Remediation Planning and Remedial Action Plan – Feasibility Study

Eureka High Arctic Weather Station

FY12/13

EXECUTIVE SUMMARY

SENES Consultants Ltd. (SENES), in association with Franz Environmental Inc. (FRANZ), was retained by Public Works and Government Services Canada (PWGSC) on behalf of Environment Canada (EC) to prepare a remedial options feasibility study, in support of the Remedial Action Plan (RAP), at the Eureka High Arctic Weather Station (HAWS).

Objective

The objective of this report is to outline the feasibility of the remedial options for managing environmental impacts at the Eureka HAWS and to evaluate each option based on practicality, safety, cost, and site-specific logistics; and to identify the preferred and secondary remedial options. To complete the work, an update to the 2010 detailed quantitative risk assessment (DQRA) to include the data collected during the 2012 supplemental investigation and a geotechnical analysis of the stability of the slope west of the Powerhouse was required.

Work Completed in 2012

A supplemental investigation was completed in August 2012 to address the data gaps identified in the 2010 detailed quantitative risk assessment (DQRA). A background soil, sediment, and surface water sampling program was completed to confirm or refute that the elevated concentrations of metals at the site were attributable to natural, background conditions. Additional soil and sediment samples were collected in the area around the Powerhouse and Delta to delineate impacts. Indoor air and sub-slab vapour samples were collected to address the potentially unacceptable risk to operation and maintenance workers due to vapour intrusion into maintenance buildings. Geotechnical samples were collected to assess the stability of the slope west of the Powerhouse. Results of the supplemental investigation are provided under separate cover.

Results – Update to DQRA

Using rigorous statistical analysis, analytical results from background soil, surface water, and sediment samples were used to establish the highest concentration of metals that can be expected to result from natural sources (“background threshold levels”) through rigorous statistical analysis. The background threshold levels were compared to the concentration of metals found on site. The maximum concentrations from the indoor air and vapour sampling

were input into the human health risk assessment model. Based on the results, the vapour inhalation pathway was eliminated as a source of potential unacceptable risk from petroleum hydrocarbons (PHC) F1 and F2. There are no potentially unacceptable risks to human health based on the identified contaminants of concern (COCs) on site.

Based on the updated risk assessment modeling, for soil there is still a potentially unacceptable risk from PHC F2 to terrestrial plants and invertebrates. In sediment, a potentially unacceptable risk from PHC F1 and F2, xylenes, and 1-methylnaphthalene to benthic invertebrates and macrophytes remained. There is no potentially unacceptable risk to terrestrial birds and mammals as all the risk quotients were below risk threshold levels. The original DQRA identified a potentially unacceptable risk to terrestrial mammals and birds due to aluminum; however, all aluminum concentrations on site were below the established background threshold level. The aluminum concentrations that posed a potential unacceptable risk are naturally occurring and are not caused by site activities.

The site-specific target levels (SSTLs) were updated based on the data from the 2012 supplemental investigation. Based on the new SSTLs, volume estimates of impacted soil and sediment were calculated. The new expected volume of PHC F2 impacted soil (i.e., with concentrations above the SSTLs) at the Eureka HAWS is 13,200 m^3 and the volume of PHC F1 and F2, xylenes, and 1-methylnaphthalene impacted sediment is 2,400 m^3.

Results – Slope Stability Analysis

A slope stability assessment was conducted on the area between the Powerhouse and the Drainage Pond based on the select geotechnical sample analysis submitted as part of the 2012 supplemental investigation and review of site topography. The results of the slope stability analysis indicate that excavation at the top and bottom of the slope would be of high risk as there is a critical piece of infrastructure at the top, the fuel pipe line, and excavation at the toe of the slope would require an engineered shoring system that would cause limitation on where excavations could occur. Maintaining the necessary sidewalls for entry into an excavation would be difficult due to the presence of the Powerhouse and New Garage and fuel pipe line at the top and the steep slope, wet conditions, Drainage Pond, Drinking Water Reservoir walls and road at the bottom.

Results – Remedial Options Analysis

SENES/FRANZ evaluated multiple risk management options for the Eureka HAWS. These options included a site-wide remedial action plan for managing PHC impacted soils and sediment. SENES/FRANZ identified and tabulated reasonable remedial options available, and assessed and scored them with respect to applicability, limitations, time, and (order of magnitude) costs. Other criteria included the potential remedial options were evaluated based on the removal of hazards, long term effectiveness and overall protection of human health and the environment. The outcome of this remedial options evaluation process is a tabulated matrix evaluation assessing and scoring each of the remedial options identified.

Based on the evaluation and scoring of the remedial options analysis (ROA), and the SSTLs, the preferred remedial option for soil and sediment is risk management via long-term monitoring (LTM). The stability of the slope presents a high risk if excavation were to occur at the bottom or top of the slope. In addition, a critical piece of infrastructure, the fuel pipe line is at the top of the slope, and there would be a risk to the integrity of this pipeline

SENES/FRANZ recommends preparing and implementing a LTM plan which would clearly define the monitoring schedule, the comparison criteria, and the potential termination and action required criteria. The LTM program will be designed to assess whether there are any unacceptable changes in concentrations of COCs at the site that would change the risk assessment assumptions. This should also include monitoring the contributions of the seasonal active layer melt water to the seeps (if observed during monitoring round). If the long term monitoring indicates that either risk management measures are not meeting the risk management objectives or that the changing conditions (e.g., melting permafrost from climate change, new construction) are changing risk assumptions and the conceptual site model, the risk assessment and risk management plan will need to be reviewed and revised appropriately.

No secondary remedial option was identified as site conditions, such as the position of critical infrastructure, health and safety risk of the slope stability, and sensitive environment prevented the other remedial options from being applicable to the entire site. Capping was the remedial option that scored second highest; however, it would only be able to be applied in select locations.

If the proposed capital projects, including relocating the drinking water reservoir or removal of the buildings in the delta area, were to take place, an update to the remedial options is recommended.

This executive summary should be read in conjunction with the main report and is subject to the same limitations described in Section 7.0.