ENVIRONMENTAL MONITORING

SEMIANNUAL REPORT

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by

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ABSTRACT

Environmental monitoring at Atomics International is performed by the Health Physics Unit of the Health and Safety Section. Soil, vegetation, water, and air are routinely sampled up to a distance of 10 miles from Atomics International property. Average radioactivity concentrations measured during the first 6 months of 1965 generally decreased slightly from 1964 averages.

Figure 1. Atomics International World Headquarters

Figure 2. Atomics International Nuclear Development Field Laboratory

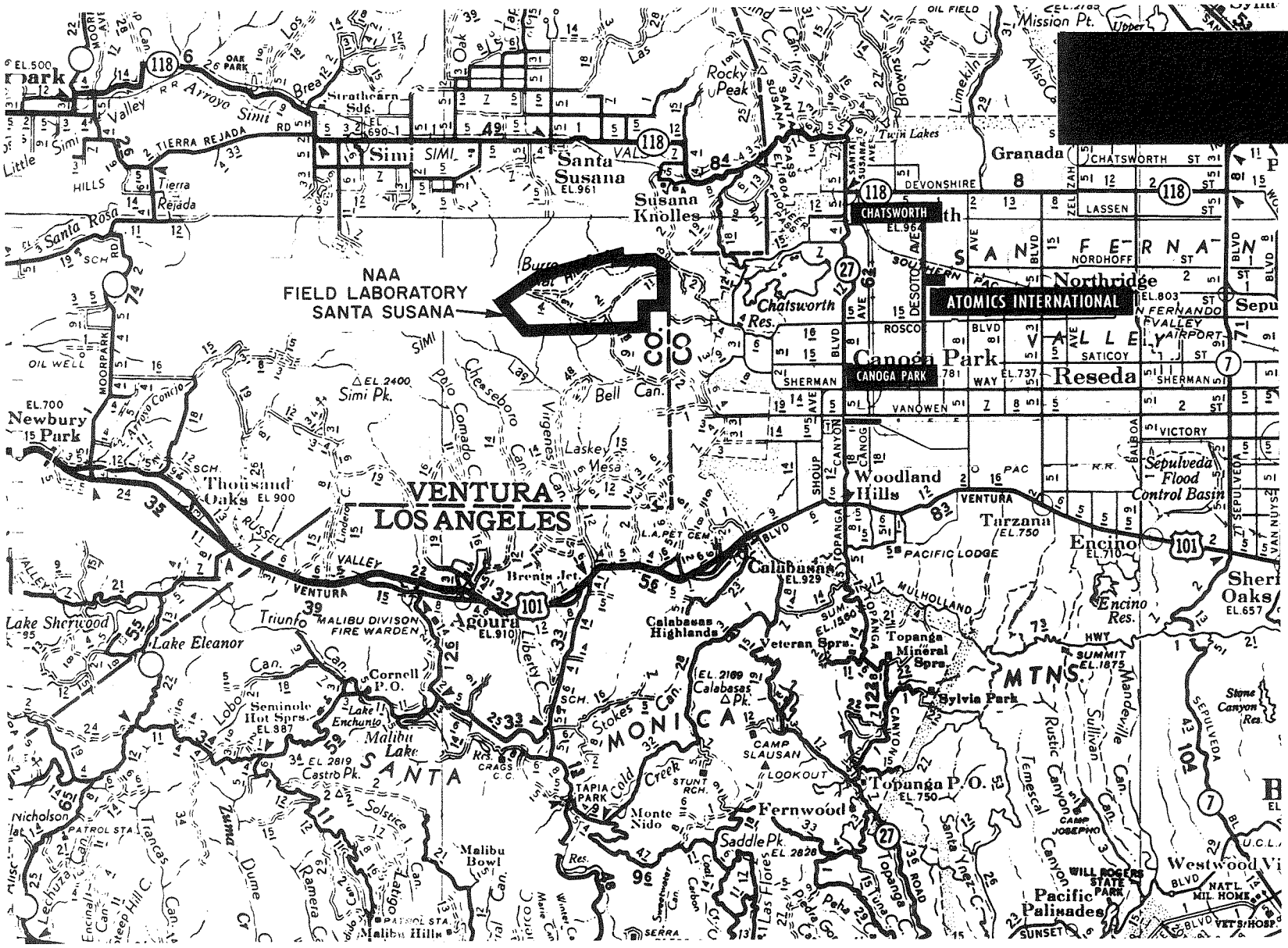


Figure 3. Map of Headquarters and Nuclear Development Field Laboratory Environs

I. SUMMARY

Atomics International, a Division of North American Aviation, Incorporated, has been engaged in atomic energy research and development since 1946. The company designs, develops, and constructs nuclear reactors for central station and compact power plants and for medical, industrial, and scientific applications.

The company occupies modern facilities in Canoga Park, California, approximately 23 miles northwest of downtown Los Angeles (Figure 1). The 290-acre Nuclear Development Field Laboratory (Figure 2), equipped with extensive testing facilities for the support of advanced nuclear studies, is in Ventura County in the Simi Hills approximately 29 miles northwest of downtown Los Angeles. The location of the above sites in relation to nearby communities is shown in Figure 3.

The basic concept of radiological hazard control at Atomics International encourages total containment of radioactive materials and, through rigid operational controls, minimizes effluent releases and external radiation levels. The environmental monitoring program provides a check on the effectiveness of radiological safety procedures and of engineering safeguards incorporated into facility design.

The environs of Atomics International Headquarters and Nuclear Development Field Laboratory (NDFL) are surveyed monthly to determine the concentration of radioactivity in typical surface soil, vegetation, and water samples. Also, continuous environmental air monitoring at the sites provides information concerning airborne particulate radioactivity. This report summarizes environmental monitoring results for the first six months of 1965.

Soil and vegetation are sampled monthly at 24 locations. Twelve sampling stations are located within the boundaries of Atomics International's sites and are referred to as "on-site" stations. The remaining 12 stations, located within a 10 mile radius of the sites, are referred to as "off-site" stations.

A. ENVIRONMENTAL RADIOACTIVITY DATA

The average radioactivity in soil and vegetation samples is presented in Table I and II.

TABLE I
SOIL RADIOACTIVITY DATA

Area	Activity	1964		First Half 1965	
		No. Samples	Average μμc/gram	No. Samples	Average μμc/gram
On Site	α	152	0.44 to 0.46	72	0.49
	β-γ	146	32	72	24
Off Site	α	299	0.40 to 0.44	70	0.50 to 0.51
	β-γ	293	26	70	17

TABLE II
VEGETATION RADIOACTIVITY DATA

Area	Activity	1964		First Half 1965	
		No. Samples	Average μμc/gram ash	No. Samples	Average μμc/gram ash
On Site	α	154	0.49 to 0.50	72	0.61 to 0.62
	β-γ	148	211	72	177
Off Site	α	293	0.50 to 0.51	70	0.78
	β-γ	299	181	70	156

Process water used at the NDFL is obtained from wells and stored in 50,000 gallon tanks. Potable water is delivered to the site by a vendor and is not analyzed. Well water is sampled monthly from the supply line at two locations. The average well water radioactivity is presented in Table III.

TABLE III
WELL WATER RADIOACTIVITY DATA

Location	Activity	1964		First Half 1965	
		No. Samples	Average μμc/liter	No. Samples	Average μμc/liter
NDFL	α	23	0.16 to 0.18	12	.22
	β-γ	23	5.1 to 5.3	12	6.5

Soil, vegetation, and water are sampled monthly at Chatsworth Reservoir, which is operated by the Los Angeles City Department of Water and Power. Soil and vegetation radioactivity data for the reservoir is averaged into data presented in Tables I and II. Normally, one water sample is obtained from the lake surface and a second sample is obtained from the reservoir supply inlet located on the north side of the lake. The average radioactivity for both surface and supply water samples is presented in Table IV.

TABLE IV
CHATSWORTH RESERVOIR WATER RADIOACTIVITY DATA

Sample Type	Activity	1964		First Half 1965	
		No. Samples	Average μμc/liter	No. Samples	Average μμc/liter
Lake Surface	α	18	0.71	6	0.53
	β-γ	18	10	6	9.8
Supply Inlet	α	12	0.49	6	0.44
	β-γ	12	8.8	6	12.2

Some of the data in Tables I, II, III, and IV are presented as a range within which lies the true average. The ranges occur when one or more of the samples contain an "undetectable" amount of radioactivity. In these instances, two values are determined. The lowest assumes that the "undetectable" samples contain no radioactivity; the highest assumes that these samples contain radioactivity equal to the appropriate minimum detection limit specified in Table VII.

Sampling of environmental air for particulate radioactivity is performed continuously at both the Headquarters and NDFL sites. Air is drawn through a filter which is counted, after a 72-hour decay period, for long-lived radioactivity. The average concentration of long-lived beta emitters is presented in Table V.

TABLE V
AIRBORNE RADIOACTIVITY DATA

Location	Activity	1964		First Half 1965	
		No. Samples	Average $\mu\mu c/M^3$	No. Samples	Average $\mu\mu c/M^3$
Head-quarters	α	355	2.7	182	2.0
NDFL	β-γ	Insufficient Data		69	1.9

II. ENVIRONMENTAL MONITORING PROGRAM

A. GENERAL DESCRIPTION

Soil and vegetation sample collection and analysis was initiated in 1952 in the Downey, California area where the Company was initially located. It was subsequently extended to the then proposed Sodium Reactor Experiment (SRE) site in May of 1954. In addition, sampling was conducted in the Burro Flats area southwest of SRE where numerous radiological installations are currently in operation. The Downey area survey was terminated when Atomics International relocated to Canoga Park. The primary purpose of the environmental monitoring program is to maintain surveillance of environmental radioactivity to ensure that Atomics International operations do not contribute measurably to environmental radioactivity levels.

Samples are collected monthly in four general survey areas including the west San Fernando Valley (Canoga Park and Reseda areas), Simi Valley, Russell Valley and vicinity, and the Chatsworth Reservoir. Twenty-one soil and vegetation sampling stations are currently established within these areas. The maximum sampling station distance from the Nuclear Development Field Laboratory is approximately 10 miles, and the total survey area comprises approximately 150 square miles. Sampling station locations are indicated on Figures 4, 5, 6, 7, and in Table VI.

During each semiannual reporting period, soil, vegetation, water, and environmental air samples are obtained and analyzed by the Health Physics Laboratory for gross alpha and/or beta-gamma radioactivity. Since environmental radioactivity levels are low and there is seldom any evidence of contribution by Atomics International, specific isotopic analyses are not routinely performed on environmental samples. Such analysis would be performed if warranted.

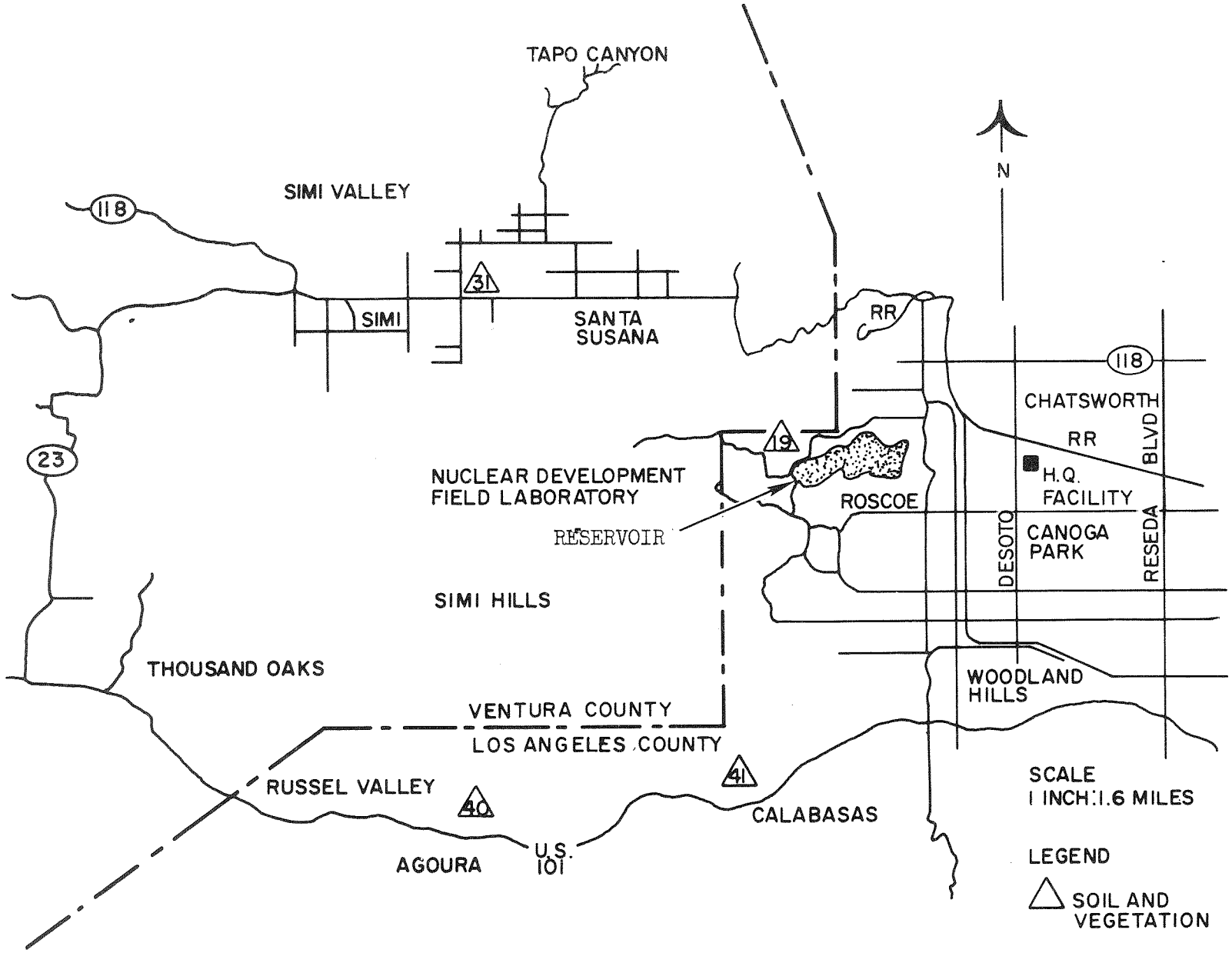


Figure 4. Map of Reseda, Canoga Park, Simi Valley, and Russell Valley Sampling Stations

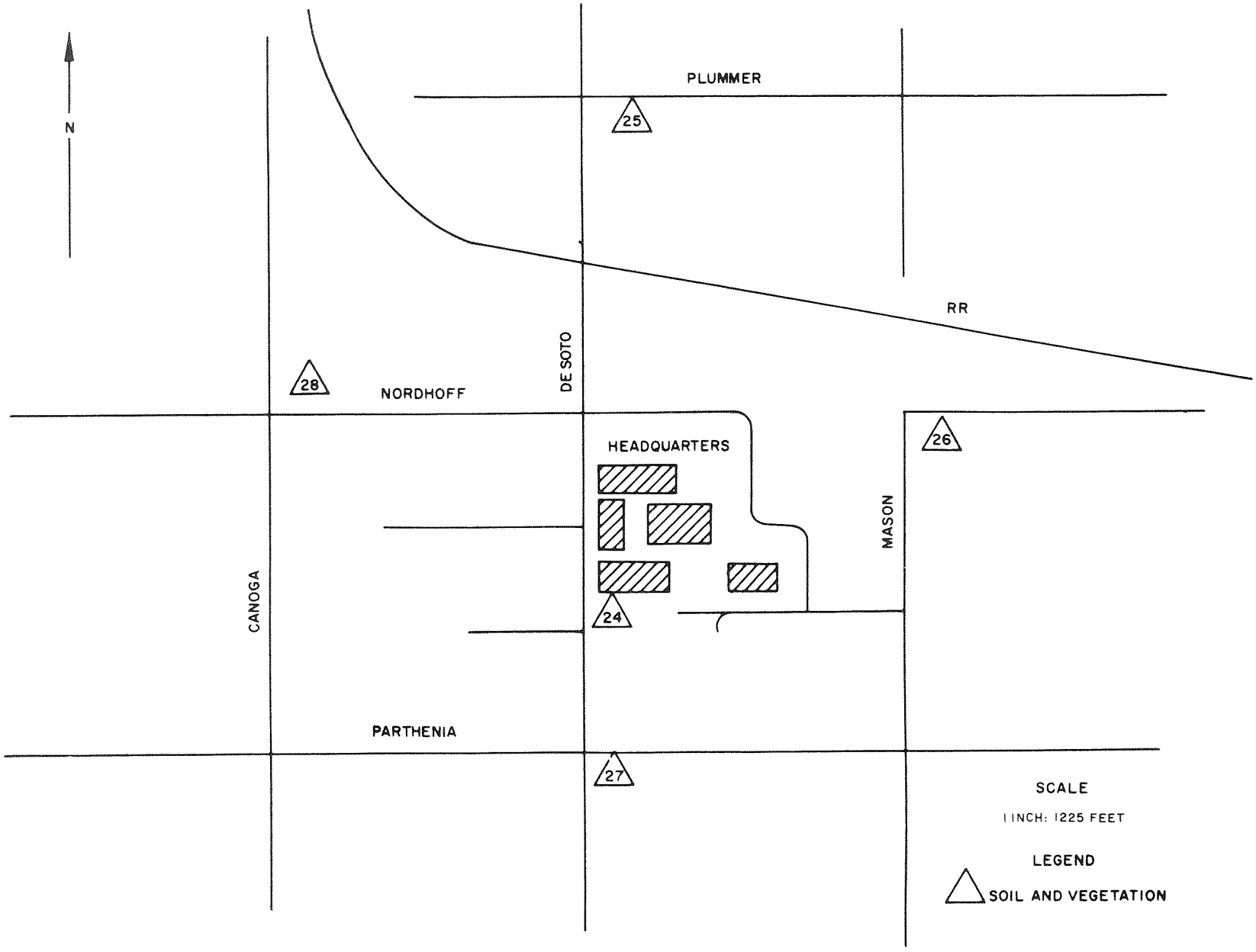


Figure 5. Map of Headquarters Vicinity Sampling Stations

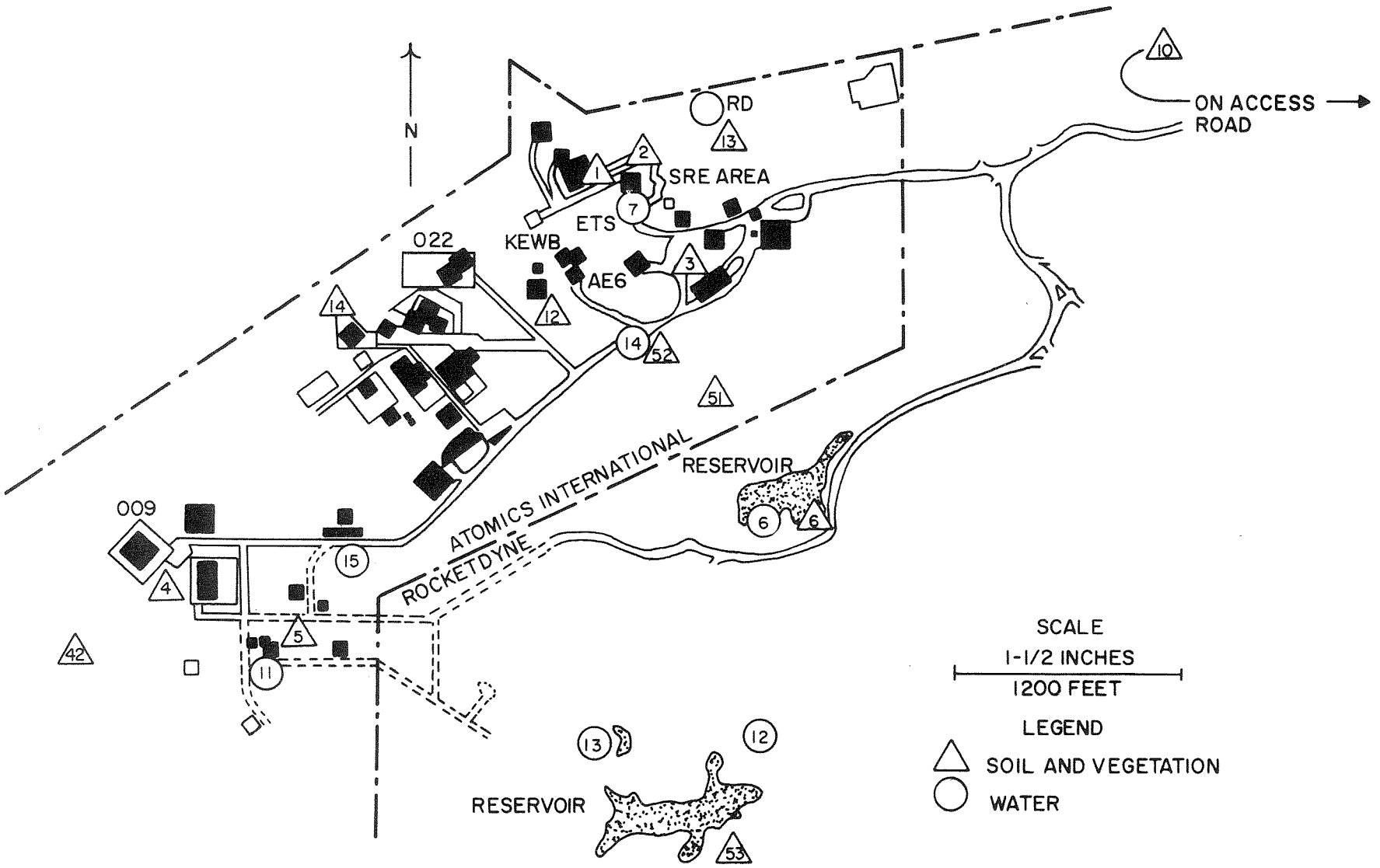


Figure 6. Map of NDFL Sampling Stations

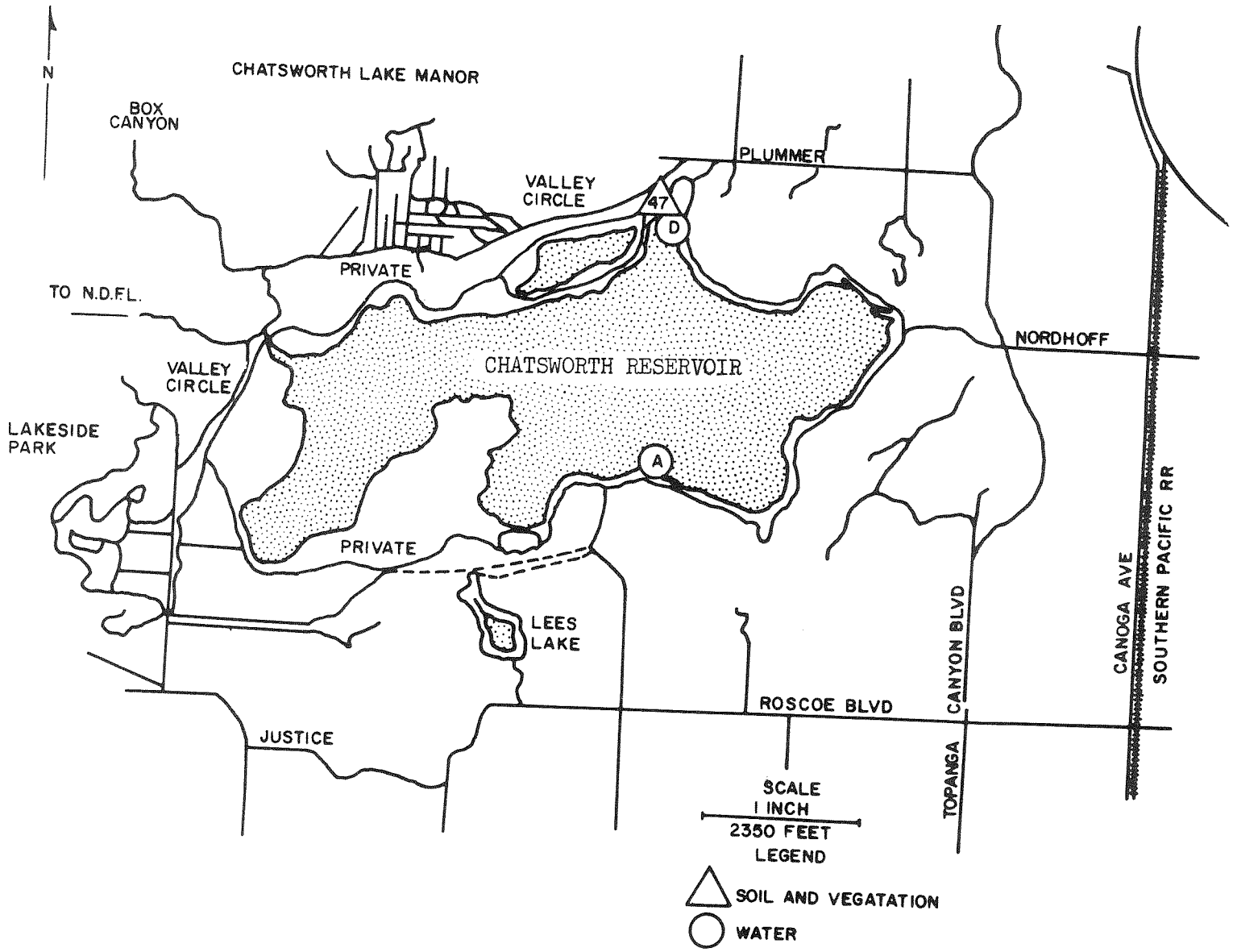


Figure 7. Map of Chatsworth Reservoir Sampling Stations

TABLE VI

SAMPLE STATION LOCATIONS

STATION	LOCATION
SV-1	SRE Reactor, NDFL
SV-2	SRE Perimeter Drainage Ditch, NDFL
SV-3	Bldg. 064 Parking Lot, NDFL
SV-4	Bldg. 020, NDFL
SV-5	Bldg. 0363, NDFL
SV-6	Rocketdyne, PFL
SV-10	Santa Susana Site Access Road
SV-12	KEWB Reactor, NDFL
SV-13	Sodium Cleaning Pad, NDFL
SV-14	Canyon Below Bldg. 022, NDFL
SV-19	Santa Susana Site Entrance
SV-24	Headquarters
SV-25	DeSoto Avenue and Plummer Street
SV-26	Nordhoff Street and Mason Avenue
SV-27	DeSoto Avenue and Parthenia Street
SV-28	Canoga Avenue and Nordhoff Street
SV-31	Simi Valley, Los Angeles Avenue and Sycamore Road
SV-40	Agoura
SV-41	Calabasas
SV-42	Non-Radioactive Materials Disposal Area, NDFL
SV-47	Chatsworth Reservoir - North Side
SV-51	Adjacent to Bldg. 029, NDFL
SV-52	Burro Flat Drainage Control Pond G. St. and 17th St., NDFL
SV-53	Top of Bell Canyon Below Rocketdyne Delta Pond Spillway, PFL
W R.D.	SRE Retention Dam, NDFL
W 6	Rocketdyne Retention Reservoir, PFL
W 7	Well Water From E.T.B., NDFL
W 11	Well Water From Bldg. 363, NDFL
W 12	Rocketdyne Retention Reservoir, PFL
W 13	Rocketdyne Retention Reservoir, PFL
W 14	Burro Flat Drainage Control Pond, G. Street and 17th Street, NDFL
W 15	Burro Flat Drainage Channel Adjacent to Bldg. 383. (Collects drainage from Bldg. 009, 020, and 100 areas)
W A	Chatsworth Reservoir, South Side
W D	Chatsworth Reservoir, Supply Inlet

B. SAMPLING AND PREPARATION METHODS

SOIL

Surface soil types available for sampling range from decomposed granite to clay and loam. Samples are taken from the top $\frac{1}{2}$-inch layer of ground surface. The soil samples are packaged and sealed in plastic containers and returned to the laboratory for analysis.

Sample preparation consists of transferring the soils to pyrex beakers and drying in a muffle furnace at 500°C for approximately 8 hours. After cooling, the soil is sieved to obtain a uniform particle size. One-gram aliquots of the sieved soil are weighed and transferred to stainless-steel planchets. The soil is wetted in the planchet with acetone, agitated to obtain uniform sample thickness, re-dried, and counted.

VEGETATION

Vegetation samples obtained in the field are of the same plant type wherever possible, generally sunflower or wild tobacco plant leaves. These types maintain a more active growth rate during the dry season than do most natural vegetation indigenous to the local area. Vegetation leaves are stripped from plants and placed in ice cream cartons for transfer to the laboratory for analysis. Plant root systems are not routinely sampled.

Vegetation samples are first washed with tap water to remove foreign matter and then thoroughly rinsed in distilled water. Washed vegetation is placed in porcelain crucibles and ashed in a muffle furnace at 500°C for approximately eight hours, producing a completely oxidized ash. Three hundred milligram aliquots of pulverized ash from each crucible are weighed and transferred to stainless steel planchets for counting.

WATER

Samples of well water are obtained monthly at the NDFL and water is also obtained from the Chatsworth Reservoir. The water is drawn into 1-liter polyethylene bottles and transferred to the laboratory.

Five hundred ml. of water is evaporated to dryness in crystallizing dishes at approximately 90°C. The residue salts are transferred to stainless steel planchets, wetted with distilled water to produce a uniform sample distribution, re-dried under infra-red lamps, and counted.

AIR

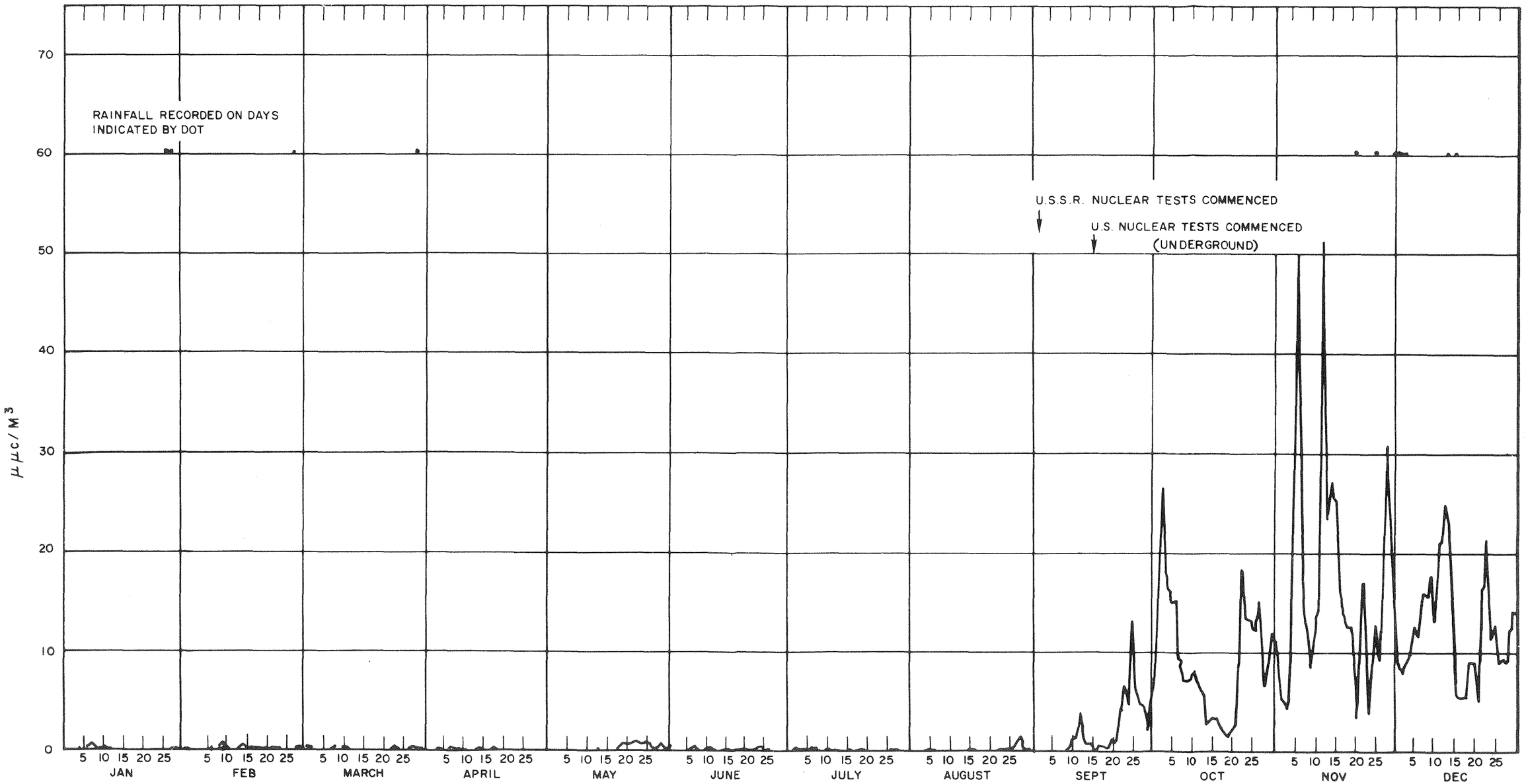
Environmental air sampling is conducted continuously at the Headquarters and NDFL sites with automatic air samplers operating on 24-hour sampling cycles. Airborne particulate radioactivity is collected on a filter tape which is automatically changed at the end of each sampling period. The filter is removed from the sampler and counted after the radioactivity is allowed to decay for at least 72 hours. The volume of a typical daily environmental air sample is approximately 21 cubic meters. The minimum detection limit, which varies somewhat between samplers due to differences in airflow, is on the order of 0.02 uuc/M^3.

When abnormally high airborne activities are observed, the radioactivity decay is plotted to determine the presence of short-lived isotopes other than naturally occurring radon—thoron and daughters. If fallout is suspected, the decay characteristics are observed for a period of from several days to several weeks. If the radioactivity decays as a function of $t^{-1.2}$, the data curve is extrapolated in order to determine the date of origin. This date is compared with the dates of publicized nuclear detonations to determine if the abnormal airborne radioactivity was caused by such detonations.

A graph of long-lived airborne radioactivity concentrations detected at the Headquarters facility during 1961, 1962, 1963, 1964 and the 1965 reporting period is presented in Figure 8. Airborne radioactivity concentrations present subsequent to the nuclear weapons tests series in 1958 had decreased to relatively insignificant levels until the resumption of atmospheric testing of nuclear weapons by the USSR in the fall of 1961. The graph shows a rapid increase from mid-September to November, 1961. Concentrations during 1962 decreased considerably by the end of June

and remained low until mid-October when transient peaks occurred and and continued through July, 1963. Since that period concentrations remained low until January of this year when the destruction of KIWI at the Nevada Test Site caused a spike to appear on the graph. However, it was but a few days later that the activity dropped to a low level again and has remained so to date with minor daily variations.

Also indicated on the graph are days on which rainfall was recorded at the Headquarters facility weather station. This illustrates the effect of precipitation on airborne radioactivity levels. In general, during periods of precipitation the airborne radioactivity decreased somewhat due to the combined effects of particulate removal from the air by rainfall and wind conditions associated with precipitation in the local area.



LONG LIVED AIRBORNE PARTICULATE RADIOACTIVITY

ATOMICS INTERNATIONAL HEADQUARTERS– 1961

Figure 8. Long-Lived Airborne Particulate Radioactivity Atomics International Headquarters – 1961

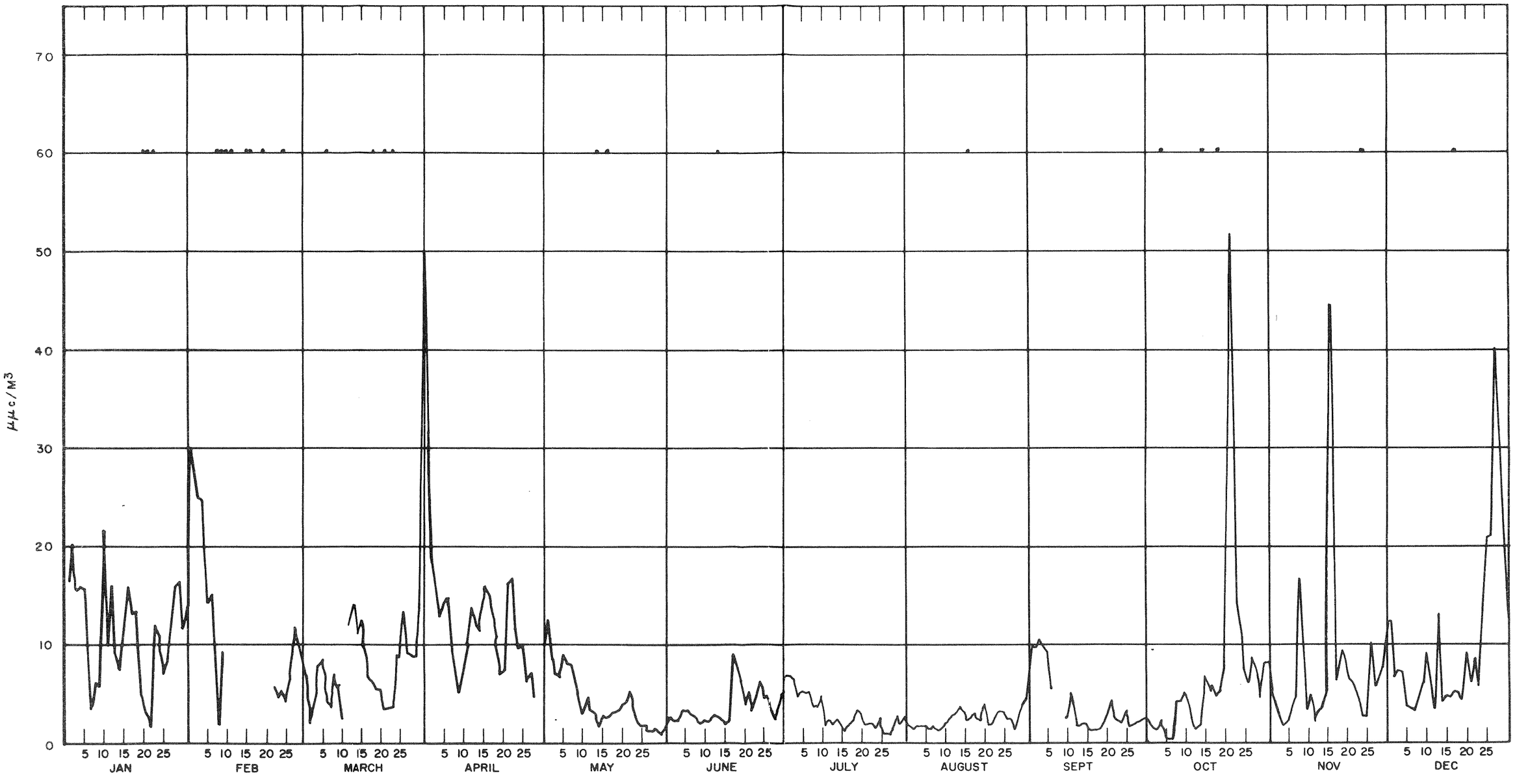
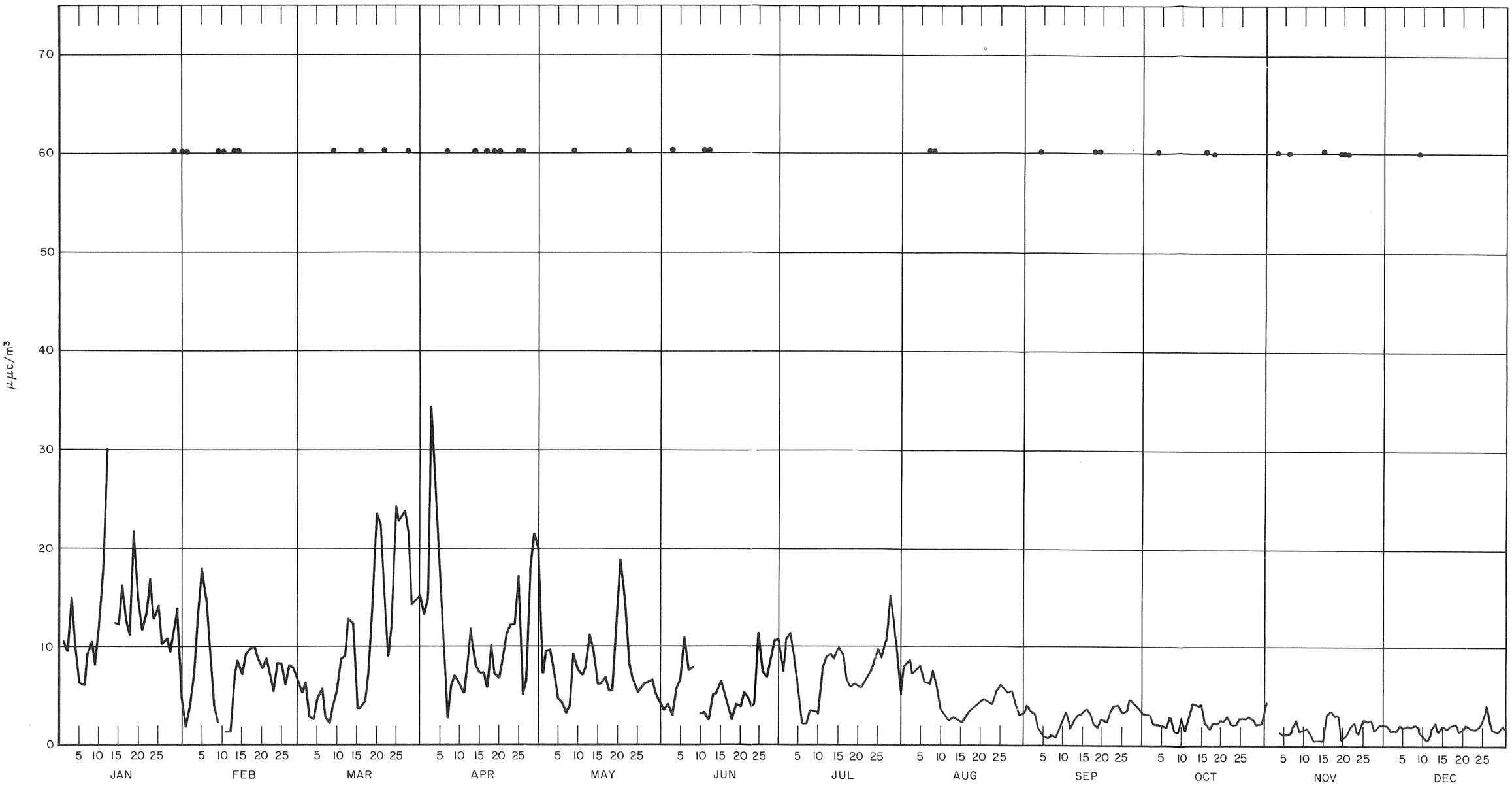


Figure 8. Long-Lived Airborne Particulate Radioactivity Atomics International Headquarters – 1962



LONG-LIVED AIRBORNE PARTICULATE RADIOACTIVITY

ATOMICS INTERNATIONAL HEADQUARTERS — 1963

Figure 8. Long-Lived Airborne Particulate Radioactivity Atomics International Headquarters — 1963

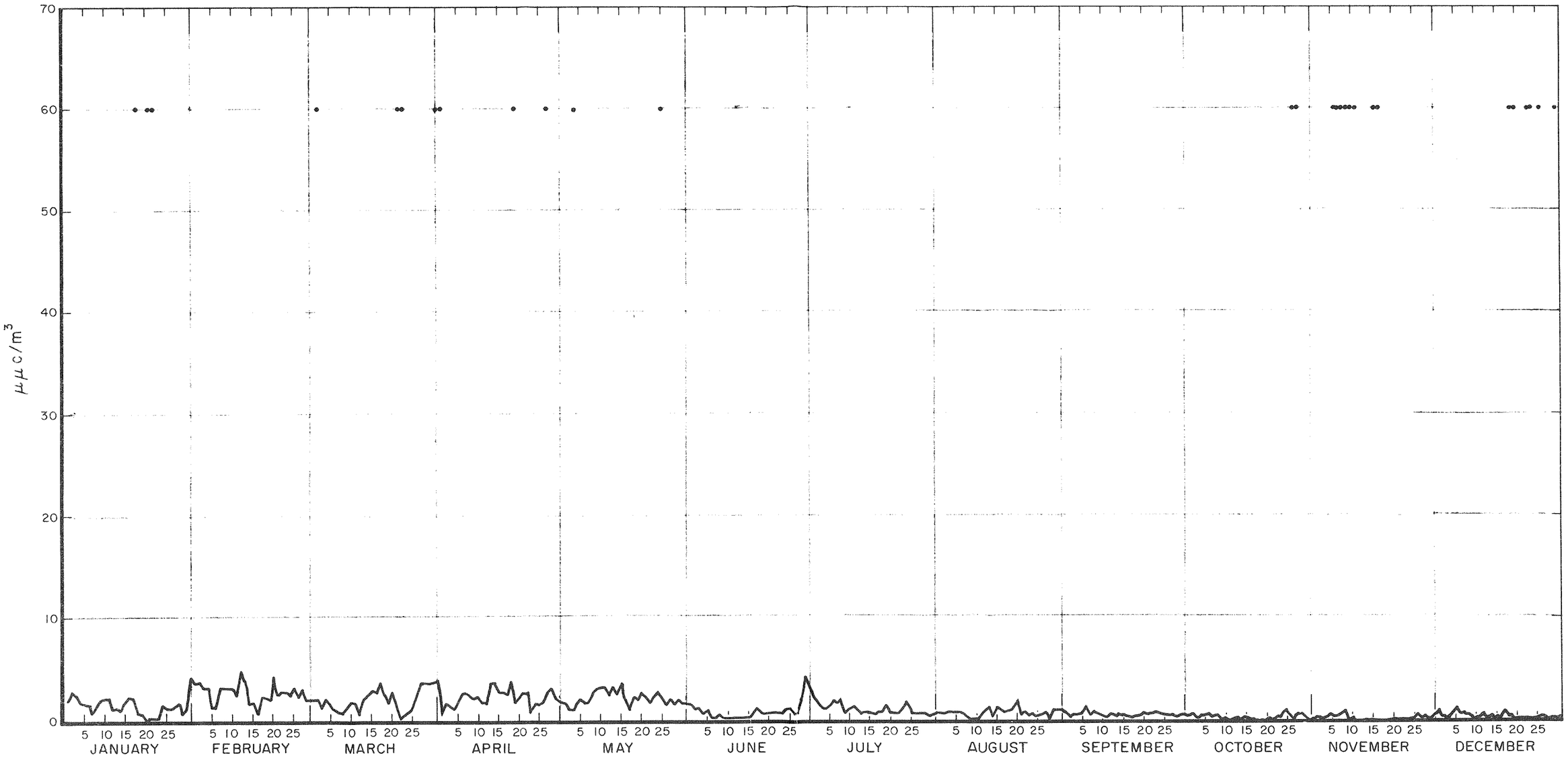
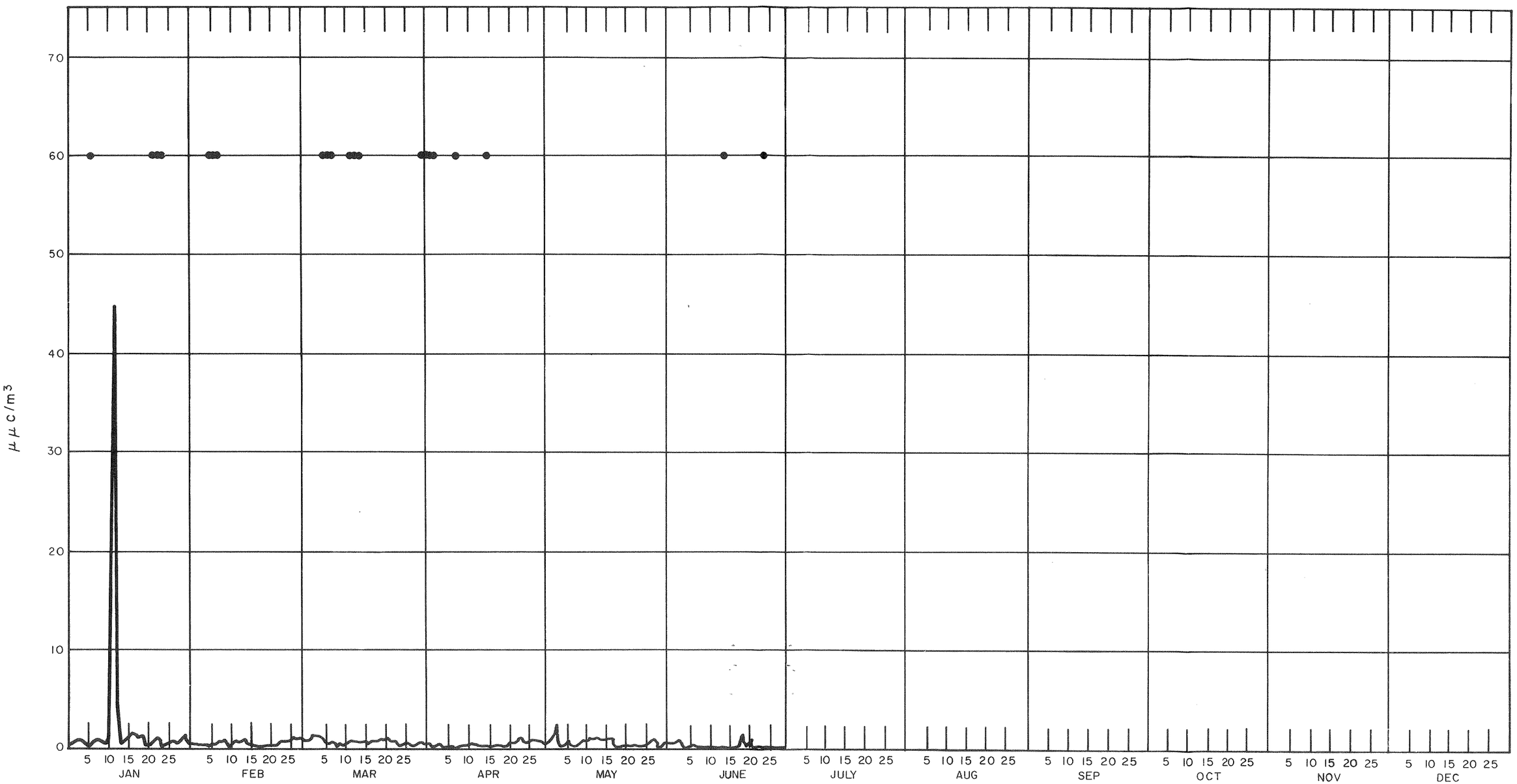


FIGURE 8 LONG-LIVED AIRBORNE PARTICULATE RADIOACTIVITY
ATOMICS INTERNATIONAL HEADQUARTERS - 1964

LONG-LIVED AIRBORNE PARTICULATE RADIOACTIVITY
ATOMICS INTERNATIONAL HEADQUARTERS - 1964



LONG-LIVED AIRBORNE PARTICULATE RADIOACTIVITY

ATOMICS INTERNATIONAL - 1965

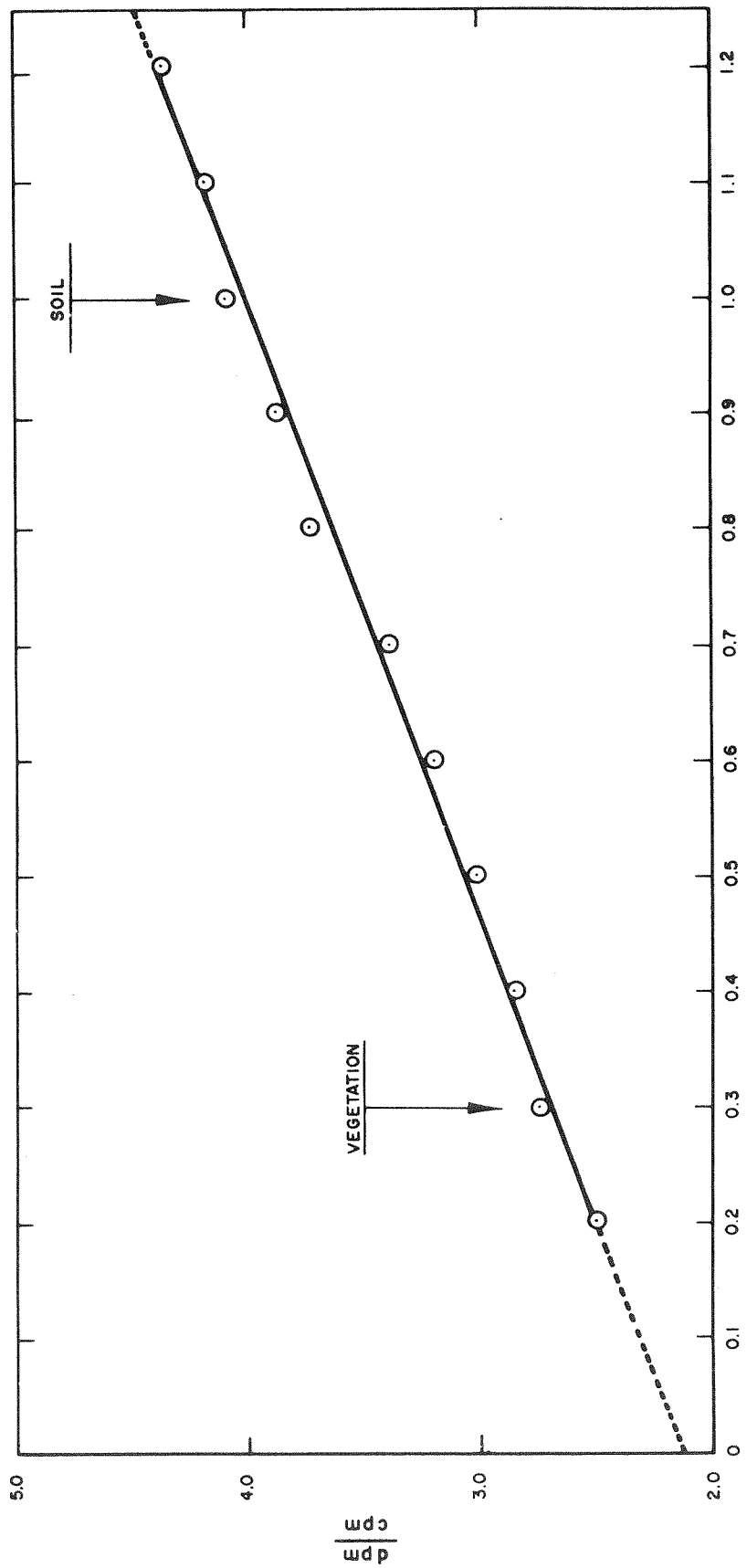


Figure 9. Self-Absorption Correction Graph