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RIO BLANCO GAS COMPOSITION: PREPRODUCTION TESTING OF THE RBE-01 WELLHEAD

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March 1, 1976

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Prepared for U.S. Energy Research & Development Administration under contract No. W-7405 Eng 48.

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ABSTRACT

The chemical composition and radionuclide concentration of Rio Blanco gas samples collected prior to the production testing of the RBE-01 well and analyzed at LLL are presented. The analytical procedures and their uncertainties are briefly summarized. Information that associates the analytical data with the field operations is included.

INTRODUCTION

Project Rio Blanco was the third experiment in the AEC's Plowshare Program to investigate the feasibility of stimulating low-permeability natural-gas-bearing formations with nuclear explosives. Three nominal 30-kt explosives were detonated simultaneously in a single wellbore near Rifle, Colorado, on May 17, 1973.

A prompt gas-sampling system was installed in the emplacement hole and was the principle source for gas samples during the post-detonation shut-in period. A detailed description of the physical construction of the system is available in other publications;¹ only a brief description is given here.

A stainless steel gas-sampling tube, 1.27 cm (0.5 in.) o.d., ran from the surface to near the top of the upper explosive assembly, 1770 m (~5800 ft) down, and was placed in the annular space between the emplacement and well casings. The last 134 m (440 ft) of the tube were filled with a wire rope to prevent the tube from being crushed by the ground shock. This rope had sufficient interstitial space to allow the withdrawal of gas samples. Above the wire rope, at depths of 914 and 1220 m (3000 and 4000 ft) were two 10.3-MPa (1500-psi) gradient-rupture diaphragms to prevent the flow of gas up the tube until they were intentionally ruptured by a planned overpressure from above. A third diaphragm at a depth of 1749.6 m (5740 ft) was to keep water, grout, and dirt out of the sampling tube and was not expected to survive detonation. The gas-sampling tube extended from the wellhead at ground zero to the gas-sampling skid 168 m (550 ft) away, where all required instrumentation, plumbing, sampling, and gas-storage facilities were located.

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The annulus is the space between the 27.31-cm (10.75-in.) emplacement hole casing and the 17.78-cm (7-in.) well casing. This space was completely filled with cement from the perforated casing ~1700 m (~5600 ft) below ground to the surface.

Because of prolonged geophonic activity, reentry to ground-zero after detonation was delayed. System check-out began 2 h after detonation and was completed 5 h later. The sampling tube was pressurized with nitrogen and the 914-m (3000-ft) rupture diaphragm was broken. The 1220-m (4000-ft) diaphragm was then broken and the system pressurized to 5000 psi; however, no communication between the tubing and the chimney was established.

Initial samples taken from the annulus and the gas sample tube contained no gases characteristic of a nuclear detonation. Fourteen days (2259 h) after detonation a geophone signal indicated possible further chimney collapse and was accompanied by an immediate pressure rise in the sample tube. Analysis of samples taken four days after this pressurization confirmed the presence of radioactive chimney gases. Subsequent collections produced samples of decreasing radionuclide concentration and increasing formation gas content.² On 28 August, (3.5 months after detonation) the gas sampling system was dismantled and the downhole tubing plugged with epoxy in preparation for post-shot drilling.

In the cement-filled annular space, the only samples containing chimney gas should have been from the sampling tube. However, radioactive gases were detected in the annulus. To determine if leak paths developed between the annulus and the sampling tube after detonation, the sampling tube was pressurized with SF_6 and annulus gas samples were analyzed for SF_6 . Conversely, the annular space was pressurized with SF_6 and tube samples were analyzed for SF_6 . There was a leak between the annulus and tube in the wellhead. Throughout the shut-in period, collections from the sample tube were made at the same general time as collections from the wellhead assembly above the annular space.

Appendix A is a brief outline of field activities and sampling operations during the preproduction shut-in period and is meant to serve as a context for placing the analytical results. It is not a definitive field-activity log.

This report is neither an inclusive report of all gas composition measurements made by LLL in support of the Rio Blanco experiment nor a complete summary of all available information regarding the composition of gas collected from RBE-01. Additional information gathered from the LLL analyses of gas from other sources and by other laboratories from analyses in support of the Rio Blanco program is summarized in separate topical reports.¹⁻³ Only a minimal evaluation of the significance of the data is given here.

ANALYTICAL PROCEDURES

Field samples were first subjected to a screening process in which their gross fission product content and chemical composition were measured. An estimate of the total activity in a sample was sometimes obtained by internal proportional counting of the dried sample gas. The fission-product radio-nuclide concentration was estimated by thin-window beta counting a portion of the untreated sample. Chemical composition was measured by mass spectrometric techniques.

Results of the preliminary screening were used in conjunction with considerations of sampling time, field operations, and the desired information to select appropriate samples for detailed radiochemical analyses. In this process, elution chromatography is used to obtain chemically pure component fractions of the samples for specific activity measurements.⁴ Inactive carrier gases were introduced to the separation system to facilitate handling of trace components. The purified fractions were measured using either thin-window or internal-fill, beta-proportional counters. Specific activity measurements were converted to concentrations using the known composition of the initial sample.

DISCUSSION

Samples were taken periodically from both the tube and the annulus to investigate the available gas quality, to establish the nature and source of the sampled gas, and to observe variability of the gas concentration as a function of time. Wellhead sampling experiments provided sufficient reason to disregard all but the tubing samples for the purposes of this report. Tube samples were taken before, during, and after depressurization of the tube.

The pressure was allowed to equilibrate into storage tanks to effect gas flow in the system. This insured that samples at the end of the equilibration period (flow samples) would be representative of the downhole conditions at the time of sampling. Samples taken prior to pressure equilibration (snap samples) were expected to be a mixture of residual gas from the previous sampling period and subsequent pressurization. Figure 1 presents the ratio of ^{85}Kr activity in the preproduction samples to that found in the top chimney gas as a function of sampling time. Chimney gas contained 16.65 Bq (450 pCi) of ^{85}Kr per ml.⁵ Figure 1 reveals that:

- The best sample (73-1-14-24) contained only about 20% chimney gas.
- The decline of activity between the equilibration periods indicates a dilution caused by the incursion of formation gas into the tube.
- The total drop in activity throughout the entire preproduction period suggests that an isolated pocket of depleted activity was sampled instead of the actual chimney.

Figure 2 presents the ratio of CH_4 to ^{85}Kr as a function of time. The increasing ratio suggests the dilution of cavity CH_4 with formation gas. This curve is essentially the inverse of that in Fig. 1 and suggests that tubing pressurization between sampling opportunities was solely a result of formation gas influx. The slight decrease seen between 41 and 76 d is not statistically significant.

Table 1 presents the flow sample results for some detonation-related gas constituents as ratios to be measured ^{85}Kr concentration. The constancy of the $^{133}\text{Xe}/^{85}\text{Kr}$ ratio during this sampling period is expected because both species would have completed growth from their fission product precursors prior to the sampling. The magnitude of the ratios is, however, significantly less than the expected value of 2.3×10^4 well-mixed chimney gas. The observed ratio can be obtained only if the gaseous products were separated from their precursors very shortly after detonation. Comparison of the measured value with calculated fission-gas ratios⁶ indicates an apparent separation time of <8 min, or approximately 70 min after detonation. The constancy of the $^{37}\text{Ar}/^{85}\text{Kr}$ ratio and its correspondence with the measured value of 6.25 in the top chimney gas indicates that complete ingrowth and mixing of the ^{85}Kr occurred prior to separation of ^{85}Kr and Br and implies separation at +10 to 15 min or later. From these observations, we conclude

Fig. 1. Ratio of ^{85}Kr in preproduction samples to that in chimney gas as a function of sampling time.

Fig. 2. Ratio of CH_4 to ^{85}Kr as a function of time.

Table 1. Selected ratios of detonated-related gas constituents.

Ratio ^a	No. days after detonation					Average	Chimney gas
	19.21	21.25	27.98	41.10	75.97		
$\frac{^{133}\text{Xe}}{^{85}\text{Kr}}$	530±10	440±70	510±30	420±30	-	480±50	2.3×10^4 (calculated)
$\frac{^{37}\text{Ar}}{^{85}\text{Kr}}$	6.5±0.9	8.5±0.1	7.1±0.2	6.8±0.2	-	7.2±0.9	6.62
$\frac{\text{cm}^3}{\text{nCi}}$	0.18±	0.19±	0.36±	0.19±	0.3±	0.24±	0.23
$\frac{\% \text{H}_2}{^{85}\text{Kr}}$	0.001	0.003	0.01	0.003	0.01	0.08	
$\frac{\text{cm}^3}{\text{Bq}}$	0.0048±	0.0005±	0.0010±	0.0005±	0.0081±	0.0065±	0.0062
	0.00003	0.00008	0.0003	0.00008	0.0003	0.0022	
$\frac{\text{cm}^3}{\text{pCi}}$	0.046±	0.041±	0.039±	0.043±	-	0.0423±	0.133
$\frac{\% \text{CO}_2}{^{85}\text{Kr}}$	0.0005	0.001	0.001	0.0006		0.0003	
$\frac{\text{cm}^3}{\text{Bq}}$	1.24±	1.11±	1.05±	1.16±	-	1.14±	3.59
	0.01	0.027	0.027	0.016		0.008	
$\frac{\text{CH}_3\text{T}}{^{85}\text{Kr}}$	0.0043±	0.0038±	0.0093±	0.319±	0.312±	-	0.06
	0.0007	0.0001	0.0004	0.008	0.010		
$\frac{\text{HT}}{^{85}\text{Kr}}$	0.028±	0.031±	0.032±	0.051±	-	0.0354±	0.006
	0.001	0.001	0.002	0.002		0.011	
$\frac{\text{pCi}}{\text{cm}^3}$	0.338±	0.071±	0.038±	0.708±	0.881±	-	95
	0.058	0.002	0.001	0.015	0.020		
$\frac{\text{CH}_3\text{T}}{\text{CH}_4}$	9.14±	1.92±	1.03±	19.14±	23.81±	-	2567.57
$\frac{\text{Bq}}{\text{cm}^3}$	1.57	0.05	0.03	0.41	0.54		
$\frac{\text{pCi}}{\text{cm}^3}$	157±7	161±3	88±4	270±13	-	169±75	25
$\frac{\text{HT}}{\text{H}_2}$							
$\frac{\text{Bq}}{\text{cm}^3}$	4243±	4351±	2378±	7297±	-	4568±	676
	190	81	114	351		2027	

^aRadionuclide concentrations have been decay-corrected to the time of detonation.

that the sampling-tube gas separated from the main body of chimney gas at about 70 min after detonation and that this pocket remained isolated throughout the sampling period.

The quantity of CO_2 relative to ^{85}Kr in a nuclear chimney would be expected to change as chemical equilibria shift in response to changing cavity temperature, pressure, gas composition, and continued carbonate decomposition. No such effect is seen in the ratios. The constancy of the experimental ratios may be taken as added support for the early separation and isolation of the sampled pocket. The deviation of these ratios from those encountered in the top chimney is in the same direction, and of comparable magnitude to previous observations at the Gasbuggy experiment.⁷ The quantity of H_2 relative to ^{85}Kr is constant over the entire sampling period and is comparable to that found in the upper chimney. However, based on the Gasbuggy experience, a decrease in this ratio by a factor of two was expected. These data are being evaluated in detail.

Ratios involving tritiated H_2 and CH_4 in the tubing samples are listed in Table 1. The $\text{CH}_3\text{T}/^{85}\text{Kr}$ ratio presents an interesting anomaly. Initial samples show a ratio considerably less than that found later in the chimney. This is consistent with the Gasbuggy experience at early times. However, later samples exhibit a significantly larger CH_3T content (relative to ^{85}Kr) than could reasonably be expected in chimney gas. The increase could have been an artifact generated as a result of measurement inaccuracies at the low activity levels encountered and cannot be explained on the basis of chimney gas influx. Possibly our pocket of isolated gas contained tritiated water of high specific activity that participated in exchange reactions with the CH_4 . However, the rate of these reactions cannot have been great under the conditions that characterized the gas pocket. Similarly, the methane specific activity ($\text{CH}_3\text{T}/\text{CH}_4$) is quite uncertain. These results do, however, illustrate the extreme dilution of the tritiated species relative to chimney gas.

In contrast, the $\text{HT}/^{85}\text{Kr}$ and HT/H_2 ratios appear to be rather well behaved. Hydrogen in the samples contains nearly seven times as much tritium as that in the chimney. This trend is similar to that observed in the Gasbuggy event, but it is less by a factor of six or seven.

ACKNOWLEDGMENTS

This work is the result of the combined efforts of a number of individuals. Samples were collected for our analyses by the Eberline Instrument Corporation* field team. Gas composition measurements were made by C. Otto; radiochemical determinations were made by J. Rego and J. Fontanilla, all of the LLL Chemical and Material Science Department. Beneficial suggestions, assistance, and encouragement came from the Continental Oil Company, Eberline Instrument Corporation, USAEC-PAD, the LLL Earth Sciences, Test Directors Office, and Radiochemistry Divisions.

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*Reference to a company or product name does not imply approval or recommendation of the product by the University of California or the U.S. Energy Research and Development Administration to the exclusion of others that may be suitable.

APPENDIX A: OUTLINE OF FIELD ACTIVITIES

Date	Time (MDT)	Sample source	Sample no.	Comments
3/8/71	1500		73-1-14-1	Pre-shot sample, Fawn Creek Well No. 1
1/9/73	1300		-2	Pre-shot sample, Fawn Creek Well No. 2
5/8		Wellhead	-3	From gas ebullition during explosive emplacement
5/17 Detonation	1000			First rupture diaphragm broken with nitrogen as planned. Pressurized sample line to 5000 psi in an effort to rupture 2nd diaphragm with nega- tive results. Closed emplacement well valve at that pressure on the downhole side and bled surface side to 3000 psi.
5/19	1404	Annulus Tube	-4, -5	Leak paths appeared to have developed between the sampling tube and annulus. Samples taken to determine if the two sample sources were of like compositions.
5/19 Sample tube pres- surized with SF ₆	1430			To determine if leak paths actually exist between the annulus and tube.
5/19	1630	Annulus Tube	-6, -7	Samples taken for SF ₆ analysis.
5/19 Sample tube bleed and equilibrated to 345 psi with nitrogen	+1630	Tube	-9a, -9b	Tube pressurized to pre- vent chimney gas mitigation into annulus.

Date	Time (MDT)	Sample source	Sample no.	Comments
5/21				Annulus bled and tube evacuated in an effort to obtain a sample from the lower depth.
Gas sample line appears to be leaking at a greater depth than expected				
5/22	0810- 0845	Annulus Tube	-12, -13, -14	Sampled after overnite build-up from vacuum.
5/26	1240, 1406	Annulus Tube	-21, -22	Continuation of sampling in conjunction with wellhead events 5/21-22.
5/29	1115	Annulus	-17	
5/31	2259			Possible underground motion.
Geophonic activity with increased pressure at the surface				
6/1	1140	Annulus	-18	Annular space pressurized with SF ₆ to determine if leak paths exist between annulus and tube.
6/5	1500	Tube	-24 through -26	
6/7	1215- 1600	Annulus Tube	-27 through -31	Samples analyzed to determine if cavity communication exists.
6/14	0900- 1100	Annulus Tube	-32 through -35	Continuation of gas sampling and analysis.
6/27-29		Annulus Tube	-36 through -45	Sampled at start, during, and end of annulus and tube production flow.
7/30	0935	Tube	-46	Sampling tube top.
7/30	0955	Storage Tank	-47	
7/31	0915- 1100	Annulus	-48 through -51	Sampled at start and end of 10 cf production flow.
8/1	0920	Tube	-52	Sampled at tube bottom.

Date	Time (MDT)	Sample source	Sample no.	Comments
8/1,2		Arming and Firing Cable	-53, -54	To determine if the arming and firing cable would yield satisfactory samples.
8/27-28	1300, 0940	Annulus Tube	-56, -59	Sampled prior to closure of sample tube with epoxy.
8/28 Sample tube filled with epoxy	+0940			Termination of pre- reentry shut-in sampling.

APPENDIX B: GAS ANALYSIS REPORTS OF RIO BLANCO E-01 WELLHEAD SAMPLES
DURING THE SHUT-IN PERIOD, MAY THROUGH SEPTEMBER, 1973

Notes

Notes

- These gas analysis reports are the LLL analyses of samples collected from the RBE-01 wellhead during the shut-in period following detonation and prior to reentry.* They should not be confused with the definitive tabulations of the same data issued by the CER Geonuclear Corporation or the Continental Oil Company.
- The reports are ordered by the date of receipt of the sample at LLL and not necessarily by the date of sampling. Collections times are in Mountain Daylight time. Sample container volumes and temperature-pressure measurements are of historical significance only and should not be confused with wellhead conditions.
- Thin-film beta counters recorded total fission gas (given in parentheses), i.e., ^{133}Xe , ^{131}Xe , and ^{85}Kr at time of counting.
- Low-background, internal-proportional counters recorded total β^- activity, i.e., ^{133}Xe , ^{131}Xe , ^{85}Kr , ^3H , and ^{222}Rn .
- "Top of sampling tube" indicates that the sample was taken prior to bleed-down. "Bottom of sample tube" indicates the sample was taken to the surface storage tank after equilibrating the tube.
- Chemical composition data are corrected for air. Oxygen is presumed not to be a component of the produced gas and is therefore used as an indicator of the pressure of air dilution in the sample. Normal air, based on accepted ratios to oxygen, is subtracted from the sample analysis and the residual is renormalized to 100%. Air corrections for some of these samples were significant as a consequence of the snap technique used.
- Chemical composition is in volume-percent after air corrections are determined by mass spectrometry. Probable accuracy is one to five units in the last reported figure ($\pm 1\%$ to $\pm 20\%$ depending on the concentration range.)

*Appendix A shows the samples relative to the field activities.

- Some samples contained extraneous materials introduced into the well or sampling tube during investigation of the sampling system. The sample compositions were not corrected for these materials.
- Radionuclide concentrations are in picocuries per standard milliliter (0°C, 760 mm Hg) of the air-corrected sample. Indicated errors are one standard deviation of the mean of replicate samples, or $\pm 1\%$, whichever is greater.

Project Fawn Creek #1 Well (Rio Blanco) Report Date _____
Sample Source Samples 1A and 1B LLL Sample No. 73-1-14-1
Collection Time 1500 Collection Date 3/18/71
Sample Container 500-ml bottles Sample Pressure 1800 psig @ _____ °C
Remarks Composite of two mass spectrometry and two rare gas analyses

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	0.2		Argon-37	
Oxygen			Argon-39	
Argon		11±2		
			Krypton-85	
Carbon Monoxide				
Carbon Dioxide	0.62		Xenon-133	
			Xenon-131m	
Hydrogen	0.06			
Methane	94.		Radon-222	
Ethane	3.5			
Propane	0.7		Tritium as hydrogen	
i - butane	0.2		Tritium as methane	
n - butane	0.2		Tritium as ethane	
C ₅ + hydrocarbons	0.62		Tritium as propane	
			Total tritium (_____)	
Helium		80±10	Carbon-14 monoxide	
Neon		<0.015	Carbon-14 dioxide	
Krypton		0.001	Carbon-14 in methane	
Xenon		0.001		
Total	100.		Total	

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

Indicated errors are one standard deviation of the mean of replicate measurements. Absolute uncertainty is unknown, but is most probably less than ± 10% of the values given.

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Project Fawn Creek #2 (Rio Blanco) Report Date _____
Sample Source Samples 2A (pot 1) and 2B (pot 2) LLL Sample No. 73-1-14-2
Collection Time 1300 Collection Date 1/9/73
Sample Container 500-ml bottles Sample Pressure 250/265 psig @ 20 °C
Remarks Composite of two mass spectrometry analyses

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☒ 4/5/73

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	0.4		Argon-37	
Oxygen			Argon-39	
Argon		11±2	Krypton-85	≤0.004
Carbon Monoxide			Xenon-133	
Carbon Dioxide	0.4		Xenon-131m	
Hydrogen			Radon-222	0.004±0.001
Methane	94.1		Tritium as hydrogen	
Ethane	3.54		Tritium as methane	
Propane	0.72		Tritium as ethane	
i - butane	0.5		Tritium as propane	
n - butane			Total tritium ()	
C ₅ + hydrocarbons			Carbon-14 monoxide	
Helium		80±10	Carbon-14 dioxide	
Neon		<0.015	Carbon-14 in methane	
Krypton		0.001		
Xenon		0.001		
Total	99.7		Total	

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-3
Collection Time _____ Collection Date 5/8/73
Sample Container 0.8 L Sample Pressure _____ psig @ _____ °C
Remarks Gas ebullition during explosive emplacement

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>48.9</u>	_____
Oxygen	<u>12.6</u>	_____
Argon	<u>0.59</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>0.21</u>	_____
Methane	<u>37.1</u>	_____
Ethane	<u>0.2</u>	_____
Propane	<u>0.14</u>	_____
i - butane	<u>0.06</u>	_____
n - butane	_____	_____
C ₅ + hydrocarbons	<u>0.23</u>	_____
_____	_____	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>100.</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☐ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
_____	_____
Krypton-85	_____
_____	_____
Xenon-133	_____
Xenon-131m	_____
_____	_____
Radon-222	_____
_____	_____
Tritium as hydrogen	_____
Tritium as methane	_____
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	(_____)
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
_____	_____
Total	_____

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

Indicated errors are one standard deviation of the mean of replicate measurements. Absolute uncertainty is unknown, but is most probably less than $\pm 10\%$ of the values given.

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-4
Collection Time 1404 Collection Date 5/19/73
Sample Container 115-cc bottle Sample Pressure 350 psig @ _____ °C
Remarks _____

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	<u>45.8</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.06</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.25</u>	_____	_____	_____
Methane	<u>48.2</u>	_____	Radon-222	_____
Ethane	<u>2.38</u>	_____	_____	_____
Propane	<u>1.05</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.25</u>	_____	Tritium as methane	_____
n - butane	<u>0.04</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium (_____)	_____
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

Indicated errors are one standard deviation of the mean of replicate measurements. Absolute uncertainty is unknown, but is most probably less than $\pm 10\%$ of the values given.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-5
Collection Time 1404 Collection Date 5/19/73
Sample Container 115 cc-bottle Sample Pressure 46 psig @ _____ °C
Remarks After sampling, tube bled to atmosphere and filled to
180 p.s.i. with SF₆

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	<u>94.0</u>		Argon-37	
Oxygen			Argon-39	
Argon				
			Krypton-85	
Carbon Monoxide				
Carbon Dioxide			Xenon-133	<u>(0.32±0.1)</u>
			Xenon-131m	
Hydrogen	<u>0.23</u>			
Methane	<u>5.23</u>		Radon-222	
Ethane	<u>0.23</u>			
Propane	<u>0.12</u>		Tritium as hydrogen	
i - butane	<u>0.04</u>		Tritium as methane	
n - butane			Tritium as ethane	
C ₅ + hydrocarbons	<u>0.04</u>		Tritium as propane	
			Total tritium	<u>()</u>
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	<u>100.</u>		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-6
Collection Time 1630 Collection Date 5/19/73
Sample Container 115-cc bottle Sample Pressure 100 psig @ _____ °C
Remarks _____

Report basis: ☒ Sample as received ☐ Sample Time
☐ Sample less _____ % normal air (based on oxygen). Decay Corrected to: ☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	<u>10.0</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.07</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>3.42</u>	_____	_____	_____
Methane	<u>79.2</u>	_____	Radon-222	_____
Ethane	<u>4.30</u>	_____	_____	_____
Propane	<u>2.10</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.51</u>	_____	Tritium as methane	_____
n - butane	<u>0.15</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.03</u>	_____	Tritium as propane	_____
SF ₆	<u>0.24</u>	_____	_____	_____
_____	_____	_____	Total tritium (_____)	
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-7
Collection Time 1640 Collection Date 5/19/73
Sample Container 115-cc bottle Sample Pressure 200 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 0.14 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	<u>9.77</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.08</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>3.41</u>	_____	_____	_____
Methane	<u>79.47</u>	_____	Radon-222	_____
Ethane	<u>4.29</u>	_____	_____	_____
Propane	<u>2.09</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.53</u>	_____	Tritium as methane	_____
n - butane	<u>0.10</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as propane	_____
SF ₆	<u>0.20</u>	_____	_____	_____
_____	_____	_____	Total tritium	(_____)
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>99.9</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-9A-B
Collection Time 0955 and 1051 Collection Date 5/21/73
Sample Container 115-cc bottles Sample Pressure 357; 310 psig @ _____ °C
Remarks 5/19/73 - Tube bled and equilibrated to 345 p.s.i. with high purity N₂

Report basis: ☒ Sample as received
☐ Sample less _____ % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	100	
Oxygen		
Argon		
Carbon Monoxide		
Carbon Dioxide		
Hydrogen		
Methane		
Ethane		
Propane		
i - butane		
n - butane		
C ₅ + hydrocarbons		
Helium		
Neon		
Krypton		
Xenon		
Total	100	

RADIONUCLIDE CONCENTRATION

Component	☐ pCi/ml (STP) ☐
Argon-37	
Argon-39	
Krypton-85	
Xenon-133	
Xenon-131m	
Radon-222	
Tritium as hydrogen	
Tritium as methane	
Tritium as ethane	
Tritium as propane	
Total tritium ()	
Carbon-14 monoxide	
Carbon-14 dioxide	
Carbon-14 in methane	
Total	

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-12
Collection Time 0810 Collection Date 5/22/73
Sample Container 115-cc bottle Sample Pressure 50 psig @ _____ °C
Remarks Sample obtained after overnight buildup from vacuum

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>98.84</u>	_____
Oxygen	_____	_____
Argon	<u>0.01</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>0.03</u>	_____
Methane	<u>0.73</u>	_____
Ethane	_____	_____
Propane	<u>0.01</u>	_____
i - butane	_____	_____
n - butane	_____	_____
C ₅ + hydrocarbons	_____	_____
SF ₆	<u>0.32</u>	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>99.9</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
_____	_____
Krypton-85	_____
_____	_____
Xenon-133	<u>(0.33±0.07)</u>
Xenon-131m	_____
Radon-222	_____
_____	_____
Tritium as hydrogen	_____
Tritium as methane	_____
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	(_____)
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
_____	_____
Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-13
Collection Time 0816 Collection Date 5/22/73
Sample Container 115-cc bottle Sample Pressure 5 psig @ _____ °C
Remarks Tubing flushed to 5 p.s.i.

Report basis: ☐ Sample as received
☒ Sample less 0.38 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	98.78	
Oxygen		
Argon	0.02	
Carbon Monoxide		
Carbon Dioxide		
Hydrogen	0.04	
Methane	0.63	
Ethane		
Propane		
i - butane	0.01	
n - butane	0.01	
C ₅ + hydrocarbons	0.03	
SF ₆	0.51	
Helium		
Neon		
Krypton		
Xenon		
Total	100.	

RADIONUCLIDE CONCENTRATION

Component	☐ pCi/ml (STP) ☐
Argon-37	
Argon-39	
Krypton-85	
Xenon-133	
Xenon-131m	
Radon-222	
Tritium as hydrogen	
Tritium as methane	
Tritium as ethane	
Tritium as propane	
Total tritium	()
Carbon-14 monoxide	
Carbon-14 dioxide	
Carbon-14 in methane	
Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-14
Collection Time 0845 Collection Date 5/22/73
Sample Container 115-cc bottle Sample Pressure 80 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 1.15 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.94</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.05</u>	_____	_____	_____
Carbon Monoxide	_____	_____	XXXXXXXXXX Total fission products	<u>(0.150±0.002)</u>
Carbon Dioxide	_____	_____	Xenon-133	_____
Hydrogen	<u>2.73</u>	_____	Xenon-131m	_____
Methane	<u>85.98</u>	_____	Radon-222	_____
Ethane	<u>5.02</u>	_____	Tritium as hydrogen	_____
Propane	<u>2.46</u>	_____	Tritium as methane	_____
i - butane	<u>0.48</u>	_____	Tritium as ethane	_____
n - butane	<u>0.25</u>	_____	Tritium as propane	_____
C ₅ + hydrocarbons	<u>0.05</u>	_____	_____	_____
Helium	_____	_____	Total tritium	<u>()</u>
Neon	_____	_____	Carbon-14 monoxide	_____
Krypton	_____	_____	Carbon-14 dioxide	_____
Xenon	_____	_____	Carbon-14 in methane	_____
Total	<u>100.</u>	_____	Total radio- nuclides	<u>(0.85±0.04)</u>

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-15
Collection Time 1045 Collection Date 5/23/73
Sample Container 500-cc bottle Sample Pressure 265 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 0.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	3.03		Argon-37	
Oxygen			Argon-39	
Argon	0.04		Krypton-85	
Carbon Monoxide			Xenon-133	(0.63±0.14)
Carbon Dioxide			Xenon-131m	
Hydrogen	2.83		Radon-222	(0.056±0.034)
Methane	86.68		Tritium as hydrogen	
Ethane	4.74		Tritium as methane	
Propane	2.07		Tritium as ethane	
i - butane	0.04		Tritium as propane	
n - butane	0.12		Total tritium	()
C ₅ + hydrocarbons			Carbon-14 monoxide	
Helium			Carbon-14 dioxide	
Neon			Carbon-14 in methane	
Krypton				
Xenon				
Total	99.6		Total	

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-21
Collection Time 1240 Collection Date 5/26/73
Sample Container 115-cc bottle Sample Pressure 101 psig @ _____ °C
Remarks Annulus at atmospheric pressure

Report basis: ☐ Sample as received
☒ Sample less 0.62 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>88.67</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.02</u>	_____	Krypton-85	<u>(<0.50)</u>
Carbon Monoxide	_____	_____	Xenon-133	_____
Carbon Dioxide	_____	_____	Xenon-131m	_____
Hydrogen	<u>0.33</u>	_____	Radon-222	_____
Methane	<u>9.56</u>	_____	Tritium as hydrogen	_____
Ethane	<u>0.45</u>	_____	Tritium as methane	_____
Propane	<u>0.22</u>	_____	Tritium as ethane	_____
i - butane	<u>0.05</u>	_____	Tritium as propane	_____
n - butane	_____	_____	Total tritium	<u>(_____)</u>
C ₅ + hydrocarbons	<u>0.47</u>	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	Total	_____
Xenon	_____	_____		
Total	<u>99.8</u>	_____		

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-22
Collection Time 1406 Collection Date 5/26/73
Sample Container 500-cc bottle Sample Pressure 240 psig @ _____ °C
Remarks After 1-h buildup

Report basis: ☐ Sample as received
☒ Sample less 0.48 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>3.14</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.05</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	<u>(≤ 0.48)</u>
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.81</u>	_____	_____	_____
Methane	<u>86.51</u>	_____	Radon-222	_____
Ethane	<u>4.74</u>	_____	_____	_____
Propane	<u>2.20</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.45</u>	_____	Tritium as methane	_____
n - butane	<u>0.13</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-17
Collection Time 1115 Collection Date 5/29/73
Sample Container 115-cc bottle Sample Pressure 220 psig @ _____ °C
Remarks After 1-h buildup

Report basis: ☐ Sample as received
☒ Sample less 0.29 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>3.09</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.04</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	<u>0.24±0.05</u>
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.71</u>	_____	_____	_____
Methane	<u>86.25</u>	_____	Radon-222	<u>(0.100±0.002)</u>
Ethane	<u>4.88</u>	_____	_____	_____
Propane	<u>2.37</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.53</u>	_____	Tritium as methane	_____
n - butane	<u>0.15</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	(_____)
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-18
Collection Time 1140 Collection Date 6/1/73
Sample Container 115-cc bottle Sample Pressure 215 psig @ _____ °C
Remarks After 1-h buildup

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>2.99</u>	_____
Oxygen	_____	_____
Argon	<u>0.04</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>2.56</u>	_____
Methane	<u>86.26</u>	_____
Ethane	<u>4.95</u>	_____
Propane	<u>2.42</u>	_____
i - butane	<u>0.48</u>	_____
n - butane	<u>0.23</u>	_____
C ₅ + hydrocarbons	<u>0.04</u>	_____
_____	_____	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>100.</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	<u>0.009±0.007</u>
Argon-39	_____
_____	_____
Krypton-85	<u><0.001</u>
_____	_____
Xenon-133	<u>0.011±0.006</u>
Xenon-131m	_____
_____	_____
Radon-222	<u>0.020±0.001</u>
_____	_____
Tritium as hydrogen	<u>0.060±0.001</u>
Tritium as methane	<u>0.006±0.008</u>
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	(_____)
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
Total	_____

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

Indicated errors are one standard deviation of the mean of replicate measurements. Absolute uncertainty is unknown, but is most probably less than ± 10% of the values given.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-24
Collection Time 1435 Collection Date 6/5/73
Sample Container 115-cc bottle Sample Pressure 716 psig @ _____ °C
Remarks No flush

Report basis: ☒ Sample as received
☐ Sample less 1.14 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	77.39		Argon-37	
Oxygen			Argon-39	
Argon	0.02			
			Krypton-85	(81.3±0.9)
Carbon Monoxide	0.67			
Carbon Dioxide			Xenon-133	(1960±20)
			Xenon-131m	
Hydrogen	1.45			
Methane	19.42		Radon-222	
Ethane	0.58			
Propane	0.08		Tritium as hydrogen	
i - butane	0.03		Tritium as methane	
n - butane			Tritium as ethane	
C ₅ + hydrocarbons	0.05		Tritium as propane	
SF ₆	0.38			
			Total tritium	()
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	100.		Total	

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-25
Collection Time 1500 Collection Date 6/5/73
Sample Container 115-cc bottle Sample Pressure 210 psig @ _____ °C
Remarks After bleed of tube; sample compressed to 210 psi

Report basis: ☐ Sample as received
☒ Sample less 3.96 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>9.40</u>		Argon-37	<u>303±3</u>
Oxygen			Argon-39	
Argon	<u>0.04</u>		Krypton-85	<u>67.6±0.7</u>
Carbon Monoxide	<u>0.29</u>		Xenon-133	<u>2790±50</u>
Carbon Dioxide	<u>0.11</u>		Xenon-131m	<u>4.8±0.7</u>
Hydrogen	<u>1.20</u>		Radon-222	<u>0.010±0.001</u>
Methane	<u>85.80</u>		Tritium as hydrogen	<u>1.88±0.08</u>
Ethane	<u>2.47</u>		Tritium as methane	<u>0.29±0.05</u>
Propane	<u>0.30</u>		Tritium as ethane	
i - butane	<u>0.09</u>		Tritium as propane	
n - butane			Total tritium ()	
C ₅ + hydrocarbons	<u>0.01</u>		Carbon-14 monoxide	
SF ₆	<u>0.27</u>		Carbon-14 dioxide	
Helium			Carbon-14 in methane	
Neon				
Krypton				
Xenon				
Total	<u>100.</u>		Total	

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-25
Collection Time 1500 Collection Date 6/5/73
Sample Container 115-cc bottle Sample Pressure 210 psig @ _____ °C
Remarks After bleed of tube; sample compressed to 210 psi

Report basis: ☐ Sample as received
☒ Sample less 3.96 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	9.40	
Oxygen		
Argon	0.04	
Carbon Monoxide	0.29	
Carbon Dioxide	0.11	
Hydrogen	1.20	
Methane	85.80	
Ethane	2.47	
Propane	0.30	
i - butane	0.09	
n - butane		
C ₅ + hydrocarbons	0.01	
SF ₆	0.27	
Helium		
Neon		
Krypton		
Xenon		
Total	100.	

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	303±3
Argon-39	
Krypton-85	67.6±0.7
Xenon-133	2790±50
Xenon-131m	4.8±0.7
Radon-222	0.010±0.001
Tritium as hydrogen	1.88±0.08
Tritium as methane	0.29±0.05
Tritium as ethane	
Tritium as propane	
Total tritium	()
Carbon-14 monoxide	
Carbon-14 dioxide	
Carbon-14 in methane	
Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-26
Collection Time 1535 Collection Date 6/5/73
Sample Container 115-cc bottle Sample Pressure 275 psig @ _____ °C
Remarks No prior annulus flow

Report basis: ☐ Sample as received
☒ Sample less 1.58 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>60.62</u>	_____	Argon-37	<u>520. ±2</u>
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.03</u>	_____	_____	_____
Carbon Monoxide	<u>0.57</u>	_____	Krypton-85	<u>63.5±0.9</u>
Carbon Dioxide	_____	_____	_____	_____
Hydrogen	<u>1.71</u>	_____	Xenon-133	<u>1590±30</u>
Methane	<u>34.54</u>	_____	Xenon-131m	<u>3.6±0.4</u>
Ethane	<u>1.52</u>	_____	Radon-222	<u>0.017±0.005</u>
Propane	<u>0.57</u>	_____	_____	_____
i - butane	<u>0.13</u>	_____	Tritium as hydrogen	<u>2.87±0.03</u>
n - butane	<u>0.03</u>	_____	Tritium as methane	<u>0.28±0.04</u>
C ₅ + hydrocarbons	_____	_____	Tritium as ethane	_____
_____	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
Helium	_____	_____	Total tritium	(_____)
Neon	_____	_____	Carbon-14 monoxide	_____
Krypton	_____	_____	Carbon-14 dioxide	<u>0.009±0.001</u>
Xenon	_____	_____	Carbon-14 in methane	_____
_____	_____	_____	_____	_____
Total	<u>99.7</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-27
Collection Time 1215 Collection Date 6/7/73
Sample Container 115-cc bottle Sample Pressure 346 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 1.53 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>8.3</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.01</u>	_____	_____	_____
_____	_____	_____	Krypton-85	<u>(53.9±0.6)</u>
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	<u>0.22</u>	_____	Xenon-133	<u>(1900±20)</u>
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>1.05</u>	_____	_____	_____
Methane	<u>87.44</u>	_____	Radon-222	_____
Ethane	<u>2.49</u>	_____	_____	_____
Propane	<u>0.31</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.09</u>	_____	Tritium as methane	_____
n - butane	_____	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>99.9</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-28
Collection Time 1600 Collection Date 6/7/73
Sample Container 500-cc bottle Sample Pressure 53 psig @ _____ °C
Remarks Sample tube bottom

Report basis: ☐ Sample as received
☒ Sample less 0.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>4.25</u>	_____	Argon-37	<u>96.4±0.2</u>
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	Krypton-85	<u>17.2±0.3</u>
Carbon Monoxide	_____	_____	Xenon-133	<u>460±70</u>
Carbon Dioxide	_____	_____	Xenon-131m	<u>2.±10</u>
Hydrogen	<u>0.33</u>	_____	Radon-222	_____
Methane	<u>92.19</u>	_____	Tritium as hydrogen	<u>0.53±0.01</u>
Ethane	<u>2.71</u>	_____	Tritium as methane	<u>0.065±0.002</u>
Propane	<u>0.35</u>	_____	Tritium as ethane	<u>0.027±0.001</u>
i - butane	<u>0.11</u>	_____	Tritium as propane	_____
n - butane	_____	_____	Total tritium (_____)	
C ₅ + hydrocarbons	<u>0.02</u>	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	<u>0.057±0.001</u>
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-29
Collection Time 1600 Collection Date 6/7/73
Sample Container 115-cc bottle Sample Pressure 54 psig @ _____ °C
Remarks Duplicate of sample no. 73-1-14-28

Report basis: ☐ Sample as received
☒ Sample less 0.33 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>3.85</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	Krypton-85	<u>(13±0.2)</u>
Carbon Monoxide	_____	_____	Xenon-133	<u>(420±10)</u>
Carbon Dioxide	<u>0.08</u>	_____	Xenon-131m	_____
Hydrogen	<u>0.25</u>	_____	Radon-222	_____
Methane	<u>92.71</u>	_____	Tritium as hydrogen	_____
Ethane	<u>2.68</u>	_____	Tritium as methane	_____
Propane	<u>0.34</u>	_____	Tritium as ethane	_____
i - butane	<u>0.11</u>	_____	Tritium as propane	_____
n - butane	<u>0.01</u>	_____	Total tritium	<u>(_____)</u>
C ₅ + hydrocarbons	_____	_____	Carbon-14 monoxide	_____
SF ₆	<u>0.01</u>	_____	Carbon-14 dioxide	_____
Helium	_____	_____	Carbon-14 in methane	_____
Neon	_____	_____	_____	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	Total	_____
Total	<u>100.</u>	_____		

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-30
Collection Time 1415 Collection Date 6/7/73
Sample Container 115-cc bottle Sample Pressure 280 psig @ _____ °C
Remarks before bleed-down

Report basis: ☐ Sample as received
☒ Sample less 1.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	33.7		Argon-37	
Oxygen			Argon-39	
Argon	0.02		Krypton-85	(34±1)
Carbon Monoxide			Xenon-133	(72±2)
Carbon Dioxide			Xenon-131m	
Hydrogen	2.08		Radon-222	
Methane	59.8		Tritium as hydrogen	
Ethane	2.78		Tritium as methane	
Propane	1.10		Tritium as ethane	
i - butane	0.22		Tritium as propane	
n - butane	0.05		Total tritium	()
C ₅ + hydrocarbons			Carbon-14 monoxide	
SF ₆	0.16		Carbon-14 dioxide	
Helium			Carbon-14 in methane	
Neon				
Krypton				
Xenon				
Total	99.9		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-31
Collection Time 1545 Collection Date 6/7/73
Sample Container 115-cc bottle Sample Pressure 250 psig @ _____ °C
Remarks After bleed-down

Report basis: ☐ Sample as received
☒ Sample less 0.57 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.8</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.04</u>	_____	_____	_____
_____	_____	_____	Krypton-85	<u>(1.2±0.1)</u>
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	<u>(40.±1.)</u>
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.5</u>	_____	_____	_____
Methane	<u>86.7</u>	_____	Radon-222	_____
Ethane	<u>4.8</u>	_____	_____	_____
Propane	<u>2.36</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.46</u>	_____	Tritium as methane	_____
n - butane	<u>0.23</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.05</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
Total	<u>99.9</u>	_____	Total	_____

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-32
Collection Time 0900 Collection Date 6/14/63
Sample Container 500-cc bottle Sample Pressure 880 psig @ _____ °C
Remarks Snap Sample from top of sample tube

Report basis: ☐ Sample as received
☐ Sample less 0.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>3.3</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	_____	_____
Carbon Monoxide	_____	_____	Krypton-85	<u>(8.1±0.4)</u>
Carbon Dioxide	<u>0.08</u>	_____	_____	_____
Hydrogen	<u>0.15</u>	_____	Xenon-133	<u>(101.±3.0)</u>
Methane	<u>93.19</u>	_____	Xenon-131m	_____
Ethane	<u>2.76</u>	_____	Radon-222	_____
Propane	<u>0.37</u>	_____	_____	_____
i - butane	<u>0.11</u>	_____	Tritium as hydrogen	_____
n - butane	_____	_____	Tritium as methane	_____
C ₅ + hydrocarbons	<u>0.03</u>	_____	Tritium as ethane	_____
_____	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
Helium	_____	_____	Total tritium	<u>(_____)</u>
Neon	_____	_____	Carbon-14 monoxide	_____
Krypton	_____	_____	Carbon-14 dioxide	_____
Xenon	_____	_____	Carbon-14 in methane	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
 Sample Source Tube LLL Sample No. 73-1-14-33
 Collection Time 0930 Collection Date 6/14/73
 Sample Container 500-cc bottle Sample Pressure 1000 psig @ _____ °C
 Remarks Bottom of sample tube; bled down to 89 p.s.i.

Report basis: ☐ Sample as received
☒ Sample less 0.14 % normal air
 (based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.71</u>	_____	Argon-37	<u>16.0±0.1</u>
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.01</u>	_____	Krypton-85	<u>3.88±0.10</u>
Carbon Monoxide	_____	_____	Xenon-133	<u>49.±2.</u>
Carbon Dioxide	<u>0.15</u>	_____	Xenon-131m	<u>1.3±0.2</u>
Hydrogen	<u>0.14</u>	_____	Radon-222	_____
Methane	<u>94.4</u>	_____	Tritium as hydrogen	<u>0.123±0.005</u>
Ethane	<u>2.2</u>	_____	Tritium as methane	<u>0.036±0.001</u>
Propane	<u>0.28</u>	_____	Tritium as ethane	<u>0.015±0.0002</u>
i - butane	<u>0.12</u>	_____	Tritium as propane	<u><0.001</u>
n - butane	_____	_____	Total tritium	(_____)
C ₅ + hydrocarbons	_____	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-34
Collection Time 1010 Collection Date 6/14/73
Sample Container 500-cc bottle Sample Pressure 300 psig @ _____ °C
Remarks Snap sample from Annulus top

Report basis: ☐ Sample as received
☒ Sample less 0.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>5.73</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	_____	_____
Carbon Monoxide	_____	_____	Krypton-85	<u>(7.4±0.2)</u>
Carbon Dioxide	_____	_____	_____	_____
Hydrogen	<u>0.63</u>	_____	Xenon-133	<u>(91±2)</u>
Methane	<u>89.59</u>	_____	Xenon-131m	_____
Ethane	<u>3.06</u>	_____	Radon-222	_____
Propane	<u>0.71</u>	_____	_____	_____
i - butane	<u>0.14</u>	_____	Tritium as hydrogen	_____
n - butane	<u>0.1</u>	_____	Tritium as methane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as ethane	_____
_____	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
Helium	_____	_____	Total tritium	<u>()</u>
Neon	_____	_____	Carbon-14 monoxide	_____
Krypton	_____	_____	Carbon-14 dioxide	_____
Xenon	_____	_____	Carbon-14 in methane	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-35
Collection Time 1150 Collection Date 6/14/73
Sample Container 500-cc bottle Sample Pressure - psig @ _____ °C
Remarks After bleed-down following SF₆ injection

Report basis: ☐ Sample as received
☒ Sample less 0.10 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.63</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.03</u>	_____	Krypton-85	<u>(0.5±0.9)</u>
Carbon Monoxide	_____	_____	Xenon-133	<u>(2.6±0.5)</u>
Carbon Dioxide	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.49</u>	_____	Radon-222	_____
Methane	<u>86.68</u>	_____	Tritium as hydrogen	_____
Ethane	<u>4.93</u>	_____	Tritium as methane	_____
Propane	<u>2.41</u>	_____	Tritium as ethane	_____
i - butane	<u>0.57</u>	_____	Tritium as propane	_____
n - butane	<u>0.17</u>	_____	Total tritium	<u>(_____)</u>
C ₅ + hydrocarbons	<u>0.02</u>	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>99.9</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-36
Collection Time 1030 Collection Date 6/27/73
Sample Container 115-cc bottle Sample Pressure 1600 psig @ _____ °C
Remarks Top of gas sample tube

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.15</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	_____	_____
Carbon Monoxide	_____	_____	Krypton-85	<u>(3.74±0.40)</u>
Carbon Dioxide	<u>0.15</u>	_____	_____	_____
Hydrogen	<u>0.07</u>	_____	Xenon-133	<u>(6.8±1.8)</u>
Methane	<u>94.28</u>	_____	Xenon-131m	_____
Ethane	<u>2.82</u>	_____	Radon-222	_____
Propane	<u>0.39</u>	_____	_____	_____
i - butane	<u>0.13</u>	_____	Tritium as hydrogen	_____
n - butane	_____	_____	Tritium as methane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as ethane	_____
_____	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
Helium	_____	_____	Total tritium	<u>(_____)</u>
Neon	_____	_____	Carbon-14 monoxide	_____
Krypton	_____	_____	Carbon-14 dioxide	_____
Xenon	_____	_____	Carbon-14 in methane	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

a probable accuracy of the above results is 1-5 units in the last
orted figure unless otherwise indicated.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-37
Collection Time 1222 Collection Date 6/27/73
Sample Container 115-cc bottles Sample Pressure 1000 psig @ _____ °C
Remarks Sampled after equilibrating tube to surface storage tanks

Report basis: ☐ Sample as received
☒ Sample less 0.29 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>1.68</u>	_____
Oxygen	_____	_____
Argon	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	<u>0.10</u>	_____
Hydrogen	<u>0.04</u>	_____
Methane	<u>94.77</u>	_____
Ethane	<u>2.85</u>	_____
Propane	<u>0.39</u>	_____
i - butane	<u>0.13</u>	_____
n - butane	_____	_____
C ₅ + hydrocarbons	<u>0.03</u>	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>100.</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
Krypton-85	<u>(1.80±0.11)</u>
Xenon-133	<u>(7.7±1.9)</u>
Xenon-131m	_____
Radon-222	_____
Tritium as hydrogen	_____
Tritium as methane	_____
Tritium as ethane	_____
Tritium as propane	_____
Total tritium	(_____)
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-38
Collection Time 1225 Collection Date 6/27/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Sampled after equilibrating tube to surface storage tanks

Report basis: ☐ Sample as received
☒ Sample less 0.67 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>1.39</u>	_____	Argon-37	<u>6.33±0.13</u>
Oxygen	_____	_____	Argon-39	_____
Argon	_____	_____	Krypton-85	<u>2.09±0.03</u>
Carbon Monoxide	_____	_____	Xenon-133	<u>3.80±0.30</u>
Carbon Dioxide	<u>0.09</u>	_____	Xenon-131m	<u>0.11±0.04</u>
Hydrogen	<u>0.04</u>	_____	Radon-222	_____
Methane	<u>95.04</u>	_____	Tritium as hydrogen	<u>0.108±0.005</u>
Ethane	<u>2.89</u>	_____	Tritium as methane	<u>0.673±0.014</u>
Propane	<u>0.40</u>	_____	Tritium as ethane	<u>0.002±0.001</u>
i - butane	<u>0.14</u>	_____	Tritium as propane	<u>0.001±0.0001</u>
n - butane	_____	_____	Total tritium	(_____)
C ₅ + hydrocarbons	<u>0.05</u>	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-39
Collection Time 1222 Collection Date 6/27/73
Sample Container 115-cc bottles Sample Pressure 310 psig @ _____ °C
Remarks Top of annulus

Report basis: ☐ Sample as received
☒ Sample less 0.29 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>2.18</u>	_____
Oxygen	_____	_____
Argon	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
Hydrogen	<u>0.29</u>	_____
Methane	<u>93.97</u>	_____
Ethane	<u>2.90</u>	_____
Propane	<u>0.46</u>	_____
i - butane	<u>0.11</u>	_____
n - butane	<u>0.03</u>	_____
C ₅ + hydrocarbons	<u>0.05</u>	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>100.</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
Krypton-85	<u>(3.09±0.10)</u>
Xenon-133	<u>(7.7±0.7)</u>
Xenon-131m	_____
Radon-222	<u>(0.030±0.006)</u>
Tritium as hydrogen	_____
Tritium as methane	_____
Tritium as ethane	_____
Tritium as propane	_____
Total tritium	<u>()</u>
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-40
Collection Time 1304 Collection Date 6/27/73
Sample Container 115-cc bottle Sample Pressure 150 psig @ _____ °C
Remarks Annulus after flowing 3.11 cubic feet.

Report basis: ☐ Sample as received
☒ Sample less 0.38 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.61</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.03</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.92</u>	_____	_____	_____
Methane	<u>87.94</u>	_____	Radon-222	<u>(0.085±0.003)</u>
Ethane	<u>4.55</u>	_____	_____	_____
Propane	<u>2.10</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.49</u>	_____	Tritium as methane	<u>(2.56±0.14)</u>
n - butane	<u>0.12</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-43
Collection Time 1532 Collection Date 6/27/73
Sample Container 115-cc bottles Sample Pressure 177 psig @ _____ °C
Remarks Annulus after approximately 10 ft³ flowed

Report basis: ☐ Sample as received
☒ Sample less 0.72 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volumc %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.70</u>		Argon-37	
Oxygen			Argon-39	
Argon	<u>0.04</u>			
			Krypton-85	<u>(0.17±0.30)</u>
Carbon Monoxide				
Carbon Dioxide			Xenon-133	<u>(<1.00)</u>
			Xenon-131m	
Hydrogen	<u>2.44</u>			
Methane	<u>86.92</u>		Radon-222	<u>(0.227±0.010)</u>
Ethane	<u>4.85</u>			
Propane	<u>2.34</u>		Tritium as hydrogen	
i - butane	<u>0.45</u>		Tritium as methane	<u>(0.215±0.008)</u>
n - butane	<u>0.21</u>		Tritium as ethane	
C ₅ + hydrocarbons	<u>0.04</u>		Tritium as propane	
			Total tritium	<u>()</u>
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	<u>100.</u>		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-41
Collection Time 1745 Collection Date 6/27/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Annulus after 30 ft³ flowed. Compressed to 1000 psi from 179 psi.

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>2.46</u>	_____
Oxygen	_____	_____
Argon	<u>0.03</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>2.42</u>	_____
Methane	<u>86.97</u>	_____
Ethane	<u>4.90</u>	_____
Propane	<u>2.42</u>	_____
i - butane	<u>0.56</u>	_____
n - butane	<u>0.17</u>	_____
C ₅ + hydrocarbons	<u>0.02</u>	_____
_____	_____	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>99.95</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
_____	_____
Krypton-85	_____
_____	_____
Xenon-133	_____
Xenon-131m	_____
Radon-222	<u>(0.238±0.002)</u>
_____	_____
Tritium as hydrogen	_____
Tritium as methane	<u>(0.320±0.040)</u>
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	<u>(_____)</u>
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-44
Collection Time 0910 Collection Date 6/28/73
Sample Container 115-cc bottles Sample Pressure 1000 psig @ _____ °C
Remarks Annulus after 93 ft³ flowed.

Report basis: ☐ Sample as received
☒ Sample less 0.72 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.36</u>	_____	Argon-37	<u>(0.04±0.01)</u>
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.04</u>	_____	_____	_____
_____	_____	_____	Krypton-85	<u>(1.24±0.30)</u>
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.35</u>	_____	_____	_____
Methane	<u>87.12</u>	_____	Radon-222	<u>(0.274±0.008)</u>
Ethane	<u>4.92</u>	_____	_____	_____
Propane	<u>2.40</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.47</u>	_____	Tritium as methane	<u>(0.24±0.06)</u>
n - butane	<u>0.27</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.05</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.0</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-45
Collection Time 0854 Collection Date 6/29/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks After 155.8 ft³ flowed

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>9.17</u>		Argon-37	<u>0.024±0.001</u>
Oxygen			Argon-39	
Argon	<u>0.03</u>		Krypton-85	<u>0.010±0.006</u>
Carbon Monoxide			Xenon-133	<u>4.40±0.5</u>
Carbon Dioxide			Xenon-131m	<u>0.24±0.02</u>
Hydrogen	<u>2.10</u>		Radon-222	<u>0.112±0.001</u>
Methane	<u>81.26</u>		Tritium as hydrogen	<u>0.223±0.005</u>
Ethane	<u>4.50</u>		Tritium as methane	<u>0.034±0.001</u>
Propane	<u>2.21</u>		Tritium as ethane	
i - butane	<u>0.54</u>		Tritium as propane	
n - butane	<u>0.21</u>		Total tritium ()	
C ₅ + hydrocarbons	<u>0.02</u>		Carbon-14 monoxide	
Helium			Carbon-14 dioxide	
Neon			Carbon-14 in methane	
Krypton				
Xenon				
Total	<u>100.</u>		Total	

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-46
Collection Time 0935 Collection Date 7/30/73
Sample Container 115-cc bottle Sample Pressure 1600 psig @ _____ °C
Remarks Top of sample tube

Report basis: ☐ Sample as received
☒ Sample less 0.33 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>100.</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.01</u>	_____	_____	_____
_____	_____	_____	Krypton-85	<u>(0.08±0.06)</u>
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	<u>0.01</u>	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	_____	_____	_____	_____
Methane	<u>0.12</u>	_____	Radon-222	_____
Ethane	<u>0.01</u>	_____	_____	_____
Propane	_____	_____	Tritium as hydrogen	_____
i - butane	_____	_____	Tritium as methane	<u>(0.008±0.011)</u>
n - butane	_____	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	_____	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	(_____)
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Storage Tank LLL Sample No. 73-1-14-47
Collection Time 0955 Collection Date 7/30/73
Sample Container _____ Sample Pressure 184 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 0.19 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>19.79</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.03</u>	_____	Krypton-85	<u><0.4</u>
Carbon Monoxide	_____	_____	Xenon-133	_____
Carbon Dioxide	_____	_____	Xenon-131m	_____
Hydrogen	<u>1.91</u>	_____	Radon-222	<u>(<0.03)</u>
Methane	<u>71.44</u>	_____	Tritium as hydrogen	_____
Ethane	<u>3.99</u>	_____	Tritium as methane	<u>(0.034±0.002)</u>
Propane	<u>2.05</u>	_____	Tritium as ethane	_____
i - butane	<u>0.43</u>	_____	Tritium as propane	_____
n - butane	<u>0.28</u>	_____	Total tritium	(_____)
C ₅ + hydrocarbons	<u>0.06</u>	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-48
Collection Time 0915 Collection Date 7/31/73
Sample Container 115-cc bottle Sample Pressure 360 psig @ _____ °C
Remarks Snap sample

Report basis: ☐ Sample as received
☒ Sample less 0.24 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	35.40		Argon-37	
Oxygen			Argon-39	
Argon	0.02			
			Krypton-85	0.44±0.07
Carbon Monoxide				
Carbon Dioxide			Xenon-133	
			Xenon-131m	
Hydrogen	1.50			
Methane	58.14		Radon-222	(0.625±0.008)
Ethane	3.07			
Propane	1.45		Tritium as hydrogen	
i - butane	0.31		Tritium as methane	(0.064±0.03)
n - butane	0.11		Tritium as ethane	
C ₅ + hydrocarbons	0.01		Tritium as propane	
			Total tritium	()
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	100.		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-49
Collection Time 0945 Collection Date 7/31/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Snap sample

Report basis: ☐ Sample as received
☒ Sample less 0.14 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>99.03</u>	_____
Oxygen	_____	_____
Argon	<u>0.02</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>0.03</u>	_____
Methane	<u>0.47</u>	_____
Ethane	_____	_____
Propane	_____	_____
i - butane	<u>0.02</u>	_____
n - butane	<u>0.06</u>	_____
C ₅ + hydrocarbons	_____	_____
_____	_____	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>99.6</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☐ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
_____	_____
Krypton-85	_____
_____	_____
Xenon-133	_____
Xenon-131m	_____
_____	_____
Radon-222	_____
_____	_____
Tritium as hydrogen	_____
Tritium as methane	_____
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	(_____)
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
_____	_____
Total	_____

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-50
Collection Time 1044 Collection Date 7/31/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Sampled after flowing 10 SCFM

Report basis: ☐ Sample as received
☒ Sample less 0.62 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>7.05</u>		Argon-37	
Oxygen			Argon-39	
Argon	<u>0.03</u>			
			Krypton-85	<u>(0.24±0.09)</u>
Carbon Monoxide				
Carbon Dioxide			Xenon-133	
			Xenon-131m	
Hydrogen	<u>2.24</u>			
Methane	<u>83.32</u>		Radon-222	<u>(0.105±0.006)</u>
Ethane	<u>4.41</u>			
Propano	<u>2.16</u>		Tritium ac hydrogen	
i - butane	<u>0.42</u>		Tritium as methane	<u>(0.155±0.004)</u>
n - butane	<u>0.23</u>		Tritium as ethane	
C ₅ + hydrocarbons	<u>0.04</u>		Tritium as propane	
			Total tritium	<u>()</u>
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	<u>100.</u>		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-51
Collection Time 1100 Collection Date 7/31/73
Sample Container 115-cc bottles Sample Pressure 1000 psig @ _____ °C
Remarks Annulus after 10 cfm flowed and vented. Compressed to 1000 psi.

Report basis: ☐ Sample as received
☒ Sample less 0.43 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>2.77</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.03</u>	_____	_____	_____
_____	_____	_____	Krypton-85	<u>(0.23±0.24)</u>
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	_____	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>2.30</u>	_____	_____	_____
Methane	<u>87.17</u>	_____	Radon-222	<u>(0.191±0.057)</u>
Ethane	<u>4.65</u>	_____	_____	_____
Propane	<u>2.33</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.47</u>	_____	Tritium as methane	<u>(0.179±0.018)</u>
n - butane	<u>0.27</u>	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.05</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-52
Collection Time 0920 Collection Date 8/1/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Sampled after equilibrating tube to surface storage tanks

Report basis: ☐ Sample as received
☒ Sample less 0.14 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	23.62		Argon-37	
Oxygen			Argon-39	
Argon				
Carbon Monoxide			Krypton-85	(2.09±0.05)
Carbon Dioxide				
Hydrogen	0.07		Xenon-133	
Methane	73.81		Xenon-131m	(0.33±0.24)
Ethane	2.09		Radon-222	(0.183±0.051)
Propane	0.27			
i - butane	0.07		Tritium as hydrogen	
n - butane			Tritium as methane	(0.65±0.02)
C ₅ + hydrocarbons			Tritium as ethane	
			Tritium as propane	
			Total tritium	()
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	99.9		Total	

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Project _____ Report Date _____
Sample Source Post-Shot Sample LLL Sample No. 73-1-14-53
Collection Time 1515 Collection Date 8/1/73
Sample Container 115-cc bottle Sample Pressure 19.7 psig @ _____ °C
Remarks Arming and firing cable

Report basis: ☐ Sample as received
☒ Sample less 0.91 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☒ pCi/ml (STP) ☐
Nitrogen	<u>3.50</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.06</u>	_____	Krypton-85	<u>(0.06±0.07)</u>
Carbon Monoxide	_____	_____	Xenon-133	_____
Carbon Dioxide	<u>0.01</u>	_____	Xenon-131m	_____
Hydrogen	<u>5.79</u>	_____	Radon-222	_____
Methane	<u>90.62</u>	_____	Tritium as hydrogen	_____
Ethane	_____	_____	Tritium as methane	_____
Propane	<u>0.01</u>	_____	Tritium as ethane	_____
i - butane	_____	_____	Tritium as propane	_____
n - butane	_____	_____	Total tritium	<u>()</u>
C ₅ + hydrocarbons	_____	_____	Carbon-14 monoxide	_____
Helium	_____	_____	Carbon-14 dioxide	_____
Neon	_____	_____	Carbon-14 in methane	_____
Krypton	_____	_____	_____	_____
Xenon	_____	_____	_____	_____
Total	<u>100.</u>	_____	Total	_____

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Project _____ Report Date _____
Sample Source Post-Shot Sample LLL Sample No. 73-1-14-54
Collection Time 0900 Collection Date 8/2/73
Sample Container 115-cc bottle Sample Pressure 8.5 psig @ _____ °C
Remarks Arming and firing cable. Bottle open to Line 1537 8/1/76

Report basis: ☐ Sample as received
☒ Sample less 0.86 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	3.37		Argon-37	0.047±0.06
Oxygen			Argon-39	
Argon	0.06			
			Krypton-85	<0.40
Carbon Monoxide				
Carbon Dioxide	0.01		Xenon-133	
			Xenon-131m	
Hydrogen	7.46			
Methane	89.07		Radon-222	<0.02
Ethane	0.09			0.043 0.020
Propane			Tritium as hydrogen	
i - butane			Tritium as methane	
n - butane			Tritium as ethane	
C ₅ + hydrocarbons			Tritium as propane	
			Total tritium	()
Helium			Carbon-14 monoxide	
Neon			Carbon-14 dioxide	
Krypton			Carbon-14 in methane	
Xenon				
Total	100.		Total	

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Project _____ Report Date _____
Sample Source Annulus LLL Sample No. 73-1-14-56
Collection Time 1300 Collection Date 8/27/73
Sample Container 115-cc bottle Sample Pressure 375 psig @ _____ °C
Remarks _____

Report basis: ☐ Sample as received
☒ Sample less 0.48 % normal air
(based on oxygen).

Decay Corrected to: ☒ Sample Time
☐ _____

CHEMICAL COMPOSITION

Component	Volume %	ppm by Vol.
Nitrogen	<u>18.92</u>	_____
Oxygen	_____	_____
Argon	<u>0.02</u>	_____
_____	_____	_____
Carbon Monoxide	_____	_____
Carbon Dioxide	_____	_____
_____	_____	_____
Hydrogen	<u>0.74</u>	_____
Methane	<u>76.77</u>	_____
Ethane	<u>2.62</u>	_____
Propane	<u>0.68</u>	_____
i - butane	<u>0.17</u>	_____
n - butane	<u>0.05</u>	_____
C ₅ + hydrocarbons	<u>0.01</u>	_____
_____	_____	_____
_____	_____	_____
Helium	_____	_____
Neon	_____	_____
Krypton	_____	_____
Xenon	_____	_____
Total	<u>100.</u>	_____

RADIONUCLIDE CONCENTRATION

Component	☒ pCi/ml (STP) ☐
Argon-37	_____
Argon-39	_____
_____	_____
Krypton-85	_____
_____	_____
Xenon-133	_____
Xenon-131m	_____
_____	_____
Radon-222	_____
_____	_____
Tritium as hydrogen	_____
Tritium as methane	<u>(3.20±0.06)</u>
Tritium as ethane	_____
Tritium as propane	_____
_____	_____
Total tritium	<u>(_____)</u>
Carbon-14 monoxide	_____
Carbon-14 dioxide	_____
Carbon-14 in methane	_____
_____	_____
_____	_____
Total	_____

The probable accuracy of the above results is 1-5 units in the last reported figure unless otherwise indicated.

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Project _____ Report Date _____
Sample Source Tube LLL Sample No. 73-1-14-59
Collection Time 0940 Collection Date 8/28/73
Sample Container 115-cc bottle Sample Pressure 1000 psig @ _____ °C
Remarks Sampled from Tube bottom

Report basis: ☐ Sample as received
☒ Sample less 1.24 % normal air
(based on oxygen).

Decay Corrected to: ☐ Sample Time
☐ _____

CHEMICAL COMPOSITION			RADIONUCLIDE CONCENTRATION	
Component	Volume %	ppm by Vol.	Component	☐ pCi/ml (STP) ☐
Nitrogen	<u>13.60</u>	_____	Argon-37	_____
Oxygen	_____	_____	Argon-39	_____
Argon	<u>0.01</u>	_____	_____	_____
_____	_____	_____	Krypton-85	_____
Carbon Monoxide	_____	_____	_____	_____
Carbon Dioxide	<u>0.12</u>	_____	Xenon-133	_____
_____	_____	_____	Xenon-131m	_____
Hydrogen	<u>0.08</u>	_____	_____	_____
Methane	<u>83.33</u>	_____	Radon-222	_____
Ethane	<u>2.39</u>	_____	_____	_____
Propane	<u>0.30</u>	_____	Tritium as hydrogen	_____
i - butane	<u>0.10</u>	_____	Tritium as methane	<u>(5.20±0.09)</u>
n - butane	_____	_____	Tritium as ethane	_____
C ₅ + hydrocarbons	<u>0.01</u>	_____	Tritium as propane	_____
_____	_____	_____	_____	_____
_____	_____	_____	Total tritium	<u>(_____)</u>
Helium	_____	_____	Carbon-14 monoxide	_____
Neon	_____	_____	Carbon-14 dioxide	_____
Krypton	_____	_____	Carbon-14 in methane	_____
Xenon	_____	_____	_____	_____
_____	_____	_____	_____	_____
Total	<u>99.9</u>	_____	Total	_____

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Indicated errors are one standard deviation of the mean of replicate measurements. Absolute uncertainty is unknown, but is most probably less than ± 10% of the values given.

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Printed in the United States of America
Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$ ____*; Microfiche \$2.25

MSG/gw/sg

<u>* Pages</u>	<u>NTIS Selling Price</u>
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