



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

January 21, 2016

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

SUBJECT: NRC INSPECTION REPORT 040-08027/15-003

Dear Mr. Ellis:

This refers to the U.S. Nuclear Regulatory Commission (NRC) team inspection conducted from October 19-21 and November 3-4, 2015, at your Sequoyah Fuels Corporation site near Gore, Oklahoma, with additional in office inspection related activities through January 14, 2016. 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 and representative records, observations of activities, and interviews with personnel. The preliminary inspection findings were presented to you and your staff at the conclusion of the onsite inspection. The final inspection results were presented to your staff by telephone on January 15, 2016, after NRC review of your revised Change of License Application CL014 dated January 13, 2016

The inspection examined 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. The inspection included a technical review of construction activities and confirmatory survey of several excavated areas. As allowed by your performance-based license, you elected to change the location of the raffinate sludge and pond sediments that will be placed into the onsite disposal cell. This proposed change was documented in CL014. The NRC staff reviewed the technical evaluation, interviewed site staff, and observed construction in progress, and the staff concluded that you could make this proposed change to the Reclamation Plan, without prior NRC approval. The enclosed report presents the results of this inspection including our review of CL014. No violations were identified, and no response to this letter is required.

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 electronic document system (ADAMS), accessible from the NRC's Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards 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, Senior Health Physicist, at 817-200-1234 or the undersigned at 817-200-1191.

Sincerely,

*/RA/*

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

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

Enclosure:  
NRC Inspection Report 040-08027/15-003

cc: A. Gutterman  
R. Ware  
A. Enstrom  
W. Andrews  
C. Eubanks  
D. Cates  
S. Hill  
J. Harris  
M. Broderick

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       J. Harris  
       M. Broderick

**DISTRIBUTION:**

M. Norato, NMSS/DUWP/MDB	L. Howell, DD:DNMS
K. Kalman, NMSS/DUWP/MDB	R. Kellar, C:FCDB
Z. Cruz, NMSS/DUWP/RDB	R. Evans, FCDB
M. Meyer, NMSS/DUWP/RDB	D. Stearns, FCDB
M. Dapas, RA	G. Schlapper, FCDB
K. Kennedy, DRA	M. Herrera, Fee Coordinator, DRMA
M. Shaffer, D:DNMS	

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OFFICE	RIV:DNMS:FCDB	FCDB	FCDB	NMSS:DUWP
NAME	RJEvans	GASchlapper	DLStearns	KLKalman
SIGNATURE	<b>/RA/</b>	<b>/RA/</b>	<b>/RA/</b>	<b>/RA/</b>
DATE	01/21/16	01/21/16	01/21/16	01/15/16
OFFICE	NMSS:DUWP	C:NMSS/DUWP	C:FCDB	
NAME	ZLCruz	MANorato	RLKellar	
SIGNATURE	<b>/RA/</b>	<b>/RA/</b>	<b>/RA/</b>	
DATE	01/15/16	01/15/16	01/21/16	

**OFFICIAL RECORD COPY**

**Service list:**

Alvin H. Gutterman  
Morgan, Lewis, Bockius LLP  
1111 Pennsylvania Avenue, NW  
Washington, DC 20004

Rita Ware, RCRA Enforcement Branch  
Compliance Assurance & Enforcement  
Division  
U.S. EPA, Region VI  
1445 Ross Avenue, Mail Stop 6EN-HX  
Dallas, Texas 75202-2733

Ann-Charlotte Engstrom, Vice President,  
General Counsel & Secretary  
General Atomics  
P.O. Box 85608  
San Diego, California 92186-5608

William Andrews, Supervisory Hydrologist  
U.S. Geological Survey  
202 N.W. 66<sup>th</sup> Street  
Oklahoma City, Oklahoma 73116

Clayton Eubanks  
Environmental Protection Unit  
Office of Attorney General  
313 NE 21<sup>st</sup> Street  
Oklahoma City, Oklahoma 73105

Sara Hill, Esq.  
Assistant Attorney General  
Cherokee Nation  
Office of Attorney General  
P.O. Box 948  
Tahlequah, Oklahoma 74465

Jim Harris  
U. S. Army Corps of Engineers  
1645 South 101<sup>st</sup> East Avenue  
Tulsa, Oklahoma 74128-4629

Mike Broderick, Administrator  
Oklahoma Department of  
Environmental Quality  
Waste Management Division  
Radiation Management Section  
P.O. Box 1677  
Oklahoma City, Oklahoma 73101-1677

U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket: 040-08027

License: SUB-1010

Report: 040-08027/15-003

Licensee: Sequoyah Fuels Corporation

Location: P.O. Box 610, Gore, Oklahoma

Dates: October 19-21, 2015  
November 3-4, 2015

Inspectors: Robert J. Evans, Ph.D., P.E., C.H.P., Senior Health Physicist  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety  
Region IV

Gerald Schlapper, Ph.D., P.E., C.H.P., Health Physicist  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety  
Region IV

Donald L. Stearns, Health Physicist, Inspector  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety  
Region IV

Zahira L. Cruz, Geotechnical Engineer  
Reactor Decommissioning Branch  
Division of Decommissioning, Uranium Recovery, and  
Waste Programs  
Office of Nuclear Material Safety and Safeguards

Accompanied by: Matthew R. Meyer, Hydrogeologist  
Reactor Decommissioning Branch  
Division of Decommissioning, Uranium Recovery, and  
Waste Programs  
Office of Nuclear Material Safety and Safeguards

Approved By: Ray L. Kellar, P.E., Chief  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety  
Region IV

Attachment: Supplemental Inspection Information

Enclosure

## EXECUTIVE SUMMARY

### Sequoyah Fuels Corporation NRC Inspection Report 040-08027/15-003

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

#### Onsite Construction

- The licensee was constructing the disposal cell in accordance with Reclamation Plan requirements. The NRC staff reviewed, in detail, the licensee's proposed change to the Reclamation Plan involving the relocation of raffinate sludge and pond sediments within the disposal cell. Based on technical information reviewed, interviews with site staff, and visual observations of the disposal cell, the NRC staff concluded that the licensee could relocate the raffinate sludge and pond sediments within the disposal cell in accordance with its performance-based license. (Section 1.2)

#### Closeout Inspection and Survey

- The inspectors reviewed the licensee's final status survey design, survey implementation, and sample results for the former fluoride holding basin No. 2 and surrounding area. The licensee's records indicate that it designed and implemented a survey in accordance with license and procedural requirements. All sample results were below the cleanup level threshold specified in the NRC-approved Reclamation Plan. (Section 2.2.a)
- The inspectors conducted confirmatory surveys of the area of the former fluoride holding basin No. 2. The surveys included measurement of ambient gamma radiation levels and collection of soil samples. All soil sample results were below the limit specified in the Reclamation Plan. The confirmatory survey results indicate that the licensee had effectively remediated the area, with several exceptions. In response to the NRC's confirmatory survey findings, the licensee planned to conduct additional cleanup work outside of the basin. (Section 2.2.b)
- The licensee accidentally cross-contaminated an area that had been previously remediated and radiologically surveyed. In response, the licensee conducted a corrective action review. The corrective actions included cleanup of the area and plans to resurvey the area. (Section 2.2.c)

## Report Details

### Summary of Plant Status

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

Since the previous inspection, conducted in April-May 2015 (ADAMS Accession No. ML15195A210), the licensee continued to remediate the site and construct the onsite disposal cell. The licensee started construction of the side slope cover in late-July 2015. This work included installation of the 2-foot clay layer and synthetic liner. During the onsite inspection, the inspectors noted that the licensee had installed most of the clay layer and synthetic liner on the side slopes.

The inspectors observed that the top of the disposal cell remained open, to allow for disposal of the remaining soils and debris. These remaining soils and debris included the concrete yellowcake pad, the soil underneath the pad, the southeastern area soils, Pond 2 material, clarifier area soils, and the remaining structures within the radiologically restricted area. The remaining site structures included the northeastern corner of the main process building, water treatment facility, oil storage building, and laundry building.

The licensee still possessed approximately 11,000 tons of bagged raffinate sludge, material previously removed from the four clarifier basins. The licensee also possessed 851 bags of sediments removed from the emergency basin, north ditch, and sanitary lagoon. By letter dated July 24, 2015 (ML15225A452), the licensee informed the State of Oklahoma and the Cherokee Nation that it planned to place the raffinate sludge and pond sediments into the disposal cell, in accordance with the NRC-approved reclamation plan. Further discussion of the raffinate sludge and pond sediment disposal is provided in Section 1.2 of this inspection report.

At the time of the onsite inspection, the licensee had partially remediated clarifier basins Nos. 1 and 4. Clarifier basin Nos. 2 and 3 remained in service and were being used for storage and processing of potentially contaminated water. Processed water from the clarifier basins was being directed to the storm water reservoir for eventual release to the environment in accordance with State of Oklahoma discharge permit requirements.

The licensee continued to store equipment previously salvaged from the former DUF<sub>4</sub> Building in the main process building. The licensee plans to transfer this salvaged material to a different NRC licensee in the near future. Further, the licensee continued to store DUF<sub>4</sub> and natural uranium in 77 drums. The drums were being stored in two metal shipping containers in the southeastern corner of the site. The licensee plans to ship this material for reuse or disposal at some point in the future.

## **1 Onsite Construction (88001)**

### **1.1 Inspection Scope**

The inspectors reviewed the licensee's decommissioning activities to determine if these activities were being conducted in accordance with Reclamation Plan requirements.

### **1.2 Observations and Findings**

License Condition 51 allows the licensee to conduct site decommissioning in accordance with the NRC-approved Reclamation Plan. The technical specifications, an attachment to the Reclamation Plan, provide the detailed requirements for construction of the disposal cell. The inspectors reviewed recent design changes and discussed these changes with licensee staff. The inspectors conducted tours of the construction area and compared the ongoing work to the construction requirements specified in the technical specifications. The inspectors also reviewed construction-related records and discussed these records with licensee staff. In summary, the inspectors concluded that the licensee was conducting construction-related activities in accordance with Reclamation Plan requirements.

License Condition 51.A specifies that the licensee shall submit a written request for NRC approval prior to installation of the radon barrier (disposal cell cover). By letter dated June 12, 2015 (ML1517A364), the licensee requested NRC authorization to proceed with installation of the first two layers of the radon barrier, consisting of the compacted clay layer and high-density polyethylene (HDPE) liner on the side slopes of the disposal cell. (The NRC-approved design for the side slopes includes a 2-foot clay layer and synthetic liner at the bottom of the 10-foot cover.) The licensee made the request, in part, to prevent further erosion of the side slopes and to reduce the amount of suspended solids in its storm water discharge.

The NRC subsequently granted the licensee permission to install the clay layer and synthetic liner by letter dated July 31, 2015 (ML15183A440). The NRC also specified that the licensee had to remove temporary erosion controls, including felt and vegetative cover material, as part of the installation process. The NRC's approval only applied to the clay layer and synthetic liner. The remainder of the cover could only be installed after resolution of several technical issues as discussed in the July 31, 2015, letter. The licensee began constructing the clay layer and synthetic liner on the side slopes immediately after NRC approval.

During site tours, the inspectors observed the status of the construction work. The licensee had completed the majority of the clay layer and HDPE liner installation. The licensee continued to install the clay layer and HDPE liner on the remaining side slopes, omitting portions that were necessary for access roads. Based on interviews and records review, the inspectors confirmed that the licensee had removed the temporary erosion protection layer on the side slopes prior to installation of the clay layer.

The Reclamation Plan provides general guidance for the disposal of the raffinate sludge material in the disposal cell. These instructions include construction of upper and lower liners around the material, and placement of the material at the bottom of the disposal cell. As noted earlier, by letter dated July 24, 2015, the licensee informed the State of Oklahoma and Cherokee Nation that it planned to place the raffinate sludge and pond



sediments into the disposal cell. As the bottom of the disposal cell was no longer accessible for disposal of this material, a design change was necessary. The licensee analyzed the change in accordance with its performance-based license.

As allowed by License Condition 54, the Plant Review Committee reviewed and approved the design change to allow placement of the raffinate sludge and pond sediments in a different location in the disposal cell. The design change was documented in the licensee's Change of License Application CL014 dated October 27, 2015. The NRC staff reviewed CL014, and the NRC staff questioned the licensee's radon flux analysis via email dated November 13, 2015. In response, the licensee updated CL014 on November 20, 2015, and submitted the revised document to the NRC for review.

The NRC staff reviewed CL014, in part, for compliance with License Condition 51.A requirements. License Condition 51.A specifies that the licensee will use data obtained from the upper 15 feet of contaminated material placed in the cell to demonstrate that the long-term radon flux will meet regulatory requirements. The licensee updated CL014 to include information regarding the radon flux analysis using the RADON computer code. To reduce the radon flux from the disposal cell above the new location of the raffinate sludge and pond sediment material within the cell, the analysis assumes that all of the raffinate sludge and pond sediment material will be placed below the top 15 feet of waste material. Thus, material within the top 15 feet is expected to have low levels of thorium and radium. The overlying waste material within the top 15 feet will be sampled and characterized for radioactivity concentrations when placed in the disposal cell. The resulting data, along with data collected from the raffinate material, will then be utilized in modeling the radon emanation for the completed disposal cell.

The NRC staff reviewed the updated CL014, and the NRC identified several technical concerns with the technical analyses. First, the wording of CL014 did not clearly state whether the raffinate sludge concentrations would be included in the radon flux analysis, even though it would be located greater than 15 feet below the cover. The NRC staff believed that inclusion of the raffinate sludge concentrations would be a conservative method of ensuring that the cover thickness was adequate. Second, the NRC staff questioned whether the licensee had fully considered the settlement of the waste material below the new location for the raffinate sludge and pond sediments. The original design assumed that the material would be placed at the bottom of the cell, but change CL014 allowed the material to be placed in a location above the bottom of the cell. Thus, the NRC questioned whether the licensee had fully considered the potential for settlement of the waste material located immediately below the raffinate sludge and pond sediments. These concerns were presented to the licensee in a conference call on December 22, 2015. During the call, the licensee agreed to review CL014 and update the analysis accordingly.

The licensee provided the NRC staff with a revised version of CL014 dated January 13, 2016, which addressed the staff's concerns. The revised CL014 stated that the characterization data for both the raffinate sludge and the 15 feet of overlying waste material will be utilized when modeling the radon emanation to ensure compliance. Additionally, the licensee confirmed that it compacted the soil and waste material below the proposed location of the raffinate sludge in accordance with technical specifications requirements. Thus, differential settlement is not expected to occur due to the relocation of the raffinate material.

During the onsite inspection, the NRC staff observed the area where the raffinate sludge bags will be placed, expected to be 12 feet deep, within the former Phase 3 area. Based on the information reviewed during the inspection, the revised CL014, and interviews with licensee staff and contractors, the NRC staff agreed with the licensee that a license amendment was not needed for placement of the raffinate sludge bags in a different location within the disposal cell.

On August 28, 2015 (ML15247A374), the licensee submitted a license amendment application to the NRC for approval of two additional sources of rock. The rock will be used as rip-rap and erosion protection material. As noted in previous inspections, the final dimensions of the disposal cell, including cell height, will impact the quantity and size of rock needed. During the inspection, NRC staff visited the three rock quarries, one currently approved and two being considered as future sources of rock.

The two new proposed quarries included the Roberts Quarry located west of Tahlquah, Oklahoma, and the Hanson Quarry located east of Sallisaw, Oklahoma. The rock at the Roberts Quarry is limestone of the Pennsylvanian aged, Morrowan Series. The rock at the Hanson Quarry is sandstone of the Pennsylvanian aged, Des Moines Series. The NRC staff discussed the licensee's procedure for rock production with licensee staff. The licensee plans to stockpile and approve the rock at the quarries to ensure that the rock does not contain undesirable features and is of acceptable quality before the rock is delivered to the site. The Souter Quarry is located north of Gore, Oklahoma, and produces limestone rock from Pennsylvanian aged, Morrowan Series. The NRC previously approved the northeast quarry wall at the Souter Quarry for use as erosion protection of the cover. However, the rock located at the northeast wall of the quarry has been mined and is no longer available. The licensee has identified the east wall in the northeast corner of the quarry as a potential future source of rock. At the conclusion of the onsite inspection, the NRC staff continued to review the license amendment application submitted by the licensee for approval of the two additional sources of rock from the Roberts Quarry and Hanson Quarry and the new rock source at the Souter Quarry.

License Condition 54 allows the licensee to make changes to the Reclamation Plan under certain circumstances. The NRC staff reviewed two recent changes to the Reclamation Plan. The first change, designated as CL012, involved a revision to technical specifications related to the licensee's soil borrow area. The purpose of the change was to establish the technical criteria for borrow area materials, an action which would allow the licensee to expand the number of locations where it could obtain soil. The inspectors reviewed this change during the March 2015 inspection, documented in NRC Inspection Report 040-08027/15-002 (ML15113A199). At that time, the inspectors noted that the licensee made two additional technical changes to CL012 without sufficient explanation for the reasons for these two changes. The first change involved the materials specifications (how much material must pass through a #200 sieve) and the second change involved the thickness of the side slopes. The inspectors discussed these two technical changes with the licensee, in part, to understand how they impacted radon attenuation. The licensee agreed to revise CL012 to provide additional justifications for these two technical changes. The NRC staff also reviewed Change CL015 which analyzed minor revisions to several sections in the technical specifications, to provide technical details for the cover system. The staff did not identify any technical concerns with these changes.

### 1.3 Conclusions

The licensee was constructing the disposal cell in accordance with Reclamation Plan requirements. The NRC staff reviewed, in detail, the licensee's proposed change to the Reclamation Plan involving the relocation of raffinate sludge and pond sediments within the disposal cell. Based on technical information reviewed, interviews with site staff, and visual observations of the disposal cell, the NRC staff concluded that the licensee could relocate the raffinate sludge and pond sediments within the disposal cell in accordance with its performance-based license.

## **2 Closeout Inspection and Survey (83890 and 83822)**

### 2.1 Inspection Scope

The purpose of this portion of the inspection was to ensure that the licensee was conducting radiological surveys during decommissioning in accordance with license requirements.

### 2.2 Observations and Findings

#### a. Review of Final Status Survey Results

License Condition 51 stipulates that site decommissioning shall be conducted in accordance with the guidance provided in the Reclamation Plan dated January 2008, as amended. At the time of the onsite inspection, the licensee had excavated the former fluoride holding basin No. 2 and the area around the holding basin. This area was located northwest of the disposal cell. Before the licensee could backfill the area, the licensee had to verify that the ground surface met certain radiological characteristics.

The NRC-approved Reclamation Plan provides two sets of survey requirements, depending on the radionuclides of concern in that area. In certain areas, the radionuclides of concern include thorium-230, radium-226, and natural uranium. These areas include the clarifier basins, Pond 2, and Pond 1 spoils pile area. For the remainder of the site, the radionuclide of concern is natural uranium. The former fluoride holding basin No. 2 is included in the area where the radionuclide of concern is natural (total) uranium only.

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. The licensee is required to survey the natural uranium contaminated areas using the guidance provided in NUREG-1575, Revision 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)." To verify if an area with uranium contamination had been adequately remediated, the licensee collected soil samples and measured ambient gamma radiation levels in the area.

Section 3.2.2 of the Reclamation Plan provides the cleanup criteria for radionuclides in soil. If the soil sample results are less than the cleanup levels, then the licensee has effectively remediated the areas. If the sample results are above the cleanup levels, the licensee is required to conduct additional reclamation work in that area. The soil cleanup level for natural (total) uranium is 100 picocuries per gram (pCi/g), regardless of

depth. According to Section 3.2.2, the cleanup levels will be applied without subtracting background levels.

In addition to soil sampling, the licensee conducted gamma radiation scan surveys using an action level of three times background. This action level represents the differentiation between background levels and contaminated material. Prior to conducting the walk-over scan survey of an excavated area, the licensee conducted survey measurements in a background area. The licensee then compared the measurements in the excavated area to the background measurements. Any area that exhibited elevated contamination was flagged for further investigation or additional remediation.

The licensee conducted soil sampling and gamma scan surveys of the former fluoride holding basin No. 2 and surrounding area to demonstrate that the residual radioactivity in the survey unit satisfied the applicable release criteria. Detail guidance for conducting final status surveys was provided in Attachment B, "Final Status Survey," of the Reclamation Plan. Additional details are provided in site procedure AI-33, "Final Status Survey, Class 1 Soils." The inspectors reviewed the licensee's final status survey design and survey results for the former fluoride holding basin, in part, to ensure that the licensee had remediated and surveyed the area in accordance with Reclamation Plan requirements.

The former fluoride holding basin and surrounding area was approximately 15,600 square meters (m<sup>2</sup>) in size. Because the radionuclide of concern was natural (total) uranium, the licensee designed and implemented a radiological survey in accordance with the guidance provided in MARSSIM. The licensee's survey included gamma scans and soil sampling for natural (total) uranium concentrations. None of the licensee's scan survey results exceeded the action level, although the licensee was unable to scan survey the middle of the fluoride holding basin due to standing rainwater.

The licensee established 250 m<sup>2</sup> survey grids in this area. The licensee collected soil samples from 66 sample points in this area, including eight duplicate and eight replicate samples. The highest soil sample result for natural (total) uranium was 40 micrograms of uranium per gram of soil (27.1 pCi/g). In summary, all soil sample results were below the cleanup level of 100 pCi/g.

The inspectors conducted a review of the licensee's survey design to ensure that the licensee had collected a sufficient number of samples. Using MARSSIM guidance, for areas with natural uranium contamination only, the licensee calculated that each 2,000 m<sup>2</sup> survey unit should have at least eight sample locations—one sample for every 250 m<sup>2</sup> of surface area. Based on MARSSIM guidance, the minimum number of samples was 64, but the licensee actually collected 66 samples. In addition, the licensee is required to collect duplicate/split and replicate samples for quality assurance/quality control requirements. The licensee was required to collect a minimum of seven split and replicate samples, but the licensee collected eight split and replicate samples. In summary, the licensee collected a sufficient number of samples to comply with Reclamation Plan and procedural requirements as well as MARSSIM guidance.

The licensee's final status survey results for the fluoride holding basin will be combined with the final status survey results for the remainder of the site. The licensee plans to submit the final status survey results to the NRC at a later date, after the entire site has been remediated and final surveyed.

b. Confirmatory Survey

The inspectors conducted confirmatory surveys of the 15,600-m<sup>2</sup> fluoride holding basin No. 2 and surrounding land, located northwest of the disposal cell. The purpose of the surveys was to confirm the effectiveness and accuracy of the licensee's final status survey relative to whether the area meets the acceptance criteria established in the Reclamation Plan. The confirmatory surveys included measurement of ambient gamma exposure rates and collection of soil samples.

The inspectors conducted the gamma scans using a Ludlum Model 19 microRoentgen survey meter calibrated to radium-226 (NRC No. 015540, calibration due date of 08/12/16), a Ludlum Model 12 count rate meter with 2-inch by 2-inch sodium iodide probe (NRC No. 20888G, calibration due date of 08/12/16), and a Radeye G survey meter (NRC No. 086963, calibration due date of 08/18/16). Prior to conducting the gamma scans, the inspectors measured ambient background levels to establish action levels for each survey meter. The background measurements were recorded outside of the restricted area in the yard adjacent to the administrative building. The licensee's action level for gamma radiation exposure rates was three times the background level. For consistency, the NRC inspectors' action levels were also set at three times the measured background levels for each survey meter.

The inspectors conducted walk-over scan surveys. Using the Model 19 survey meter, the exposure rates ranged from 13-18 microRoentgens per hour ( $\mu\text{R/hr}$ ), with a background of 10-12  $\mu\text{R/hr}$ . Using the Model 12 count rate meter, the exposure rates ranged from 12,000-20,000 counts per minute, with a background of 13,000 counts per minute. Finally, using the Radeye G survey meter, the exposure rates ranged from 7-11  $\mu\text{R/hr}$ , with a background of 7-8  $\mu\text{R/hr}$ . In summary, none of the exposure rates exceeded the action level of three times background.

The inspectors identified seven locations for soil sampling. The seven samples were split with the licensee. Three locations were identified based on slightly elevated gamma exposure rate readings. The first elevated area (designated as NRC-1) was located north of the former holding basin. The second area (NRC-3) was located at the southern fence line boundary. The third location (NRC-4) was situated in the southeastern corner. The licensee later screened all samples with an X-ray fluorescence meter and concluded that two samples (NRC-1 and NRC-3) contained uranium in sufficient quantities that additional remediation was required in these two areas. Sample NRC-3 was returned to the licensee. Samples NRC-1 and NRC-3 were not analyzed by the NRC.

The inspectors also collected two samples (NRC-5 and NRC-6) from soil staged for use as backfill material. This material was located in lifts on the eastern side of the disposal cell. The backfill material is required to meet the same cleanup level (100 pCi/g of uranium) as the remediated areas. The inspectors wanted to confirm that the uranium concentrations in the backfill was less than the cleanup level specified in the Reclamation Plan.

After the conclusion of the first confirmatory survey, the licensee subsequently conducted remediation in the area north of the holding basin, an area where one sample (NRC-1) indicated elevated concentrations of uranium. (The licensee's remediation efforts were limited by rain which resulting in wet ground surfaces and standing water.) The NRC inspectors conducted a second confirmatory survey in this area. The NRC

inspectors collected one split sample from the northern area (Sample NRC-1A) which replaced the sample NRC-1 which was recalled by the licensee. The inspectors submitted six soil samples to the NRC's contract laboratory, Oak Ridge Associated Universities in Oak Ridge, Tennessee, for analysis.

The ORAU laboratory analyzed the samples to quantify the total uranium concentrations. The licensee collected split samples and submitted these samples to its contract laboratory for radiochemical analysis. The NRC's sample results and the licensee's split sample results are presented in the Table below, in units of picocuries per gram (pCi/g):

**Table: Split Sample Results for Total Uranium Concentrations**

NRC Sample	Licensee Sample	Sample Location	NRC (pCi/g)	Licensee* (pCi/g)
NRC-1A	HA-2042	North central area, north of former holding basin	8.8 ± 2.2	6.37
NRC-2	HA-2027	Southeast corner of former basin	34.5 ± 7.2	48.1
NRC-3	Sample not analyzed			
NRC-4	HA-2029	Southeast corner of excavated area	35.8 ± 7.6	13.7
NRC-5	HA-2030	Backfill, south end, upper level	3.23 ± 0.92	2.25
NRC-6	HA-2031	Backfill, south end, lower level	6.2 ± 1.9	4.4
NRC-7	HA-2043	Northwest of former basin near fence line	23.2 ± 5.0	14.1

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

The inspectors compared the total uranium concentrations in the samples to the NRC-approved cleanup level of 100 pCi/g for natural (total) uranium. All sample results were less than the cleanup level.

The inspectors 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. In summary, the confirmatory survey results suggest that the licensee had adequately remediated the former fluoride holding basin No. 2, although the licensee planned to conduct additional cleanup work outside of the former basin.

c. Accidental Recontamination of Area Previously Remediated and Surveyed

The NRC inspectors conducted a review of the licensee's accidental recontamination of an area that had previously been remediated and final status surveyed. The north burial area, also known as the solid waste burial area No. 2, was remediated by the licensee in 2014. The licensee conducted a final status survey of the area after remediation. The

NRC inspector reviewed the licensee's survey results during the November 2014 inspection, as documented in NRC inspection report 040-08027/14-002 dated February 3, 2015 (ML15034A612). The inspector confirmed that the scan survey and soil sample results were less than the action levels. The NRC inspector also conducted a confirmatory survey during the November 2014 inspection, and the inspector confirmed that the licensee had effectively remediated the area.

During late-July 2015, the licensee decided to remove sediments from fluoride holding basin No. 2 (the area that was confirmatory surveyed by the NRC during this inspection), to speed up the soil and sediment drying process. The licensee did not expect the pond sediments to contain uranium. The licensee chose to place this material in the north burial area, adjacent to the fluoride holding basin No. 2. The licensee intended to radiologically survey the material being placed in the north burial area, after it had sufficiently dried. In addition, the licensee planned to survey the laydown area after the material had been removed from the north burial area, to ensure that the area had not been radiologically impacted by the sediments.

However, the contractors conducting the excavation accidentally removed more material than just pond sediments from the fluoride holding basin. The excavation process removed calcium fluoride/fly ash material that was located below the sediments. This additional material contained uranium in excess of the cleanup level. When the licensee discovered the error in August 2015, it began moving the remaining material excavated from the fluoride holding basin No. 2 directly to the disposal cell. After the material in the north burial area had dried, it was also removed and transported to the disposal cell. The licensee completed the transfer of the basin sediments and contaminated soil to the disposal cell in October 2015.

The licensee conducted a corrective action review to document the accidental contamination of the north burial area. The proposed corrective actions included performance of another final status survey within the north burial area. The NRC inspectors will review the licensee's survey results and will conduct a second confirmatory survey of the area during a future inspection.

### 2.3 Conclusions

The inspectors reviewed the licensee's final status survey design, survey implementation, and sample results for the former fluoride holding basin No. 2 and surrounding area. The licensee's records indicate that it designed and implemented a survey in accordance with license and procedural requirements. All sample results were below the cleanup level threshold specified in the NRC-approved Reclamation Plan.

The inspectors conducted confirmatory surveys of the area of the former fluoride holding basin No. 2. The surveys included measurement of ambient gamma radiation levels and collection of soil samples. All soil sample results were below the limit specified in the Reclamation Plan. The confirmatory survey results indicate that the licensee had effectively remediated the area, with several exceptions. In response to the NRC's confirmatory survey findings, the licensee planned to conduct additional cleanup work outside of the basin.

The licensee accidentally cross-contaminated an area that had been previously remediated and radiologically surveyed. In response, the licensee conducted a

corrective action review. The corrective actions included cleanup of the area and plans to resurvey the area.

#### **4 Exit Meeting**

The inspectors reviewed the preliminary inspection scope and findings during an exit meeting conducted at the conclusion of the onsite inspections. The final inspection findings were presented to the licensee's staff by telephone on January 15, 2016, after review of the revised Change of License Application CL014 dated January 13, 2016. During the inspection, the licensee did not identify any information reviewed by the inspectors as proprietary.



## SUPPLEMENTAL INSPECTION INFORMATION

### PARTIAL LIST OF PERSONS CONTACTED

J. Ellis, President  
R. Miller, Contractor, RMA  
S. Munson, Manager, Health, Safety and Environment  
B. Reid, Director, Decommissioning, RMA  
K. Schlag, Manager, Quality Assurance, RMA

### INSPECTION PROCEDURES USED

IP 88001	Onsite Construction
IP 83822	Radiation Protection
IP 83890	Closeout Inspection and Survey

### ITEMS OPENED, CLOSED, AND DISCUSSED

#### Opened

None

#### Closed

None

#### Discussed

None

### LIST OF ACRONYMS

ADAMS	Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
DUF <sub>4</sub>	depleted uranium tetrafluoride
IP	Inspection Procedure
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
m <sup>2</sup>	square meters
μR/hr	microRoentgens per hour
NRC	U.S. Nuclear Regulatory Commission
pCi/g	picocuries per gram