Safety Evaluation Report:
Nuclear Fuel Services, Inc. North Site
Final Status Survey Report
Subsurface Soil Characterization and FSS Project, Survey Unit 11

1.0 INTRODUCTION

1.1 Background

The Nuclear Fuel Services, Inc. (NFS) North Site Decommissioning Plan (DP) was approved via Amendment 27 to Materials License SNM-124, dated June 19, 2001, and supplemented by information provided to satisfy Safety Condition S-47. One product of the Decommissioning Plan was a Final Status Survey (FSS), to be performed after an area has been fully characterized and remediation has been completed. The FSS design is an iterative process that requires appropriate site classification based on the potential radionuclide concentration levels relative to the Derived Concentration Guideline Levels (DCGL's), and incorporates a process to ensure the quality of the data obtained.

In Amendment 69 to Materials License SNM-124, dated February 15, 2006, the NRC approved a revised method to derive subsurface (greater than 15 cm below the ground surface) soil derived concentration guideline levels (DCGLs). These DCGL's were derived to demonstrate compliance with the 25 mrem/year dose criterion for unrestricted release of the area in accordance with 10 CFR 20, Subpart E.

In terms of the health physics and surveying aspects, the NRC staff concluded that the subsurface FSS Plan, as described in the revised Appendix B to Chapter 5 of the DP (dated December 14, 2005) was adequate to perform FSS for subsurface soils in the North Site area for demonstrating compliance with the radiological criteria for license termination.

As described above, the subsurface approach proposed by the licensee is site specific, and should only be applied to the North Site area of the NFS site. Because of this, potential application to other areas or other sites must be considered carefully by licensees and by the NRC staff. Also, because of the above considerations, and because the proposed approach is one not applied to NRC-licensed facilities previously, the NRC staff will carefully evaluate the results of these surveys as presented in the eventual FSS Reports.

1.2 Request for Action

By letter dated March 17, 2008, Nuclear Fuel Services, Inc. (NFS) submitted the Final Status Survey Report (FSS report, or FSSR) for Survey Unit (SU) 11 of the subsurface soil characterization and FSS Project of the NFS North Site Area. NFS requested confirmation that this SU will be suitable for unrestricted release in accordance with 10 CFR Part 20, Subpart E. Direct comparison of a single SU, out of many SU's that cover the whole North Site Area, to the unrestricted use criteria of Subpart E is generally inappropriate; in this evaluation, the NRC staff compares results of the SU 11 FSSR to the NFS DP, which shows how NFS plans to meet the requirements of Part 20, Subpart E.

2.0 EVALUATION

2.1 Applicable Requirements

The licensee's subsurface FSS Plan is provided in Appendix B of the North Site DP, Revision 3, which was submitted to the NRC staff May 2, 2006, and approved by letter from NRC dated May 18, 2006.

2.2 Final Status Survey Results

The NRC staff reviewed the FSSR for SU 11 submitted by NFS. The NRC staff identified four issues requiring additional information from NFS, and NRC staff sent a request for additional information (RAI), dated July 17, 2008. NFS responded to the RAI with additional information, dated August 12, 2008. The issues raised by the NRC staff are summarized as follows.

2.2.1 Survey Unit 11 Demarcation

The NRC staff requested additional information from NFS regarding the demarcation of SU 11. The staff expressed a concern about historical data that showed an area of potentially elevated radioactivity near the intersection of SU's 11, 18, and 19 while most of SU 11 appeared to have relatively homogeneous and relatively low radionuclide concentrations. In its response to the RAI, NFS provided additional information about the historical data for the location near the intersection of SU's 11, 18, and 19. Although the iso-contour maps provided in the FSSR show elevated concentrations extending into SU 11, NFS stated that this was an artifact of the interpolation process used in the software (SADA) to generate the figures. NFS stated that the elevated measurement values were accounted for in the design of the FSS for SU's 18 and 19.

The NRC staff also had a concern about how SU 11 provided a physical barrier to the movement of residual radioactivity. NFS provided additional information about the topography of SU 11. The topography and the existence of the double-wide, high-security fencing did provide some impediment to deliberate or systematic deposition of radioactivity.

With consideration of the additional information provided by NFS, the NRC staff concludes that the demarcation of SU 11 is acceptable.

2.2.2 Determination of Number of Coreholes for Survey Unit

The NRC staff requested additional information from NFS regarding the method used to determine the number of coreholes for SU 11. The FSS Plan in the DP specifies that sum-of-fraction (SOF) values (which are sums of ratios of concentration to Derived Concentration Guideline Level (DCGL), for all radionuclides) would be used in determining the number of coreholes. For SU 11, NFS did not use SOF, but used only concentrations of Th-232 in determining the number of coreholes. In its response to the RAI, NFS provided additional justification for determining corehole density based only on the historical Th-232 concentrations. One important reason given is that the ratio of mean concentration to DCGL for Th-232 is more than an order of magnitude larger than the same ratio for the next most sensitive radionuclide in the SOF calculation. A second important reason is that if an insufficient number of coreholes are implemented, the resultant data may not have sufficient power to demonstrate compliance with the statistical tests. In addition, NFS performed the sample size calculations using a SOF

calculation. The result of the analysis was the same as the initial analysis based on Th-232 data only. With consideration of the additional information provided by NFS, the NRC staff concludes that NFS adequately justified its non-compliance with the DP and that the determination of the number of coreholes of SU 11 is acceptable.

2.2.3 Surrogate Ratios from Characterization

The NRC staff requested additional information from NFS regarding why FSS surrogate ratios were not compared with post-remediation surrogate ratios. In the DP, NFS committed that surrogate ratios determined during the FSS would be compared to ratios from the post-remediation characterization dataset to verify that the planning of the FSS was appropriate. However, the SU 11 FSSR does not include a comparison to ratios from the post-remediation characterization dataset. NFS responded that based on comparing surrogate ratios from the FSS planning to ratios from the FSS measurements, five of eight surrogate ratios were non-conservatively estimated in the planning. Based on the non-conservative estimates, NFS evaluated the impact of the surrogate ratios on the adjustment of corehole frequencies to satisfy the DCGL for elevated measurement comparison ($DCGL_{EMC}$) design criteria of the FSS design. Using surrogate ratios from the FSS, NFS computed the maximum areal frequency that would satisfy the $DCGL_{EMC}$ test, using the 90th percentile values from the FSS dataset, and using the maximum concentrations from the FSS dataset. The result was that neither the maximum areal frequency based on the 90th percentile nor the maximum frequency based on the maximum concentration was less than the areal frequency of coreholes implemented in the FSS.

With consideration of the additional information provided by NFS, the NRC staff concludes that NFS adequately justified its non-compliance with the DP. In addition, NFS compared surrogate ratios determined through the FSS to ratios determined from the characterization dataset, and evaluated the impact of the surrogate ratios from the FSS on the FSS design. The NRC staff concludes that the FSS design is acceptable.

2.2.4 Evaluation of Field Duplicate Sample Analyses

The NRC staff requested additional information from NFS regarding its evaluation of the results of field duplicate sample analyses, including a description of the evaluation method and the criteria for judging the results. In its response to the RAI, NFS briefly described the duplicate error ratio method used to evaluate the paired results of field duplicate sample analyses, and cited the NFS standard operating procedure that is followed. NFS also provided the criterion used to evaluate the duplicate error ratio evaluations.

With consideration of the additional information provided by NFS, the NRC staff concludes that the evaluation of field duplicate sample analyses is acceptable.

2.3 Potential for Recontamination

The NRC staff notes that NFS is not requesting a partial site release of SU 11 at this time. Thus, there may be some potential for the SU area to be re-contaminated from other activities on the NFS site, dependent on the time period before partial site release is requested. The staff notes that the DP discusses preventing recontamination of decommissioned areas. When partial site release is requested, the potential for re-contamination of the area should be considered.

2.4 Only Soil Contamination is Addressed

The NRC staff notes that the SU 11 FSSR and this present safety evaluation report only address contamination in soils. If evaluation of contamination of other media is needed prior to partial site release, that must be done separately.

3.0 CONCLUSION

The NRC staff's review of the SU 11 FSSR and NFS' response to RAIs determined that the FSS for SU 11 was performed consistent with the FSS Plan in the DP, or in the limited cases of deviations (as described in RAIs) from the FSS Plan, the deviations are conceptually consistent with the Plan and are acceptable. Therefore, the NRC staff approves confirming that SU 11 will be suitable for unrestricted release, subject to the caveats described in Sections 2.3 and 2.4. The NRC staff notes that if NFS does not follow the DP for future SU's in the North Site Area, NFS should explain and justify such non-compliance in the FSSR for the appropriate SU's.

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