

JAN 29 1990

DOCKET NO: 40-8027
LICENSEE: New Sequoyah Fuels Corporation (SFC)
Gore, Oklahoma
SUBJECT: SAFETY EVALUATION REPORT, AMENDMENT APPLICATION DATED
NOVEMBER 7, 1989, RE RAFFINATE FERTILIZER PROGRAM

Background

Since the early 1970's, SFC has been applying treated raffinate solution as fertilizer under controlled conditions on test plots. The program started on a small test plot and has expanded to over 8,000 acres of land. The testing program was designed to evaluate the effects of using the treated raffinate as a fertilizer. The use of the treated raffinate solution as a fertilizer was initiated as a means of reducing the current and expected volume of liquids in the lagoons so that further lagoon expansion would not be necessary. Additionally, the fertilizer program was considered a beneficial use of the treated raffinate.

The treated raffinate solution contains dilute ammonium nitrate (nitrogen) and trace metal salts, including small quantities of uranium and its decay products. The concentrations of uranium and its decay products in the solution are all at least one order of magnitude below the 10 CFR 20 allowable concentrations for release of liquid effluents to unrestricted areas. The current license contains restrictions on the Ra-226 and uranium concentrations for the treated raffinate, nitrogen application rates, and forage concentrations. SFC is required to do extensive sampling and analysis of the treated raffinate, soil, surface water, ground water, and forage grown on the fertilized land and to submit an annual report summarizing the program and analytical results.

On March 30, 1989, SFC requested revisions to the fertilizer program requirements. These consisted of changes to the monitoring program, raising the concentration limits for Ra-226 and uranium, and lifting the restriction against using raffinate on food crops. After discussion with the staff, SFC revised its request on May 1, 1989, to reinsert the restriction against using the treated raffinate on food crops. SFC resubmitted the entire application on July 25, 1989, to renumber the revised pages of the license to be consistent with the April 11, 1989, application which was incorporated into the license by amendment on July 7, 1989. SFC revised its request on November 7, 1989, to remove the portion raising the concentration limits for Ra-226 and uranium. As part of the March 30, 1989, submittal, SFC submitted a comprehensive report of the testing and monitoring associated with the program from 1973-1986. The "Sequoyah Fuels Corporation - Fertilizer Program Report" was prepared by Dr. Billy Tucker of Oklahoma State University (OSU). Dr. Tucker, an agronomist and soil scientist, has provided the oversight for the fertilizer program. In addition to the information from this report, data from the annual reports for the years 1980-1988 were reviewed.

Discussion

Currently, SFC is required to neutralize the raffinate with a two-stage barium treatment process to enhance removal of Ra-226 and heavy metals. SFC has

9002090162 900129
PDR ADOCK 04008027
C PDC

JAN 29 1990

Sequoyah Fuels Corporation

2

requested that this requirement be changed to allow SFC to treat the raffinate in accordance with SFC approved procedures. This would allow SFC to make changes to the treatment process without getting prior NRC approval. Because the limits on the Ra-226 and uranium concentrations remain unchanged, the request is acceptable and should be approved.

SFC proposes to discontinue the calculation of total cumulative soil loadings for the trace elements in the treated raffinate. The calculation is done to assure that the cumulative loading does not exceed the recommended total cumulative loading in the irrigation water standards taken from National Academy of Sciences Water Quality Criteria, 1972. The 1988 total cumulative loadings were well below the recommended standard. The license contains a limit on the total quantity of nitrogen applied which will indirectly control the quantity of trace elements applied. SFC will still be required to obtain input from Oklahoma State Extension Agronomists. This use of good agronomic practice and the indirect limit on trace elements is adequate to assure loading will not be a problem. Therefore, it is not necessary for SFC to continue to calculate the loading.

Currently, SFC is required to sample the monitoring wells and surface water from ponds at the beginning of each fertilizer application season, every other month during the season, and 1 month after the last application. These samples are analyzed for nitrates, gross alpha (Ra-226 and uranium if over 15 pCi/l), and the elements whose concentration in the raffinate exceed the concentrations for either short-term use of irrigation waters (wells) or Livestock Enterprise Standards (ponds). SFC has requested that the sampling program be revised to sample on the same frequency but only for nitrates. If the nitrate level in a sample is above 20 mg/l, SFC would take action including sampling for those elements whose concentration in the treated raffinate exceeds the concentrations in the above standards.

In support of the SFC request, OSU calculated coefficient of determination (r^2) values to examine statistically if loading rates are related to soil, forage, or water composition. The independent variables were the cumulative loading rates, and the dependent variables were the measured concentration in forage, soil, and ground water. These calculations demonstrated that there were no significant linear relationships between the loading and measured ground water variables. OSU has concluded that application of the raffinate has not had an adverse effect on the ground water quality.

Water percolation through soils is generally low and only mobile ions would quickly reach the ground water. The metal ions would generally be bound to the soil. Nitrates, being mobile, would be one of the first elements to reach the ground water. Monitoring for nitrates can be used as a trigger for the monitoring of other elements. Since uranium and Ra-226 levels are controlled by the concentration limits on the raffinate, it is not necessary to monitor for them.

Runoff into the surface water should only be a problem if too much raffinate is applied in one application. Good agronomic practice should eliminate any problem with over application. Accordingly, the staff agrees that the reduced monitoring program will provide sufficient information on the effect of raffinate application on the surface and ground waters.

SFC proposes to eliminate baseline forage sampling and the forage release restrictions. Baseline test analyses of forage are not significantly different from analyses of SFC forage. Baseline testing over the years has provided a data base for background values. The staff agrees that further baseline testing is not necessary. SFC collects vegetation samples from the control sites and under certain conditions, from other application areas and analyzes them for trace elements, uranium, thorium, and radium. These control samples serve as an indicator of elemental concentrations in vegetation grown on all other treated sites. If the concentrations of the trace elements are below the maximum tolerable dietary levels given in the National Academy Science report, "Mineral Tolerance of Domestic Animals," the forage may be released. In the past, trace element concentrations, except for molybdenum (Mo), have been below these levels. Several lots of forage exceeded the limit for Mo prior to 1982. Historical data, with the exception of the lots having elevated Mo concentrations, shows that heavy metal accumulation in the forage is not a problem. Therefore, SFC's proposal to remove the forage release restrictions and to use results from test sites as an indicator of elemental concentrations in all vegetation are acceptable to the staff.

The final requested change in the program is for soil analysis. SFC proposes to analyze soil semiannually for nitrate content. If excessive accumulation is determined by the consulting agronomist, further analysis would be conducted for trace elements whose concentrations in the treated raffinate exceeded the standards for irrigation water. Currently, samples of every major soil type in each fertilized area are collected annually and analyzed for those elements whose concentration in the treated raffinate exceed those listed in "Recommended Maximum Concentrations of Trace Elements in Irrigation Waters." Analyses for elements whose concentration are less than those listed are conducted on a biennial basis, as are analyses for uranium, Th-230, and Ra-226. OSU calculated the relationship between loadings and measured quantities of trace elements and radionuclides in the soil. OSU found that there are no positive linear relationships which indicates that there is no evidence of positive accumulation. Nickel exhibited a negative correlation, i.e., a significant net decrease of soil nickel as more treated raffinate was applied. Some of the field data indicates apparent small increases in trace elements; however, the increases are within the expected uncertainty in sampling and analysis. Because SFC also applies other fertilizer supplements to the fields, it is difficult to determine if a high result is from the raffinate or the fertilizer supplements. The concentrations of most of the elements in commercial fertilizers are much higher than in the treated raffinate. Copper (Cu), Ni, and Mo concentrations are on the same order of magnitude or exceed the values in commercial fertilizer. The treated raffinate contributed less than 50 percent of the total element applied for most of the trace elements and radionuclides. Percentages of Cu, Mo, and Ni originating from the raffinate were larger, ranging in the 70-90 percentages. Because the percentage of most of the elements originating from the treated raffinate are low, monitoring the effects of the treated raffinate on the soil loading and determining the fate of the pathways for these elements in the samples are not possible to any degree of accuracy. Staff considers the apparent increases to be of no environmental significance. Hence, revision of the soil sampling should be authorized.

JAN 29 1990

Sequoyah Fuels Corporation

4

SFC included the page changes for the fertilizer distribution program in the April 11, 1989, application. Condition 25 excluded the April 11 pages on the fertilizer distribution program and identified those pages which remained in effect. As the new section will be incorporated into the license, Condition 25 will be deleted.

Conclusion/Recommendation

Based on the above discussion, SFC's request for a revised monitoring program is acceptable. The reduced monitoring program will provide sufficient information to evaluate the effects of treated raffinate application. It is recommended that the SFC amendment request be granted.

The Region IV Principal Inspector had no objection to the proposed action.

Original Signed By:

Merri Horn
Uranium Fuel Section
Fuel Cycle Safety Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

Approved by: Original Signed By:
George H. Bidinger, Section Leader

*See previous concurrence

OFC: IMUF: <i>MAH</i>	IMUF: *	IMUF: <i>GHBS</i>
NAME: MHorn: mh:	VLTharpe:	GHBidinger:
DATE: 1/25/90:	1/ /90:	1/25/90:

OFFICIAL RECORD COPY