

Targeted onsite septic system investigation - Response to NATECH report findings

Final investigation report

**Report prepared for the Office of the Chief Medical Officer of
Health, Department of Health in collaboration with Health
Protection Services, Department of Public Safety**

June 2019

Please note: Portions of this report, including maps, street names and photographs, have been redacted in order to protect privacy and prevent the potential identification of private properties

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Introduction

This report has been produced as a result of recommendations from the “Parlee Beach Water Quality” Final Report (April 2018)¹ submitted by the Steering Committee for Parlee Beach Water Quality, as well as the report submitted by NATECH Environmental Services Inc., titled “Status Review of On-Site Sewage Disposal in the Unserved Areas near Parlee Beach” (December 2017)², referred to as the NATECH report in this document.

NATECH Environmental Inc. was commissioned to assess the state of the privately owned on-site effluent disposal systems surrounding the Parlee Beach area. The purpose of the study was to assess whether on-site sewage disposal systems were a potential non-point source of bacteria that could impact water quality at Parlee Beach.

The results of their investigation did not identify any case(s) of failing system(s); however a few areas with suspected occasional discharges of partially treated effluent were outlined. From these findings, it was recommended to further investigate the possibility of septic system malfunctioning in these areas.

In addition, in its final report to government, the Steering Committee for Parlee Beach Water Quality outlined 14 recommendations to government¹. The Steering Committee’s recommendation #3 states: “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”.

In light of the findings by NATECH Environmental Inc. and the recommendations made by the Steering Committee, our objective was to further investigate the possibility of onsite septic system malfunctioning in the identified high risk areas. There are two objectives in identifying and subsequently remediating failing septic systems:

- Addressing any localized environmental or health risks related to direct or indirect (i.e. groundwater contamination of wells) contact or exposure to untreated sewage.
- Reducing the risk of untreated sewage negatively impacting the water quality in Shediac Bay.

Methodology

As summarized in the investigation proposal, the following points outline the scope of the work that was undertaken and is described in this report.

- **Some areas identified as 1D, 1C and 3B in the NATECH report were targeted for further investigation:** The areas that were identified as potential problem areas in the NATECH report and identified in the summary and conclusions of the “Parlee Beach Water Quality Report” submitted by the steering committee were targeted for the investigation. While all of the three areas were included in our investigation, a specific focus was placed on the areas that were highlighted in the NATECH report as being at risk for onsite sewage impacts. These were identified through vegetation growth typically present with septic infiltration (indicated in red dotted outline), or through sample results that yielded *E. coli* levels of equal or greater than 1000cfu/100cc.
- **There were four (4) different types of activities conducted:**

1. Mapping:

The purpose of the mapping was to determine the number of approved on-site sewage disposal systems in these areas and to assist in the determination of the soil characterization, based on the type of system installed as well as knowledge of the area. This would assist staff during the on-site visual inspection stage to identify systems that are known to have an approval from the Department of Health and those that are of an unknown status.

The mapping consisted of individual searches within SNB’s registry and mapping services Planet database to retrieve the current Property Identification (PID) numbers of the properties located with the targeted areas. Each individual PID number was then manually input into our IT system to request a match with a file number.

Our IT system contains onsite septic system application information from years 2002 to 2016. On-site permits that were issued by the Technical Inspection Services Branch of the Department of Justice and Public Safety (from years 2016 to 2018)

have been incorporated into the mapping through collaboration and communication with their staff. Approved systems that were installed prior to 2002 would not be retrieved from this system; identifying these systems would require a manual search in paper files which are currently filed under the original owner's name (which may or may not be the current owner). Therefore, it is acknowledged that the mapping exercise will not identify all approved systems in these areas but would still provide partial information on the areas of interest.

The mapping activity was completed in March and April of 2018. The PID's that were successfully matched with an on-site file number are limited but have been identified in the individual target area maps that are included in the results section below.

2. On site visual inspections

The purpose of the on-site visual inspection was to look for signs of onsite septic systems that may be malfunctioning, identify visual evidence of the presence of on-site systems that were not identified by the mapping exercise, and to characterize the types of developments. This was supplemented by the results of the mapping exercise and knowledge of a Public Health Inspector that is familiar with the local area. The following was also assessed:

- Examine the topography and characteristics of the surrounding properties in order to assess if a mound type on-site system may be present.
- Determine ground slope and flow of surface water in the area to help better assess potential areas where untreated sewage may be found.
- Identify locations that have blockages or barriers to surface water flow that would contribute to stagnant water.
- Identification of any Recreational Vehicles (RVs) that are present, and the type of installation (permanent or temporary).

Evidence of mound systems and drainage features for each targeted area were observed and described. We observed for any signs of potentially failing systems such as type of vegetation, odour, ditch discharges and leaching soils.

The on-site visual investigations involved each targeted area being inspected on several different occasions during the summer of 2018. More specifically, visits were conducted on the following dates: May 29th, June 14th, July 10th, August 21st and August 30th. The evaluation of potentially failing systems are more revealing in the summer months due to increased occupancy of the seasonal dwellings, less dilution from rain events and the receded seasonal high water table.

3. Sampling:

The purpose of this exercise was to collect bacteriological samples in the areas identified as at risk, according to the NATECH report, as well as other areas where ponding or stagnating surface water was present, or where concerns were identified while onsite. The sampling results could provide some characterization of the water quality that was found in these areas.

Sampling was conducted in July and August of 2018 as this time of year would have less interference with spring runoff, and seasonal high water tables. Drought conditions would also assist in identifying areas that have standing water. This time of year would also increase the chance of identifying any potential leaching from on-site systems from seasonal dwellings.

The samples collected were stored in a cooler during collection and transportation to the RPC laboratories in Moncton for analysis where *E. coli* quantification was conducted. *E. coli* was used as the sole indicator in our investigation as it is the most specific to fecal contamination, and was the only indicator used in the NATECH report for ranking of the sample results.

4. Door to Door Pamphlet Delivery:

A door to door campaign was conducted in the 1C and 1D area. The purpose of the door to door campaign was to talk to home owner about the state of their on-site sewage disposal system and provide them with information as it pertains to the functioning and maintenance of their on-site sewage disposal system.

The door to door campaign involved several inspectors that went to each residence in the target areas on August 30th, 2018 and spoke to homeowners and distributed pamphlets entitled "Your Septic System, a reference guide for home owners". As the inspectors walked through the neighborhoods they looked for signs of malfunctioning systems.

Results

The results will be presented for each specific area sequentially.

Area 1-C

Background

One targeted area was developed prior 1976, before the regulatory requirements for 1 acre lots came into effect. This area has a variety of developments that consist of full time dwellings, seasonal cottages and travel trailers. This was observed during the on-site investigations. The original lots sizes were generally 462 m² as retrieved from SNB's registry and mapping services, Planet database. However some lots have been amalgamated to create bigger lots. The amalgamation of lots would have provided a larger area that could accommodate an on-site system while respecting the regulatory setback distances; otherwise the lot size of 462 m² would generally only permit a holding tank while respecting the on-site regulatory setbacks.

Some of the full time dwellings participated in the Environmental Trust Fund (ETF) program that was offered late 1990's and early 2000's, which allotted money for on-site septic system upgrades to properties in the Shediac Bay watershed area. The Environmental Trust Fund provided financial assistance for homeowners that qualified to upgrade their on-site systems; this program was only offered to full time dwellings.

Soil and topography

The area is generally flat with a gentle slope down towards the shore. The area has a variety of soil conditions consisting of a sandy loam in some of the streets, with a seasonal high-water table. Sandy loam and Loamy sand can be detected as you approach the shore line.

Although some of these areas still have a potential seasonal high water table it is dependent on the drainage and the site specific conditions.

On-site septic systems

The variability in soil conditions and types of developments made it difficult to determine the type and location of the on-site sewage disposal systems on individual lots. The type of on-site system varies as some lots were previously approved for holding tanks and very few have evidence of mound systems. There was no evidence of effluent breaking out to the surface or road ditch from any of the on-site systems.

Culverts and ditches

One targeted area has drainage ditches along some property lines and side streets that extend to the main road; however many of the drainage systems are not maintained or are infilled which can cause water to be trapped and stagnate. The main road has a drainage ditch that extends to the shore area. Along this road there is an area with vegetation which is indicated in the NATECH report that may suggest septic system impacts. During our assessment we identified a culvert under the road of one of the streets that is at least 8 inches above the bottom of the drainage ditch causing this water to be trapped and stagnate. These drainage ditches eventually get trapped in a deep pit before it over flows to the beach. No malodorous smell or visible signs of sewage effluent were detected.

Sampling

The following table presents the results of sampling conducted in the area.

Table 1: Area 1-C Sampling results

Date	E.coli Results per 100ml
July 10, 2018	Sample 1 – 313
July 10, 2018	Sample 2 – 8212
August 21, 2018	Sample 3 – 26.8
August 21, 2018	Sample 4 – 544.6

Sample 1 was collected on July 10, 2018 in the drainage ditch along the main road; this area was identified in the NATECH report as having vegetation that could indicate septic system impacts. The drainage conditions in this area also promote this type of vegetation growth. The other areas with this type of vegetation identified in the NATECH report were dry at the time of sampling on July 10, 2018 and there was not enough liquid for a sample on August 21, 2018. No odour or visual clues indicative of sewage was detected in these locations. Standing water was sampled on August 21, 2018 between two of the streets in the area identified as sample 3.

Although sample 2 had elevated counts at 8212 CFU/100ml, this sample was collected from a pool of stagnant water, rich in nutrients and in very warm temperatures. The follow up sample results were much lower at 544.6 CFU/100ml. The literature generally concludes that random environmental samples can produce widely varying fecal coliform and/or *E. coli* results (with *E. coli* values ranging from the hundreds to thousands), depending on several environmental factors (ie stagnating or flowing waters, warmer temperatures, contamination by domestic or wild animals etc). Therefore, these values are within the expected range and do not necessarily confirm or rule out the presence of untreated sewage^{3,4,5}. This is in contrast to *E. coli* counts of raw, undiluted sewage, which are generally close to or above a million CFU/100ml^{6,7,8}.

The overflow of this ditch water is dependent on the precipitation. On July 10, 2018 it was not overflowing on to the sand but was on August 21, 2018. Samples from this ditch were collected on both dates (samples 2 and 4 in the table above). Most of the ditches in this area were dry or had very little water on July 10, 2018 other than those areas that were sampled. On August 21, 2018, there had been some precipitation on the previous day which led to more run off in the ditches; however most of the rain water had been absorbed by the soil or dispersed through the drainage system along the roadways, not leaving enough water in the ditches for sampling in some of the areas. Where there was standing water, it was clear and did not have a malodourous smell or visible sign of sewage contamination.

General observations

During our assessment, we observed 3 lots that were at the preliminary stage of development since the building permits were on the temporary power poles. Two of them were travel trailers and one was a mini home in the set up phase. None of these 3 lots corresponded with any of the on-site permits that were issued according to our files and the files of Technical Inspection Services Branch.

Door to door pamphlet delivery

The visual inspections during the walk-through did not reveal any signs of malfunctioning systems. The homeowners provide some details as to the location of their on-site systems and found the information on maintenance requirements useful.

Conclusion

From our investigation, we did not find evidence to suggest failure of on-site sewage disposal systems. There were no visible or odor cues to indicate failing septic systems. While one water sample result was somewhat elevated, subsequent sampling was much lower. As mentioned, random environmental sampling can yield wide variation in results, and these values would be within an expected range. Therefore, our sample results do not specifically indicate the presence of a failing onsite system.

Area 1-D

Background

Area 1-D in the NATECH report, is comprised mostly of full time, single family dwellings. The lots sizes vary depending on the time of development; commonly the west side of the street is around 1000 m² while the lots on the east side of the street are approximately 1800 m². This information was retrieved from SNB's registry and mapping services, Planet database.

As mentioned in the previous section of this report, this area had a high participation rate in the ETF funding program. Many of these households did repair or replace their on-site systems as the financial assistance provided a good opportunity to improve their on-site systems.

Soil and topography

The road slopes down to the marshy wetland area where there is a tributary that leads to the bay. From the marshy area, the road then slopes up heading north. The area closer to route 133, the southern end of the street, has predominantly clay soils with some silty loam. As the lots encroached closer to the wetland to the north, soil was often imported to make the lots suitable for development as their original condition was swampy.

On-site septic systems

During the assessments, we identified many properties with visual evidence of mound systems. These were identified visually since these raised rectangular configurations on the individual properties are noticeable and very predominant in this section of area 1-D. The inspector for the area recalls performing numerous on-site inspections for this section of the area prior to the database system. The area was mapped with findings from our mapping exercise, onsite visual inspection as well as the locations of the samples collected. This area has approximately 33 lots which are almost all developed.

During the assessment, one of the properties had an area that looked damp and was identified as a possible failing sewage system. This property was further investigated and, after numerous attempts, we did succeed in contacting the homeowner. The homeowner advised that the previously damp area in question was used for surface water drainage for the house and landscaping; this was dry at the time of inspection. The homeowner proceeded to show the inspectors where the septic system was located on the property. The homeowner informed the inspectors that they did not have any problems with the septic system but did not permit access to the home to perform a dye test. There was not sufficient evidence to proceed further.

Culverts and ditches

There are drainage ditches along both sides of the roadway that are generally open, although some have been infilled with culverts and landscaped. At the time of the assessments, the ditches were dry with no flowing water until we reached the wetland area of the marsh where it is influenced by the tidal flow and wetland streams.

Sampling

On July 10, 2018 the ditches were generally dry on both sides of the road. The ditches had some accumulation of organic matter and vegetation but did not have enough water for sample collection and there was no smell indicating sewage discharge. Where there was sufficient water in the road ditch further towards the marshy area, water samples were collected from each side of the road to try to replicate the areas sampled in the NATECH report. One of the ditches towards the marshy area is home to a groundhog as seen at the time of sampling; in addition, other water fowl and wildlife were noted. This type of fauna can contribute to *E. coli* being detected in surface water samples.

Table 2: Area 1-D Sampling Results

Zone 1-D	
Date	E.coli Results per 100ml
July 10, 2018	Sample 1 – 120
July 10, 2018	Sample 2 – 97

Door to door pamphlet delivery

The visual inspections during the walk-through did not reveal any signs of malfunctioning systems. The homeowners provide some details as to the location of their on-site systems and found the information on maintenance requirements useful.

Conclusion

Based on site visits and sample results, no evidence was found to suggest on-site sewage disposal system point sources of contamination.

Area 3-B

Background

Area 3-B in the NATECH report, is comprised mostly of full time, single family dwellings with lower density and larger lots sizes, as determined through SNB’s registry and mapping services, Planet database. The area was developed in the late 1980’s, and was very marshy and low lying; therefore the lots were infilled in order to make them suitable for development. The infilling was approximately 5-6 feet in elevation from the original ground level.

Soil and topography

There is very little natural slope for the road side ditches to drain sufficiently; this causes surface water to accumulate and stagnate as there is very little flow. The soil conditions in this area consist of imported fill material as stated above; this was required in order to reduce the risk of flood during storm surges and allow for a solid base material for development.

On-site septic systems

The on-site systems are all mound systems that were installed in the 1990’s. The inspector recalls performing many inspections for the on-site systems at the time these lots were developed. The area was mapped with findings from our mapping exercise, onsite visual inspection as well as the locations of the samples collected. During the assessment no evidence was found to suggest malfunctioning on-site sewage disposal systems

Culverts and ditches

The natural drainage for the ditches and culverts is very poor as they do not have sufficient slope for good water movement. Many of these ditches have cattails as the original ground was predominantly a form of coastal wetland.

Sampling

Water samples were collected during the site visit. The sample results are provided in the table 3. It should be noted that one of the Road is a dead end and does not connect to route 134.

Table 3: Area 3-B Results

Zone 3-B	
Date	E. coli Results per 100ml
July 10, 2018	Sample 1 – <10
July 10, 2018	Sample 2 – 41

Door to door pamphlet delivery

The visual inspections during the walk-through did not reveal any signs of malfunctioning systems. The homeowners provide some details as to the location of their on-site systems and found the information on maintenance requirements useful.

Conclusion

From our site assessment and sampling results, we did not find evidence to suggest failing on-site systems.

Limitations

There are a number of limitations related to this investigation that are important to outline.

Mapping

Although some information was successfully retrieved from our IT system for the mapping exercise, it only includes applications received from 2002 to 2016. Therefore, systems approved prior to this time are not included in this system and could not easily or reliably be retrieved. Approvals issued prior to 2002 are filed under the property owners name, at the time of application, in a Cardex (ie paper based) system and have no consistent property identifier that would allow for any easy search mechanism. Therefore, even if files could not be retrieved for many of the systems, it does not mean that these lots did not receive the appropriate approvals for their onsite systems.

In addition, the IT system cannot tell us if lots were amalgamated, subdivided or if there was the creation of a new lot where the PID numbers may have changed. This would prohibit us from identifying approved application files for those new lots.

Given these limitations, the mapping does not give an accurate representation of the number of approved systems. There were lots that had visual evidence of mound systems and the inspector for the area recalls doing several final inspections on properties in the target areas, even though our search did not find any approval for these systems.

On-site visual investigation

Some of the areas were marshlands and wetlands that do not easily allow for the identification of malfunctioning on-site systems due to the amount of natural soil saturation. In addition, some areas were not accessible due to saturated and unstable soil conditions. Certain ditches did not have a consistent slope and that would cause surface water to collect below the culvert and become stagnated; these areas are described in the area specific section of the report. Some of the Recreational Vehicles (RVs) appeared to be newly located and it could not be determined if they were going to stay permanently on the lots or if they were just temporarily located there. Finally, some malfunctioning onsite septic systems may not be easily identifiable through visual inspection. Depending on the underlying soil characteristics, leaching from these systems may not come up to the surface and therefore escape visual detection.

Sampling

We intended to sample all the sites identified in the NATECH report as having *E. coli* results greater than 1000CFU/100ml; however, some of the ditches and culverts in those areas were dry and were not able to be sampled.

Door to door

At the time of the door to door campaign, not all residents were at home which did not allow for the face to face interaction; however, the pamphlets were left at each dwelling and a visual inspection of the property was performed.

Conclusions and recommendations

The NATECH report concluded that “There were no signs that on-site sewage disposal systems are a significant contributor of elevated coliform bacteria to surface water in the bay”. Our additional investigative efforts into the specific areas of concern did not identify evidence of on-site septic system failures. We are therefore in agreement with their conclusion.

The targeted areas, and the Shediac bay area in general, continue to develop however. Going forward, better coordination and communication between the different agencies involved could improve adherence to regulatory standards that pertain to lot development and lot sizes. Currently small lots are being developed that may or may not have been approved for an on-site sewage disposal system. Electrical sheds and travel trailers continue to develop and evolve into fixed structures on occasion; these would then require an on-site sewage system but are constrained by the small lot size. Also, some seasonal dwellings are being transformed into full time residences which increase the demand on any existing system that may not have been designed for that purpose.

In order to improve communication and coordination, the implementation of a workgroup could be an option. A working group with stakeholders from all permitting agencies such as the planning commission and Health did exist in the past. Its objective was to facilitate the work of all participating agencies in order to ensure that regulations were adhered to. For example, prior to 2007 the planning commission required an on-site approval for the issuance of a building permit; this procedure was a joint effort between the Department of Health and the Beaubassin planning commission, which has jurisdiction in the Shediac Bay watershed area. This cooperation enhanced compliance with the on-site sewage regulations and provided better protection of the groundwater and surface water in the region.

Finally, it would be beneficial to track files with the PID numbers as most commissions and departments use this as a common identifier. Identifying ways to track the status of the development of the lot as the services accumulate such as buildings and or structures, electrical, well, plumbing and on-site could also be useful. The information compiled through the SNB's registry and mapping services, Planet database, could be used for that purpose. This would be helpful to government as well as property owners since Public Health does receive calls regularly from individuals that are inquiring about records of installations.

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