UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Federal Center, Denver, Colorado

In reply refer to:

Technical Letter
Dribble-42

February 8, 1965

Mr. James E. Reeves, Manager
Nevada Operations Office
U. S. Atomic Energy Commission
P. O. Box 1676
Las Vegas, Nevada

Dear Mr. Reeves:

Transmitted herewith are two copies of:

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

TECHNICAL LETTER: DRIBBLE 42

RADIOCHEMICAL ANALYSES OF WATER SAMPLES
COLLECTED POSTSHOT IN THE VICINITY OF
TATUM DOME, MISSISSIPPI

By

V. J. Janzer and S. J. Rucker

USGS-474-298

Additional copies have been distributed as indicated on the attached sheet.

Sincerely yours,

W. S. Twenhofel

W. S. Twenhofel
Acting Branch Chief

26
DISTRIBUTION STATEMENT A

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Distribution:

Technical Library, NVOO (4)
R. F. Beers, Inc. Alexandria (12)
R. F. Beers, Inc., Las Vegas (2)
DTIE, Oak Ridge, Tenn.
DPNE, AEC
Brig. Gen. D. L. Crowson, DMA
Capt. Benj. R. Petrie, Jr., DMA
Hazleton-Nuclear Sci. Corp. (3)
J. F. Philip, SAN
R. H. Goeckermann, LRL
C. P. Benedix, LRL
D. R. Rawson, LRL (2)
Spenst M. Hansen, LRL
Clovis G. Craig, LRL
R. D. McArthur, LRL, Mercury
Basil Smith, LRL, Mercury
Isotopes, Inc. (Attn. M. C. Gardner)
E. G. Bowen, H&N, Las Vegas
Sam Howell, H&N, Las Vegas
Col. L. A. Kiley, FC/DASA, Albuquerque
Fenix & Scisson, Inc., Mercury (4)
Fenix & Scisson, Inc., Las Vegas
Fenix & Scisson, Inc., Tulsa

USGS

T. B. Nolan
V. R. Wilmarth
Alfred Clebsch, Jr.
G. Debuchananne
J. W. Lang
D. H. Eargle
W. E. Hale

CONTENTS

	Page
Introduction	1
Procedures and results	3
Summary.	7
Laboratory analyses.	8

TABLES

Table 1. Postshot beta activity of ground water in the vicinity of the Tatum Salt Dome, Lamar Co., Miss.	5
2. Preshot beta activity of ground water in the vicinity of the Tatum Salt Dome, Lamar Co., Miss.	6

ILLUSTRATIONS

Figure 1. Map of Tatum Dome area.	2
---	---

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Federal Center, Denver, Colorado

In reply refer to:
Technical Letter
Dribble-42

February 8, 1965

TECHNICAL LETTER: DRIBBLE-42

RADIOCHEMICAL ANALYSES OF WATER SAMPLES
COLLECTED POSTSHOT IN THE VICINITY
OF TATUM DOME, MISSISSIPPI

By

V. J. Janzer and S. J. Rucker

INTRODUCTION

The Project Salmon underground nuclear device was detonated in the Tatum Salt Dome on October 23, 1964, as part of the Vela Uniform Project's continuing efforts to detect underground nuclear testing.

This report presents radiochemical data obtained by analyzing a series of water samples collected by Isotopes, Inc., in the vicinity of the Tatum Salt Dome. Isotopes, Inc., collected water samples from representative aquifers overlying the area of the Project Salmon detonation as part of their postshot evaluation research program sponsored by ARPA. The U. S. Geological Survey received splits of the samples collected during this study effort. Acknowledgment is made to Isotopes, Inc., for their courtesy in providing these samples.

As part of their work done in cooperation with the Nevada Operations Office of the Atomic Energy Commission, the Geological Survey is distributing analyses of the water samples.

Locations of the hydrologic test wells sampled, numbers 1a, 2a, 3, 4, 5 and 6, are shown in figure 1.

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FIGURE 1. FROM TECHNICAL LETTER DRIBBLE -29, APRIL 3, 1963

Figure 1.--Map of Tatum Dome Area

PROCEDURES AND RESULTS

To obtain gamma spectrums on the water samples, each sample was placed in a 3.5-liter, Marinelli-type, polyethylene beaker. Then a 1,000-minute gamma spectrum for each water sample was obtained using a 3" x 3" sodium iodide, thallium-activated, scintillation crystal and a Model-512 RIDL 400-channel analyzer. Visual comparison of sample spectrums with a 1,000-minute background spectrum showed no discernible differences between the sample spectrums and the background spectrum.

Before determining the tritium concentration of the water samples, a small volume of each sample was distilled to dryness. Distillation eliminates quench problems and interferences caused by dissolved solids. Carrying the distillation of a sample to dryness eliminates possible fractionation effects on the tritium concentration of the distillate compared to the concentration of the original sample. The tritium concentration of each sample was determined by mixing a 1.0-ml aliquot of sample distillate with 19.0 ml of a dioxane-based liquid scintillation "cocktail" in a polyethylene counting vial and then counting the sample solution in a refrigerated sample changer and associated Packard Model 314E liquid scintillation spectrometer.

Counting efficiencies and instrument counting characteristics were determined using a Packard Instrument standard calibrated on September 29, 1962, as yielding 2.51×10^6 dpm/ml (disintegrations per minute per milliliter). Suitable dilutions (1 to 100) of this standard were made for the calibration of the instrument. The diluted standards were counted with the samples to check instrument operation.

None of the samples showed any significant number of counts above the detection level of the procedure used. Counts obtained for the samples were compared to both standard solutions and blanks containing no tritium. Under the conditions of the test it should be possible to detect tritium concentrations of 4 pc/ml (picocuries per milliliter).

Beta activity of six ground-water samples was determined on sample aliquots ranging in volume from 100 to 1,000 ml. Volumes were dependent upon the total dissolved solids in the waters and were chosen to yield deposits within certain weight tolerances, which would standardize self-absorption of the samples. The beta activity of the six samples (table 1) is within the expected range of values for waters in the vicinity of the Tatum Salt Dome. Data for comparable samples collected before the October 23, 1964, detonation are given in table 2.

Table 1.--Postshot beta activity of ground water in
the vicinity of the Tatum Salt Dome, Lamar Co., Miss.

Well	Location	Date sampled	Aquifer	Depth of sample (feet)	Beta activity as strontium-90 (pc/l)
HT-4	Lamar Co., Miss., NE1/4 sec. 14, T. 2 N., R. 16 W.	11-23-64	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 1	361-421	12 $\pm$ 1.8 1-19-65
HT-5	Lamar Co., Miss., NE1/4 sec. 14, T. 2 N., R. 16 W.	11-24-64	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 2a	590-680	13 $\pm$ 2 1-19-65
HT-2a	Lamar Co., Miss., SW1/4 sec. 14, T. 2 N., R. 16 W.	11-25-64	do	935-1,016	8.4 $\pm$ 1 1-19-65
HT-1a	Lamar Co., Miss., sec. 12, T. 2 N., R. 16 W.	11-27-64	Hattiesburg and Pascagoula Formations, undifferentiated, aquifers 2a and 2b	868-1,089	7.3 $\pm$ 1.1 1-19-65
HT-6	Lamar Co., Miss., sec. 14, T. 2 N., R. 16 W.	12-5-64	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 2b	760-800	7.5 $\pm$ 1.1 1-19-65
HT-3	Lamar Co., Miss., sec. 14, T. 2 N., R. 16 W.	12-8-64	Calcite caprock	934-1,006	6.8 $\pm$ 1 1-19-65

Table 2.--Preshot beta activity of ground water in the vicinity of the Tatum Salt Dome, Lamar Co., Miss.

Well	Location	Date sampled	Aquifer	Depth of sample (feet)	Beta activity as strontium-90 (pc/l)
HT-2c	Lamar Co., Miss., sec. 14, T. 2 N., R. 16 W.	5-26-60	Hattiesburg and Pascagoula Formations, undifferentiated, local aquifer	341-361	3.5 ± 0.5 8-29-61
L-8-1	Lamar Co., Miss., SE1/4 sec. 8, T. 2 N., R. 14 W.	9-12-61	Terrace deposits	7.35	4.6 ± 0.7 1-10-62
M-8-2	Lamar Co., Miss., NE1/4 sec. 8, T. 1 N., R. 16 W.	1-25-62	Hattiesburg and Pascagoula Formations, undifferentiated	175-425	1.6 ± 0.2 3-23-62
L-35-1	Lamar Co., Miss., NW1/4 sec. 35, T. 2 N., R. 14 W.	1-25-62	do	1/	3.1 ± 0.5 3-16-62
P-7-1	Lamar Co., Miss., SW1/4 sec. 7, T. 2 N., R. 17 W.	1-24-62	do	175-1,028	2.5 ± 0.4 3-16-62
D-31-1	Lamar Co., Miss., SE1/4 sec. 31, T. 4 N., R. 15 W.	1-23-62	do	175-724	4.6 ± 0.7 3-16-62
J-13-3	Lamar Co., Miss., sec. 13, T. 2 N., R. 16 W.	4-15-61	do	860-1,050	10 ± 2 6-15-61
HT-1b	Lamar Co., Miss., sec. 12, T. 2 N., R. 16 W.	4-17-61	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 2	850-890	13 ± 2 7-3-61
J-12-7 HT-1a	Lamar Co., Miss., sec. 12, T. 2 N., R. 16 W.	4-12-61	do	868-929 to 1,029-1,089	10 ± 2 6-15-61
HT-2a	Lamar Co., Miss., SW1/4 sec. 14, T. 2 N., R. 16 W.	4-30-61	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 2a	935-1,016	5.8 ± 0.9 7-8-61
J-12-6 HT-1	Lamar Co., Miss., sec. 12, T. 2 N., R. 16 W.	5-15-61	Hattiesburg and Pascagoula Formations, undifferentiated, aquifer 2	925-955 1,060-1,130	2.7 ± 0.4 8-22-61
J-14-18 HT-2	Lamar Co., Miss., SW1/4 sec. 14, T. 2 N., R. 16 W.	5-26-61	Catahoula Sandstone, aquifer 3	1,270-1,400	12 ± 2 8-18-61
H-28-2	Lamar Co., Miss., sec. 28, R. 14 W., T. 3 N.	5-11-62	Catahoula Sandstone	181-890	1.8 ± 0.3 9-4-62
J-12-6 HT-1	Lamar Co., Miss., sec. 12, T. 2 N., R. 16 W.	4-28-61	Vicksburg Group, aquifer 4	1,742-1,880	23 ± 4 6-15-61

1/ Depth of well - 250 ft.

SUMMARY

On the basis of the analytical methods used, preliminary radiochemical analysis of the water samples collected after the Salmon event indicate that no detectable level of radioactive contamination exists. Samples were obtained from the calcite caprock at a depth of 934-1,006 feet and through intervening aquifers to aquifer 1 at a depth of 365-421 feet from the surface. The water sample collected from the calcite caprock was taken within approximately 1,700 feet of the detonation (~~oral communication, Dick Taylor~~).

Periodic sampling of the wells will continue and more refined analytical techniques will be used in analyzing the samples. After the hydrologic test wells have been better developed by bailing, additional isotopes will be investigated.

Lab. No. 65-256U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - RadiochemicalSource Well HT-4
Location Tatum Salt Dome, Lamar Co., Miss.
1/4 1/4 NE 1/4 Sec. 14 T. 2N. R. 16W. Field/Office No. _____Date Col. 11-23-64 Time _____
Col. By W. Oakley
Field aetns: Temp. (°F) 76 pH _____
Sp. Cond. (µmhos) 1,225 Eh _____
Appearance ClearWell Type Drilled Use Test. Observation. _____
Depth (ft) 474 Cased to _____
Diam. (in) _____ Date Drilled April 1963
Water level (ft) 91 below land surface datum
Discharge 1/
W.B.F. Hattiesburg and Pascagoula Fms.
undiff. Producing aquifer 1, 361 to 421 ft.
Owner U. S. Atomic Energy Commission1/ 20 gpm after swabbing 2,192 gallons.

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium <u>µg/l</u>			
Radium as Ra ²²⁶			
Gross beta (as Sr ⁹⁰)	<u>12 ± 1.8</u>		<u>1-19-65</u>
Gross alpha (as Ra ²²⁶)			
Extractable alpha activity (net)			
Gross gamma (as Cs ¹³⁷)			
Potassium ⁴⁰			
Strontium ⁹⁰ *			
Gamma Spectrum Analysis			
Barium-lanthanum ¹⁴⁰			
Cerium-praseodymium ¹⁴⁴			
Cesium ¹³⁷			
Chromium ⁵⁷			
Cobalt ⁶⁰			
Ruthenium ¹⁰⁶			
Zinc ⁶⁵			
Zirconium-niobium ⁹⁵			
Gross gamma scan	<u>Nothing detected above normal background level.</u>		

Tritium Sought but not detected by method used.Date sample received 11-30-64 Analyst PKR, VJJ, SJR
Date data released 1-22-65 Date checked 1-22-65
Program classification Dribble-Project Salmon Checked by: S. J. Rucker

* Analyzed only when indicated by gross beta count.

Lab. No. 65-257U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - RadiochemicalSource Well HT-5Location Tatum Salt Dome, Lamar Co., Miss.1/4 1/4 NE 1/4 Sec. 14 T. 2N R. 16W Field/Office No. _____Date Col. 11-24-64 Time _____Col. By N. T. OakleyField aetns: Temp. ($^{\circ}$ F) 78 pH _____Sp. Cond. (μ mhos) 120 Eh _____Appearance Colored

Swabbing 3,090 gallons.

Well Type Drilled Use Test Observation _____

Depth (ft) _____ Cased to _____

Diam. (in) _____ Date Drilled April 1963Water level (ft) 104.71 below land surface

Discharge _____ datum _____

W.B.F. Hattiesburg and Pascagoula Fms.,
undiff., aquifer 2a, 590 to 680 ft.Owner U. S. Atomic Energy Commission

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium μ g/l			
Radium as Ra 226			
Gross beta (as Sr 90)	13 $\pm$ 2.0		1-19-65
Gross alpha (as Ra 226)			
Extractable alpha activity (net)			
Gross gamma (as Cs 137)			
Potassium 40			
Strontium 90 *			
Gamma Spectrum Analysis			
Barium-lanthanum 140			
Cerium-praseodymium 144			
Cesium 137			
Chromium 57			
Cobalt 60			
Ruthenium 106			
Zinc 65			
Zirconium-niobium 95			
Gross gamma scan	Nothing detected above normal background level.		

Tritium Sought but not detected by method used.

Date sample received 11-30-64Analyst PKR, VJJ, SJRDate data released 1-22-65Date checked 1-22-65Program classification Dribble-Project SalmonChecked by: S. J. Rucker

* Analyzed only when indicated by gross beta count.

U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - RadiochemicalSource Well HT-2aLocation Tatum Salt Dome, Lamar Co., Miss.1/4 1/4 SW 1/4 Sec. 14 T. 2N. R. 16W. Field/Office No. _____Date Col. 11-25-64 Time _____Col. By W. T. OakleyField detns: Temp. (°F) 73 pH _____Sp. Cond. (µmhos) 125 Eh _____Appearance ColoredSwabbing 2,400 gallons. Discharge pipe.Well Type Drilled Use Test. Observation.Depth (ft) 1,079 Cased to _____Diam. (in) 5 x 3 1/2 Date Drilled April 1961Water level (ft) 133.57 below land surface

Discharge _____ datum

W.B.F. Hattiesburg and Pascagoula Fms.,

undiff., aquifer 2a, 935 to 1,016 ft.

Owner U. S. Atomic Energy Commission

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium <u>µg/l</u>			
Radium as Ra ²²⁶			
Gross beta (as Sr ⁹⁰)	<u>8.4 ± 1</u>		<u>1-19-65</u>
Gross alpha (as Ra ²²⁶)			
Extractable alpha activity (net)			
Gross gamma (as Cs ¹³⁷)			
Potassium ⁴⁰			
Strontium ⁹⁰ *			
Gamma Spectrum Analysis			
Barium-lanthanum ¹⁴⁰			
Cerium-praseodymium ¹⁴⁴			
Cesium ¹³⁷			
Chromium ⁵⁷			
Cobalt ⁶⁰			
Ruthenium ¹⁰⁶			
Zinc ⁶⁵			
Zirconium-niobium ⁹⁵			
Gross gamma scan	Nothing detected above normal background level.		

Tritium Sought but not detected by method used.

Date sample received 11-30-64Analyst PKR, VJJ, SJRDate data released 1-22-65Date checked 1-22-65Program classification Dribble-Project SalmonChecked by: S. J. Rucker

* Analyzed only when indicated by gross beta count.

U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - Radiochemical

Source Well HT-1a
 Location Tatum Salt Dome, Lamar Co., Miss.
1/4 1/4 1/4 Sec. 12 T. 2N. R. 16W. Field/Office No. _____

Date Col. 11-27-64 Time _____
 Col. By Isotopes, Inc.
 Field aetns: Temp. (°F) 74 pH _____
 Sp. Cond. (μmhos) _____ Eh _____
 Appearance Dirty

Well Type Drilled Use/Test. Observation.
 Depth (ft) 1,090 Cased to _____
 Diam. (in) 5 x 3 1/2 Date Drilled 1961
 Water level (ft) 116 below land surface datum
 Discharge _____
W.B.F. Hattiesburg and Pascagoula Fms.,
undiff., aquifers 2a and 2b, 868 to 1,089 ft.
 Owner U. S. Atomic Energy Commission

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium <u>μg/l</u>			
Radium as Ra ²²⁶			
Gross beta (as Sr ⁹⁰)	7.3 ± 1.1		1-19-65
Gross alpha (as Ra ²²⁶)			
Extractable alpha activity (net)			
Gross gamma (as Cs ¹³⁷)			
Potassium ⁴⁰			
Strontium ⁹⁰ *			
Gamma Spectrum Analysis			
Barium-lanthanum ¹⁴⁰			
Cerium-praseodymium ¹⁴⁴			
Cesium ¹³⁷			
Chromium ⁵⁷			
Cobalt ⁶⁰			
Ruthenium ¹⁰⁶			
Zinc ⁶⁵			
Zirconium-niobium ⁹⁵			
Gross gamma scan	Nothing detected above normal background level.		
Tritium Sought but not detected by method used.			

Date sample received 12-14-64 Analyst PKR, VJJ, SJR
 Date data released 1-22-65 Date checked 1-22-65
 Program classification Dribble-Project Salmon Checked by: S. J. Rucker

* Analyzed only when indicated by gross beta count.

U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - Radiochemical

Source <u>Well HT-6</u>		Well Type <u>Drilled</u> Use <u>Test</u> . Observation.	
Location <u>Tatum Salt Dome, Lamar Co., Miss.</u>		Depth (ft) <u>812</u> Cased to <u></u>	
<u>1/4</u>	<u>1/4</u>	<u>1/4</u> Sec. <u>14</u>	T. <u>2N.</u> R. <u>16W.</u> Field/Office No. <u></u>
Date Col. <u>12-5-64</u> Time <u></u>		Diam. (in) <u></u> Date Drilled <u>March 1963</u>	
Col. By <u>Isotopes, Inc.</u>		Water level (ft) <u>109.38</u> below land surface	
Field detns: Temp. (°F) <u>84</u> pH <u></u>		Discharge <u></u> datum <u></u>	
Sp. Cond. (μmhos) <u></u> Eh <u></u>		W.B.F. <u>Hattiesburg and Pascagoula Fms.,</u>	
Appearance <u>Clear</u>		undiff. aquifer <u>2b. 760 to 800 ft</u>	
		Owner <u>U. S. Atomic Energy Commission</u>	

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium <u>μg/l</u>			
Radium as Ra ²²⁶			
Gross beta (as Sr ⁹⁰)	<u>7.5 ± 1.1</u>		<u>1-19-65</u>
Gross alpha (as Ra ²²⁶)			
Extractable alpha activity (net)			
Gross gamma (as Cs ¹³⁷)			
Potassium ⁴⁰			
Strontium ⁹⁰ *			
Gamma Spectrum Analysis			
Barium-lanthanum ¹⁴⁰			
Cerium-praseodymium ¹⁴⁴			
Cesium ¹³⁷			
Chromium ⁵⁷			
Cobalt ⁶⁰			
Ruthenium ¹⁰⁶			
Zinc ⁶⁵			
Zirconium-niobium ⁹⁵			
Gross gamma scan	Nothing detected above normal background level.		

Tritium Sought but not detected by method used.

Date sample received <u>12-14-64</u>	Analyst <u>PKR, VJJ, SJR</u>
Date data released <u>1-22-65</u>	Date checked <u>1-22-65</u>
Program classification <u>Dribble-Project Salmon</u>	Checked by: <u>S. J. Rucker</u>

* Analyzed only when indicated by gross beta count.

Lab. No. 65-293U. S. DEPT. OF THE INTERIOR--GEOLOGICAL SURVEY
Statement of Water Analysis - Radiochemical

Source <u>Well HT-3</u>		Well Type <u>Drilled</u> Use <u>Test</u> Observation.	
Location <u>Tatum Salt Dome, Lamar Co., Miss.</u>		Depth (ft) <u>1,064</u> Cased to	
<u>1/4 1/4 1/4</u> Sec. <u>14</u> T. <u>2N.</u> R. <u>16W.</u> Field/Office No. _____		Diam. (in) _____ Date Drilled <u>March 1963</u>	
Date Col. <u>12-8-64</u> Time _____	Water level (ft) <u>102.51</u> below land surface		
Col. By <u>W. T. Oakley</u> USGS	Discharge _____ datum		
Field detns: Temp. (°F) <u>83</u> pH _____	W.B.F. <u>Calcite caprock, 934 to 1,006 ft.</u>		
Sp. Cond. (μmhos) _____ Eh _____	Owner <u>U. S. Atomic Energy Commission</u>		
Appearance <u>Colored</u>			

Element	pc/l	pc/g	Calculated for radioactive decay to date
Uranium <u>μg/l</u>			
Radium as Ra ²²⁶			
Gross beta (as Sr ⁹⁰)	6.8 ± 1.0		1-19-65
Gross alpha (as Ra ²²⁶)			
Extractable alpha activity (net)			
Gross gamma (as Cs ¹³⁷)			
Potassium ⁴⁰			
Strontium ⁹⁰ *			
Gamma Spectrum Analysis			
Barium-lanthanum ¹⁴⁰			
Cerium-praseodymium ¹⁴⁴			
Cesium ¹³⁷			
Chromium ⁵⁷			
Cobalt ⁶⁰			
Ruthenium ¹⁰⁶			
Zinc ⁶⁵			
Zirconium-niobium ⁹⁵			
Gross gamma scan	Nothing detected above normal background level.		

Tritium Sought but not detected by method used.

Date sample received <u>12-14-64</u>	Analyst <u>PKR, VJJ, SJR</u>
Date data released <u>1-22-65</u>	Date checked <u>1-22-65</u>
Program classification <u>Dribble-Project Salmon</u>	Checked by: <u>S. J. Rucker</u>

* Analyzed only when indicated by gross beta count.