ON SAMPLING URANIUM DEPOSITS AND MINES

1. Why is uranium so specific?
Uranium is a radioactive element. It produces daughter elements through a decay process. Familiarity with the decay series helps to assess the significance of any disequilibrium within the radioactive family. The state of equilibrium and its variability across the deposit can critically influence a grade-tonnage estimate and should be carefully assessed. Uranium-bearing ores emit gamma rays, another distinguishing aspect of uranium.

2. Measuring radioactivity
Devices that capture and make gamma rays a useful source of quantitative information include probes, portable counters and scanners. Radiometric measurements are sensitive to a wide range of factors. Let us cite a few: geometry of mineralisation, rock type and matrix, distance between gamma-ray emitting source and instrument, background level, radon contamination and importantly the calibration of the radiometric instrument. Instrument calibration may require extensive test work and expert input is recommended.

3. Working with radiometric measurements
Down-hole gamma logging is very convenient for cost-effectively exploring and evaluating uranium deposits. Furthermore, it may enhance the geological interpretation of the deposit. Radiometric readings of ore faces, ore piles and truckloads of uranium-bearing ore are commonly used for grade control and tonnage-grade calculation purposes. Radiometric sorting can be used to upgrade the ore, which may contribute to the optimisation of the process plant.

4. Converting radiometric data into U₃O₈ grades
As exploration and mining use large amounts of radiometric data, it is important that the relationships between radiometric data and U₃O₈ grades be accurately determined. This usually requires the development of specific sampling programs and must be based on high-quality data. A range of factors including those discussed above in paragraphs 1 and 2 can be expected to influence the radioactivity-U₃O₈% relationship. In a production environment, operational constraints may play a part. As several stages of sampling may be necessary to characterise a radioactivity-U₃O₈% relationship, maintaining quality control is essential.

5. Let us emphasize that:
- Assembling a high-quality uranium resource database requires a suitably-trained team, well-designed and rigorously-implemented procedures and a strong commitment to quality control.
- Working with radioactivity can greatly benefit early to advanced exploration projects and comes in handy in a variety of applications at a mine site.