UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Mr. Steve Lafflam
Environmental Manager
Rockwell-Rocketdyne Inc.
6633 Canoga Ave.
Canoga Park, CA 91303

Dear Mr. Lafflam

Enclosed is a memorandum from Gregg D. Dempsey, EPA Office of Radiation Programs-Las Vegas Facility) to Daniel Shane, On-Scene Coordinator, Emergency Response Unit, Region 9. This memorandum contains preliminary findings of Mr. Demsey based on his site visit to Santa Susana Field Laboratory on July 12, 1989.

I would appreciate your review of and response to Mr. Dempsey's preliminary findings. Please forward your comments to Carmen Santos of my staff by September 10th. After reviewing your response we will finalize our findings and recommendations. Thank you for your cooperation.

Sincerely,

Rich Vaille, P.E.
Assistant Director (for Waste Programs)
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JUL 28 1989

MEMORANDUM

SUBJECT: Site Visit to Santa Susana Field Laboratory Operated by Rockwell/Rocketdyne

FROM: Richard D. Hopper for Gregg D. Dempsey, Chief
Field Studies Branch, ORP

TO: Daniel M. Shane, On-Scene Coordinator, Emergency Response Unit

On July 5, 1989, I reviewed documentation that your office had assembled on the Rockwell/Rocketdyne Santa Susana Field Laboratory (SSFL) located near Canoga Park, California. The purpose of my consultation to your office was to help assess the relative magnitude of health hazards, health risks, past, present, and future environmental problems and how Superfund, through your office, might address those concerns.

In the two and a half days I spent in your office reviewing that documentation, I studied previous Rocketdyne Environmental Reports, contractor reports on wells and DOE site reviews. As I communicated to you during my exit interview, it was my opinion that I could not come to a conclusion about conditions relating to the site without a visit which would include; discussions with Rocketdyne's laboratory personnel, my personally making measurements on the various sites identified, and possibly collecting environmental samples for radiation analysis. You arranged for your technical assistance team (T.A.T.) contractor, Ecology and Environment, Inc., to prepare a site safety plan and outline of measurements and sampling protocol with my input according to your internal procedures. Arrangements were made at that time and in the following days for a site visit. I also made assurances to the Ecology and Environment Corporate Health Physicist, Jackie Gillings, that I would provide dosimetry and exit personnel surveys for T.A.T. personnel working at my direction on the SSFL site.

On July 12, 1989, I met with you at SSFL for the purpose of reviewing site and laboratory operations. I spent the afternoon of the 12th reviewing the environmental monitoring laboratory procedures and protocols. On July 13, I personally visited the locations at the SSFL that there were questions about, performed an environmental survey with hand-held radiation survey equipment and directed your T.A.T. contractor to collect environmental samples in areas where I felt they were warranted. Explaining and communicating my concerns and the physics of and analytical processes for environmental radioactivity are difficult to do in a short memorandum. It may be appropriate for me to visit you in the near future to answer any questions you may have about this or my future evaluation of the analytical data.

Rocketdyne has had an environmental monitoring program for over 20 years at this site. Many facilities of this type have not had an environmental program until forced by some legislation or other need. The personnel whom I questioned regarding the laboratory were most cooperative. The Manager of Radiation and Nuclear Safety, Robert Tuttle, and the Manager of the Radiological Laboratory, John Moore, were extremely open and helpful during my review of their laboratory.

During my review, I questioned Mr. Moore and Mr. Tuttle extensively concerning their procedures and protocols relating to laboratory equipment and sampling procedures. Laboratory equipment that has been provided to this laboratory is state-of-the-art and seems to be in good working order.

However, certain problems exist within this laboratory that make me question the validity of some, if not all, of their environmental data. This laboratory apparently has never had a thorough review or audit by Rocketdyne or DOE. These reviews are conducted to assess the direction of the environmental program, identify problems in procedures and protocols, and make recommendations for improvement. Both Mr. Tuttle and Mr. Moore admitted that such reviews had not been conducted. It is a common practice among good laboratories to conduct peer reviews. Such a review should have revealed many of the problems I will describe below. DOE apparently conducted a limited audit in February 1989, but the report has not been finalized.

Much of the environmental sampling consists of sampling soil on site and counting it to determine radioactivity. SSFL lab personnel analyze soil for gross alpha and beta radioactivity. This is not a good method for assessing environmental radioactivity. In the Rocketdyne procedure, soils are heated in a muffle furnace for 8 hours at 500°C. Several problems were identified: first, this temperature is sufficient to volatilize most man-made radionuclides of concern, including cesium-137 and strontium-90. Second, from the Rocketdyne procedure, soil is sieved through a Coors crucible to obtain uniform particle size.

Mr. Moore told me that approximately 10% of the soil will not pass through the crucible, mainly due to the fact that the sand, clay or pebble size is too large. It is common practice that if one wishes to obtain a uniform particle size, soil is ground in a machine designed for this purpose. Two grams of soil are used in a planchet for counting. Because of absorption of the alpha and beta radioactivity within the soil, the procedure has highly variable results. The procedure attempts to make a correction for this but it is not adequate. The environmental report states that samples are to be counted in a stainless steel planchet, but the current SSFL procedure (Rockwell Document Number N001DWP000008, dated July 9, 1984) states that a copper planchet is called for. This also makes a difference in counting and calibration. I asked Mr. Tuttle and Mr. Moore for the basis of the 500 degrees and was shown an EPA procedure that is used to prepare a sample for an analysis for americium-241 by alpha spectroscopy, an entirely different procedure. I asked for documentation or references on the validity of the procedure used by SSFL. I was told by Mr. Moore that this procedure was worked out a long time ago and he did not know where that documentation might be or if it existed. He also stated that while the SSFL does participate in DOE/EML quality assurance rounds, this procedure for soil is not included. Spike samples have apparently never been prepared and run through this procedure to provide internal quality control. I discussed this procedure with Dr. Paul Hahn, an EPA radiochemist who has over 30 years experience in preparing and counting samples for radioactivity, and he verified my conclusions. In short, gross alpha and beta data on soil, even though it has indicated some radiation areas on this site, is not a true representation of conditions present in the environment. This procedure is a screening method at best and is not an accurate quantitative procedure.

Water samples are also collected on the SSFL site. The procedure is to evaporate the water to dryness and count for gross alpha and beta radioactivity. I inspected typical samples and found that alpha and beta self-absorption is, again, likely to be a problem. I asked Mr. Moore for a typical beta counting efficiency for this procedure. Simply, this is a measure of the ability of the counter to detect radiation. Mr. Moore told me that this is typically 2 dpm/cpm (two disintegrations per minute per count per minute) or 50%, I called the manufacturer of this counter and was told that their specifications will only guarantee 45-47% with a massless point source, something a water sample can never be. For similar reasons as stated above, I doubt the validity of these analyses as well.

Vegetation samples were collected until 1986. This was stopped only two years after an internal SSFL review determined that problems existed with alpha and beta counting and changes should be made. I reviewed the procedure for vegetation counting. It is similar to the soil counting in that the vegetation is essentially ashed before counting and only one gram of ash is analyzed. The procedure states: "Gently wash the vegetation in the

container with warm tap water to remove external foreign matter." If past operations at Rocketdyne had produced airborne contamination and it settled on the surface of the vegetation instead of being absorbed through the roots, it is washed off before counting. Or it may be volatilized during ashing at 500°C. Even so, I do not think the reasons were good enough to stop vegetation sampling.

Part of a good environmental program involves checking other pathways to man through which radionuclides might travel. One of these is through meat samples obtained from feral species. I realize that hunting is probably not permitted in the area around SSFL, but I saw abundant evidence of deer (bedding spots, hoofprints) and squirrel (directly). These animals are not sampled. A permit to collect these species should be obtained or SSFL should occasionally examine a road kill. This is not being done.

Air samples are collected at SSFL and are examined. I did not see the procedure for gross alpha and beta counting, but I think it is adequate to measure what it is supposed to from what I saw in the lab. Air flow calibrations on air samplers are necessary to complete a good program. I did not review these procedures.

Environmental samples are analyzed quarterly for gamma radioactivity. I examined the procedure to calibrate this counter and found that an acceptable, well-documented procedure is used. As an example of this counting, I was given a printout of an air filter composite that was counting and had finished while I was in the lab. I asked how the bag of filters was counted and was told that basically the bag was draped over the detector and counted. Later, upon examination of the printout and SSFL procedures, I found that the counting time of 10,000 seconds violated the SSFL stated procedure time of "at least 36,000 seconds". I also found that the procedure stated that the sample be counted in a Marinelli beaker instead of loose in a bag. Statistically, one could defend the technique and counting time which I was shown, but it violates SSFL written procedure. One or the other should be changed. The SSFL lab participates in a quality assurance program and provides acceptable data for the media tested by gamma spectroscopy.

The lab also provides environmental thermoluminescent dosimetry for the facility and offsite areas. Certain questionable practices are alluded to in the environmental report. The first is that data obtained by dosimeters is normalized to a 1000-foot altitude, by using an adjustment factor equal to 15 mR/1000 ft. elevation difference to obtain site averages. I talked to two nationally recognized dosimeter experts and neither had heard of this practice. This 15 mR/1000 ft. is undocumented by reference in the environmental reports. Both experts I spoke to felt that this normalization is meaningless. Also, in both the calendar year 1987 and the unpublished calendar year 1988 SSFL environmental reports, comparisons for the dosimeters placed by the State of California and a DOE intercomparison project were "not available"

for inclusion at the time the report was published. Bill Watson of the California Department of Health Services, Environmental Management Branch, assured me that data was available and provided to SSFL. Even if data was unavailable for inclusion in a previous year's report, it should have be added as an addendum for the following year's report. The unpublished 1988 report does not contain information about 1987 omissions. This leads me to think that the SSFL dosimetry program might not compare favorably with the other groups. Systematic error that might be present in dosimetry analyses might make SSFL dosimetry data look comparable to itself but still may make these analyses invalid or suspect. A more thorough review needs to be conducted.

Also on July 12, you, your T.A.T. contractor, a representative of the State of California, Department of Health Services, Charles Myers, and myself met with SSFL staff to determine the course of action regarding visiting contaminated or formerly contaminated locations at SSFL. We reviewed several locations and as a parting question you asked if there were any other locations that SSFL personnel could tell us about that were not in the environmental reports. The location which was shared with us we later learned was near the Special Nuclear Materials Storage Area and had involved a liquid spill in the early 1960's. It was agreed that we would look at that location along with the others.

On July 13, I prepared the T.A.T. contractor and myself to go onto these locations. In accordance with arrangements I made with the Ecology and Environment Corporate Health Physicist, I placed "pocket" or "pencil" type gamma dosimeters on all T.A.T. personnel. I extended that level of protection to both you and myself as well. No dosimeter accrued a measurable exposure during the course of the day although dosimeters worn by Mr. Suter and Mr. Chambers of the T.A.T. did drift off zero in the first two hours after charging. This potential exposure is negligible. I also prepared a Ludlum Model 19 Micro-R Gamma Scintillation Counter, an Eberline E-520 Geiger-Mueller Counter with both HP-260 and HP-270 Gamma Probes and a Ludlum Model 14C Geiger-Mueller Counter with a "pancake" type gamma probe, all recently calibrated. The Ludlum 14C was used to verify that contamination had not been removed from each location. Each person from EPA and the contractor were surveyed with this instrument following exit from each site and none were found to be contaminated. We were escorted through the SSFL site by Randy Ueshiro, at times by Mr. Tuttle, and Gary Lavagnino of the Department of Energy, ESQA Division.

The first site visited was described as the "Old Sodium Burn Pit," an area where radiologically contaminated materials had been dumped at some time in the past. There were "Caution-Radioactive Materials" signs around the perimeter of this pit. At one time, a protective dike or berm around this area had washed away and material from this pit was allowed to move off this site in an uncontrolled fashion. The dikes had been rebuilt and a concrete gutter had been constructed on the upslope side of the pit to

prevent rain or wash water from damaging these pits in the future. Survey instrument readings with the Ludlum Micro-R meter were unremarkable for this area. Background in the immediate area and for most of the SSFL site was about 20 μR/hr (microroentgens per hour). For comparison, in Simi, the background is about 8 μR/hr. This 20 μR/hr background at SSFL is normal for that altitude and site geology. The highest reading I was able to find in walking the site area for over two hours was about 30 μR/hr in the upper pit near a location SSFL personnel had identified. I also walked down the natural drainage channel about a tenth of a mile and around the area and recorded between 16 and 20 μR/hr. Because of the lack of information concerning the spill at this site, soil samples were taken in both pits. These pits had areas which were obviously lowest, that is, where any rainwater that might accumulate in these pits would evaporate last. The sample in the upper pit was collected from mud in this lowest spot. The sample will be analyzed for gamma emitting isotopes and tritium by the contractor lab. Duplicate samples were collected at this site for quality control. In the other pit, a sample was collected to be analyzed for gamma emitting isotopes at a spot where old "cooling tubes" were sticking through the surface. Both locations were marked with red surveyor's flags should additional samples or measurements be needed in the future.

SSFL or Rocketdyne has not collected soil or water samples to be analyzed for tritium, a radioactive isotope of hydrogen. If the materials accidently dumped at this area and others contained tritium, there was no way in their measurement protocol to detect it. SSFL personnel could not assure me that materials dumped did not contain tritium. Tritium, with a 12 year half-life, has gone through about two complete half-lives since this spill and it is rapidly distributed in the environment. This means that if ground or waterborne radionuclides are traveling toward the offsite areas, tritium will migrate the quickest. The samples collected above may verify the absense or presence of tritium.

The second area visited was called the "Leach Field" because it had been used as a sewage leach field at one time. Radioactive materials had been accidently dumped into it. SSFL had initiated a cleanup and it is probable that most of the radioactivity was contained. Gamma radiation in this area showed between 20 and 30 μR/hr with about a 30 μR/hr average. This radiation is due largely or totally to naturally occurring radioactivity in the rock outcroppings in the area. One soil sample to be analyzed for gamma emitting isotopes was collected in this field at a location identified by SSFL personnel as having "high beta readings."

The next location surveyed was Building 059, a location where a reactor had once been housed. Contaminated items had been removed. The site was considered clean, except for some sand in the building itself. Readings were 15-18 μR/hr in the immediate area. There was a pump installed on the French drainage system for this building and SSFL samples it. Two water samples were collected directly from the pump for radioanalysis, one for

cific gamma emitting isotopes and one for tritium.

The "Old Conservation Yard" was surveyed next. This is an area which had recently been cleaned up by SSFL personnel because of "high beta readings." The area was unremarkable at 13 - 15 μR/hr. No samples were collected from this location for radioanalysis.

We then went to the "New Sodium Burn Pit Area." It was also described as having "previously high beta readings" but again was unremarkable at 18 - 20 μR/hr. No samples were collected for radioanalysis.

The last site we visited was the site we had been told about only the day before in the meeting with SSFL officials. It was described as "Building 064, the Special Nuclear Materials Storage Area." An area around this site was in the process of being cleaned up. I spoke to a technician, Mr. Wallace, who was conducting a survey of this area. He showed me an area of 60 μR/hr. I got a shovel and upon digging at this location in about a foot was able to increase the surface reading to 200 μR/hr. Mr. Wallace stated that about 50 pCi/gm of beta radioactivity had been seen at this site. SSFL personnel were unsure of the nature or time of the spill at this location but were confident it was in the early 1960's. Apparently SSFL environmental surveys had identified this site. One soil sample to be analyzed for specific gamma emitting radionuclides was collected at this site. A duplicate was also collected for quality control of the contractor laboratory.

There are several reasons why I did not collect certain environmental samples. Vegetation both on and off site was of interest to me. The majority of grasses in the area were dry and apparently had been that way for some time. I would have sampled typical forage on which deer might browse, but SSFL personnel were unsure about what these might be. Second, it might be necessary once the gamma results are obtained from the contractor to go back and get samples analyzed for Sr-89/90 or actually collect new samples. As you are aware, a contract laboratory for the radioanalyses was selected without a review of their laboratory performance. The Sr-89/90 analysis is extremely difficult and tedious and it will be necessary to verify lab performance before samples are analyzed so worthless data is not generated.

It is also important to comment on the audit that was conducted by the Department of Energy in February 1989. This document is in preliminary form and was supplied to me by your office to assist in my review. DOE made an attempt to review many aspects of the SSFL Environmental Program in this document. I echo their concerns about the well and air sampling at SSFL and offsite. Both of these items, as well as environmental sampling in general, need to be reviewed for adequacy. DOE also identified some problems in the Radiological Laboratory but did not do an extensive review. The lack of a meteorological tower onsite was also mentioned as a concern. SSFL uses the EPA code AIRDOS to define dose to affected offsite areas. However, the tower information used is from the

Burbank Airport. Better AIRDOS information could be generated with a closer-to-site or onsite met tower.

I had mixed feelings about what I saw at SSFL. The staff was most cooperative and were very willing to show us everything we needed to see. They believe they are doing a good job.

The SSFL Radiological Lab needs updating very badly and this should be highly stressed in your report to your superiors. I don't think analyses of the samples collected by our group onsite will show a serious radiological health hazard. I will reserve commenting on those analyses until they are complete. However, the SSFL sampling, placement of sample locations, and analyses cannot guarantee that past actions have not caused offsite impacts. If the environmental program stays uncorrected, SSFL cannot guarantee that unforseen or undetected problems onsite will not impact the offsite environment in the future.

It is also clear to me that Rocketdyne does not have a good "handle" on where radiation has been inadvertently or intentionally dumped onsite. Most of the evidence on site spills is incompletely documented or anecdotal. DOE or Rocketdyne should conduct a complete survey of the site, specifically looking for other spill areas. A good start and a valuable aid for these surveys would be contracting with the EG&G Energy Measurements group in Las Vegas, Nevada for a flyover with their gamma radiation counting equipment. This group is already under contract to DOE/NVO. This survey would rapidly identify potential areas of concern. Site aerial readings are plotted on a site photo in this survey.

I will be in touch with you in the near future to discuss the results of the samples collected at SSFL. If there are any questions about the material above, I will be happy to discuss it with you.

CC: Mike Bandrowski, Region 9
Robert S. Dyer (ANR-461)