

Parlee Beach Water Quality Summary

Introduction

This document presents a summary of the report of the Steering Committee for the Parlee Beach Water Quality project. The Committee was comprised of representatives from four government departments: Health; Environment and Local Government; Agriculture, Aquaculture and Fisheries; and Tourism, Heritage and Culture. The Committee mandate was to:

- Develop and implement a robust plan of technical work to identify point and non-point sources of bacteria and possible remedial action.
- Complete sampling and monitoring.
- Prepare a report highlighting recommended actions to government.

Beach Water Quality Monitoring Protocol

In 2017 new Water Quality Monitoring Protocols were put in place at Parlee Beach. The Protocol is in accordance with the recommendations contained in the *Guidelines for Canadian Recreational Water Quality*. The purpose of the Protocol is to clearly outline roles and responsibilities for monitoring and reporting, and to ensure that a transparent recreational water monitoring process is in place so that the public is informed of any potential risk and has access to water quality information. The Protocol is available at the website:

http://www2.gnb.ca/content/dam/gnb/Departments/eco-bce/Promo/Parlee_Beach/parlee_beach_water_monitoring_protocol_document.pdf

Highlights of the protocol include:

- Samples collected daily at five locations equally distributed along the beach.
- Samples transported to the accredited RPC laboratory in Fredericton and tested using standard methods.
- Test results transmitted electronically to Medical Officer of Health.
- Instructions issued by the Medical Officer of Health regarding the issuance of swimming advisory.
- Appropriate signs posted at the beach by Tourism, Heritage and Culture.
- Test results posted to a dedicated website at:

<http://beaches.gnb.ca/en/SamplingLocation/Details/5882>

The Canadian Guidelines have established guideline values for *E. coli* and *enterococcus*, as indicated in the table below. Water quality results from Parlee Beach samples were compared to guideline values for both the geometric mean and single-sample maximum for *E. coli* and *enterococcus*.

<i>E. coli</i>		<i>Enterococcus</i>	
Single Sample Maximum	Geometric Mean of 5 most recent samples	Single Sample Maximum	Geometric Mean of 5 most recent samples
*400	*200	*70	*35

*All values are per 100 ml sample.

At Parlee Beach, water samples were collected daily from May 15 to October 9, 2017; a period of 148 days. During this time there was a total of 1452 samples collected (726 *E. coli* and 726 *enterococcus*). 98.6% of these samples were below the guideline values.

For the 2017 beach season, “No Swimming” advisories were in place for a total of 23 days, 15 of which were precautionary due to rainfall and 8 due to an exceedance of a guideline value. Of the 15 days when precautionary “No Swimming” advisories were issued, only two (July 22 and July 23) coincided with an exceedance of a guideline value. Of the 8 days where a “No Swimming” advisory was issued due to an exceedance of a guideline value, 4 of those days (July 8, August 24, September 2 and September 20) had only one of the 10 test results (5 for *E. coli* and 5 for *enterococcus*) exceed a single-sample maximum guideline value.

Based on the samples collected in 2017, concentrations of *E. coli* and *enterococcus* at Parlee Beach were generally lower than the value contained in the Canadian Guidelines. This suggests that any bacterial contamination of water at Parlee Beach is not chronic in nature, and the water quality is suitable for swimming. However, it is important to acknowledge that New Brunswick experienced an exceptionally dry summer in 2017 and some caution is therefore warranted in arriving at definitive conclusions.

In addition to bacteria counts, the following data were collected from May 15 to October 9, 2017 at Parlee Beach:

- Wind speed and direction
- Number of beachgoers
- Air and water temperature
- Daily precipitation
- Tidal water levels

Based on the analysis within the main report, wind direction (and possibly tidal height) may be important factors. During the occasional times when exceedances occur at the beach, it is likely due to sources of bacteria originating from within the watershed, that make their way to Parlee Beach under certain combinations of meteorological (weather) and oceanographic conditions. Consequently, there is support for the development of a predictive model that would allow issuance of timelier “No Swimming” advisories (when necessary) and potentially allow for a reduction in sampling frequency.

Investigating Bacterial Sources

Numerous studies were commissioned to investigate the potential point- and non-point sources of bacteria in the Shediac bay Watershed. Of these, four studies were specifically aimed at gathering water quality and

related data that would support a more complete understanding of the movement and fate of bacteria. These studies included:

- Watershed Reconnaissance Survey and Water Sampling Program – which resulted in two reports, namely: *Parlee Beach Water Quality Monitoring Plan for 2017*, and *State of the Bay Water Quality Surveys for E.coli in the Shediac Bay Watershed 2000-2017*.
- Beach Sand Bacteria and Shallow Groundwater Flow Paths Study which is summarized in the *Parlee Beach Sand Bacteria and Shallow Groundwater Flow Path Study Final Report*.
- Septic Systems Survey and Mapping which formed the basis for the report entitled: *Status Review on On-Site Effluent in the Unserviced Areas near Parlee Beach*, and
- Coastal Hydrodynamic Modelling Study, the outcomes of which are articulated in a report entitled: *Parlee Beach and Shediac Bay Hydrodynamic Modelling Study New Brunswick*.

These reports are available upon request.

The ***Watershed Reconnaissance Survey*** involved water quality monitoring at 57 sampling locations which included: facilities that operate under *Certificates of Approval* for wastewater discharge issued by the Department of Environment and Local Government; small natural drainage channels and local stormwater drains; small local tributaries that may be influenced by a range of local bacteria sources such as small on-site sewage disposal systems, stormwater inputs, or runoff from fields; areas that might be influenced by livestock operations or horticultural activity; offshore locations in Shediac Bay near Parlee Beach; locations adjacent to Parlee Beach that would provide useful information on whether the sediments contain bacteria; above tidal waters and on small streams that surround Shediac Bay; freshwater locations distributed along the Scoudouc River; and, freshwater locations in the Shediac River watershed draining into Shediac Bay.

The main report provides a detailed review of bacterial counts for all the locations for each sampling date. The report also provides maps of the spatial distribution of the geometric mean for *E. coli* (200 MPN/100ml. – guideline value) of the samples collected at each sampling location. Sources of bacteria are distributed throughout the watershed, including in the upper reaches.

The objectives of the ***Parlee Beach Sand Bacteria and Shallow Groundwater Flow Path*** assignment were to determine if the sand at Parlee Beach could potentially be a bacteria reservoir and act as a non-point source of contamination; and, to identify sources of bacteria flowing in shallow groundwater discharges into Shediac Bay. The main report provides an overview of the methods, sampling locations and test results. The findings determined that for beach sand, the bacteria concentrations (*E. coli* and *enterococcus*) were low; for groundwater, the bacteria concentrations in all samples were below the Canadian Guidelines values; for surface water, the bacteria concentrations were generally higher following a substantial rain event, and the Canadian Guidelines single-sample maximum concentration was exceeded in three samples collected under wet conditions; the overall concentration of DNA detected at various locations was relatively low, and indicated the presence of human, ruminant, avian and dog DNA; the groundwater flow direction at Parlee Beach is from inland to Shediac Bay; and, the Greater Shediac Sewage Commission treatment plant may overflow through the drainage ditch at the northwest corner of the lagoon, resulting in a potential source for bacterial contamination after rainfall events.

The objectives of the ***Septic Systems Survey and Mapping*** assignment were to assess privately owned on-site sewage disposal systems in the areas outside the jurisdiction of the Greater Shediac Sewage Commission: at Grand Barachois, Gilbert's Corner, and Shediac Bridge. The main report summarizes the

number of developed lots with privately owned on-site sewage disposal systems; lot sizes; typical on-site

sewage disposal system characteristics (tank types and volumes, disposal technology used, disposal field sizes, proximity to water supplies, soils information, presence of privately owned systems with piped off-site discharges to surface water, etc.); and, comparison of the existing situation with the *New Brunswick Technical Guidelines for On-Site Sewage Disposal Systems*.

The findings determined that: a few properties within the Greater Shediac Sewage Commission jurisdiction are not connected to the piped system, but there is no indication that their on-site sewage disposal systems are failing or that they contribute to the discharge of contaminated surface water into Shediac Bay; there is no clear evidence of significant impact from private on-site sewage disposal systems to water quality in Shediac Bay; there are no obviously failing on-site sewage disposal systems or discharges of untreated sewage, but potential problem areas exist in Grand Barachois and Shediac Bridge.

There is potential for future surface water and groundwater quality problems related to the operation and maintenance of private on-site sewage disposal systems and the main report offers recommendations for improving the management of on-site sewage disposal systems in the un-serviced area surrounding Parlee Beach.

The objectives of the ***Coastal Hydrodynamic Modelling*** were to develop a computer model of coastal circulation patterns in Shediac Bay accounting for the combined influence of tides, currents, winds and waves on water movement in Shediac Bay in general, and near Parlee Beach in particular; simulate potential pollutant trajectories of particles and dissolved plumes to determine how released substances are transported; and, investigate the potential contribution of various contaminant sources to water quality at Parlee Beach. The main report provides an overview of model development and calibration, scenarios of various wind direction and wave / current patterns as well as several animations of plume trajectories under different meteorological and oceanographic conditions.

The findings determined that wind plays a dominant role in local conditions within Shediac Bay and at Parlee Beach; the two most frequent wind directions during summer months, southwest and south, drive currents at Parlee Beach in opposite directions; sources southwest and east of Parlee Beach potentially contribute to bacteria concentrations at Parlee Beach under northwest and east wind and wave conditions, respectively. The relative importance of Shediac Bay versus east of Parlee Beach sources depends on the relative strength (rate and concentration) of any discharges, as well as the effective decay rates; and, the relative dilution / dispersion of hypothetical contaminant plumes is rapid.

Parlee Beach is particularly vulnerable to water quality conditions in the watershed. The coastal hydrodynamic model indicates that plumes are often transported efficiently along the shore by wind and wave-driven currents.

Other Initiatives

The main report provides a brief synopsis of several initiatives undertaken to better understand and / or mitigate potential bacteria related problems at Parlee beach. These include:

- Cumulative effects assessment and protocols development
- Best practices for beach management
- Parlee Beach infrastructure assessment

- Educational campaign regarding boating practices and sewage loading
- Marina pump-out facilities
- Responsible dog ownership
- Boater education and exclusion zone
- Wetland delineation

These reports are available upon request.

Steering Committee Conclusions

The main report presents five conclusions:

- Based on the samples collected in 2017, water quality at Parlee Beach is very good. However, more data collection and monitoring will be required this year to make firm conclusions since 2017 was a dry summer season.
- Based on the samples collected in 2017, concentrations of *E. coli* and enterococcus in Shediac Bay and at Parlee Beach are generally lower than the values stated in the *Guidelines for Canadian Recreational Water Quality*.
- Concentrations of bacteria in the Shediac Bay Watershed may flow into Shediac Bay, under certain oceanographic and meteorological (weather) conditions may make their way to Parlee Beach. Wind direction, wave and tidal conditions appear to be determining factors. More data collection and monitoring will also be required this year to make firm conclusions.
- There are different types of sources of bacteria distributed throughout the Shediac Bay Watershed. Surface water run-off from agriculture and urban areas, sewage system overflows, on-site sewage disposal systems, and birds, wild and domesticated animals are potential sources.
- To improve water quality in the Shediac Bay Watershed and reduce “No Swimming Advisories”, at Parlee Beach, the bacteria sources which exist throughout the Watershed should be addressed.

Steering Committee Recommendations

The main report presents 14 recommendations which assume that:

- Water Quality Monitoring Protocols for Parlee Beach and Murray Beach will continue to be implemented in 2018.
- The “*Water Strategy for New Brunswick 2018-2028*” includes actions that could address some of the issues related to water quality at Parlee Beach.

The recommendations are:

- Enhance and continue watershed monitoring programs to gather additional data that will help identify specific sources of bacteria. Enhancements may include: increasing sampling frequency, additional collection sites, weather stations, conducting DNA testing (both at the beach and in the watershed), and sampling during wet conditions / rainfall events.

- Apply the hydrodynamic model to validate the transport paths related to actual discharges into the Bay (concentrations, volumes, weather conditions).
- Conduct a targeted investigation in the high-density areas with sub-standard building lots, identified in the consultant’s report, to verify if on-site sewage disposal systems are a potential source of bacteria.
- Develop and implement a watershed management plan for Shediac Bay. Further details are included in Appendix C of the *“Recommendations for Enhanced Watershed Management in New Brunswick”*.
- Conduct a hydraulic / hydrology study at the “pond” at Parlee Beach Provincial Park to identify any remedial action that may be necessary to mitigate poor water quality in the pond and drainage creek.
- Develop and validate a tool for predicting water quality, based on relevant environmental and meteorological data, which could be used by the Medical Officer of Health to issue “No Swimming Advisories” at Parlee Beach. A predictive tool would address concerns with the 48-hour delay related to analyzing water quality samples.
- Continue data collection by lifeguards (beachgoer numbers, air and water temperature, and boater numbers) to better understand the relationship between Parlee Beach activities and water quality.
- To enhance swimmer safety and mitigate potential effects of motorized boats near Parlee Beach, implement the “people-powered recreation zone” delineated during stakeholder and public consultations conducted in August 2017.
- Continue the dog waste management / education program and expand to the entire Shediac Bay Watershed.
- Identify examples of stormwater quality management methods that are appropriate for the Shediac Bay Watershed that could be implemented by local communities.
- Engage the agricultural community to explore precautionary mitigative methods aimed at reducing the potential for bacteria from agricultural operations to enter Shediac Bay.
- Continue the boater education program and subsidize, for one year, the use of pump-out facilities at the Shediac Yacht Club and the Pointe-du-Chêne Harbour Authority and improve tracking of the frequency of use of these facilities.
- Develop an education program aimed at operating and maintaining on-site sewage disposal systems in the Shediac Bay Watershed.
- Establish a Working Group to review the regulation and oversight of on-site sewage disposal systems, including inspection and enforcement, design standards, and options for ensuring that on-site sewage disposal systems are properly functioning and maintained.