REQUEST FOR CLARIFICATIONS

DECOMMISSIONING PLAN

Contaminated Structures

In Section 8.9 of the Decommissioning Plan (DP), the applicant stated that the Western Area Treatment Facility (WATF) building and the secure storage facility will be subject to a Final Status Survey (FSS). In Section 15.4 of the DP, the applicant stated that it anticipates that only the WATF and the Burial Area 1 Treatment Facility will require an FSS. Based on these observations, there is insufficient clarity for the U.S. Nuclear Regulatory Commission (NRC) staff to determine which potentially contaminated structures will be subject to an FSS at the completion of groundwater remediation activities.

Please provide a comprehensive list of all structures that will be subject to an FSS at the completion of groundwater remediation activities and prior to license termination.

Contaminated Systems and Equipment

In Section 8.9.2 of the DP, the applicant stated that the uranium treatment units and the resin processing system may be decontaminated for release. The applicant did not describe how decontamination of the uranium treatment units or resin processing system will be accomplished.

In Section 8.9.3 of the DP, the applicant stated that the nitrate treatment system may be decontaminated for release. The applicant did not describe how decontamination of the nitrate treatment system will be accomplished.

In Sections 8.9.5 and 8.9.7 of the DP, the applicant stated that all accessible piping will be considered releasable for unrestricted use. In addition, FSSs will not be required for wellfield groundwater piping and appurtenances because the piping will have conveyed groundwater containing very low uranium concentrations over the majority of its lifespan. However, the applicant has not presented a relationship between uranium concentration in water and residual surface contamination on the piping surface

The treatment of piping described above is not consistent with other parts of the applicant's radiation protection program. For example, the applicant stated in Section 13.1.2 that it is disposing of all potentially contaminated material during groundwater processing that cannot be surveyed.

1) Please provide a description of any techniques that may be used for the decontamination of the uranium treatment units, the resin processing system, and the nitrate treatment system. Please also describe any radiation protection measures that will be employed during the decontamination of these systems.

2) Please provide a technical basis, including any proposed surveys, for assuming that all piping used for groundwater remediation can be considered releasable for unrestricted use.

Soil

The applicant stated (Radiation Protection Plan [RPP], Section 12.5) that it will survey soils in areas that are disturbed as a result of groundwater remediation activities. However, details on these surveys were not provided in Revision 2 of the DP.

In addition, the applicant previously committed to subjecting areas of Subarea F disturbed as a result of groundwater monitoring be subjected to FSS again (Agencywide Documents Access and Management System [ADAMS] Accession No. ML021360011). There is currently no commitment from the applicant for performing this type of a survey.

Please describe any actions that will be taken if analyses indicate that any soil exceeds License Condition 27(c) requirements. Also, please describe any types of final surveys performed in areas disturbed as a result of groundwater remediation activities.

For example:

- Please address in the RPP the commitment for surveys of subsurface soil provided in the May 24, 2019, submittal, ADAMS Accession No. ML19154A597.

- Please provide a figure incorporating the Subareas developed in 1994 for the purpose of conducting FSSs into Drawing BMCD-GWREMED-C002 in Appendix I of the DP. See previous drawing in Attachment 1 to the June 7, 2019, submittal, ADAMS Accession No. ML20094L181.

- Please address in the DP the commitment for surveys of subsurface soil provided in the June 7, 2019, submittal, ADAMS Accession No. ML20094L181.

- Please provide a figure depicting the uranium plume, areas of disturbance, and their relationship to the Subareas developed in 1994 for the purpose of conducting FSSs. See Figure 3-3 in the July 10, 2019 submittal, ADAMS Accession No. ML19204A022.

- Please address areas of Subarea F disturbed as a result of groundwater monitoring regarding FSSs (see letter dated May 10, 2002, ADAMS Accession No. ML021360011).

In-Process Monitoring

Monitoring groundwater treatment progress is discussed by the licensee (DP 8.6, 15.3). Please provide an analysis by the licensee demonstrating that discharges are in accordance with the Oklahoma Pollutant Discharge Elimination System Standards Discharge Permit and meet the requirement of Title 10 of the *Code of Federal Regulations* (10 CFR) 20.2001. This should include an analysis based on enriched uranium and the unity rule, taking technetium-99 (Tc-99) into account. Please include a discussion of Tc-99 related to discharges into the Cimarron River. Please provide an analysis that demonstrates effluent discharges are in compliance with 10 CFR 20.2001 or identify where this demonstration is in the application.

Note that this issue was previously addressed by the licensee's submittal dated May 7, 2019 (ADAMS Package Accession No. ML20199M163). However, the response does not appear to be found in the current DP.

Environmental Monitoring and Control

- Section 12 of the revised DP still does not appear to include an explicit description of the As Low As Reasonably Achievable (ALARA) goals for effluent control and it is not clear what the ALARA goals are. Note that the licensee's proposed language to address this comment (provided to the NRC in May 2019) does not appear to have been incorporated in the current version of the DP.

- Section 12 of the revised DP also does not appear to include a detailed description (or reference to a detailed description) of the procedures, engineering controls, and process controls to maintain doses ALARA. Note that the licensee's proposed language to address this comment (provided to the NRC in May 2019) does not appear to have been incorporated into the current version of the DP. Also, adding a short description noting where relevant information is provided in other sections of the DP (i.e., a paragraph like the one provided in the May 2019 request for supplemental information [RSI] responses), to Section 12 DP would be helpful in keeping ensuring that all pertinent information can be readily located.

- Section 12.2 includes information on the expected maximum concentration of uranium (i.e., the minimum concentration limit), but it does not include information on the concentration of other radionuclides and whether any other radionuclides are present at levels above background. Information such as that provided in the May 2019 responses to RSIs should be incorporated into the DP.

- Section 12 does not appear to contain a summary of the action levels (if different than the ALARA goals) and a description of the actions to be taken if a limit is exceeded (see Section 17.4.3 of NUREG 1757 Vol 1 Rev 2).

- Section 12 of the revised DP also does not appear to include a summary of the estimates of doses to the public from effluents and a description of the method used to estimate these public doses per 10 CFR 20.1302. This estimation of doses should account for all radionuclides that are present above background. Note that the language previously provided to the NRC in May 2019 to address this comment does not appear to have been incorporated into the current revision of the DP. Also, a calculation of this dose, like one provided in the May 2019 response to RSIs should be included in the DP.

- Some key information listed as information that should be in a DP in the guidance in NUREG-1757 Vol 1, Rev 2 appears to be only included in secondary or tertiary references that can be revised by the licensee. A high-level description of the commitments and information (i.e., a sufficient description to meet the guidance in NUREG-1757) should be brought into a document that can be tied to the license with a particular revision number (*e.g.,* in the DP or in a specific revision of the RPP). Some specific examples include:

    - Most of the information on the ALARA program is in RP-10 "ALARA Program" rather than in the DP or RPP

    - The environmental monitoring recording and reporting procedures are described in QAIP-17.1 "Data Management Practice" rather than the DP or RPP

Radioactive Waste Management

- The revised DP does not address if any volumetrically contaminated waste is expected.

- The revised DP does not seem to contain the name and location of the disposal facility or facilities that the licensee might use for each solid radioactive waste type. Note that the proposed language in the May 2019 RSI responses does not appear to have been incorporated in the current revision of the DP.

- It is the NRC's understanding that there is currently some waste containing material from licensed operations in a secure area of the office building adjacent to the licensed site. The DP does not appear to have a commitment to move this waste back onsite once an appropriate storage place is built onsite and the DP does not appear to have a commitment that the waste will be disposed of appropriately.

Administrative Issues

Please revise the Title Page to list the revision number as "2" rather than "1".

Please correct the labels for Highways 33 and 74 on Figures 2-2, 2-5 and 2-6.

RADIATION PROTECTION PLAN (RPP)

General Comment

Throughout the RPP, the applicant used the terms "designee" and "qualified individuals" when referring to radiation protection activities, including the performance of surveys. In Section 3.9 of the RPP, the applicant provided suggested qualifications for Radiation Safety Officer (RSO) designees but did not provide a clear commitment regarding those qualifications. Please provide the explicit qualifications of the RSO designees and qualified individuals that will be responsible for performing the health physics activities at the Cimarron site (*e.g.,* a qualified health physicist).

Internal Exposure Determination

1) The applicant provided an assessment (calculation) of a potential intake from groundwater processing and resin handling in Appendix A to its RPP. This assessment was performed using the methodology in NUREG-1400 for low enriched uranium.

The NRC staff found several inconsistencies in the description of the intake assessment presented in Appendix A to the applicant's RPP.

Please address the following inconsistencies in the assessment (calculation) of potential intake in Appendix A to the RPP:

- NUREG-1400 methodology: Please provide a justification for assigning dispersibility factor (D) a value of 0.1 when only a positive value of 10 is discussed in NUREG-1400. Please include a discussion on system pressurization in the determination of the D value.

- Section 7.3: The applicant states that there are four resin bed exchanges per year (*see also* Equation 7.3). However, calculations in the Excel spreadsheet are based on twelve resin bed exchanges per year. Please clarify.

- Please clarify in the text describing Equation 7.3 whether SA_{enrich} is divided by (as described in the text) or multiplied by (as shown in Equation 7.3), the total mass of uranium.

- Please clarify in the text (Section 7.3) presenting the calculated potential intake for 5 percent enriched uranium as 2.59 x 10-5 µCi or, as presented in the Excel spreadsheet, as 7.78 x 10-5 µCi.

2) In Sections 6.6 and 10.8 of the RPP, the applicant discussed its internal exposure and air monitoring programs. In these sections, the applicant referred to limits associated with annual limit on intakes (ALIs), derived air concentration (DAC), and DAC-hrs. However, the applicant did not specify which specific ALIs or DACs would be used for compliance purposes.

The applicant does not plan on needing respiratory protection for radiological work at the Cimarron facility. However, the applicant does have provisions for the use of respiratory equipment if certain "trigger" levels of airborne radioactivity are encountered. The applicant committed to performing air samples throughout the resin unloading and packaging process for at least the first three resin exchanges (Section 10.8 of the RPP). The applicant stated that procedures would be developed for determining worker intakes from airborne concentrations if airborne monitoring was required (Section 6.6 of the RPP). However, the applicant did not provide a description on how worker intakes from airborne concentrations would be determined during the first three resin exchanges.

The applicant identified Tc-99 as a groundwater constituent that may or may not be removed by the ion exchange resin. In any case, Tc-99, a beta emitter, and the short-lived daughters of uranium, also beta emitters, will also be processed through the groundwater treatment facilities. In Appendix A to the RPP, the applicant discussed the results of a sensitivity analysis that it performed for these beta-emitting radionuclides. However, the applicant did not provide a technical basis (*e.g.,* an intake assessment) for excluding these radionuclides from its assessment of a potential intake of airborne radionuclides from groundwater processing and resin handling.

A) There appears to be an unfinished sentence on p. 10-6, second bullet, of the RPP:

"Based on the nature of the low enriched uranium encountered, the detection capability of the air sampling equipment and associated radiological analysis (*e.g.,* sample counting) will be used to determine the total volume of air needed to be collected **to ensure that 1% of the DAC**."

B) Referring to Sections 6.6 and 10.8 of the RPP, please provide the specific ALIs and DACs that will be used for compliance purposes (*e.g.,* initiating air sampling, bioassays, or respiratory protection).

C) Please provide sample calculations demonstrating how airborne radioactive materials in the workplace are converted to committed effective dose equivalent.

D) Please address the requirements of 10 CFR 20.1204(g) for expected mixtures of radionuclides in the internal exposure monitoring program at the Cimarron facility. For this response, either demonstrate how certain radionuclides will be excluded or that the calculated internal dose will include all radionuclides present, to the extent required.

Radiation Protection Instrumentation

1) License Condition 27(c) specifies the use of the release criteria August 1987 "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material" (the Guidelines) for surfaces of buildings and equipment. Table 1, footnote f, of the Guidelines specifies dose rate requirements for beta-gamma emitters.

The applicant identified Tc-99 and the short-lived daughters of uranium, all beta-gamma emitters, as groundwater constituents that will be processed through the groundwater treatment facilities and thus potential radioactive contaminants.

The instruments listed in Table 7-1 of the RPP do not appear to be able to measure the dose rate from beta-gamma emitters as required by License Condition 27(c).

Please specifically address which instrument is used to evaluate the release criterion specified in the August 1987 Guidelines (License Condition 27(c)), Table 1, footnote f.

2) The applicant described its method to estimate the minimum detectable activity (MDA) for portable survey instruments by providing the following basic equation for calculating MDA (refer to Section 7 in the RPP):

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

Where:

R_b is background count rate (counts/minute)
T_s is sample count time (minutes)
T_b is background count time (minutes)
E is instrument efficiency (counts/disintegration)

Equation 1 MDA for portable survey instruments

The general form of Equation 1 is applicable for static measurements (i.e., the probe is held steady over the surface being evaluated), but not for scanning surveys (i.e., the probe is moved slowly over the surface being evaluated). Methods for determining the MDA for scanning surveys can be found in NRC guidance documents, including NUREG-1507 (NRC, 1998). The NRC staff previously addressed the need for determining scan minimum detectable concentration (MDCs) (ADAMS Accession No. ML15295A045).

In Sections 15.3.3—15.3.5 of the DP, the applicant stated that all its instruments used for contamination surveys will have minimum detection limits that are less than 10 percent of the limits for unrestricted release specified in Section 15.1 of the DP. The NRC staff notes that this detection limit can be difficult to achieve due to background values (for beta/gamma surveys) and instrument limitations. For example, the applicant lists the Ludlum Model 19 gamma micro-R meter in Table 7-1 of the RPP. According to the manufacturer's website, the lowest range on the Model 19 meter is 1 µRoentgen (µR)/hr. The applicant's minimum detection limit for exposure rate measurements at 1 meter (3.3 feet) would be 0.5 µR/hr (10 percent of 5 µR/hr). In addition to not being able to detect beta particles, this value would not be discernable on the Model 19 meter.

In addition, the applicant did not address expected radionuclide mixtures in its response. While the applicant recognizes the presence of beta-emitting uranium daughter products in addition to Tc-99 (*e.g.,* short-lived daughters of uranium), it does not appear to account for them in its survey program. Section 5.5 of NUREG-1507 provides guidance on determining a weighted efficiency for a mixture of radionuclides. The NRC staff previously addressed the need for determining a weighted efficiency for a mixture of radionuclides (ADAMS Accession No. ML15295A045).

The applicant also did not address correcting for probe sizes that are different from 100 cm^2 when performing contamination surveys that will be reported in disintegrations per minute (dpm) per 100 cm^2. For example, according to the manufacturer's website, the Model 44-9 probe has an active window area of 15 cm^2 (see, for example, Equation 6-9 of NUREG-1507). A smaller active probe area, compared to a probe with an active window area of 100 cm^2, will increase the MDC.

Lastly, the applicant stated that the surface efficiency for beta emitters would be 0.5. However, NUREG-1507 describes the use of the 0.5 surface efficiency for beta emitters only for those radionuclides with maximum beta emissions greater than 0.4 MeV. The applicant provided no technical basis for using this value of surface efficiency for beta-emitting radionuclides expected at its facility. The NRC staff notes that thorium-231 and thorium-234, two beta-emitting radionuclides identified by the applicant, have maximum beta emission energies significantly less than 0.4 MeV.

Please provide calculations demonstrating the radionuclide-weighted surface contamination detection capability for radiation survey instruments, including scan MDC for portable instruments, used for releasing equipment and materials for unrestricted use, personnel contamination monitoring, and other routine surveys. The detection capability for static and scanning modes should be provided in terms of dpm/100 cm^2 for the alpha and beta radiation expected at the Cimarron facility.

For these demonstrations, typical background values may be assumed, or a maximum background value may be calculated to achieve the desired MDC. The demonstration of MDC should include the following information, as a minimum:

- Alpha MDC calculations for uranium should be based on the enrichment at the Cimarron facility.

- Beta MDC calculations should be evaluated for short-lived uranium progeny as well as a mixture of short-lived uranium progeny with Tc-99. A technical basis for the activity fractions for the mixture of short-lived uranium progeny with Tc-99 should be provided.

- Provide a technical basis for assigning an instrument efficiency to any radionuclide.

- Provide the radionuclide(s), dimensions, and pedigree (*e.g.,* National Institute of Standards and Technology traceable) of any radioactive source(s) used for determining instrument efficiency.

- Assign surface efficiencies to radionuclides consistent with NUREG-1507 or a technical basis for assigning other values.

- MDC calculations for portable instruments should take probe area into account.

- The response should include a description of how any assumptions used in determining MDC will be incorporated into the health physics program. For example, scan speed and distance from source are relevant to ensuring that field measurements are consistent with derived MDC values. In addition, background radiation levels exceeding assumed levels can impact MDC values.

3) The applicant described its method to estimate the MDC for air sampling by providing the following basic equation for calculating MDC (refer to Section 7 in the RPP):

$$MDC\left(\frac{\mu Ci}{mL}\right) = \frac{\frac{3}{T_s} + 3.29\sqrt{\frac{R_b}{T_s} + \frac{R_b}{T_b}}}{EVC}$$

Where:

R_b is background count rate (counts/minute)
T_s is sample count time (minutes)
T_b is background count time (minutes)
E is instrument efficiency (counts/disintegration)
V is Volume of air of air sampled (mL)
C is conversion of µCi to dpm (i.e. 2.22E+06)

Equation 2 MDC for air sampling

The NRC staff notes that Equation 2 is similar to the Equation 6.15 presented in NUREG-1400 (NRC, 1993) for determining the MDC of an air sampling program. However, the applicant's equation is missing a term for the filter efficiency. As described below, the applicant did not address filter efficiencies in its air monitoring program.

Related to the MDA is the efficiency of the collection media used for air sampling. Regulatory Guide 8.25 (NRC, 1992) recommends evaluating for radioactive material not captured by the filter media as well as penetration of the radioactive material into the filter media and self-absorption of radiation by the material collected. If the count rate of the radioactive material collected would be reduced by more than 5 percent due to these processes, correction factors should be applied to the survey results. NUREG-1400 (1993) provides examples of how to apply these correction factors. The applicant has not addressed whether there is a need to account for these types of count rate corrections.

The applicant stated that the detection capability of the air sampling equipment and associated radiological analysis will be based on "…either the actual enrichment collected on the resin or a conservative basis (i.e., 4%)." [Section 10.8 of the RPP (EPM, 2021)]" The applicant also provided the activity contribution of uranium isotopes based on the uranium enrichment in Table 1 below.

Enrichment (% U-235 by mass)	Percent of Total Activity			Percent of Total Mass		
	U-234	U-235	U-238	U-234	U-235	U-238
0.711	48.1%	2.3%	49.7%	0.005%	0.711%	99.3%
1	54.8%	2.8%	42.5%	0.007%	1%	99%
2	68.3%	3.7%	28.1%	0.013%	2%	98%
3	75.1%	4.1%	20.8%	0.019%	3%	97%
5	82.1%	4.5%	13.4%	0.031%	5%	95%

Table 1 (Source: Table 7.1 of EPM, 2017)

A) Please provide a description of how the efficiency of air sampling collection media is evaluated for losses (refer to Regulatory Guide 8.25, Section 6.2) and how these losses are incorporated into the determination of air sampling detection efficiency. As an alternative, please provide an explanation of why these potential losses will not significantly affect the air sampling detection efficiency.

B) For the conservative basis assumption (4 percent enrichment) of the detection capability of the air sampling equipment and associated radiological analysis, please demonstrate with calculations that the calibration of the equipment used for the radiological analysis of the air samples will result in a conservative value.