

COMPLIANCE INSPECTION REPORT

II-A, 2

1. Name and address of licensee
Federal-Radrock-Gas Hills Partners
1370 South Third West
Salt Lake City, Utah

2. Date of inspection **October 10, November 14, 16, December 11, 1961**

3. Type of inspection **Follow-up**

4. 10 CFR Part(s) applicable
20 & 40

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

License **R-257** Docket No. **40-4492** Issued: **10/1/59** Expired: **9/30/60**

Scope:

"You are hereby licensed to receive possession of and title to raw and refined source material at your mill located in the Gas Hills area of Fremont County, Wyoming, for resale and for processing with raw source material from your own mining operations. The procedures stated in your applications dated July 30, 1959, September 1, 1959 and September 25, 1959 are incorporated herein by reference, and observance thereof made a condition of the license.

"You are further licensed to transfer and deliver possession of and title to refined source material to any person licensed by the Atomic Energy Commission, within the limits of his license.

Conditions:

"You are required to maintain records of your inventories, receipts and transfers of refined source material.

"This license is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U.S. Atomic Energy Commission, including 10 CFR 20 "Standards for Protection Against Radiation."

(Continued)

6. Inspection findings (and items of noncompliance)

The licensee has posted all applicable areas, instituted a program for analysis of liquid effluents and kept records of same, and revamped process equipment in an attempt to reduce exposure to airborne concentrations of natural uranium.

The following items of noncompliance were observed or otherwise noted:

10 CFR 20.201 Surveys

(b) in that the licensee's surveys as inadequate in the following manner:

- (1) during the period August 4, 1960, to November 16, 1961, the hazards to persons in the restricted area, from airborne natural uranium have not been fully defined in that the licensee has not taken air samples in all mill areas where time studies show occupancy and where there is a potential that high concentrations of airborne natural uranium exist; the licensee has not utilized existing information to compute complete weighted exposures, the licensee has not adjusted the permissible concentrations to correspond to his employee's work schedules. (Par. 13, 14 & 15).

*Time studies
apparently OK*

(Continued)

7. Date of last previous inspection

August 2-4, 1960

8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒
(Specify page(s) and paragraph(s))

(Inspector)

Approved by: **Donald I. Walker, Director**
ORIGINAL SIGNED BY **Region IV**
DONALD I. WALKER **Division of Compliance**
(Operations office)

February 15, 1962

(Date 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.

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

9504170073 620312
PDR ADOCK 04004492
C PDR

COMPLIANCE INSPECTION REPORT

II-A, 2

1. Name and address of licensee
Federal-Radrock-Gas Hills Partners
1370 South Third West
Salt Lake City, Utah

2. Date of inspection **October 10, November 16, December 11, 1961**

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4. 10 CFR Part(s) applicable
20 & 40

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

License R-237 Docket No. 40-4492 Issued: 10/1/59 Expired: 9/30/60

Scope:

"...you are hereby licensed to receive possession of and title to raw and refined source material at your mill located in the Gas Hills area of Fremont County, Wyoming, for resale and for processing with raw source material from your own mining operations. The procedures stated in your applications dated July 30, 1959, September 1, 1959 and September 25, 1959 are incorporated herein by reference, and observance thereof made a condition of the license.

"You are further licensed to transfer and deliver possession of and title to refined source material to any person licensed by the Atomic Energy Commission, within the limits of his license.

Conditions:

"...you are required to maintain records of your inventories, receipts and transfers of refined source material.

"This license is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U.S. Atomic Energy Commission, including 10 CFR 20 'Standards for Protection Against Radiation'."

(Continued)

6. Inspection findings (and items of noncompliance)

The licensee has posted all applicable areas, instituted a program for analysis of liquid effluents and kept records of same, and revamped process equipment in an attempt to reduce exposure to airborne concentrations of natural uranium.

The following items of noncompliance were observed or otherwise noted:

10 CFR 20.201 Surveys

(b) in that the licensee's surveys as inadequate in the following manner:

- (1) during the period August 4, 1960, to November 16, 1961, the hazards to persons in the restricted area, from airborne natural uranium have not been fully defined in that the licensee has not taken air samples in all mill areas where time studies show occupancy and where there is a potential that high concentrations of airborne natural uranium exist; the licensee has not utilized existing information to compute complete weighted exposures, the licensee has not adjusted the permissible concentrations to correspond to his employee's work schedules. (para 13, 14 & 15).

(Continued)

7. Date of last previous inspection

August 2-4, 1960

8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒

(Specify page(s) and paragraph(s))

C.I. (1)
IV (1)

Approved by: **Donald I. Walker, Director**
ORIGINAL SIGNED BY: **Region IV**
DONALD I. WALKER **Division of Compliance**
(Operations office)

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February 15, 1962

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10-73814-2 U. S. GOVERNMENT PRINTING OFFICE

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

Federal-Radocrock-Gas Hills Partners

ITEM 5 (Continued)

Amendment (Issued 10/26/60)

"This license is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U. S. Atomic Energy Commission, including 10 CFR 20 "Standards for Protection Against Radiation", except that exemption is hereby granted from Sections 20.203(e)(2), (f)(2), and (f)(4) for all areas and containers in the plant, provided that all entrances to the mill shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the Words 'Caution - Radioactive Material (s)'."

Amendment (Issued 3/10/61)

"...delete reference to that portion of your application dated July 30, 1959, which stipulated a program of monthly bio-assays."

Amendment (Issued 9/14/61)

"...you are hereby authorized to conduct personnel monitoring in accordance with the procedures outlined in your letter of March 15, 1961."

ITEM 6 (Continued)

- (2) during the period August 4, 1960, to November 16, 1961, the hazards to persons in the unrestricted area to airborne natural uranium were not fully evaluated in that the licensee did not collect an adequate number of samples; samples were not collected in all downwind locations in the unrestricted area; the licensee had been utilizing the wrong permissible concentration in evaluating the samples that were taken. (Par. 16.).
- (3) the licensee has, by his admission, incinerated yellow cake filter cloths but has not determined whether or not these cloths contained licensed material. (Par. 20.).

Letter of Application, dated September 1, 1959, incorporated as a license condition:

- Par. 8. in that, during the period August 4, 1960, to May 16, 1961, the licensee did not take weekly air samples with a "Gast Spot Check" instrument. (Par. 14)
- Par. 8. in that, during the period August 4, 1960, to November 16, 1961, the twelve specified sampling stations were not sampled every month. (Par. 14)

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9. Initial Inspection

An initial inspection of the Federal-Radorock-Gas Hills Partner uranium ore processing mill was conducted on August 2 to 4, 1960. The report of the initial inspection was transmitted to AEC Headquarters on November 25, 1960. In a letter dated April 18, 1961, the AEC informed the licensee of the following:

"It appears that certain of your activities were not conducted in full compliance with the requirements of the AEC's 'Standards for Protection Against Radiation,' Part 20, Title 10, Code of Federal Regulations, and conditions of your license, in that:

- "1. Your air survey data indicates that a yellow cake packaging operator had been exposed to average concentrations of airborne natural uranium in excess of the limits specified in Section 20.101(b), 'Exposure of individuals in restricted areas.'
- "2. Radiological surveys conducted pursuant to Section 20.201(b), 'Surveys', were inadequate in that:
 - a. Radium and thorium concentrations in water from wells located in the mill personnel housing area and inhabited areas adjacent to the tailings pond were not determined.
 - b. Radium and thorium concentrations in liquid effluents discharged to unrestricted areas as tailings pond overflow were not determined.
 - c. Concentrations of airborne radioactivity discharged in atmospheric effluents to unrestricted areas were not determined.
 - d. Breathing zone air samples, time occupancy studies, and time weighted exposure determinations have not been made for the purpose of determining compliance with Section 20.101(b) for those employees who occasionally or frequently occupy mill areas with concentrations of airborne radioactivity in excess of the limits in Appendix B, Table I, Column 1.
- "3. Certain entrances to the yellow cake packaging area and crushing plant were posted with signs that did not contain the symbol required by Section 20.203(a)(1), 'Caution signs, labels and signals.'
- "4. Airborne radioactivity areas were not posted as required by Section 20.203(d)(2), 'Caution signs, labels and signals.'
- "5. Tailings pond areas were not posted as required by Section 20.203(e)(2), 'Caution signs, labels and signals.'
- "6. Process containers in the mill were not labeled as required by Section 20.203(f)(2), 'Caution signs, labels and signals.'
- "7. Records of liquid effluent sampling results were not maintained in the units specified in Section 20.401(c), 'Records of surveys, radiation monitoring and disposal.'
- "8. Records were not maintained of results from the analysis of potable well water from the nearby trailer housing area for natural uranium content as required by Section 20.401(c), 'Records of surveys, radiation monitoring and disposal.'
- "9. Certain of the radiological procedures described in your letter of application dated September 1, 1959, were not followed as required by your license, in that:

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- a. The crushing plant ventilation and dust collection equipment were not operating while ore was being processed at the time of the inspection. (See letter, Paragraph 4.)
 - b. There were three openings into the mill area through the seven foot chain link fence, of which one opening did not have a gate. (See letter, Paragraph 5.)
 - c. Not all liquid mill tailings have been neutralized to a pH of 5. (See letter, Paragraph 7.)
 - d. Weekly air samples were not taken using a "Gast Spot Check" instrument and not all of the 13 designated sampling locations were surveyed for airborne radioactivity on a monthly basis. (See letter, Paragraph 8.)
 - e. The mill had not been surveyed for external radiation. (See letter, Paragraph 9.)
 - f. Mill liquid effluents and mill well water had not been analyzed for radium content. (See letter, Paragraph 10).
- "10. Floors, stairways, walkways and platforms in the ore crushing plant had not been washed down as described in Paragraph 6 of 'Employee Standard Procedures for Radiological Safety' (attachment to letter of application, dated September 1, 1959) and required by your license.
- "11. A radiation survey instrument capable of measuring 500 mr radiation was not available for use as discussed in your telegram dated September 25, 1959, and required by your license."

The AEC's letter further requested that the licensee "...notify this office, within thirty days of your receipt of this notice, of the steps taken or to be instituted in achieving correction of the alleged violations and the date when such correction has been or will be achieved". In a letter dated May 17, 1961, Mr. R. Ellerman, Project Manager, Federal-Radorock-Gas Hills Partner replied to the AEC's request. A copy of Mr. Ellerman's reply, without enclosure, is attached as Appendix A. The contents of Mr. Ellerman's reply will be discussed, where applicable, in the body of this report. In a letter dated September 1, 1961, (Appendix B) the AEC acknowledged receipt of Mr. Ellerman's letter and stated that "These matters will be reviewed during the next inspection of your facilities".

10. Follow-up Inspection

A follow-up inspection of the subject license facility was conducted on October 10 and November 14 and 16, 1961. The following licensee's employees were contacted during the course of the follow-up inspection:

R. Ellerman, Project Manager
R. Shimmin, Mill Superintendent
D. Ferguson, Safety Director
R. Von Holdt, Assistant to the Safety Director

Mr. Ellerman stated that except for the following, the licensee's administrative structure had remained unchanged since the last inspection:

- a. R. Ellerman has replaced R. G. Lindlof as Project Manager
- b. Nels W. Stalheim has replaced R. W. Neyman as President of the managing partner, Federal Uranium Corporation. Mr. Stalheim is therefore the new General Manager of the Federal-Radorock-Gas Hills Partner

Mr. Ferguson said that Mr. Von Holdt was responsible for the mill's sur programs and the related record keeping.

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11. Physical Plant

During a tour of the mill, Mr. Shimmin stated and, it was observed, that the following changes had been made:

- a. Installing of new vents coupled with a type N-AAF "Rotoclone" for dust collection in the crusher plant.
- b. Revamping of the process system, i.e., enlarging the process vessels and installing mechanical agitators in lieu of air spargers.
- c. Reducing the number of yellow cake packaging stations from four to one and installing a negative pressure dust collection system on the packaging mechanism.
- d. Building up the number one tailings pond's dyke to a height of approximately twenty-five feet.

In the licensee's letter (Appendix A), Item 9.a., it was stated that the crushing plant dust collection had been redesigned and a "Rotoclone" had been installed. Mr. Shimmin stated that the reduction of the number of yellow cake packaging stations and the installation of the negative pressure dust collection system had been done in an effort to reduce the airborne natural uranium concentration in the yellow cake packaging room (See Item 1, Appendix A). Mr. Shimmin stated that because of the revamping of the mill processing equipment the mill was operating at its rated capacity. Mr. Von Holdt stated and, it was observed, that the licensee had procured an industrial vacuum cleaner; this vacuum cleaner is used to clean the crushing plant and the sample preparation rooms (See Item 10 of the AEC's letter of April 18, 1961 - Paragraph 9, Item 10 of the licensee's letter - Appendix A and the AEC's letter of September 1, 1961 - Appendix B). It was observed that the number of entrances to the mill compound had been reduced to two, at the scale house and the administration building, and that these entrances were equipped with gates (See Item 9 b. of the AEC's letter of April 18, 1961 and licensee's letter - Appendix A).

12. Liquid Sampling

a. Unrestricted Area

Mr. Ferguson stated that in May, 1961, they contracted with U. S. Nuclear Corp., Burbank, California, to have water samples analyzed for Ra-226 content. According to Mr. Ferguson they collect drinking water samples from the Mimar Trailer Camp (located adjacent to the mill's No. 1 tailings pond), the B & B Trailer Camp (located approximately one mile north of the No. 1 tailings pond) and the mill living area (located approximately one-half mile south of the No. 1 tailings pond). According to Mr. Ferguson, in June, 1961, Ionics, Inc., Cambridge, Massachusetts, contracted to analyze the liquid for Ra-226 and Th-230 content and that starting October 1, 1961, samples would be analyzed by Mr. E. L. Hazen, Denver, Colorado. The samples analyzed by U. S. Nuclear in May, 1961, were collected by the licensee in April. A transcript of the licensee's unrestricted area liquid effluent sampling records follows:

Area	Date: *May	Ra-226 uc/ml x 10 ⁸				Th-230 uc/ml x 10 ⁸			
		June	July	Aug.	Sept.	June	July	Aug.	Sept.
Mimar Camp	1.20**	0.61	0.45	0.35	0.3	0.0046	0	0.045	3.0
B & B Camp	0.96	1.10**	0.55	1.00	0.7	0.0046	0	0.14	2.4
Federal Camp (Well No. 11)	1.00	0.35	0.40	0.22	<0.2	0	0	0.095	<0.01

*Date samples were analyzed; collected in the previous month.

**These samples exceed the MPC for Ra-226 in the unrestricted area.

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According to Mr. Ferguson, the analytical results for the samples which were collected in September and October, 1961, had not been received from Ionics. It should be noted that even though some individual samples contained Ra-226 in excess of the concentration specified in 10 CFR 20, Appendix B, Table II, the average concentration is less than the specified limit, e.g., Mimar Camp; average concentration 0.58×10^{-8} uc/ml Ra-226 and B & B Camp; average concentration 0.84×10^{-8} uc/ml Ra-226.

Mr. Ferguson stated that samples from the three aforementioned stations were also analyzed for natural uranium content by the mill's laboratory; a transcript of these records follows:

Area	U-Natural uc/ml $\times 10^5$					
	9/15/60	10/28/60	1/20/61	5/16/61	6/16/61	8/23/61
Mimar Camp	0.013	0.016	<0.001	0.002	0.0009	0.01
B & B Camp	0.004	0.014	<0.001	0.006	0.0004	0.01
Federal Camp (Well No. 11)	0.009	0.005	<0.001	0.004	0.003	0.004

b. Inspector's Sampling

This office has obtained samples of the Mimar Camp drinking water on three separate occasions. These samples were analyzed by the Analysis Branch, Health and Safety Division, ID (as were all samples discussed in this subparagraph); the results of the analyses follow:

Date Sampled	Mimar Camp Drinking Water	
	Ra-226 uc/ml $\times 10^8$	Th-230 uc/ml $\times 10^8$
8/4/60	0.14	<0.5
12/19/60	0.51	7.1
3/24/61	0.59	<0.5

During the subject inspection, drinking water samples were obtained from the Mimar Camp, and the B & B Camp and the mill camp; the analytical results for these samples were received on December 12, 1961; the results of these analyses follow:

Location	Ra-226 uc/ml $\times 10^8$	
	Ra-226 uc/ml $\times 10^8$	Th-230 uc/ml $\times 10^8$
Mimar Camp (laundry room)	0.48	0.50
B & B Camp (laundry room)	0.81	32.60
Federal Camp (Well No. 11)	0.44	<0.5
Federal Mill (Well No. 3)	0.26	1.7

On December 13, 1961, the inspector obtained two potable water samples from the Mimar Camp; the analytical results for these samples were received on January 18, 1962; the results follow:

Location	Ra-226 uc/ml $\times 10^8$	
	Ra-226 uc/ml $\times 10^8$	Th-230 uc/ml $\times 10^8$
Mimar Camp (laundry room)	0.5	<0.5
Mimar Camp (house trailer nearest Federal tailings pond)	0.6	<0.5

On December 13, 1961, the inspector was informed by an unidentified resident of the Mimar Camp that the camp obtained their water from two

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wells rather than one well as discussed in Paragraph 22 of the initial inspection report. The inspector observed that the second well is located at the extreme south end of the Mimar Camp approximately 25 yards from Federal's Number 1 tailings pond; the other well is located in the approximate center of the Mimar Camp. The aforementioned individual stated that the camp's potable water was a mixture of the water from the two wells. The inspector was unable to find out the depth of the well. This office will collect samples from this well during the next inspection. The licensee's unrestricted area liquid sampling program is referred to in Items 2 a., 7, 8 and 9 f. of AEC's April 18, 1961, letter (Paragraph 9) and the licensee's letter of May 17, 1961, (Appendix A).

c. Restricted Area

According to Mr. Ferguson, the liquor from the tailings ponds is analyzed monthly for Ra-226 content by U.S. Nuclear Corp.; this program was initiated in October, 1960. The program was expanded to include Th-230 when the licensee's analytical work was assumed by Ionics in June, 1961. The maximum concentrations in the tailings ponds were Ra-226: 6.1×10^{-6} uc/ml, Th-230: 3.10×10^{-4} uc/ml, and the minimum concentrations were Ra-226: 1.6×10^{-6} uc/ml, Th-230: 0.41×10^{-4} uc/ml. The licensee's records indicate that the tailings ponds liquor and the process water is analyzed for natural uranium content by the mill's laboratory. Copies of the records of the aforementioned analyses are being retained by this office. According to Mr. Shimmin, there has not been a release of tailings liquor to the unrestricted area since April, 1960. This release is discussed in Paragraph 21 of the initial inspection report. The licensee's restricted area liquid sampling program is referred to in Items 2 b. and 11 f. of the AEC's April 18, 1961, letter (Paragraph 9). It should be noted that all concentrations were expressed in the units specified in 10 CFR 20.401(b).

13. Adjusted Maximum Permissible Concentrations (MPC)

a. Shift Schedule

Mr. Shimmin stated that the mill employees are on the following four-week basic shift schedule.

	<u>Sun.</u>	<u>Mon.</u>	<u>Tues.</u>	<u>Wed.</u>	<u>Thurs.</u>	<u>Fri.</u>	<u>Sat.</u>
N - Night Shift	D	D	D	D	D	D	D
A - Afternoon Shift	D	O	O	O	O	A	A
D - Day Shift	A	A	A	A	A	O	N
O - Off	N	N	N	N	N	N	O

It should be noted that the aforementioned schedule necessitates the working of 56 hours in seven consecutive days, and, that the schedule averages 44 hours worked per week for the 28-day period. Mr. Ferguson stated that two mill employees work different schedules; the scale house employee works nine hours/day, five days/week and the yellow cake packaging employee works 40 hours one week and 48 hours the next and, that these two men alternate approximately every three months.

b. Definitions

Hereafter in this report, concentrations of natural uranium will be reported in two units; the definitions of these units follow:

uc : This unit denotes that the scientific definition
s for a curie of natural uranium has been used, i.e., specific activity equals 0.681 uc/gram.

uc : This unit denotes that the 10 CFR 20, amended January 1,
r 1961, definition for a curie of natural uranium has been used, i.e., specific activity equals 0.333 uc/gram.

c. Adjusted MPC

Mr. Ferguson stated that he does not adjust the MPC as directed in 10 CFR 20.103(b) (Amended January 1, 1961), but rather considers 2.5×10^{-11} uc_r/ml natural uranium as the MPC for the crushing end and 6×10^{-11} uc_r/ml natural uranium as the MPC for the process end of the mill. Hereafter in this report the following MPC values shall be considered applicable for the majority of the mill employees.

$MPC_{50} = 3.57 \times 10^{-11}$ uc_s/ml natural uranium for all restricted mill areas. This concentration is the MPC for all restricted mill areas prior to January 1, 1961.

$MPC_{61-a} = 1.79 \times 10^{-11}$ uc_r/ml natural uranium. This MPC is applicable in all mill areas where natural uranium is in secular equilibrium with its daughter products and is in effect after January 1, 1961.

$MPC_{61-b} = 4.29 \times 10^{-11}$ uc_r/ml natural uranium. This MPC is applicable in all mill area where natural uranium is present free from its daughter products, and is in effect after January 1, 1961.

The aforementioned MPC's have all been adjusted to correspond to 56 hours worked in seven consecutive days, as directed in 10 CFR 20.101(b) or 10 CFR 20.103(b) (Amended January 1, 1961), whichever is applicable. The adjusted MPC for the yellow cake packager is 5.0×10^{-11} uc_r/ml natural uranium and for the scale house man is 2.2×10^{-11} uc_r/ml natural uranium; these values are effective after January 1, 1961. Mr. Ferguson stated that he was planning to request exception to 10 CFR 20.103(b) in that they be allowed to adjust concentrations to correspond to 160 hours exposure in 28 consecutive days.

14. Air Sampling - Restricted Area

a. Instruments

It was observed that the licensee possessed the following air sampling equipment:

- (1) Two Gast, Model AD 440, "Spot Check"; one of these instruments is battery operated. The Gast "Spot Check" is rated at a maximum of 25 liters per minute.
- (2) One Staplex, Type TF1A, "Hi Vol"; this instrument is rated at a maximum of 70 cubic feet per minute.
- (3) One IDC, Model W-4, "Tape Sampler". See Paragraph 14 of the initial inspection report for details on the operational characteristics of this instrument.

According to Mr. Von Holdt the aforementioned instruments are routinely calibrated by the Wyoming State Department of Health. Mr. Von Holdt said that he collects air samples on Whatman-41 filter paper.

b. Sampling Method - General Air

Mr. Von Holdt stated that he uses the "Tape Sampler" to obtain eight-hour samples at 14 predetermined locations in the mill; that these samples are taken monthly; and, that eight one-hour samples are taken at a rate of seven liters/minute but that these samples are analyzed

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as a single sample. According to Mr. Von Holdt, the "Spot Check" is used to obtain 30 minute samples at the 14 sampling stations; these samples are taken weekly at a sampling rate of 11.5 liters per minute. Mr. Von Holdt stated on October 10, 1961, that he always places his sampler in the same place and that he does not sample at various locations within a mill area. On November 14, 1961, Mr. Von Holdt stated that he had started to take samples at various places within the specific mill areas.

c. Recorded Sampling Results - General Air

Mr. Von Holdt produced records of the analytical results of all samples taken in the mill; copies of these records are being retained by this office. A compilation of the results of the monthly "tape" samples taken during the period August 1, 1960, to January 1, 1961 follows:

<u>Location</u>	<u>Station Number</u>	<u>No. of Samples</u>	<u>Natural Uranium</u> uc _g /ml x 10 ¹¹			<u>Times MPC-60</u>
			<u>High</u>	<u>Low</u>	<u>Ave.</u>	
Desk, south of mill office on mezzanine	1	3	20.0	5.9	10.7	3.0
Mezzanine over south precipitation tank	2	3	27.5	1.9	13.4	3.7
10' northeast of ball mill	3	3	3.2	1.5	2.7	<1.0
Mezzanine over north make-up tank	4	0	-	-	-	
North wall of yellow cake packaging room	5	6	239.0	5.1	136.6	32.5 **
South room of the sample preparation building	6	3	2.9	1.3	1.9	<1.0
North room of the sample preparation building	7	4	5.8	3.1	3.9	1.1
West wall inside dryer building	8	0	-	-	-	
Second floor of crusher building at jaw crusher	9	4	15.0	2.2	6.1	1.7
Second floor of crusher building at samplers	10	2	10.3	6.7	8.5	2.3
Top of fine ore bins	11	3	17.2	1.6	8.6	2.3
Under the fine ore bins	12	2	4.6	2.2	3.4	<1.0
Center of the yellow cake packaging room	13	5	362.0	0.23 *	117.6	28.0 **

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<u>Location</u>	<u>Station Number</u>	<u>No. of Samples</u>	Natural Uranium $uc_g/ml \times 10^{11}$			<u>Times MPC-60</u>
			<u>High</u>	<u>Low</u>	<u>Ave.</u>	
Yellow cake roaster deck	14	0	-	-	-	
Sparkler Filter No. 1	15	0	-	-	-	
Yellow cake sherry tank-1st floor	16	0	-	-	-	

*Sample taken at night when yellow cake was not being packaged.

** MPC considered to be $4.17 \times 10^{-11} uc_g/ml$ Unat, because of yellow cake packager's schedule.

A compilation of the monthly air sample (tape) records for the period January 1, to October 1, 1961, follows:

<u>Location</u>	<u>Sample Station Number</u>	<u>No. of Samples</u>	Natural Uranium $uc_r/ml \times 10^{11}$			<u>Ave.</u>
			<u>High</u>	<u>Low</u>	<u>Ave.</u>	
Desk, south of mill office on mezzanine	1	11	2.10	0.03	0.83	
Mezzanine over south precipi- tation tank	2	8	0.68	0.10	0.33	
10' northeast of ball mill	3	6	1.14	0.09	0.26	
Mezzanine over north make-up tank	4	7	1.00	0.40	0.57	
North wall of yellow cake packaging room	5	10	7.60	0.50	3.11	
South room of the sample preparation building	6	7	0.74	0.05	0.55	
North room of the sample preparation building	7	11	1.90	0.02	0.52	
West wall inside dryer building	8	5	0.30	0.10	0.17	
Second floor of crusher building at jaw crusher	9	6	1.40	0.20	0.59	
Second floor of crusher building at samplers	10	6	4.40	0.20	1.39	
Top of fine ore bins	11	5	0.60	0.10	0.40	
Under the fine ore bins	12	9	1.00	0.04	0.47	
Center of yellow cake packaging room	13	10	2.30	0.80	1.56	
Yellow cake roaster deck	14	6	3.80	0.50	2.13	
Sparkler Filter No. 1	15	1	-	-	0.10	
Yellow cake sherry tank 1st floor	16	1	-	-	0.04	

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A compilation of the weekly "spot check" air sample records for the period May 16 through November 7, 1961, follows:

Location	Sample Station Number	No. of Samples	Natural Uranium uc _r /ml x 10 ¹¹		Ave.
			High	Low	
Desk, south of mill office on mezzanine	1	23	11.40	0.10	2.60
Mezzanine over south precipitation tank	2	21	20.50	0.09	1.50
10' northeast of ball mill	3	23	3.20	0.10	0.46
Mezzanine over north make-up tank	4	22	1.90	0.30	0.87
North wall of yellow cake packaging room	5	23	23.70	0.20	4.36
South room of the sample preparation building	6	23	2.50	0.09	0.53
North room of the sample preparation building	7	23	2.00	0.20	0.46
West wall of the dryer building	8	23	1.60	0.03	0.40
Second floor of crusher building at jaw crusher	9	24	4.90	0.10	0.69
Second floor of crusher building at samplers	10	22	16.60	0.10	1.50
Top of fine ore bins	11	22	2.30	0.20	0.75
Under the fine ore bins	12	23	3.50	0.04	0.66
Center of the yellow cake packaging room	13	23	15.40	0.06	2.56
Yellow cake roaster deck	14	16	7.10	0.32	1.97

d. Breathing Zone Samples

Mr. Ferguson said that on June 21, 1961, he obtained one-half-hour breathing zone samples on five mill employees; that these five breathing zone samples were all that had been taken. Mr. Von Holdt stated that the battery operated Gast "Spot Check" had been obtained specifically for the purpose of obtaining breathing zone samples; that because of its cumbersome nature the instrument had not been utilized; that the breathing zone samples had been taken with the standard Gast "Spot Check" operating at 11.5 liter/min. A transcript of the results of the licensee's breathing zone samples follows:

Individual Samples	Sample Time (Minutes)	Natural Uranium uc _r /ml x 10 ¹¹
Ore Sample Preparation Operator	30	0.5
Crusher Operator	30	0.7
Ball Mill Operator	30	0.3
Yellow Cake Packager	30	6.5*
Make-up Operator	30	2.5

* This concentration is 1.3 times the adjusted MPC_{61-b} for this man.

e. Inspector's Sampling

On November 14, 1961, the writer collected 18 general air samples and four breathing zone samples at various locations in the mill. These samples were analyzed by the Analysis Branch, Health and Safety Division, ID. The analytical results for the general air samples are attached as Appendix c; the results of the breathing zone samples follow:

Breathing Zone Samples

<u>Operation</u>	<u>Sampling Time (Minutes)</u>	<u>Sampling Rate</u>	<u>Natural Uranium uc./ml x 10¹¹</u>	<u>Times MPC</u>
Cleaning pulver- isor in the ore sample preparation room	3	10 l/m	2.7	1.5*
Raking and checking the yellow cake Skinner Roaster	4.5	12.5 l/m	15.2	3.5**
Final filling and agitating of a yellow cake barrel	4	10 l/m	2.5	
Changing, weighing and topping of a yellow cake barrel	7	10 l/m	4.7	

* MPC_{61-a} is applicable

** MPC_{61-b} is applicable

f. Discussion

In regard to the licensee's general air sampling data (Subparagraph c. of the paragraph) the following should be noted:

- (1) During the five month period, August 1, 1960, to January 1, 1961, only one of the 12 specified sampling stations (station number 5) was sampled every month and two of the stations were not sampled at all (stations number 4 and 8).
- (2) During the nine month period January 1 to October 1, 1961, only four of the 12 specified sampling stations were sampled every month.
- (3) The weekly air sampling program was not instituted until May 16, 1961, and the licensee had not collected weekly "Spot Check" samples prior to this date.
- (4) The licensee's letter of application dated September 1, 1959, specified that the 12 sample stations would be sampled both weekly and monthly. (See Paragraph 8 of the September 1, 1959, letter)

Mr. Ferguson stated that air samples had been collected only at specific locations because of their letter of application dated September 1, 1959; that this letter of application specified that samples were to be taken at 12 specified locations; and, that they felt that they could not vary these specific locations without being in noncompliance with the conditions of their license. It should be noted that Mr. Von Holdt had started to vary the sample locations after the October portion of the inspection, but he was still taking samples at the specified locations. The status of the licensee's sampling program is discussed in Items 2 d. and 9 d. of the AEC's letter of April 18, 1961 (Paragraph 9) and the licensee's letter of May 17, 1961 (Appendix A).

15. Weighted Exposures - Restricted Area

a. Time Studies

Mr. Von Holdt stated that time studies had been made on representative members of the operating crew in December, 1960, and in June, 1961. Examination of the records revealed that time studies had been made on the yellow cake packaging operator, the R.I.P. operator, the make-up operator, the sample prep. operator, and the extra man in 1960 and on the crusher operator and the ball mill operator in 1961. A copy of these time studies is attached as Appendix D.

b. Weighted Exposure

Mr. Von Holdt and Mr. Ferguson said that they do not calculate complete weighted exposures to concentrations of airborne natural uranium to individuals or to persons in specific job classifications. Mr. Ferguson said that they compute a partial weighted exposure; a transcript of one of these computations follows:

"Calculated Total Exposure

"Yellow Cake Packaging Operator Breathing Zone Sample

"The operator was exposed to 6.5×10^{-11} uc/ml for a total of 3.82 hours per day.

"When figured on a 40 hour basis the operator received 20.3 parts of a permissible (d) units."

Mr. Ferguson stated that they compute a weighted exposure only when a general air or breathing zone sample exceeds the MPC and that they only compute the weighted exposure for that period when the individual is in the high concentration. Mr. Ferguson stated that the weighted exposure is calculated in the manner prescribed by their consultant, Mr. H. L. Hazen. It should be noted that weighted exposures were not determined during the period August 10, 1960, to January 1, 1961, but that the average concentrations in many of the mill areas during this period were in excess of MPC₆₀ (Paragraph 14 c.).

c. Discussion

Refer to Appendix D, the time study on the "Yellow Cake Packaging Operator"; it should be noted that this employee spends 1.27 hours "in north end of the room cleaning and filling drums" and 2.55 hours "in the center and west side of y.c. room cleaning and stenciling drums." According to Mr. Von Holdt the first location is represented in their general air sampling by sample station No. 5 and the second location is represented by sample station No. 13 (see Par. 14 c.). Mr. Von Holdt said that samples were not taken in the other four locations shown in Appendix D. According to Mr. Ferguson and Mr. Von Holdt, and it was observed, that when a "Spot Check" sample was greater than 6×10^{-11} uc/ml natural uranium (see Par. 14 c. - high concentration) a partial weighted exposure was determined using only the excessive concentration. Refer to Appendix D, the time study on the "Extra Man"; it should be noted that this employee spends 1.36 hours "tending roaster." The inspector obtained a breathing zone sample of the extra man raking and checking the roaster (Par. 14 e.); this sample was 3.5 times the MPC 61-b; however, according to Mr. Von Holdt the only samples that the licensee has taken during this operation are at sample stations Nos. 2 and 14, both of which are at least 20 feet from the roaster. See Appendix D for the inspector's general air sample results of these stations; it should be noted that the general air sample at Station No. 2 was being taken at the same time the breathing zone sample was obtained. Mr. Ferguson stated that they would start obtaining

more breathing zone samples and that they would compute complete weighted exposures. It was impossible for the AEC representative to evaluate personnel exposures to concentrations of airborne uranium due to insufficient licensee data.

16. Air Sampling - Unrestricted Area

a. Release Points

According to Mr. Ferguson there are three points in the mill process system where natural uranium can be released to the environs. Mr. Ferguson stated that these points are the exhaust stacks from the yellow cake dryer, the ore dryer and the yellow cake rotoclone. Mr. Von Holdt said that samples had been obtained from the outlets from these stacks; a compilation of the results of the analyses of these samples follows:

<u>Location</u>	<u>Date</u>	<u>Natural Uranium</u> <u>uc/ml x 10¹²</u>
Yellow cake dryer stack	12/21/60	4,260*
Ore dryer stack	12/21/60	415*
Yellow cake dryer stack	2/ 3/61	3.4**
Yellow cake dryer stack	5/31/61	99**
Yellow cake rotoclone stack	5/31/61	1,814**

* Concentration expressed as uc_g/ml

** Concentration expressed as uc_r/ml

Mr. Ferguson attributed the drop in the concentrations released from the yellow cake dryer stack to the revamping of the mill process equipment.

b. Unrestricted Area Sampling

Mr. Von Holdt stated that he takes samples at the Federal Trailer Camp, the B & B Trailer Camp, the Mimar Trailer Camp and at various locations along the mill perimeter fence. Mr. Von Holdt stated that he also takes an occasional background sample; that this sample is usually taken approximately two miles upwind from the mill. Mr. Von Holdt states that he uses the Staplex "Hi Vol" sampler (Paragraph 14 a) to collect the unrestricted area samples; the records state that the majority of these samples are taken for ten minutes at a rate of 35 cubic feet per minute. Mr. Von Holdt supplied copies of the analytical results of the unrestricted area sampling; a compilation of these records follows:

<u>Location</u>	<u>Number of</u> <u>Samples</u>	<u>Natural Uranium</u> <u>uc_r/ml x 10⁻¹²</u>			<u>Times**</u> <u>MPC</u>
		<u>High</u>	<u>Low</u>	<u>Ave.</u>	
Federal Camp	5	4.00	0.05	1.03	1.3
B & B Camp	3	0.50	0.10	0.33	
Mimar Camp	6	1.50	0.10	0.69	
Background Sample	2	0.60	0.15	0.37	
*Fence Line	8	4.10	0.29	1.45	1.8
Total	24				

* These samples were taken at various locations along the fence.

** MPC_u is considered to be 8.0×10^{-13} uc_r/ml .

According to Mr. Ferguson, the unrestricted area sampling program was started on January 5, 1961. The licensee had collected only 24 environmental air samples between January 5, 1961, and the date of this inspection. Most of the sampling records contain, in addition to the analytical results, the following information; wind direction, approximate wind

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velocity, and general weather conditions, i.e., clear, cloudy, cool, etc.; the one exception to the foregoing occurred on the record which contained the high reading for the Federal Camp.

It should be noted that excluding the background samples and four of the Federal Camp samples (which were collected upwind from the mill), all of the unrestricted area samples were taken downwind from the mill. According to Mr. Ferguson, the high sample in the Federal Camp was probably taken when the wind was blowing from the camp towards the mill for the following reasons:

- (1) The Federal Camp is approximately $3/4$ mile southwest of the mill.
- (2) The prevailing wind is from the southwest; this was also stated by employees of other mills in this area during the inspection of their facilities.

c. Inspector's Sampling

The inspector collected three unrestricted area samples on November 14, 1961. These samples were submitted to the Analysis Branch, Health and Safety Division, ID, for analysis; the results of these analyses follow:

<u>Location</u>	<u>Natural Uranium</u> <u>uc_r/ml x 10¹²</u>
B & B Cafe located approximately one mile north of the mill	0.30
Mimar Trailer Camp at tailings pond perimeter fence	0.05
Mimar Trailer Camp at north end - opposite side of camp from tailings pond	0.10

The above samples were taken directly downwind from the mill on a clear cool day at a rate of 22.5 ft³/min. for a period of 30 minutes. The wind velocity was approximately 15 miles per hour.

d. Discussion

Mr. Ferguson stated that he was using 2×10^{-12} uc_r/ml natural uranium as the MPC for the unrestricted area rather than 8×10^{-13} uc_r/ml natural uranium as directed in 10 CFR 20, Appendix B. Mr. Ferguson said that he would start using 8×10^{-13} uc_r/ml natural uranium. It should be noted that the average concentration in the Federal Camp is less than 8×10^{-13} uc_r/ml natural uranium if the average concentration of the background sample is subtracted. According to Mr. Von Holdt and Mr. Ferguson, the emphasis in unrestricted area sampling is being placed on the local inhabited areas rather than on the entire area surrounding the mill. I should be noted that a large open pit mine is located approximately one mile southwest of the mill compound.

The inspector gave Mr. Ferguson a copy of the AEC's publication "An Acceptable Basis for Surveying to Determine Concentrations of Radioactive Material Discharged as Air Effluents from Uranium Mills". Mr. Ferguson stated that he had not previously seen a copy of this publication. The licensee's unrestricted area air sampling program was discussed in Item 2.c. of the AEC's letter of April 18, 1961, (Paragraph 9) and the licensee's letter of May 17, 1961, (Appendix A).

17. Posting and Labeling

It was observed that the entrances to the mill compound were posted with signs approximately 24" x 18", magenta on yellow background, bearing the radiation caution symbol and the wording "Caution - Radioactive Materials - Any Building or Container Within This Area May Contain Radioactive Materials."

On August 12, 1960, the licensee requested exemption from "regulation 20.203(f) in 10 CFR 20"; in a letter dated October 26, 1960, from the AEC to the licensee the following appeared:

"... License R-237 ... is hereby amended to read as follows:
"This license is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U. S. Atomic Energy Commission, including 10 CFR 20 "Standards for Protection Against Radiation", except that exemption is hereby granted from Sections 20.203(e)(2), (f)(2), and (f)(4) for all area and containers in the plant, provided that all entrances to the mill shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words 'Caution - Radioactive Material(s)'."

It was observed that all entrances to the mill process building, the crushing plant, and the ore drying building were posted with signs approximately 6" x 10", magenta on yellow background, bearing the radiation caution symbol and the wording "Caution - Airborne Radioactivity Area." The entrances to the yellow cake packaging room were posted with signs identical to those described immediately above and with signs approximately 8" x 14", blue on white background, bearing the wording "Notice - All Employees Whose Work Does Not Require Them To Enter This Area Must Keep Out." Signs, approximately 6" x 10", magenta on yellow background, bearing the radiation caution symbol and the wording "Caution - Radioactive Materials" were observed to be posted at approximately 20 yard intervals on the mill perimeter fence and on the tailings ponds perimeter fences. The discrepancies which were noted during the initial inspection in the licensee's posting are discussed in Items 3, 4, 5, and 6 of the AEC's April 18, 1961, letter (Paragraph 9).

18. External Radiation Surveys and Instruments

- a. Mr. Ferguson stated that they possessed the following portable radiation survey instruments"

- (1) One-Precision Radiation Instruments, Inc., Model 107 c, gieger counter, ranges: 0 to 0.2 mr/hr, 0 to 2.0 mr/hr, and 0 to 20 mr/hr.
- (2) One-Victoreen, Model AGE 500 BSR, "Radector", ranges: 0 to 500 mr/hr and 0 to 500 R/hr.

It should be noted that Byproduct Material License No. 49-7540-1 authorizes the subject licensee to possess the 10 uc Strontium-90 internal calibration source that is contained in the "Radector". Mr. Ferguson stated that the "Radector" had been procured so that they could comply with their September 25, 1959, telegram to L&R; Item 11 of the AEC's letter of April 18, 1961 (Par. 9) and the licensee's letter of May 17, 1961, (Appendix A), pertains to this telegram.

- b. Mr. Ferguson stated that an external radiation survey program was initiated at the mill on September 28, 1960. Mr. Von Holdt said that the gieger counter was used to conduct the external radiation surveys. Examination of the external radiation survey records revealed the following:

- (1) That 11 surveys had been conducted between the period of September 28, 1960, to October 26, 1961.

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- (2) That external radiation readings are taken in both the restricted and unrestricted areas; e.g., readings are recorded for locations inside of the mill process building (restricted area) and for locations along the mill perimeter fence (unrestricted area).
- (3) That the maximum recorded readings was 2.3 mr/hr, beta plus gamma; the reading was obtained in the yellow cake packaging room.
- (4) That the maximum recorded reading in the unrestricted area was 0.35 mr/hr, beta plus gamma; the reading was obtained at the scale house gate.
- (5) That approximately 95 percent of all readings in the restricted area were less than 1.0 mr/hr beta plus gamma and that approximately 95 percent of all readings in the unrestricted area were less than 0.15 mr/hr beta plus gamma.

Copies of the external radiation survey records were supplied by Mr. Ferguson and are being retained by this office.

19. Personnel Monitoring

a. Reported Overexposure

In a letter dated February 20, 1961, the licensee informed the AEC that one of their employee's film badges had received an exposure of 1940 mrem beta plus 55 mrem gamma during the period January 2 to 29, 1961. The licensee's letter stated that the individual in question had not received the exposure but that the badge had been lost and had been found two days later under the yellow cake roaster. On March 3, 1961, the AEC replied to the licensee's letter as follows:

"Thank you for your letter of February 20, 1961, reporting a film badge overexposure. We will advise you if further information is needed."

Examination of the licensee's film badge record for Gordon H. White, the man whose badge received the aforementioned exposure, revealed the following (It should be noted that the Tracerlab pack contains two films, one film is processed monthly and one film is processed quarterly):

- (1) The monthly film badge readings for the first quarter of 1961 were: January 2 to January 29 - 1940 mrem beta plus 55 mrem gamma; January 29 to February 26 - 100 mrem beta plus less than 50 mrem gamma; and February 26 to April 2 - 90 mrem beta plus less than 50 mrem gamma.
- (2) The cumulative film badge reading for the period January 2 to April 2, 1961, was 790 mrem beta plus 600 mrem gamma.
- (3) The monthly film badge readings for the period April 2 to August 27, 1961, are as follows:

<u>Period Ending</u>	<u>Beta</u>	<u>Gamma</u>
4/30/61	90 mrem	*
5/28/61	250 mrem	*
7/ 2/61	60 mrem	*
7/30/61	*	*
8/27/61	60 mrem	*

* Less than 50 mrem, according to badge supplier.

The foregoing information indicates that, even if Mr. White were wearing his badge at the time of the reported exposure, he received either a maximum skin dose of 2285 mrem and a whole body dose of 155 mrem or a skin dose of 1390 mrem and a maximum whole body dose of 600 mrem, during the first quarter of 1961.

b. Routine Badging

Mr. Ferguson stated that prior to October 1, 1961, they were badging all mill employees (82 persons) but that as of October 1, only 40 persons were badged. In a letter dated March 15, 1961, the licensee requested that the AEC allow them to badge only employees with certain job classifications rather than all employees. A letter dated September 14, 1961, from the AEC to the licensee stated, "...you are hereby authorized to conduct personnel monitoring in accordance with the procedure outlined in your letter of March 15, 1961." Mr. Ferguson stated that as of October 1, 1961, they had discontinued the Tracerlab film badge service and had started procuring their film badges from U. S. Nuclear Corp., Burbank, California. It was observed that the film badge records are retained on Tracerlab's reports and on Form AEC-5; a compilation of these records for the period August 2, 1960, to August 27, 1961, follows:

- (1) The maximum monthly exposure, excluding Mr. White, was 210 mrem beta plus less than 50 mrem gamma.
- (2) The maximum cumulative quarterly exposure, excluding Mr. White, was 350 mrem beta plus less than 50 mrem gamma.
- (3) Approximately 75 percent of all readings were less than 50 mrem beta and approximately 98 percent of all readings were less than 50 mrem gamma.

It should be noted that the licensee had not received their first report from the U. S. Nuclear Corp. at the time of the inspection.

Mr. Ferguson stated that he had completed Form AEC-4 on approximately 60 percent of all mill employees.

20. Incineration of Materials

Mr. Shimmin stated that the filter cloths for the "Sparkler" yellow cake filter are disposed of in the following manner:

- ✓ a. The cloths are patched until they are no longer usable.
- ✓ b. The cloths are hung in the acid leach tanks to remove the uranium.
- ✓ c. The cloths are taken to the camp dump and are burned as routine garbage.

Mr. Ferguson stated that the filter cloths had never been analyzed for uranium content prior to burning and that he could not estimate the quantity of uranium in the cloths. Mr. Shimmin and Mr. Ellerman assured the inspector that in the future the filter cloths would be buried in the tailings pond unless analysis of the cloths shows that they do not contain licensed materials.

21. Posting of Notices to Employees

It was observed that Form AEC-3 and a Thermofax copy of 10 CFR 20 were posted in the mill office near the time clock and in the mill employee's change house. According to Mr. Ferguson a copy of their license is on file in Mr. Shimmin's office and any employee may, on request, read the license.

22. Meeting with Management

At the termination of the inspection, the findings were discussed with Mr. Shimmin, Mr. Ferguson and Mr. Von Holdt. Mr. Ellerman was not in the Riverton area on November 16; however, the inspector held informal discussions with him prior to the inspection termination. An attempt was made to contact Mr. Ellerman on December 11, 1961, but he again was not available; Mr. Ferguson stated at this time that he (Ellerman) had been informed of the findings. The licensee's comments are contained, where applicable, in the body of this report.