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ENVIRONMENTAL MONITORING REPORT

APRIL 1, 1961 to JUNE 30, 1961

ATOMICS INTERNATIONAL

CANOGA PARK, CALIFORNIA

Summary

The environs of Atomics International's World Headquarters and Nuclear Development Field Laboratory near Los Angeles, California are periodically surveyed to determine the radioactivity of typical surface soil, vegetation and water samples. In addition, continuous air samples taken at the above sites provide information concerning airborne particulate radioactivity. This report summarizes the environmental monitoring results for the second quarter of 1961.

Soil and vegetation are sampled monthly at forty-eight locations. Ten of these are within the boundaries of Atomics International sites; the remaining thirty-eight are within a ten mile radius of the sites.

The average soil and vegetation activities are shown in Tables I and II.

Table I - Soil

Location	Activity	1960		Second Quarter 1961	
		No. Samples	Average uuc/gram	No. Samples	Average uuc/gram
On Site	α	104	0.45	30	0.46 to 0.48
	$\beta-\gamma$	114	23.0	30	35.0
Off Site	α	324	0.36	112	0.33 to 0.38
	$\beta-\gamma$	360	19.0	112	24.0

Table II - Vegetation

Location	Activity	1960		Second Quarter 1961	
		No.Samples	Average uuc/gram(ash)	No.Samples	Average uuc/gram(ash)
On Site	α	89	0.41	30	0.32
	$\beta-\gamma$	113	136.0	30	152.0
Off Site	α	281	0.28	113	0.35
	$\beta-\gamma$	358	135.0	113	135.0

Two water wells at the N.D.F.L. are sampled monthly. The average water activity is shown in Table III.

Table III - Well Water

Location	Activity	1960		Second Quarter 1961	
		No. Samples	Average uuc/liter	No. Samples	Average uuc/liter
N.D.F.L.	α	12	0.14	6	0.082 to 0.099
	$\beta - \gamma$	19	2.0	6	2.5

The Chatsworth Reservoir, which is operated by the Los Angeles City Department of Water and Power, is sampled monthly for soil, vegetation, and water. The average water activity is shown in Table IV.

Table IV - Reservoir Water

Location	Activity	Second Quarter 1961	
		No.Samples	Average uuc/liter
Chatsworth Reservoir	α	15	0.39
	$\beta - \gamma$	15	7.7

Environmental air sampling is performed continuously at the Headquarters and N.D.F.L. sites. The average concentration of long lived airborne beta emitters is shown in Table V.

Table V - Air

Location	Activity	1960		Second Quarter 1961	
		No.Samples	Average uuc/M^3	No.Samples	Average uuc/M^3
Head-quarters	$\beta - \gamma$	182	0.24	47	0.25
N.D.F.L.	$\beta - \gamma$	44	0.44	*	--

* No data available during this period

Conclusions

Table I indicates a general increase in the second quarter 1961 soil beta-gamma radioactivity level. Table II indicates that the second quarter 1961 vegetation radioactivity is generally commensurate with the 1960 values for off site samples; however, an increase in on site vegetation beta-gamma radioactivity is evident.

Table III shows that N.D.F.L. well water beta-gamma radioactivity has increased slightly during the second quarter of 1961, while alpha radioactivity decreased.

Table IV shows Chatsworth Reservoir water radioactivity to be small compared with the applicable M.P.C. of 1×10^{-8} uc/cc. Sampling in the reservoir grounds was initiated during the first quarter of 1961; therefore, no comparative data was available for inclusion in the table.

Table V indicates that airborne long lived radioactivity has remained essentially stable during the second quarter of 1961.

Some of the data in Tables I and III is given as a range within which lies the true average. This occurs when one or more of the samples contains an undetectable amount of radioactivity. In these instances, two averages are determined. The lowest value assumes that the "undetectable" samples contain no radioactivity. The highest value assumes that these samples contain radioactivity equal to the appropriate minimum detection limit.

General Description of Program

Soil and vegetation sample collection and analysis, initiated in 1952 in the Downey, California area, was extended to the then proposed SRE site in May 1954, and to the Canoga Park area in December 1954. The Downey area survey was stopped when Atomics International relocated to Canoga Park. The primary purpose of the environmental monitoring program is to ensure that Atomics International's operations are not contributing measurably to environmental radioactivity and, at the same time, to provide a continuing check on the integrity of engineering safeguards for the containment of radioactivity. Due to the effect of geographical location on environmental radioactivity, comparison between widely spread sampling locations is difficult. Useful information can be obtained, however, by observing the trend of individual or closely spaced groups of locations.

For this reason, samples are collected monthly in six general survey areas including Canoga Park (2), Santa Susana Mountains, Simi Valley,

Russell Valley, and the Chatsworth Reservoir which is operated by the Los Angeles Department of Water and Power. Forty-eight sampling stations are currently established within the indicated areas. The maximum sampling station distance from the Nuclear Development Field Laboratory at Santa Susana is approximately ten miles. Sampling station locations are indicated on Figures 1, 2, 3, and 4, and in Table VII.

During each calendar quarter, approximately 144 soil, 144 vegetation, 36 water, and 90 environmental air samples are obtained and analyzed by the Health and Safety Laboratory for gross alpha and/or beta-gamma radioactivity.

Methods

SOIL

Surface soil types available for sampling range from decomposed granite to clay and sandy loam. Collected samples represent the top one half inch layer of ground surface. The soil is packed in small plastic containers which are then taken to the laboratory for analysis. Sample preparation consists of transferring the soil to pyrex beakers and drying in a muffle furnace at 500° centigrade for eight hours. After cooling, the soil is screened to obtain uniform particle sizes for counting. One gram aliquots of the screened soil are then weighed out and transferred to stainless steel planchets for counting.

The prepared samples are counted under a thin window, gas flow proportional counter calibrated with Ra D+E (with and without alpha absorber) and K^{40}. The K^{40} in the form of crystalline KCl is used to correct for self absorption in the soil and vegetation samples. This method affords the minimum detection limits shown in Table VI. While better sensitivity and accuracy are possible, the additional counting time required is not warranted for routine analysis.

Table VI - Minimum Detection Limits

Sample	Activity	Minimum Detection Limit
Soil	α	0.24 ± 0.094 uuc/gram*
	$\beta - \gamma$	6.9 ± 2.1 uuc/gram*
Vegeta-tion	α	0.086 ± 0.089uuc/gram**
	$\beta - \gamma$	13.8 ± 4.1 uuc/gram*
Water	α	0.052 ± 0.054 uuc/liter**
	$\beta - \gamma$	2.5 ± 1.3 uuc/liter**

* - 95 percent error
** - standard error

VEGETATION

Vegetation samples obtained in the field at each station are of the same plant type wherever possible, and are generally sun flower or wild tobacco plant leaves. These plant types maintain an active rate of growth during the dry season, a characteristic uncommon to most other plant types indigenous to the area. Vegetation leaves to be sampled are stripped from the plant and placed in ice cream cartons for transfer to the Health and Safety Laboratory.

Preparation of samples for analysis includes rinsing in distilled water to remove foreign matter and placing in porcelain crucibles for reduction to ash. The crucibles are placed in a muffle furnace at 500° centigrade for approximately eight hours. This ashing time is sufficient to produce a finely divided, completely oxidized ash of uniform density. Three hundred milligram aliquots of ash from each crucible are then weighed and transferred to stainless steel planchets for analysis. Analytical methods are the same as for soil samples. Sensitivity and accuracy are shown in Table VI.

WATER

Samples of well water are obtained at the Nuclear Development Field Laboratory. The water is drawn into one liter polyethylene bottles for transfer to the laboratory. The samples are measured into 500 milliliter volumetric flasks and then evaporated into crystallizing dishes at approximately 90° centigrade. The residue salts are transferred to stainless steel planchets, wetted to produce an even deposition

in the planchet, re-dried and counted in the proportional system. Sensitivity and accuracy are shown in Table VI.

AIR

Environmental air sampling is conducted continuously at the Headquarters and NDFL sites by automatic twenty-four hour step cycle air monitors. Airborne particulates are collected on a fixed filter tape which is moved, after each twenty-four hour period, to place the new sample beneath a thin window G.M. detector. At pre-set intervals, usually twenty minutes, the number of counts observed by the scaler during the interval is recorded.

It has been determined that for this type of instrument twice the counting rate after 18.6 hours decay minus the counting rate after 8 hours decay closely approximates the long-lived contribution. This counting rate can be converted easily to the average long-lived airborne activity (uuc/m^3) during the sampling period. The minimum detection limit, which varies somewhat between instruments, is on the order of 0.04 uuc/m^3.

When abnormally high activities are observed, the data is plotted to determine the presence of short-lived activities other than radon and thoron daughters. If fallout is suspected, samples are removed to the laboratory where their decay is observed for a period of several days to several weeks. If the activity decays as a function of $t^{-1.2}$, the data is extrapolated in order to find the date of origin. This date is then compared with the dates of publicized nuclear detonations in order to demonstrate that the abnormal airborne activity was not caused by Atomics International operations.