

March 02, 2005

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

SUBJECT: SEQUOYAH FUELS CORPORATION - MATERIALS LICENSE NO. SUB-1010  
REQUEST FOR ADDITIONAL INFORMATION - RECLAMATION PLAN -  
GROUND WATER PROTECTION (TAC L52511)

Dear Mr. Ellis:

The U.S. Nuclear Regulatory Commission (NRC) has completed a detailed technical review of the ground water protection aspects of Sequoyah Fuels Corporation's (SFC's) proposed Reclamation Plan for the SFC facility in Gore, Oklahoma. We have reviewed the original submittal of January 28, 2003, and supplements submitted by letters dated August 8, 2003, August 29, 2003, February 17, 2004 and June 22, 2004. Our review has identified deficiencies in the material provided; we will need the additional information identified in the enclosure in order for us to complete our review. Note that the numbering scheme identifies the area of review (i.e., GW for ground water protection) and continues the request for additional information numbering from our March 24, 2003, letter.

Within 30 days of the date of this letter, please either provide the requested information or a schedule to provide the information. If you have any questions concerning this letter please contact me at (301) 415-6629 or via e-mail to [mhf1@nrc.gov](mailto:mhf1@nrc.gov).

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be 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>.

Sincerely,

/RA/

Myron H. Fliegel, Project Manager  
Fuel Cycle Facilities Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 40-8027  
License No.: SUB-1010

Enclosure: Request for Additional Information

cc: William Andrews, USGS  
Patricia Ballard, NRMNC  
Michael Broderick, OK DEQ  
Kelly Burch, Esq., OK AG  
Will Focht, OSU  
Alvin Gutterman, Esq., Morgan Lewis & Bockius  
Pat Gwin, Cherokee Nation  
Jeannine Hale, Esq., Cherokee Nation  
Craig Harlin, SFC  
Jim Harris, USACE  
Troy Poteete, Cherokee Nation  
Charles Scott, USFWS  
Saba Tahmassebi, OK DEQ  
Rita Ware, EPA  
Kim Winton, USGS  
Merritt Youngdeer, BIA

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<b>OFC</b>	FCFB		FCFB		FCFB	
<b>NAME</b>	M. Fliegel		B. Garrett		R. Nelson	
<b>DATE</b>	03/ 01/05		03 /02/05		03/ 02/05	

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**Sequoyah Fuels Corporation  
Reclamation Plan Review  
Request for Additional Information**

**GW3 Detection Monitoring**

Sequoyah Fuels Corporation (SFC) intends to construct an 11e.(2) byproduct material disposal cell in an area of the facility that currently exhibits soil and ground water contamination. To construct a detection monitoring system, SFC proposes to excavate contaminated soils, backfill the excavation with clean fill, and install point of compliance (POC) wells in clean fill to allow for detection of hazardous or radiological components leaking from the cell. In addition, a leak detection system will be installed below the waste to detect breaches of an overlying synthetic liner.

- A REQUEST: Although the POC wells will be installed in clean fill, residual ground water contamination will remain at the cell location. Concentrations of the residual contamination would likely be sufficient to mask potential contamination emanating from the cell in the event of leak. It appears, therefore, that the detection monitoring system may not meet the requirements of 10 CFR 40, Appendix A, Criterion 7A that requires a detection monitoring system that can detect a leak from an impoundment. Furthermore, 10 CFR 40, Appendix A, Criterion 5(E)1, requires that the leak detection system be in addition to, not *in-lieu* of, a detection monitoring system.

SFC must provide additional information regarding the manner in which the proposed detection monitoring system can meet the requirements of Criterion 7A. Per the introduction to 10 CFR 40, Appendix A, SFC may propose an alternative to the requirements of Criterion 7A. However, in order for the Nuclear Regulatory Commission to approve such an alternative, SFC must demonstrate that it will contain and stabilize the site and be protective of public health, safety, and the environment in an equivalent manner as Appendix A and the standards promulgated in 40 CFR 192.

BASIS: 10 CFR 40, Appendix A, Criterion 5(E)1, states the following: "Where synthetic liners are used, a leakage detection system must be installed immediately below the liner to ensure major failures are detected if they occur. This is in addition to the ground-water monitoring program conducted as provided in Criterion 7."

10 CFR 40, Appendix A, Criterion 7A, states that, "The licensee shall establish a detection monitoring program needed for the Commission to set the site-specific groundwater protection standards in paragraph 5(B)1 of this appendix." Furthermore, "The initial purpose of the program is to detect leakage of hazardous constituents from the disposal area so that the need to set ground-water protection standards is monitored."

10 CFR 40, Appendix A, Introduction states the following: "Licensees or applicants may propose alternatives to the specific requirements in this appendix. .... The

Enclosure

Commission may find that the proposed alternatives meet the Commission's requirements if the alternatives achieve a level of stabilization and containment of the sites concerned, and a level of protection of public health, safety, and the environment from radiological and nonradiological hazard associated with the sites, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by the requirements of this appendix and the standards promulgated by the Environmental Protection Agency in 40 CFR Part 192, subparts D and E."

- B REQUEST: Section 7.0, Attachment E of the Reclamation Plan indicates that three point of compliance (POC) wells are proposed for the disposal cell monitoring network. Such a network assumes that ground water gradients will remain largely unaffected by the presence of an above ground disposal cell. However, topographic alterations, such as disposal cells, can cause localized changes in groundwater gradients because of the higher total hydraulic head in the disposal cover. Such conditions could cause ground water to migrate radially away from the disposal cell for a certain distance before being overcome by the regional groundwater gradient. Therefore, SFC should propose additional POC wells along the disposal cell circumference or provide justification that the three proposed wells will provide sufficient coverage after the disposal cell is built.

BASIS: 10 CFR 40, Appendix A, Criterion 7A states that the initial purpose of a detection monitoring program is to detect leakage of hazardous constituents from the disposal area. Compliance with this criterion is not possible without a sufficient number of wells in the detection monitoring network.

- C REQUEST: Provide details regarding the manner in which POC wells will be constructed. Examples of such information include well diameter, casing and screen materials, screen slot size, type and thicknesses of filter pack materials, bentonite, and cement grout. Requirements for post-installation well development should also be specified.

BASIS: This information is necessary to evaluate whether the wells will be suitable for ascertaining compliance with 10 CFR 40, Appendix A, Criterion 7A.

- D REQUEST: Table 7.1 of Attachment E to the Reclamation Plan lists the water quality constituents to be analyzed during compliance monitoring. Along with the constituent list, SFC must specify the methodology it will use to determine whether or not leakage has occurred from the proposed disposal cell.

BASIS: 10 CFR 40, Appendix A, Criterion 7A, states that, "The initial purpose of the program is to detect leakage of hazardous constituents from the disposal area so that the need to set ground-water (sic) protection standards is monitored." Identifying and implementing an appropriate methodology is important for complying with this criterion.

- E REQUEST: According to Appendix D, background ground water samples were analyzed for uranium, radium-226, thorium-230, nitrates, and fluoride. Background ground water samples apparently were not analyzed for arsenic, although arsenic is

listed as a constituent of concern in Appendix B. Please provide arsenic background ground water concentration data. Also, the discussion of background data collection does not adequately describe the results of the investigation and statistical analysis methods. Please provide the actual results of the background investigation including any statistical analyses performed.

BASIS: 10 CFR 40, Appendix A, Criterion 5B(5), presents the acceptable concentration limits applicable to ground water monitoring programs associated with the disposal of 11e.(2) byproduct material. A background determination is necessary to understand whether or not ground water contamination exceeds the background concentration limit specified in 5B(5)(a).

#### **GW4 Disposal Cell Cover Protective Layer**

- A REQUEST: According to Drawing 20 of the Reclamation Plan, the bottom 18 inches of the cover will be a protective layer with a minimum particle size of 1 inch. This protective layer presumably serves to drain infiltrating water away from the synthetic liner. However, this protective layer is not described in the text of the Reclamation Plan. SFC should provide details regarding this layer, including grain size distribution, installation specifications, and the purpose of the layer.
- B REQUEST: It appears that the median grain size of the protective layer will be substantially larger than that of the remaining, overlying soil cover. As a result, the protective layer could become clogged, reducing its ability to drain infiltrating water. This condition has two potential consequences. Because infiltrating water may not drain quickly, it could be available to seep into the waste material if tears in the synthetic liner exist. Also, pore pressure could begin building up reducing the effective friction angle of the cover/liner interface, potentially destabilizing the cover slope. Please provide additional information regarding the manner in which SFC will preclude clogging of the protective layer or provide justification that it is not necessary to do.
- C REQUEST: Because of the large grain size of the protective layer particles, the underlying synthetic liner may be susceptible to tearing or puncture damage during protective layer installation. Provide information on how SFC will prevent damage to the synthetic liner during installation of the protective layer.

BASIS: 10 CFR 40, Appendix A, Criterion 6, states that licensees shall place an earthen cover over tailings and wastes and the cover shall be designed to provide reasonable assurance of control of radiological hazards to be effective for 1,000 years to the extent reasonably achievable, and, in any case, for at least 200 years.

#### **GW5 Disposal Cover Water Balance**

REQUEST: Recent research by Albright, et al., indicates that store-deplete (water balance) covers are not completely effective at eliminating seepage through the cover in humid environments. The researchers tested 15 water balance covers in climates

ranging from semi-arid to humid. In all cases, water balance covers in humid areas allowed small amounts of water to percolate through the cover after 5 years. However, with time more water would likely permeate the cover due to increased secondary porosity (e.g., from dessication cracking and root penetration). SFC must justify its conclusion that the proposed cover will preclude water penetrating to the cover in light of the above cited research or address the consequences of water penetrating the cover, including its effects on slope stability.

BASIS: 10 CFR 40, Appendix A, Criterion 6, states that licensees shall place an earthen cover over tailings and wastes and the cover shall be designed to provide reasonable assurance of control of radiological hazards to be effective for 1,000 years to the extent reasonably achievable, and, in any case, for at least 200 years.

Albright, W.H., Benson, C.H., Gee, G.W., Roesler, A.C., Abichou, T., Apiwantragoon, P., Lyles, B.F., Rock, S.A. *Field Water Balance of Landfill Final Covers*. Journal of Environmental Quality. American Society of Agronomy. February 2004.

#### **GW6 Disposal Cover Vegetation**

SFC proposes to construct a self sustaining vegetative cover for the cell. The proposed vegetation includes local trees.

- A REQUEST: Please provide the botanical names of the tree species you propose to plant on the disposal cell cover. Describe the methodology that was used to select the tree species and provide the basis for your conclusion that the cover thickness is sufficient to prevent root penetration of the waste.
- B REQUEST: Please discuss other native or non-native tree species near the site that have the potential to invade the cover. If such species exists, provide information similar to that provided for the species to be planted, including the information requested above. If not, provide the basis for your conclusion.

BASIS: 10 CFR 40, Appendix A, Criterion 6, states that licensees shall place an earthen cover over tailings and wastes and the cover shall be designed to provide reasonable assurance of control of radiological hazards to be effective for 1,000 years to the extent reasonably achievable, and, in any case, for at least 200 years.

#### **GW7 Geology/Hydrogeology**

- A REQUEST: A discrepancy exists between the written geologic descriptions and associated maps contained in Appendix D. Page 3-14 states that Sandstone 1 underlies the Terrace Groundwater System; however, cross-sections contained in Figure 11, Appendix D, and in Figure 14 of the Reclamation Plan show that Shale 1 underlies the Terrace system. Please clarify this discrepancy.
- B REQUEST: SFC states that the Terrace Groundwater System is perched on the shallow bedrock aquifers. Shale 1, which underlies the Terrace Groundwater System, is considered an aquifer unit as opposed to Sandstone 1 that is an aquitard. Appendix D states there is no hydraulic connection between the shallow

bedrock and terrace systems. If the shale units are aquifers and the sandstone units the aquitards, would not the Terrace and Shale 1 systems be interconnected? If so, please revise appendices B and D to reflect this condition. If Shale 1 and the Terrace Groundwater System are hydraulically separated, provide the justification for calling it a perched zone when it appears to be a large unconfined aquifer that is recharged through infiltration of precipitation.

BASIS: 10 CFR 40, Appendix A, Criterion 5B(1), states that hazardous constituents entering the ground water from a licensed site must not exceed the specified concentration limits in the uppermost aquifer beyond the point of compliance for the compliance period. A clear definition of the uppermost aquifer must be presented in the Reclamation Plan to comply with this criterion.