

Summary of Response Efforts and Recommendations - July 12, 2024 - City of Abbotsford Firefighting Foam Release

Introduction

GHD Limited (GHD) was engaged by the City of Abbotsford (City) to provide emergency environmental response services following a release of firefighting foam into a stormwater drainage system that discharges into Stoney Creek, in Abbotsford, British Columbia (BC) (Site). The City led a coordinated environmental response, which included GHD, the City's contractors, Semá:th and Matsqui First Nations, the Ministry of Environment and Climate Change Strategy, and others. GHD's emergency response team of environmental technical professionals included environmental engineers, biologists, risk assessors, chemists, and technicians.

Incident Information

The release of firefighting foam occurred on July 3, 2024 and the products entered the local storm sewer that is connected to Stoney Creek. On July 4, a coordinated environmental response was initiated. A cut-off dam was established approximately 1,000 meters (m) downstream of the Site, and daily surface water sampling commenced. On July 5, fish salvage operations began, with both live and deceased fish recovered from between the Site and the cut-off dam. As a precautionary measure, water treatment was initiated upstream of the cut off dam on July 6. During the environmental response, 1,448 live fish were collected and relocated to an unimpacted watercourse, Clayburn Creek, approximately 700 m northeast of the Site, and a total of 922 deceased fish were recovered from Stoney Creek. No other impacts to plants or animals were observed, but to further support the response and investigation, samples were collected from sediment, insects (benthic invertebrates), and deceased fish.

Summary of Environmental Fate and Effects of the Products

GHD understands that the product released was identified as PHOS-CHEK 1% Fluorine Free firefighting foam (PHOS-CHEK) and, out of an abundance of caution, Frontier 3% Fluorine Free Foam Concentrate (Frontier 3%) was also evaluated. Both products which contain biodegradable surfactants and organic solvents. Based on a review of the safety data sheets (SDSs) for the products and a focused scientific literature review, the two products are highly soluble in water, readily biodegradable, and do not readily absorb into surrounding landforms, or organisms found in the water. From this, we can surmise that impacts to the environment would be acute (short-term) and not chronic (long-term).

Physical effects

Firefighting foam is the product of chemical concentrates and water, that forms a film that quickly cuts off oxygen to the fire. The release of the firefighting foam products into Stoney Creek resulted in wide-spread foaming, which likely resulted in lowered dissolved oxygen conditions within the creek. Additionally, while these substances are generally not toxic to fish, they can physically coat their gills, which can cut off their oxygen supply. The combination of low oxygen in the creek and decreased gill function likely resulted in rapid fish mortality as the fish would not be able to access sufficient oxygen to survive.

Following the release, chemicals in the products would have rapidly diluted, undergone biodegradation/photooxidation, and the short-term physical effects would have rapidly diminished. It is estimated that the fish mortalities occurred on or before July 5. Based on visual observations made between July 5 and 11 of live fish salvaged from Stoney Creek and the insect (benthic invertebrate) community, it is believed that the short-term physical effects of the products no longer pose a risk to aquatic life in the creek.

Chemical effects

Both product SDSs indicate that they are of low toxicity to aquatic life. However, as a precaution, surface water samples were collected daily beginning on July 4, and sent to an analytical laboratory to evaluate chemical concentrations in Stoney Creek in an effort to assess the potential for the components of these products to negatively impact the environment. These results are discussed below.

Surface Water Sampling and Analytical Results

Surface water samples were collected daily from locations upstream and downstream of the Site. Surface water samples were analyzed for diethylene glycol monobutyl ether (DGME), which is the main ingredient in PHOS-CHEK and propylene glycol monobutyl ether (PGME), which is the main ingredient in Frontier 3%. The surfactants in these two products could not be analyzed by the laboratory; however, these chemicals are also considered to be of very low toxicity to aquatic life, are biodegradable, and do not bioaccumulate in organisms.

Chemistry results for samples collected on July 4 and 5, 2024, showed that DGME and PGME were not detected above the laboratory detection limit, both 15 milligrams per litre (mg/L). Analytical results from July 6 through 10 are pending from the laboratory, but concentrations are expected to decrease over time due to the characteristics of the products. An update will be provided to the City when additional analytical results are available.

GHD conducted an exposure pathway analysis to evaluate the completeness of exposure pathways for surface water to potentially impact human health and the environment. That is, could humans physically come in contact with these products through exposure to drinking water and could these products impact aquatic in Stoney Creek. GHD also compared the sample analytical results for DGME and PGME against literature-based toxicity values and guideline values for BC and other jurisdictions.¹

Drinking Water Exposure Pathway

- Based on a desktop review of publicly available information, there are no reported active drinking water intakes or wells located downstream of the Site; therefore, there is no physical way for potential concentrations of DGME or PGME in the creek to impact drinking water.
- DGME was not detected in the surface water samples above the laboratory detection limit of 15 mg/L. The BC CSR Standard protective of drinking water is 0.1 mg/L, which is lower than the laboratory detection limit for DGME. There is no provincial water quality standard or guideline protective of drinking water for PGME.
- Given that there are no reported active drinking water intakes or wells that could be intercepted by surface water in the creek, **there is no risk to human health from exposure to drinking water.**

Aquatic Life Exposure Pathway

- There are no water quality standards or guidelines for DGME or PGME that are protective of aquatic life from either BC or other North American jurisdictions; however, there are toxicity values available from the European Union (EU) and European Chemical Agency (ECHA). GHD compared the potential concentrations of DGME and PGME in surface water samples (less than 15 mg/L) to the concentrations that are documented to be toxic to aquatic life, referred to as the Lethal Concentration 50s (LC50s) provided by the EU and ECHA.
- DGME and PGME were not detected in surface water samples from Stoney Creek at levels above the laboratory detection limit (15 mg/L), which is 1 to 2 orders of magnitude less than the LC50s. Therefore these concentrations do not pose a meaningful risk to aquatic life in Stoney Creek. Furthermore, concentrations of DGME and PGME would have continuously decreased since July 4 and 5, 2024 due

¹ Limited provincial water quality standards and guidelines are available for DGME and PGME. The Contaminated Sites Regulation Schedule 3.2 Generic Numerical Water Standards (BC CSR Standards) provides a standard for DGME that is protective of drinking water (0.1 mg/L) but does not provide a standard for PGME. The BC Approved and Working Water Quality Guidelines (BC WQG) and BC Source Drinking Water Guidelines (BC SDWQG) do not provide guidelines for PGME or DGME.

to dilution, biodegradation, and photooxidation. Given these lines of evidence, **there is a negligible risk to aquatic life from DGME and PGME exposure in Stoney Creek.**

Recommendations for Next Steps

Based on the information presented above, GHD recommends the following next steps:

- Following the planned flushing activities (which will be completed with appropriate environmental and fish monitoring in place), discontinue water treatment, remove cut-off dam, and remove bird deterrents.
- Discontinue fish salvage.
- Discontinue environmental sampling (surface water, sediment, fish tissue, and benthic invertebrates).
- Periodic monitoring of the creek may be considered to monitor the return of fish.
- Review data pending from the laboratory when available, including sediment data from July 5 and surface water data from July 6 to 10, 2024. Concentrations are expected to decrease over time due to the characteristics of the products; however, concentrations will be confirmed based on the lab data. GHD will communicate results and associated conclusions and recommendations to the City.

Summary

Based on observations of conditions in Stoney Creek, a review of scientific literature related to toxicity of the components in the products and the surface water analytical chemistry data available (summarized above), the short-term adverse conditions in Stoney Creek that are believed to have caused the fish mortalities are no longer present. Therefore, conditions in Stoney Creek no longer pose a risk to aquatic life in the creek. Likewise, the chemical components of the firefighting foams do not accumulate in fish tissue and, therefore, the fish remaining in Stoney Creek as well as the fish relocated to Clayburn Creek are not expected to be further impacted by the chemical components in these products. There are no reported active drinking water intakes or wells that could be intercepted by surface water in the creek. Accordingly, there is no risk to human health from the consumption of drinking water. GHD recommends discontinuation of fish salvage, environmental sampling, and other response measures given the negligible risk to human health and the environment related to the release as of July 11, 2024. Analytical data that is pending from the lab as well as associated conclusions and recommendations will be provided to the City as they become available.