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ENVIRONMENTAL SURVEILLANCE SAMPLING RESULTS AT THE NEVADA TEST SITE

July, 1968 through June, 1969

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BY

THE STAFF OF

THE ENVIRONMENTAL SURVEILLANCE

GROUP

Environmental Sciences Department

Technical Services Division

Reynolds Electrical & Engineering Co., Inc.

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The Environmental Surveillance group of the Environmental Sciences Department collected all samples, prepared the initial text, and provided technical evaluation during the final preparation of this report. Laboratory analysis was performed by the Department's Laboratory Operations group. The Reports Coordination group prepared the various figures, edited the text, and coordinated the final preparation of the report.

ABSTRACT

This report summarizes the data obtained from periodic environmental surveys at the Nevada Test Site (NTS) from July, 1968 through June, 1969.

The Environmental Surveillance group performed routine and special surveys of the NTS. Samples of potable water were collected for laboratory analysis from living quarters, administrative facilities, and cafeterias. Additionally, samples of water from waste ponds, sewage basins, reservoirs, springs, and wells were collected on a routine basis to determine ambient levels of radioactivity or any changes of radioactivity. Air samples were also routinely collected at selected locations throughout NTS for the same purpose as for water samples. Soil and vegetation samples were collected to provide information for assessing trends in the distribution of fallout radioactivity levels.

All environmental samples, except soil and vegetation, were analyzed routinely for gross beta radioactivity, and selected samples were additionally analyzed for plutonium alpha activity. Soil and vegetation samples were routinely analyzed for gross gamma radioactivity. Significant increases or changes in the radioactivity levels of these samples were reported to the appropriate field monitoring groups for investigation and remedial action. All sample results are permanently maintained by the Environmental Surveillance group for record purposes and for comparison with previous results to determine trends and correlations where feasible.

ENVIRONMENTAL SURVEILLANCE
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SECTION 1

AIR SAMPLING

1.1 Introduction

The Environmental Surveillance group maintains low-volume continuously-operating air sampling equipment at twenty-three permanent locations (Figure 1 and Table 1) situated to provide monitoring of the particulate airborne radioactivity primarily in the vicinity of major working and living areas within the Nevada Test Site (NTS) boundaries.

1.2 Description of Equipment

The air sampling equipment used consists of a positive displacement Gast pump that pulls air through a four-inch Whatman-41 filter paper mounted in a disposable plastic filter head. A dry gas meter is utilized to measure the total volumne of displaced air over a period of seven days. The total volume of air sampled during a regular seven-day sampling period is approximately 10^3 cubic meters. The flow rate of air through the filter is maintained at approximately four cubic feet per minute.

1.3 Counting Procedures

All collected air samples were held in storage for at least five days before counting. This time interval allows the naturally occurring radon and thoron daughter products to decay to insignificant levels. Air samples were analyzed for gross beta radiation using a Beckman WIDE-BETA II gas proportional counter having an efficiency (the ratio of observed counts to known disintegrations) of 52.4% for beta. Background counts for beta on the WIDE-BETA II system were determined by counting for 100 minutes. A Baird Atomic SPECTROMETER was used for determination of gross gamma activity. If the activity for gamma was such that the apparent 2σ counting error was less than 50%, then the sample was transferred to a multi-channel gamma-spectrum analyzer to qualitatively determine the contributing radionuclides.

Sample activity results, reported by the laboratory, were compared with an established "alert level." The determination of the alert level is based on the radiation concentration guides (RCG) for unknown radionuclides in air for continuous exposure (168 hours) as outlined in USAEC Manual Chapter 0524. The alert level for beta activity has been maintained at 1.0×10^{-11} μCi/cc of air after a five-day decay period.

Although a particular air sample may exceed this alert level, it does not necessarily mean that the actual RCG has been exceeded. Whenever a sample does approach or exceed the alert level, more detailed analysis, investigation, or re-sampling are performed to determine the validity of the sample results.

1.4 Data Discussion

The means and ranges of gross beta radioactivity in weekly collections of air samples from the twenty-three permanent locations from July, 1968 through June, 1969 are tabulated in Table 2 and plotted in Figure 2. During this time period, two sample activity values exceeded the alert level of 1.0×10^{-11} μCi/cc. During the two-week period ending December 29, 1968, the maximum air concentration for the year was recorded at 4.71×10^{-11} μCi/cc in Area 11, Gate 293, Guard Station. During this period, fourteen of the air sampling stations indicated air concentrations above the RCG alert level. These unusual sample levels of activity were investigated and found to have resulted from the atmospheric fallout resulting from the SCHOONER event which occurred on December 8, 1968. The consequences of this particular event were to influence practically all of the Environmental Surveillance samples collected during this period as will be noted by the appropriate sample results for all water, soil, and vegetation samples to be discussed later. Four additional periods in July, 1968, and January and June, 1969 also indicated air concentration above the RCG. These results were correlated with the arrival of atmospheric fallout from foreign weapons tests, primarily. The stated maximum air concentration value may be compared with the maximum value obtained during the last annual reporting period (July, 1967 through June, 1968) of 3.48×10^{-10} μCi/cc recorded after the BUGGY event (this sample was collected in Area 20 during March, 1968).

Figure 2 is a plot of the means and ranges of all air sampling stations as a function of time. The mean air concentration shows a general decline from July, 1968 to November, 1968 and a steep rise to a maximum in the last two weeks of December, 1968. A decline is noted in January, 1969 with a gradual increase to a maximum in the latter part of May and first part of June, 1969.

Figure 3 and Table 3 show the means and ranges for each of the mean values of all twenty-three sampling locations which averaged 1.73×10^{-13} μCi/cc. This value is slightly higher than the mean observed for all air samples collected over two previous fiscal periods which averaged 1.56×10^{-13} μCi/cc for fiscal year 1968 and 1.02×10^{-13} μCi/cc for fiscal year 1967.

The highest observed mean value for a sampling location was 2.44×10^{-13} μCi/cc at the Area 5 Maintenance Control, and the lowest was 1.42×10^{-13} μCi/cc in Area 5 at the Gate 250 Guard Station. The wide range of values encountered during this sampling period are shown in Table 3 Figure 3. Ranges varying greater than a factor of 100 were usually the result of a single high or low value. These extreme variances did not drastically affect the mean values due to logarithmic transformation of the observed activity results. (The statistical treatment of data for this report is presented in Appendix A.)

Routine gamma counting of pre-filters during this reporting period indicated the presence in many cases of short-lived gamma emitting radionuclides. Gamma spectrum and decay analyses indicated the origin of the activity in several samples was primarily due to atmospheric fallout

from either the SCHOONER event or foreign weapons testing activities.

1.5 Summary

These results indicate, in general, a slight increase in mean values since the preceding report periods. This is attributed to the contribution of domestic weapons testing as noted in Figure 3 when a sharp peak in activity values occurs in December, 1968.

Results of Environmental Surveillance sampling activity values obviously cannot be accurately translated into personnel exposure doses. They are instead useful as an index of ambient activity and in the detection of trends, and emphasis is either sustained or shifted to other sample types whenever significant changes in levels are noted.

SECTION 2

WATER SAMPLING

2.1 Introduction

Water samples were collected from selected waste ponds, reservoirs, sewage basins, natural springs, wells, and potable water sources, such as cafeterias, swimming pools, etc., on a "grab sample" basis.

2.2 Collection Methods

Water samples were collected in one liter glass bottles on a weekly, monthly, and special basis depending upon the potential use of the water source and the likelihood of its becoming radioactively contaminated. The potable water samples were collected from taps at the point of consumption, usually cafeterias and dispensaries, after allowing the water to run freely for a few minutes. All industrial reservoir water was collected near the inlet points to the reservoirs, while natural spring water samples were "grab" samples obtained by dipping at the surface.

2.3 Sample Preparation

All water samples were analyzed for gross beta and tritium concentrations. A fifteen milliliter aliquot was first taken from the original sample in a five dram plastic vial and submitted to the laboratory to be gamma-counted. A one milliliter sample was aliquoted for tritium analysis which was performed using standard liquid scintillation counting techniques. The remainder of the one-liter sample was evaporated to fifteen milliliters, transferred to a two-inch stainless steel planchet, and evaporated to dryness under infra-red lamps. A wetting agent was added during final evaporation to provide even distribution of the sample on the planchet. From the sample preparation laboratory, the samples were sent to the counting laboratory and counted for beta activity. When indicated, one liter samples of water were submitted for gamma spectrum analysis.

2.4 Counting Procedures

All routine environmental water samples were analyzed by a Beckman WIDE-BETA II system equipped with an automatic sample changer. The efficiency, i.e., the ratio of observed counts to known disintegrations, on the WIDE-BETA system, was 57% for beta activity. The average background count rate was 1.8 counts per minute.

Tritium analyses were performed using a Packard Tri-Carb Liquid Scintillation Spectrometer with an efficiency of 18% and an average background of 16 counts per minute.

2.5 Statistical Summary of Results for Water

2.5.1 Potable Water Samples

The statistical breakdown for potable water samples for fiscal year 1969 was based on nine sampling locations (Table 4 and Figure 4) obtained on a weekly basis.

Table 5 and Figure 5 give the means and ranges for gross beta activity from July, 1968 through June, 1969. The means ranged from a low of 1.19×10^{-9} μCi/cc recorded on July 28, 1968 to a maximum of 1.45×10^{-8} μCi/cc recorded on January 12, 1969. The maximum value for the year was 1.54×10^{-6} μCi/cc recorded January 19, 1969 at the Area 2 Men's Restroom. This value correlates well with the high air sample results observed during the latter part of December, 1968. This maximum, as has been stated earlier, may be correlated with the SCHOONER event primarily. Subsequent weekly samples at this location showed decreasing results. The average mean for fiscal year 1969 was 4.60×10^{-9} μCi/cc as compared with 6.41×10^{-9} μCi/cc for fiscal year 1968 and 3.77×10^{-9} μCi/cc for fiscal year 1967. The current year's value is well below the RCG level of 1.0×10^{-7} μCi/cc. This value is based upon the exposure guides in USAEC Manual Chapter 0524.

Table 6 and Figure 6 give the means and ranges for gross beta activity of the nine potable water sample locations over the fiscal period 1969. The maximum mean value for a potable water sampling station was at the Area 6 Cafeteria and was recorded at 9.60×10^{-9} μCi/cc, a value not significantly different from the other eight mean values reported and well below the RCG of 1.0×10^{-7} μCi/cc.

There were a total of six potable water sample results above the alert level of 1.0×10^{-7} μCi/cc recorded during fiscal year 1969.

2.5.2 Natural Springs Water Samples

The term "natural springs" encompasses most of the naturally occurring spring-fed pools located within the NTS. Although these springs may be used infrequently as drinking water by some individuals, they are considered as a separate classification from potable water sources. In an effort to adequately cover the test site, seven sampling locations have been selected (Figure 7 and Table 7). All of these locations were sampled once a month.

Table 8 and Figure 8 show the means and ranges for gross beta activity over a twelve month period (fiscal year 1969). The means ranged from a maximum of 2.45×10^{-8} μCi/cc in December, 1968 to a low of 7.70×10^{-9} μCi/cc recorded in November, 1968. The maximum recorded value for this fiscal year was 1.62×10^{-7} μCi/cc recorded at Cane Spring in Area 5 in December, 1968. As noted before, this maximum value correlates well with the

SCHOONER event. The average mean for fiscal year 1969 was 1.45 x 10^{-8} μCi/cc as compared with 1.61 x 10^{-8} μCi/cc for fiscal year 1968 and 1.27 x 10^{-8} μCi/cc for fiscal year 1967. Therefore no statistically significant trend in the data for the three year period is apparent.

A total of two samples collected during fiscal year 1969 were in excess of the recommended RCG of 1.0 x 10^{-7} μCi/cc. The maximum range of values occurred at Cane Springs in Area 5, whereas the maximum mean value was recorded at Gold Meadows in Area 12. A maximum range of 1.47 x 10^{-7} μCi/cc also was recorded at Gold Meadows (Table 9 and Figure 9). This latter location has a maximum potential for contamination due to runoff and accumulation, test site originated fallout, and foreign weapons tests contamination since it is completely exposed to the atmosphere.

2.5.3 Open Reservoir Water Samples

Open reservoirs have been created throughout the NTS to furnish a ready supply of water for various industrial purposes. Twelve of these reservoirs have been selected as sampling locations (Figure 10 and Table 10).

Table 11 and Figure 11 give the means and ranges for gross beta activity over the twelve month period of fiscal year 1969. The means ranged from a low of 6.93 x 10^{-7} μCi/cc recorded in August, 1968 to a maximum of 3.69 x 10^{-8} μCi/cc in January, 1969. The maximum recorded value for this reporting period was 5.64 x 10^{-7} μCi/cc which was collected in January, 1969 from Well U20a Reservoir in Area 20. This reservoir was in the fallout path from the SCHOONER event on December 8, 1968. Two other open reservoirs on routine collection schedules also were exposed to this fallout, Well Uel9gs Reservoir and Well 4 Reservoir in Groom Lake. The former reservoir recorded 2.34 x 10^{-7} μCi/cc and the latter 1.38 x 10^{-7} μCi/cc. The average mean value for fiscal year 1969 was computed at 1.62 x 10^{-8} μCi/cc. This value does not differ markedly from the average observed in fiscal year 1968, which was 1.32 x 10^{-8} μCi/cc or for fiscal 1967 which was 8.00 x 10^{-9} μCi/cc.

With the exception of the three reservoirs discussed above which were in the fallout path during December, 1968, (See Figure 12 and Table 12) all other open reservoir water samples collected during fiscal year 1969 were below the RCG value of 1.0 x 10^{-7} μCi/cc.

2.5.4 Supply Wells Water Samples

Fourteen supply wells were sampled on the NTS during fiscal year 1969 (Figure 13 and Table 13). Water from these and other wells throughout the Test Site is used for a variety of purposes ranging from sanitary water supply to drilling mud preparation. The criteria for selecting particular wells to be sampled was based not only upon their potential use for human consumption but also

upon their value as an index for measuring the possible movement of radioactivity through water in the aquifer. Most of these wells are located in areas where the movement of water in the aquifer is from known contaminated test sites. To date, no data have been obtained that would indicate that the ground water at any well sampling location has been significantly affected by movement of contamination through the aquifer.

Table 14 and Figure 14 give the means and ranges for gross beta activity over a year's period from July, 1968 through June, 1969. The means of sample activity ranged from a low of 4.44×10^{-9} μCi/cc recorded in August, 1968 to a maximum of 1.12×10^{-8} μCi/cc recorded in July, 1968. The highest sample obtained during fiscal year 1969 was 8.81×10^{-8} μCi/cc in February, 1969, from Well U20j in Area 20. The average of all mean values computed for fiscal year 1969 was 8.52×10^{-9} μCi/cc. This value is slightly lower than the observed value of 1.07×10^{-8} μCi/cc in fiscal year 1968 and slightly higher than the value of 7.76×10^{-9} μCi/cc in fiscal year 1967.

All sample values during fiscal year 1969 were well below any level of concern and did not exceed the RCG value of 1.0×10^{-7} μCi/cc.

2.5.5 Final Effluent Samples

Four locations were sampled (Figure 16 and Table 16), all in NTS living areas, to determine what, if any, levels of radioactivity were present in sewage.

A total of fourteen samples were analyzed from these four locations during this reporting period. No tabular presentations were prepared due to the small number of samples from each location. Analysis of the data obtained indicates that the lowest value observed was 1.86×10^{-9} μCi/cc gross beta activity collected during April, 1969 from the Mercury Final Effluent Pond. The maximum detected value was 1.26×10^{-7} μCi/cc from Area 12 Final Effluent Pond collected in January, 1969. This latter result is somewhat higher than the maximum observed in fiscal year 1968 which was 4.92×10^{-8} μCi/cc and was also from the Area 12 Final Effluent Pond. All other values obtained from these locations during fiscal year 1969 were within the ranges mentioned above. The average value for all results reported was computed to be 3.18×10^{-8} μCi/cc. This result is statistically the same as that reported for last year, i.e., 2.17×10^{-8} μCi/cc. The average value stated above for fiscal year 1969 is well below the RCG value of 1.0×10^{-7} μCi/cc.

2.5.6 Miscellaneous Water Samples

There were six miscellaneous water sampling locations sampled during fiscal year 1969. Each location had some unique feature that precluded its inclusion in any of the preceding categories. Therefore, each location has been treated separately.

The first two sampling locations to be discussed are the Mercury swimming pool in Area 23 and Groom Lake station 2. Both are unique in that the water is continuously filtered. The swimming pool in Mercury is open to atmospheric fallout at all times, whereas station 2 at Groom Lake is enclosed (however, dust from the outside can still be tracked in and dispersed in the water).

The next group of related sample locations comprises the permanent bodies of contaminated water located in Area 12 at Upper and Lower Haines Lakes and the Laboratory Sump in Area 23. The Haines Lakes were established as catch-basins for industrial water when a water source was exposed during construction of E-Tunnel. This water source became contaminated from a test in E-Tunnel in 1961 and again in 1967 and later tests. The Area 23 Laboratory Sump is a receptacle for all plumbing waste from the Environmental Sciences Laboratories contaminated sample preparation laboratories in the 650 Building. The sump is connected to a network of perforated pipes underground constituting a leach field allowing liquid contaminated wastes to percolate into the soil.

Papoose Lake is the only natural drainage basin outside the Test Site which is continually sampled. Any contamination which is detected at this location is the result of airborne surface material or atmospheric fallout from past atmospheric detonations.

Table 17 and Figure 17 show the locations of the miscellaneous water sampling stations in relation to the entire NTS. Table 18 and Figure 18 give the means for all six locations based on samples collected once a month over a twelve-month sampling period. The wide ranges noted from Upper and Lower Haines Lakes samples for this report period are the result of periods of peak activity when copious water inflow tended to dilute contamination levels at the points of collection. No attempt was made to average means from these sample locations since the sources sampled included both purposely contaminated and non-contaminated sources.

SECTION 3

SOIL AND VEGETATION SAMPLING

3.1 Introduction

Soil and vegetation samples were collected from sixteen sampling locations throughout the Nevada Test Site. Both types of samples were obtained in close proximity to each other to permit correlation of data in the future.

3.2 Sampling Methods

Attempts at sampling soil and vegetation have been made locally and elsewhere in previous years with rather disappointing results. Particularly in the case of vegetation sampling, typical problems concerned the absence of homogeneity in choice of species selected, lack of sufficient attention to sampling topography, and lack of consideration of the most advantageous biological characteristics when selecting species of plants for sampling.

The sampling procedures used by the Environmental Surveillance group reflect a concerted effort to overcome the problems outlined previously. Sampling locations were chosen to reflect a stable soil surface, i.e., a topographically appropriate area having a minimum amount of channeling effects due to canyons, sand-eddy formations, etc. Soil samples consisted of a series of cylindrical cores one centimeter in depth and aggregating approximately 100 grams.

Vegetation samples consisted of four species commonly available on the NTS on a year round basis - - sagebrush, blackbrush, winterfat, and creosote. A number of considerations were taken into account when selecting species, such as availability, leaf type, leaf density, and structure. Owing to the type of vegetation selected and the sparse rainfall encountered in a desert environment, uptake of radionuclides was minimized, and the data reflect essentially fallout deposition. Sufficient vegetation was collected per sample to yield approximately 100 grams of leaf material. The vegetation was placed in a heavy paper sack, taped shut, and allowed to dry. After the leaves had become sufficiently brittle, they could be shaken loose from the stems and ground up to form a compact sample mass.

3.3 Counting Procedures

Both soil and vegetation samples received gamma spectrum analyses and gross gamma analyses. The samples were leached according to standard laboratory procedures and evaporated on counting planchets. A Baird Atomic SPECTROMETER was used for determination of gross gamma activity. If the activity was such that the apparent 2σ counting error was less than 50%, then the sample was transferred to a multi-channel gamma-spectrum analyzer to qualitatively determine the contributing radionuclides.

3.4 Data Discussion

Table 19 and Figure 19 give the sampling locations for soil and vegetation samples. The means and ranges of gross gamma activity in monthly collections of soil samples and vegetation samples from July, 1968 through June, 1969 are tabulated in Tables 20, 22 and plotted in Figures 20, and 22 respectively. Soil and vegetation data are tabulated by location in Tables 21, 23 and plotted in Figures 21, and 23 respectively.

3.4.1 Soil Sampling Data

Mean values of gross gamma activity in surface soil ranged from a low of 9.86×10^{-6} μCi/gm in June, 1969 to a maximum of 1.82×10^{-5} μCi/gm in November, 1968. These values do not vary significantly from the corresponding means documented in fiscal year 1968, which were 1.16×10^{-5} μCi/gm and 1.75×10^{-5} μCi/gm respectively. The observed mean values exhibited a rather close grouping for the entire year. The highest value recorded was 2.31×10^{-4} μCi/gm obtained in November, 1968 at the Old Fallout Station in Area 5. The average for the year of all mean values recorded was 1.34×10^{-5} μCi/gm.

3.4.2 Vegetation Sampling Data

Mean values of gross gamma activity deposited on vegetation exhibited more variability than the results from soil sampling. Mean values ranged from a low of 3.49×10^{-6} μCi/gm dry weight in September, 1968 to a maximum of 1.29×10^{-5} μCi/gm in July, 1968. The average value of the monthly means was 7.79×10^{-6} μCi/gm dry weight. This compares favorably with the results recorded for soil samples. The average of the monthly means for fiscal year 1969 was slightly lower than the comparable figure for fiscal year 1968 which was 1.23×10^{-5} μCi/gm. The highest recorded value was 5.57×10^{-4} μCi/gm dry weight collected in December, 1968 at Stake 20L-12 in Area 20. This location and data strongly suggests fallout from the SCHOONER event which occurred during this period.

APPENDIX A

STATISTICAL TREATMENT OF DATA

A.1 Geometric Mean

The frequency distribution of radioactivity results for air and water samples indicated a positive skew, a degree of distortion from symmetry of a normal curve. This type of asymmetrical distribution is caused by the extremes in the higher values distorting the curve towards the right.

The data must therefore be handled by logarithmic transformation to obtain normality, and treated as normally distributed random variables.

Therefore, an estimate of the true mean of a sample type is calculated by:

$$\bar{X} = \log^{-1}\left[\frac{\Sigma \log X_i}{N} + \frac{S^2}{Z}\right]$$

where: X_i = observed value
N = number of observations
S^2 = variance of log value

Though the geometric mean is not widely known and is relatively tedious to compute, its relative advantage is that it is a more typical average than the arithmetic mean since it is less affected by extremes.

A.2 Radioactivity of a Sample

The radioactivity of a sample (X) is indicated in the equation:

$$X = \frac{R_s - R_b}{A\ B\ C}$$

where: R_s = gross count rate of sample c/m
R_b = background count rate, c/m
A = counting efficiency for a particular counter (cpm/dpm)
B = conversion factor (2.22 d/m/pCi or 2.22×10^6 d/m/μCi
C = subsample amount, cc, liter, or gram

The associated percent counting error at the 2-sigma confidence level ($\% E_{2\sigma}$) for each radioactivity value (X) was:

$$\% E_{2\sigma} = \frac{100\ 2}{R_s - R_b}\left[\frac{R_s}{T_s} + \frac{R_b}{T_b}\right]^{\frac{1}{2}}$$

where: z = Z, the number of standard deviations for the confidence interval (95.4%)
T_s = sample count interval, minutes
T_b = background count interval, minutes

The radioactivity of a sample was considered statistically significant if the net count rate of the sample was greater than the detection limit, i.e., two times the net count for which the 2-sigma error was 100 percent.

The detection limit was computed by the formula:

$$DL = \frac{2\,z}{A\,B\,C}\left[\frac{d + R_b}{T_s} + \frac{R_b}{T_b}\right]^{\frac{1}{2}}$$

where: d = net count rate for which the 2-sigma error is 100

Any activity value which was equal to or less than the detection limit was recorded as zero.

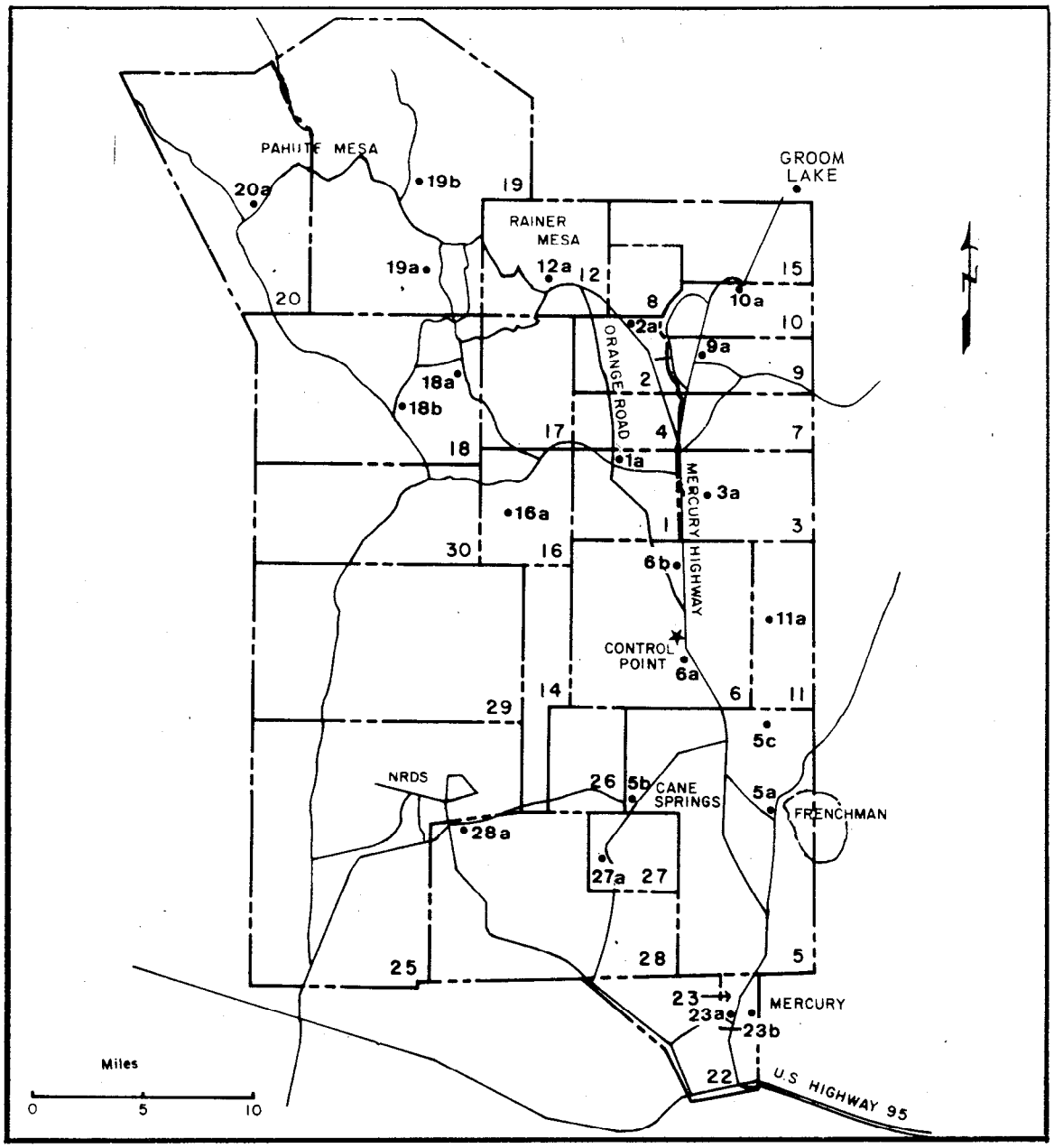

Figure 1 NTS Environmental Surveillance Air Sampling Locations

TABLE 1 – NTS ENVIRONMENTAL SURVEILLANCE AIR SAMPLING STATION LOCATIONS

Area	Sample Station Location	Map Code
1	Gravel Pit	1a
2	Camp Compound	2a
3	North of Cafeteria	3a
5	East of Well 5B Reservoir	5a
	Guard Station 250	5b
6	Maintenance Complex	5c
6	Air Station	6a
	Well 3 Complex	6b
9	9-300 Bunker	9a
10	Guard Station 700	10a
11	Guard Station 293	11a
12	Changehouse	12a
16	Tunnel Site Maintenance	16a
18	East of Cafeteria	18a
	North of Cafeteria	18b
19	Echo Peak	19a
	Stake 19C-10	19b
20	West of Aid Station	20a
23	Building 214	23a
	Health & Safety Building Rooftop	23b
27	West of Dispensary	27a
28	Project HENRE	28a
Groom Lake	East of Station 1	

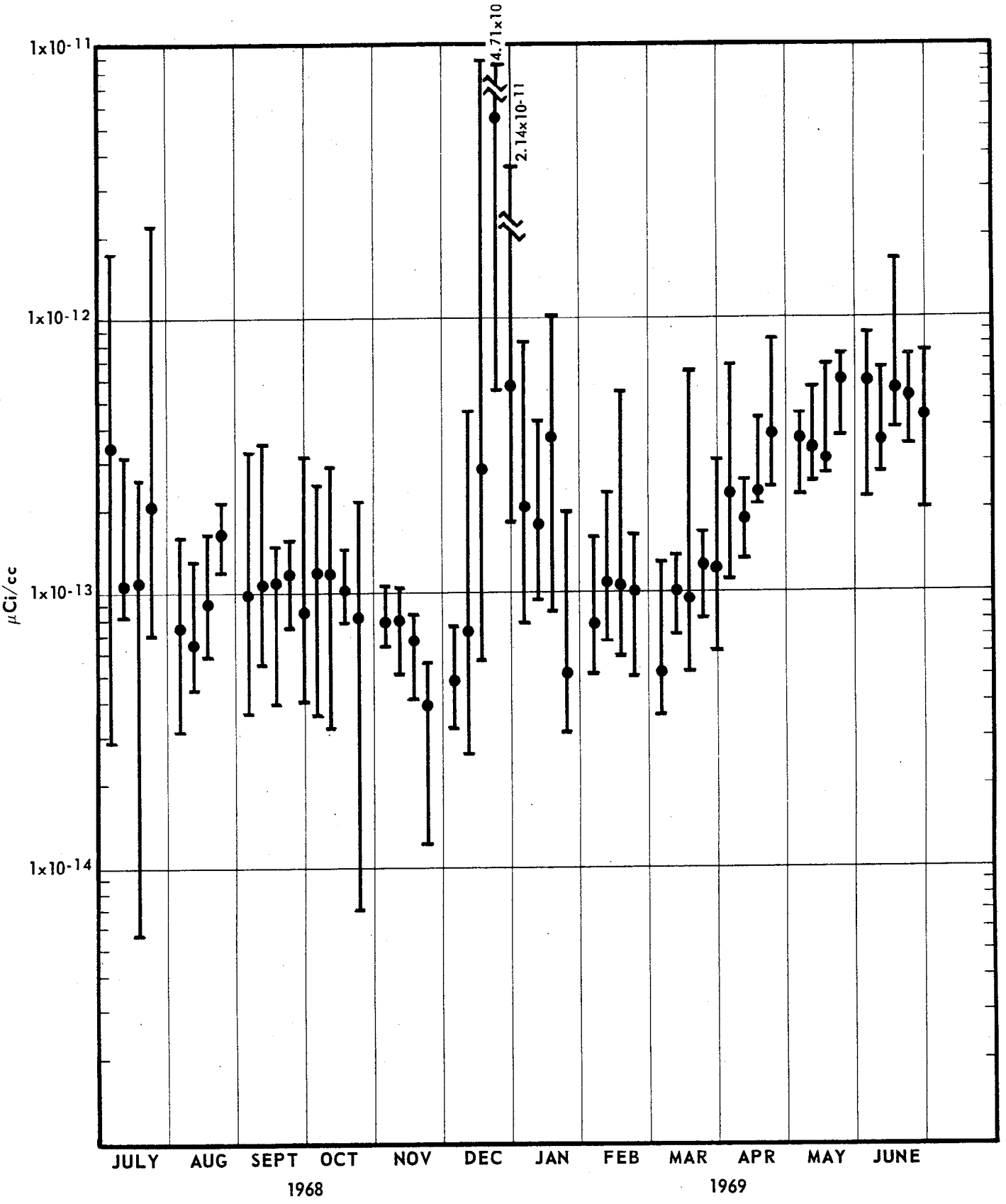

Figure 2 Weekly Means and Ranges of Gross Beta Radioactivity from July, 1968 through June, 1969; Air Sampling.

TABLE 2

Weekly Means and Ranges of Gross Beta Radioactivity at NTS Environmental Air Sampling Station Locations from July 1968 through June 1969.

Values in Terms of μCi/cc

DATE (Week Ending)	MEAN	RANGE	
		MAXIMUM	MINIMUM
07/07/68	3.46×10^{-13}	1.71×10^{-12}	2.87×10^{-14}
07/14/68	1.04×10^{-13}	3.10×10^{-13}	8.27×10^{-14}
07/21/68	1.12×10^{-13}	2.57×10^{-13}	5.71×10^{-15}
07/28/68	2.09×10^{-13}	2.17×10^{-12}	7.14×10^{-14}
08/04/68	7.42×10^{-14}	1.60×10^{-13}	3.15×10^{-14}
08/11/68	6.45×10^{-14}	1.33×10^{-13}	4.40×10^{-14}
08/18/68	9.09×10^{-14}	1.63×10^{-13}	5.89×10^{-14}
08/25/68	1.67×10^{-13}	2.19×10^{-13}	1.21×10^{-13}
09/01/68	9.93×10^{-14}	3.23×10^{-13}	3.66×10^{-14}
09/08/68	1.09×10^{-13}	3.47×10^{-13}	5.44×10^{-14}
09/15/68	1.10×10^{-13}	1.49×10^{-13}	3.97×10^{-14}
09/22/68	1.17×10^{-13}	1.56×10^{-13}	7.47×10^{-14}
09/29/68	8.64×10^{-14}	3.19×10^{-13}	4.01×10^{-14}
10/06/68	1.17×10^{-13}	2.45×10^{-13}	3.59×10^{-14}
10/13/68	1.16×10^{-13}	2.85×10^{-13}	3.26×10^{-14}
10/20/68	1.03×10^{-13}	1.44×10^{-13}	7.81×10^{-14}
10/27/68	8.10×10^{-14}	2.13×10^{-13}	7.13×10^{-15}
11/03/68	7.92×10^{-14}	1.05×10^{-13}	6.41×10^{-14}
11/10/68	7.97×10^{-14}	1.03×10^{-13}	5.14×10^{-14}
11/17/68	6.73×10^{-14}	8.32×10^{-14}	4.18×10^{-14}
11/24/68	3.89×10^{-14}	5.52×10^{-14}	1.21×10^{-14}
12/01/68	4.81×10^{-14}	7.54×10^{-14}	3.22×10^{-14}
12/08/68	7.28×10^{-14}	4.51×10^{-13}	2.57×10^{-14}
12/15/68	2.81×10^{-13}	8.85×10^{-12}	5.66×10^{-14}
12/22/68	5.33×10^{-12}	4.71×10^{-11}	2.93×10^{-13}
12/29/68	5.55×10^{-13}	2.14×10^{-11}	1.81×10^{-13}
01/05/69	2.08×10^{-13}	8.02×10^{-13}	7.71×10^{-14}
01/12/69	1.76×10^{-13}	4.19×10^{-13}	9.34×10^{-14}
01/19/69	3.66×10^{-13}	1.02×10^{-12}	8.51×10^{-14}
01/26/69	5.17×10^{-14}	1.96×10^{-13}	3.12×10^{-14}
02/02/69	7.73×10^{-14}	1.58×10^{-13}	5.03×10^{-14}
02/09/69	1.09×10^{-13}	2.24×10^{-13}	6.60×10^{-14}
02/16/69	1.03×10^{-13}	5.34×10^{-13}	5.88×10^{-14}
02/23/69	1.01×10^{-13}	1.62×10^{-13}	4.92×10^{-14}
03/02/69	5.15×10^{-14}	1.26×10^{-13}	3.59×10^{-14}
03/09/69	1.08×10^{-13}	1.33×10^{-13}	7.06×10^{-14}
03/16/69	9.60×10^{-14}	6.35×10^{-13}	5.17×10^{-14}
03/23/69	1.23×10^{-13}	1.65×10^{-13}	8.10×10^{-14}
03/30/69	2.10×10^{-13}	2.96×10^{-13}	6.12×10^{-14}
04/06/69	2.30×10^{-13}	6.62×10^{-13}	1.12×10^{-13}
04/12/69	1.85×10^{-13}	2.55×10^{-13}	1.31×10^{-13}
04/20/69	2.30×10^{-13}	4.28×10^{-13}	2.14×10^{-13}
04/27/69	3.72×10^{-13}	8.26×10^{-13}	2.42×10^{-13}
05/04/69	3.60×10^{-13}	4.41×10^{-13}	2.28×10^{-13}
05/11/69	3.37×10^{-13}	5.51×10^{-13}	2.53×10^{-13}
05/18/69	3.05×10^{-13}	6.75×10^{-13}	2.68×10^{-13}
05/25/69	5.93×10^{-13}	7.30×10^{-13}	3.74×10^{-13}
06/01/69	5.92×10^{-13}	8.71×10^{-13}	2.20×10^{-13}
06/08/69	3.63×10^{-13}	6.56×10^{-13}	2.79×10^{-13}
06/15/69	5.64×10^{-13}	1.62×10^{-12}	3.95×10^{-13}
06/22/69	5.06×10^{-13}	7.29×10^{-13}	3.50×10^{-13}
06/29/69	4.42×10^{-13}	7.50×10^{-13}	2.02×10^{-14}

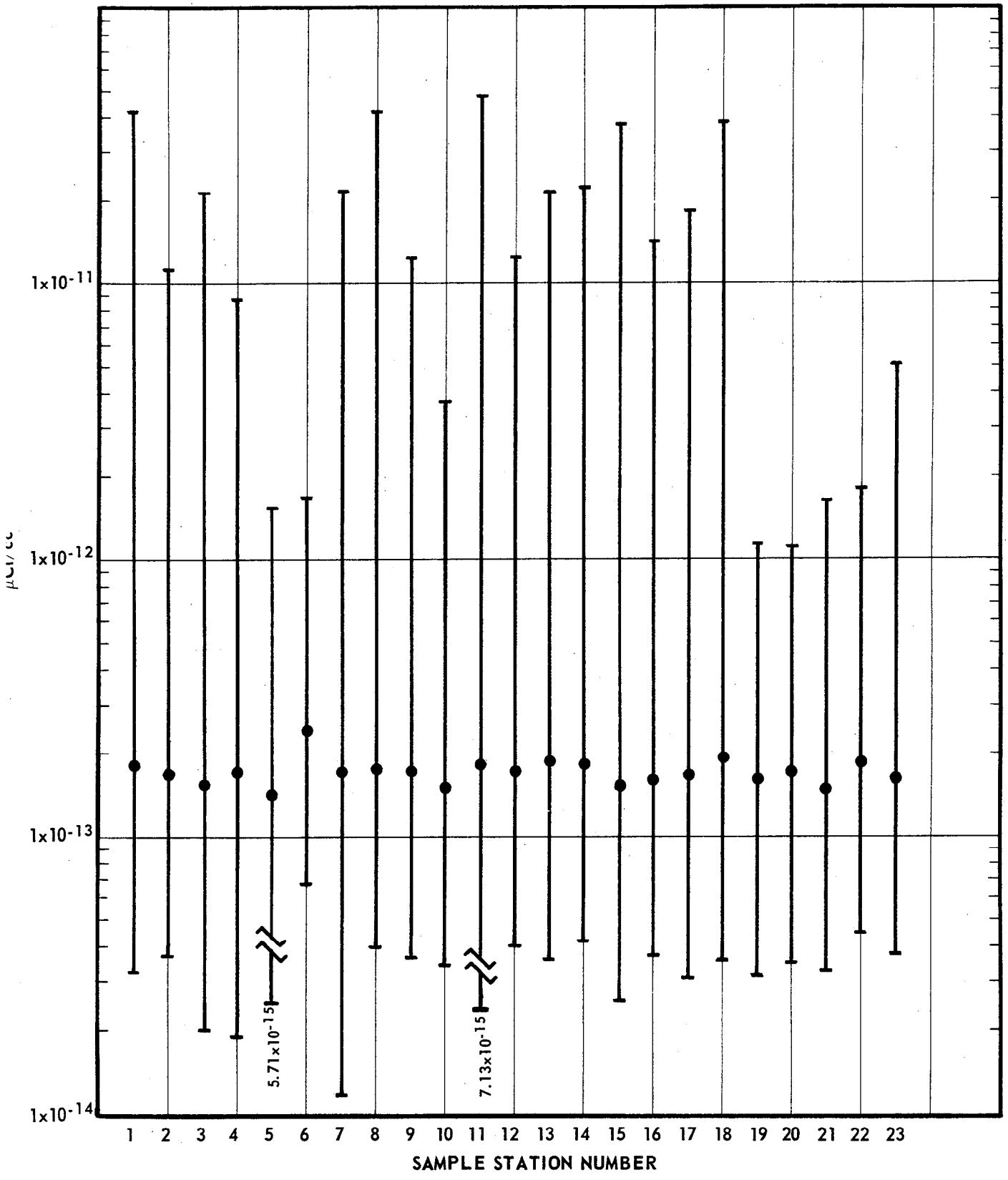

Figure 3 Means and Ranges of Gross Beta Radioactivity in NTS Environmental Air Sampling Station Locations from July, 1968 through June, 1969.

TABLE 3

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Air Sampling Station Locations from July, 1968 through June, 1969

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	MEAN	RANGE	
		MAXIMUM	MINIMUM
1. Area 1 Gravel Pit	1.84×10^{-13}	4.10×10^{-11}	3.26×10^{-14}
2. Area 2 Camp Compound	1.68×10^{-13}	1.12×10^{-11}	3.72×10^{-14}
3. Area 3 North of Cafeteria	1.55×10^{-13}	2.12×10^{-11}	2.02×10^{-14}
4. Area 5 East of Well 5B	1.72×10^{-13}	8.85×10^{-12}	1.90×10^{-14}
5. Area 5 Gate 250 Guard Sta.	1.42×10^{-13}	1.50×10^{-12}	5.71×10^{-15}
6. Area 5 Maintenance Control	2.44×10^{-13}	1.66×10^{-12}	6.78×10^{-14}
7. Area 6 CP-2 Complex	1.70×10^{-13}	2.14×10^{-11}	1.25×10^{-14}
8. Area 6 Well 3 Complex	1.77×10^{-13}	4.19×10^{-11}	3.97×10^{-14}
9. Area 9 9-300 Bunker	1.77×10^{-13}	1.25×10^{-11}	3.71×10^{-14}
10. Area 10 Gate 700 Guard Sta.	1.53×10^{-13}	3.70×10^{-12}	3.50×10^{-14}
11. Area 11 Gate 293 Guard Sta.	1.81×10^{-13}	4.71×10^{-11}	7.13×10^{-15}
12. Area 12 Change House	1.70×10^{-13}	1.22×10^{-11}	4.01×10^{-14}
13. Area 16 Tunnel Site	1.89×10^{-13}	2.14×10^{-11}	3.61×10^{-14}
14. Area 18 Cafeteria	1.83×10^{-13}	2.23×10^{-11}	4.24×10^{-14}
15. Area 18 Airstrip	1.53×10^{-13}	3.80×10^{-11}	2.57×10^{-14}
16. Area 19 Echo Peak	1.63×10^{-13}	1.40×10^{-11}	3.75×10^{-14}
17. Area 19 Stake 19c-10	1.68×10^{-13}	1.79×10^{-11}	3.12×10^{-14}
18. Area 20 Dispensary	1.94×10^{-13}	3.76×10^{-11}	3.59×10^{-14}
19. Area 23 Old Mousehouse	1.62×10^{-13}	1.11×10^{-12}	3.15×10^{-14}
20. Area 23 H & S Rooftop	1.73×10^{-13}	1.07×10^{-12}	4.49×10^{-14}
21. Area 27 Dispensary	1.48×10^{-13}	1.62×10^{-12}	3.22×10^{-14}
22. Area 28 HENRE Site	1.87×10^{-13}	1.78×10^{-12}	4.50×10^{-14}
23. Groom Lake East of Cafe.	1.64×10^{-13}	5.01×10^{-12}	3.75×10^{-14}

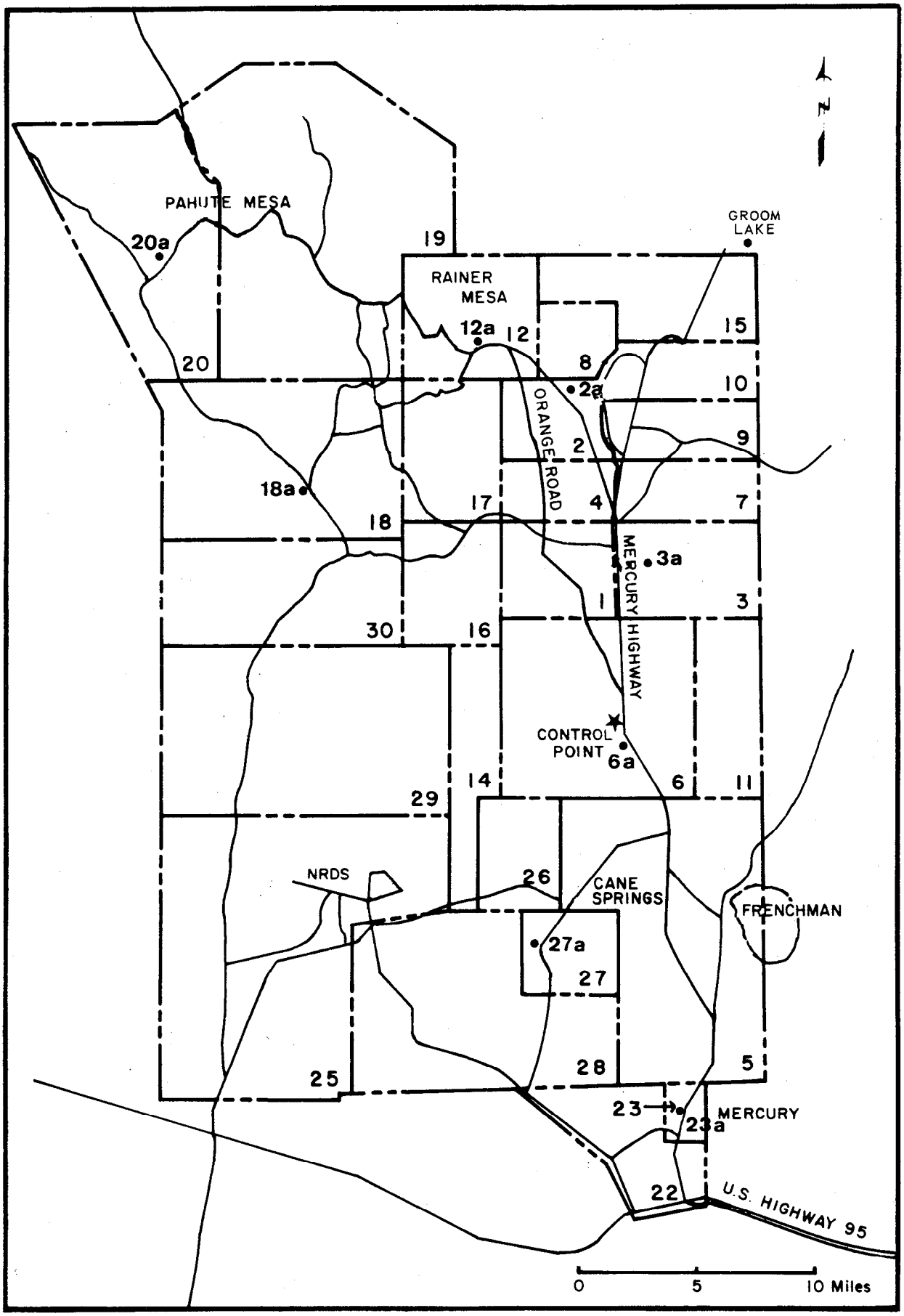

Figure 4 NTS Environmental Surveillance Potable Water Sampling Locations

TABLE 4

ENVIRONMENTAL SURVEILLANCE
POTABLE WATER SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 4
2	Men's Rest Room	2a
3	Cafeteria	3a
6	Cafeteria	6a
12	Cafeteria	12a
18	Fire Station	18a
20	Dispensary	20a
23	Cafeteria	23a
27	Cafeteria	27a
GROOM LAKE	Station 1	Groom Lake

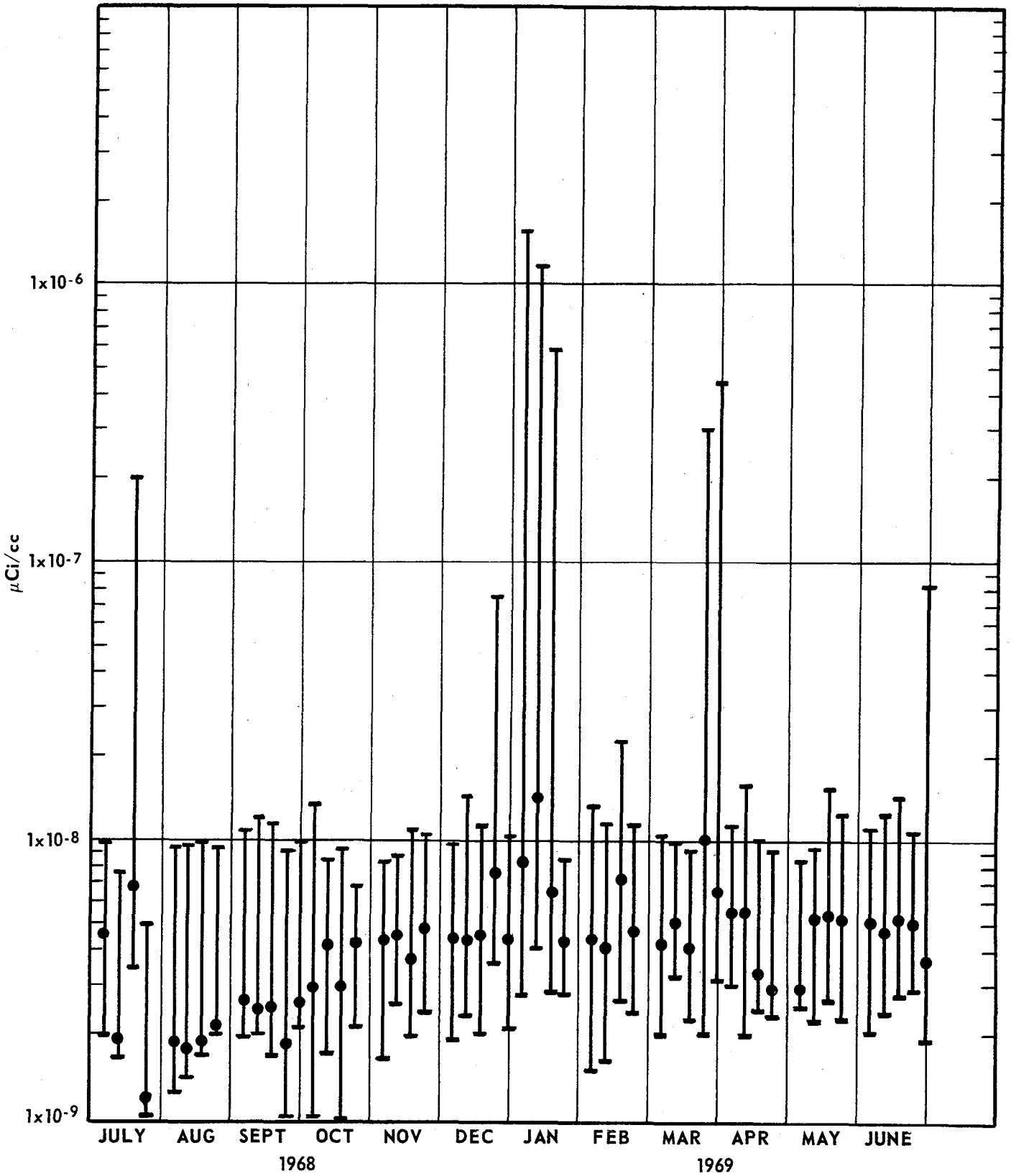

Figure 5 Weekly Means and Ranges of Gross Beta Radioactivity in Potable Water Samples from July, 1968 through June, 1969.

TABLE 5

Weekly Means and Ranges of Gross Beta Radioactivity at NTS Environmental Potable Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

DATE (Week Ending)	MEAN	RANGE	
		MAXIMUM	MINIMUM
07/07/68	4.74×10^{-9}	9.93×10^{-9}	2.00×10^{-9}
07/14/68	1.91×10^{-9}	7.71×10^{-9}	1.64×10^{-9}
07/21/68	6.98×10^{-9}	1.99×10^{-9}	3.43×10^{-9}
07/28/68	1.19×10^{-9}	4.96×10^{-9}	1.02×10^{-9}
08/04/68	1.89×10^{-9}	9.42×10^{-9}	1.27×10^{-9}
08/11/68	1.78×10^{-9}	9.62×10^{-9}	1.40×10^{-9}
08/18/68	1.84×10^{-9}	9.93×10^{-9}	1.73×10^{-9}
08/25/68	2.14×10^{-9}	9.24×10^{-9}	2.02×10^{-9}
09/01/68	2.63×10^{-9}	1.08×10^{-8}	1.98×10^{-9}
09/08/68	2.46×10^{-9}	1.20×10^{-8}	2.06×10^{-9}
09/15/68	2.51×10^{-9}	1.14×10^{-8}	1.69×10^{-9}
09/22/68	1.86×10^{-9}	9.25×10^{-9}	1.00×10^{-9}
09/29/68	2.63×10^{-9}	1.01×10^{-8}	2.18×10^{-9}
10/06/68	2.98×10^{-9}	1.34×10^{-8}	1.00×10^{-9}
10/13/68	4.13×10^{-9}	8.67×10^{-9}	1.70×10^{-9}
10/20/68	3.00×10^{-9}	9.33×10^{-9}	1.00×10^{-9}
10/27/68	4.34×10^{-9}	6.76×10^{-9}	2.12×10^{-9}
11/03/68	4.41×10^{-9}	8.39×10^{-9}	1.65×10^{-9}
11/10/68	4.60×10^{-9}	8.98×10^{-9}	2.55×10^{-9}
11/17/68	3.75×10^{-9}	1.10×10^{-8}	1.97×10^{-9}
11/24/68	4.96×10^{-9}	1.05×10^{-8}	2.43×10^{-9}
12/01/68	4.50×10^{-9}	9.70×10^{-9}	1.92×10^{-9}
12/08/68	4.41×10^{-9}	1.46×10^{-8}	2.38×10^{-9}
12/15/68	4.59×10^{-9}	1.15×10^{-8}	2.03×10^{-9}
12/22/68	7.98×10^{-9}	7.41×10^{-8}	3.71×10^{-9}
12/29/68	4.44×10^{-9}	1.04×10^{-8}	2.17×10^{-9}
01/05/69	8.50×10^{-9}	1.54×10^{-6}	2.80×10^{-9}
01/12/69	1.45×10^{-8}	1.15×10^{-6}	4.13×10^{-9}
01/19/69	6.77×10^{-9}	5.90×10^{-7}	2.92×10^{-9}
01/26/69	4.45×10^{-9}	8.72×10^{-9}	2.83×10^{-9}
02/02/69	4.41×10^{-9}	1.32×10^{-8}	1.50×10^{-9}
02/09/69	4.18×10^{-9}	1.15×10^{-8}	1.68×10^{-9}
02/16/69	7.33×10^{-9}	2.28×10^{-8}	2.71×10^{-9}
02/23/69	4.86×10^{-9}	1.14×10^{-8}	2.42×10^{-9}
03/02/69	4.33×10^{-9}	1.04×10^{-8}	2.02×10^{-9}
03/09/69	5.13×10^{-9}	9.97×10^{-9}	3.32×10^{-9}
03/16/69	4.29×10^{-9}	9.14×10^{-9}	2.33×10^{-9}
03/23/69	1.02×10^{-8}	3.03×10^{-7}	2.09×10^{-9}
03/30/69	6.87×10^{-9}	4.45×10^{-7}	3.32×10^{-9}
04/06/69	5.58×10^{-9}	1.15×10^{-8}	3.08×10^{-9}
04/12/69	5.56×10^{-9}	1.60×10^{-8}	2.02×10^{-9}
04/20/69	3.39×10^{-9}	1.03×10^{-8}	2.51×10^{-9}
04/27/69	2.96×10^{-9}	9.31×10^{-9}	2.48×10^{-9}
05/04/69	2.91×10^{-9}	8.60×10^{-9}	2.61×10^{-9}
05/11/69	5.33×10^{-9}	9.54×10^{-9}	2.32×10^{-9}
05/18/69	5.42×10^{-9}	1.54×10^{-8}	2.71×10^{-9}
05/25/69	5.28×10^{-9}	1.24×10^{-8}	2.38×10^{-9}
06/01/69	5.23×10^{-9}	1.11×10^{-8}	2.11×10^{-9}
06/08/69	4.86×10^{-9}	1.26×10^{-8}	2.48×10^{-9}
06/15/69	5.33×10^{-9}	1.44×10^{-8}	2.84×10^{-9}
06/22/69	5.17×10^{-9}	1.09×10^{-8}	2.95×10^{-9}
06/29/69	3.83×10^{-9}	8.14×10^{-8}	1.95×10^{-9}

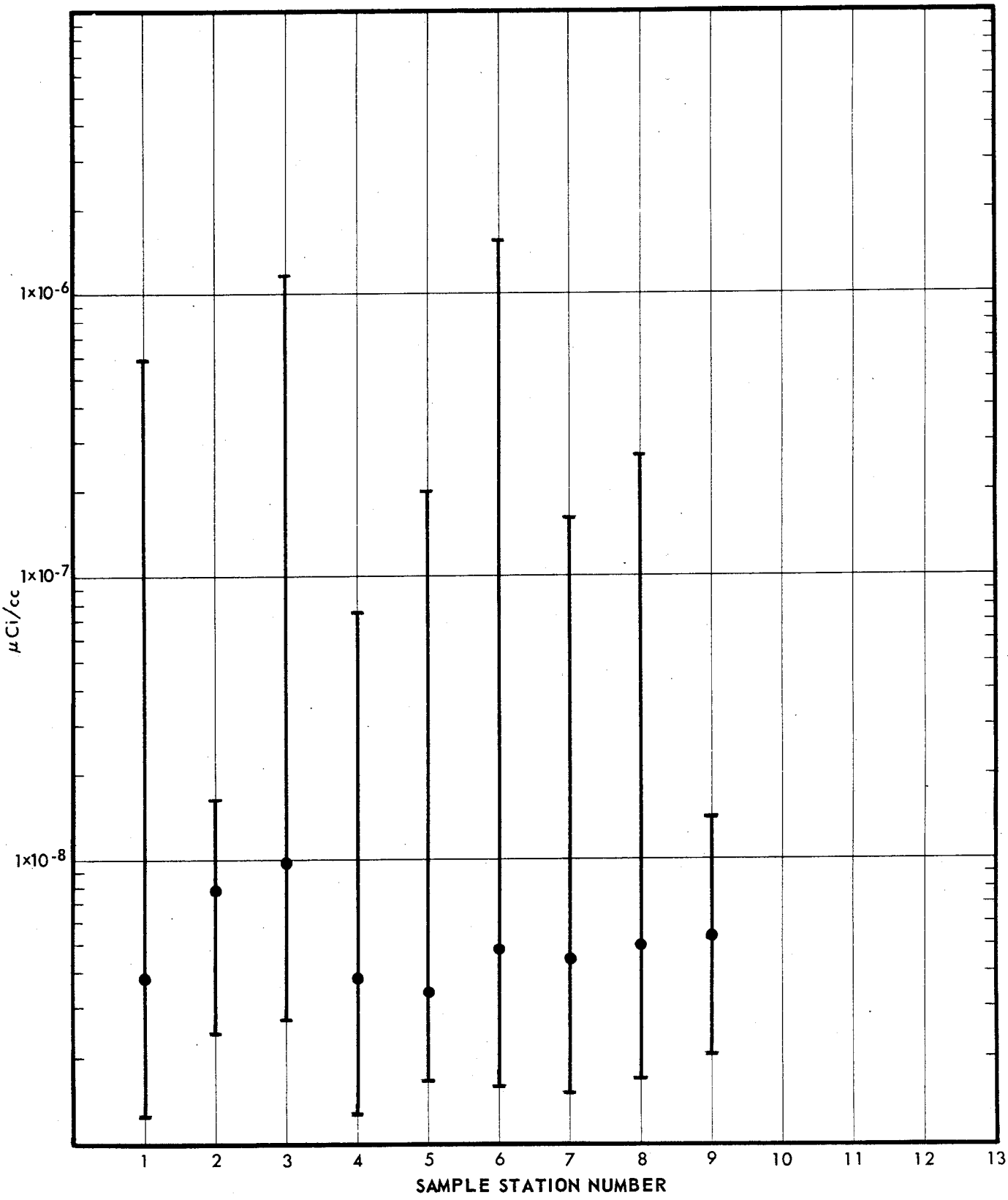

Figure 6 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Potable Water Sampling Locations from July, 1968 through June, 1969.

TABLE 6

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Potable Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	MEAN	RANGE	
		MAXIMUM	MINIMUM
1. Area 2 Men's Restroom	3.81×10^{-9}	5.90×10^{-7}	1.27×10^{-9}
2. Area 3 Cafeteria	7.93×10^{-9}	1.60×10^{-8}	2.44×10^{-9}
3. Area 6 Cafeteria	9.60×10^{-9}	1.15×10^{-6}	2.71×10^{-9}
4. Area 12 Cafeteria	3.81×10^{-9}	7.41×10^{-8}	1.27×10^{-9}
5. Area 18 Fire Station	3.38×10^{-9}	2.99×10^{-7}	1.68×10^{-9}
6. Area 20 Dispensary	4.84×10^{-9}	1.54×10^{-6}	1.57×10^{-9}
7. Area 23 Cafeteria	4.48×10^{-9}	1.59×10^{-7}	1.50×10^{-9}
8. Area 27 Cafeteria	4.93×10^{-9}	2.64×10^{-7}	1.69×10^{-9}
9. Groom Lake Sta. 1	5.20×10^{-9}	1.39×10^{-8}	2.04×10^{-9}

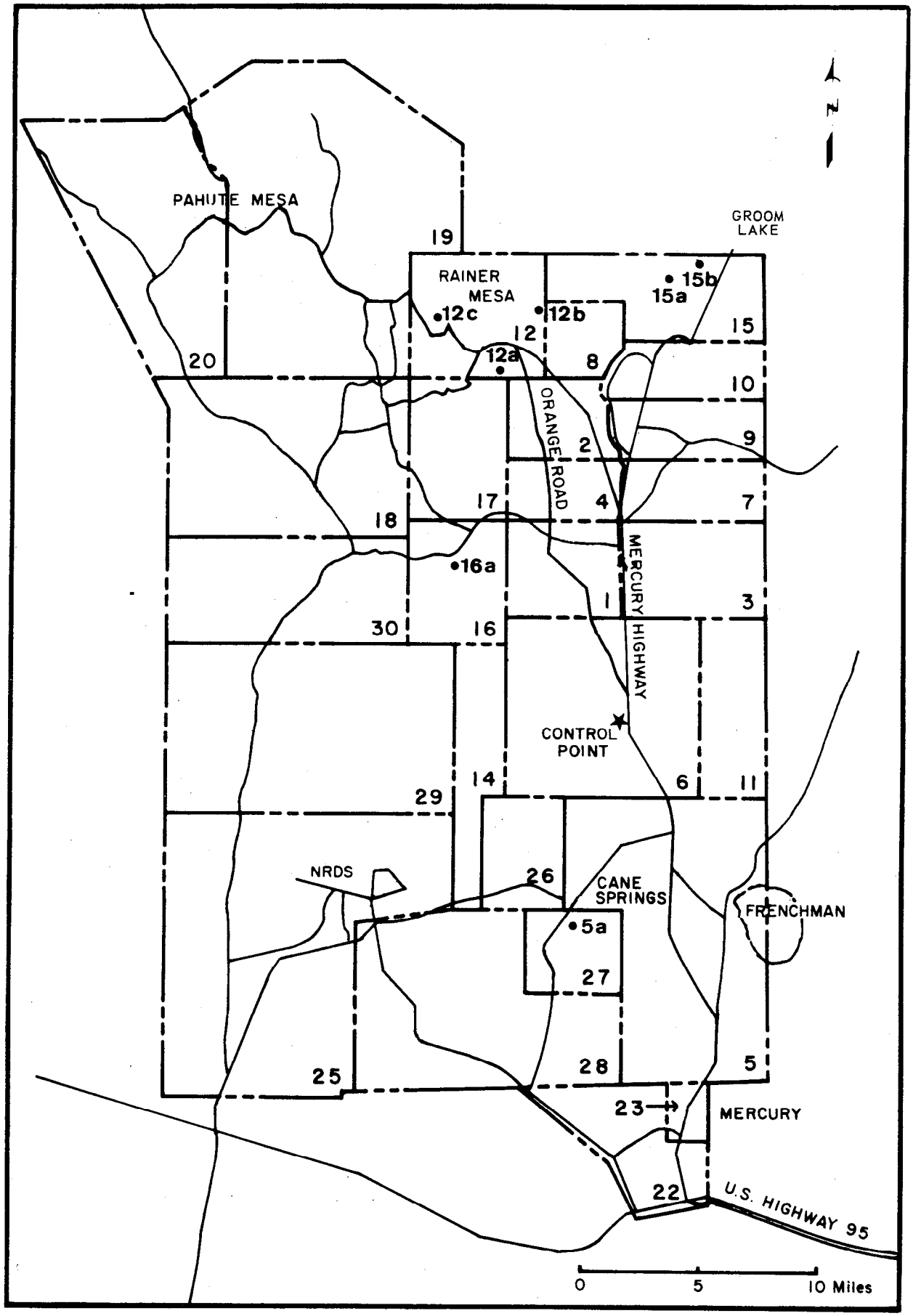

Figure 7 NTS Environmental Surveillance Natural Springs Sampling Locations

TABLE 7

ENVIRONMENTAL SURVEILLANCE
NATURAL SPRINGS SAMPLING STATION LOCATIONS

AREA	SAMPLE STATION LOCATION	MAP CODE FOR FIGURE 7
5	Cane Springs	5a
12	Capt. Jack Spring	12a
	White Rock Spring	12b
	Gold Meadows	12c
15	Oak Spring	15a
	Tub Spring	15b
16	Tippipah Spring	16a

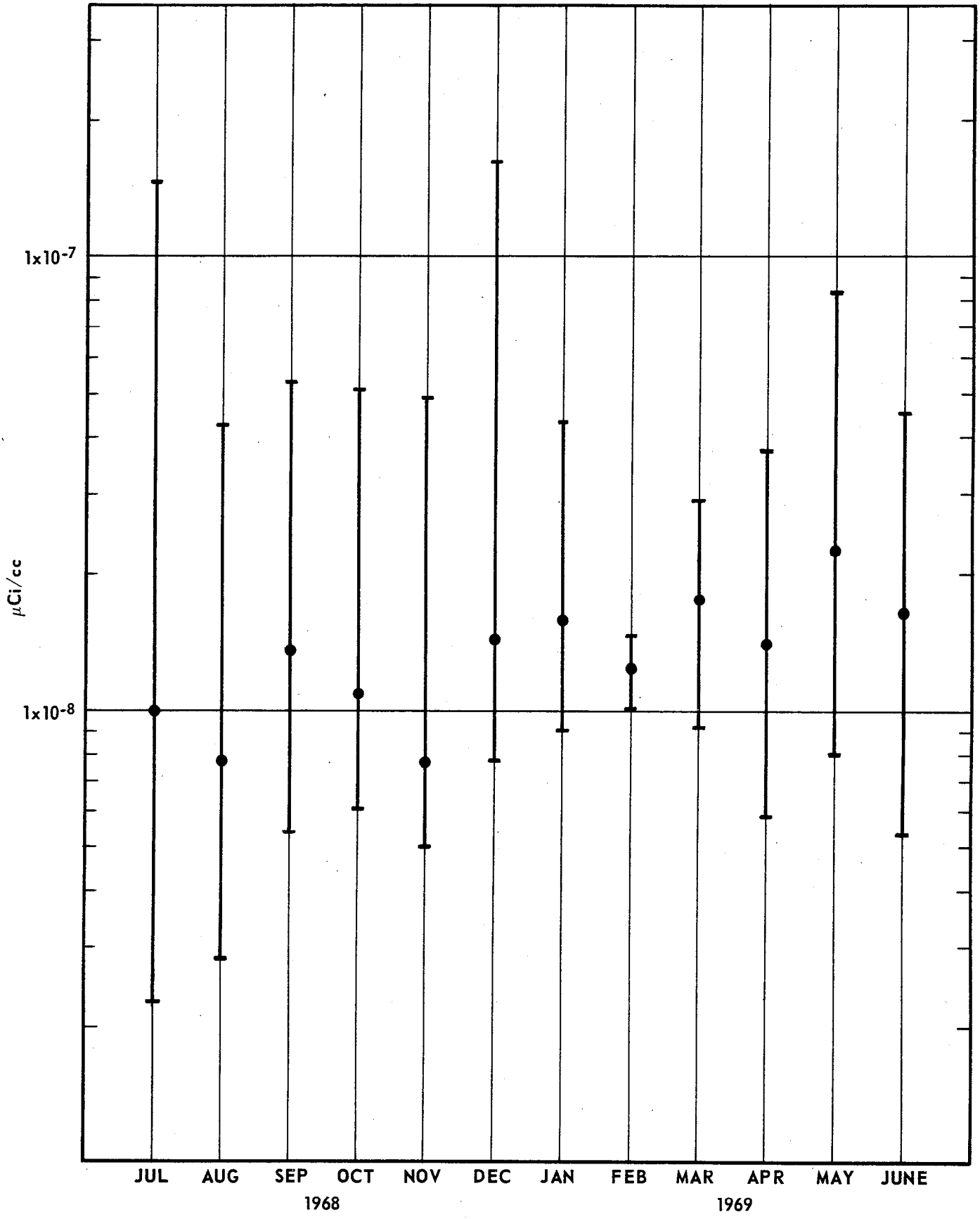

Figure 8 Monthly Means and Ranges of Gross Beta Radioactivity in Natural Springs Water Samples from July, 1968 through June, 1969.

TABLE 8

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Natural Springs Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

DATE	MEAN	RANGE	
		MAXIMUM	MINIMUM
July 1968	1.03×10^{-8}	1.47×10^{-7}	2.30×10^{-9}
August 1968	7.87×10^{-9}	4.22×10^{-8}	2.85×10^{-9}
September 1968	1.37×10^{-8}	5.26×10^{-8}	5.41×10^{-9}
October 1968	1.10×10^{-8}	5.02×10^{-8}	6.11×10^{-9}
November 1968	7.70×10^{-9}	4.90×10^{-8}	5.01×10^{-9}
December 1968	2.45×10^{-8}	1.62×10^{-7}	7.71×10^{-9}
January 1969	1.58×10^{-8}	4.29×10^{-8}	9.05×10^{-9}
February 1969	1.23×10^{-8}	1.48×10^{-8}	1.05×10^{-8}
March 1969	1.74×10^{-8}	2.89×10^{-8}	9.22×10^{-9}
April 1969	1.40×10^{-8}	3.73×10^{-8}	5.90×10^{-9}
May 1969	2.27×10^{-8}	8.36×10^{-8}	8.01×10^{-9}
June 1969	1.63×10^{-8}	4.54×10^{-8}	5.28×10^{-9}

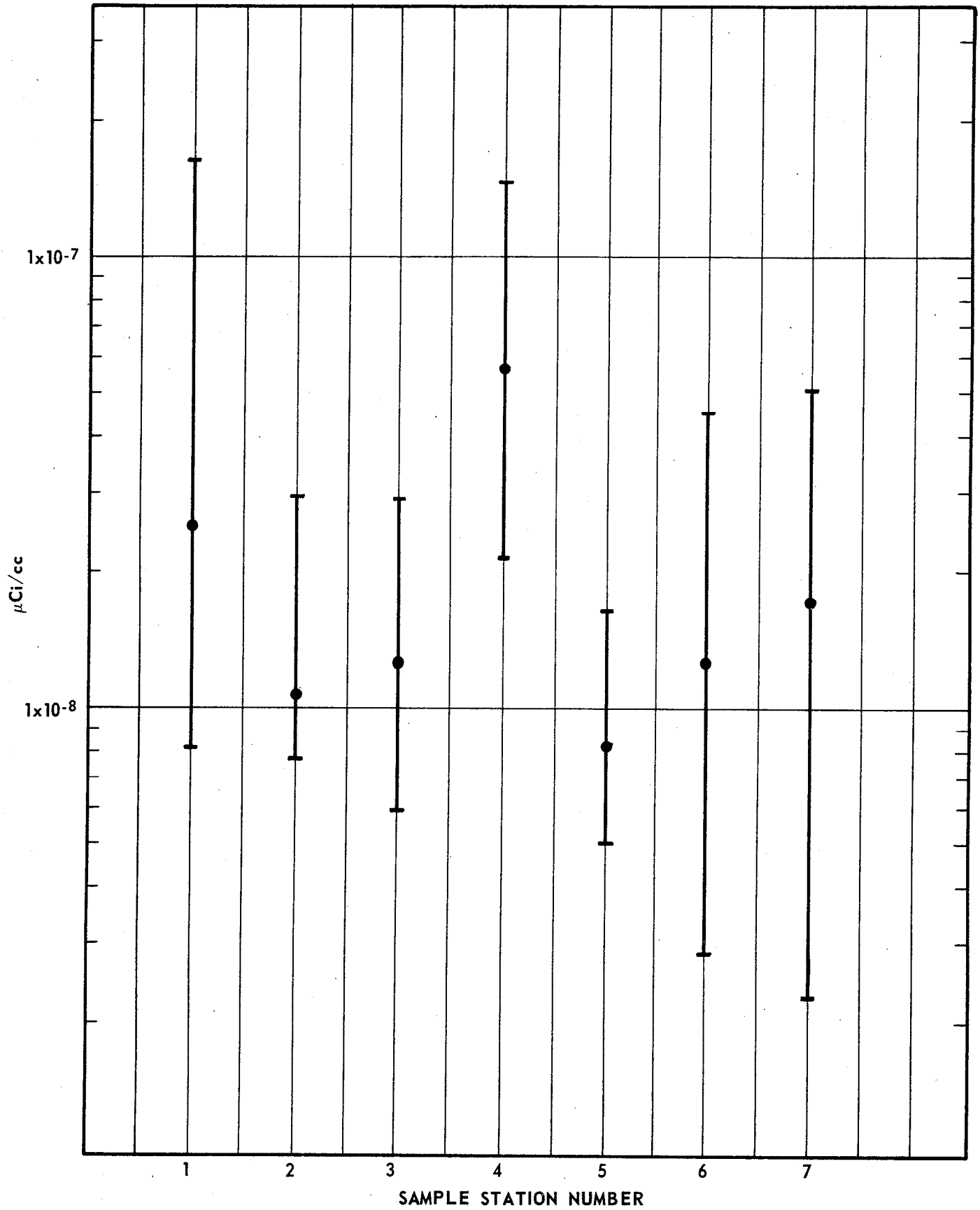

Figure 9 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Natural Springs Sampling Locations from July, 1968 through June, 1969.

TABLE 9

Means and Ranges of Gross Beta Radioactivity at NTS Natural Springs Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	MEAN	RANGE	
		MAXIMUM	MINIMUM
1. Area 5 Cane Spring	2.54×10^{-8}	1.62×10^{-7}	8.12×10^{-9}
2. Area 12 White Rock Spring	1.07×10^{-8}	2.91×10^{-8}	7.71×10^{-9}
3. Area 12 Captain Jack Spring	1.24×10^{-8}	2.89×10^{-8}	5.90×10^{-9}
4. Area 12 Gold Meadows	5.64×10^{-8}	1.47×10^{-7}	2.17×10^{-8}
5. Area 15 Oak Spring	8.29×10^{-9}	1.64×10^{-8}	5.01×10^{-9}
6. Area 15 Tub Spring	1.26×10^{-8}	4.54×10^{-8}	2.85×10^{-9}
7. Area 16 Tippipah Spring	1.71×10^{-8}	5.02×10^{-8}	2.30×10^{-9}

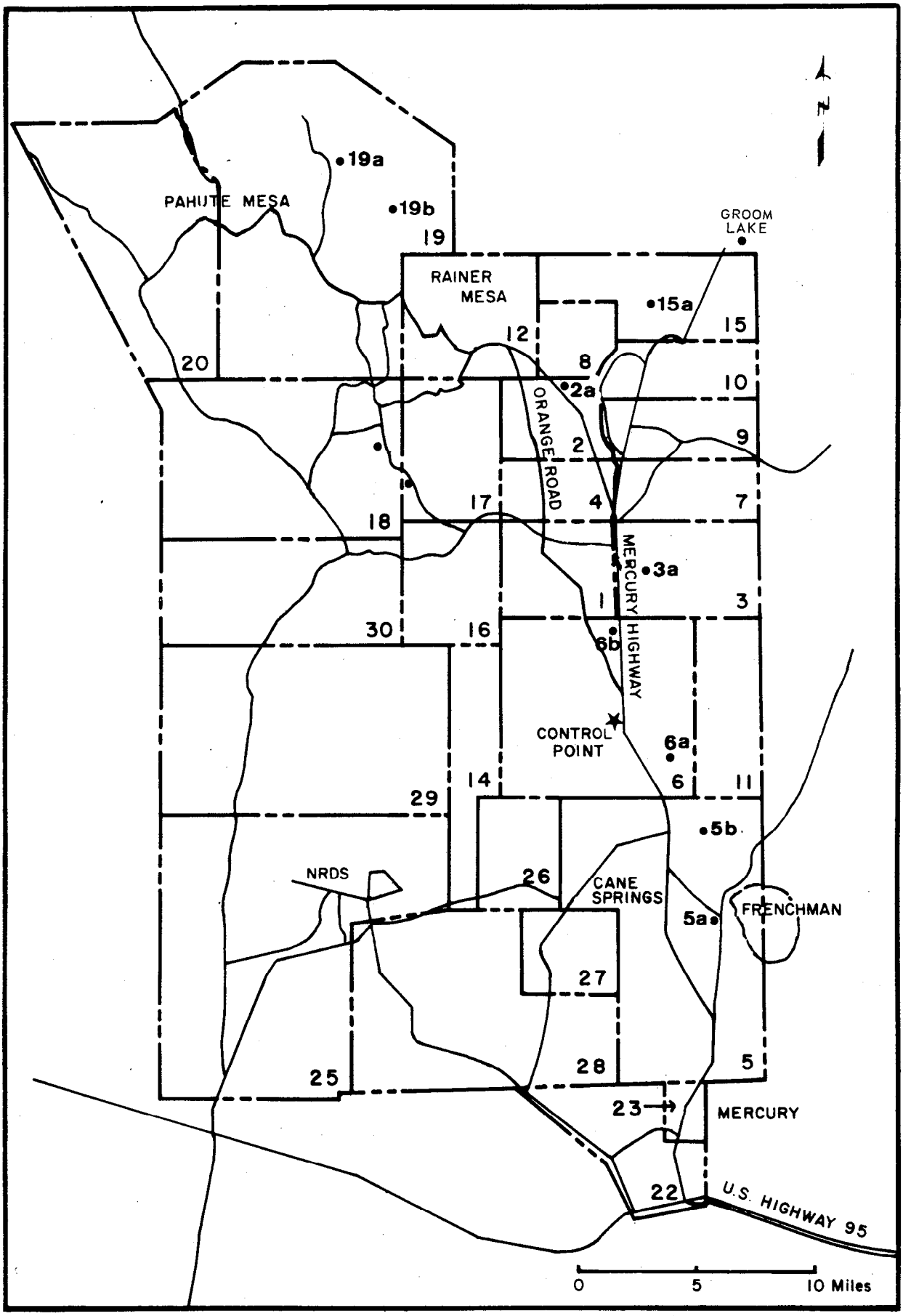

Figure 10 NTS Environmental Surveillance Open Reservoirs Sampling Locations

TABLE 10

ENVIRONMENTAL SURVEILLANCE
OPEN RESERVOIR SAMPLING STATION LOCATION

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 10
2	Well 2 Reservoir	2a
3	Well A Reservoir	3a
5	Well 5B Reservoir	5a
	Well Ue5c Reservoir	5b
6	Well 3 Reservoir	6a
	Well C1 Reservoir	6b
15	Well Ue15d Reservoir	15a
18	Camp 17 Reservoir	18a
19	Well Ue19gs Reservoir	19a
	Well Ue19e Reservoir	19b
20	Well U20a Reservoir	20a
Groom Lake	Well 4 Reservoir	Groom Lake

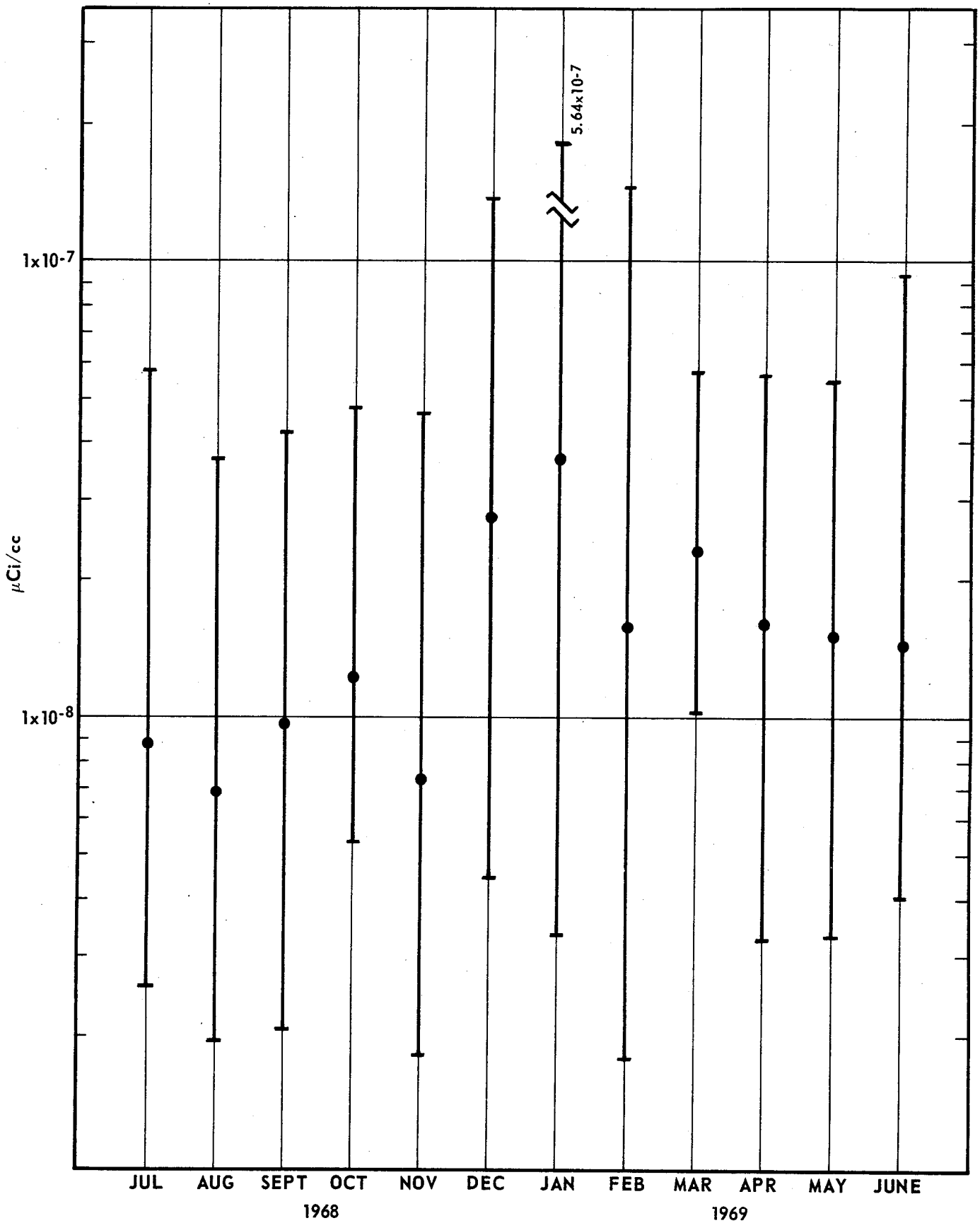

Figure 11 Monthly Means and Ranges of Gross Beta Radioactivity in Open Reservoir Water Samples from July, 1968 through June, 1969.

TABLE 11

Monthly Means and Ranges of Gross Beta Radioactivity at NTS Environmental Open Reservoir Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

DATE	MEAN	RANGE	
		MAXIMUM	MINIMUM
July 1968	8.77×10^{-9}	5.66×10^{-8}	2.54×10^{-9}
August 1968	6.93×10^{-9}	3.68×10^{-8}	1.94×10^{-9}
September 1968	9.65×10^{-9}	4.18×10^{-8}	2.06×10^{-9}
October 1968	1.22×10^{-8}	4.70×10^{-8}	5.24×10^{-9}
November 1968	7.27×10^{-9}	4.60×10^{-8}	1.81×10^{-9}
December 1968	2.76×10^{-8}	1.38×10^{-7}	4.42×10^{-9}
January 1969	3.69×10^{-8}	5.64×10^{-7}	3.34×10^{-9}
February 1969	1.59×10^{-8}	1.44×10^{-7}	1.79×10^{-9}
March 1969	2.33×10^{-8}	5.76×10^{-8}	1.02×10^{-8}
April 1969	1.61×10^{-8}	5.62×10^{-8}	3.28×10^{-9}
May 1969	1.52×10^{-8}	5.43×10^{-8}	3.33×10^{-9}
June 1969	1.45×10^{-8}	9.33×10^{-8}	4.01×10^{-9}

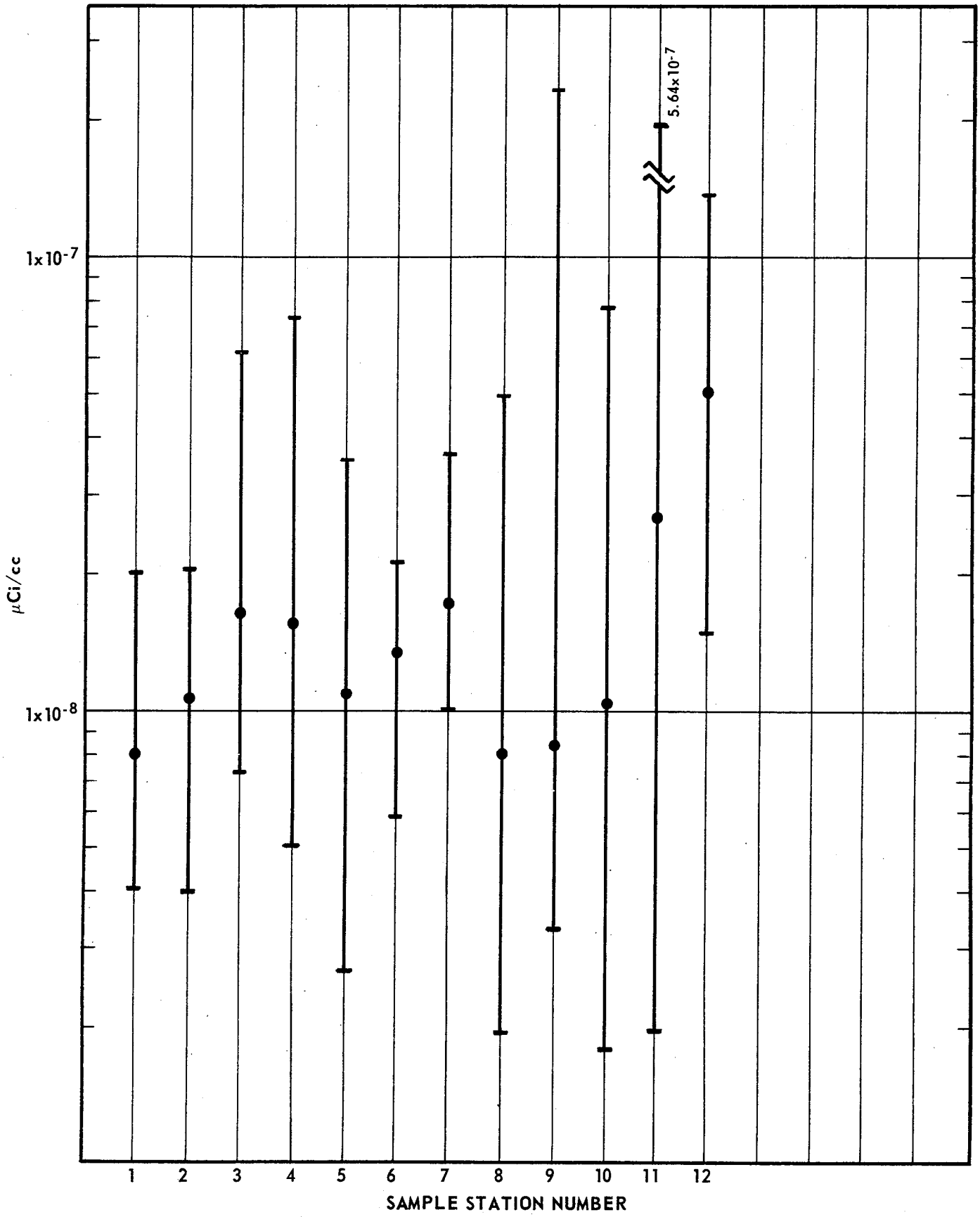

Figure 12 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Open Reservoir Sampling Locations from July, 1968 through June, 1969.

TABLE 12

Means and Ranges of Gross Beta Radioactivity at NTS Environmental Open Reservoir Water Sampling Locations from July 1968 through June 1969

Values in Terms of μCi/cc

	STATION NUMBER AND LOCATION	MEAN	RANGE	
			MAXIMUM	MINIMUM
1.	Area 2, Well 2 Reservoir	8.04×10^{-9}	1.97×10^{-8}	4.07×10^{-9}
2.	Area 3, Well A Reservoir	1.08×10^{-8}	2.02×10^{-8}	3.95×10^{-9}
3.	Area 5, Well 5B Reservoir	1.64×10^{-8}	6.10×10^{-8}	7.27×10^{-9}
4.	Area 5, Well Ue5c Reservoir	1.59×10^{-8}	7.40×10^{-8}	5.05×10^{-9}
5.	Area 6, Well 3 Reservoir	1.10×10^{-8}	3.58×10^{-8}	2.68×10^{-9}
6.	Area 6, Well C1 Reservoir	1.35×10^{-8}	2.11×10^{-8}	5.91×10^{-9}
7.	Area 15, Well Ue15d Reservoir	1.73×10^{-8}	3.70×10^{-8}	1.03×10^{-8}
8.	Area 18, Camp 17 Reservoir	8.06×10^{-9}	4.91×10^{-8}	1.94×10^{-9}
9.	Area 19, Well $Ue19_{gs}$ Reservoir	8.55×10^{-9}	2.34×10^{-7}	3.33×10^{-9}
10.	Area 19, Well Ue19e Reservoir	1.06×10^{-8}	7.78×10^{-8}	1.81×10^{-9}
11.	Area 20, Well U20a Reservoir	2.71×10^{-8}	5.64×10^{-7}	2.06×10^{-9}
12.	Groom Lake, Well 4 Reservoir	5.18×10^{-8}	1.38×10^{-7}	1.51×10^{-8}

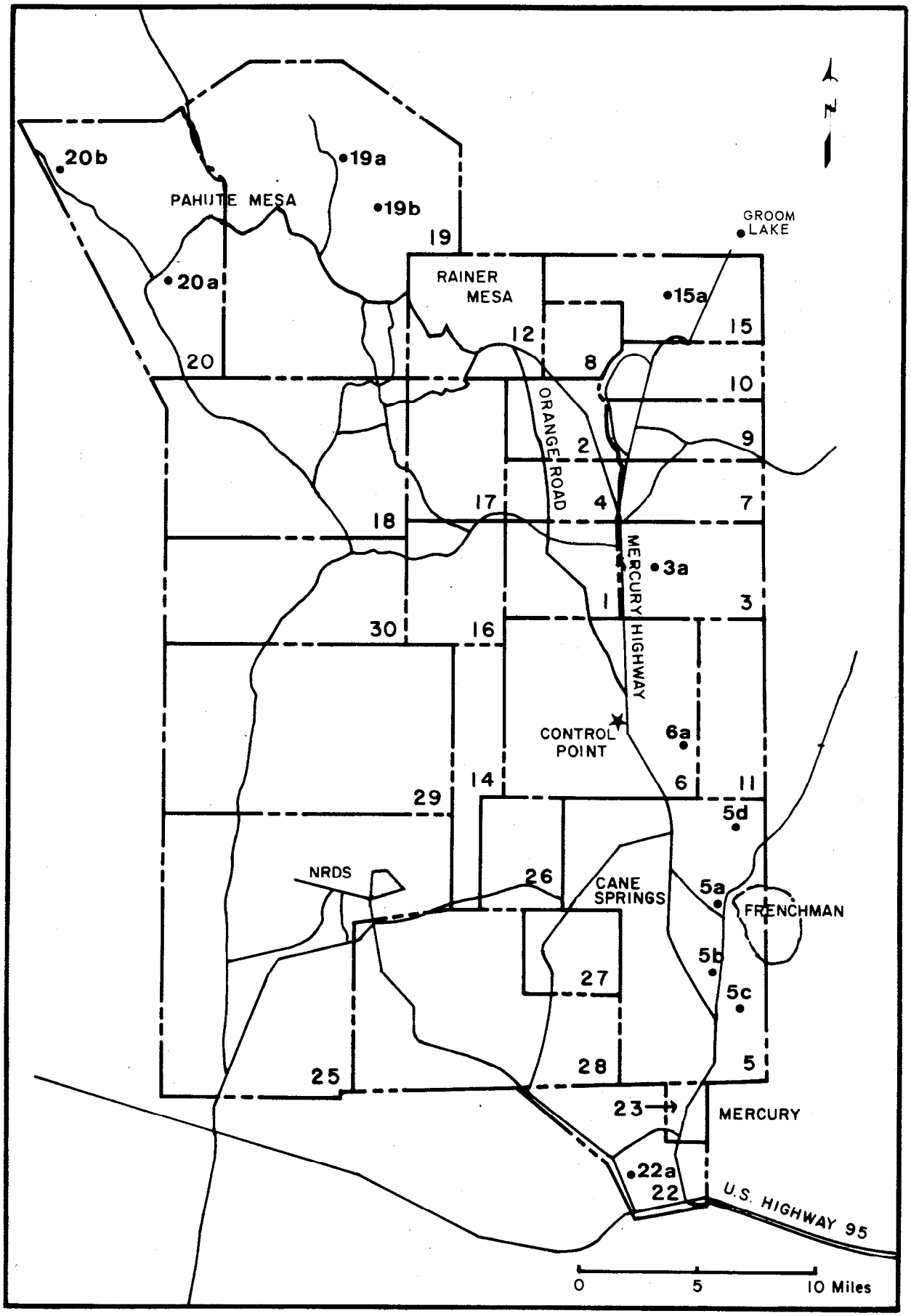

Figure 13 NTS Environmental Surveillance Supply Well Sampling Locations

TABLE 13

ENVIRONMENTAL SURVEILLANCE
SUPPLY WELLS SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 13
3	Well A	3a
5	Well 5A	5a
	Well 5B	5b
	Well 5C	5c
	Well Ue5c	5d
6	Well C1	6a
15	Well Ue15d	15a
19	Well Ue19gs	19a
	Well Ue19e	19b
20	Well U20a	20a
	Well U20j	20b
22	Army Well #1	22a
Groom Lake	Well 3	Groom Lake
	Well 4	Groom Lake

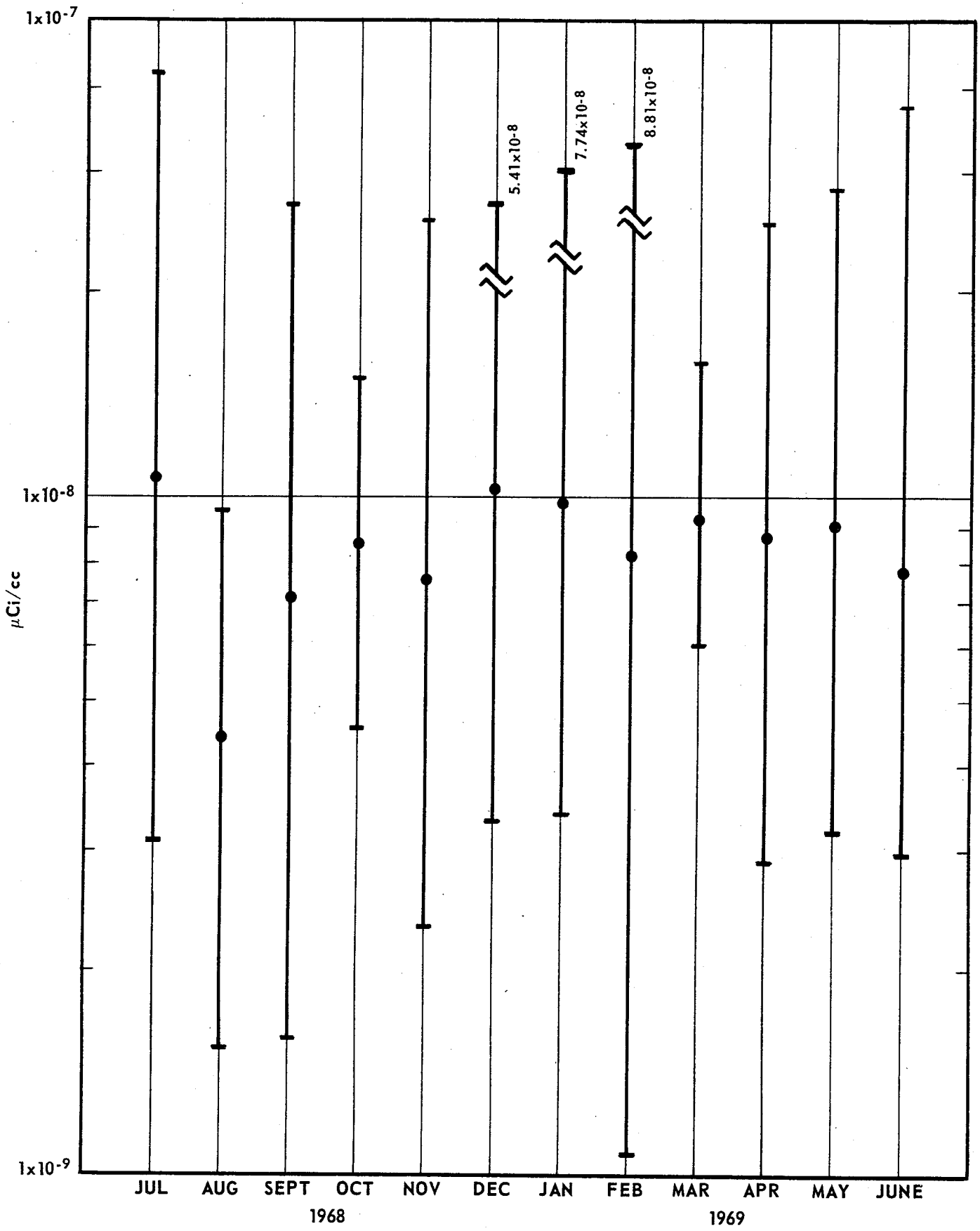

Figure 14 Monthly Means and Ranges of Gross Beta Radioactivity in Supply Well Samples from July, 1968 through June, 1969.

TABLE 14

Monthly Means and Ranges of Gross Beta Radioactivity in Supply Wells Samples from July 1968 through June 1969

Values in Terms of μCi/cc

DATE (Monthly)	MEAN	RANGE	
		MAXIMUM	MINIMUM
July 1968	1.12×10^{-8}	4.20×10^{-8}	3.12×10^{-9}
August 1968	4.44×10^{-9}	9.53×10^{-9}	1.59×10^{-9}
September 1968	7.06×10^{-9}	2.70×10^{-8}	1.70×10^{-9}
October 1968	8.51×10^{-9}	1.97×10^{-8}	4.59×10^{-9}
November 1968	7.54×10^{-9}	2.56×10^{-8}	2.34×10^{-9}
December 1968	1.05×10^{-8}	5.41×10^{-8}	3.36×10^{-9}
January 1969	9.81×10^{-9}	7.74×10^{-8}	3.41×10^{-9}
February 1969	8.23×10^{-9}	8.81×10^{-8}	1.18×10^{-9}
March 1969	9.26×10^{-9}	1.64×10^{-8}	6.09×10^{-9}
April 1969	8.85×10^{-9}	2.54×10^{-8}	2.91×10^{-9}
May 1969	9.18×10^{-9}	2.86×10^{-8}	3.24×10^{-9}
June 1969	7.77×10^{-9}	3.78×10^{-8}	2.99×10^{-9}

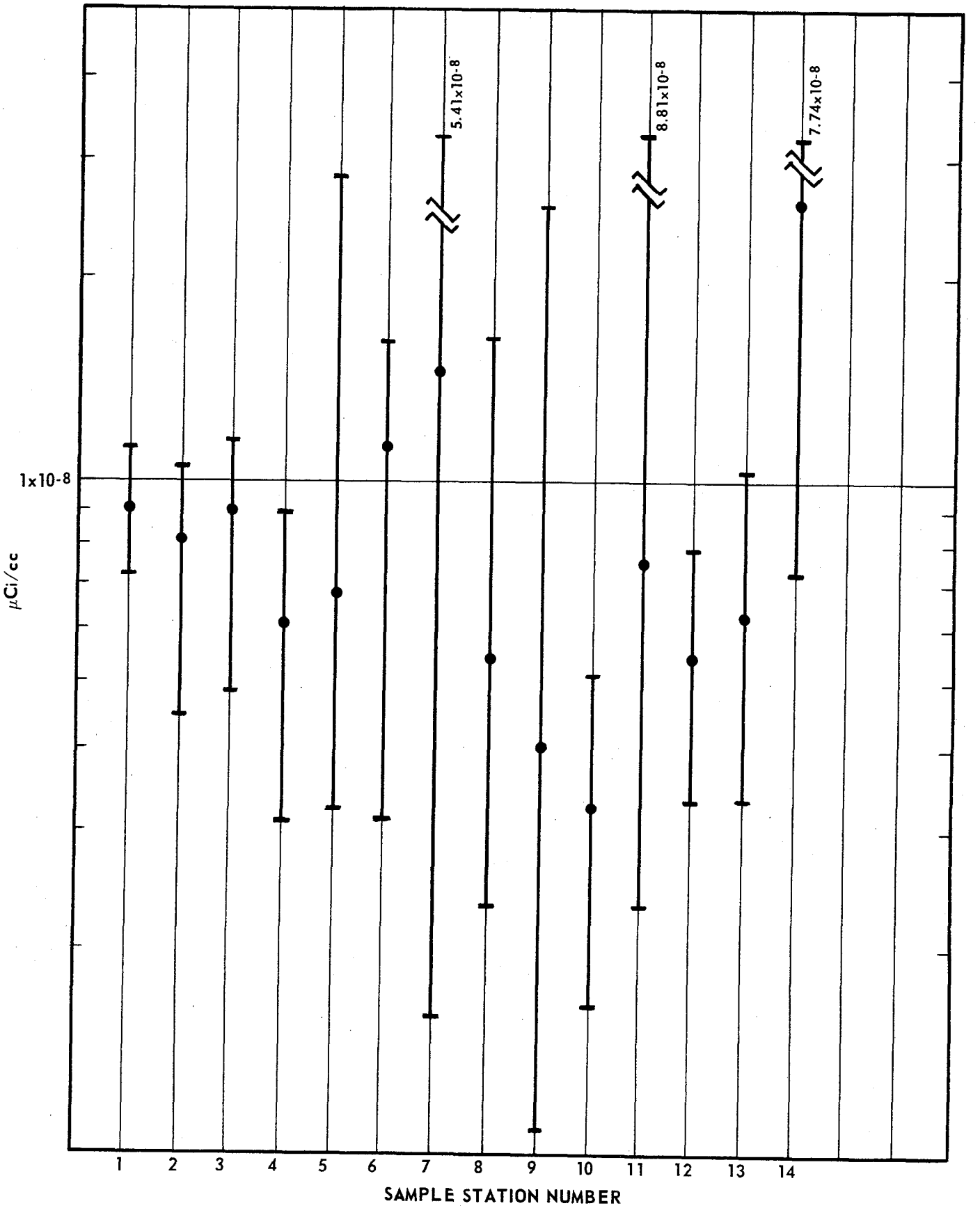

Figure 15 Means and Ranges of Gross Beta Radioactivity at NTS Environmental Supply Wells Sampling Locations from July, 1968 through June, 1969.

TABLE 15

Means and Ranges of Gross Beta Radioactivity at NTS Supply Wells Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

	STATION NUMBER AND LOCATION	MEAN	RANGE	
			MAXIMUM	MINIMUM
1.	Area 3, Well A	9.03×10^{-9}	1.23×10^{-8}	7.27×10^{-9}
2.	Area 5, Well 5A	8.19×10^{-9}	1.08×10^{-8}	4.49×10^{-9}
3.	Area 5, Well 5B	9.05×10^{-9}	1.29×10^{-8}	4.89×10^{-9}
4.	Area 5, Well 5C	6.16×10^{-9}	8.90×10^{-9}	3.12×10^{-9}
5.	Area 5, Well Ue5c	6.87×10^{-9}	2.86×10^{-8}	3.29×10^{-9}
6.	Area 6, Well C1	1.26×10^{-8}	1.71×10^{-8}	3.16×10^{-9}
7.	Area 15, Well Ue15d	1.42×10^{-8}	5.41×10^{-8}	1.70×10^{-9}
8.	Area 19, Well Ue19gs	5.40×10^{-9}	1.72×10^{-8}	2.34×10^{-9}
9.	Area 19, Well Ue19e	4.01×10^{-9}	2.54×10^{-8}	1.18×10^{-9}
10.	Area 20, Well U20a	3.31×10^{-9}	5.11×10^{-9}	1.85×10^{-9}
11.	Area 20, Well U20j	7.63×10^{-9}	8.81×10^{-8}	2.36×10^{-9}
12.	Area 22, Army Well 1	5.48×10^{-9}	7.89×10^{-9}	3.36×10^{-9}
13.	Groom Lake, Well 3	6.30×10^{-9}	1.06×10^{-8}	3.38×10^{-9}
14.	Groom Lake, Well 4	2.60×10^{-8}	7.74×10^{-8}	7.31×10^{-9}

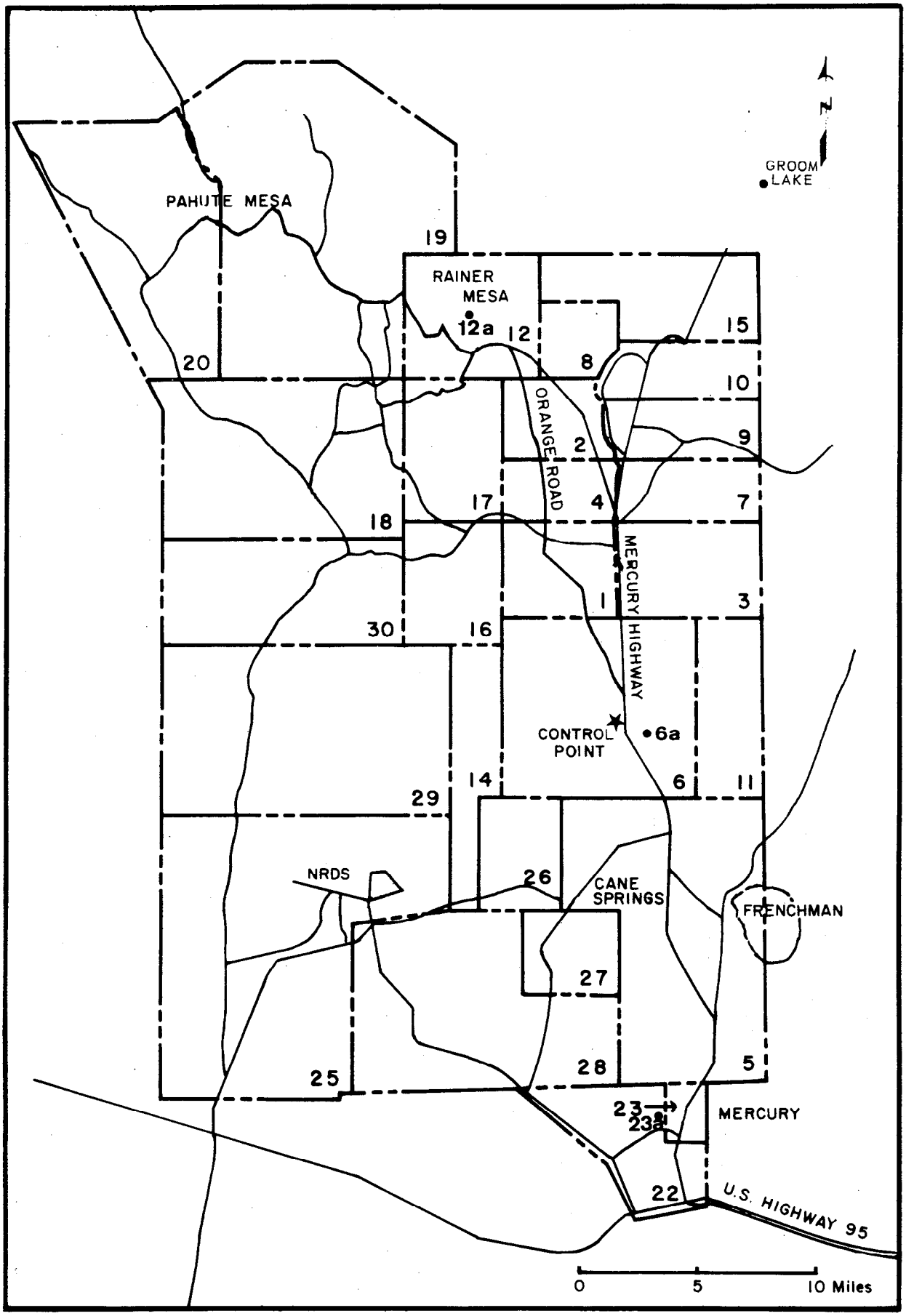

Figure 16 NTS Environmental Surveillance Final Effluent Pond Sampling Locations

TABLE 16

ENVIRONMENTAL SURVEILLANCE
FINAL EFFLUENT SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATION	MAP CODE FOR FIGURE 16
6	Final Effluent Pond	6a
12	Final Effluent Pond	12a
23	Final Effluent Pond	23a
Groom Lake	Final Effluent Pond	Groom Lake

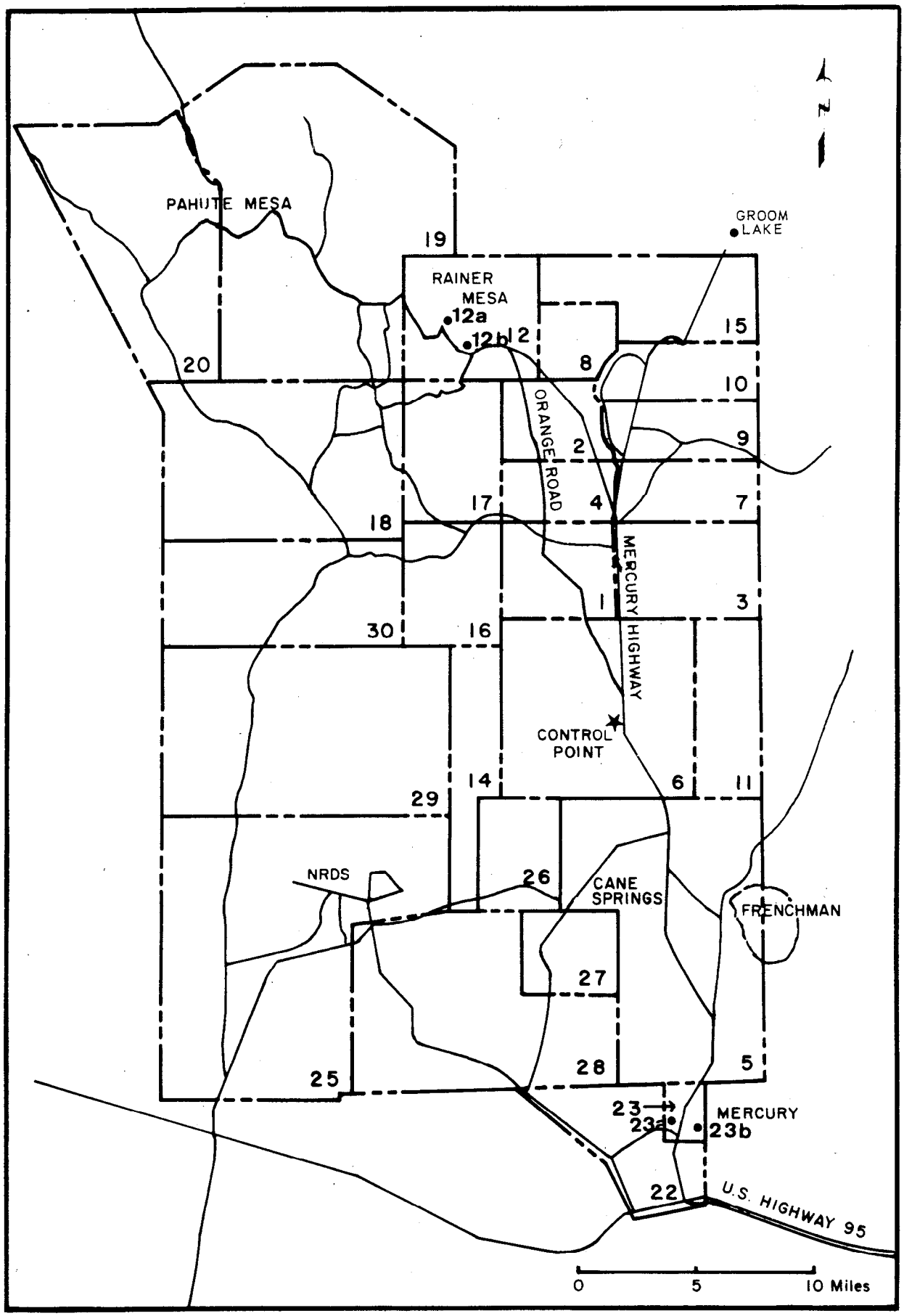

Figure 17 NTS Environmental Surveillance Miscellaneous Water Sampling Locations

TABLE 17

ENVIRONMENTAL SURVEILLANCE
MISCELLANEOUS WATER SAMPLING STATION LOCATIONS

AREA	SAMPLING STATION LOCATIONS	MAP CODE FOR FIGURE 17
12	Upper Haines Lake	12a
	Lower Haines Lake	12b
23	Swimming Pool	23a
	Laboratory Sump	23b
Groom Lake	Station 2	Groom Lake
	Station 3	Groom Lake

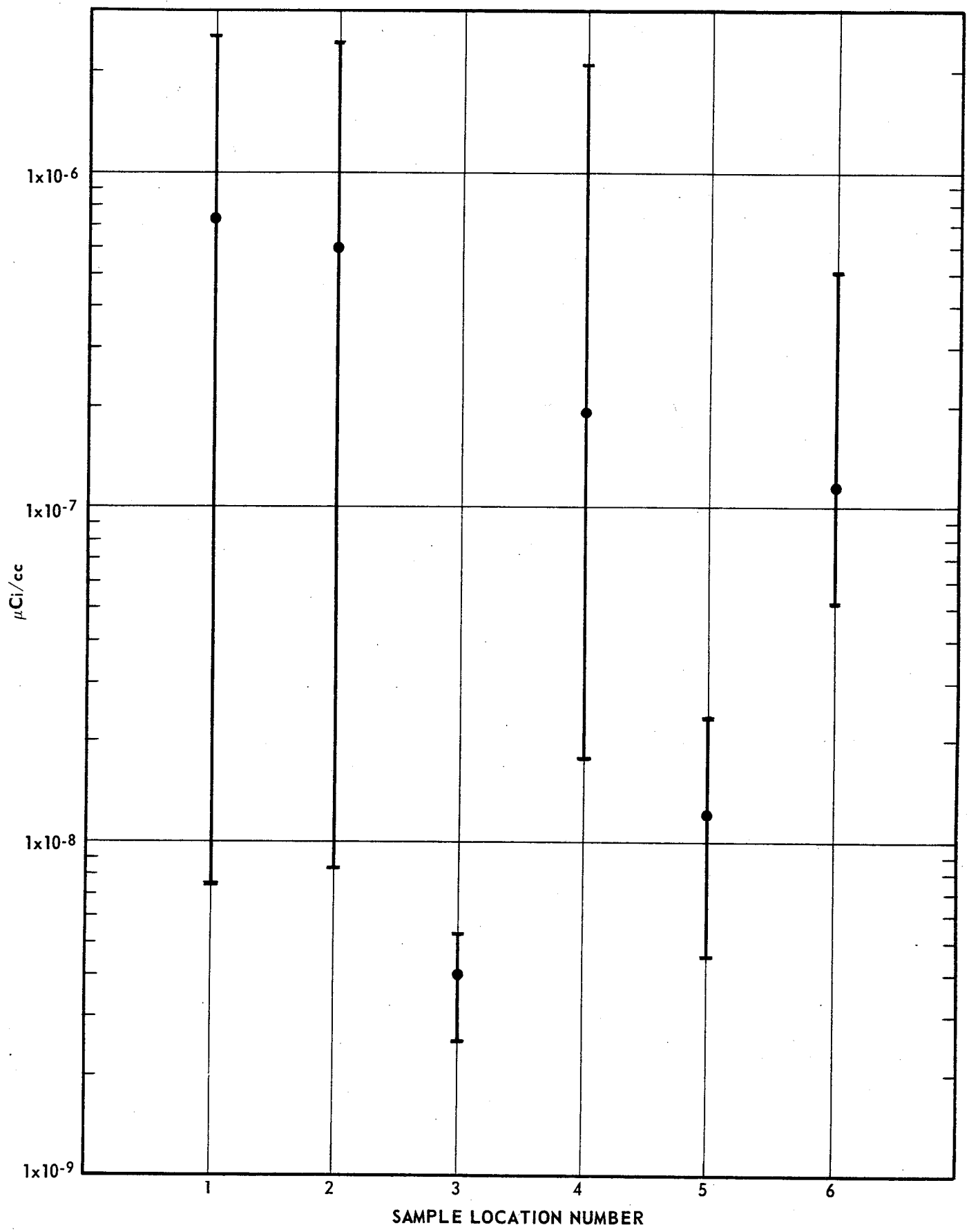

Figure 18 Means and Ranges of Gross Beta Radioactivity from July, 1968 through June, 1969; Miscellaneous Water Sampling Locations.

TABLE 18

Means and Ranges of Gross Beta Radioactivity at NTS Miscellaneous Water Sampling Station Locations from July 1968 through June 1969

Values in Terms of μCi/cc

STATION NUMBER AND LOCATION	MEAN	RANGE	
		MAXIMUM	MINIMUM
1. Area 12 Upper Haines Lake	7.22×10^{-7}	2.56×10^{-6}	7.43×10^{-9}
2. Area 12 Lower Haines Lake	5.95×10^{-7}	2.45×10^{-6}	8.32×10^{-9}
3. Area 23 Swimming Pool	4.08×10^{-9}	5.33×10^{-9}	2.55×10^{-9}
4. Area 23 Laboratory Sump	1.90×10^{-7}	2.08×10^{-6}	1.77×10^{-8}
5. Groom Lake Sta. 2	1.22×10^{-8}	2.36×10^{-8}	4.57×10^{-9}
6. Groom Lake Sta. 3	1.15×10^{-7}	5.03×10^{-7}	5.15×10^{-8}

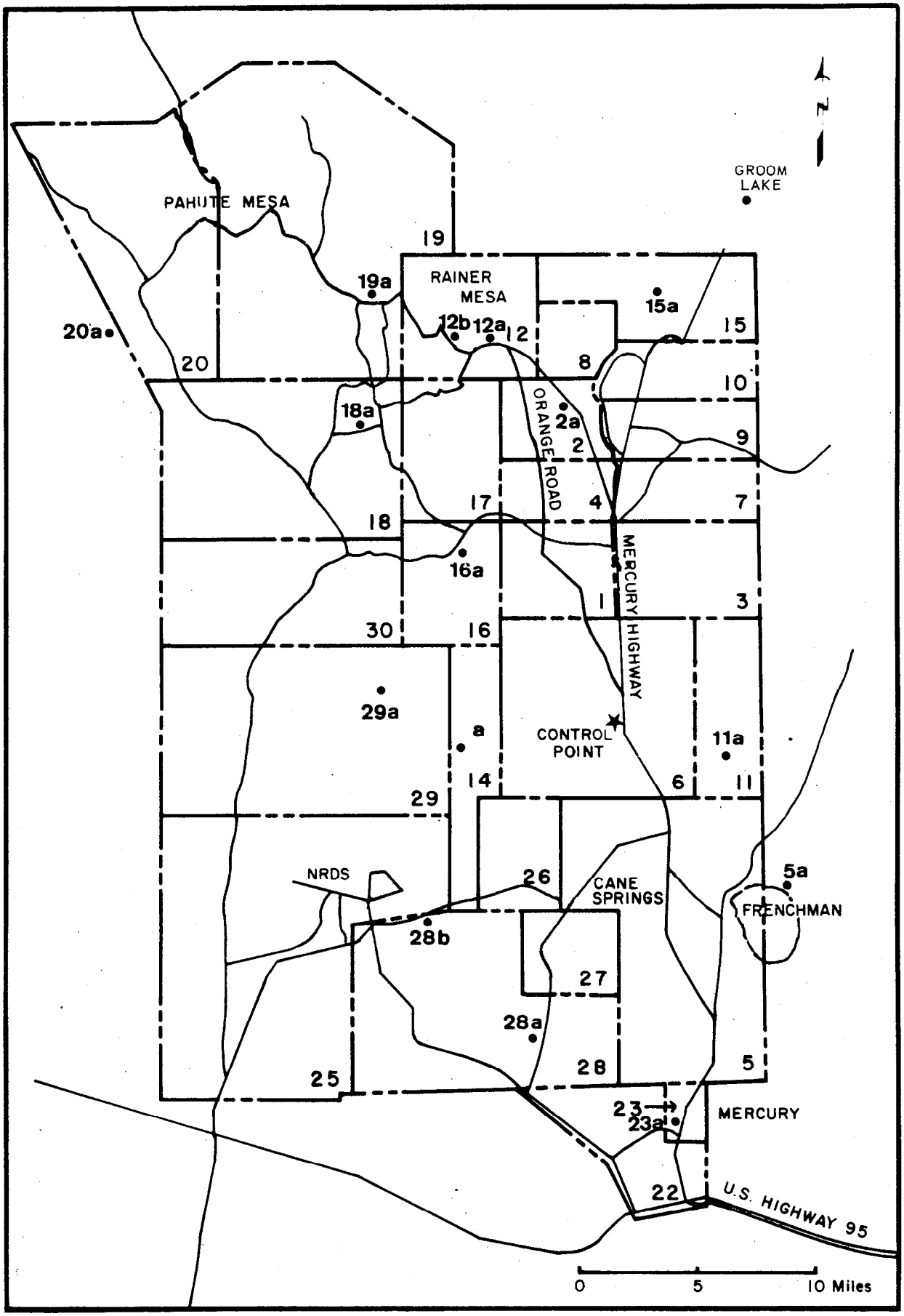

Figure 19 NTS Environmental Surveillance Soil and Vegetation Sampling Locations

TABLE 19

ENVIRONMENTAL SURVEILLANCE
VEGETATION SAMPLING LOCATIONS

AREA	SAMPLE STATION LOCATION	SPECIE	MAP CODE FOR FIGURE 19
2	Orange Road Stake 63-64	b	2a
5	Old Fallout Station	d	5a
11	Stake 11 W-4	c	11a
12	Campsite	a	12a
	ESSA Station	a	12b
14	Saddle Mtn. Road Barricade	a	14a
15	N.E. of USPHS Farm	b	15a
16	Campsite	a, b	16a
18	Stake 18 B-16	a	18a
19	Stake 19 F-13	a	19a
20	Stake 20 L-12	a	20a
23	Pistol Range Road	b	23a
28	Pan Am Stake 152	d	28a
	Project HENRE Site	d	28b
29	Shoshone Mountain Barricade	a	29a
Groom Lake	South of Groom Lake	c	Groom Lake

CODE EXPLANATION FOR SPECIES:

(a) SAGEBRUSH - Artemesia spp.
(b) BLACKBRUSH - Coleogyne ramossisima
(c) WINTERFAT - Eurotia lanata
(d) CREOSOTE - Larrea divaricata

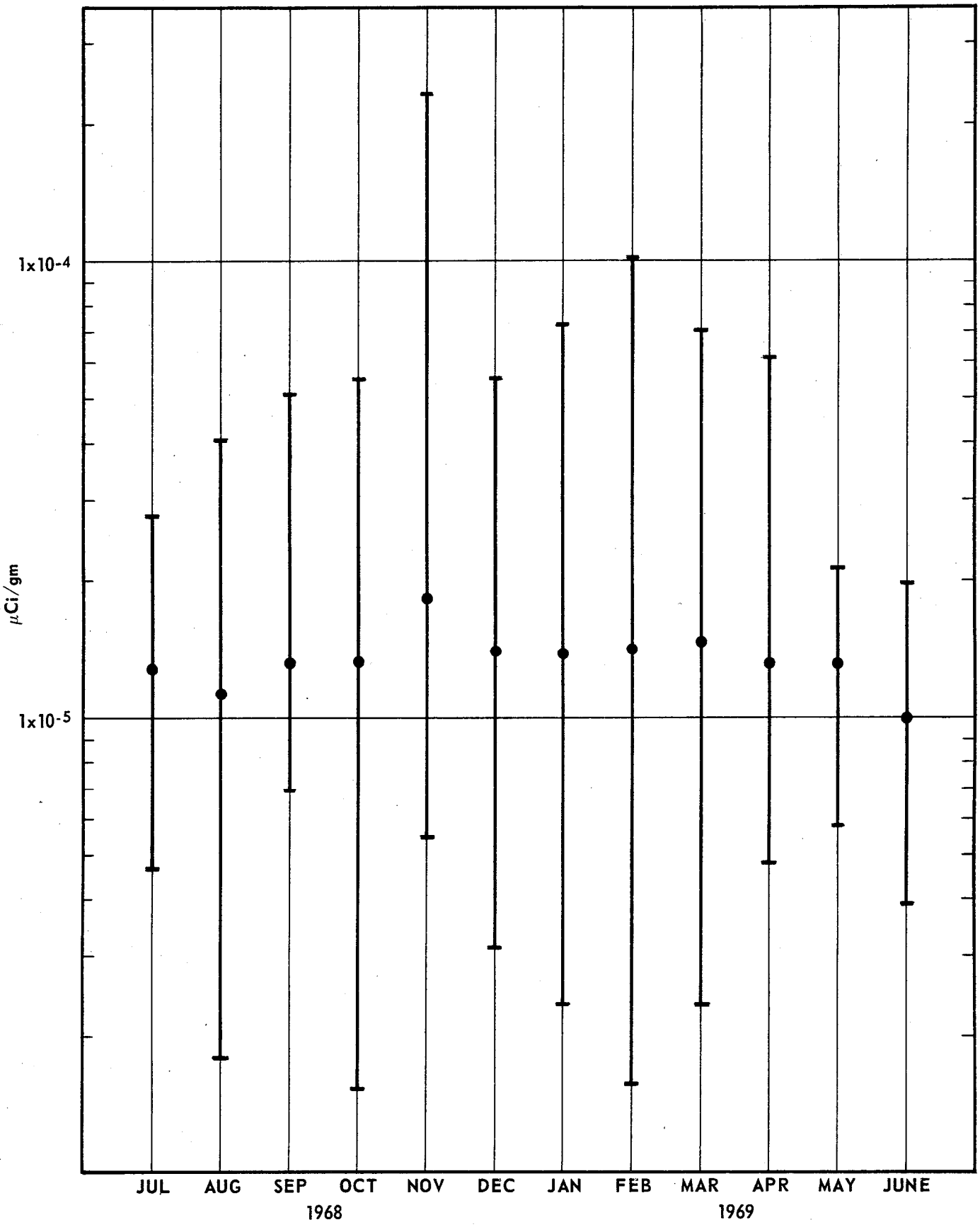

Figure 20 Monthly Means and Ranges of Gross Gamma Radioactivity in NTS Soil Sampling Locations from July, 1968 through June, 1969.

TABLE 20

Means and Ranges of Gross Gamma Radioactivity at NTS Soil Sampling Locations from July 1968 through June 1969

Values in Terms of μCi/gm

DATE (Monthly)	MEAN	RANGE	
		MAXIMUM	MINIMUM
July 1968	1.29×10^{-5}	2.78×10^{-5}	4.68×10^{-6}
August 1968	1.13×10^{-5}	4.08×10^{-5}	1.80×10^{-6}
September 1968	1.31×10^{-5}	5.05×10^{-5}	6.99×10^{-6}
October 1968	1.33×10^{-5}	5.54×10^{-5}	1.54×10^{-6}
November 1968	1.82×10^{-5}	2.31×10^{-4}	5.50×10^{-6}
December 1968	1.40×10^{-5}	5.54×10^{-5}	3.13×10^{-6}
January 1969	1.37×10^{-5}	7.21×10^{-5}	2.38×10^{-6}
February 1969	1.42×10^{-5}	1.01×10^{-4}	1.57×10^{-6}
March 1969	1.47×10^{-5}	6.99×10^{-5}	2.38×10^{-6}
April 1969	1.31×10^{-5}	6.14×10^{-5}	4.83×10^{-6}
May 1969	1.31×10^{-5}	2.12×10^{-5}	5.82×10^{-6}
June 1969	9.86×10^{-6}	1.94×10^{-5}	3.93×10^{-6}

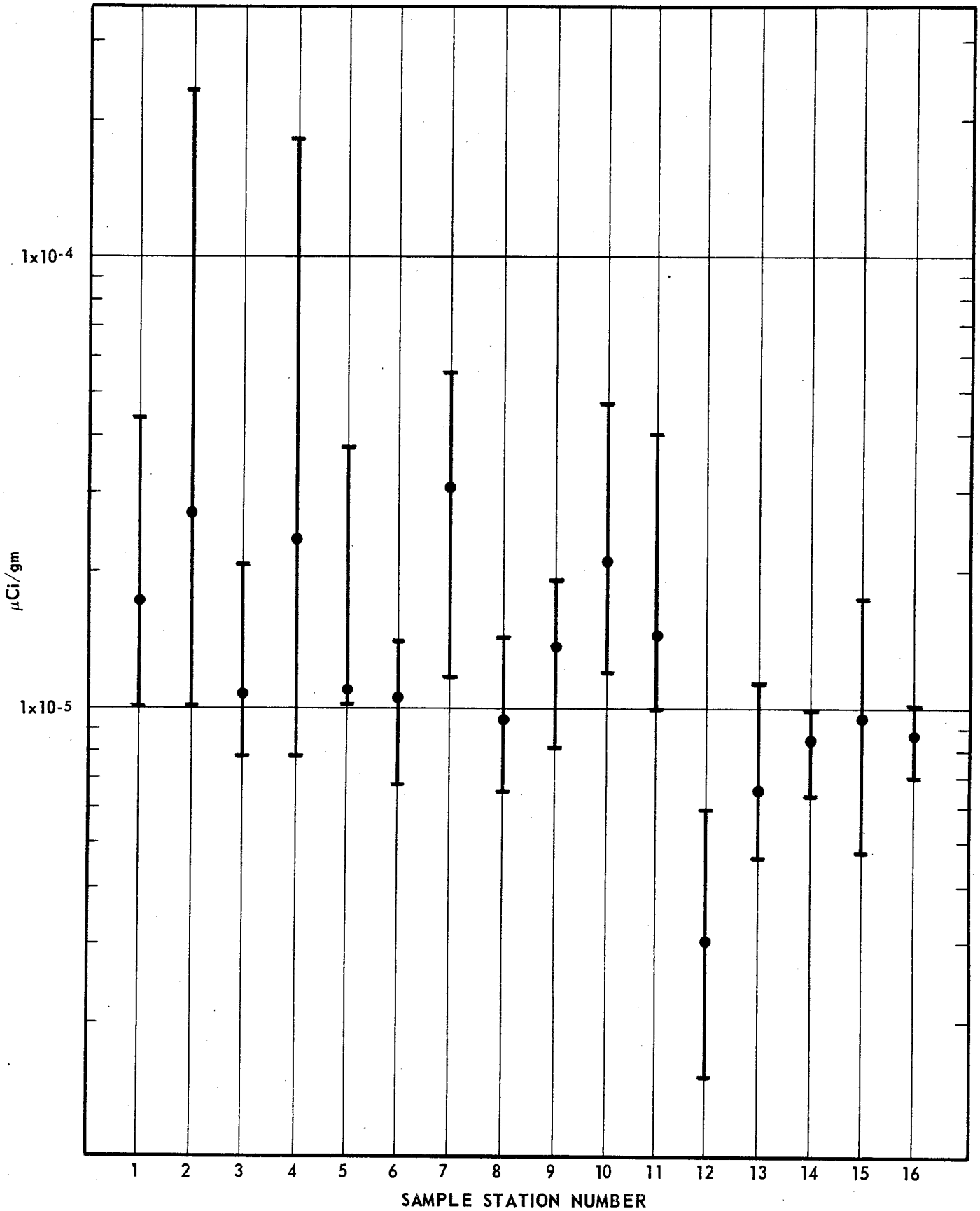

Figure 21 Means and Ranges of Gross Gamma Radioactivity in NTS Soil Sampling Locations from July, 1968 through June, 1969.

TABLE 21

Means and Ranges of Gross Gamma Radioactivity at NTS Soil Sampling Locations from July 1968 through June 1969

Values in Terms of μCi/cc

	SAMPLING LOCATION	MEAN	RANGE	
			MAXIMUM	MINIMUM
1.	Area 2 Orange Road Stake 63-64	1.71×10^{-5}	4.39×10^{-5}	1.09×10^{-5}
2.	Area 5 Old Fallout Station	2.74×10^{-5}	2.31×10^{-4}	1.04×10^{-5}
3.	Area 11 Stake 11W-4	1.09×10^{-5}	2.05×10^{-5}	7.83×10^{-6}
4.	Area 12 Campsite	2.37×10^{-5}	1.81×10^{-4}	7.82×10^{-6}
5.	Area 12 ESSA Station	1.10×10^{-5}	3.75×10^{-5}	1.04×10^{-5}
6.	Area 14 Saddle Mountain Road Barricade	1.05×10^{-5}	1.39×10^{-5}	6.80×10^{-6}
7.	Area 15 Northeast of USPHS Farm	3.04×10^{-5}	5.54×10^{-5}	1.19×10^{-5}
8.	Area 16 Campsite	9.53×10^{-6}	1.42×10^{-5}	6.51×10^{-6}
9.	Area 18 Stake 18B-16	1.39×10^{-5}	1.93×10^{-5}	8.23×10^{-6}
10.	Area 19 Stake 19F-13	2.12×10^{-5}	4.72×10^{-5}	1.21×10^{-5}
11.	Area 20 Stake 20L-12	1.46×10^{-5}	3.99×10^{-5}	9.96×10^{-6}
12.	Area 23 Pistol Range Road	3.12×10^{-6}	5.82×10^{-6}	1.54×10^{-6}
13.	Area 28 Pan Am Stake 152	6.60×10^{-6}	1.18×10^{-5}	4.68×10^{-6}
14.	Area 28 Project HENRE Site	8.57×10^{-6}	9.90×10^{-6}	6.43×10^{-6}
15.	Area 29 Shoshone Mountain Barricade	9.56×10^{-6}	1.76×10^{-5}	4.83×10^{-6}
16.	South of Groom Lake	8.73×10^{-6}	1.01×10^{-5}	7.19×10^{-6}

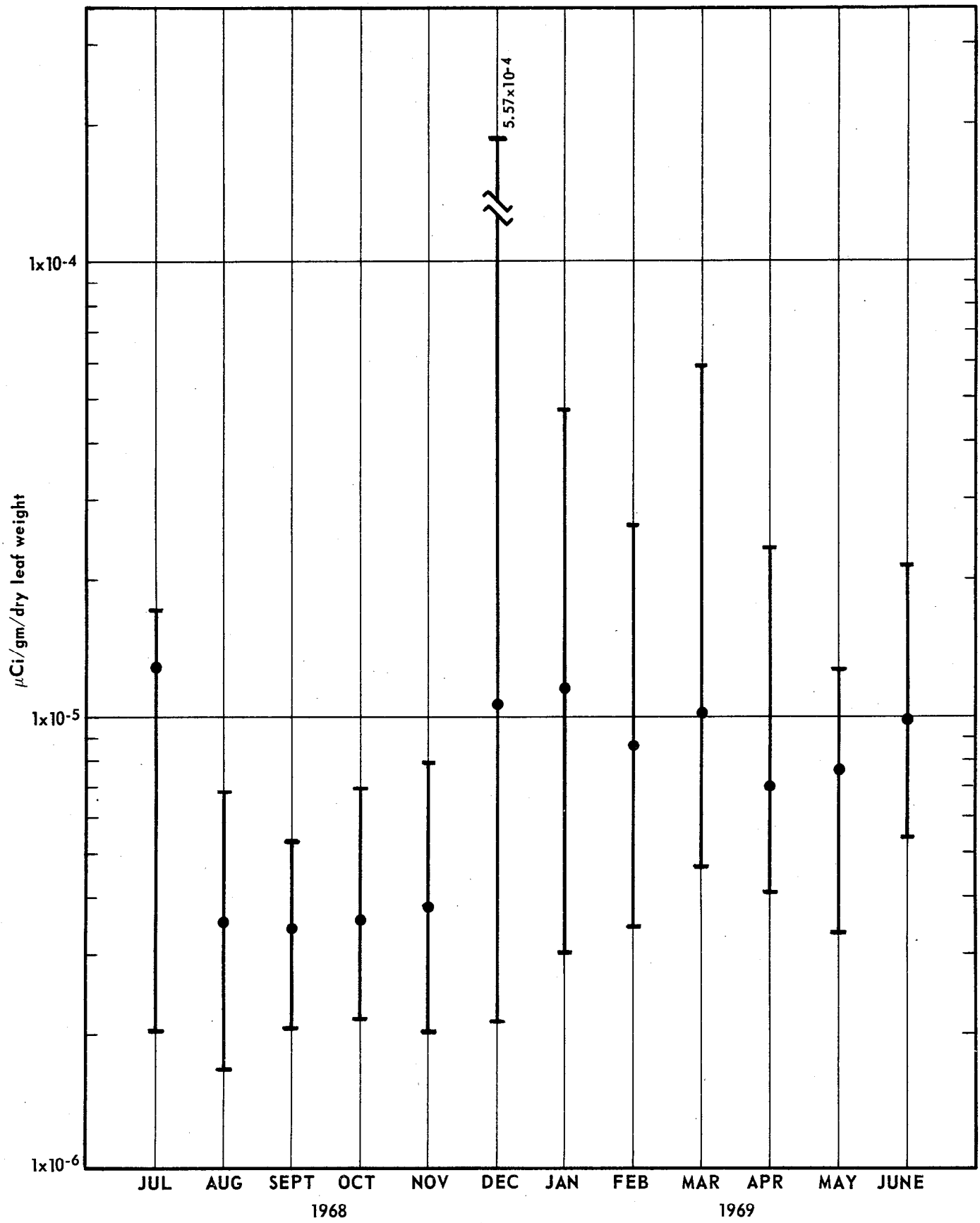

Figure 22 Monthly Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July, 1968 through June, 1969.

TABLE 22

Monthly Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July 1968 through June 1969

Values in Terms of μCi/gm

DATE	MEAN	RANGE	
		MAXIMUM	MINIMUM
July 1968	1.29×10^{-5}	1.70×10^{-5}	2.07×10^{-6}
August 1968	3.54×10^{-6}	6.67×10^{-6}	1.69×10^{-6}
September 1968	3.49×10^{-6}	5.30×10^{-6}	2.07×10^{-6}
October 1968	3.62×10^{-6}	6.86×10^{-6}	2.19×10^{-6}
November 1968	3.87×10^{-6}	7.91×10^{-6}	2.01×10^{-6}
December 1968	1.08×10^{-5}	5.57×10^{-4}	2.15×10^{-6}
January 1969	1.17×10^{-5}	4.76×10^{-5}	3.02×10^{-6}
February 1969	8.66×10^{-6}	2.61×10^{-5}	3.49×10^{-6}
March 1969	1.02×10^{-5}	5.91×10^{-5}	4.66×10^{-6}
April 1969	7.07×10^{-6}	2.33×10^{-5}	4.17×10^{-6}
May 1969	7.71×10^{-6}	1.27×10^{-5}	3.36×10^{-6}
June 1969	9.97×10^{-6}	2.13×10^{-5}	5.53×10^{-6}

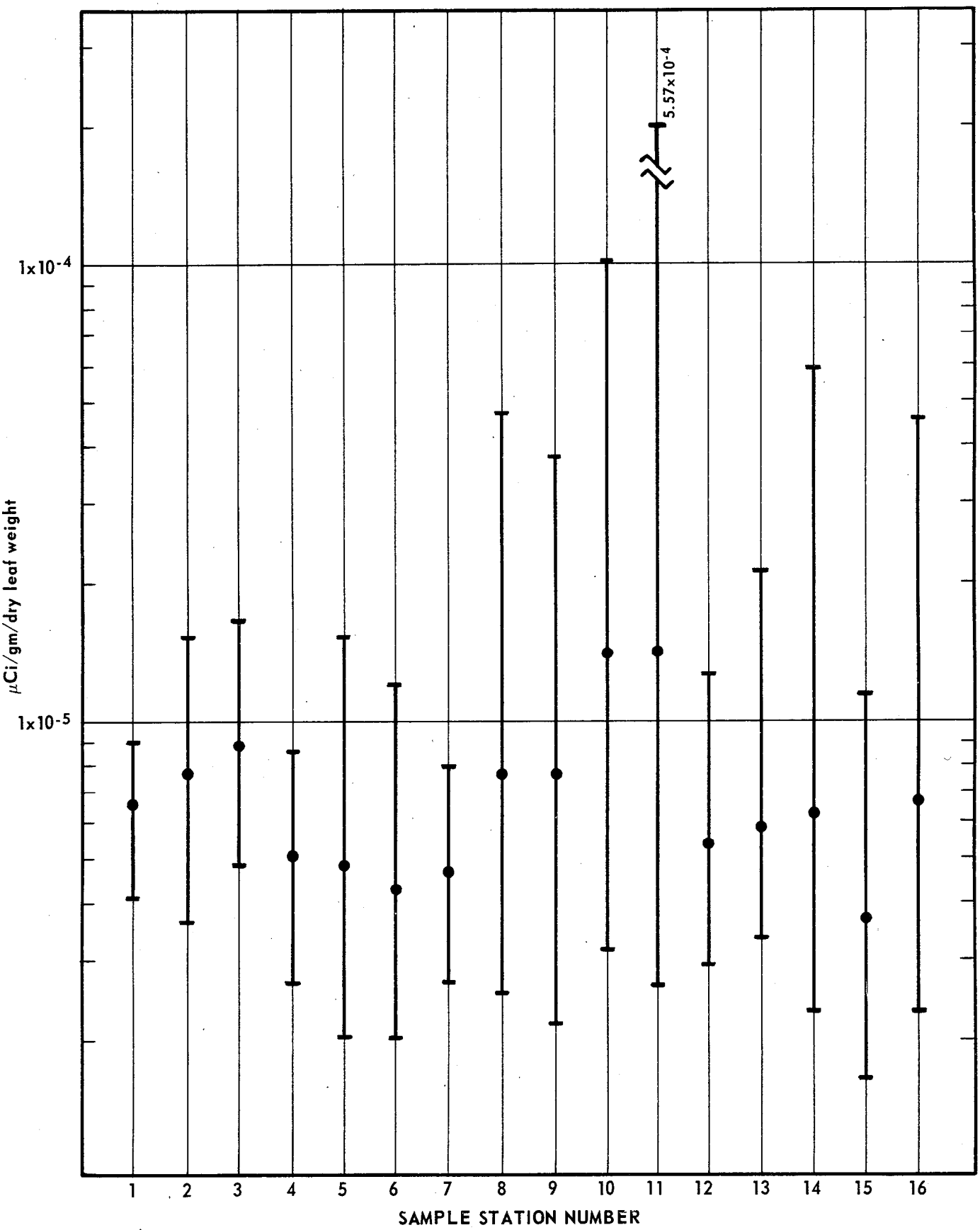

Figure 23 Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July, 1968 through June, 1969.

TABLE 23

Means and Ranges of Gross Gamma Radioactivity at NTS Vegetation Sampling Locations from July 1968 through June 1969

Values in Terms of μCi/cc

	SAMPLING LOCATION	MEAN	RANGE	
			MAXIMUM	MINIMUM
1.	Area 2 Orange Road Stake 63-64	6.60×10^{-6}	8.96×10^{-6}	4.06×10^{-6}
2.	Area 5 Old Fallout Station	7.71×10^{-6}	1.53×10^{-5}	3.64×10^{-6}
3.	Area 11 Stake 11W-4	8.86×10^{-6}	1.66×10^{-5}	4.92×10^{-6}
4.	Area 12 Campsite	5.12×10^{-6}	8.54×10^{-6}	2.65×10^{-6}
5.	Area 12 ESSA Station	4.83×10^{-6}	1.53×10^{-5}	2.01×10^{-6}
6.	Area 14 Saddle Mountain Barricade	4.38×10^{-6}	1.20×10^{-5}	2.07×10^{-6}
7.	Area 15 Northeast of USPHS Farm	4.67×10^{-6}	7.98×10^{-6}	2.69×10^{-6}
8.	Area 16 Campsite	7.74×10^{-6}	4.76×10^{-5}	2.57×10^{-6}
9.	Area 18 Stake 18B-16	7.77×10^{-6}	3.79×10^{-5}	2.19×10^{-6}
10.	Area 19 Stake 19F-13	1.42×10^{-5}	1.02×10^{-4}	3.15×10^{-6}
11.	Area 20 Stake 20L-12	1.41×10^{-5}	5.57×10^{-4}	2.65×10^{-6}
12.	Area 23 Pistol Range Road	5.40×10^{-6}	1.28×10^{-5}	2.92×10^{-6}
13.	Area 28 Pan Am Stake 152	5.84×10^{-6}	2.13×10^{-5}	3.33×10^{-6}
14.	Area 28 Project HENRE Site	6.30×10^{-6}	5.91×10^{-5}	2.35×10^{-6}
15.	Area 29 Shoshone Mountain Barricade	3.71×10^{-6}	1.15×10^{-5}	1.67×10^{-6}
16.	South of Groom Lake	6.68×10^{-6}	4.60×10^{-5}	2.32×10^{-6}

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