



September 28, 1990

**Certified Mail
Return Receipt Requested**

Mr. Robert D. Martin
Regional Administrator
U.S. NUCLEAR REGULATORY COMMISSION
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76011

Dear Mr. Martin:

In my letters to you of August 30, 1990 and September 13, 1990, Sequoyah Fuels Corporation (SFC) committed to have an independent party review its entire response to the solvent extraction area contamination situation. In response to this commitment, please find enclosed the "Independent Review of SFC Response to Incidents and Events," as conducted by Dr. James A. Buckham of Pickard, Lowe, and Garrick, Inc.

We are currently reviewing the enclosed report and will provide you with our response to the recommendations as soon as possible. Should you have any questions, please contact me at 918/489-3206.

Sincerely,
Reau Graves Jr
Reau Graves, Jr.
President

RG:nv

Enclosure

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September 27, 1990
SFC-6025-PLG-12

Mr. Reau Graves, President
Sequoyah Fuels Corporation
P.O. Box 610
Carlyle Road
Gore, OK 74435

Dear Mr. Graves:

REVISED INCIDENT RESPONSE REVIEW

Enclosed are two copies of the PLG Incident Response Review revised to reflect movement of incident records 90-6-1 and 90-8-1 from Appendix B to Appendix A. We understand that these incidents were reported to the NRC on an informational basis. The main report has been revised to reflect this change in distribution between the appendices.

Please call me if you have any questions.

Very truly yours,

Willard C. Gekler

Enclosures



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September 25, 1990
SFC-6025-PLG-10

Mr. Reau Graves, President
Sequoyah Fuels Corporation
P.O. Box 610
Carlyle Road
Gore, OK 74435

Dear Reau:

INCIDENT RESPONSE REVIEW

Enclosed is a report on a review of Sequoyah Fuels Corporation's responses to events, incidents, and unusual situations during 1990. The review covered responses to a total of 13 incidents, but the emphasis was on the August event in which significant quantities of uranium from pre-1985 releases were discovered during an excavation north of the solvent extraction building to place two large buried tanks in a concrete pit. The review was conducted by Dr. James A. Buckham during his visit to the site on September 5-12, 1990, for the tenth quarterly reassessment of facility activities.

The report contains 10 recommendations that, when effectively implemented, should greatly improve the Sequoyah Fuels Corporation responses.

If we can be of further assistance in this matter, please let me know.

Very truly yours,

W.C. Dekker
B. John Garrick *for*

Enclosure

INDEPENDENT REVIEW OF SFC RESPONSE TO INCIDENTS AND EVENTS

by

James A. Buckham

PLG, Inc.

September 24, 1990

1. INTRODUCTION

PLG, Inc., was engaged by Sequoyah Fuels Corporation (SFC) to review SFC's responses to incidents, events, and unusual situations. This review was initiated because of the August 1990 event involving the finding of significant quantities of uranium in soil and seepage during an excavation. The excavation was required so that a buried hexane storage tank and an adjacent dump tank north of the solvent extraction (SX) building could be enclosed in a concrete pit to comply with new environmental regulations. Although the emphasis in this review is on the SFC response to that event, responses to all 1990 incidents and events were reviewed. Appendix A summarizes the four events in 1990 that involved reports to the U.S. Nuclear Regulatory Commission (NRC). Appendix B lists the nine incidents in 1990 that did not involve reports to the NRC. These events and incidents are covered under those topics involving the generally expected response to such events or incidents. Each topic includes a summary of findings, discussions, and recommendations.

The review was performed onsite by Dr. James A. Buckham between September 5 and 12, 1990, and the report was subsequently prepared by him with consultation from other senior PLG personnel who are familiar with the Sequoyah facility and its activities through involvement in the Independent Oversight Team and in 10 subsequent quarterly reassessments that were made between October 1986 and the present.

2. EXECUTIVE SUMMARY

SFC had 6 incidents during 1990 that involved reports to the NRC, and 7 that did not. All 13 incidents were reviewed, and 10 recommendations are made concerning the collective responses. Review of the August event that stemmed from the excavation of two tanks adjacent to the solvent extraction building was emphasized, and most of the recommendations stem from the responsiveness to this incident. Three recommendations relate to the reporting of incidents to the NRC, two relate to project management, three relate to SFC cultural problems, one relates to the broadening of the Serious Incident Report system, and one relates to initiating formal root cause analyses for all incidents.

3. NRC REPORTING REQUIREMENTS

3.1 FINDINGS

Current formal requirements for reporting events or serious incidents are contained in 10CFR20.403. Section 1 of this regulation requires immediate reporting of very serious events. Section 2 requires reporting of less serious events within 24 hours. The selection of appropriate reporting response can be determined by the following numerical criteria:

Event Consequence	(a) Immediate Reporting	(b) Reporting within 24 Hours
(1) Exposures Whole Body Skin Extremities	25R 150R 375R	5R 30R 75R
(2) Releases	5,000 X Appendix B, Table II	500 X Appendix B, Table II
(3) Loss of Operation of Any Affected Facilities	1 Week	1 Day
(4) Property Damage	>\$200,000	>\$2,000

During 1990, none of the incidents caused exceedance of either the exposure or the release criterion, but at least two exceeded the 1-day-loss-of-operation-criterion, and several exceeded the \$2,000 criterion as did dozens of other recurring types of operational failures during the year. Only one incident during 1990 was reported per these requirements: namely, that of August 3, 1990, involving a small release of depleted UF₆ and an outage of the affected facilities expected to exceed 1 day. The event of January 22, 1990, involving a spill of about 14,000 pounds of UF₄ powder at the Depleted UF₆ Reduction Facility, should also have been reported, based on the same criterion. A review of subsequent voluminous correspondence regarding that event shows that both the NRC staff and SFC agree with this interpretation.

3.2 DISCUSSION

The NRC apparently recognizes problems that are associated with the current formal reporting requirements in that it has prepared a proposed regulation to replace those requirements. This proposed regulation would delete reporting requirements that deal with loss of operation or damage to property because the NRC staff (properly) believes that these criteria are not the best way to describe events that pose a hazard to public health and safety or to the environment. The proposed regulations will require reporting of other significant events for which reports are not currently required. An example is Serious Incident 90-8-3 of August 16, 1990, involving loss of a safety system for about 7 hours because of an operator error.

One of the most difficult problems in deciding what to report under the current requirements has been the long-term acceptance by the NRC of not reporting the numerous equipment failures that have occurred for decades in conveyors, reaction vessels, and many other pieces of equipment. Many of these failures involve spills of uranium compounds or solutions; many involve outages exceeding 1 day; and most involve repair costs that exceed \$2,000. In view of this acceptance, it has been difficult for SFC to decide which 1-day outages should be reported.

The author infers that some of the current concern is caused because some view the August event as a "release" of uranium. Instead, the author regards it as a discovery of many earlier releases occurring prior to the mid-1980s and as a recapturing of a large portion of uranium

from those releases by recycling the seepage and stockpiling of the excavated soil. However, there were many other actions that were taken in response to the August 3 event that fall short of what should be expected. These actions are discussed later in this report.

3.3 RECOMMENDATIONS

1. Until NRC reporting requirements are officially changed, SFC should err on the side of reporting all events that occur from an accident or unexpected event that might be covered by 10CFR20.403, but not those events expected to recur (e.g., equipment tripouts) unless these events might have caused a reportable exposure or release.
2. SFC should begin reporting by telephone to Region IV all events that will require reporting under the proposed regulation within the time frames specified in the proposed regulation, even though that regulation is not yet in effect.
3. SFC and Region IV should establish an unofficial, informal communication system through which specific advice on reporting can be obtained during the 24-hour interval. This could be, for example, a phone call from Mr. Lacey to a knowledgeable individual at Region IV in which the situation is explained and discussed with the NRC to formulate an acceptable and correct plan of action.

4. SFC PROJECT MANAGEMENT

4.1 FINDINGS

SFC employs a unique system of incorporating comments and obtaining approval of the health, safety and environment, operations, and maintenance departments on all engineering projects undertaken rather than requiring sign-off on all project drawings as is the more common nuclear industry practice. The SFC system involves (1) a design review meeting before the project is finalized at which senior representatives of these departments are present and make comments or request changes; (2) signing of a design change authorization (DCA) by these departmental managers; and (3) approval of a hazardous work permit by responsible representatives of these departments. This practice was followed for the August excavation project; however, as allowed by present company rules, the DCA was not approved until near the end of the project.

During this review, interviews with veteran employees at the facility by the author revealed that many knew that, prior to 1985, large quantities of concentrated uranium solutions had overflowed from the dump tank that was to be excavated as well as from the former adjacent evaporator; many also knew that before the several repairs of the solvent extraction building floor in the mid-1980s, dilute uranium solutions may have leaked through cracks and holes in the floor. However, none of this knowledge was pointedly brought to bear on planning for this project. This may have resulted, in part, from failure to recall and recognize the significance of these past events to the excavation project.

4.2 DISCUSSION

Most of the persons who were involved in planning or approving plans for this project were relatively new in service at the Sequoyah facility. Thus, they were not personally able to interject any historical knowledge. Furthermore, no one had any apparent stimulus to seek

such knowledge from others. Documentation of pertinent pre-1986 activities is essentially nonexistent. In view of this, the prudent course of action is to expect to find uranium at some level in any future excavation and to create standard procedures, guidelines, and action levels for responding if it is found. This practice, even if completely negative findings are made, would further aid in the environmental characterization of the site.

4.3 RECOMMENDATIONS

1. Require sign-off on the DCA prior to initiating work on every project performed by outside contractor as is now the case with work performed by SFC maintenance personnel. Near-final project drawings should be available to those signing the DCA.
2. Prepare a generalized written procedure covering all safety-related aspects of excavations on the facility site, including required sampling and analyses for uranium, necessary communications, action levels, and steps to be taken to initiate remedial actions if uranium is encountered.

5. SFC CULTURAL PROBLEMS RELATED TO RESPONSIVENESS

5.1 GENERAL FINDINGS

Many of the problems resulting from the reviewed incidents stem from cultural problems that have been evident at SFC since the beginning of the Independent Oversight Team's observations. While there has been a substantial improvement in these areas over the 4-year period, much remains to be done. Areas for further improvement can be grouped in three categories.

5.1.1 Responsible Attitude toward Public Concerns

The chemical hazards at the Sequoyah facility are probably many times those associated with uranium. Most employees are acutely aware of these and properly so. No employee would ignore a leak or an unexpected appearance of UF_6 , HF, F_2 , or NH_3 , and they would instinctively take corrective action and make effective communications of findings because they realize that their physical well-being is at stake. On the other hand, the public concern is probably much larger for uranium and other radiological hazards than for the chemical hazards. As a result, political and regulatory concerns are also focused on these radiological hazards, at least at present. The employees need to understand that their responsible attitude toward chemical safety must also apply to the concerns of the public, political, and regulatory sectors. They need to understand that their attitude is closely linked to their job security and reputations.

5.1.2 Communication inside and outside the Company

1. Effective communication is the lifeblood of any successful company. Yet, SFC employees have generally been reluctant to communicate observations or to ask questions. Similarly, management in various degrees and at various levels has not effectively communicated its knowledge of situations and goals to all levels of employees.

2. One aspect of communication that is especially important in instances such as the August 3 event is making every effort to ensure that the facts are presented to the public in a manner that informs them but does not create unnecessary alarm even when the communication is by others. In the August 3 event, the NRC released information to the public that included the ratio of the highest concentration of uranium that was analyzed in the seepage being collected and recycled (8 g/l) to the action level for environmental releases from the restricted area (225 μ g/l). This ratio (35,000) was heard by the author from many nearby residents who were encountered while he was away from the site. The residents were under the impression that SFC had released to groundwater 35,000 times the safe amount of uranium and that their drinking water supplies might thereby be endangered. This conclusion was unsupported by the facts at hand, and there continues to be no evidence for this conclusion. It was unfortunate that the release of information was not handled with greater care and clarity for public consumption. As it is, more damage has been done to the company's image by the content and format of the NRC announcement than by any SFC action.

5.1.3 Compartmentalized Job Performance Attitude

To a greater extent than is desirable, SFC employees do their work with a "binders-on" approach and hesitate to express concerns or get involved in "other people's business." Up to a point, each employee **should** be concentrating on his own job but, as a member of a team, he should also feel free to get involved in other aspects without repercussions or criticism. In many ways, this is not now the case.

5.2 DISCUSSION

Specific examples of difficulties that were caused by these cultural problems during the August excavation project are the following:

- Very delayed communication of early results to upper levels of management.
- Although it was then recognized that the NRC would want to be informed, additional delay in so informing it occurred. Many lower-level employees and supervisors stated that two NRC inspectors were onsite at the time that the initial high uranium concentrations were discovered in seepage and the drumming of seepage was initiated. Therefore, these employees concluded, incorrectly, that the NRC must be aware of it, and that notification would be redundant.
- Only after prompting by the NRC were efforts made to close pathways for any further migration from the uncovered uranium source.
- Personnel were reported to be unconcerned about subsequent leaking of drummed liquids back into a hole in the soil.
- Covering of the exhumed soil to prevent uncontrolled migration in event of heavy rainfall was delayed.

It is the author's judgment that none of these specific delays in taking appropriate actions would have occurred had the organization been free from the aforementioned cultural problems.

5.3 RECOMMENDATIONS

1. Management should take overt action to make all employees aware of the importance of controlled and contained handling of uranium compounds in all of its activities. This action should include direction on how to determine if an activity or observation is important when the employee is uncertain.
2. Management should take overt action to encourage open communication of pertinent information and to discourage failure to do so at all levels of the organization.
3. Management should encourage a team spirit and be tolerant of flexible divisions of responsibility in execution of work and be tolerant of "interference-type" suggestions.

6. IMMEDIATE AND SHORT-TERM CORRECTIVE ACTIONS

6.1 FINDINGS

Although there were numerous undesirable delays in defining and implementing corrective actions during the August excavation event, and many were not taken until after the NRC investigations began, SFC, in general, has been very good at conceiving and implementing both immediate and follow-up corrective actions following the various 1990 events that were reviewed. This was especially true when an event was immediately defined as a serious incident. In those instances, responsibility for development of corrective actions was promptly assigned.

For the most part, corrective actions that are taken following incidents are devised to prevent similar incidents. An exception was the action taken following Incident 90-4-2 in which only the offending group was re-educated in the proper use of lockout tags.

6.2 DISCUSSION

The underlying cause for the delayed implementation of corrective action from the August incident probably was the failure initially to regard it as a serious incident and to take the required actions. This, in turn, was mostly caused by the cultural problems discussed in Section 5.

6.3 RECOMMENDATION

Modify the Serious Incident Reporting system to include all occasions on which an unexpected hazard is discovered or an unusual situation is encountered that could lead to safety or environmental problems.

7. IMPLEMENTATION OF ROOT CAUSE ANALYSES

7.1 FINDINGS

No methodical determination of root causes has been performed by SFC following any of the 1990 incidents. Such determinations are becoming a standard practice elsewhere in the nuclear industry, and many reports and short courses are available so that personnel can learn how to perform these analyses.

7.2 DISCUSSION

A cursory root cause analysis of the August incident by the author indicates that the cultural problems cited in Section 5 are the primary cause of the failure to promptly report the incident to the NRC. There is a need for SFC to recognize that root cause analyses are needed to identify the basic cause(s) of an event and thereby enable corrective actions that give maximum assurance that similar events will not recur.

7.3 RECOMMENDATION

It is recommended that SFC implement a root cause determination for every incident and implement whatever corrective actions are appropriate as indicated by such determinations.

Appendix A

1990 Events Involving Reports to the NRC

No.	Date	Types of Report	Event Description
1	1/22/90	Informational	Approximately 14,000 lbs. of depleted UF ₄ was spilled on the floor of the DUF ₆ Reduction Plant over a 5-minute period due to equipment failure causing a bin overflow during DUF ₄ blending and packaging operations. Little material escaped to the environment, no injuries occurred, and only minimal radiation exposures were involved. SFC interpreted this as an event not requiring reporting under 10CFR20.403 but did inform Region IV on January 23, 1990.
2	3/28/90	Informational	<p>Due to excessive rainfall, freeboard levels in SFC ponds were approaching critical levels. Thus, liquids had to be transferred to the unlined pond 2, delaying completion of remediation activities there that were about 95% completed. Fortunately, subsequent weather conditions permitted all liquids to be contained in ponds, but completion of remediation of pond 2 has not yet been possible. It still has about 15 million gallons of liquid in it.</p> <p>Many actions have been taken to reduce the volume of impounded liquid. Due to the cumulative effect of these actions, and assuming normal rainfall, the equivalent of a spare pond, not counting pond 2, is predicted to be available in late 1990, and by late 1991, the equivalent of two spare ponds is expected. Remediation of pond 2 will continue after it is emptied.</p>
3	8/30/90	Per 10CFR 20.403(b)(3)	A small release of depleted UF ₆ occurred during cylinder heeling operations at the Depleted UF ₆ Reduction Plant. The release was apparently caused by a failure of the automatic valving function. Operators took immediate action, and the exhaust ventilation was shut down in about 5 minutes. About 100 grams of depleted uranium were released from the building, only two individuals were exposed, each to less than 0.01 MPC-hr. Corrective actions were completed to prevent recurrence, including revised interlock logic, thorough inspection of the distributive control system resulting in minor adjustments, and revision of the operating procedure.
4	8/90	Informational	During excavation of a 14-foot-deep pit at the north edge of the solvent exchange building to place the hexane storage tank and the dump tank in a concrete-lined pit to comply with new environmental regulations, significant amounts of uranium were encountered in excavated soil and in liquid seeping into the excavation. In total, about 3,000 kg of uranium were found in the excavated soil and about 50 kg of uranium in the liquid. Old-timers knew that significant amounts of uranium had entered the ground at this location from prior overflows of the dump tank and from numerous spills of concentrated uranium solutions from the old adjacent evaporator. They also knew that dilute uranium solutions had frequently leaked through several holes in the pre-1983 solvent exchange building floor. This knowledge, however, was not factored into the project planning. When samples of liquids seeping into the pit

No.	Date	Types of Report	Event Description
			<p>were found to range from 1 to 8 g/l U, and when soil samples were found to contain from 0.05 to 0.5% U, this information was not promptly communicated to management, although the liquids were drummed, and the soil was segregated.</p> <p>Because the purpose of the project was to protect the surroundings from inadvertent leakage of hydrocarbons, the initial emphasis was on project requirements to look for escaped hexane. Excavation on this project began on July 31, 1990. The first high-concentration uranium sample in seepage was encountered on August 6 (2.06 g/l), at which time drumming of liquid seepage was initiated. Since no preexcavation preparations had been made for dealing with uranium, results were not correlated nor reported to upper levels of management until about August 17. At that point, it was agreed that the NRC should be informed, but it was decided to await the return of the Sr. Vice President and President to the plant after the weekend before doing so. On August 22, Region IV of the NRC was informed of the situation, and numerous communications and onsite investigations ensued and were still in progress at the time of this review.</p> <p>At the time of this review, most of the drummed seepage had been recycled through the miscellaneous digester, about 2/3 of the soil had been placed in drums on the yellowcake storage pad, and the remainder of the soil had been placed on plastic sheeting on the yellowcake storage pad and covered with plastic. Also, about a dozen buried pipeways leading to or from or near the solvent exchange building had been excavated at a point, concrete bulkheads were poured, and sampling pipes were installed upstream of the bulkheads to prevent any further underground seepage from the area and to permit recovery of any subsequent seepage to those points. Soil from these excavations was also placed on the yellowcake storage pad.</p>
5	6/6/90	Informational	Solvent extraction fire foam system activated itself when a corroded pipe allowed decay in supervisory pressure. No fire and minimal downtime.
6	8/5/90	Informational	Fertilizer tractor trailer rig overturned while negotiating a turn on back roads, spilling 1,500 gal. of 14 g/l nitrogen fertilizer onto SFC property and road right-of-way. Driver received minor injuries. Right of way was scalped, and soil placed on adjacent SFC property.

Appendix B

1990 Incidents Not Involving Reports to the NRC

No.	Date	Description	Corrective Action Status
90-4-1	4/3/90	Customer slurry was being transferred in the ADU building when the receiving tank overflowed for about 5 minutes. Material had to remain on the floor about 2 hours awaiting space to which it could be pumped. The next day, environmental samples were high. This prompted close examination of the floor, and cracks were found that were later repaired.	Closed
90-4-2	4/25/90	Failure to tag out drum elevator at sampling plant during lunchhour repairs. No injuries or damage.	Closed
90-5-1	5/2/90	Pond dredge cut a cable, which tangled and capsized pump and cutter hydraulics. No injuries.	Closed
90-5-2	5/29/90	Ash receiver cart upended when the receiver was placed too far back on a cart that had too long of a platform. No injuries but a near miss.	Closed
90-7-1	7/10/90	When hydrotesting a new boildown tank resting on poor footing, it fell over, causing no injuries but minor equipment damage.	Closed
90-8-2	8/15/90	A sulphuric acid leak at the cooling tower was improperly neutralized with caustic soda beads causing a rapid reaction. No injuries or damage were encountered.	Open
90-8-3	8/16/90	The blower providing suction for the health physics air sampling system failed at 2300 hours, and the alarm sounded. Those on duty did not know what the alarm meant and inquired. The shift supervisor told the operator, but since someone had silenced the alarm, the supervisor assumed that the blower had been restarted. When finally restarted, the blower had been out-of-service for 7 hours.	Open

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