

COMPLIANCE INSPECTION REPORT

Category I  
Priority II

1. Name and address of licensee  Kerr-McGee Corporation Kerr-McGee Building Oklahoma City, Oklahoma 73102	2. Date of inspection April 29 and 30, 1970
	3. Type of inspection Announced Initial/ Investigation
	4. 10 CFR Part(s) applicable 20 and 40

5. License number(s), issue and expiration dates, scope and conditions (including amendments)

License No. SUB-1010 (Docket No. 40-8027), Issued October 14, 1969

License Condition No. 8 - For storage only

Amendment No. 1, Issued November 24, 1969

License Condition No. 8 - For sampling only

Amendment No. 2, Issued February 20, 1970

For complete operations

"8. Authorized use (Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.)  
Subject to the conditions specified herein, this license authorizes the activities described in the licensee's application dated September 23, 1969, as supplemented January 14 and February 3, 1970, in accordance with the representations, specifications, and procedures in Appendix A of the said application, including supplements."

"11. This license authorizes the use of respirators in determining employee exposures to airborne radioactive materials subject to the conditions and specifications in the attached Annex A."

6. Inspection findings (and items of noncompliance)

The initial inspection and an investigation to determine answers to the questions posed by letter dated March 19, 1970, from Congressman Allard K. Lowenstein to Dr. Glenn T. Seaborg, Chairman, U. S. Atomic Energy Commission, were conducted on April 29 and 30, 1970. The plant was in limited production since the startup of sample operations and initial processing beginning on March 2, 1970. The processing, as of the time of the inspection, had proceeded only up to the process stage preceding hydrofluorination. Due to lack of approval for deep well disposal, waste streams were being routed to the #1 holding pond and the Illinois River. The inspection covered review of process, waste management, training, written procedures, personnel monitoring, airborne effluents, surveys, unusual occurrences, audits and records required by the license and 10 CFR Part 20, instruction of personnel and posting and labeling.

With respect to the investigation, prompted by a letter from Congressman Allard K. Lowenstein to Dr. Glenn T. Seaborg dated March 19, 1970, and attached as Exhibit A, the two questions specifically to be covered by the inspection disclosed that no measurements were made or planned with respect to airborne discharges of HF which, according to design and 5,000 TPY throughput, were estimated to be ~ .003 ppm (see paragraph 17) in the main stack exhaust at point of stack discharge and scrubber water from the HF scrubber was flowing at 60 gallons per minute to a limestone pile some 300 feet south of the plant and hence into the Illinois River. This scrubber stream was also fed by about 700 gallons per minute of Tenkiller Lake plant bypass water and intermittent low-volume liquid lab effluents. No measurements had been performed in this

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7. Date of last previous inspection  None	8. Is "Company Confidential" information contained in this report? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (Specify page(s) and paragraph(s))
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DISTRIBUTION:

Glenn D. Brown, Senior Radiation Specialist  
Herman J. Papp, Jr., Radiation Specialist

Approved by:

Donald I. Walker, Director  
Regional IV, Division of Compliance, Denver  
(Operations office)

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(Data report prepared)

If additional space is required for any numbered item above, the continuation may be extended to the reverse of this form using foot to head format, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form under appropriate item.

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RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

Kerr-McGee Corporation  
Kerr-McGee Building  
Oklahoma City, Oklahoma

License No. SUB-1010

Paragraph 6 (continued)

stream by the licensee. The HF gas had not been in contact with <sup>uranium</sup> since no hydrofluorination had been performed to date. The licensee had permission for the above noted discharge from the Oklahoma Water Resources Board (see paragraphs 13 and 43). No limits for airborne HF concentrations have been set by the State of Oklahoma, and the licensee has had no contact with the State concerning this. (See paragraph 17)

The following items of noncompliance were noted during the course of the inspection:

Contrary to the requirements of 10 CFR 20.201(b), "Surveys," adequate surveys were not conducted in order to show compliance with 10 CFR 20.106(a), "Concentrations in effluents to unrestricted areas," in that:

- (1) During the period March 3 through April 27, 1970, the measured concentration of uranium in airborne effluents discharged to the environs from the sampling plant dust collection system in the restricted area averaged  $8.3 \times 10^{-11}$  uc/ml (41 X MPC for the unrestricted area), (see paragraphs 31 and 33) and,
- (2) During the period March 9 through March 17, 1970, the measured daily concentrations of uranium in airborne effluents discharged to the environs from the sample preparation room exhaust system in the restricted area were in the range of  $6 \times 10^{-12}$  uc/ml to  $9.5 \times 10^{-11}$  uc/ml (3 to 47 X MPC for the unrestricted areas). (See paragraphs 32 and 33)

Contrary to the requirements of License Condition No. 8, during the period from plant startup on March 2 through April 30, 1970, the environmental airborne sampling program was not maintained in accord with procedures defined in Appendix A, Page 11, in that, no samples, which are required monthly, were collected at downwind locations along the restricted area fence, during periods of plant operation. (See paragraphs 15, 16, and 34)

Contrary to the requirements of 10 CFR 20.201(b), "Surveys," during the period March 3 through March 20, 1970, no air samples were obtained to determine concentrations of radioactive materials at the third and fourth floor work area of the sampling tower and in the sample preparation room, for purposes of showing compliance with 10 CFR 20.103(a), "Exposure of individuals to concentrations of radioactive material in restricted areas," (See paragraphs 37 and 38)

Contrary to the requirements of 10 CFR 20.201(b), "Surveys," during the period March 3 through March 31, 1970, in which the average measured concentrations of airborne uranium repetitively showed values in excess of the applicable MPC of  $6 \times 10^{-11}$  uc/ml on the first and second floor work areas of the sampling tower, surveys were inadequate to show compliance with 10 CFR 20.103, "Exposure of individuals to concentrations of radioactive material in restricted areas," in that, no information was obtained to time-weight the exposure of assigned personnel and no information was maintained regarding the intermittent wearing of respiratory protection by assigned personnel as authorized by License Condition No. 11. (See paragraphs 37 and 39)

(continued)

Kerr-McGee Corporation  
Kerr-McGee Building  
Oklahoma City, Oklahoma

License No. SUB-1010

Paragraph 6 (continued)

Contrary to the requirements of License Condition No. 11, which authorize the use of respirators, the licensee did not follow all conditions and specifications as required in Annex A in the use of respiratory protection in those areas where concentrations of airborne material exceeded Part 20 limits. The following deficiencies were noted: (See paragraphs 20 through 27)

- (1) Contrary to the requirements defined in Paragraph 1, C(ii), procedures were not established to assure proper selection and supervision of personnel using protective respiratory equipment.
- (2) Contrary to the requirements of Paragraph 1, C(iii), no procedures were established to assure the adequate fitting of respirators and the testing of this equipment for operability.
- (3) Contrary to the requirements defined in Paragraph 1, C(iv), procedures were not established for maintenance of respiratory equipment to assure full effectiveness of the equipment, including issuance, cleaning and decontamination, inspection, repair, and storage.
- (4) Contrary to the requirements defined in Paragraph 1, C(v), employee bioassay results, ranging up to 230 ug/l on March 5, 6, and 9, 1970, were not used to evaluate individual exposures and to assess protection provided by respiratory equipment.
- (5) Contrary to the requirements of Paragraph 1, C(vi), during the period March 3 through April 30, 1970, the licensee failed to initiate a record program for purposes of permitting periodic evaluation of the adequacy of the respiratory protective program.

Contrary to 10 CFR 20.201(b), "Surveys," adequate surveys were not conducted in order to show compliance with 10 CFR 20.103(a), "Exposure of individuals to concentrations of radioactive material in restricted areas," during the following described nonroutine maintenance operations and unusual contamination conditions:

- (1) Airborne concentrations of uranium were not determined on March 2, 1970, when maintenance personnel were involved in the opening and repair of the bucket elevator after it had become plugged and leaked following the introduction of seven drums of yellow cake. (See paragraphs 41 and 42)
- (2) No evaluations of concentrations of airborne uranium were made following the failure of the mechanical drum dumper to accept a short drum on March 11, 1970, which resulted in a spill of approximately 250 pounds of yellow cake. The extent of contamination on the three floor levels of the sampling plant was not defined in the records. (See paragraphs 41 and 42)
- (3) No evaluations of concentrations of airborne uranium were made during the occurrence and subsequent cleanup operations related to a spill involving yellow cake on the storage level on March 13, 1970. The amount and extent of contamination were not defined in the records. (See paragraphs 41 and 42)

Kerr-McGee Corporation  
Kerr-McGee Building  
Oklahoma City, Oklahoma 73102

License No. SUB-1010 (Docket No. 40-8027)

Date of Inspection: April 29 and 30, 1970  
Announced, initial inspection

Persons accompanying inspectors:

Robert Craig, Engineer, Division of Radiological Health,  
Oklahoma State Department of Health  
Kirk Malone, Physicist, Oklahoma State Department of Health

Licensee Personnel contacted:

Burnell Brown, Plant Manager  
George Wuller, Licensing and Regulation Officer  
A. M. Valentine, Health and Safety Officer  
F. J. Edwards, Jr., Facility Health and Safety Officer  
Jim Craig, Production Manager  
D. Foley, Engineering Manager  
Sample Tower Operators

## REPORT DETAILS

### Inspection History

9. A precicensing inspection was conducted by John McBride and Don Harmon, of DML, accompanied by G. D. Brown, Region IV, on February 13 and 14, 1970.

### Plant Location

10. The Sequoyah Plant is located in Sequoyah County, Oklahoma, near Gore, Oklahoma, on several hundred acres of land belonging to Kerr-McGee. The nearest inhabited area is a farmhouse located about one mile from the plant.

### Organization and Function

11. The organization chart on page 6 shows the present management, with respect to the Sequoyah facility, according to George Wuller.

Burnell Brown is the Plant Facility Manager and F. Edwards is the Facility Health and Safety Officer, who is responsible to Brown for plant safety. G. Wuller and A. Valentine, Licensing and Regulation Officer and Health and Safety Officer, respectively, are responsible for providing technical assistance to plant personnel and for performing audits of plant health and safety. The plant employs approximately 45 operators, 25 maintenance personnel, 10 clerical, and 20 supervising and engineering personnel on a three-shifts-per-day, seven-days-per-week operation.

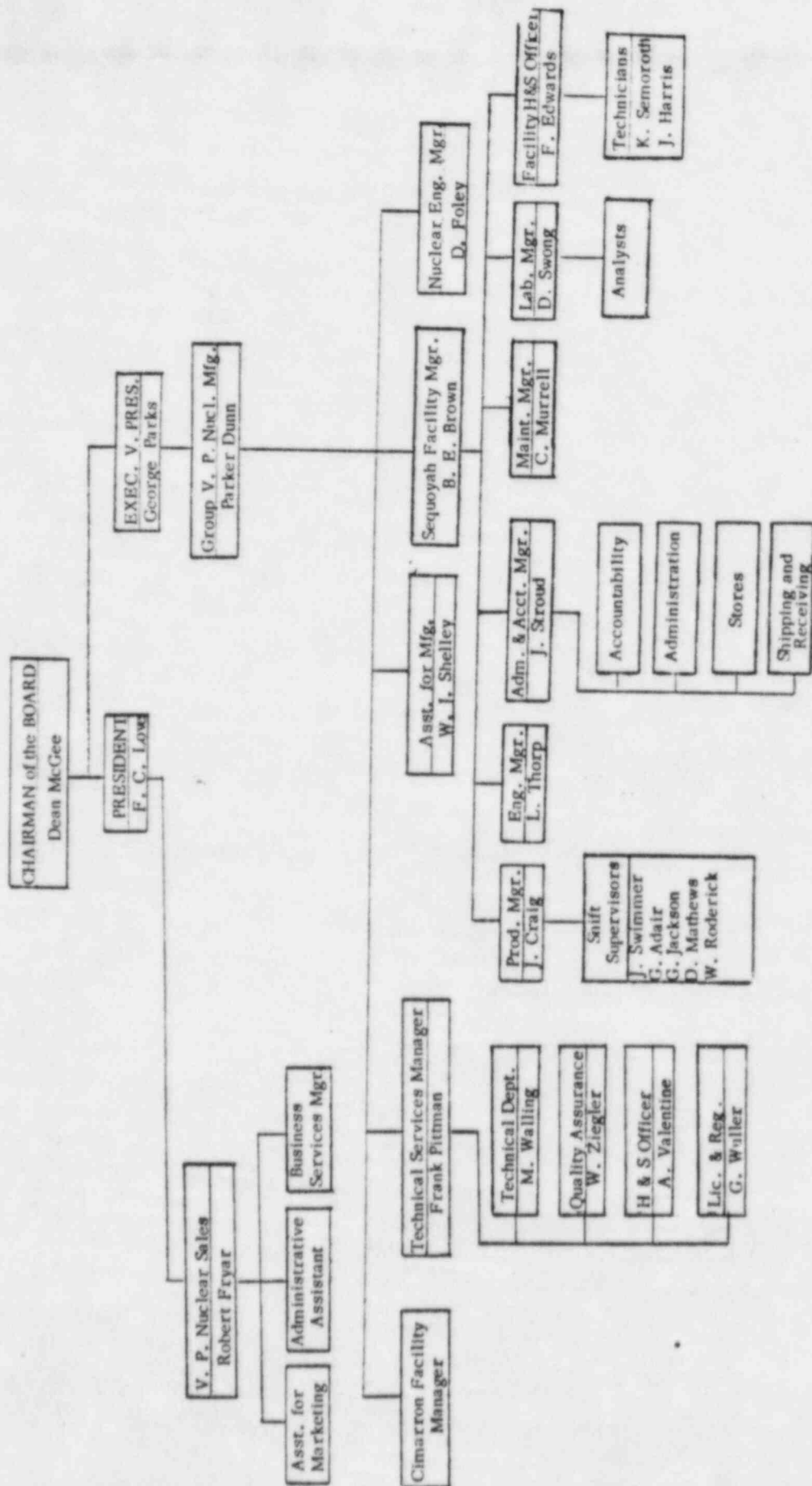
### Plant Process

12. A process flowsheet and schematic drawing of the plant process are shown on pages 7 and 8 of the report. The plant is currently designed to convert 5,000 tons per year of uranium feed material (yellow cake) to uranium hexafluoride for shipment to enrichment facilities. The sampling and feed portion of the plant is constructed to process twice this amount and room has been left in the other stages of the process to increase capacity at some future date, according to Wuller and Brown. The process was observed to be as described in the license application, with some modification in liquid waste disposal due to deep well disposal not authorized at present, according to Craig.
13. All liquid waste streams, with the following exceptions, are impounded in the #1 retention pond, according to Brown and Craig. HF scrubber water, currently 60 gallons per minute, is drained to a limestone bed for neutralization and hence to the Illinois River. Craig said that no off-gas from the fluorination process has passed through the scrubber, to date. Low volume wastes from the laboratory, HF vaporizer room floor sump and neutralization room floor sump, along with Lake Tenkiller water bypass are also drained to the Illinois River, for a total flow of approximately 800 gallons per minute (see Exhibit B). Edwards and Craig stated that no analyses had been performed on this stream. Independent samples were obtained by the inspectors (see paragraph 43). HF scrubber flow in this stream is determined by the material flow into the scrubber. Dave Foley stated that temporary permission was given to Kerr-McGee by the Oklahoma State Water Resources Board to divert these streams to the Illinois River. The waste stream (raffinate) from the solvent extraction process is diverted, at present, to the #1 retention pond. Wuller and Craig stated that, at present, the raffinate is placed in holding tanks for analysis for process loss prior to disposal; a sample cut each hour is collected for an 8-hour analysis for uranium and the 8-hour samples are composited into weekly sampling for analyses of Ra-226 and thorium. They stated that no analytical results for radium and thorium had been completed at the time of the inspection. Accepted process loss for uranium is 0.1 gram/liter, but they have run about one gram/liter uranium in the 40,000 gallons of raffinate that had been disposed of to the #1 pond up to the time of the inspection, due to process problems during startup.

### Airborne Effluents and Ventilation System

14. The off-gas system was determined from discussions with Foley, Craig, and Wuller to be as described in the license application. Essentially, the systems where release of radioactive materials is possible are the main stack (150 feet high) with a flow rate of a minimum of  $8.85 \times 10^4$  cfm, to a nominal flow rate of  $1.9 \times 10^5$  cfm. This exhaust is not sampled. Vacuum and dust collection system consisting of a cyclone separator and felt bag filters are used for the vacuum and sample room stack exhausts. The flow from the vacuum system is 750 cfm and 4,400 cfm from the dust collection system.

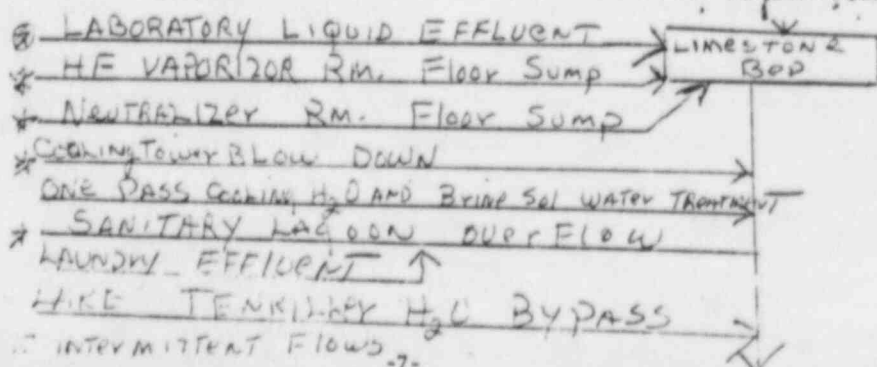
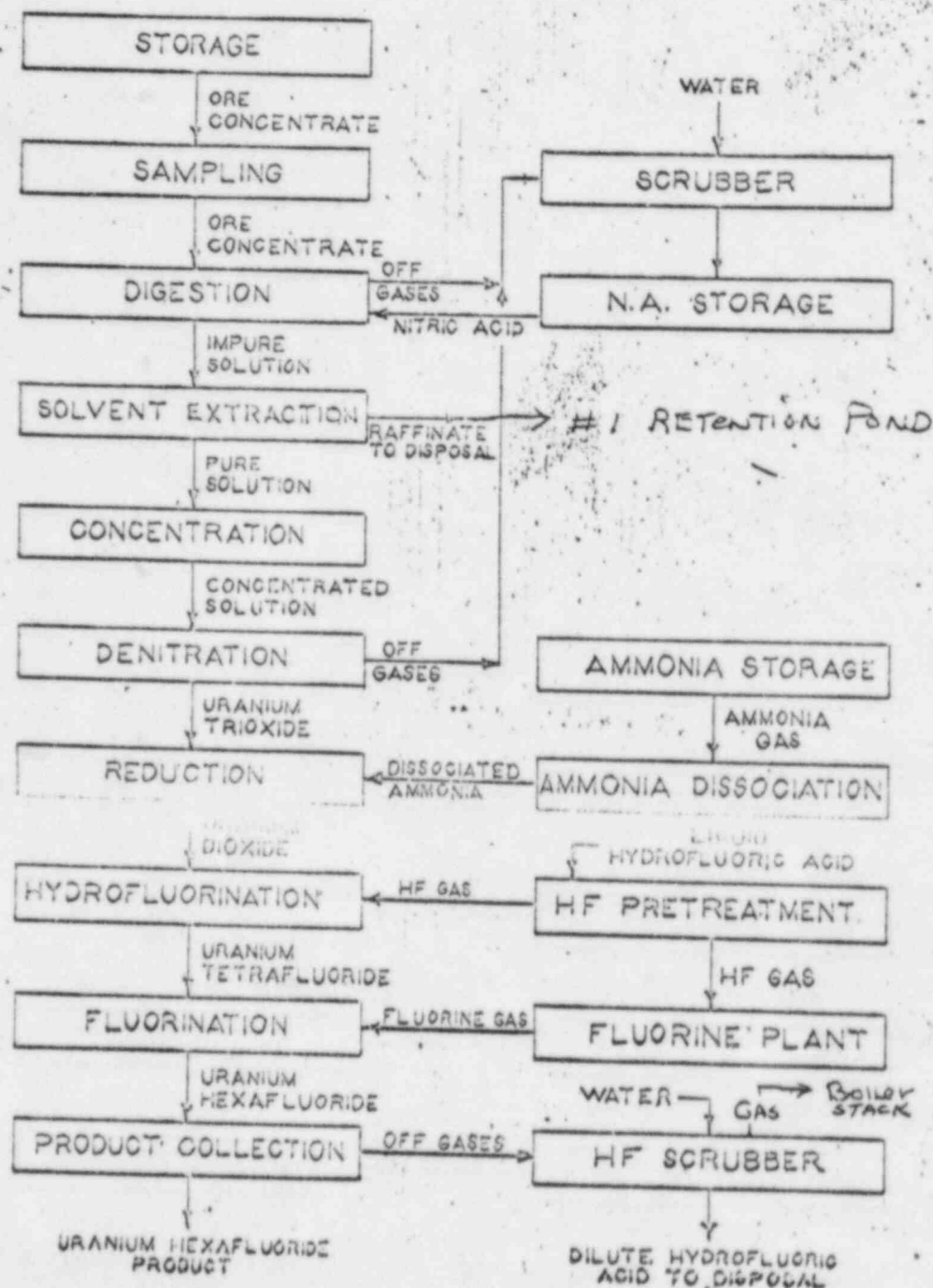
# KERR-MCGEE CORPORATION NUCLEAR ORGANIZATION



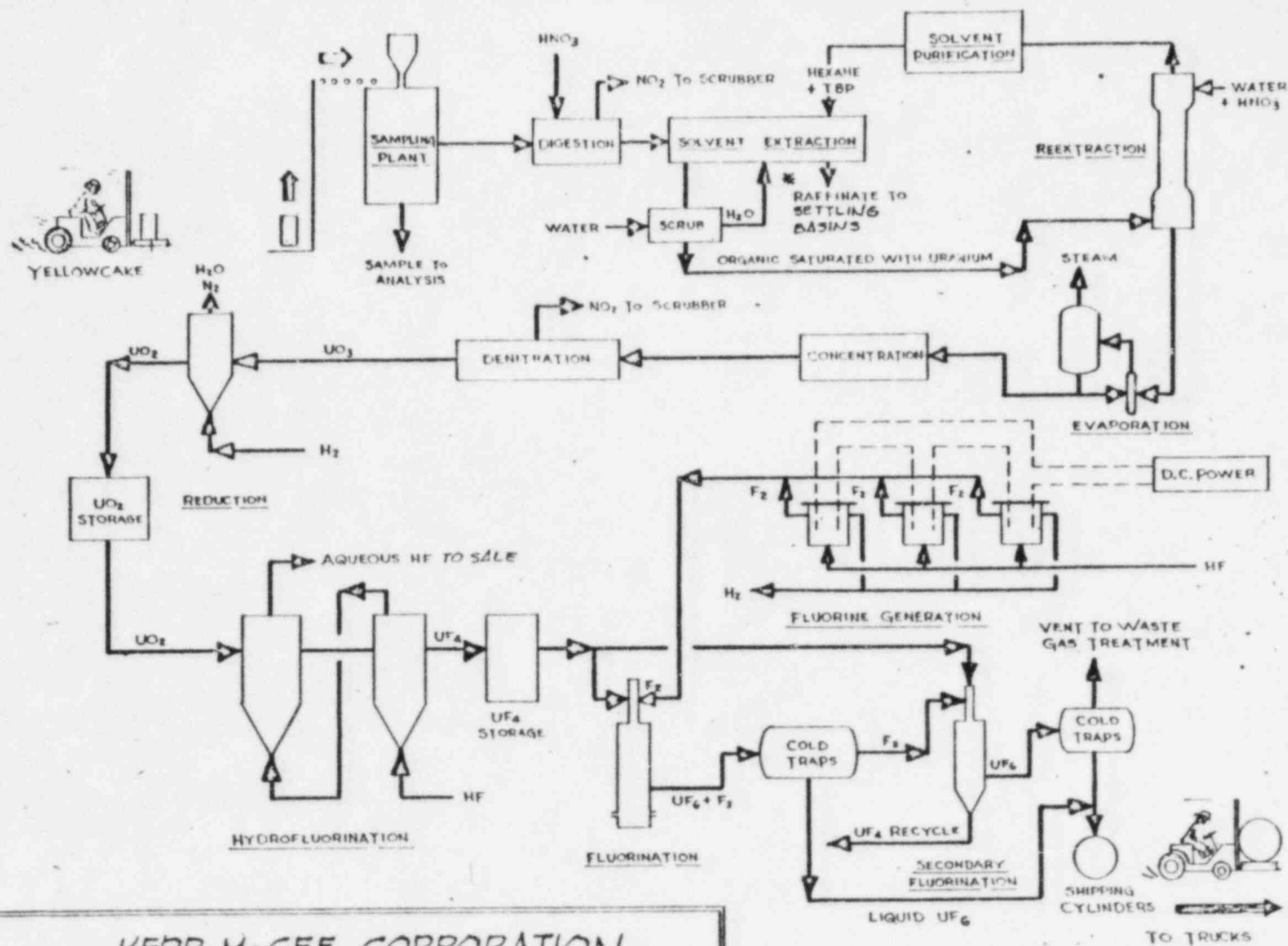
April 30, 1970



# SEQUOYAH PROCESS FLOWSHEET



ILLINOIS



**KERR-McGEE CORPORATION**  
**SCHEMATIC OF SEQUOYAH FACILITY PROCESS**



The building ventilation exhausts through several roof vents. The vacuum and dust collection systems are sampled continuously for 24 hours during each month. The building exhausts are not sampled, but concentrations exhausted are related to inplant air concentrations. Sample results, to date, are described in paragraph 30.

#### Airborne Effluents to the Unrestricted Area

15. No sampling of the main stack is performed, according to Wuller and Edwards, and only intermittent sampling is performed on the vacuum and dust system exhausts. The licensee, in the application, has described a diffusion model for the basis for no sampling and specifying (Appendix A of the license application, which is incorporated in License Condition No. 8) that environmental sampling at the perimeter of the restricted area and other areas be performed as follows:
  - (a) Monthly sampling during plant operation at downwind locations along the restricted area fence.
  - (b) Quarterly air sampling at upwind and downwind locations from plant in area of maximum ground level concentrations, as determined by acceptable diffusion calculations.
  - (c) Air sampling at occupied locations in the immediate surroundings and in area of maximum concentration, as determined by acceptable diffusion calculations, in event of an accidental release of airborne radioactivity.
16. Wuller and Edwards stated that no airborne environmental samples have been taken since plant startup on February 23, 1970. Therefore, no monthly samples were taken in accordance with Item (a), above. The plant had not operated three months at the time of the inspection (see paragraphs 33 and 34).
17. Foley and Wuller stated that no discussions or approvals had been obtained from the Oklahoma Air Pollution Board with respect to airborne concentrations of HF or other chemical pollutants, nor did the licensee have any plans for a sampling program for the above. Foley stated that the design basis for emission of HF from the HF scrubber was 0.003 ppm. This is based on a throughput of 5,000 tons per year of feed with results in a discharge of 0.033 lb-mole per hour of HF through the main stack which has a minimum flow rate of  $8.85 \times 10^4$  cfm. Robert Craig, Oklahoma State Health Department, confirmed that no contacts had been made with the State and that the State, at present, had no standards for HF pollution, but that the State would immediately look into the problem. A design sheet for the HF scrubber is attached as Exhibit C.

#### Processing from Startup to Date of Inspection

18. Approximately 80,000 pounds of U308 have been processed through sampling and, at the time of the inspection, 20,000 pounds of UO3 were in UO3 storage. No hydro-fluorination had taken place. Only one denitrator had been operated. Approximately 40,000 gallons of raffinate from solvent extraction had been discharged to the #1 retention pond. Seventeen fluoride cells had been actuated. The above information was supplied by Craig and from review of the operating logs.

#### Unusual Occurrences

19. According to Craig and Edwards, on April 2, 1970, while attempting to unplug a line in the boildown and feed to the denitrator, a low pressure steam line of about 10 psi was used instead of 100 psi specified was used. Additionally, the line was not closed as required by operating procedures prior to starting feed pumps (120 psi). Consequently, about 2500 pounds of uranium, as UNH,\* was backed up through the process steam system and eventually to the steam boiler and cooling tower. The concentration was about 8 pounds U/gallon of UNH solution. The system was drained and backflushed as soon as detected to remove the acidic material from the carbon steel system. The material was drained and flushed to the #1 retention pond. The incident was noted by an unusual reading on a conductivity meter reading in the control room. Procedures have been modified to preclude recurrence. The above information supplied by Craig, Wuller, and Edwards. Edwards stated no material became airborne. Inplant spills are described in paragraphs 41 and 42.

\* uranyl nitrate hexahydrate

#### Respiratory Protective Equipment Program

20. License Condition No. 11 authorizes the use of respirators in determining employee exposures to airborne radioactive material subject to conditions and specifications described in Annex A. During the review of airborne concentrations measured in the restricted area, and the review of exposure of personnel to these measured concentrations, Mr. Edwards affirmed that respirators are worn intermittently by operating personnel. During the tour of the facility, it was observed that certain operators carried respirators; however, no operator was observed to be wearing a respirator. Edwards stated, and observation verified, that the licensee uses a MSA Comfo, 2-cannister, half-mask in this program. It was noted in the records that, in accord with Condition No. 2 of Annex A, the licensee notified the Director, CO:IV, in correspondence dated March 12, 1970, that the respiratory protection program was initiated effective February 23, 1970. The conditions for use of respiratory protective equipment, as defined in Annex A, were reviewed with the licensee. Mr. Edwards stated that, in accord with conditions defined in paragraph 1, Item B., users of respiratory equipment have been informed, through the media of safety meetings and refresher training, that they may leave the area for relief from respirator use in case of equipment malfunction, discomfort, or any other condition that might cause reduction in the protection afforded the wearer. Two sample tower operators were personally contacted by the inspector during the tour of the facility and they stated to the inspector that they had received these instructions during their training and during safety meetings.
21. Deficiencies in the licensee's air sampling program and inadequacies in related surveys conducted for purposes of identifying the hazard and evaluating individual exposure, in reference to the requirements of Annex A, paragraph 1, Item C(i), were noted. Items of noncompliance related to these deficiencies are discussed in this report under "Restricted Area Air Sampling Program."
22. Edwards stated, and a review of procedures verified, that the licensee had not established any procedures for purposes of assuring the proper selection, supervision, and adequate training of personnel using respiratory equipment. Edwards stated that the selection of respiratory equipment and the determining of when to wear and when not to wear the equipment is done at the discretion of the employee. Edwards and Valentine were informed that the licensee's failure to establish procedures for purposes of assuring proper selection and supervision of personnel using protective respiratory equipment was in noncompliance with License Condition No. 11, which references Annex A, wherein paragraph 1, C(ii), states that such procedures shall be maintained.
23. Edwards and Valentine stated that the licensee did not have any procedures for assuring the adequate fitting of respirators and the testing of equipment for operability. Edwards and Valentine were informed that the failure to have these procedures was in noncompliance with the requirements of License Condition No. 11, which references Annex A, wherein paragraph 1, C(iii), states that such procedures shall be established.
24. Edwards stated that no procedures had been established for maintenance of respiratory equipment to assure full effectiveness of the equipment, including issuance, cleaning and decontamination, inspection, repair, and storage. Edwards stated that, to the best of his knowledge, there had been no occasions where equipment was found to be faulty or in the need of repair. He stated that individual operators perform their own selection of equipment and that the operators change the cannisters as they deem necessary. It was noted that the licensee does perform portable instrument surveys for purposes of assuring complete decontamination after any mask has been cleaned. Records of these surveys were maintained. Edwards and Valentine were informed that the failure to establish procedures for maintenance of respiratory equipment to assure full effectiveness of the equipment, including issuance, cleaning and decontamination, inspection, repair, and storage, was in noncompliance with the requirements of License Condition No. 11, which references Annex A, wherein paragraph 1, C(iv), states that such procedures shall be established.
25. The results obtained from the monthly and special bioassay programs conducted by the licensee (see paragraph 37) were not used to evaluate individual exposures and to assess protection actually provided by respiratory devices, according to Edwards. It was noted that nearly all bioassay results for samples collected during the period March 5 through March 9, 1970, exceeded the background established for the employees sampled by factors ranging from 3 to 23. The maximum results showed 230 micrograms per liter. Edwards stated that he recognized that values of this order of magnitude

could be appropriately used to assess the validity of protection factors for respiratory equipment; however, he stated that they had not established procedures for conducting this evaluation and, to date, had not implemented any evaluation program. Edwards and Valentine were informed that the failure to have these procedures and the failure to evaluate individual exposures and to assess protection actually provided was in non-compliance with the requirements of License Condition No. 11, which references Annex A, wherein paragraph 1, C(v), states that these procedures shall be established and these evaluations shall be made.

26. Edwards stated that the licensee had not initiated any record-keeping program regarding the times and intervals when respiratory protection was worn by personnel exposed to known concentrations of airborne uranium. It was apparent that this record deficiency precluded any possibility of the licensee performing an evaluation of the adequacy of the respiratory protective program. Edwards and Valentine were informed that the failure to initiate and maintain the record program for purposes of permitting periodic evaluation of the adequacy of the respiratory protective program was in noncompliance with License Condition No. 11, which references Annex A, wherein paragraph 1, C(vi), states that such records shall be maintained.
27. From the above discussions and statements of the licensee, it was apparent that the licensee had not established any procedures related to the testing, use, and evaluation of the respiratory protection program. Similarly, no record-keeping systems have been initiated or maintained. Messrs. Edwards and Valentine acknowledged this overall deficiency and Valentine stated that the requisite procedures and records, as required by Annex A, paragraph 1, Items C(ii) through (vi) would be implemented and maintained.

#### Personnel Monitoring - External Dosimetry

28. Records exhibited by the licensee showed that whole body exposure to radiation is evaluated by film badge. The licensee subscribes to a monthly film badge exchange service furnished by U. S. Testing, Richland, Washington. The records showed that approximately 60 employees are badged in the licensee's program. A review of exposure records for the period covered by this inspection showed that the maximum quarterly exposure received by any employee was 60 mr. It was apparent from this review that no licensee personnel are likely to receive radiation exposure in excess of 25% of 10 CFR 20.101(a) limits.

#### Personnel Monitoring - Internal Dosimetry

29. Records maintained by the licensee showed that a bioassay sampling program was conducted for all employees prior to startup operations for purposes of evaluating background uranium deposition. The results of this program showed values in the range < 10 ug/l to 40 ug/l. Valentine stated that coincident with startup of operations, the licensee initiated a monthly bioassay sampling program. Valentine estimated that approximately 90% of the samples collected are analyzed at the Kerr-McGee research center, Oklahoma City, and the remaining 10% are forwarded to Eberline for analysis. Results of the March sampling program were available for review, whereas the April samples were in the process of analysis at the time of the inspection. The review of the March results showed uranium values ranging from background to 230 ug/l. One employee showing the value of 230 ug/l was resampled three days later and the value was observed to have decreased to 40 ug/l. This employee was the only individual showing a value in excess of 150 ug/l which, according to the licensee's procedures, requires resampling and work restriction. Valentine stated that the employee was placed on a work restriction during the period in which the bioassay measurement decreased from 230 ug/l to 40 ug/l.

#### Airborne Radioactive Effluents to Unrestricted Areas

##### 30. General

Operation of the Sequoyah facility, as performed during the period covered by this inspection, provided two potential sources from which radioactive contaminants were discharged to the environs. These include (1) the stack which vents the dust collection system from the four work levels of the sampling plant and, (2) the stack which vents the exhaust from the hoods and downdraft tables in the sample preparation room. The vent from the sampling plant dust collection system includes all air discharged from

the drum vacuum system, the mechanical dumper system, the sample splitter station, and the redrumming station. The air stream goes to a cyclone collector and is exhausted from the roof of the sample tower. The exhaust system from the sample preparation room, which includes the effluent discharged from the hoods and the downdraft tables, exhausts directly to the roof and is not filtered in any manner. Each of these exhaust systems was observed to be provided with a sampling port from which the licensee collects air samples using a Gelman vacuum sampler. Edwards stated that samples are collected on Gelman glass fiber filter paper and subsequently counted in a NMC proportional counter Model 3PC-3T. The results obtained from the sampling program conducted on these two stacks during the period covered by this inspection were reviewed and it was noted that the average concentration of natural uranium discharged to the environs through these two systems repetitively exceeded the MPC of  $2 \times 10^{-12}$  uc/ml for the unrestricted area.

31. Records exhibited by the licensee showed that the airborne concentration of uranium discharged from the exhaust in the sampling plant dust collection system exceeded  $2 \times 10^{-12}$  uc/ml during the following period:

<u>Date</u>	<u>Concentration of Uranium Discharged</u>
March 3, 1970	$1.7 \times 10^{-10}$ uc/ml
March 4, 1970	$1.4 \times 10^{-10}$ uc/ml
March 5, 1970	$7.1 \times 10^{-11}$ uc/ml
March 9, 1970	$8.9 \times 10^{-11}$ uc/ml
March 10, 1970	$8.1 \times 10^{-11}$ uc/ml
March 11, 1970	$5.0 \times 10^{-11}$ uc/ml
March 12, 1970	$2.1 \times 10^{-11}$ uc/ml
March 13, 1970	$4.6 \times 10^{-11}$ uc/ml
March 16, 1970	$1.1 \times 10^{-10}$ uc/ml
March 17, 1970	$1.2 \times 10^{-10}$ uc/ml
March 20, 1970	$1.3 \times 10^{-10}$ uc/ml
March 23, 1970	$2.5 \times 10^{-11}$ uc/ml
March 31, 1970	$1.1 \times 10^{-10}$ uc/ml
April 16, 1970	$7.8 \times 10^{-12}$ uc/ml
April 27, 1970	$7.9 \times 10^{-11}$ uc/ml

32. Records exhibited by the licensee showed that airborne concentrations of uranium discharged to the environs from the sample preparation room exhaust stack exceeded  $2 \times 10^{-12}$  uc/ml on the following occasions:

<u>Date</u>	<u>Concentration of Uranium Discharged</u>
March 9, 1970	$7.9 \times 10^{-11}$ uc/ml
March 10, 1970	$2.2 \times 10^{-11}$ uc/ml
March 11, 1970	$1.2 \times 10^{-11}$ uc/ml
March 12, 1970	$6 \times 10^{-12}$ uc/ml
March 13, 1970	$1.4 \times 10^{-11}$ uc/ml
March 16, 1970	$9.5 \times 10^{-11}$ uc/ml
March 17, 1970	$2.9 \times 10^{-11}$ uc/ml

33. With reference to the repetitive discharge of uranium concentrations above the MPC of  $2 \times 10^{-12}$  uc/ml from the sample preparation room and sample tower exhaust system, Mr. Edwards was asked what concentrations of uranium were measured at sampling locations in the unrestricted area. Mr. Edwards stated that no air samples had been collected from the environs since the completion of the preoperational background study during the summer of 1969. Messrs. Edwards and Valentine were informed that the licensee's failure to evaluate the concentrations in the unrestricted area following the discharge of above MPC concentrations, noted in paragraphs 31 and 32, was in non-compliance with the requirements of 10 CFR 20.201(b), "Surveys," in that, no surveys were performed for purposes of showing compliance with 10 CFR 20.106(a), "Concentration in effluents to unrestricted areas." In particular, it was noted that environmental air sampling surveys were inadequate during the period March 3 through April 27, 1970, when the airborne concentration of uranium discharged to the environs from the sampling plant dust collection system averaged  $8.3 \times 10^{-11}$  uc/ml, and during the period March 9 through March 17, 1970, when the measured daily concentrations of uranium in airborne effluents discharged to the environs from the sample preparation room exhaust system were in the range of  $6 \times 10^{-12}$  uc/ml to  $9.5 \times 10^{-11}$  uc/ml. Messrs. Valentine and Edwards acknowledged this deficiency and stated that they would initiate the air sampling program in the unrestricted area immediately.



34. It was further noted that the licensee's failure to conduct an environmental air sampling program was contrary to the requirements of License Condition No. 8, in that, during the period from plant startup on March 2, 1970, through April 30, 1970, the environmental airborne sampling program was not maintained in accord with procedures defined in Appendix A, Page 11, which state that monthly air samples will be collected during periods of plant operation at downwind locations along the restricted area fence. Edwards stated he was not aware of this license requirement and Valentine stated that, although he was aware of the requirements, he was not aware of the fact that these samples were not being collected and evaluated. Valentine stated he would implement the necessary actions to initiate the reference monthly sampling program.

#### Restricted Area Air Sampling Program

35. The licensee employs 18 fixed-location air samplers which are operated from the plant vacuum system and uses four portable "Gelman" vacuum samplers for the conduct of special studies. Five of the fixed-location samplers are located in the sampling plant and are operated for 8-hour intervals, coincident with the work schedule in the sampling plant. The remaining 13 fixed air samplers are located throughout the plant and are operated continuously for 24-hour intervals.
36. Messrs. Valentine and Edwards stated, and the records verified that, the installation of the 18 fixed-location samplers was completed on April 6, 1970, and that these samplers have been maintained in continuous service since that date. Prior to April 6, 1970, the portions of the air sampling program that the licensee did conduct were performed using the four portable "Gelman" type samplers.
37. Records exhibited by the licensee showed that following the introduction of feed material into the sampling plant on March 2, 1970, the licensee initiated an air sampling program at locations on the first floor level and second floor level of the sampling plant. This program was maintained on a daily basis through March 20, 1970, after which date the licensee initiated an air sampling program that included each of the four floor levels of the sampling plant and the sample preparation room. The following table summarizes the results obtained from the conduct of this sampling program during the period March 3, 1970, through March 31, 1970.

Average Concentration of Uranium Measured in Air Samples					
Date of Sample	1st Floor S. Plant	2nd Floor S. Plant	3rd Floor S. Plant	4th Floor S. Plant	Sample Preparation
3/3/70	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	NS	NS	NS
3/4/70	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	NS	NS	NS
3/5/70	$4.8 \times 10^{-11}$	$5.4 \times 10^{-11}$	NS	NS	NS
3/6/70	$1.7 \times 10^{-10}$	$4.8 \times 10^{-11}$	NS	NS	NS
3/9/70	$7.2 \times 10^{-11}$	$3.6 \times 10^{-11}$	NS	NS	NS
3/10/70	$7.8 \times 10^{-11}$	$4.2 \times 10^{-11}$	NS	NS	NS
3/11/70	$9.6 \times 10^{-11}$	$7.8 \times 10^{-11}$	NS	NS	NS
3/12/70	$6.6 \times 10^{-11}$	$1.2 \times 10^{-10}$	NS	NS	NS
3/13/70	$1.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	NS	NS	NS
3/16/70	$1.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	NS	NS	NS
3/17/70	$1.6 \times 10^{-10}$	$1.4 \times 10^{-10}$	NS	NS	NS
3/20/70	$1.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	NS	NS	NS
3/23/70	$1.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$5.1 \times 10^{-10}$	$9.3 \times 10^{-10}$	$2.4 \times 10^{-11}$
3/25/70	$1.9 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.0 \times 10^{-10}$
3/26/70	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$2.8 \times 10^{-10}$	NS
3/30/70	$6.5 \times 10^{-10}$	$3.7 \times 10^{-10}$	$4.1 \times 10^{-10}$	$6 \times 10^{-10}$	NS
3/31/70	$1.3 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.0 \times 10^{-10}$	$4.2 \times 10^{-11}$

NS indicates that no sample was collected from this location on the date indicated.

38. As noted in the above tabulation, the average concentration of natural uranium measured throughout the sampling plant and in the sample preparation room repetitively exceeded the applicable MPC of  $6 \times 10^{-11}$  uc/ml. Mr. Edwards stated that employees working in the sampling plant and in the sample preparation room worked a 40-hour week throughout this period. This work week consisted of five 8-hour days on the day shift and he noted that the sampling plant was only run on the day shift during this period. Edwards stated that as near as he could recollect, three employees would be engaged in work assignments at the various levels of the sample tower and in the sample preparation room. Edwards stated that no records were maintained for these employees for purposes of time-weighting

their exposures at the various work locations. He further stated that respiratory protection, in the form of a half face mask, was worn intermittently by these employees; however, he stated that no records of the intervals during which respiratory protection was worn were maintained. It should be noted that License Condition No. 11 authorizes the licensee to use respiratory protection which, if used in the form of a half face mask, allows a protection factor of 10. Messrs. Valentine and Edwards were informed that, due to the failure to maintain records related to time-weighting the exposure of personnel working in the sampling plant and sample preparation room and the failure to maintain records related to the intervals during which respiratory protection was worn, it was apparent that the licensee was in noncompliance with the requirements of 10 CFR 20.201(b), "Surveys," in that, these record deficiencies prevented evaluation of personnel exposure for purposes of showing compliance with 10 CFR 20.103, "Exposure of individuals to concentrations of radioactive material in restricted areas." Edwards stated that he did not realize that it was necessary to maintain records for purposes of time-weighting exposures and Valentine stated that he realized that these records were necessary, but did not realize the Edwards was not maintaining them. Valentine stated that he would implement procedures immediately to establish records of time-weighted work assignments and intervals of respiratory protection use such that this information would be adequate for evaluating the exposure of individuals to concentrations of radioactive material in restricted areas.

39. During the review of the air sampling program conducted in the sampling plant and sample preparation room during the period March 3 through March 31, 1970, as shown in the tabulation in paragraph 37, it was noted that contrary to the requirements of 10 CFR 20.201(b), "Surveys," no air samples were obtained at the third and fourth floor work areas of the sampling tower and in the sample preparation room during the period March 3 through March 20, 1970. A review of the shift log and statements by Edwards verified that material was processed through this portion of the plant during this period. It was further noted that airborne concentrations of uranium at these three locations exceeded the applicable MPC of  $6 \times 10^{-11}$  uc/ml following the inception of the sampling program at these locations on March 23, 1970. Messrs. Edwards and Valentine were informed that contrary to the requirements of 10 CFR 20.201(b), "Surveys," during the period March 3 through March 20, 1970, the survey program at the third and fourth floor work area levels of the sampling tower and in the sample preparation room was inadequate in that no air samples were collected for purposes of showing compliance with 10 CFR 20.103(a), "Exposure of individuals to concentrations of radioactive material in restricted areas." Mr. Edwards stated that he was using the portable air samplers during this period and, although he had four portable samplers, he confined his sampling efforts to the first and second floors of the sampling plant during the period and did not realize the necessity of taking the additional samples until March 23, 1970. Edwards also stated that during the period March 3 to March 23, 1970, he was having some difficulties regarding calibration of the portable air samplers. The deficiency was acknowledged by Edwards and verified by Valentine. Valentine stated that corrective action regarding this deficiency had been taken coincident with the startup of the fixed air samplers which operate off the plant vacuum system on April 6, 1970.
40. Records exhibited by the licensee showed that following the completed installation of the 18 fixed sampling locations operated from the plant vacuum system on April 6, 1970, the licensee maintained a continuous air sampling program at 18 locations throughout the plant. A review of the records from this sampling program showed no work locations wherein the average concentration of airborne uranium exceeded the MPC of  $6 \times 10^{-11}$  uc/ml over a 40-hour exposure period. It should be noted that the review of the shift log showed that plant operations were intermittent during this period as the licensee's numerous startup and maintenance problems were of a type offering negligible potential for increased airborne concentrations of uranium.

#### Exposure of Personnel to Airborne Concentrations of Uranium During Nonroutine Operations

41. The shift-wise operating logs, as documented by the shift supervisors, were reviewed for purposes of determining if the licensee had experienced any unusual maintenance or incident-type situations wherein the nature of the occurrence offered a potential for experiencing airborne concentrations of uranium in excess of those routinely measured. The review of these data revealed three occasions wherein the maintenance operations and unusual contamination conditions were very indicative of encountering higher-than-average concentrations of airborne uranium.\* These were described as follows:  
\* The plant vacuum system was used for recovery of the spills. Edwards stated that half masks were worn by the cleanup personnel.



- (a) On March 2, 1970, following the dumping of seven drums of yellow cake, the bucket elevator became plugged and leaked. The bucket elevator was opened, repaired, and one-half drum of yellow cake was removed. Maintenance work included repairs on the drum dumper.
  - (b) On March 11, 1970, the mechanical drum dumper failed to engage a short drum resulting in a spill of 250 pounds of uranium over three floor levels of the sampling plant.
  - (c) On March 13, 1970, a yellow cake spill occurred on the storage level. The shift log entry fails to describe the amount of material involved or the extent of the contaminated area.
42. The three incidents described in the previous paragraph were reviewed and verified by Mr. Edwards. Upon inquiry, Mr. Edwards stated that, although each of the described incidents offered a potential for experiencing unusual concentrations of natural uranium, no air samples were collected during the described, nonroutine maintenance operations and unusual contamination conditions. It was further noted that the routine air samplers, located on the third floor working level and fourth floor working level of the sampling tower were not operating during the March 11, 1970, incident. Messrs. Edwards and Valentine were informed that the licensee's failure to evaluate concentrations of airborne uranium for purposes of showing compliance with 10 CFR 20.103(a), "Exposure of individuals to concentrations of radioactive material in restricted areas," was in noncompliance with the requirements of 10 CFR 20.201(b), "Surveys." Edwards and Valentine acknowledged that the licensee's air monitoring program was deficient during each of these three incidents and they agreeably stated that they would implement procedures such that airborne concentrations are evaluated during any nonroutine maintenance operations and during periods when unusual contamination conditions exist.

#### Liquid Radioactive Effluents to Unrestricted Areas

43. Under current operating status, only one liquid discharge is made to the unrestricted area (see Exhibit B). This discharge consists of a stream whose composition represents feed from several inplant sources. Major contribution to the stream is from the fluorination scrubber which discharges approximately 60 g/m to a limestone rock pile neutralization field facility located in the unrestricted area which subsequently discharges the neutralized effluent directly to the Illinois River (see Photo No. 2). Additionally, several small quantity and intermittent flowing plant sources discharge into this stream. These include laboratory waste, floor drains in the laboratory, and caustic solutions from the miscellaneous digester caustic scrubber. To date, the miscellaneous digester has not been used in the process and no discharge has been made from this source to the effluent stream. Prior to emptying into the Illinois River (see Photo No. 7), this stream is further diluted by overflow water from the licensee's Lake Tenkiller raw water supply (see Photo No. 6). During December, 1969, the licensee initiated an environmental water sampling program. This program is conducted monthly and includes the collection and analysis of liquid samples from ponds, wells, and streams at 18 different plant locations. Exhibit D shows the geographic locations where these samples are collected and Exhibit E identifies the locations. Licensee records showed that the first set of samples was collected on December 8, 1969, and the second set of samples collected on January 26, 1970. The results of the analyses of the two sets of samples were reviewed and no unusual results were noted. Messrs. Edwards and Valentine stated that the monthly sampling program was continued during the months of March and April and stated that these samples are currently in the process of analysis. The results of the last two monthly sets of samples were not available on the date of the inspection. Except for the delinquency in the processing of liquid samples, no deficiencies in the licensee's unrestricted area water sampling program were apparent.

#### Independent Measurements

44. Six liquid samples were collected by CO:IV personnel during the course of the inspection (see Exhibit B). These samples included (1) upstream sample of Illinois River, (2) Illinois River 1/4-mile downstream from discharge confluence, (3) fluorination scrubber outfall after neutralization and prior to dilution by Lake Tenkiller raw water, (4) combined outfall as discharged to the Illinois River, (5) #1 retention pond, and (6) north test well, which is located adjacent to the #1 retention pond. These samples were submitted to the Health & Safety Laboratory, National Reactor Testing Station, Idaho Falls, Idaho, with accompanying request for analysis of concentrations of Ra-226.

Th-230, and natural uranium. Analysis for fluorides were requested for those samples representative of the fluorination scrubber discharge. The complete results of these analyses will be transmitted as an appendix to this report upon receipt from the analytical laboratory. Preliminary sample results received by telephone from IDO are:

	U Nat	Th-230	F
(1)	$1.4 \times 10^{-8}$ uc/ml	$< 2 \times 10^{-8}$ uc/ml	$< 2.5$ ppm
(2)	$1.2 \times 10^{-8}$ uc/ml	$< 2 \times 10^{-8}$ uc/ml	$< 2.5$ ppm
(3)	$6 \times 10^{-9}$ uc/ml	$< 2 \times 10^{-8}$ uc/ml	$< 2.5$ ppm
(4)	$2.2 \times 10^{-8}$ uc/ml	$< 2 \times 10^{-8}$ uc/ml	21 ppm
(5)	$4.7 \times 10^{-9}$ uc/ml	$< 2 \times 10^{-8}$ uc/ml	----
(6)	$1.9 \times 10^{-5}$ uc/ml	$3.8 \times 10^{-8}$ uc/ml	----

#### Procedures

45. In accordance with License Condition No. 8, approved written health and safety standards were provided as well as operating procedures, as required by Appendix A-3 of the license. *jm*

46. Special hazard work permits, as required by Operating Instructions, Appendix A-6 of the license, are used and were reviewed by the inspectors. Special clothing and health physics are checked on the permits. The permits are all approved by the appropriate operating shift supervisor. The permit shows the time work was started and completed and the type of masks, if required, to be worn. *10/24/70*

#### Training

47. Wuller, Edwards, and Brown stated that all plant personnel had received the appropriate training as described in the demonstration section of the license application, or as new employees, were in the process of receiving the training. Although no records showing the specific instruction or course an individual had received were maintained, records were on hand to show that courses were given on certain dates, as observed by the inspectors. Two plant operating employees were questioned by Paas and adequately answered questions related to their training. Maintenance of records for specific training received is not required by license conditions. *jm 10/24/70*

#### Inspection of Audits

48. Edwards stated that he wrote a monthly report to plant management of the results of his health physics inspection and trends. These reports were reviewed by the inspectors. Valentine, the Health Physics Officer, stated that he had participated in the reports, but this was not apparent from the written reports. License Condition No. 8, which incorporates Appendix A of the application states, on page A-11, that, "The above shall be performed monthly by the Facility Health and Safety Officer (Edwards) and the Health Physics Officer (Valentine)." *jm 10/24/70*

49. The same condition requires that quarterly audits be performed by the Facility Manager, Health Physics Officer, and Licensing and Regulation Officer, with a written summary of the findings. Wuller and Brown stated that no audits had been performed, to date, since the plant had only started up a couple of months ago.

#### Instrumentation

50. The licensee possessed the following survey equipment, which is calibrated by the Facility Health and Safety Officer, against a 15-mc Co-60 source:

Cutie Pie (2)  
Eberline PAC-4G (2)  
Geiger Müller (2)

51. Air samples are counted in a calibrated Nuclear Measurements Corporation Model PC-3T gas proportional alpha-beta instrument. The instrument is calibrated with a standard alpha source.

#### Emergency Plans

52. The licensee was observed to have an emergency procedure in the event of unusual or accidental release of significant amounts of material, in addition to conventional

inplant accidents to personnel. Medical aid is provided in the procedure. The procedure calls for immediate evaluation of radioactive material in unrestricted areas and notification of inhabitants and authorities.

#### Posting and Labeling

53. The entrances to the plant areas were observed to be posted with the standard radiation caution symbol and the wording, "Caution - Any Area At This Plant May Contain Radioactive Material," in accordance with License Condition No. 12.

#### Incineration

54. No incineration of waste, as authorized by the license, had been performed as of the date of the inspection.

#### Retention Dikes

55. The #1 retention pond was toured by the inspectors and, at the time, appeared to be about 50% full of capacity. The freeboard was observed to about five feet. Some slight erosion from wave action was observed on the inside slope of the dike. A section of the original dike had been removed and replaced, according to Wuller and Edwards, to remove a weir box in the dike since the pond was currently being used for a purpose other than originally intended (see Exhibit B). Don Harmon, during a precicensing inspection on February 13 and 14, had determined that the dike met AEC requirements for earthen dike systems. Wuller did not have information available to demonstrate that the disturbed section of the dike had been reconstructed to original specifications.
56. During the inspection on April 30, G. D. Brown called Don Harmon to get clarification of License Condition No. 8. As a result of the telephone discussion, Mr. Harmon stated that this condition was somewhat ambiguous, but that the licensee was tied by the condition only to Appendix A of the application and not to the demonstration section. Consequently, there are no specifications in Appendix A relating to construction of retention systems, although the demonstration section of the application specifically states detailed specifications by which the system will be constructed. Additionally, the demonstration section, but not Appendix A, states that supervisors and maintenance will visually inspect each system monthly for evidence of deterioration. At the time of the inspection, no evidence of leakage or seepage was noted. It was pointed out to Wuller and Brown, that close surveillance of the system should be made as the pond is being filled in order to be in accordance with intent of the license as stated in the demonstration section of the license application. Wuller, Valentine, and Edwards were informed that records of rebuilding the section of the dike would be reviewed during the next inspection.

#### Surveys and Contamination Control

57. The licensee performs periodic surveys of work areas, locker rooms, related unrestricted areas, respiratory equipment, and cannisters for purposes of evaluating contamination control. The results of these programs were recorded and a review of these data showed that, except for those measurements associated with known incidents (see paragraph 41), the contamination levels were maintained below 1,000 d/m per 100 cm<sup>2</sup>. Direct alpha survey techniques were used in these evaluations. The licensee also performs periodic surveys of respiratory equipment following washing and decontamination for purposes of assuring that no detectable alpha contamination remains on equipment that has been approved for use. All entrance and egress from process areas is through the change room. Surveys of personnel were observed to be as required by Appendix A, page A-9.0, as well as required clothing change, showers, and/or surveys.

#### Management Discussion

58. The items of noncompliance and apparent need for expeditious audits, as required quarterly by the Health and Safety Officer, Licensing and Regulation Officer, and Facility Manager, were discussed with B. Brown, G. Wuller, A. Valentine, and F. Edwards. The conclusion of the above was that action would be taken to correct the noted conditions. Higher level management was not available during the remainder of the week. Plans were made with CO:HQ for J. R. Roeder to discuss the results of the inspection with higher management at a future date.