REQUEST FOR CLARIFICATIONS

RADIATION PROTECTION PLAN

Soil

The licensee addresses its previous commitments[1] for surveying subsurface soil brought to the surface during installation of injection and extraction trenches, monitoring wells, trenches for piping and utilities, etc., in Section 12.5 of the Radiation Protection Plan (RPP). The licensee stated that these soils have been previously released from license controls. However, this statement is not accurate. The three subareas remaining under NRC license SNM-928 (the license), F, G, and N, have had various surveys performed within them for the purpose of demonstrating that they could be released from radiological controls and removed from the license. These surveys are described, in part, in the licensee's May 3, 2021, letter.[2] However, there has been no regulatory action to release these subareas from the license and they are therefore not released "from license controls" as stated by the licensee.

For the purpose of surveying areas of disturbed soils (not including the 1206 Drainage sediment and spoils), the licensee divided soil depths into three groups: less than one foot below the ground surface, from one foot to one meter below the ground surface, and one meter or more below the ground surface. As the NRC staff understands the proposed method for surveying disturbed soil, the licensee will perform a gamma scan of soil before and after excavation of these three soil depths. The licensee proposed using an action level of "two times background" to determine if soil samples need to be obtained from excavated soil and sent offsite for laboratory analysis. The results for the laboratory analyses would then be compared to the requirements in License Condition 27.c. of the license to determine if the soil can be released for unrestricted use. The NRC staff notes that "2 times background" is not an objective measure and can't be used for comparison against decommissioning criteria.

Clarification requested:

Provide the rationale for dividing the soil into the three specified depths.

Provide a methodology for confirming that subsurface soil brought to the surface (not including the 1206 Drainage sediment and spoils) will not result in soils exceeding soil release criteria in any land area.

Internal Exposure Determination

NUREG-1400[3]

The licensee discusses the use of a dispersibility factor (D) less than 10. However, this is not substantiated in NUREG-1400. The factors discussed by the licensee (resin being moist, large particles, a closed processing system) are already captured by the release fraction R and the confinement factor C.

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[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML19154A597
[2] ADAMS Accession No. ML21123A290
[3] ADAMS Accession No. ML13051A671

The licensee also states:

> In considering an appropriate dispersion factor for particles that do not tend to become airborne, Figure 2.6 of NUREG-1400 was reviewed. This figure provides an example where quantitative dispersion factors are determined directly through air sampling. Although quantitative values cannot be determined at this time, NUREG-1400 supports use of dispersions factors less than 1.

The NRC staff reviewed Figure 2.6 of NUREG-1400 and can't corroborate the licensee's interpretation. Figure 2.6 is related to Section 2.2.2.2 of NUREG-1400 discussing quantitative airflow studies. Figure 2.6 is related to the dispersion of aerosols from the source of a release:

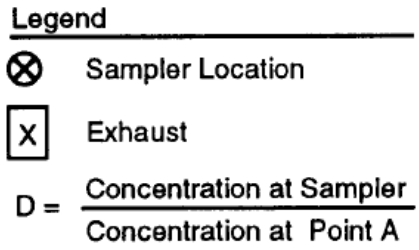

Figure 2.6. Quantitative Dispersion Factors

The "D" in Figure 2.6 is referred to as the "dispersion factor". This is not the same as the "dispersibility factor" discussed in Section 1.2.3 of NUREG-1400 for determining potential intakes.

<u>Clarification requested</u>:

Provide a justification for the use of a dispersibility factor (D) less than 10 that is consistent with Section 1.2.3 of NUREG-1400 for determining potential intakes.

10 CFR 20.1204(g).

The licensee was requested to address the requirements of 10 CFR 20.1204(g) for their expected mixture of radionuclides. 10 CFR 20.1204(g) states:

> (g) When a mixture of radionuclides in air exists, licensees may disregard certain radionuclides in the mixture if—
>
> (1) The licensee uses the total activity of the mixture in demonstrating compliance with the dose limits in § 20.1201 and in complying with the monitoring requirements in § 20.1502(b), and
>
> (2) The concentration of any radionuclide disregarded is less than 10 percent of its DAC, and
>
> (3) The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30 percent.

The licensee evaluated 10 CFR 20.1204(g)(2) and (3) but did not address 10 CFR 20.1204(g)(1).

Clarification requested:

The requirements that specify when a licensee may disregard certain radionuclides in a mixture when determining internal exposure are found in 10 CFR 20.1204(g). NRC guidance on 10 CFR 20.1204(g) can be found in NUREG-1736.[4] NUREG-1736 presents several examples of calculations using mixtures of radionuclides.

The following questions and answers on the NRC website may also be helpful in addressing mixtures of radionuclides and when certain radionuclides may be disregarded when assessing internal dose:

Q121: http://www.nrc.gov/about-nrc/radiation/protects-you/hppos/qa121.html

Q403: http://www.nrc.gov/about-nrc/radiation/protects-you/hppos/qa403.html

Q453: http://www.nrc.gov/about-nrc/radiation/protects-you/hppos/qa453.html

In particular, question Q403 addresses disregarding the contribution of a radionuclide for recording and reporting purposes if it is less than 10% of the committed effective dose equivalent.

The licensee's proposed method of assessing mixtures of radionuclides does not meet the requirement of 10 CFR 20.1204(g)(1) and is not consistent with the guidance provided above for this regulation. Specifically, the licensee's proposed methodology does not account for the activity of those radionuclides it disregarded based on the derived air concentration analysis.

Either provide the NRC staff with a proposed method of assessing mixtures of radionuclides that meets the requirement of 10 CFR 20.1204(g)(1) and is consistent with the guidance provided above for this regulation or provide justification for an alternate methodology. An alternate methodology that does not meet the requirement of 10 CFR 20.1204(g)(1) will require an exemption to this regulation.

Radiation Protection Instrumentation

Scan MDC

The licensee provided an example scan MDC calculation for beta contamination. However, the scan MDC for alpha contamination uses a different equation. The licensee should provide an example of a calculated scan MDC for alpha contamination as previously requested.

The NRC staff notes that there appears to be an extra subscript for the surface efficiency in its equation for scan MDC:

[4] ADAMS Accession No. ML013330179

$$Scan\ MDC = \frac{d' \times \sqrt{b^i} \times \left(\frac{60}{1}\right)}{\sqrt{p} \times \varepsilon_i \times \varepsilon_{is} \times \left(\frac{probe\ area}{100}\right)}$$

Where:

d' = the index of sensitivity, typically 1.38 is based on 95% correct detections and 60% false positive rates but may be modified by the RSO depending on project decision as to confidence desired in ability to detect elevated area
b_i = background counts in the observation interval
i = observational interval (in seconds), based on the scan speed and areal extent of the contamination, 1 second is used.
ε_i = the instrument efficiency
ε_s = the surface efficiency
probe area = physical probe area of the radiation detector (cm^2)
p = surveyor efficiency, 0.5

This appears to have been addressed in the RPP (Note 3 in Section 7.5 of the RPP). However, in Note 1, the licensee provides the following equation for minimum detectable activity (MDA), where PA is the probe area as defined above:

$$MDA = \frac{3 + 3.29\sqrt{R_b T_s (1 + {}^{T_s}/_{T_b})}}{(E \times T_s)/(\frac{P_A}{100})}$$

The PA/100 term appears to be incorrectly divided in the denominator.

In Section 7.5.1, Contamination Survey Instrument Counting Efficiency, of the RPP, the licensee states:

> The RSO may provide alternative methods for determining calibration efficiency, which could include use of the counting efficiency provided on the instrument calibration certificate. Alternative methods shall be documented with the instrument records.

Please provide the NRC staff with an example of such an alternative method. The NRC staff can accept alternative methods to those given in guidance documents, but not without details sufficient for the NRC staff to understand those alternative methods.

Also, please clarify the use of “calibration” efficiency and “counting” efficiency as used above.

<u>Clarification requested</u>:

- Provide an example of a calculated scan MDC for the alpha contamination expected at the Cimarron site as previously requested.
- Confirm the PA/100 term in the MDA equation above.
- Clarify the use of “calibration” efficiency and “counting” efficiency as used above.
- Provide the NRC staff with the details of any alternative methods that the licensee wants to use for determining counting efficiency, scan MDC, etc.

Surface efficiencies

The licensee provided a novel approach to assigning beta surface efficiencies to its radionuclide mixture. This novel approach derived an overall surface efficiency for the radionuclide mixture based on an average beta energy of that mixture.

The NRC staff can't corroborate this novel approach as it doesn't address the physics behind the derivation of the surface efficiency. The surface efficiency is derived for individual particles, not for mixtures. For example, a radionuclide with a high energy beta particle emission, such as Pa-234m (E_{max}=2.28 MeV), has no bearing on a radionuclide with a low energy beta particle emission, such as Th-234 (E_{max}=0.19 MeV).

Clarification requested:

The licensee should provide a calculation of counting efficiencies that utilizes an accepted methodology for incorporating surface efficiencies. If the licensee wants to use an alternative approach to determine counting efficiency, it should provide sufficient information for the NRC staff to evaluate the approach. This information could include, for example, a comparison of the alternative approach with the accepted methodology and any empirical data developed by the licensee.