AECOM

Climate Risk and Vulnerability Assessment (CRiVA)

Eureka HAWS

Public Services and Procurement Canada (PSPC)

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Executive Summary

Climate change has adverse effects on Canadian infrastructure. The Government of Canada has developed initiatives to increase the preparedness of communities against climate change and as a result, Public Services and Procurement Canada (PSPC) is focusing on climate change impacts on federal assets. To this end, PSPC has retained AECOM to conduct a Climate Risk and Vulnerability Assessment (CRiVA) on the Eureka High Arctic Weather Station (HAWS), a polar weather station and research facility in Nunavut managed by Environment and Climate Change Canada (ECCC).

Using the Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol, AECOM Canada ULC assessed the Eureka HAWS against the current and future climate conditions. The assessment also considers the current condition information provided by PSPC/ECCC. The time horizons covered in this assessment includes 2021-2050 and 2051-2080 and these time horizons were compared to the historical climate (1991-2020) under the worst-case emission scenario, SSP5-8.5.
The Eureka HAWS ensemble of assets was broken down into five groups to allow for a detailed assessment. These asset groups include buildings, tanks, site services, soil treatment, and water/wastewater. The residents of the Eureka HAWS, aka People, were also considered within the framework of this CRiVA.

In this assessment, 17 climate indicators were selected to assess the climate change risks on the Eureka HAWS. The climate indicators include average and extreme values of temperature, precipitation, wind, and indicators that are derived from these indicators e.g., drought, heatwaves, etc. Moreover, compounding (combination of several) climate indicators such as permafrost thaw, sea-level change, and coastal erosion were also considered, and climate likelihood scores developed.

A consequence matrix with different impact categories i.e., Health and Safety, Infrastructure Integrity, Operation, Reputation, and Financial Impact was developed in conjunction with ECCC. These consequences were assessed on the Eureka HAWS assets. By multiplying the likelihood scores (climate indicator probabilities) and consequence scores, risk scores were developed. The greatest risk scores occur due to the increasing permafrost thaw.

After identifying the risks and the elements prone to experience medium, medium-high, and high risks, appropriate adaptation measures were suggested, as follows:

- Monitor the permafrost thaw impact on the Eureka HAWS buildings, reservoir and lagoon, tanks, and roads. Local mitigative measures might be required.
- Transmission and fuel delivery to the tanks from the ships should use an adjustable system, so that the sea level change does not impact the delivery.
- Develop a coastal erosion and sea level change monitoring program which includes inspection of infrastructure that could be impacted by coastal erosion. Local armoring solutions may be required e.g., rip rap, gabion baskets, etc.
- Monitor water level in the reservoir. Mid-winter snowmelt might reduce the water availability even though rainfall is projected to increase, hence, it is recommended to develop policies and train staff to reduce water consumption.
- Wastewater lagoon might require odour control in the future. Consider aeration and increasing circulation to reduce the odour.
- Monitor health of the staff as permafrost thaw may increase the chances of contracting certain diseases.