Radiation Hazard Control Plan

Thelon Project
ATHA Energy Corp.
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1.0 Introduction

This Radiation Hazard Control Plan (Plan) applies to the Thelon Property (the Property or the Project) operated by ATHA Energy Corp. (ATHA) (through its subsidiary, ATHA Energy (NU) Corp. (ATHA NU)). This Plan shall be in effect from date of issue of applicable land use license(s) until the expiry of such licenses.

All employees and contractors working on the Property are to be aware of and follow this Plan. A copy of this Plan is to be posted in an office on the Project, once established. In addition, this Plan is available digitally on ATHA's internal network. Contact the Project Manager for a copy of this Plan.

The purpose of this Plan is to establish procedures that enable exploration activities to be undertaken in a way that protects people and minimizes disturbance to the environment. The overarching goal as it relates to radiation safety is to keep exposure as low as reasonably achievable (ALARA).

The Plan should be used in conjunction with other Property plans, including the:

- Abandonment and Restoration Plan
- Wildlife Management Plan
- Spill Contingency Plan
- Waste Management Plan

2.0 Regulatory Context

Exploration activities in Nunavut must comply with the *Territorial Land Use Act* and *Territorial Land Use Regulations* as well as the *Mine Health and Safety Act* of the Northwest Territories and Nunavut. In addition, uranium exploration is subject to the Canadian Guidelines for the Management of Naturally Occurring Radioactive Material (NORM). Transportation of mineralized core and samples is governed by the *Packaging and Transportation of Nuclear Substance Regulations*, administered by the CNSC, as well as Transport Canada's *Transportation of Dangerous Goods Regulations*.

3.0 Radiation Overview

During mineral exploration activities, the source of radiation is from naturally occurring radioactive material (NORM). NORM primarily contains uranium and thorium (which can release radon gas during decay) and potassium. Radiation is energy that is transmitted in the form of waves or particles and can be divided into two types: ionizing and non-ionizing. Ionizing radiation has enough energy to remove electrons from an atom, creating ions which can be harmful to human health. While humans are exposed to radiation from a number of natural (e.g., soil, rocks, sun) and artificial sources (e.g., x-rays, smoke detectors), the goal is to keep exposure to ionizing radiation as low as reasonably achievable.

As it relates to NORM, there are three relevant types of radiation:

- **Alpha particles**: relatively heavy charged particles (i.e. helium nuclei) that are readily stopped by material such as a sheet of paper. Alpha particles are of concern to human health or safety if they are ingested or inhaled.

- **Beta particles**: lighter charged particles (i.e. electrons or positrons) with slightly more penetrating power, however, can be stopped by a small amount of shielding such as clothing or a sheet of plastic. Some beta particles can penetrate the skin, however, as with alpha particles, are primarily a concern when they are inhaled or ingested.

- **Gamma rays**: electromagnetic radiation with high penetrating ability. Gamma rays can easily pass completely through the human body or be absorbed by tissue, causing a radiation hazard for the entire body. Gamma rays can be absorbed by denser materials such as concrete or lead.

In general, exposure to radiation can be reduced by minimizing the time spent close to radioactive sources, increasing the distance from the source, and by shielding. These principles of radiation protection are known as "time, distance and shielding". The protective measures outlined in this Plan take these principles into account.

The maximum amount of radiation people are allowed to receive in the workplace is regulated. For people involved in uranium exploration, the exposure limit allowed in the workplace is 1 mSv which is the same limit as members of the general public. In contrast, a nuclear energy worker (e.g., someone working in a uranium mine or a nuclear power plant), the annual limit is 50 mSv per year and 100 mSv over 5 years (an average of 20 mSv per year).

4.0 Radiation in Uranium Exploration

The potential sources of mineralized material encountered during exploration for uranium include naturally occurring mineralized outcrop or boulder fields, drill core, and drill cuttings. From these sources, radiation exposure may come from:

- Gamma radiation emitted from the uranium mineralization
- The inhalation of radon (and the resulting radon progeny decay products) emanating from the drill core and drill cuttings
- The inhalation of radioactive dust
- The ingestion of radioactive dust

The level of exposure when handling mineralization will depend on:

- The grade of the mineralization
- The amount of time spent with the mineralization
- The proximity to the mineralization
- The amount or volume of mineralization

5.0 Radiation Safety

5.1 Training

All employees and contractors arriving on the Property are to be provided with an orientation that includes training on identifying radiation hazards and radiation protection appropriate for their job duties.

5.2 Radiation Protection Controls

Uranium exploration and drilling programs involve various grades of uranium ore and various levels of potential radiological hazards. A radiation level has been determined above which Radiation Protection (RP) controls are initiated and all the elements of the Radiation Protection Guidelines described below come into effect. If the ore being handled is below this action level, general health and safety-related practices are to be in effect.

The RP level has been determined on the basis of available Federal and Provincial guidelines that address uranium exploration and radiological safety controls in mining areas. This indicates that areas with exposure rates that are less than 1 µSv/h don't require controls. An exposure rate greater than **1 µSv/h** corresponds to a reading of **1000 cps at one metre** on an exploration scintillometer and triggers Radiation Protection (RP) controls.

5.3 Radiation Protection Guidelines

Worker Responsibilities

All employees and contractors, collectively referred to as workers, active on the Property must:

- Attend required training, safety meetings and briefing sessions
- Be familiar with and adhere to this Plan
- Perform only those tasks that can be performed safely
- Report any unsafe conditions to their supervisor or Project Manager
- Wear a TLD (dosimeter) badge if assigned, store the badge appropriately when not in use, and immediately report if lost or damaged

Personal Protective Equipment

When working with uranium mineralization, the following personal protective equipment (PPE) is to be worn, as appropriate for the task at hand:

- Coveralls and gloves to protect from and minimize the spread of radioactive dust
- Safety glasses to protect eyes from beta radiation
- Use a ½ face particulate respirator when radioactive dust is expected (e.g., core splitting). Store respirator in a clean plastic bag away from the work area when not in use

General Protection Guidelines

The following measures are mandatory when working directly with or in an environment that may contain radioactive materials:

- Minimize time handling radioactive material and maximize distance from radioactive material
- Use shielding to block radioactive material (e.g. core lids on boxes not actively being logged)
- Do not wear work clothes or footwear that may have been in contact with mineralized material in non-work settings (kitchen tent, sleep tent, common areas, etc.)

- Maintain good hygiene by washing hands regularly (including after handing mineralized material and before eating or smoking), washing hair and clothes regularly
- Do not lick any rock
- Bandage open wounds
- Do not eat, drink or smoke in core shacks, splitting shacks, the dry, on the drill platform or any other location with elevated radiation levels
- Reduce dust by wetting the area with water on a regular basis
- Always work in well-ventilated environment
- Store radioactive material at least 30 metres away from where people regularly work or congregate (e.g., the drill shack and the core logging tent)

6.0 Additional Precautions

6.1 Mapping, Prospecting and Geophysics

Exposure to uranium mineralization is predicted to be negligible during geological field mapping, prospecting and geophysical surveys. No additional radiation-related measures are required during these activities.

6.2 Drilling

Drill hole setups are to be located by GPS to facilitate future inspection and monitoring. Photos are to be taken before and after drilling. Scintillometer readings are to be taken around the drill site to determine the radiation levels before drilling occurs.

Upon commencement of drilling, the drill crews are to be notified of the depth mineralization is expected. While awaiting transportation, mineralized core is to be stored 30 metres from the drill shack and at least 30 m away from the ordinary high-water mark of any water body. A placard noting radiation is to be posted at the drill site core storage area.

For handling of mineralized cuttings, please refer to ATHA's *Waste Management Plan*. For information on drill hole grouting requirements, please refer to ATHA's *Abandonment and Restoration Plan*.

6.3 Core Logging

Drill core with radioactivity of >25 µSv/h, or with a uranium content greater than 0.5% U_3O_8 over one meter is to be logged in a "hot tent" at least 30 m away from other common work areas. A radiation warning sign must be placed on the core shack door when while radioactive core is inside.

6.4 On-site Transportation and Storage

Radioactive core may be temporarily stored on the Property in core stacks (e.g., while awaiting transport from the drill). Boxes of radioactive core will be secured using a wood or Plexiglass lid. Radioactive core will not be transported unless it is secured with a lid.

Once the uranium content has been established by assaying, a decision will be made on the long-range storage of the core. If stored on the Property, it will be located in the long-term core storage area for radioactive rocks that is a minimum of 100 meters away from the normal high-water mark of any water body. This core storage area will be located at a minimum of 31 metres from other working structures. Radiation levels must be reduced to less than 1.0 µSv measured at 1 metre from the surface and in no instance will be allowed to exceed 2.5 µSv. Core storage areas are to have signs indicating a radioactive hazard.

6.5 Off-site Transportation

The shipping of radioactive materials (Class 7) from the Project site is controlled by the CNSC *Packaging and Transport of Nuclear Substances Regulations (PTNSR)* and Transport Canada's *Transportation of Dangerous Goods Act* and *Regulations*.

The Project Manager, or designate, will supervise the shipping of radioactive materials and will ensure those shipping are certified to the standards required by the *Transport of Dangerous Goods Regulations*.

The Regulations stipulate that Low Specific Activity consignments are to be shipped as Excepted Packages if the radiation on the external surface does not exceed 5µSv/hr. The container must bear the UN Number as per PTNSR 17(2) and contain a marking of "radioactive" on an internal surface that is visible upon opening the package.

The transportation of uranium mineralization and ores that have an average specific activity in excess of 70 kBq/kg conforming to the requirements of the *Packaging and Transport of Nuclear Substances Regulations*.

Exploration camps have one exemption to the *Transport of Dangerous Goods Regulations* and are permitted to transport core samples by air, providing they are less than 100 mm in diameter and are packaged in accordance with the *Packaging and Transport of Nuclear Substances Regulations*.

6.6 Spills

Any spillage or accumulation of mineralized materials will be cleaned up immediately. For spilled drill core, return it to the box and ensure no spilled remnants remain. For mineralized cuttings, scoop into an appropriate container for further disposal (see ATHA's *Waste Management Plan* for additional details).

6.7 Monitoring

Monitoring exposure with a TLD badge is an effective method of measuring exposure. ATHA sources TLD's from Health Canada's National Dosimetry Services (NDS).

In addition to the TLD badges, ATHA may use additional real-time monitoring devices as appropriate depending on the level of mineralization encountered.

7.0 Additional Information

Workers are encouraged to consult regulatory guidelines for additional Radiation Safety information.

Copies of the Canadian Guideline for the Management of Naturally Occurring Radioactive Materials (NORM) from Health Canada, the Radiation Protection Guidelines for Uranium Exploration from Saskatchewan Labour, Occupational Health and Safety, the CNSC Radiation Protection Regulations and the CNSC Packaging and Transport of Nuclear Substance Regulations are available for review from the Project Manager.