



Human Health Risk Assessment of Sediment, Surface Water and Fish from Lake Charles Halifax Regional Municipality

Issue Summary: Lake Charles is downstream of the former Montague Mines site, and the presence of arsenic in the lake is due to both natural occurring arsenic in regional geology as well as releases over many years from the former Montague Mine site, which operated from the 1860s to the 1940s. As a result of recent and historical data, additional sampling of Lake Charles sediment, surface water and fish was conducted in fall and winter of 2019, and a human health risk assessment (HHRA) study was conducted to evaluate potential risks related to recreational activities such as swimming, fishing, wading or paddle boarding in the lake. The risk assessment focused on arsenic in sediment, surface waters and fish tissues and evaluated mercury in fish tissues since it is also associated with historic mining activities. The conclusions of the risk assessment are that exposures to arsenic in surface water, sediment and fish tissues are low. Exposures to arsenic while swimming in Lake Charles and consuming fish from Lake Charles are estimated to be so low that any risks are concluded to be negligible, or insignificant. The risk assessment concluded that mercury is not of concern for human health in Lake Charles as long as people respect the Provincial fish consumption guidelines (see: <https://novascotia.ca/nse/fish-consumption-advisory.asp>).

Additional studies related to the upstream historic Montague Mines site are being completed and a final closure plan design is being developed for the site, which is expected to reduce arsenic input into Lake Charles.

Additional studies related to understanding water and sediment transport from the former Montague Mines site and potential risks to aquatic life in upstream areas are also being conducted, and the findings of these studies are necessary to make final management decisions for the overall area.

Key Messages:

- Exposures to arsenic while swimming or wading in Lake Charles and consuming fish from the lake are estimated to be so low that any risks are concluded to be negligible, or insignificant.
- Mercury is not of concern for human health in Lake Charles as long as people respect the Provincial fish consumption guidelines.
- The Province is completing a closure plan for the historic Montague Mines site. There are many studies underway at this time to complete the plan. Following acceptance of the plan by government regulators, the remediation work will be completed, and arsenic levels entering Lake Charles should reduce over time.



Questions & Answers:

What kind of study was conducted in Lake Charles?

- A human health risk assessment (HHRA) study was conducted to examine whether people using the lake for swimming, wading, or fishing could be exposed to levels of arsenic that could be of concern from a human health perspective. Arsenic is a naturally occurring mineral and is naturally elevated in this area due to the underlying geology, but historic mining activities have increased arsenic levels above what is typically found in the environment.
- Mercury was also included in this risk assessment out of an abundance of caution, as it is associated with historic mining activities, and can accumulate in fish tissues.
- Human health risk assessment studies are often conducted when measured levels of chemicals in sediments or surface waters are higher than standards set by the Province. The study's methods followed Health Canada guidelines using conservative high-exposure scenarios to look at the potential for impacts on health.

What did the study find in Lake Charles?

- Arsenic is present in surface waters and sediments in Lake Charles at levels that are higher than those expected for natural background conditions. This has been reported previously in some other studies. The presence of arsenic in the lake is due to both natural occurring arsenic in regional geology as well as releases over many years from the former Montague Mine site.
- The largest concentrations of arsenic in sediments are in layers below the sediment surface that were deposited many years ago, likely during the active mining time corresponding to the late 1800s and early 1900s. These deeper sediments are now being covered by sediments with lower concentrations of arsenic in many parts of the lake, which suggests that the shallow lake sediments are slowly returning to pre-mining arsenic levels. The area with the highest sediment concentrations is in the area where Barry's Run flows into the lake, and some parts of this area continue to be influenced by sediments transported from the former mine site. Many areas with sediment containing the higher levels of arsenic are in deep water, where human contact is unlikely.
- The conclusions of the human health risk assessment are that exposures to arsenic while swimming or wading in Lake Charles and consuming fish from Lake Charles are estimated to be so low that any risks are concluded to be negligible, or insignificant.
- Mercury is also associated with historical mining activities, and the risk assessment concluded that mercury is not a concern for human health in Lake Charles as long as people respect the Provincial fish consumption guidelines.



- Based on this study, the closure plan of the historical mine site is important to implement in order to reduce the transport of arsenic from the former mine site downstream towards Lake Charles. The closure planning project underway for the Montague Mines site in 2020 is expected to further reduce concentrations of arsenic (and mercury) in surface waters, and suspended sediment in downstream areas including Lake Charles. No specific risk management is recommended for Lake Charles.
- Reducing or eliminating ground-disturbing activities such as ATV and dirt-bike use at the former Mine site and in downstream areas (such as Mitchell's Brook and Barry's Run), and stabilizing exposed mine tailings at the former mine area in the Closure plan, will help to reduce sediment transportation and improve the situation in areas upstream of Lake Charles, and Lake Charles.

How long is the closure planning going to take for the Former Montague Mines?

- The closure planning project started in late 2018, with the development of a preliminary closure plan in summer of 2019 (Read the report [HERE](#)). There are a number of studies going on since that preliminary plan was released, to refine the preliminary plan to a more final plan. These studies will not be completed until well into 2021.