SURPLUS FACILITIES MANAGEMENT PROGRAM

INTERIM POST REMEDIAL ACTION SURVEY REPORT FOR HOT CAVE (BUILDING 003) SANTA SUSANA FIELD LABORATORY ROCKWELL INTERNATIONAL CANOGA PARK, CALIFORNIA

OCCUPATIONAL HEALTH AND SAFETY DIVISION
Health Physics Section
ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS

Prepared for the U. S. DEPARTMENT OF ENERGY
under Contract W-31-109-Eng-38

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439

SURPLUS FACILITIES
MANAGEMENT PROGRAM

INTERIM POST REMEDIAL ACTION SURVEY REPORT FOR BUILDING 003 SANTA SUSANA FIELD LABORATORY ROCKWELL INTERNATIONAL

October 1981
April 1982

Prepared by

R. A. Wynveen	Associate Division Director, OHS
W. H. Smith	Senior Health Physicist
C. M. Sholeen	Health Physicist
A. L. Justus	Health Physicist
K. F. Flynn	Health Physicist

Radiological Survey Group
Health Physics Section
Occupational Health and Safety Division

May 1983

Work Performed under

Budget Activity DOE HA-01-07-05-2
and ANL 73706

INTERIM RADIOLOGICAL SURVEY REPORT FOR ROCKWELL INTERNATIONAL, SANTA SUSANA LABORATORIES, BUILDING 003

INTRODUCTION

A post remedial action (certification) survey of the "hot" cave in Building 003 was undertaken at the behest of the Department of Energy, by the Radiological Survey Group of the Occupational Health and Safety Division, Health Physics Section (OHS/HP), of Argonne National Laboratory (ANL) during October 1981. This survey showed residual contamination in various parts of the building. As a result of this survey, additional decontamination work was conducted by Rockwell International. This decontamination work was concluded in March 1982, and the results of a comprehensive radiological survey of the building conducted at that time, by Rockwell International personnel, were documented (IL, F.E. Begley, "Radiation Survey of Building T003-Santa Susana" March 15, 1982).

A final post remedial action (confirmatory survey) was conducted by the ANL Radiological Survey Group during April 1982. At this time only those areas that had previously been found contaminated were surveyed.

The results of the investigations by the ANL-OHS/HP Radiological Survey Group together with concomitant conclusions and recommendations are included in this report.

The "hot" cave in Building 003 has been inactive since the close-out of the System for Nuclear Auxilliary Power Program (SNAP) in 1973. Prior to that time, the facility had been used for the analysis of SNAP fuel burn-up samples and the evaluation of irradiation experiments. After Building 003 facilities were declared "excess," decontamination and dismantling of the contaminated facility by Rockwell International proceeded as described in the Decontamination and Decommissioning of Facilities Program Plan No. PP-704-990-002.* The actual decontamination and decommissioning (D&D) efforts in Building 003 began in January 1975 and ended in June 1975. At that time the building was given a preliminary release.

*This report was prepared by Rockwell International and is available from their Canoga Park, California Division.

SITE DESCRIPTION

The Santa Susana Laboratories of Rockwell International are located in the Santa Susana mountains northwest of Los Angeles, California (see Fig. 1). The location of Building 003, with respect to the rest of the laboratory site, is given in Figure 2. A detailed drawing of Building 003 is given in Figure 3.

RADIOLOGICAL SURVEY PROCEDURES

Instrumentation

Four types of portable survey instruments were used to conduct the direct radiological surveys. Gas-flow proportional detectors with window areas of 51 cm^2 and 325 cm^2 (using Eberline PAC-4G-3 electronics) were used to monitor for alpha and/or beta-gamma radiation. NaI crystal detectors, 2 in. diameter by 2 mm thick (Eberline PG-2 with Eberline PRM-5-3 electronics), were used to monitor for low energy x-ray and gamma radiation. NaI crystal detectors, measuring 1 in. diameter by 1 in. thick (Eberline PRM-7 μR meter) and calibrated with a ^{226}Ra standard source, were used to measure the ambient external penetrating radiation field in units of μR/h. An end-window Geiger-Mueller (GM) detector (Eberline HP-190 with a 7 mg/cm^2 window and Eberline 530 electronics), calibrated with a ^{226}Ra standard source, was used to measure the contact exposure rate (mR/h) of contaminated areas. Integrated measurements of the ambient penetrating radiation field were taken with a pressurized ionization chamber (Reuter Stokes RSS-111) calibrated with an NBS traceable ^{137}Cs-^{137m}Ba gamma-ray source.

Whenever possible, a contaminant was identified by performing gamma spectral analysis on either the contaminated item or on a sample of material taken from a contaminated area, using a sodium iodide or hyperpure germanium detector coupled to a multichannel analyzer.

Smear Surveys

Dry smears were taken at representative locations throughout the building using a 4.75 cm diameter filter paper (Whatman #1). A smear sample was obtained by applying moderate pressure with the tips of the first two fingers to the back

of the filter paper and wiping the surface over an area of ~ 900 cm^2. Smears were taken on original structures and components such as walls, floors, pipes, and vents. A smear of 100 cm^2 was taken if an area or object was found which had a higher than normal radiation level as indicated by a portable survey instrument. A smear area of 100 cm^2 was also taken if the surface was extremely dusty.

In order to expedite counting of numerous smear samples, two counting techniques were employed using two types of counters. A large-area, thin-window, gas-flow proportional counter, sensitive to alpha and/or beta-gamma radiation, was used to make an initial count on groups of smears. For more sensitive counts on individual smears, a Nuclear Measurement Corporation Model PC-5 (or 3A), Internal Gas-Flow Proportional Counter with a thin aluminized Mylar window (referred to as Mylar spun top) was used.

Initial counts were made with the large area counter on groups of ten smears at one time. Any set of smears indicating a reading above the instrument background was then counted individually in the PC counter. In addition, at least one smear of each group of ten was selected at random and counted in the PC counter. All smears of the areas or objects with elevated direct readings were counted individually in the PC counter.

Air Samples

Air particulate samples were collected using an ANL-modified, commercial vacuum cleaner to pull air through the filter media (HV-70). A total volume of 26.7 m^3 of air was sampled at a flow rate of 40 cubic meters per hour (m^3/h). A 10% portion (5 cm in diameter) was removed from the filter media after collection and counted for both alpha and beta-gamma activity in the PC counter, using a Mylar spun top. Radon (^{222}Rn), thoron (^{220}Rn), and the presence of any long-lived airborne radionuclides were determined based on the result of several counts at specified intervals on each sample.

Air particulate samples were also collected on Millipore Filter media for 40 minutes at a flow rate of approximately 1.5 m^3/h. A portion of each filter sample was used for alpha spectral analysis to determine the actinon (^{219}Rn) concentration.

Sludge, Water and Soil Samples

Sludge, water and soil samples for radiochemical analysis were taken from several "suspect" areas at the site.

RADIOLOGICAL SURVEY RESULTS

The October 1981 post remedial action survey of the interior of Building 003 indicated several areas with significant levels of radiological contamination. Radiation levels were found that measured as high as 400 cts/min-51 cm^2 surface alpha (α) activity, 200 k cts/min-51 cm^2 surface alpha beta-gamma ($\alpha\beta\gamma$) activity, 45 k cts/min low energy x and gamma (γ) radiation, and 16 $\mu R/h$ ambient radiation level at 3 ft. as determined with a μR meter.* The areas of contamination were limited to Rooms 101, 102, 170, 180, 200, 205 and the High Bay Area (see Fig. 3). All other areas of the building interior were free from measurable contamination.

Some contamination (e.g. up to 500 cts/min-51 cm^2 surface $\alpha\beta\gamma$) was observed on the south roof (exterior) in the vicinity of the blowers. There was no contamination detected on the north roof. A detailed survey of the outside perimeter of the building revealed no detectable contamination.

Short-term air samples were taken from seven locations within the building for the purpose of determining any airborne contamination. These samples revealed Working Levels (WL) for radon (^{222}Rn) daughter concentrations ranging from 0.00069 to 0.0025; radon (^{222}Rn) concentrations ranging from 0.069 pCi/ℓ to 0.25 pCi/ℓ; thoron (^{220}Rn) concentrations ranging from 0.0012 pCi/ℓ to 0.015 pCi/·; and actinon (^{219}Rn) concentrations that were below detectable limits. No long-lived particulate contamination was found in any of these air samples.

Samples of the contaminated tiles in Room 205 (sample 10-T89) and Room 102 (samples 10-T90 and 10-T91) were taken for analysis. The results of the gamma spectral analyses indicated that the contamination was due primarily to ^{155}Eu in

*The direct measurement results presented in this report are gross readings. Background radiation levels have not been subtracted, nor have conversion factors been applied for specific radioisotopes.

Room 205 and ^{137}Cs in Room 102. The results of the uranium fluorometric analyses for these samples indicated uranium concentrations of 6.6 µg/g (10-T89), 78.6 µg/g (10-T90), and 310 µg/g (10-T91).

A water sample was taken from the cutting mock up pit in Room 170 (sample 10-W88) and water and sludge samples (10-W87 and 10-SS87) were taken from the sewer sump on the west side of the building. The water samples from the mock up pit and the sewer sump showed no significant contamination, however, the sludge sample from the sewer sump showed elevated levels of uranium. This sample (10-SS-87) had 314 µg of uranium present (30.7 µgU/g solids). Mass spectrometric analysis of ths uranium indicated that the material was slightly enriched in the 235 isotope (i.e. 1.03% ^{235}U versus 0.72% ^{235}U for normal uranium).

Subsequent to the October 1981 radiological survey, all areas of contamination were cleaned of residual radioactivity by Rockwell International personnel. The ANL Radiological Survey Group resurveyed these areas during April 1982, and found them to be free of contamination.

The presence of enriched uranium in the sewer sump rendered all sewer lines suspect. It was decided by Rockwell International to remove the sewer lines within Building 003. Prior to backfilling, the trench where the sewer lines were located was surveyed and soil samples were collected for analysis. A total of nine soil samples (10-S116 through 10-S124) were taken from the trench. The location of the trench and the soil samples is shown in Figure 4. These soil samples were analysed for ^{137}Cs, ^{232}Th decay chain, ^{226}Ra decay chain, and ^{60}Co by gamma spectral analysis; for uranium by laser fluorometry; and for ^{90}Sr by radiochemical analysis. No significant levels of radioactive contaminants were found in the soil samples and the direct survey measurements indicated background levels of radiation.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this survey, the following conclusions are drawn:

1. Both the interior and exterior of Building 003 are free from radioactive contamination, i.e., they meet the criteria specified for the release of facilities for unrestricted use as promulgated by the U.S. Nuclear Regulatory Commission (July 1982).

2. The adjacent lands around the perimter of the building are also free from contamination.

3. Air samples taken within the building indicated radon-daughter concentrations of 0.0025 WL or less, radon (^{222}Rn) concentrations of 0.25 pCi/ℓ or less, thoron (^{220}Rn) concentrations of 0.015 pCi/ℓ or less, and actinon (^{219}Rn) concentrations below detectable limits. These levels are all well below the Environmental Protection Agency (EPA) limits. No other airborne contamination (e.g. long-lived particulate) was observed.

4. The areas where the sewers were located within the building are free from radioactive contamination.

Based on the above conclusions, the following recommendations are made:

1. Building 003 can be released for unrestricted use.

2. The sewer lines exterior to the building must be considered potentially contaminated with radionuclides and, therefore, subject to restricted use. This involves proper health physics control and suitable disposal of any material associated with these sewer lines. Effluent from the outfall of this sewer system should be monitored for radionuclides on some periodic basis.

Robert A. Wynveen
Associate Division Director, OHS

Walter H. Smith
Senior Health Physicist, OHS

ANL-HP DWG. NO. 80-71

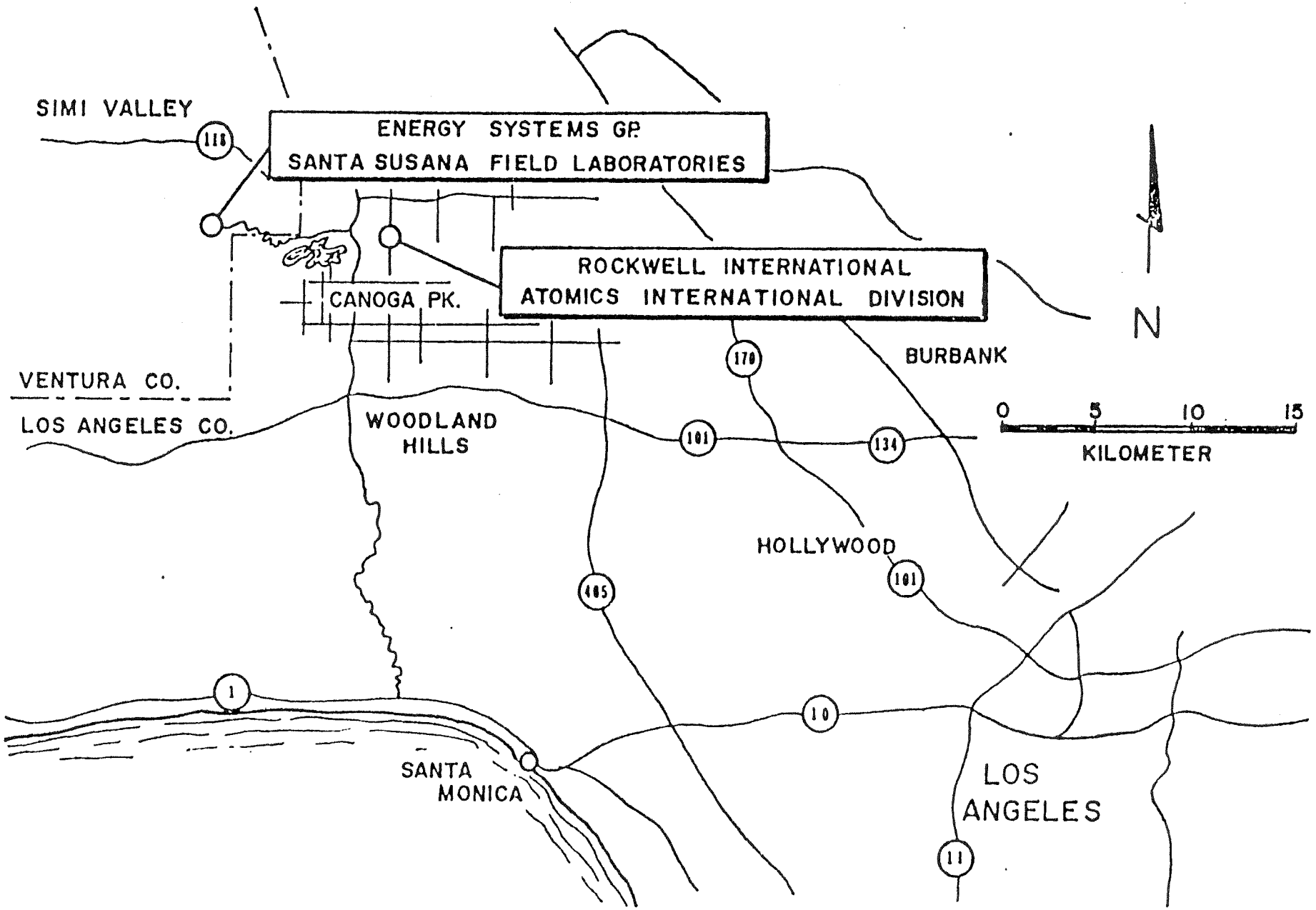

Figure 1

ANL-HP DWG. NO. 83-20

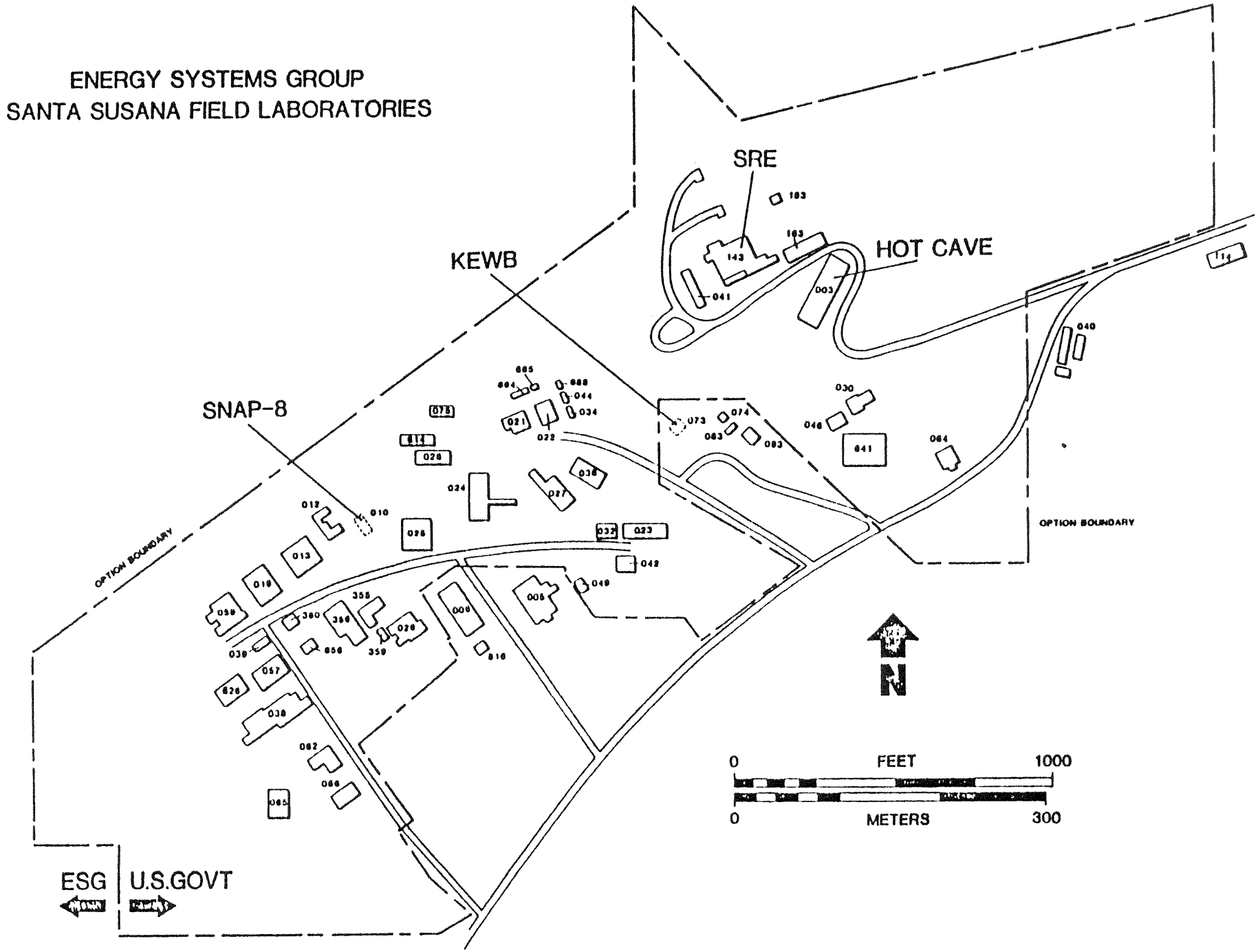

FIGURE 2

ANL-HP DWG. NO. 83-21

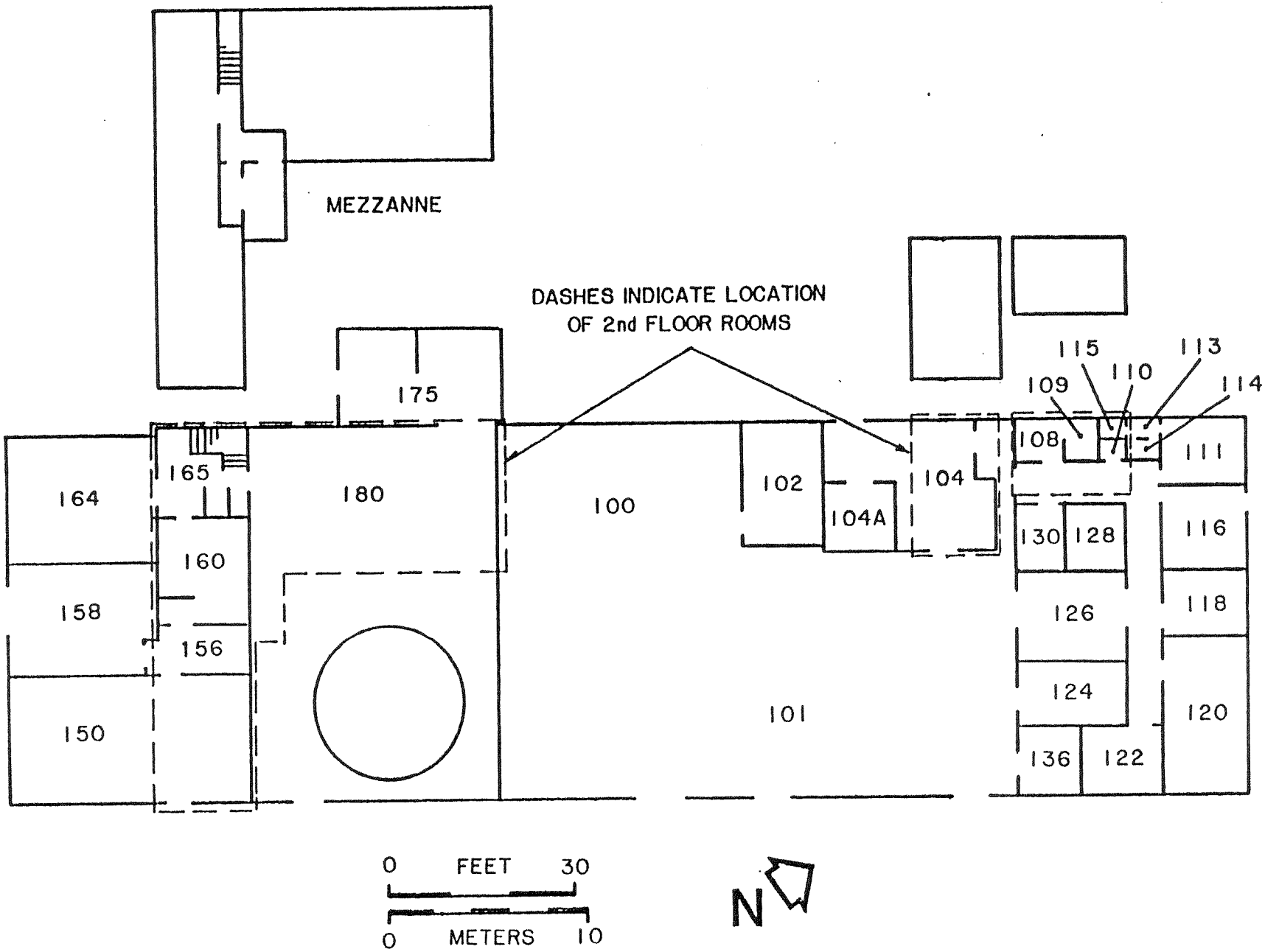

FIGURE 3

ANL-HP DWG. NO. 83-22

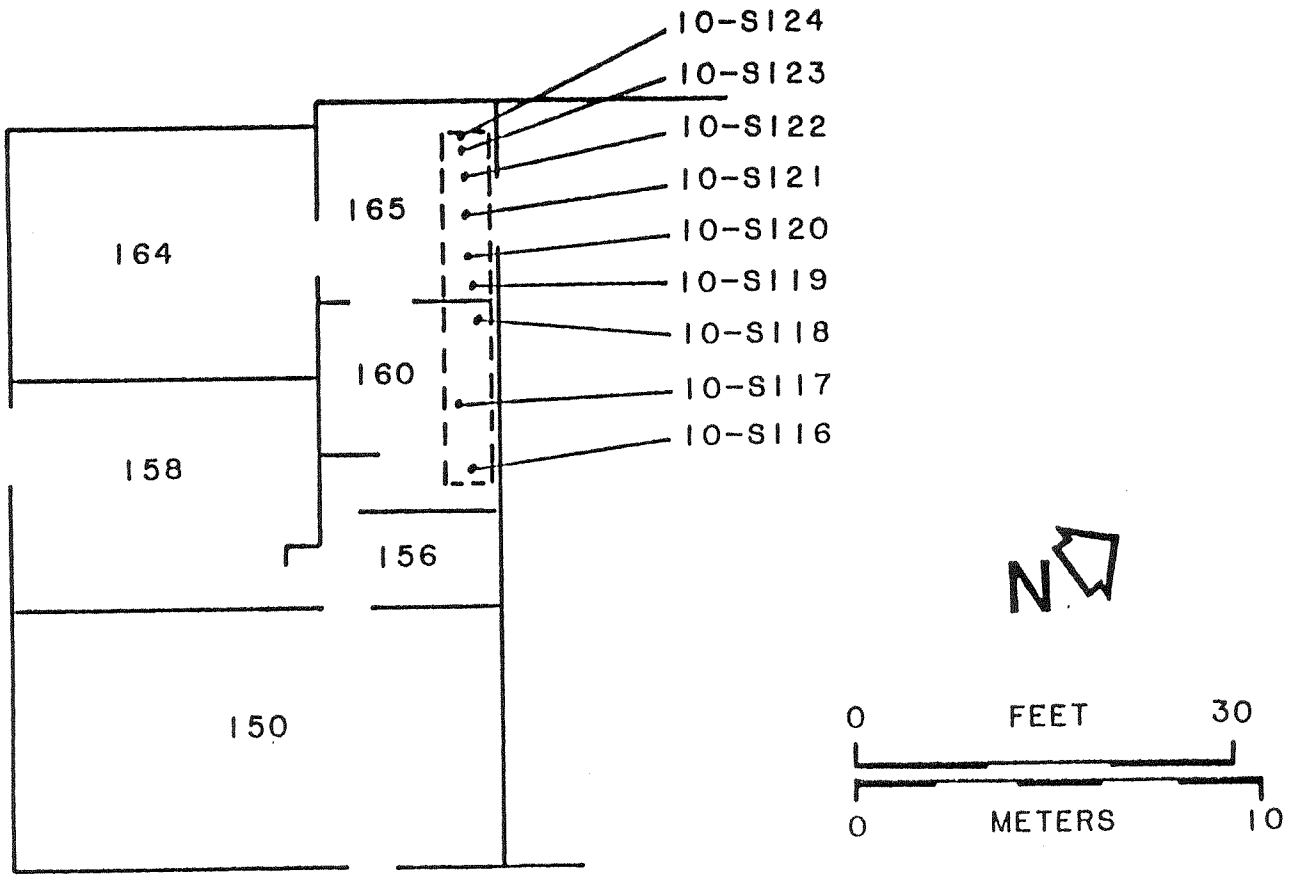

FIGURE 4