Alberta safe beach protocol

Alberta

About this document:

The Safe Beach Protocol was prepared to provide Albertans with a clear understanding of the management of recreational waters in the province. It provides information on the role of owners and operators in overseeing these sites, monitoring water quality and responding to health risks, with the support and commitment of provincial agencies. The information in this document may be of interest to policy makers, researchers, public health professionals, or members of the public who are interested in recreational water sites (beaches).

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Alberta Safe Beach Protocol [2022 edition]

Alberta Health

Contents

Purpose

The Alberta Safe Beach Protocol (Protocol) outlines the provincial program to assess and manage the public health risks associated with recreational waters throughout Alberta. It specifies recreational water quality standards designed to protect bathers primarily from microbiological risks and, where applicable, from physical and chemical risks. It also introduces a site assessment tool that can be used to assess each site for hazards[1], and a template that may be used to further evaluate those hazards and identify strategies to reduce them.

Scope

The Protocol applies to natural or manmade Alberta recreational water sites (beaches[2]), which have designated public access for recreational activities where immersion and ingestion are likely.

The Protocol does not apply to the following:

- non-beach areas of a lake, where activities such as water skiing, windsurfing, tubing, canoe/kayaking and fishing occur;
- water stored in storm water retention ponds, dug outs, hot springs and similar bodies of water;
- water-based amusement park activities;
- pools regulated under the Public Swimming Pools Regulation;
- water bodies and beaches not designated for public use;
- activities on ice-covered water bodies;
- injury risks associated with use of watercraft (boats) and personal floatation devices; or
- water used solely as a source of drinking water.

Recreational water sites with a history of high-use and poor water quality are designated as priority beaches and should be routinely sampled each season to monitor water quality (outlined in Appendix B: Monitoring) and assessed using the site assessment tool (outlined in Appendix C: Recreational Water Site Assessment).

Recreational water sites that do not meet the definition of a beach, or that have a history of low-use and a combination of satisfactory and unsatisfactory water quality (designated as non-priority beaches), are excluded from routine sampling. Despite this exclusion, all beaches should still be monitored visually for cyanobacterial (blue-green algal) blooms, assessed using the site assessment tool, and any public complaints forwarded to Alberta Health Services Environmental Public Health (AHS) either through the local public health inspector or online at: https://www.albertahealthservices.ca/eph/Page13916.aspx. Opportunities may exist that allow sample collection to occur at some sites through stakeholder partnerships. Please consult with your local public health inspector.

[1] Hazard is any situation or condition that poses or will pose a threat to human health and includes physical, chemical and biological hazards.

[2] Beach refers to the area of water body available for public swimming and wading, as well as the landform alongside a body of water made up of loose particles such as rock, sand, gravel and biological constituents. This includes natural pools, defined as ‘an artificially created ecosystem that reproduces the conditions of a natural body of water where the water is purified by biological and physical treatment’ under the Public Swimming Pool Regulation.

History and development process

Alberta Health began the development of the Protocol in collaboration with AHS, Environment and Parks, Agriculture and Forestry, Municipal Affairs, and the University of Alberta (School of Public Health) in 2015. Other partners that have also contributed to this work include Alberta Precision Laboratories and the Alberta Centre for Toxicology. This non-regulatory Protocol replaces Part 3 Public Beaches of the 2003 Nuisance and General Sanitation Regulation, a section that had become outdated and no longer reflective of the current management practices or water quality guidelines recognized to be protective of public health.

Historically in Alberta, recreational water quality has been assessed using fecal indicator bacteria, such as fecal (thermotolerant) coliforms, and reports from bathers regarding swimmer's itch. In 2012, with increasing concern regarding cyanobacteria in Alberta lakes, a monitoring program was introduced to visually detect blooms, collect samples for total cyanobacterial cell count and species composition, and collect samples for the concentrations of the most common cyanobacterial toxin, microcystin. The cyanobacterial sampling and water quality targets have been revised based on Health Canada's Guidelines for Canadian Recreational Water Quality (Health Canada, 2012), and the newly published Guidelines for Canadian Recreational Water Quality – Cyanobacteria and their Toxins (Health Canada, 2022).

Further research (Wade et al., 2008) on fecal indicator bacteria discovered that E. coli and coliforms did not have a strong relationship to bather illness, and that *Enterococcus* species was a stronger indicator of health risk. Based on these studies, the published work by the United States Environmental Protection Agency (US EPA, 2014), and further laboratory research in Alberta, *Enterococcus* was selected as the best indicator organism for monitoring fecal contamination in recreational water.

The site assessment tool and water quality indicator (*Enterococcus*) were evaluated through a desktop exercise and field pilot project in 2016-2018 and the results were used to complete the final version of the Protocol. In 2018, the Provincial Laboratory for Public Health (ProvLab) also conducted a pilot project to evaluate the full implementation of *Enterococcus* as a new water quality indicator, and introduced microbial source tracking to confirm the presence of specific human and ruminant bacterial markers that indicate higher risks to human health. A report commissioned by the Government of Alberta titled *Application of Enterococcus qPCR for Water Quality Testing at Recreational Beaches in Alberta* (Alberta Health, 2021) validated qPCR methods for detection and quantification of *Enterococcus* in recreational waters as developed by the U.S. EPA. The report also validated qPCR microbial source tracking (MST) assays for genetic markers specific to humans, ruminants, geese, and seagulls.

In 2019, the Protocol introduced the cyanobacterial bloom monitoring program, and *Enterococcus* as the water quality indicator to replace fecal coliforms. The Protocol also introduced a site assessment tool to assess microbiological, chemical and physical influences on each site, and an optional recreational water management plan.

Monitoring and recreational water quality benchmarks

Monitoring

Every owner/operator[3] of a priority recreational water site[4] should monitor for either *Enterococcus* or cyanobacterial blooms, or both, as determined on an annual basis by the provincial agencies. Prior to the start of each season, provincial agencies will determine the priority sites based on established criteria including, but not limited to, history of water quality and usage.

Operators of these priority sites should establish a plan to monitor water quality at their beach. The plan should contain details such as who is responsible for sampling, which parameters are to be sampled, the frequency of sampling, and the sampling

[3] Owner/Operator refers to the person with responsibility for oversight (care and control) of the recreational site. This could include a private landowner, public landowner or a contracted manager.

[4] Priority recreational water site: a beach deemed by provincial agencies to be of significance due to established criteria based on bather use and water quality.

location(s). See the Monitoring Plan in Appendix B for full details of what to include in the plan. The local public health inspector may support the operator in developing the monitoring plan.

Enterococcus

- While open for the season[5], every recreational water site prioritized for fecal indicator sampling should be sampled weekly for *Enterococcus* (the total number of weeks could vary depending on various factors such as geographical location and weather conditions or as advised by the public health inspector).

Cyanobacteria (blue-green algae)

- While open for the season, every recreational water site prioritized for cyanobacterial bloom monitoring should be:
  - Visually monitored each week for cyanobacterial blooms,
  - Sampled weekly for cyanobacteria (total cyanobacterial cell count) and microcystin (microcystin LR-equivalents).
    - Weekly sampling should continue for the entire season following the issuance of an advisory in order to monitor the duration of the bloom and persistence of the toxin.

- The operator should report any of the following to the local public health inspector:
  - Any cyanobacterial blooms observed;
  - Complaints from bathers regarding health effects such as skin irritation, sore eyes or illness;
  - Evidence of health effects on animals including diseased or dead birds and animals;
  - Any adverse event associated with suspected microbiological, chemical, physical or radiological agents; or
  - Any condition that may significantly affect water quality including contamination events (e.g. storm run-off).

The local public health inspector will follow up on public complaints and reports of adverse events. Additional information on cyanobacterial blooms can be found online at https://myhealth.alberta.ca/alberta/pages/blue-green-algae.aspx.

Recreational water quality benchmarks

The following recreational water quality benchmarks for microbiological parameters have been established to protect the public.

Enterococcus

Each sample submitted for *Enterococcus* analysis must satisfy the single Statistical Threshold Value (STV)[6]:

- Where a single sample result is less than the STV of 1280 CCE[7], the water quality is deemed satisfactory;
- Where a single sample result is between 1280 CCE and 6400 CCE, microbial source tracking (MST) will be immediately conducted by the laboratory to determine whether human or ruminant *Bacteroides* species are present. If present, the water quality is deemed unsatisfactory;
- Where a single sample result is greater than 6400 CCE, the water quality is deemed unsatisfactory[8].

[5] Season refers to the open water period during which the recreational water site is in use and open for public use. The standard sampling season starts the May long weekend and ends September long weekend. Some sites, such as summer camps, may have shorter operating seasons.

[6] Statistical Threshold Value is an estimate of the 90th percentile of the water quality distribution and is intended to be a value that should not be exceeded.

[7] CCE (calibrator cell equivalents) are the measurement units for a genetic testing method called qPCR (quantitative polymerase chain reaction) which detects dead and live cells of bacteria and viruses.

[8] A sample with 6400 CCE indicates a high level of contamination regardless of the type of animal that is contributing fecal contamination. This value is based on the Beach Action Value from the Environmental Protection Agency multiplied by 10 to build in a level of protection for situations where the source of fecal contamination is unknown.

- For grab samples, failure at a single sampling point at a beach will be assessed for risk to public health on an ongoing basis.
- For grab samples, failure at two or more sampling points along a beach is considered unsatisfactory.
- Where necessary and requested, MST testing may be conducted on samples exceeding 6400 CCE to better understand the potential source of contamination.

- The Rolling Geometric Mean[9] may also be calculated for a site throughout the season and used as follows:
  - To establish water quality trends over a rolling period (30 days) at the site.
  - To inform the assessment of water quality, but it should not be used as a standalone indicator to make a decision about the water quality at the site.
  - A geometric mean of no greater than 300 CCE/100ml is recommended.

Cyanobacteria

- No visual observation of cyanobacterial bloom;
- Microcystin concentration levels of 10 µg/L or less (expressed as microcystin-LR), and
- A total cell count of 50,000 cells/mL or less indicate satisfactory water quality.

TABLE 1: SATISFACTORY BENCHMARKS FOR *ENTEROCOCCUS* AND CYANOBACTERIA

Parameter	Measure	Benchmark indicating satisfactory water quality
Enterococcus	Single statistical threshold value (STV)	< 1280 CCE/100mL or > 1280 CCE and < 6400 CCE/100mL and no evidence of human or ruminant *Bacteroides* species
Cyanobacteria	Visual observation of cyanobacterial bloom	No visual indication of cyanobacterial blooms (refer to Appendix A Visual Guide for cyanobacterial blooms)
	Microcystin concentration	10 µg/L or less (expressed as microcystin-LR)
	Total number of cells	50,000 cells/mL or less*

* In the event that cyanobacteria cell counts exceed the benchmark above, with no visual cyanobacterial bloom present, AHS will assess the risk and consider the following, prior to issuing an advisory:

- Cyanobacterial species detected and their potential to produce toxins and/or skin irritation or other health effects;
- History of cyanobacterial blooms; and
- Trophic status of water body.

[9] Rolling Geometric Mean: The geometric mean obtained over a continuous (rolling) period of 30 consecutive days.

Reporting of sample results

The public health laboratories (Alberta Precision Laboratories and the Alberta Centre for Toxicology) will send the sample result(s) electronically to the local AHS Environmental Public Health (EPH) office where the local EPH office will review and evaluate laboratory results. Operators will be notified of any exceedances of the benchmarks as quickly as possible and acceptable results will be shared regularly.

Where samples are analyzed by laboratories at the University of Alberta, the validated results will be shared with AHS and AH as quickly as possible and conveyed to the operators.

Response to recreational water quality exceedances

Enterococcus

1. Where there is an exceedance of the *Enterococcus* STV benchmark, AHS will review the available information to determine whether a resample is required or if a Water Quality Advisory (advisory) should be issued. AHS may require the operator to take immediate action to mitigate the risk.
2. When an advisory is issued, the operator is notified and advisory signs are then posted physically onsite and on the AHS website. Under direction from the inspector, the operator may post the advisory signs at the site.
3. The advisory signs shall be left in place until surveillance of the water quality demonstrates that the risk is no longer present. The duration of posting should take into account any available evidence and historical data related to the site in question.
4. The local public health inspector may issue a water quality advisory where historical data shows that the *Enterococcus* levels consistently exceed the benchmark for satisfactory results, and the recreational water site operator may post permanent information signs and discontinue sampling.
5. If corrective actions are taken to effectively remediate the source or cause of the exceedance, the posting could be re-evaluated and ordered removed/lifted by AHS.

Cyanobacterial blooms

1. Where a visual cyanobacterial bloom is reported, AHS may visit the site to confirm the bloom, issue an advisory as required and may take samples to confirm the presence of a cyanobacterial bloom. Once a cyanobacterial bloom advisory has been issued, it will remain in place for the remainder of the season, or until the conditions no longer support growth and there is a low risk of toxin release or human exposure upon reassessment.
2. Where there is an exceedance of cyanobacterial cell counts in the absence of a visual confirmation of a bloom, AHS will assess the risk and consider the following prior to issuing an advisory:
    a. The species of cyanobacteria detected and their potential to produce toxins and/or skin irritation or other health effects;
    b. History of cyanobacterial blooms at the site; and
    c. Trophic status of the water body.
3. Where there is an exceedance of the benchmark for microcystin toxin concentration (commonly associated with a visual bloom), AHS will issue an advisory.
4. For recreational water sites with a history of cyanobacterial blooms (2 consecutive years where advisories have been issued), permanent information signage will be provided by AHS, posted at the site and maintained by the operator to provide information to swimmers on appearance of blooms and risks associated with cyanobacterial blooms. The need for information signage will be evaluated on an annual basis.

Other complaints

1. Where there is evidence of an immediate chemical or physical hazard, operators should take immediate and appropriate action to address the risk and consult with AHS as soon as possible.
2. Swimmer's Itch:
    a. Any complaints received related to swimmer's itch should be referred to AHS. Signs may be posted to advise bathers of the risk of swimmer's itch. The public may also visit external websites such as swimmersitch.info for additional resources.

Recreational Water Assessment

Site assessment

Collecting water samples weekly establishes information at one point in time and builds a picture of water quality over time. However, to understand the influences on a recreational water site, the owner/operator needs to complete a thorough assessment of the recreational water site using a site assessment tool.

The site assessment tool has been developed to assist the operator in assessing the potential biological, physical and chemical hazards, including any adjacent activities that may affect the site and their associated risks to the health and safety of the public. This tool is outlined in Appendix C Recreational Water Site Assessment. The operator should complete the site assessment and revisit it as necessary to keep it current and accurate. The site assessment should be shared with your public health inspector.

Recreational water safety plan

For sites with ongoing fecal contamination concerns, the operator may also complete the optional recreational water safety plan[10] (RWSP) outlined in Appendix D Recreational Water Safety Plan which is designed to prioritize the site hazards and identify steps to prevent and/or reduce the identified biological, chemical and physical hazards. The RWSP can help beach operators to establish short and long-term measures to reduce the hazards, and is particularly useful if there are ongoing water quality issues over several seasons at the site. The RWSP process relies on collaborative work with government departments, agencies and stakeholders in addressing long-standing issues.

Maintenance

Recreational water site maintenance

Prior to opening for the season, throughout the season and following any unusual event, the operator should survey the recreational water site (water and shore) to identify and respond to physical, chemical and microbiological hazards. The operator should check for unexpected physical hazards (e.g., tree branches, logs, broken pier, etc.) both at the beginning of the season and after events such as storms and heavy rainfall.

Signage

Where signage has been posted, operators should ensure that information and advisory signage remain in good condition and are visible to the bathers throughout the season. Operators should also notify AHS where EPH-posted signs are in disrepair and need replacing.

Information signage carries general information about the recreational water site, while advisory signage conveys information about elevated microbiological or chemical risks present in the water at the time.

[10] Recreational Water Safety Plan (RWSP): a plan to assess and improve the quality of the recreational water and safety at the recreational water site through comprehensive risk assessment and risk management strategies that address hazards identified at the site.

Appendix A: Visual guide for cyanobacterial blooms

This guide will assist operators with the visual assessment of suspected cyanobacterial blooms. Where a concern exists, the operator should consult with a public health inspector.

When conducting a visual inspection, the following observations may indicate the presence of **PLANT MATERIAL OR FILAMENTOUS GREEN ALGAE**:

- There are leaf-like structures or roots;
- The material is long and stringy, or can be lifted out of the water on a stick or boat paddle;
- The material is firmly attached to plants, rock or the bottom of the water body (e.g. you can't lift it out); and
- The material is made of small bright mustard yellow or grass green particles.

The following observations **may** potentially indicate presence of a cyanobacterial bloom:

- The material consists of small particles that are pinhead size or smaller;
- The material is accumulating in a layer at the surface or along the shoreline;
- The water is murky and colored a brownish green, milky green or blue.

The following observations indicate that the presence of a cyanobacterial bloom is **very plausible**:

- The water is discolored and cloudy. The bottom is not visible close to shore;
- Particles are easily seen throughout the water. They may resemble tiny hairs, pinheads, or globs. Though not in a clear layer, there are visibly more particles near the surface or along the shoreline; and
- Particles are present in a thick layer at the surface or along the shoreline. The accumulated material may be pale green, greenish-blue or blue in color; looking like a paint spill or pea soup.

Photographs of common cyanobacterial blooms in Alberta (Courtesy Alberta Health Services, unless otherwise stated).

Cyanobacterial bloom, July 2018.

Cyanobacterial bloom, July 2018**.**

Aphanizomenon flos-aquae bloom, July 2014.

Offshore *Lyngbya* bloom, 2006. (Courtesy of Ron Zurawell).

Gleotrichia bloom, Aug 2006. (Courtesy of Ron Zurawell).

Anabaena bloom, Aug 2006. (Courtesy of Ron Zurawell).

Cyanobacterial bloom, July 2017.

Cyanobacterial bloom, July 2017.

Planktothrix spp. (captured below) are filamentous cyanobacteria that can produce chlorophyll *a* and phycoerythrins, the pigment responsible for a characteristic red or pink color.

Planktothrix bloom, Apr 2011. (Courtesy Dan Pearson).

Planktothrix bloom, Apr 2011. (Courtesy Dan Pearson).

Below are some pictures to show examples of what is **not considered** a cyanobacterial bloom.

Floating green algae (*Spirogyra* and *Mougeotia*) Jun 2005. (Courtesy Vermont, 2014).

Filamentous green algae, 2013.

Floating algae (Camp YoWoChas July 2017).

More information regarding cyanobacterial (blue-green algal blooms is available at:

www.ahs.ca/bga

Appendix B: Monitoring

Monitoring plan

The type of monitoring will depend on the priority assigned to the site by provincial agencies and could include monitoring for microbiological hazards, such as *Enterococcus*, cyanobacterial blooms (cell count and microcystin analysis), or both. Swimmer's itch is not routinely monitored in Alberta and does not need to be included in a monitoring plan. The plan to monitor these microbiological hazards should include the details listed below.

The plan should outline:

1. The person responsible for sampling (there may be designates)
2. The parameters being sampled; *Enterococcus* and/or cyanobacteria (microcystin and cell counts)
3. Sampling frequency (weekly preferred)
4. Visual monitoring for cyanobacterial blooms
5. The number of samples taken and the location of sampling
6. Sampling procedures
7. Transportation/delivery of samples for analysis
8. Recordkeeping of results, significant hazards, reports of animal illness and deaths
9. Reporting (cyanobacterial blooms, animal illness)

Sampling at *Enterococcus* priority beaches

The water quality may be assessed when the site is open for the season and the laboratory is accepting samples. The number of weeks of sampling could vary depending on various factors such as geographical location and weather conditions. Typically, the season would extend from the May long weekend to September long weekend. If there were uses for the sites at other times of the year (e.g. fall activity), the potential risk and need for sampling would be evaluated on a case-by-case basis with the local public health inspector.

Recreational water samples meant for *Enterococcus* testing should be collected on Monday or Tuesday by the operators each week, at regular times noting conditions such as weather, volume of bathers, etc. Submission of samples early in the week allows time to analyze and release results prior to the weekend when the beach use increases. AHS-EPH will provide the equipment for enterococcal monitoring as outlined in Table 2. Please advise your local inspector if laboratory supplies begin to run low during the season.

When the *Enterococcus* samples are submitted, a completed requisition form must accompany the sample. It is critical that the requisition form be filled out correctly and consistently. Incomplete requisition forms lead to either samples not being tested by the laboratory or a lack of information to properly interpret the sample result. It is important to use the specific ProvLab access number of each beach that is sampled and to include that number on all requisition forms. The access number is provided on the sample labels.

TABLE 2: MATERIALS REQUIRED FOR *ENTEROCOCCUS* SAMPLING

Materials supplied by the local AHS Environmental Public Health Office (per sampling event)
Three ProvLab microbiological bottles
Three ProvLab microbiological water analysis requisition forms
Three plastic resealable sample bags
Neon pink labels
Materials supplied by the sampler
Shoulder length gloves (veterinarian use)
Hip waders
Ice packs and cooler

Preprinted beach name/access number labels (optional)
Life jacket/PFD

For detailed instructions on how to collect and submit *Enterococcus* samples, please visit: https://www.albertahealthservices.ca/eph/Page8302.aspx.

Sampling at cyanobacterial bloom priority beaches

Visual monitoring

Risks associated with cyanobacterial blooms can often be initially detected by visual confirmation. A glossary of photos of cyanobacterial blooms is provided in Appendix A to help with the identification. The beachfront should be checked daily while open to the public and if a cyanobacterial bloom is present, it should be reported to AHS.

The presence of a cyanobacterial bloom at a beach that is not routinely monitored for cyanobacteria should be reported to AHS-EPH. AHS-EPH may investigate further and require the collection of samples to determine the number of cyanobacterial cells and presence of microcystin toxins.

Cyanobacteria sampling

The owner/operator should sample for cyanobacteria using the composite sampling method. Composite sampling is a technique whereby multiple discrete water samples from different locations are combined, thoroughly mixed, and treated as a single sample. This type of sampling method is used for cyanobacteria because blooms and clumps of the bacteria are usually not evenly dispersed in the water.

Composite samples provide an average representation of the water quality and are more cost-effective and accurate, but sampling must be conducted carefully and consistently to reduce error while collecting samples.

AHS-EPH will provide the equipment for cyanobacteria monitoring as outlined in Table 3. The owner/operator should advise the local public health inspector if laboratory supplies begin to run low during the season.

TABLE 3: MATERIALS REQUIRED FOR CYANOBACTERIAL BLOOM SAMPLING

Materials supplied by local AHS Environmental Public Health Office (per sampling event)	
One 125 mL Alberta Centre for Toxicology (ACFT) plastic bottle with a white cap – for microcystin sampling	
Two 50 mL conical tubes with orange caps – for cell count and speciation sampling	
Two plastic resealable sample bags	
Alberta Centre for Toxicology requisition form titled “Laboratory Requisition for Microcystins Analysis”	
Lugol’s solution	
Materials supplied by sampler	
Plastic or metal thermometer	Hip waders
Disposable gloves	Life jacket/ personal floatation device
Aluminum foil	Ice packs
Cooler	Camera/ camera phone
Large pail	

For detailed instructions on how to collect cyanobacteria water samples, including labeling instructions, please visit: https://www.albertahealthservices.ca/eph/Page8302.aspx.

Recordkeeping

The owner/operator should maintain records of sampling conditions and sample results. The following template can be used to collect relevant information on the environmental conditions at the time of sampling.

TABLE 4: WATER DATA COLLECTION TEMPLATE

General Information	
Date and time of collection	
Name of beach	
ProvLab access number	
Address/Location	
Name of water body	
GPS coordinates	
Number of samples taken	
Map of recreational site attached (with sampling points marked)	
Visual inspection	
Wind direction	
24-hour rainfall	
Water temperature	

Visual inspection of the beach water: Indicate turbidity (clear, slight, moderate, total/completely turbid), colour (colourless, brown, green, other (specify)), evidence of blooms (not apparent, particles in water, streaks on surface, scums on surface).

Wind direction: indicate the true direction from which the wind is blowing at a given location. For example, wind blowing from the north to the south is a north wind.

24-hour rainfall: If yes, indicate the amount of rainfall based on a nearby Environment Canada weather station; amounts are recorded on their website: www.weatheroffice.gc.ca. Another great resource is the Alberta Climate Information Service (ACIS), which provides current and historical weather station data: http://agriculture.alberta.ca/acis/alberta-weather-data-viewer.jsp.

Water temperature: indicate temperature measured with a probe thermometer.

Appendix C: Recreational water site assessment

The information requested below will assist you in assessing your site and help you gather sufficient information to understand your site.

Part I – Identification **Date conducted:**

	Inquiry	Response
1.	Name of water body	
2.	Recreational water site or beach name:	
3.	Address of recreational water site (beach)	
4.	GPS coordinates of recreational water site or beach	
5.	Responsible authority and contact information: name, phone number, email, mailing address	
6.	Person(s) conducting assessment	
7.	Recreational water use period (day/month – day/month)	

Part II – Background information

This section is a general overview of the recreational water site and watershed.

Inquiry	Response
Water body type: (lake, river, reservoir, manmade lake, river, creek, pond, etc.)	
Record the dimensions of your recreational water site [Attach map or aerial photo of suitable scale] Mark the site dimensions on the map	Recreational site dimensions Length (m): Width (m): Swimming site dimensions: Length (m): Width (average, in m):
Is there an active watershed stewardship group?	Yes, No or Don't Know If Yes, Name:
Does this water body have a current watershed management plan?	Yes, No or Don't know
Is the recreational water site lifeguarded?	Y or N
Uses for waterbody (e.g. boating, swimming)	

Number of samples

The number of samples should be determined as follows:

Width along shoreline	Number of samples

100 metres or less	• *Enterococcus* - Grab
	  • 3 single samples for *Enterococcus*
	• *Enterococcus* – Composite
	  • 3 samples composited into 1 bottle
	• Cyanobacteria – 10 water column samples composited into 1 sample for submission

> 100 metres	As determined by the Recreational Water Site Assessment

Where the length of the shoreline is longer than 100 metres, additional sampling zones should be identified, monitored and managed, and the rationale for the sampling approach included in the monitoring plan. The owner/operator should consult with the public health inspector at this stage.

The locations and depth for sampling should be based on the depth of the water, focusing on the shallow areas and areas with possible sources of pollution.

Land uses affecting the recreational water site

Documenting the land uses in the watershed will help to determine what public health risks potentially exist.

Inquiry	Response
Identify current land uses surrounding the recreational water site: (Specify types including residential, industrial, and commercial such as campsites, lodging, agricultural - livestock vs crop, landfill, park, etc.).	
Local habitat around recreational water site: (Specify habitat types for example, dunes, wetlands, river/stream, forest, park, environmental reserve, other).	
Other land uses	

Average weather conditions during recreation season

Weather conditions can greatly influence water quality and can be used to help predict when the water is not safe for recreational activities. Information on weather conditions can be found at http://agriculture.alberta.ca/acis/alberta-weather-data-viewer.jsp.

Water temperature (°C):	High:	Low:	Average:
Seasonal rainfall (mm):	Total:	Average:	Number of events/season (e.g. > 10 mm/45 days?24 h):
Air temperature (°C):	High:	Low:	Average:

Prevailing winds:	Direction	Avg. velocity (m/s):
Average length of recreational water season (in weeks):		
Have weather conditions been associated with poor water quality? Y or N If Yes, please describe:		

Select the range of number of users per day of the recreation water site below:

	Average number of users (people per day) *(circle one)*		
Weekdays	High (>100)	Moderate (30-100)	Low (<30)
Weekends	High (>100)	Moderate (30-100)	Low (<30)
Long Weekends	High (>100)	Moderate (30-100)	Low (<30)

Comments: _____

Part III – Biological hazards

Potential sources of fecal contamination

Note: When evaluating potential sources of fecal contamination, human-related sources such as sewage systems, will be considered the most likely to cause negative health effects in people.

Type of source	Level of concern (H, M, L, NA)	Location description, or latitude and longitude of source	Describe how this source might contribute to site pollution and frequency of contribution
Municipal wastewater discharges			
Sewage overflows			
Septic systems			
Sub-surface sewage disposal			
Stormwater outfalls			
Wildlife (mammals/birds)			
Agriculture runoff and source type			
Domestic animals			
Unsewered toilets (outhouse, privy)			
Erosion-prone areas			
Landfills, open dumps			
Groundwater seepage			
Stream or wetland drainage			
Other (specify):			
Other (specify):			

H = High; M = Moderate; L = Low; NA = Not applicable

Have water samples ever been collected from any of the potential pollution sources, such as streams or outfalls? Y or N

If yes, describe any analysis performed and the summary of results:

Presence of wildlife and domestic animals

Type	Degree of presence (H, M, L, NA)	Does the presence of the animal appear to correlate with bacteria results? (Yes, No, Don't Know)	Describe how this source might contribute to beach pollution (include whether fecal droppings are seen and are considered a problem)
Livestock (cattle)			
Dogs			
Geese			
Gulls			
Ducks			
Muskrats			
Deer			
Other (Specify):			
Other (Specify):			

H = High; M = Moderate; L = Low; NA = Not applicable

Have a significant number of dead birds or fish been found at the swimming or recreational site during recreation season in the past 5 years? Y, N, or Don't Know

If yes,

Year	Type of bird/fish	Number	Possible causes

Sampling information (where sampling is conducted)

Parameter	Who conducts sampling	Frequency of sampling	Describe sampling location
Cyanobacteria			
Enterococcus			
Other:			

Is the sampling staff trained on sampling techniques, equipment maintenance, and calibration procedures? Y or N

Have cyanobacterial blooms been observed in the waterbody during open water season? Y or N

Have cyanobacterial blooms been observed at the beach/recreational site during the open water season? Y or N (If yes, specify when the blooms usually appear & how they are assessed)

Is swimmer's itch a known concern at the beach/recreational site? Y or N

Advisory history

Type of advisory (Cyanobacteria, *Enterococcus*)	Date of advisory	Length of advisory (Days)	Reason for advisory and possible contributing factors	Parameter(s) used to lift advisory

Total number of advisories in past 5 years:		Total number of days under an advisory in past 5 years:		

Trophic state of the Lake:

Identify the trophic state of the lake: _____

The trophic state of the water is an indicator of the degree of fertility of a lake. Factors used to assess the trophic state of a lake include chlorophyll *a*, dissolved oxygen, phosphorus concentrations, algal biomass, water clarity (using a Secchi disk), and macrophyte biomass.
For example, mesotrophic lakes are those with moderate concentrations of nutrients in the water and support moderate production of algae and macrophytes.

The trophic state of a water body, as well as the range of trophic states contained in the table below, can be found by visiting the following website hosted by Alberta Environment and Parks:
http://environment.alberta.ca/apps/EdwReportViewer/TrophicStateAlbertaLakes.aspx.

Oligotrophic (< 2.5 µg/L chlorophyll *a*) (< 10 µg/L TP)	**Mesotrophic** (2.5–8 µg/L chlorophyll *a*) (10-35 µg/L TP)	**Eutrophic** (8–25 µg/L chlorophyll *a*) (35-100 µg/L TP)	**Hypereutrophic** (> 25 µg/L chlorophyll *a*) (>100 µg/L TP)

TP = total phosphorus.

Note: If a lake is not listed, contact Alberta Environment and Parks toll free at 310-3773 or 780-944-0313 from outside Alberta, or email aep.outreach-services@gov.ab.ca for more information.

PART IV – Chemical hazards

Potential sources of chemical contamination

Type of source	Level of concern (H, M, L, NA)	Location description or latitude and longitude	Describe how this source might contribute to beach pollution and frequency of contribution
Urban runoff, industrial waste, residential runoff			
Marinas, harbors			
Motorized watercraft			
Landfills, open dumps			
Runoff containing pesticides			
Runoff containing fertilizer			
Pipelines, railways, oil & gas development			

Other (specify):			
Other (specify):			

H = High; M = Moderate; L = Low; NA = Not applicable

Part V – Physical hazards and aesthetic conditions

Physical recreational water site conditions

Describe local water level variation:
Approximate water-edge slope at swimming site: percentage (%) gradient

Physical hazards	Level of concern (H, M, L, NA)	Describe how this source might contribute to user risk and frequency of contribution
Steep slopes or drop-offs		
Slippery or uneven bottom		
Large rocks and submerged items		
Strong currents		
Cutting hazards (glass, sharp rocks, etc.)		
Dams, weirs		
Diving structures		
Heavy weed growth/filamentous green algae		
Other (specify):		
Other (specify):		

H = High; M = Moderate; L = Low; NA = Not applicable

Recreational site cleaning

Site Maintenance	Response
Site cleaning frequency during open water season (Daily, Weekly, Monthly, or NA)	
Description of cleanup activities (e.g. leveling sand, removing vegetation)	
How often are floatables (human waste, general solid waste) found in the water at the rec area/beach? (Daily, Weekly, Monthly, NA)	
Known sources/types of floatables:	
Garbage bins: total number of bins at recreation site:	
Garbage bins: potential access/attraction by wildlife	

Part VI – Management efforts

This section will describe any management actions undertaken at the recreational water site or applied to the entire waterbody.

Have you taken steps to remediate potential biological, physical or chemical contamination sources or other water quality problems? Y or N
If yes, fill the table below:

Description of remediation	Date	Describe the results/changes that occurred after the remediation
Reduce/eliminate fertilizer use		
Provide off-stream livestock watering		
Restore riparian zone		
Connect to regional wastewater system		
Hypolimnetic withdrawal		
Dredging		
Aeration/oxygenation		
Dilution and flushing		
Add new sand		
Improve circulation/de-stratification		
Apply algaecides		
Use alum treatment		
Introduce in-lake biological preventives (i.e. establish/maintain large predatory fish)		
Improvements to onsite sewage disposal/management		
Other (specify):		

Part VII – Facilities

Label map or aerial photo with location of facilities at recreational site.

Description of sanitary facilities (toilets)

Location	Condition (good, fair, or poor)	Distance from beach (m)	Frequency of cleaning (D, W, M)	Impact on water quality (if any)

Are the current facilities adequate to support beach use? Y or N

Describe:

Description of other facilities

List facilities in the recreation site, such as restaurants, concession, bars, playgrounds, parking lots, water fountains and dog parks.

Facility name/type	Location	Condition (good, fair, or poor)	Distance from beach (m)	Describe how facility might contribute to water quality problems

Comments/observations:

Appendix D: Recreational Water Safety Plan (RWSP)

In instances where water quality has been unsatisfactory over several seasons and potential sources of contamination are suspected, further investigation of the potential contaminants may be useful. A Recreational Water Safety Plan (RWSP) can be developed to proactively and systematically identify and assess the hazards and hazardous events, and identify responses and actions to manage and reduce those hazards.

The RWSP captures information regarding potential sources of contamination and possible actions to reduce the risks to users of the site. The operator can identify and respond to evidence of microbiological hazards identified through water quality monitoring, reports of illness, evidence of significant physical or chemical hazards, and additional potential hazards identified by the site assessment.

When an operator is developing a RWSP, more data will likely be required to characterize and assess sites that are affected by the intermittent occurrence of contamination. Over time, the results could also provide guidance as to whether the routine sampling frequency should be increased or reduced.

At least 3 years of information gathering is needed at sites that have not previously been monitored for Enterococci to get a representative picture of water quality. Historical data on fecal (thermotolerant) coliforms and/or *E. coli* (previous indicators) may also be considered.

For example, those sites with a history of low or no levels of *Enterococcus* could be sampled less, while those with a consistent history of unsatisfactory results may no longer need to be sampled and could be posted permanently. Any change to sampling frequency should be reviewed with Alberta Health Services.

Steps to complete a RWSP:

Assemble a water safety plan team led by the owner/operator. The development of a RWSP requires a range of expertise and knowledge and it is recommended that the owner/operator form a support team to help complete the RWSP. This team could include representatives from Alberta Health Services, the local Watershed Planning and Advisory Council, Environment and Parks, Agriculture and Forestry, a Watershed Stewardship group, Municipalities, Regional Service Commissions and other stakeholders as needed. Information and data required for the site assessment can be obtained from these agencies. Resources such as the WHO Guidelines for safe recreational water environments Volume 1 Coastal and fresh waters are also helpful (WHO, 2003).

1. Review the Recreational Water Site Assessment to identify and record the known and potential biological, physical and chemical hazards and hazardous events as well as any previous management actions. The assessment is designed to highlight the influences of various environmental and built factors, ranging from rainfall to pollution sources and knowledge of the lake and activities in both summer and winter. (See Recreational Water Site Assessment in Appendix C.)
2. Add the potential hazards to the RWSP Template (see below).
3. Rank the importance of each hazard using the risk matrix in Figure 1.

The significance of the hazard is evaluated based on the probability of occurrence and the impact on water safety. Likelihood X Consequence = Risk Score.

Hazards with a high score (equal to or greater than 32) are ranked a higher priority, and preventive or protective action(s) should be taken to reduce the risk to an acceptable level.

FIGURE 1: HAZARD RANKING

Risk Matrix

			Consequence Descriptor				
	Score	Not Applicable	Insignificant	Minor	Moderate	Severe	Catastrophic
	Not Applicable	0	**1**	**2**	**4**	**8**	**16**
Likelihood Descriptor	Most Unlikely	**1**	1	2	4	8	16
	Unlikely	**2**	2	4	8	16	32
	Medium	**4**	4	8	16	32	64
	Probable	**8**	8	16	32	64	128
	Almost Certain	**16**	16	32	64	128	256

4. Develop short-term and long-term actions to address the priority hazards (contamination sources).

Preventive/protective actions would range from short-term measures such as communication strategies and posting signs to more long-term measures aimed at improving overall water quality. These measures could include:

- Preventing the hazard from reaching the water (source protection),
- Reducing/eliminating the extent and probability of the hazard in the water, and
- Reducing the proliferation of the hazard (in-situ treatment).

Ideally, the plan would include long-term actions designed to reduce the level of contaminants or protect the water from contamination where appropriate. These are not mandatory and are often beyond the purview of the operator.

These types of actions are best considered in partnership with Environment and Parks, Watershed Planning and Advisory Councils (WPACs), the Alberta Lake Management Society and Lake Stewardship groups, which have a mandate to protect and improve surface water quality. Resources such as the Workbook for Developing Lake Management Plans in Alberta may be helpful (ALMS, 2013). Information gathered from the Recreational Water Site Assessment can be used to inform a wider lake management plan.

Once the RWSP is completed, establish and maintain documentation of procedures/actions and records of monitoring to illustrate the effect of actions identified in the RWSP.

TABLE 5: RWSP TEMPLATE

Identified hazard (from the site assessment)	Short term preventive measures	Medium term preventive measures	Checking preventive measures		Action (if standard is exceeded)	Hazard ranking
			What to check	Signs that action is needed		
E.g., Run-off from local sewage storage	e.g. Natural fresh water dilution	e.g. Education of local owners regarding proper sewage disposal	e.g. Monitor *Enterococcus* weekly	e.g. *Enterococcus* samples exceed 6400 CCE, or are between 1280-6400 CCE but have human or ruminant markers	e.g. Re-sample and if still unsatisfactory, AHS to issue advisory	

Adapted from New Zealand, 2014.

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