UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

April 24, 2003

Lt. Col. Kali Mather
Department of the Air Force
USAF Radioisotope Committee
HQ AFMOA/SGZR
110 Luke Ave, Suite 405
Bolling AFB, DC 20322-7050

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING EGLIN AIR FORCE BASE DECOMMISSIONING PLAN

Dear Lt. Col. Mather:

The NRC has initiated a technical review of the decommissioning plan for Test Area C-74L at Eglin Air Force Base, Florida. The decommissioning plan was submitted to the NRC by letter dated May 24, 2002. Supplemental information was submitted by letter dated November 1, 2002.

The NRC has reviewed the radiological acceptance criteria provided in the decommissioning plan and has determined that insufficient information was provided to support some of the proposed criteria. Details of the technical review are provided in the enclosure to this letter. We request that you submit additional information as necessary to address these issues. An alternative would be to accept the NRC's calculated acceptance criteria, determined through dose modeling, as provided in Section 5 of the enclosure.

In addition, we request that you clarify a discrepancy identified in the decommissioning plan involving the radiological criteria for unrestricted release as specified in 10 CFR 20.1402. In Section 6A of the decommissioning plan, the Air Force commits to a 15-millirem per year total effective dose equivalent (TEDE); however, the derived concentration guideline level calculations appear to be based on a 25-millirem per year TEDE. This potential discrepancy has a direct impact on the numerical values of the acceptance criteria currently being reviewed by the NRC. Accordingly, we request that you clarify which radiological criteria for unrestricted release you are proposing for this decommissioning project.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this letter, please contact Mr. Anthony Gaines at (817) 860-8252 or the undersigned at (817) 860-8186.

Sincerely,

/RA/

Charles L. Cain, Chief
Nuclear Materials Licensing Branch

Docket No.: 030-28641
License No.: 42-23539-01AF
Control No.: 469166

Enclosure:
Review of Acceptance Criteria for Eglin Air Force Base

cc w/enclosure:
Florida Radiation Control Program Director

bcc: (via ADAMS e-mail distribution)
EECollins
DBSpitzberg
CLCain
ADGaines
RJEvans
RSBrowder
RBCodell, NMSS/DWM/HLWB
TRDecker, RII
OMasnyk-Bailey, RII
FCDB
MIS System
RIV Nuclear Materials File - 5th Floor

ADAMS: ☒Yes ☐No Initials: RJE

☒Publicly Available ☐Non-Publicly Available ☐Sensitive ☒Non-Sensitive

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ENCLOSURE

REVIEW OF ACCEPTANCE CRITERIA FOR EGLIN AIR FORCE BASE

1 Introduction

The licensee submitted a decommissioning plan for Test Area C-74L at Eglin Air Force Base, Florida. The area was used for testing of depleted uranium (DU) munitions. There was contamination with DU of both buildings (inside and out) and grounds. The NRC initiated a review of the following site-specific acceptance criteria for decommissioning leading to unconditional release of the site:

- Building interior $DCGL_w$: 99 dpm/100 cm^2 net alpha
- Building exterior $DCGL_w$: 5000 dpm/100 cm^2 net alpha
- Equipment $DCGL_w$: 5000 dpm/100 cm^2 net alpha
- Soil $DCGL_w$: 600 pCi/g total uranium.

2 Building Interior, Building Exterior, and Equipment DCGLs

The staff reviewed these $DCGL_w$ values by comparing them to a previous study performed for the Picatinny Arsenal building surfaces, which used the RESRAD-BUILD computer code (Trottier, 2002). The licensee's $DCGL_w$ value for contaminated indoor surfaces, which were default handbook values, are more conservative than those the staff calculated for Picatinny Arsenal (13,500 dpm/100 cm^2). Therefore, the NRC considers it to be acceptable without further deliberation.

The licensee's choice for external building and equipment DCGLs of 5000 dpm/100 cm^2 corresponds to the guidance in Nuclear Regulatory Commission (NRC) Regulatory Guide 1.86. In addition, this value was compared to nominal soil $DCGL_w$ values and was also determined to be conservative. For example, if one assumes that the soil $DCGL_w$ value was nominally 300 pCi/g total uranium and was contained in a soil layer 15-cm thick, the number of alpha decays in an area of 100 cm^2 would be about 2×10^6 dpm. The NRC expects the licensee's FIDLER survey instrument to determine a significant fraction of the penetrating gamma radiation from these decays, so the 5000 dpm/100 cm^2 $DCGL_w$ will be a conservatively low standard. The licensee expects to use a calibration level for the final status survey for contaminated soil of 22,000 dpm/100 cm^2.

3 Soil DCGL

The licensee used the RESRAD code to determine soil $DCGL_w$. They examined three land-use scenarios: (1) an onsite resident who uses well water, grows food crops and has a milk cow; (2) an industrial worker who works on the site in a manner similar to a present-day worker, and (3) a construction worker who spends up to a year on the site. In Scenarios 2 and 3, workers are exposed to direct radiation, soil ingestion and inhalation, but there are no water or food pathways. Parameters inputted to the RESRAD analyses were approved by the Eglin Tier I Partnering Team, whose members included the U.S. Environmental Protection Agency, Florida Department of Environmental Protection, managers for the Eglin Environmental Management Restoration, U.S. Army Corps of Engineers, the Air Force Center for Environmental

Excellence, and the licensee's contractors. NRC staff have evaluated the chosen RESRAD parameters, and finds them acceptable, and more conservative in many instances than the default values recommended for RESRAD.

The staff used the licensee's scenarios and parameters to generate soil DCGLs, as discussed below:

3.1 Onsite Resident Scenario

This scenario was broken into two parts; a child from age 0-6 years and an adult for the next 24 years. The licensee used the same dose conversion factors for adult and child, but had different usage and residence factors, as shown in Table 1.

Table 1 - Usage and residence factors differing from default RESRAD values for adult and child in Onsite Resident Scenario

Input Parameter	Adult	Child	RESRAD Default
Ingestion rate, soil mg/day	100	200	100
Exposure duration, yr	24	6	30
Drinking water, L/yr	720	365	510
Fruits, vegetables and grain Kg/yr	190	200	160
Leafy vegetables Kg/yr	64	26	14
Inhalation rate, m^3/hr	0.83	0.625	1

3.1.1 NRC's Deterministic Analyses

Child - NRC staff used the RESRAD code, version 6.1, to calculate for the deterministic case that the peak dose for the child would be 0.0962 millirem/year for a one pCi/gm total uranium soil contamination that would occur at t=0 years, and was mostly from the direct-radiation pathway. This corresponds to a $DCGL_w$ of 260 pCi/g for 25 mR/year (NRC criterion) or 156 pCi/g for a 15 mR/year standard.

Adult - For the adult, NRC calculated $DCGL_w$ of 197 pCi/g for 25 mR/yr or 119 pCi/g for 15 mR/yr. The adult peak dose occurred at 874 years, and was mostly from the drinking water pathway. Therefore, the adult appears to be more restrictive than the child for this case. These values are lower (more restrictive) than the licensee's stated $DCGL_w$ of 500 pCi/yr for the onsite resident.

3.1.2 NRC's Probabilistic Analyses

NRC also calculated the soil $DCGL_w$ probabilistically for the adult resident with RESRAD 6.1. For the probabilistic case, the staff varied the input variables for soil Kd of uranium,

soil density, inhalation rate, mass loading, evapotranspiration, runoff, and consumption of fruits and vegetables, milk, soil and drinking water, using ranges obtained from NUREG/CR-6697 (Yu, 2000). It should be noted that nearly all of the licensee's deterministic values fit within the parameter distributions except soil loading, for which the licensee's value was higher than the highest value of the distribution. However, most dose came from drinking water ingestion, and inhalation was not one of the major pathways. From the probabilistic RESRAD analyses, NRC estimates a soil $DCGL_w$ of 469 pCi/g for 25 mR/yr and 281 pCi/g for 15 mR/yr.

3.2 Industrial and Construction Worker Scenarios

The industrial and construction workers are assumed to be exposed to direct radiation, inhalation and ingestion of soil. There would be no exposure pathways from on-site water or foodstuffs. Furthermore, these scenarios consider adults only, since it is unlikely that children would be present during any industrial or construction activities, except as occasional visitors. Table 2 shows the RESRAD inputs differing from the default for both the industrial and construction worker scenarios. The NRC finds that the licensee's choice of parameters for these scenarios is reasonable and conservative, and that they have chosen the correct pathways.

Table 2 - RESRAD Inputs Different From Default For Industrial and Construction Workers

Parameter	Industrial or Range Worker	Construction Worker	RESRAD Default
Soil Ingestion, mg/day	100	290	100
Inhalation rate, m^3/hr	2.5	2.5	1
Mass loading of dust, g/m^3	0.0002	0.0006	0.0002
Fraction of time spent outdoors	0.25	0.17	0.25
Fraction of time indoors	0.5	0	0.5
Exposure duration, yr	25	1	30

3.2.1 NRC Results for Industrial and Construction Scenarios

For the parameters chosen by the licensee, NRC calculated a DCGL for the industrial and construction scenarios of 1201 pCi/g and 408 pCi/g, respectively for a 25 millirem/yr allowed exposure. The corresponding DCGLs for a 15 millirem/yr allowed exposure would be 721pCi/g and 245 pCi/g for the industrial and construction scenarios, respectively. Most of the exposure came from direct radiation — 84 percent for the industrial worker and 70 percent for the construction worker.

The NRC also used a probabilistic analysis for the industrial worker, varying parameter values recommended in NUREG/CR-6697 for airborne dust loading, soil ingestion and

inhalation, and found somewhat more favorable $DCGL_w$ values of 723 pCi/g for the 25 millirem/yr exposure limit and 434 pCi/g for 15 millirem/yr exposure limit. The NRC results are lower (more restrictive) than the licensee's reported $DCGL_w$ value of 600 pCi/g for industrial workers.

4 Discussion

4.1 Scenario Choice

The licensee chose the industrial scenario as the basis for evaluating DCGLs over the resident scenario, even though the resident scenario gave somewhat more restrictive results (600 pCi/g for industrial use vs. 500 pCi/g for residential use). One of their rationales for this decision is that the land is unlikely to be used for residences, and will remain restricted to industrial or military use for the foreseeable future because of unexploded ordinance. The staff does not fully agree with this standpoint for two reasons:

- The most restrictive pathway for the resident adult scenario calculated from the RESRAD analysis is ground water usage, which does not peak until about 900 years in the NRC's calculations. It would be difficult to predict land use or to impose land-use restrictions that far in the future.

- There is no evidence that shallow groundwater beneath the site in unsuitable for human consumption. Although most groundwater usage is from wells hundreds of feet deep and isolated from surface contamination by thick clay sequences, shallow groundwater at the site is within a reasonable distance from the surface, and appears to be potable.

4.2 Parameter Choices

Although the staff considers that the licensee's choice of parameter values is reasonable for the identified scenarios, the results of the NRC and licensee $DCGL_w$ calculations are different by a wide margin, which the staff cannot reconcile. The NRC's $DCGL_w$ values simply took the RESRAD results and calculated the required soil concentrations of total uranium necessary to comply with a 25 or 15 millirem/yr dose limit. Staff results were less restrictive for the probabilistic analyses, but still not that close to the licensee's chosen $DCGL_w$.

The licensee chose to represent DU as pure U-238, whereas the staff used a reasonable mix of isotopes for DU, derived from previous work on decommissioning of the Picatinny Arsenal site (Trottier, 2002). Differences in the results are small, likely to be no greater than about 6 percent more restrictive for the DU case in the resident scenario.

5 Conclusions

The NRC staff has analyzed the licensee's proposed DCGLs for the Eglin Air Force Base decommissioning and cannot reconcile the differences between the staff's and licensee's analysis for soil $DCGL_w$. Furthermore, the licensee has not adequately justified why the resident scenario is so unlikely that it can be excluded from consideration as a basis for $DCGL_w$.

The licensee should present its detailed calculations of soil $DCGL_w$ for the Eglin site, including the input and output values used in the RESRAD or other analyses, how they determined the soil DCGLs from the analyses, and why the resident scenario can and should be excluded. Alternatively, they can consider accepting the staff's $DCGL_w$ value for soil of 469 pCi/g for 25 millirem/year or 281 pCi/g for 15 millirem/yr determined from the probabilistic RESRAD runs for the onsite resident adult.

6 References

6.1 Trottier, 2002, Memorandum from C. Trottier, Chief EPAB/DWM/NMSS to G. Pangburn, Director NRC Region 1, "Additional review of contamination guideline levels for removal of depleted uranium at Picatinny Arsenal", October 4, 2002.

6.2 Yu, 2000, "Development of probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 computer codes", NUREG/CR-6697, November 2000.