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STATE PARTNERSHIP IN ENVIRONMENTAL HEALTH  
AND SAFETY PHASE OF PLOWSHARE PROJECTS

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ABSTRACT

*When experiments on projects involving Plowshare devices are conceived, the state chosen for the project should be invited to participate in planning the health and safety aspects and be prepared to actively participate in the D-Day phase as well as the post-detonation activity.*

*In California nuclear science technology and competence have preceded the social acceptance and use of nuclear devices for large scale Plowshare projects. However, the environmental surveillance program of the Bureau of Radiological Health in the State Department of Public Health has established an operative program which will be ready and able to function as an active participant or in a support role in environmental health phases of nuclear projects scheduled in the State.*

*A description of our present program will be included in this paper. This will enable the attendees and readers to realize capabilities which will be activated for participation and/or support roles during Plowshare activities in the State or in a neighboring state if the need arises.*

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The people who planned this seminar prepared a logical outline for the entire program and then requested speakers to cover the respective subjects. The theme of this portion of the seminar was the "role of the state," with the previous speaker covering the underground engineering and this paper covering the role of the state in cratering. I was not familiar with the cratering experiments and consequently suggested an alternate title, which is a one sentence precis of this paper, namely, that the state in which the cratering experiment is being conducted should be an integral partner

in the project, with the neighboring states being alerted, informed, and ready to exercise their role in case the scheduled project did not proceed as planned. In each state, the environmental health phase is naturally handled by its health department.

#### Background Information or How it was in California

On May 28, 1957, the AEC detonated the "Boltzman" nuclear device at 4:55 a.m., at the Nevada Test Site. About 6:00 p.m. the same day a portion of the cloud from this shot swung northwest across California through the area north of Lake Tahoe. It encountered localized thunderstorms and the resulting rainout gave measurable levels of radiation in scattered localities. Both the California Disaster Office and AEC monitoring teams checked these areas on May 28 and 29 and reported that the radiation levels found were not dangerous. However, in view of the State Health Department's responsibility for the health of the public in general and the safety of domestic water supplies in particular, a field survey to get firsthand detailed information was deemed desirable.

Since information regarding the exact path of the radioactive air mass was not available to the Department, the northeast quarter of the State lying north of U. S. Highway 40 and east of U. S. Highway 99 was selected for study. The plan followed was that most of the major highways were to be traversed with gamma survey instruments. Water, mud, and snow samples were to be taken where background radiation indicated fallout had occurred or where possible concentration of radioactivity could have occurred (i.e., water reservoirs, stock ponds, other water catchment areas).

Due to the magnitude of the task, assistance in monitoring and sample collection was requested from Butte, Plumas, and Shasta County Health Departments. Field monitoring instruments were furnished by the California Disaster Office. Radioanalyses of the samples were done by the Sanitation Laboratory using the California Disaster Office Radiological Laboratory truck which was assigned to the Division of Laboratories. The truck was moved to Quincy for this study. Seventy samples were collected for analysis and approximately 1,400 miles of highway were monitored with gamma survey meters.

Of the 70 samples only 3 (the snow samples at Donner Summit, Gold Lake and Lassen Summit) had significant radioactive content. None of these snow banks drained directly to domestic water reservoirs. Water from the reservoirs supplying the Quincy water system showed barely measurable amounts of radioactivity. These findings were not considered to be of public health significance due to the small size of the reservoirs (with a high flow-through rate) and the rapid decay characteristics of fallout radioactivity.

A report of these findings was included in the July report to the Governor's office. The comment that radioactivity in the three snow

samples was above the limit considered "safe for continuous ingestion" received wide publicity and resulted in several follow-up inquiries from residents and recreational users of the Sierra Nevada area.

Because of the intense public interest, and in order to verify the earlier conclusions, a second survey was made August 7 through 9. Lassen Volcanic National Park, Lake Almanor, Quincy, Gold Lake, Beckworth, Donner Summit, and the highways between these areas were checked. Thirty samples were collected and approximately 600 miles of highway were monitored with gamma survey meters. No background radiation was found above normal nor were any of the water samples found to contain measurable amounts of radioactivity. The only snow sample obtainable was from a small residual snow bank in Lassen Park. The radioactivity found was about the same as that found on the first sampling.

These studies were executed under a 1955 law on radioactive wastes which states, "No person shall bury, throw away, or in any manner dispose of radioactive wastes in such a manner as to endanger the lives or health of human beings."

In the first calendar quarter of the following year the U.S.S.R. was conducting atmospheric tests of nuclear devices. On March 29, 1958, the California State Department of Agriculture collected some samples of leafy vegetables which were submitted to Dr. Hardin Jones, of the Donner Laboratory at the University of California, Berkeley, for radioassay. The radioactive content of twelve samples of eleven kinds of leafy vegetables collected from nine different localities in the North Coastal, San Joaquin and Sacramento Valleys of California ranged from 1970 to 41,800 disintegrations per minute for the unwashed vegetables. The radioactivity of the washed vegetables was much lower than that found on the unwashed samples. The radioactivity was characterized as mixed fission products.

In January 1959, a paper entitled, "An Analysis of the Public Health Implications of the Proposed Tracer Study of Ground Water Replenishment Operations in Los Angeles County" was submitted by the University of California, Berkeley, to the California State Department of Public Health. The introduction in this paper states, "The University of California, Berkeley, has presented a research proposal to the Los Angeles County Flood Control District concerned with the application of tritium to ground water tracing. The immediate objective of the study is to determine the water users benefiting from reclamation operations in the Upper Canyon Basin of the San Gabriel River. The long-range interest of the District is to confirm the extent to which the water reclamation program in the various basins of the San Gabriel River is effective in replenishing the ground water bodies of the Main Basin and within and downstream of the Montebello Forebay. The primary interest of the Sanitary Engineering Research Laboratory of the University is to establish the utility of tritium as a means of tracing underground waste travel. A further interest is the general phenomenon of hydraulic dispersion in flow through porous media."

The second paragraph of the Conclusions states, "The hazard of the investigation to the consumer in Los Angeles County has been demonstrated to be insignificant. The benefits of the investigation to the consumer are highly significant. A more economical development of the regional water resources will result in direct material benefits to all inhabitants. A better understanding of pollution movement in underground formations will be achieved with attendant improvements in water quality. The study is an opportunity for nuclear science to aid in solving a common problem in Southern California, that of a rapidly increasing demand for water and clearly limited water sources."

On January 23, 1959, the State Board of Public Health adopted a "Policy of California State Department of Public Health on Radioactive Tracer Studies," which contained six criteria. The proposed tritium tracer study met the six criteria but never materialized. It was rejected by adverse local public opinion.

#### California Environmental Surveillance Program - 1969

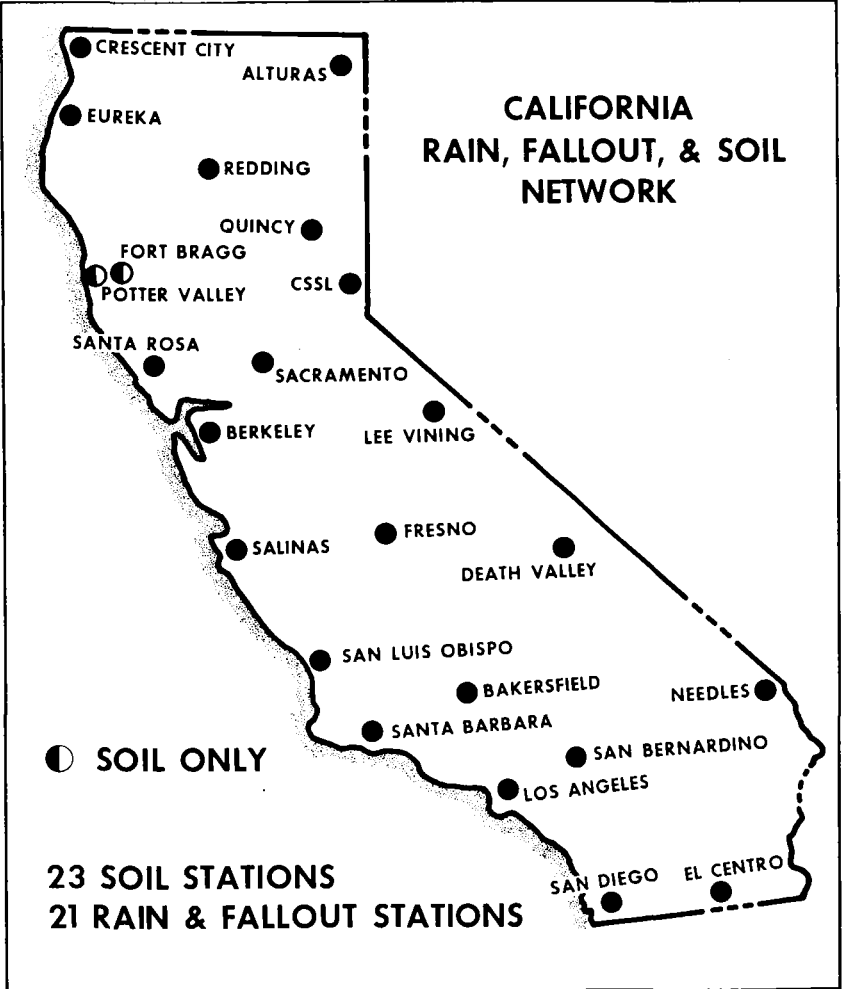
The essential features of this program are a radiochemical laboratory and a representative sampling network. The environmental media sampled are (1) Air, (2) Rain, Fallout, and Soil, (3) Domestic Water, (4) Sewage, (5) Milk, and (6) Diet. The samples are collected by 105 volunteer members of our local health departments. The location of the sampling stations and the number of stations for each of the six media sampled are shown in the following Figures 1 through 6. Table 1 is a summary of the environmental surveillance sampling and analyses.

These facilities and networks were tested and described in 1967 in an article by Amasa Cornish and George Uyesugi entitled, "Detection of Elevated Fallout Levels in California, January 1967." The abstract of the article which was published in Radiological Health Data and Reports, Vol. 9, Number 9, September 1968, is quoted:

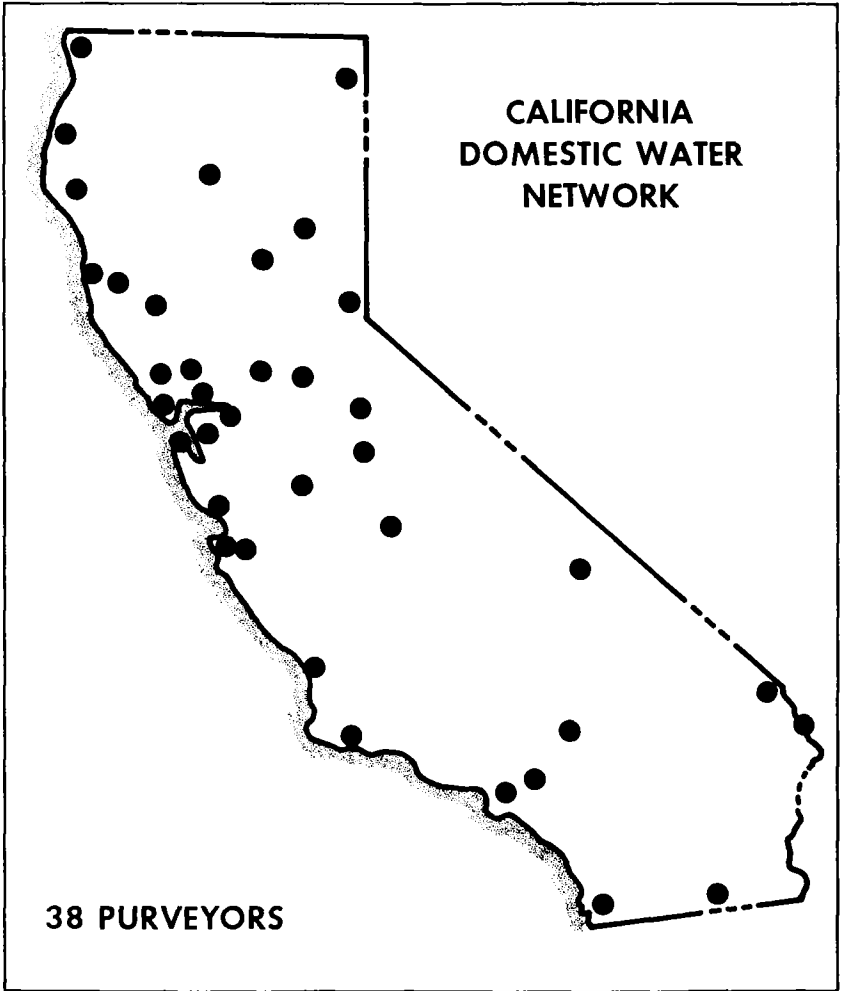
"California received a heavy fallout of radioactive debris beginning 4.5 days after a foreign nuclear device was detonated in the atmosphere on December 27, 1966. Highest air particulate levels occurred in Berkeley and Sacramento. Values obtained after allowing 3 days decay were 98 pCi/m<sup>3</sup> of air for both. Other air sampling stations had lesser amounts of fallout and Fresno received essentially no fallout. All milksheds in California were contaminated to some extent with radioactive iodine. Del Norte and Humboldt milk with 397 and 280 pCi/liter, respectively, contained the highest concentrations of iodine-131. These values were estimated to result in thyroid doses to children of 33 and 23 mrad, respectively. The apparent half-life for iodine-131 in the environment was calculated to



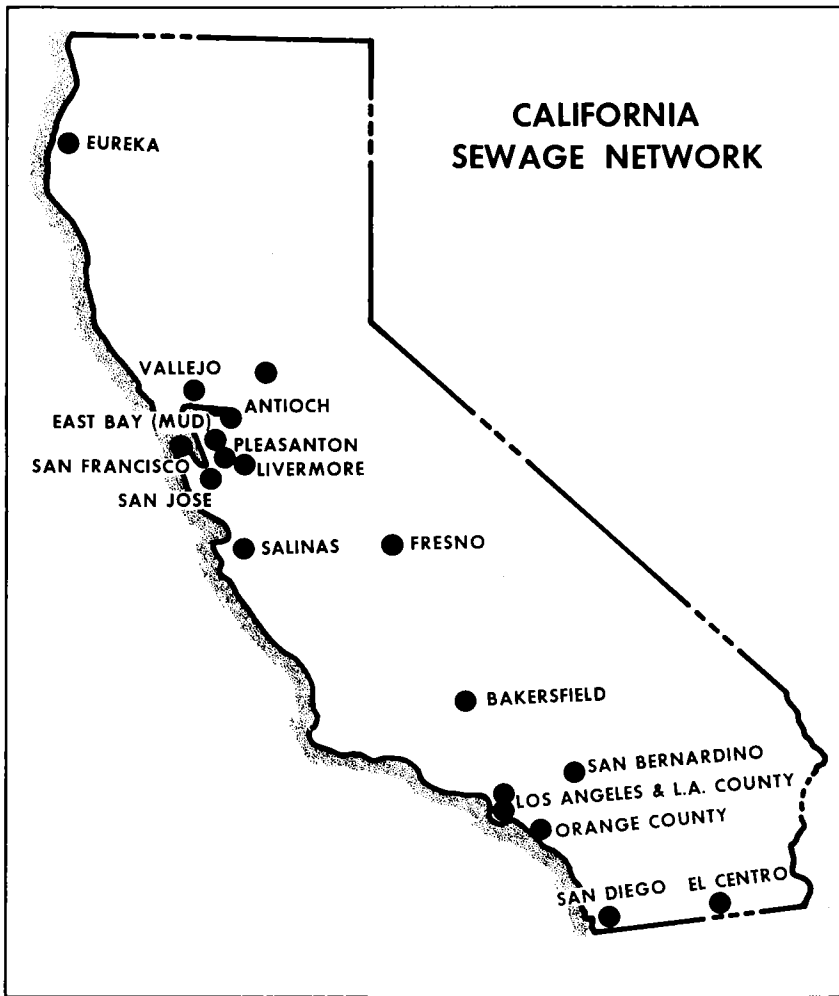
**FIGURE 1**



**FIGURE 2**



**FIGURE 3**



**FIGURE 4**





**FIGURE 5**



**FIGURE 6**

TABLE I  
SUMMARY  
ENVIRONMENTAL SURVEILLANCE  
SAMPLING AND ANALYSES

Media Sampled	Sampling Stations	Sampling Frequency	Yearly Totals	
			Samples	Analyses
Air	14	Daily <sup>3</sup>	4,224	6,276
Fallout	21	Quarterly <sup>2</sup>	92	368
Water	50	Monthly	600	904
Sewage	20	Monthly	480	960
Milk	10	Monthly <sup>4</sup>	120	360
Diet	20	Quarterly <sup>5</sup>	80	520
Snow	12	5/Year	60	60
Specials	12	1/Year	240	480
			5,896	9,928

1. Gamma scan for 8 isotopes reported as one (1) analysis above.
2. 20 stations sampled quarterly; the Berkeley station is sampled monthly.
3. 10 stations sampled on work days only; 4 stations sampled every day.
4. Does not take into account increased sampling for continuing atmospheric nuclear tests.
5. From 1960-1964 the individual foods composing a diet were sampled. In 1964 the diet sampling replaced the food sampling.

be 3.2 days."

In addition to our radiological surveillance network, California has two other activities in its Bureau of Radiological Health, namely, (1) The X-Radiation Control Program which consists of Registration and Inspection of X-Ray Generators, the facilities in which they are operated, and educational assistance to the operators of this equipment; and (2) The Radioactive Material Control Program which includes Radium. This consists of a Licensing and Inspection group as required by AEC/States Agreement. However, California and several other states exercise control of Radium which has never been regulated by a Federal agency.

The State also has considerable manpower and equipment in the State Disaster Office, including (1) radiation measuring and calibration devices and facilities and (2) a statewide communication network tied in with the State Highway Patrol and the Police and Sheriff's Offices. Last year the State Department of Public Health and the State Disaster Office signed a memorandum of understanding for cooperative participation in handling emergency incidents involving radioactive materials. This cooperative activity includes the authority to impound or quarantine the radioactive material involved for the protection of the public. We have had two training courses recently on management of incidents involving radioactive material. These were sponsored by the State Health Department and the U. S. Public Health Service. In reviewing this information, it becomes obvious that the State has a rather complete radiation protection program.

#### Role of State Health Department in Plowshare Projects

With such equipment, facilities and competence available in a number of states--the Utah State program having been described in detail to you yesterday--the states are ready to assume the responsibility, in the Plowshare Program, granted them under the Federal Constitution, which is the protection of public health.

This role is beautifully described by Herman E. Hilleboe, M.D., DeLamar Professor of Public Health Practice, Columbia University, School of Public Health and Administrative Medicine, State of New York, in Chapter III, pages 23-31, of the Radiological Health Program Guide prepared by the Southern Interstate Nuclear Board for (and published by) the U. S. Department of Health, Education, and Welfare, Public Health Service, April 8, 1966. Page 29 of this reference shows the respective roles of the Public Health Service and State Health Agencies in Radiological Health, including the degrees of responsibility of each agency.

The legality of the responsibility of the state in protecting the public from radiation exposures was stated well by Mitchell Wendell, Ph.D., L.L.B., Counsel for the Council of State Governments, Washington, D. C., in Chapter II, Legal Aspects of Federal-State Relations in Radiation Protection, Radiological Health Program Guide referenced above.

The following is a quotation from pages 19 and 20 of this reference.

"Federal-State relations in radiation protection from nuclear sources is a subject of peculiar import because of the unusual circumstances that attended the first harnessing of nuclear power, and because the revolutionary nature of this still new force inspires awe. Logically and practically it is clear that radiation protection from whatever source is merely a specialized phase of public health and safety regulation. Yet, the activities and responsibilities of the Atomic Energy Commission and of the military establishment undeniably give the Federal Government a special interest. So far the major direction of Federal and State action has been to clarify responsibilities and relationships as much as possible, and to fit the health and safety aspects of radiation protection into existing patterns of State and local administration and lawmaking as rapidly as practicable. Any other course would raise confusing questions of law and practical administration.

"Conclusion. State activities in radiation protection, and more broadly in the entire field of radiological health as well, rest on several legal foundation stones. That the police power includes the power to protect the public health is both elementary and obvious; the conventional definition of the constitutional concept of police power is the power to regulate and protect 'health, safety, morals, and welfare.' Since this authority is left with the States by the Federal Constitution, its exercise is a legal attribute of all State governments. As already pointed out, some States have so far considered the police power to be sufficient basis for the assertion of jurisdiction to engage in any and all phases of radiation protection. An increasing number of States, either because they consider agreements with the AEC essential to their programs or because they look upon them as merely advantageous, are becoming agreement States. In these jurisdictions the police power is supplemented by the statutory assurance from Congress that no conflicting action of the Federal Legislature is likely to oust the legal authority of the State.

"From the administrative point of view, the basis for State and local action also is clear. No matter how ingenious theorists become in building a separate category for nuclear activities, it remains true that State and local governments--not the Federal Government--inspect structures, issue and enforce sanitary codes, provide service and regulation in the field of industrial hygiene, fight fires, and patrol highways. Whenever the results of nuclear activity impinge on any of these areas, as they must constantly do, the State and local governments are the only ones in a position

to act. They may do so with more or less skill, depending on their training and resources. They may do so more or less effectively, depending at least in part on the degree of specific authority to deal with nuclear-related matters conferred by State and local law. But they will act, or the public will be unnecessarily exposed to danger."

Earlier this month, 48 states were represented at the Conference of State Directors of Radiation and Safety Control Program. I do not have the permission to speak for this group. However, you have heard the remarks of the preceding speaker who is President of this organization, and you can see that he is inclined to support the State role as presented above. I hope the Conference of State and Territorial Officers will accept the report of this Conference of State Directors of Radiation and Safety, one part of which appears under the heading of Radiation Control Nationally and a sub-heading, "Ionizing Radiation-- State Control," and reads, "The States are responsible for uncontrolled radiation sources in the environment as an unexpected result of a Plowshare project."

The respective states should have no fear of accepting the responsibility granted them under the Federal Constitution whether or not they have an AEC/State Agreement or whether they have a complete radiological health program. The State/Public Health Service relationship and support for this program is the same as it is for any other state program in protecting the health of the public. If the problem is too large to handle with the state resources, assistance will be furnished on request from the Public Health Service.

In regard to Plowshare in particular, each respective state would like to be a partner in this enterprise, with industry and the AEC being the other partners. We do not consider ourselves equal partners for all of the negotiations. However, after the detonation and particularly if it is in our State, the State may have a major role. In being a partner, we expect to be called into the planning meetings as early as possible, and I might say the earlier we are involved, the sooner will the project become a reality. The states should notify the PHS through its regional office and have this organization present at the first orientation meeting and most of the following meetings. After the first meeting, the State and PHS will prepare a draft of the cooperative plan to follow. This plan will be reviewed, modified, and updated frequently by both parties.

The success or failure of a proposed Plowshare project in any State will be determined by the public relations role executed by the State. This role will be more effectively executed if the State is informed early and can adequately and appropriately inform the local health authorities who will get the right story to the local press and residents as soon as possible. Yesterday Herb Parker stated he wasn't sure which radiation protection group the general public will trust. The local health group has been the protector for health and

safety for so long the odds are in favor of their gaining the confidence of the local people and thereby effecting a good public relations program which will lend public support to the project, and as Abraham Lincoln said, "With public support you can do anything and without it you can do very little." This quotation is most applicable to Plowshare, and I repeat: If the AEC will include the States as a partner in the early talking and planning stage of Plowshare projects the chances of their becoming a reality are better than the odds in most of the activities in this city and the accomplishments will be realized much sooner.

I thank you for your devoted attention through the last phase of this seminar.

QUESTION FOR SIMON KINSMAN

1. From James Payne:

What analysis do you run on the sewage effluents and why?

ANSWER:

The California Radiological Monitoring Program includes the sampling of 20 sewage treatment plants throughout the state. Analyses of sewage samples, effluent and sludge, for alpha and beta activity provide a means of monitoring to insure that industrial radioactive wastes discharged into sewerage systems do not exceed prescribed limits. The surveillance of sewage assumes greater importance as isotope licensees become more numerous and as the quantity per user increases.

Water used by a city enters the city as domestic drinking water and leaves the city as sewage. If the city adds no radioactivity to the sewage, the radiological content of the domestic water and sewage should be the same. Therefore, interest centers around the difference in yearly averages between the radioactivity in the sewage effluent and the domestic water influent, and the ratio of sewage radioactivity to domestic water radioactivity. For example, two cities might have the following:

City	Water	Sewage	Difference	Ratio
A	10 pCi/l	15 pCi/l	5 pCi/l	1.5
B	10 pCi/l	80 pCi/l	70 pCi/l	8

Obviously, something is happening to city B that should be investigated while city A appears to be normal. In 1967 these ratios, in California cities that were sampled, ranged from 1.0 to 7.8 and the differences from 0.4 pCi/l to 37.4 pCi/l.

The present policy in California is that no city should discharge to the uncontrolled environment a sewage effluent containing more than  $1 \times 10^{-7}$   $\mu\text{Ci/ml}$  (100 pCi/liter) above the domestic water entering the city. In practice, the Bureau of Radiological Health of the California State Department of Public Health becomes concerned when the discharge values are one third of the maximum permissible value of 100 pCi/liter. An increase to this concentration indicates that some or several discharges are releasing too much radioactivity into the sewerage system. These discharges may be in excess of California's Radiation Control Regulations which are compatible with 10 CFR 20. A followup to determine the source of this increase in radioactivity enables us to determine licensee compliance or non-compliance with our regulations.



DISCUSSION OF HIGHLIGHTS AND  
CLOSING REMARKS

Dr. Raymond T. Moore  
Acting Director, BRH  
U. S. Public Health Service  
Rockville, Maryland

Summarizing four full days and 38 pages of a technical symposium is an herculean task. It would be impossible, in the few minutes allowed me, to dwell adequately on each of the papers presented. Rather, I would like to review some reasons why we thought this symposium was both timely and necessary.

First and foremost in our mind was the need to emphasize the health and safety aspects. While our laboratory in Las Vegas and a few states have been deeply involved in Plowshare, the public health aspects were not widely known. Up to now there had been no forum where we and our colleagues could exchange ideas or views relating to the public health aspects of the Plowshare Program.

We considered it important to present the results and analyses of relevant studies of Plowshare activities conducted by various organizations. We believed it important to include discussions of air blast and ground motion effects as well as the transport of radioactivity for these are also of public health concern.

We attempted, and I believe succeeded, in bringing people of diverse interests and views together. In our opinion, it was necessary to bring into focus those problem areas where more research or information is needed.

Several of the speakers emphasized two major problems of concern. The more important of these is the need for declassification of certain Plowshare information. I believe you will be faced with resistance to the Plowshare Program from scientists and the general public as long as such data is kept under security wraps. People want to know the facts and be able to render their own judgment. Congressman Hosmer spoke of that in his excellent speech at the banquet Tuesday evening. He proposed that the AEC take steps to separate the Plowshare development activities from weapons development.

Dr. Carlyle Thompson indicated the other problem by noting the need of the states for public funds to monitor the environment after Plowshare events. Some way must be found to support state programs financially in order that they may gear up adequately to support industrial Plowshare projects.

I believe we have had a successful symposium. I am told the registration is in excess of 600. The success is due to you who have participated. Each session was fully attended. I have never been to a meeting where so many have stayed to the last as you have. Thank you.