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July 2, 2014 **Transmission via email**

Mr. Robert Eno
Director
Environmental Protection
Government of Nunavut
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Ref. No.: QE14-214-3

Re: Expert Opinion on the Potential Risks to the Human Health and the Environment Related to the Management of Chromium Contaminated Soils at the Iqaluit International Airport

Mr. Eno,

As you are aware, environmental remediation work is needed prior to the start of the construction of the new airport terminal at the Iqaluit International Airport. The work done during a Phase III assessment has found an area of chromium contamination that was previously not known. The discovery of chromium impacted soils requires that the soils be managed in a way so as to ensure that they present no risk to human health or the environment. In order to ensure that the proposed soil management method is safe, Qikiqtaaluk Environmental (QE), who has the mandate to execute the remediation works for this file, sought the opinion of experts in toxicological risk assessment. The present document is an expert opinion prepared by senior toxicologists with more than 15 years experience in risk assessment. Please note that additional sampling is currently underway to further delimit the area of contamination in the work zone.

- ***Environmental Context***

The development of the Iqaluit International Airport requires that soils be excavated in order to complete the installation of new facilities. Typically, excavated soils can be re-used elsewhere on the site provided they respect certain environmental quality criteria. As such, soils that had to be excavated for construction purposes underwent an environmental characterization. The results in QE's Phase III Environmental Site Assessment at the airport revealed the presence of soils showing total chromium concentrations above the limit values of the applicable criteria, i.e. the CCME Soil Quality Guideline (SQG) for industrial land use (87 mg/kg) (CCME, 1997)[1]. The chromium concentrations measured to date are higher but still of the same order of magnitude as the guideline level. These soils have thus to be managed appropriately. Their re-use as fill material remains possible if mitigation measures are implemented to ensure that there is neither migration nor possible exposure conducting to a risk to the human health or the environment.

1 Canadian Council of Ministers of the Environment (CCME). Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health – Chromium. Total chromium (1997), hexavalent chromium (1999). http://ceqg-rcqe.ccme.ca/download/en/262/

➢ ***Proposed Soil Management***

QE's proposed management is to use the chromium contaminated soils as fill material in an area that will be covered with a permanent structure under the new Taxiway G and the Apron I expansion if additional fill space is necessary that will be built as part of the airport improvement project. The pavement structure will incorporate an insulation layer between the final layer of contaminated soils and the clean fill, at a thickness of 1.08 m of granular materials, and an asphalt cover, as specified in the Pre-Existing Contamination Management Plan (PECMP) prepared by CRA.

➢ ***Expert Opinion***

The SQGs derived by the CCME are generic values protecting both human health and the environment. They are derived according to a risk assessment approach, by considering any pathways of exposure potentially relevant for humans and ecological receptors (e.g. plants, animals, soil invertebrates and microorganisms). The relevance of the pathways of exposure depends on both the land use and the environmental fate of the substance. For chromium in soils, the potentially relevant pathways of exposure identified by the CCME for a generic industrial land use consist of direct contact (with humans, plants, animals, soil invertebrates and microorganisms), off-site migration (due to wind erosion or water run-off) and transfer to groundwater (for protection of drinking water and aquatic life)[2].

Based on the soil management methodology proposed by QE, none of those pathways of exposure, except the transfer to groundwater, are possible. Indeed, under these conditions:

- The contaminated soil will not be a support for terrestrial life;
- No direct contact between contaminated soil and any receptor, including humans, plants or invertebrates will occur;
- The contaminated soil will not be subject to erosion or run-off.

In order to protect the aquatic life, the potential transfer of chromium to groundwater has also to be managed. In order to prevent any impact on groundwater quality, the contaminated soil could be placed a minimum of 0.15 m over the height of the surrounding natural terrain to ensure that water will not come into contact with the contaminated soils[3]. If the soils are placed a minimum of 0.15 m over the height of the natural ground, then no monitoring down gradient will be required, since the contaminated soils will not come into contact with any groundwater. Furthermore, the contaminated soils should not extend farther than the limits of the insulation that will be placed under the Taxiway G, or the Apron I expansion, if required, to further protect it from infiltration of water.

2 Two additional pathways (inhalation of indoor air or consumption of locally grown food) are included in the CCME protocol for the derivation of SQGs. However, for chromium at an industrial site, these pathways are not relevant (CCME, 1997) because chromium is not a volatile substance (no possibility of vapor intrusion into a building) and no food is produced on an industrial site.
3 No occurrence of water sorption in the absence of fine particles

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➢ ***Conclusions***

The use of chromium contaminated soils as fill materials below the pavement structure of the Taxiway G, and the Apron I expansion if required, in compliance with the conditions and recommendations mentioned above, will prevent living organisms from any contact with the contamination as well as migration off-site. In these circumstances, based on the absence of any potential exposure, the proposed soil management will be safe to the human health or the environment.

This conclusion remains valid as long as the soils remain covered. Any soils brought back to the surface (e.g. removal of the covering structure, excavation) could require that the situation be re-assessed.

Once you have had a chance to review this information, please do not hesitate to contact us should you require any additional information, or any clarifications.

Sincerely,

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Attch: Exova analytical results for samples where chromium was detected, site plan showing the location of the chromium contamination and the location of Taxiway G

Cc: Geoffroy Lécureur, Michel Boulianne – Sintra Inc.