results are recorded after just 24 hours of incubation with the appearance of blue/green color for coliforms. *E. coli* can be detected by the appearance of fluorescence under a long wavelength UV light. Quantification is based on Most Probable Number (MPN) of colony forming-units (cfu) per 100 mL sample.

MPN TABLE

No. Wells Giving Positive Reaction	MPN per 100 mL Sample	No. Wells Giving Positive Reaction	MPN per 100 mL Sample	No. Wells Giving Positive Reaction	MPN per 100 mL Sample	No. Wells Giving Positive Reaction	MPN per 100 mL Sample
0	<3						
1	3	25	76	49	182	73	388
2	5	26	79	50	188	74	403
3	8	27	83	51	194	75	418
4	11	28	87	52	200	76	434
5	13	29	90	53	206	77	451
6	16	30	94	54	213	78	469
7	19	31	98	55	219	79	489
8	22	32	102	56	226	80	510
9	25	33	106	57	233	81	534
10	28	34	110	58	240	82	559
11	30	35	114	59	247	83	587
12	33	36	119	60	255	84	619
13	36	37	123	61	263	85	654
14	39	38	127	62	271	86	694
15	43	39	132	63	280	87	740
16	46	40	136	64	289	88	794
17	49	41	141	65	298	89	858
18	52	42	146	66	307	90	938
19	55	43	151	67	317	91	1,038
20	59	44	156	68	328	92	1,174
21	62	45	161	69	339	93	1,370
22	65	46	166	70	350	94	1,696
23	69	47	171	71	362	95	2,424
24	72	48	177	72	375	96	>2,424

*Patent pending.