



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION IV
1600 E. LAMAR BLVD
ARLINGTON, TX 76011-4511

August 3, 2017

John H. Ellis, President
Sequoyah Fuels Corp.
P.O. Box 610
Gore, OK 74435

SUBJECT: NRC INSPECTION REPORT 040-08027/2017-002

Dear Mr. Ellis:

This letter refers to the U.S. Nuclear Regulatory Commission (NRC) inspection conducted on June 15, 2017, at your Sequoyah Fuels Corporation site near Gore, Oklahoma. This inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of selected examination of procedures, representative records, observations of activities, and interviews with personnel.

The inspection included a confirmatory survey of an excavation located west of Pond 2. The confirmatory survey included a walk-over scan survey and collection of soil samples. The preliminary inspection findings were presented to your staff at the conclusion of the onsite inspection. The final inspection results were presented to your staff by telephone on July 24, 2017, after the receipt of our soil sample results on July 24, 2017. The enclosed report presents the results of the inspection.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter, its enclosure, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's ADAMS, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy or proprietary information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact Dr. Robert Evans at 817-200-1234 or the undersigned at 817-200-1191.

Sincerely,

/RA/

Ray L. Kellar, PE, Chief
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety

Docket No. 040-08027
License No. SUB-1010

Enclosure:
NRC Inspection Report 040-08027/2017-002

cc w/encl:
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**U.S. NUCLEAR REGULATORY COMMISSION
Region IV**

Docket: 040-08027
License: SUB-1010
Report: 040-08027/2017-002
Licensee: Sequoyah Fuels Corp.
Facility: Former uranium conversion facility
Location: Gore, Oklahoma
Date: June 15, 2017
Inspector: Robert J. Evans, PhD, PE, CHP, Senior Health Physicist
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety
Approved by: Ray L. Kellar, PE, Chief
Fuel Cycle and Decommissioning Branch
Division of Nuclear Materials Safety
Attachment: Supplemental Inspection Information

Enclosure

EXECUTIVE SUMMARY

Sequoyah Fuels Corp.
NRC Inspection Report 040-08027/2017-002

This inspection was a routine, announced U.S. Nuclear Regulatory Commission (NRC) inspection of decommissioning activities being conducted at the Sequoyah Fuels Corporation site near Gore, Oklahoma. In summary, the licensee was conducting decommissioning activities in accordance with regulatory and license requirements.

Closeout Inspection and Survey

- The inspector reviewed the licensee's radiological survey design and sample results for the excavation located west of Pond 2. The licensee's records indicate that it had designed and conducted its survey in accordance with license requirements, and all sample results were less than the limits specified in the NRC-approved reclamation plan. The licensee's records indicate that the area had been effectively remediated prior to performance of the final status survey. (Sections 1.2.a)
- The inspector conducted a confirmatory survey of the excavated area. The survey included measurement of ambient gamma radiation levels and collection of soil samples. The gamma radiation levels were less than the action level, and the soil sample results were less than the cleanup level specified in the reclamation plan. The confirmatory survey results suggest that the licensee had effectively remediated the area. (Section 1.2.b)

Report Details

Site Status

License Condition 51 requires the licensee to conduct decommissioning in accordance with the instructions provided in the reclamation plan dated January 2008, as amended. The licensee commenced with site decommissioning in April 2009. To decommission the site, the licensee planned to dismantle and remove systems and equipment, demolish structures, remediate contaminated sludges, sediments, and soils, and treat wastewater. Most of the waste material will be placed in an onsite cell for permanent disposal.

Since the previous inspection, conducted in February 2017 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML17065A329), the licensee continued to remediate the site and place waste material into the disposal cell. The licensee's contractor finished the demolition of the former main processing building and most of the building slab. The contractor was removing the remaining portions of the slab during the inspection. The building rubble was staged inside and outside of the disposal cell for future disposal.

Other activities completed since the previous inspection included disassembly of the former maintenance shop, a building made of sheet metal. Some of the building material had been surveyed and released, while the contaminated portions were staged for disposal. The contractor was also removing a concrete slab in the vicinity of the office building. Subsurface utilities will be removed and disposed after the slab has been removed. Future work includes remediation of the outfall 005 area, an activity that was almost complete at the time of the inspection.

The licensee still possessed approximately 11,000 tons of bagged raffinate sludge, material that was removed from the clarifier basins. The licensee also possessed approximately 850 bags of sediments removed from the emergency basin, north ditch, and sanitary lagoon. The licensee continues to stage the bagged sludge and sediment material for possible transfer to an out-of-state uranium mill for use as alternate feed material. If the licensee is unable to transfer the material to the mill, the reclamation plan allows the licensee to dispose of this material in the onsite disposal cell. The licensee continued to discuss its disposal options with the State of Oklahoma and Cherokee Nation. The licensee plans to make a final decision about the disposal of the raffinate sludge and pond sediments in the near future. In the meantime, the licensee recently replaced the cover material on five of 16 piles of raffinate sludge bags because the cover material exhibited signs of environmental degradation.

1 Closeout Inspection and Survey (83890)

1.1 Inspection Scope

The inspector attempted to ensure that the licensee was conducting decommissioning and associated radiological surveys in accordance with license requirements.

1.2 Observations and Findings

a. Review of Final Status Survey Results

License Condition 51 stipulates that site decommissioning shall be conducted in accordance with the instructions provided in the reclamation plan dated January 2008, as amended. Prior to the onsite inspection, the licensee excavated a 1,000-gallon septic tank and associated recovery system from an area west of Pond 2. This recovery

system was originally designed collect nitrate-impacted water. The bottom of the tank was located approximately seven meters below ground surface. An inclined French drain was installed to collect water and route it to the tank. During operations, the contents of the tank were pumped to fertilizer pond No. 3W for eventual land application.

The licensee started to remove the tank and recovery system in mid-March 2017 and completed the work about a month later. As part of the removal process, the licensee excavated an area roughly 10-30 meters wide and 60 meters long and rerouted a nearby road. The licensee excavated soil to a depth below the bottom of the tank. The licensee subsequently backfilled the eastern area of the excavation prior to the inspection to reestablish storm water drainage. The previously excavated soil was used as backfill material. The excavated area was estimated to be approximately 1,290 square meters.

The licensee collected soil samples before, during, and after the excavation work. A total of 109 samples were collected. The licensee analyzed the samples using an x-ray fluorescence (XRF) meter to measure the uranium concentrations. The highest measurement was 18 micrograms of uranium per gram of soil, or 12.2 picocuries of uranium activity per gram of soil (pCi/g). As discussed below, the NRC-approved cleanup level for soil in this area was 100 pCi/g, and all sample results were less than the cleanup level.

Section 3.2.3 of the reclamation plan specifies that the licensee will conduct final status surveys based on the radionuclides of concern for that area. In accordance with the reclamation plan, the radionuclide of concern in this area was natural uranium. Thus, the licensee was required to survey the area using the guidance provided in NUREG-1575, Revision 1, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Detailed guidance for conducting final status surveys was provided in Attachment B, "Final Status Survey," of the reclamation plan. The final status survey consisted of measurement of ambient gamma radiation levels and collection of soil samples.

The location of the excavation fell in the boundary between non-impacted and Class 3 areas, as defined in MARSSIM. According to MARSSIM, Class 3 areas have the lowest potential for elevated radioactivity. For this reason, MARSSIM recommends that scanning surveys be performed in outdoor areas with the highest potential for contamination based on professional judgment. Non-impacted areas are surveyed at the discretion and professional judgement of the licensee.

The licensee conducted a walk-over final status scan survey of the area on April 10, 2017. Prior to conducting the walk-over scan survey, the licensee conducted survey measurements in a background area. The licensee established an action level of three times background. The licensee then compared the measurements in the excavated area to the background measurements. Any area that exhibited elevated contamination (greater than three times background) was required to be flagged for further investigation or remediation.

The inspector reviewed the licensee's final status survey results. With a background of 8,000 counts per minute (cpm), the survey results ranged from background to 15,000 cpm. All survey results were less than the action level of three times background (24,000 cpm). In response to several rain events, the licensee elected to conduct additional scan surveys and soil sampling of the area on June 12, 2017. The scan surveys ranged from 7,500 cpm (background) to 10,500 cpm. The soil sample results are discussed below.

Section 3.2.2 of the reclamation plan provides the cleanup criteria for radionuclides in soil. The soil cleanup level for natural uranium is 100 pCi/g, regardless of depth of the contamination. (In practice, total uranium is measured in lieu of natural uranium.) Per the reclamation plan, the cleanup level is applied without subtracting background values. If the soil sample results are less than the cleanup level, then the licensee has effectively remediated the area.

The licensee conducted a historical review of soil samples collected in the vicinity of the septic tank in previous years. The licensee identified nine samples that had been collected between 1991-2012. The licensee previously analyzed the samples for uranium, thorium-230, and radium-226 concentrations. Although the excavated area was situated in an area where the radionuclide of concern was uranium, the area was located adjacent to an area that also included thorium-230 and radium-226 as radionuclides of concern. The highest uranium sample result, 3.5 pCi/g, was well below the cleanup level of 100 pCi/g. The highest thorium-230 sample result, 3.52 ± 0.55 pCi/g, was less than the 14 pCi/g cleanup level specified in the reclamation plan. Finally, the highest radium-226 sample result, 1.4 ± 0.6 pCi/g, was less than the 5 pCi/g cleanup level. In summary, thorium-230 and radium-226 contamination from Pond 2 apparently have not impacted the area of the former septic tank and associated recovery system.

As part of the final status survey, the licensee collected 11 soil samples in and around the excavated area. The licensee analyzed these samples using the XRF meter. All samples measured approximately 5 pCi/g of uranium, results that were well below the 100 pCi/g cleanup level.

The licensee collected seven additional soil samples during the performance of the second survey on June 12, 2017. This second survey was conducted to ensure that radiological conditions were consistent with prior findings after several rainfall events. Using the XRF meter, these sample results were consistently measured at approximately 4.5 pCi/g of uranium.

The licensee submitted six soil samples for offsite laboratory analysis. The licensee's staff used professional judgment to select the number and location of samples. The six locations were evenly spread around the surface area of the excavation. Four samples were selected from the 109 samples collected during the excavation work with the highest XRF measurements, and two samples were collected based on the results of the final status survey. The highest uranium sample result (9.4 pCi/g) was below the 100 pCi/g cleanup level. The inspector noted that the highest laboratory sample result (9.4 pCi/g) was the same sample that resulted in the highest XRF meter sample result (12.2 pCi/g).

In summary, the licensee's records indicate that the excavated area had been effectively remediated. The scan survey results were less than the action level. In addition, the licensee collected a sufficient number of soil samples. All soil sample results were less than the cleanup level specified in the reclamation plan.

b. Confirmatory Survey

The inspector conducted a confirmatory survey of the survey unit. The purpose of the confirmatory survey was to confirm the effectiveness and accuracy of the licensee's final status survey relative to whether the area met the acceptance criteria established in the reclamation plan. The inspector's confirmatory survey included measurement of ambient gamma exposure rates and collection of soil samples.

The inspector conducted the gamma scan using a Ludlum Model 12 survey meter with Ludlum Model 44-10 probe (NRC No. 20888G, calibration due date of 08/17/17). Prior to conducting the gamma scan, the inspector measured the ambient background level to establish an action level for the survey meter. The background measurement was recorded outside of the restricted area in the yard adjacent to the administrative building. Because the licensee's action level was three times the background level, for consistency, the inspector's action level was also set at three times the measured background level.

The inspector conducted a walk-over scan survey of the excavated area. With a background of 11,000 counts per minute (cpm), the count rates in the area ranged from 9,000 cpm to 13,000 cpm. In summary, the scan survey results remained below the action level (33,000 cpm) and were comparable to background levels.

The inspector collected two soil samples for comparison to the cleanup level specified in the reclamation plan (100 pCi/g). The first sample was collected at the western end of the excavation, while the second sample was collected at the center of the excavation. These locations were selected, in part, because they were situated in the lowest areas of the excavation, below the former septic tank.

Immediately after the soil samples were collected, the licensee conducted a measurement of the two samples using its XRF meter. The licensee's screen indicated that both samples contained less than or equal to 6 pCi/g of uranium, results that were well below the cleanup level (100 pCi/g). Based on all available information, the licensee's staff indicated that it may elect to backfill the excavated pit at risk, immediately after the onsite inspection.

The inspector submitted the two soil samples to the NRC's contract laboratory, Oak Ridge Associated Universities in Oak Ridge, Tennessee, for analysis. The samples were analyzed by gamma spectroscopy for determination of total uranium concentrations. The licensee collected split samples and submitted the samples to its offsite, contract laboratory for radiochemical analysis. The NRC's sample results and the licensee's split sample results are presented in the following table:

Table: Split Sample Results (in units of pCi/g)

NRC Sample	Licensee sample	Sample location	NRC (pCi/g)	Licensee* (pCi/g)
NRC-1	HA-2092	Western end of ditch west Pond #2	3.14	2.22
NRC-2	HA-2093	Central area of ditch west Pond #2	2.98	2.23

*Licensee's sample results were converted from units of micrograms per gram of pCi/g

The inspector compared the sample results to the NRC-approved cleanup level of 100 pCi/g for natural (total) uranium. Both sample results were less than the cleanup level. Further, the inspector noted that the NRC's sample results were similar to the licensee's sample results, suggesting good correlation between the two laboratories. Some variations in sample results can be explained by different laboratory sample protocols and possible inadequate mixing of split samples in the field.

1.3 Conclusions

The inspector reviewed the licensee's radiological survey design and sample results for the excavation located west of Pond 2. The licensee's records indicate that it had designed and conducted its survey in accordance with license requirements, and all sample results were less than the limits specified in the NRC-approved reclamation plan. The licensee's records indicate that the area had been effectively remediated prior to performance of the final status survey.

The inspector conducted a confirmatory survey of the excavated area. The survey included measurement of ambient gamma radiation levels and collection of soil samples. The gamma radiation levels were less than the action level, and the soil sample results were less than the cleanup level specified in the reclamation plan. The confirmatory survey results suggest that the licensee had effectively remediated the area.

2 Exit Meeting Summary

The inspector presented the preliminary inspection results to the licensee's representatives at the conclusion of the onsite inspection on June 15, 2017. The final inspection results were presented to the licensee's representative by telephone on July 24, 2017, after receipt of the soil sample results. During the inspection, the licensee did not identify any information reviewed by the inspector as proprietary that was included in the report.

SUPPLEMENTAL INSPECTION INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

S. Munson, Manager, Health, Safety and Environment

INSPECTION PROCEDURES USED

IP 83890 Closeout Inspection and Survey

ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
cpm	counts per minute
IP	Inspection Procedure
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual (NUREG-1575)
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picocuries per gram
XRF	x-ray fluorescence

NRC INSPECTION REPORT 040-08027/2017-002 - DATED AUGUST 3, 2017.

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