**RAI 37.A.1**

Description of Deficiency: Staff cannot verify the applicant's MILDOS calculations for the maximally exposed individual and its basis for not collecting vegetation, food, and fish samples during operations for the environmental monitoring program.

Basis for Request 10 CFR Part 40, Appendix A, Criterion 7, requires, in part: "…Throughout the construction and operating phases of the mill, an operational monitoring program must be conducted to measure or evaluate compliance with applicable standards and regulations; to evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects."

10 CFR 20.1301(a) requires, in part: "(a) Each licensee shall conduct operations so that – (1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with § 20.2003..." 10 CFR 20.1302(b) requires, in part: "A licensee shall show compliance with the annual dose limit in § 20.1301 by — (1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit..." NUREG-1569, Acceptance Criterion 5.7.7.3(1), states: "The proposed airborne effluent and environmental monitoring program is consistent with Regulatory Guide 4.14, Sections 1.1 and 2.1 (NRC, 1980) and as low as is reasonably achievable requirements as described in Regulatory Guide 8.37, Section 3 (NRC, 1993)".

RG 4.14, Section 2.1, provides guidance for conducting an operational environmental monitoring program including the collection of vegetation, food, and fish samples. Furthermore, RG 4.14 provides guidance that these media are relevant when a significant pathway to man is identified in individual licensing cases. A significant pathway is defined in RG 4.14, Footnote (o) to Tables 1 and 2, when a predicted dose to an individual would exceed 5 percent of the applicable radiation protection standard.

RG 3.51, Calculational Models for Estimating Radiation Doses to Man from Airborne

Radioactive Materials Resulting from Uranium Milling Operations, provides guidance on calculating dose for individuals including ingestion of vegetables, milk and meat.

Request for Additional Information

A. In TR Sections 5.7.7.5 and 5.7.7.6, the applicant stated that it will not collect vegetation, livestock, crop, or vegetable garden samples as part of its operational environmental monitoring program based on the results of its MILDOS calculations presented in TR Appendix M. In order for staff to verify the technical bases for this approach, please address the following issues:

1. In Appendix M1, page 7 of the report by Noel Savignac, the applicant describes the MILDOS operational input data. In addition to the assumed values of one percent for the radon venting rate of the wellfields (refer to NUREG-1569, Appendix D, and TR Appendix M, Table 2 of the report by Noel Savignac) and 20 percent of the radon released from the purge water, the applicant appears to further reduce the radon effluent by applying a 25 percent (radon venting from header houses) and 75 percent (radon venting from satellite plant) proportion factor in one scenario, and a 10 percent (radon venting from header houses) and 90 percent (radon venting from satellite plant) proportion factor in another scenario. Please provide additional clarification and justification for this apparent additional reduction in radon effluent concentration over and above the MILDOS-assumed value for wellfield venting and the applicant-assumed value for purge water venting.

**RAI 37.A.1 Response (10/27/2014)**

On 7/11/2014 a revised MILDOS was submitted to the NRC (Appendix M). The Table of Contents and Table 1 have been revised. Please replace the following pages in the MILDOS (Appendix M);

Table of Contents: Final with redline strikeouts removed

Table 1 (page 9): Corrections to columns 'Col Vol' and 'Purg'

Table of Contents

**Table 1 Operational Data for Marsland Mine Units 1–F**

| Location | X km | Y km | Z m * | Ra pCi/g | Em FR | Thick m | Den g/cm$^3$ | Area m$^2$ | Fr Rn | Col Vol L | Rn vent/d | Col Util | Por | Op days | Cir Vol L | Purg lpd |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MU-1 | -0.56 | 2.23 | 27 | 481 | 0.25 | 7.6 | 1.89 | 3.02E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 1.04E+09 | 295000 |
| MU-2 | -0.55 | 1.65 | 16 | 481 | 0.25 | 7.6 | 1.89 | 2.70E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 9.95E+08 | 295000 |
| MU-3 | -0.15 | 0.95 | 13 | 481 | 0.25 | 7.6 | 1.89 | 1.71E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 1.29E+09 | 295000 |
| MU-4 | 0.43 | 0.13 | -4 | 481 | 0.25 | 7.6 | 1.89 | 2.43E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 7.96E+08 | 295000 |
| MU-5 | 0.84 | -0.45 | -14 | 481 | 0.25 | 7.6 | 1.89 | 1.82E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 1.19E+09 | 295000 |
| MU-A | -0.86 | 2.88 | 45 | 481 | 0.25 | 7.6 | 1.89 | 2.66E+05 | 0.8 | 1.40 +05 | 0.01 | 5.00E-01 | 0.29 | 365 | 2.19E+09 | 295000 |
| MU-B | 1.12 | -1.02 | -15 | 481 | 0.25 | 7.6 | 1.89 | 2.48E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 2.79E+09 | 295000 |
| MU-C | 1.74 | -2.33 | -25 | 481 | 0.25 | 7.6 | 1.89 | 4.58E+04 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 3.03E+09 | 295000 |
| MU-D | 2.42 | -3.56 | -36 | 481 | 0.25 | 7.6 | 1.89 | 2.45E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 3.03E+09 | 295000 |
| MU-E | 2.74 | -3.98 | -42 | 481 | 0.25 | 7.6 | 1.89 | 2.08E+05 | 0.8 | 1.40 +05 | 0.01 | 5.00E-01 | 0.29 | 365 | 3.03E+09 | 295000 |
| MU-F | 2.90 | -4.30 | -47 | 481 | 0.25 | 7.6 | 1.89 | 1.06E+05 | 0.8 | 1.40E+05 | 0.01 | 5.00E-01 | 0.29 | 365 | 4.48E+08 | 295000 |

X = Km from Marsland satellite (+) = East, (-) = West

Y = Km from Marsland satellite (+) = North, (-) = South

Z = m elevation (+) = above the satellite, (-) = below the satellite

Ra = Radium concentration in picocuries per gram

EM. FR = Radon emanation fraction

THICK = Thickness of ore in meters

DEN = Density of ore in grams per cubic centimeters

AREA = Area of well unit in square meters

FR Rn = Fraction of Radon in process water

COL VOL = Ion-Exchange column volume in liters

Rn VENT = Rate of Radon venting from well heads, valves and leaking transport piping during circulation

Col Util = Ion-Exchange column unloading rate

POR = Porosity of ion exchange resin

Op Days = Days of operation in days

CIR VOL = Volume of process water in circulation in liters

PURG = Treated water purge rate in liters per day = waste water flow rate

* = MILDOS-AREA accepts source heights -20 to 30 meters