ANL/ESH-HP-98/02

CHARACTERIZATION REPORT FOR BUILDING 301 HOT CELL FACILITY

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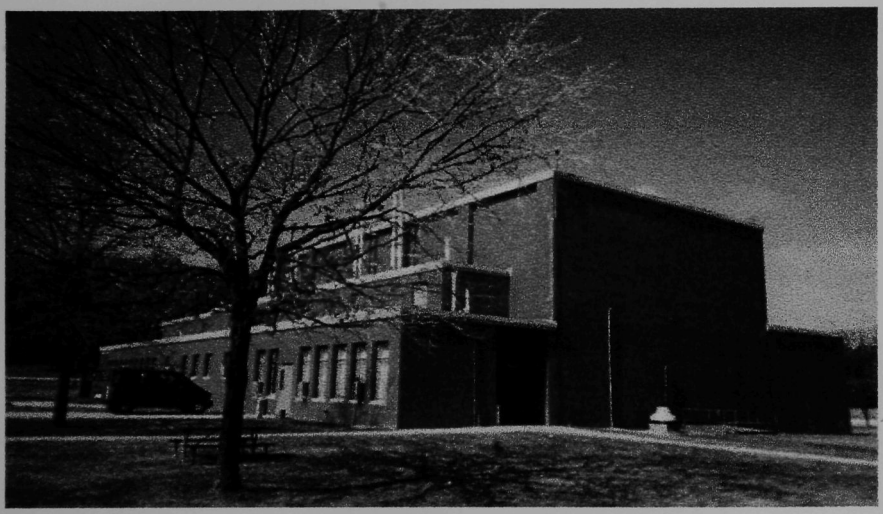
Characterization Report for Building 301 Hot Cell Facility



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BUILDING 301

CHARACTERIZATION SURVEY

REPORT

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ABSTRACT

During the period from October, 1997, through March, 1998, ANL-E Health Physics conducted a pre-D&D characterization of Building 301, referred to as the Hot Cell Facility. While primary emphasis was placed on radiological evaluation, the presence of non-nuclear hazardous and toxic material was also included in the scope of the characterization. This is one of the early buildings on the ANL-E site, and was heavily used in the 1950's and 1960's for various nuclear reaction and reactor design studies. Some degree of cleanup and contamination fixation was done in the 1970's, so that the building could be used with a minimum of risk of personnel contamination. Work records are largely nonexistent for the early history of the building, so that any assumptions about extent and type of contamination had to be kept very open in the survey planning process. The primary contaminant was found to be painted-over Cs-137 embedded in the concrete floors, although a variety of other nuclides consistent with the work said to have been performed were found in smaller quantities. Due to leaks and drips through the floor, a relatively modest amount of soil contamination was found in the service trench under the building, not penetrating deeply. Two contaminated, disconnected drain lines leaving the building could not be traced by site records, and remain a problem for remediation. The D&D Characterization Plan was fulfilled.

BUILDING 301
CHARACTERIZATION SURVEY REPORT

I. PURPOSE OF CHARACTERIZATION SURVEY

A comprehensive characterization of the contaminated areas of Building 301 was performed by ANL ESH/HP personnel in order to determine the distribution and quantity of radioactive and other hazardous materials within the facility. This information is needed to provide a quantitative basis for the preparation of a Decommissioning Plan, to evaluate the relative risks associated with various decommissioning tasks, to estimate the quantities of hazardous materials that are expected to be generated during the course of the decommissioning project, and finally as a basis for estimating volumes of material for waste disposal and salvage. The survey was conducted to follow a characterization plan developed according to the guidance in Appendix G.2 of the August 1995 U.S. DOE Office of Environmental Management Decommissioning Resource Manual.

The two primary goals to be achieved by a characterization are:

- Collection of enough data on the amount of contamination present to allow realistic cost estimates for radioactive and otherwise contaminated waste disposal.

- Identification of the extent of contaminated materials, areas, and equipment, to allow optimum task planning for the eventual D&D process.

The Hot Cell Facility portion of Building 301 has not been in active use since 1992. It was the subject of a preliminary radiological characterization in 1993, and has been under regular Health Physics surveillance. The Hot Cell Facility is known to bear high levels of fixed radioactive contamination, under a coating of paint applied in 1974. The preliminary characterization showed little loose contamination on the easily accessible portions of floors and walls.

The 301 Hot cell Facility has been slated for a D&D Project leading to either demolition or decontamination and release. Thus, identification of radioactivity levels above free release levels is critical for accurate D&D planning.

II. DESCRIPTION OF FACILITY

Building 301 was one of the first occupied at the "new" Argonne site. Plant Facilities drawings for this building are dated 1951. Overall, the building is about 120 feet by 90 feet, with two main floors, a basement service floor, a sub-basement retention tank room, and also a "penthouse" laboratory on the third floor above ground level. The building was designed and built with an elevator shaft and machine room, although the elevator was never installed. The "penthouse" occupies the space designed for elevator machinery. Floor plan drawings are contained in Appendix B.

Little or no documentation has been found describing the work performed in this building. To date, working history has been obtained through oral interviews with present and retired ANL employees. There appear to have been three phases in the use of this building which can be dated approximately to the 1950's, the 1960's, and the 1990's.

Briefly, during the first decade or so of use, in the 1950's, research and development of nuclear reactor fuel components and materials were conducted. Large amounts of plutonium and uranium were handled, machined, polished, and examined. High levels of loose and airborne contamination were frequently prevalent. At first, only Cells, 1 and 2 were built, of high-density concrete. Later, cells 4A, 4B, and 3 A/B/C were added, built of steel shells filled with a magnetite material. The interior floors and brick walls were unpainted during this period.

Work apparently intensified during the 1960's, and the amount of contamination generated increased significantly. Cave 3 A/B/C was used for plutonium machining, polishing, and optical examination. Contaminated carts from these Caves were brought around to Room D-101 for cleanup. There is said to have been a number of spill incidents, including a 5-gallon container of uranium in acid solution reading 100 R/hr onto the floor near Cell 4A. Another incident was a spill of loose Cs-137 in Cell 4A in the kilo-Curie range of activity. The D-109 work room is said to have been often filled with clouds of plutonium-bearing dust. The small concrete pad behind the building is said to have been built for outdoor placement of very high-level source material, which may have spilled from time to time. Workers also report that spills on the driveway, now enclosed into loading dock structure, were not infrequent.

Workers used the second story of 301 for office and lunchroom space. Occasionally, radioactive contamination would spread throughout the building, requiring total shutdown and evacuation. The HEPA ventilation ducts from Cells 4A and 4B, passing directly under the floor of the room used as a lunch area, at one point became so contaminated that the radiation levels in the lunch room became excessive, and workers were limited to 15 minutes in that room.

It is the work performed during 1950's and 60's that explained the present condition of this building, and gave caution as to what might be found. The suspect nuclides were Pu-xxx and Cs-137, although the possibility of other radionuclides had to be considered. However, since nuclides were not produced within this facility, isolated radionuclides found would not imply the presence of associated activation products as would be the case at an accelerator site. For example the presence of Co-60 would not imply that Fe-55, Ni-63, etc., are present. There was no particular history of use of toxic chemicals, although the possible use of organic solvents in dissolved fuel solutions was considered. The "penthouse" laboratory was said to have been designed for chemical work, which is consistent with the lead-trapped sinks, and air and gas outlets installed.

In 1974, paint was applied over floors and walls to fix contamination. Work done in the building after that time involved some use of radioactive materials, including the MACE experiments with Uranium Oxide mixtures. At one point, in 1992, a MACE setup exploded in Cave No. 1, blowing out a window, and moving the cell door off its track.

Asbestos insulation on hot water and heating pipes is prevalent in this building.

At present, the second floor and a portion of the first floor are not radiologically controlled areas, and are used as office space. However, these areas were released some years ago, when release criteria were less stringent. In order to safely release the entire building, those office areas should be re-surveyed.

Photographs of the facility may be found in Appendix A, and floor plans are contained in Appendix E.

III. QUALITY ASSURANCE PLAN

1.0 Policy

All work was performed in compliance with the QA plans of the ESH Division and the Health Physics Sections of ANL-E.

2.0 Organization

All tasks were performed under the supervision of a cognizant project coordinator, with work reviewed and approved on a daily basis. The project coordinator was a Certified Health Physicist. HP technicians performing surveys, taking samples, and performing radiological laboratory counting were fully trained and approved for work at ANL-E, according to the site-specific training requirements specified by DOE and ANL-E.

Radiological procedures and data were reviewed and approved by ANL-E Health Physics.

Tasks involving potential exposure to hazardous materials were performed with the participation and cooperation of qualified industrial hygiene safety personnel, and were approved by ANL-E ESH Division.

3.0 Instrumentation and Methodologies

All radiological instruments were:

- maintained and calibrated in compliance with ANSI N323 standard
- calibrated at least every six months
- checked daily for proper function, with results entered in a log.

Surveys, scans, and laboratory counting were performed in compliance with the ANL-E Health Physics Procedures Manual. Counting times for stationary surveys and laboratory counting

were sufficiently long to achieve minimum detectable activities (MDA) at least comparable to the release levels for transuranic alpha emitter and beta/gamma removable and total activities specified in ANL-E Health Physics Procedure HPP-610.

Unambiguous identification and chain of custody procedures, as approved by ANL ESH, were followed for the handling of all samples.

The possibility of cross-contamination of samples was minimized by proper acquisition, handling and separate packaging of individual samples. Tools used to obtain samples were cleaned between each use.

4.0 Data Quality Objectives

The Data Quality Objectives (DQO's) for the characterization survey, a subset of quality assurance, were determined in the Characterization Plan to be the pre-survey agreements on the purposes for which the characterization data would be acquired. The technical quality of the data, including systematic and statistical precision, were adequate to meet the DQO'S. The scope of data acquired (i.e. the numbers of samples) was consistent with the desired objectives, in order to achieve optimum cost effectiveness.

A Field Sampling Plan was designed to ensure that the Data Quality Objectives could be achieved. Quality Assurance guidelines were established to help ensure technical quality. The data was required to be of sufficient precision and quantity to permit the following goals to be achieved:

(1) Identification of the boundaries of all areas which are radiologically contaminated to levels exceeding the specified release guidelines.

(2) Classification of all areas and components into three categories:

- Unaffected (remediation not required)
- Possibly affected (remediation possibly required)
- Affected (radiological contamination definitely above guidelines).

(3) For affected components and surfaces: determination of nuclides, activities, and distributions <u>sufficient to allow subsequent selection of remediation or demolition techniques, and disposal cost estimates</u>.

(4) Identification of locations and approximate quantities of toxic and hazardous materials, sufficient to allow disposal cost estimates.

(5) Identification of which characterization data may be incorporated into the Final Status Survey.

Enablement of these five activities constituted the Data Quality Objectives. The data obtained in this project satisfies the DQO'S.

IV. INSTRUMENTATION

1.0 Description of Standard Health Physics Instrumentation

- Surface contamination measurements were made using a dual phosphor scintillation detector, sensitive to both alpha and beta/gamma radiation; e.g., NE ELECTRA meter with NE DP6 probe (Code: NE).

- Thin sodium iodide detector for gamma surveys; e.g., Eberline PRM-5-3 meter with PG-2 detector (Code: PG2).

- Energy-compensated GM detector for general background gamma exposure measurements; e.g., Eberline ASP-1 (Code: μR).

- Air ion chamber survey instrument with capacity for measurements through 7 mg/cm^2 or 1000 mg/cm^2 windows, e.g., Eberline RO-20 (Code: RO20).

- Tennelec gas flow proportional counting system for both alpha and beta radiation, based on thin window gas flow proportional detector (Code: APC).

- Giraffe — Cart-mounted portable air sampling system, utilizing the ESH-7 air sampling heads and a positive displacement pump with a vacuum manifold.

2.0 Description of Tech Demo Instrumentation

- As part of the DOE-funded Large Scale Demonstration Project at ANL-E, centered on the ANL-E CP-5 Reactor decontamination and decommissioning project, Shonka Research Associates, Inc. (SRA) were contracted to perform detailed floor surveys. SRA demonstrated a new method of detailed mapping of surface radioactivity, using their Surface Contamination Monitor (SCM) instrument.

  The SCM system consists of a 4-ft to 6-ft wide position-sensitive proportional counter with a forward motion measuring sensor and integral computer, which moves along with the system. The system is capable of spatial resolution down to about 5 cm x 5 cm. The detectors may be biased and the signal discrimination may be adjusted to take either alpha particle or beta/gamma surveys. The instrument is motor-driven and hand-guided. Individual survey passes are then "stitched" together by the operator to construct one contiguous

data file for a survey unit. Real-time color graphical images of "hot spots" are visible to the operator as they are passed over with the detector. Data is resolved to the size of one "pixel" which is 5 cm x 5 cm (25 cm^2).

- Canberra Industries, Inc., took in-situ gamma spectrometry measurements with their ISOCS system, at strategically selected locations.

3.0 Detection and Measurement Sensitivity

- The term "Detection Sensitivity" is used in this report to refer to the surveyor's ability to audibly detect the presence of radioactive contamination during a surface scan survey. The probability of detecting surface contamination depends not only on the sensitivity of the survey instrument, factors related to its probe size, the scanning speed, background count rate, but is also affected by the surveyor's ability to discern audible changes in the instrument's response (i.e., human factors). The surveyor must make a decision whether the audible signals represent only natural radiation background or residual contamination in excess of background. Audible scan sensitivities are subject to wide variability depending on human factors and the surveyor's scanning technique.

- The term "measurement sensitivity" is used here to define the quantity of radioactive material that can be measured with some known or estimated level of confidence for a fixed position measurement over some predetermined time interval (e.g., a non-scanning measurement). The primary factors affecting "measurement sensitivity" include the detector background counting rate, the counting efficiency of the detector and the counting time interval. When making field measurements, the "measurement sensitivity" will almost always be inferior to that which can be achieved in the laboratory due to the higher radiation background usually encountered in the field and, often times, the significantly lower detection efficiency due to geometry considerations.

- Table 2 contains a list of the measurement and scan sensitivities for the portable survey instruments and the laboratory equipment used in the characterization survey. Figures 1-4 include photographs of the various radiological instrumentation used in characterization survey.

TABLE 1 Radiological Instrumentation Used During the Characterization Survey

Purpose	Instrument	Detector Description	Typical Background and Efficiencies	Audible Scan Sensitivity*	Measurement Sensitivity
Total Surface Contamination (α)	NE Technology, Ltd. ELECTRA	Dual Scintillator 100 cm^2 sampling area 0.5 mg/cm^2	21% ^{241}Am efficiency, ≤7 cpm background	500 dpm	95 dpm (30 sec. measurement)
Total Surface Contamination (β-γ)	NE Technology, Ltd. ELECTRA	Dual Scintillator 100 cm^2 sampling area - 6 mg/cm^2	29% ^{90}Sr-Y efficiency, ≤400 cpm background	1500 dpm	370 dpm (30 sec. measurement)
Removable Surface Contamination (α)	Tennelec APC	Gas Proportional 5 cm dia. 0.1 mg/cm^2	30% ^{241}Am efficiency, ≤1 cpm background	NA	16 dpm (2 min. measurement)
Removable Surface Contamination (β-γ)	Tennelec APC	Gas Proportional 5 cm dia. 0.1 mg/cm^2	42% ^{90}Sr-Y efficiency, ≤40 cpm background	NA	48 dpm (2 min. measurement)
Exposure Rate (γ)	Eberline ASP-1	TGM N378 Energy Compensated High Sensitivity GM	15 μR/h background	5 μR/h net	–
Exposure Rate (γ)	Eberline R0 20	Air Ionization Chamber	0.2 mR/h background	NA	1 mR/h
Total Floor Surface Contamination (α)	Eberline FM-4 (Floor Monitor)	Gas Proportional 330 cm^2 0.85 mg/cm^2	11% ^{239}Pu efficiency, 2 sec residence time, ≤5 cpm background	600 dpm	Stationary measurements made with NE Electra
Total Floor Surface Contamination (β-γ)	Eberline FM-4 (Floor Monitor)	Gas Proportional 330 cm^2 0.85 mg/cm^2	28% ^{90}Sr-Y efficiency, 2 sec residence time, ≤110 cpm background	1800 dpm	Stationary measurements made with NE Electra
Gamma Scan	Eberline PRM 5-3 or ASP-1 with PG-2 detector	5 cm diameter x 2 mm thick NaI (Tℓ)	500 cpm background	500 cpm net	–

* Note: Audible scan sensitivity refers to the minimum detectable activity that could be audibly recognized by the health physics technician as an instrument response different from that of the ambient background level. Values for the audible scan sensitivities are highly variable and depend on certain human factors involving the surveyor. Scan sensitivities are based on a 2 second probe residence time and proper surface to probe distances. Various surface conditions were not taken into account in estimating any of the field measurements/scan sensitivities.

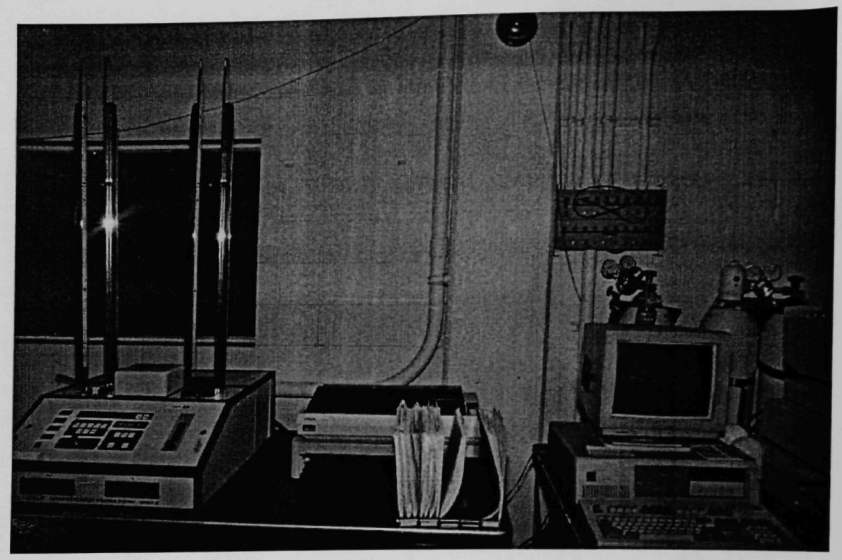

FIGURE 1 Tennelec Gas-Flow Proportional Counting System

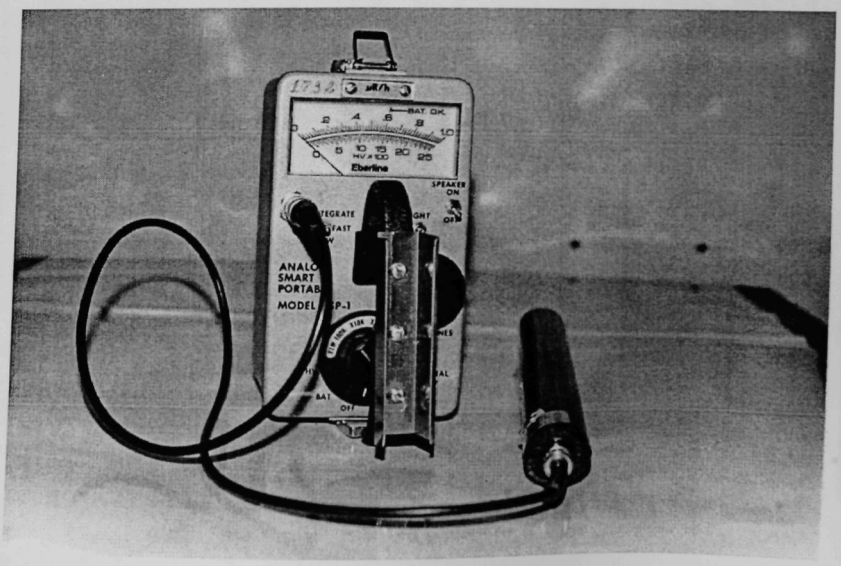

FIGURE 2 Energy Compensated GM Detector for Exposure Rate Measurements

FIGURE 3 NE Dual Phosphor Scintillation Detector for Surface Contamination Scans and Fixed Measurements

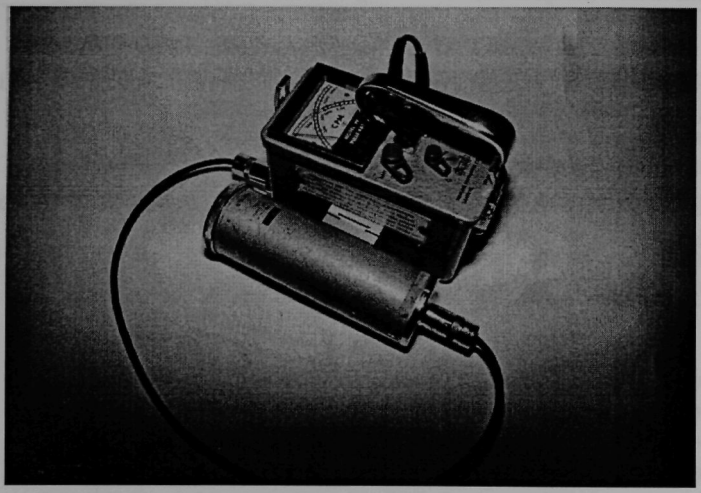

FIGURE 4 Eberline PRM 5-3 with PG-2 Scintillation Detector for Gamma Scan Measurements

V. RELEASE GUIDELINES

The following is a summary of the free-release criteria associated with surfaces contaminated with radioactive materials. Also included are guidelines associated with asbestos containing materials, airborne lead, hazardous material release and airborne radioactivity.

TABLE 2 Surface Contamination Free-Release Criteria (dpm/100 cm^2)

Total (fixed and removable) Radionuclides	Average	Maximum	Removable
Transuranics, I-125, I-129, Ra-226, Ac-227, Ra-228, Th-228 Th-230, Pa-231	100	300	20
Th-Natural, Sr-90, I-126, I-131, I-133, Ra-233, Ra-224, U-232, Th-232	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay product, alpha emitters	5,000	15,000	1,000
Beta-gamma emitters (except Sr-90)	5,000	15,000	1,000

Asbestos release criteria – a material (e.g., insulation, pipe joint compound, floor tile) is considered asbestos-containing if it contains greater than 1% asbestos by weight.

Hazardous material release criteria – RCRA (Resource Conservation Recovery Act) hazardous waste is defined as waste which meets one of the following two criteria:

1. it exhibits the 40 CFR 261.20 (reference 7) specific properties of
   - ignitability
   - corrosivity
   - reactivity
   - toxicity, and
2. it is listed in 40 CFR 265 (reference 7) as a RCRA hazardous waste, and it exceeds the specified concentration limits.

Airborne radioactivity guidelines – Workplace airborne activity concentrations are referenced to the derived air concentrations (DAC) in the DOE rule 10 CFR 835.

VI. RESULTS

1.0 Summary of Radiological Survey Results

The following is an area-by-area summary of radiological survey results throughout the facility.

Ground Floor:

- **Room C-102** Entry Area and Workroom

  - For surveying purposes, this room was divided into two parts, indicated on the maps as C-102-East and C-102-West. The floor survey was divided into three units.

  - A total of 44 smears, both large and small-area, showed very little loose contamination in this room. No significant loose alpha contamination was detected. The highest individual spot of loose beta/gamma contamination measured 1565 ∓ 87 dpm/100 cm^2.

  - Full scans with hand-held NE Electra instruments over all lower walls and in selected locations on upper walls, ceilings, and ducts indicated that the upper walls and ceiling in this room are generally clean. The north and west walls (including cell exterior faces) in this room are highly contaminated, apparently under the paint fixation layer. Detailed maps of the highest levels observed are shown on the maps in Appendix A (figures A-1 through A-7). Hot spots show activity as high as 150,000 dpm/100 cm^2 beta/gamma, while a HEPA filter unit on the north wall shows activity as high as 250,000 dpm/100 cm^2 beta/gamma.

  - The Canberra ISOCS germanium detector gamma spectrometer system was used to identify and quantify gamma-emitting nuclides at one sample area of the floor, with a circular area of about 1 square meter. The sample location was chosen to represent the clean portion of the floor. The result was that the gamma activity in the floor can be attributed to a surface concentration of 500 dpm/100 cm^2 Cs-137 only (Appendix E, msmt #30109). As a result of this and the data taken at other locations with ISOCS, we have corrected all floor survey data used in estimating a nuclide inventory, to account for the difference in floor monitor detector

efficiency to self-absorption of the low-energy beta radiation from Cs-137 imbedded in the top layer of concrete under

- A 100% floor survey was made with the SRA monitor. Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 3670 dpm/100 cm^2. After correction of the correction to account for self-absorption, the average net surface activity becomes 9655 dpm/100 cm^2. However, this activity is concentrated in several relatively small areas, so that only about 15% of the floor area would require remediation to be releasable.

- A total of 14 paint samples was obtained, including 6 from the floor. Sample locations included hot spots observed in the wall and floor surveys. The maximum alpha contamination remaining in place on one hot spot after paint removal is 73 dpm/100 cm^2 (sample #10P).

- One cement sample core was obtained from the floor area between Cave 2 and Cave 4A. (See Appendix F for discussion of cement samples). This location was selected due to being in a trafficked walkway to and from the more highly contaminated rear (northerly) areas of the floor. The top 1-inch section was submitted to ACL for gamma spectral analysis (Sample #26HCEL). The sample showed some Cs-137 content (123 pCi/g) and Bi-214 (3 pCi/g), consistent with light contamination. Cement contamination did not show up below one inch in depth.

- **Cell 5** (located in Room C-102)

  - Four large area smears, showed negligible loose contamination in this small cave.

  - Full scans with hand-held NE Electra instruments located several hot spots on the north, west and east inner walls. The HEPA pre-filter is contaminated, with high alpha and beta/gamma activity (655 and 112,000 dpm/100 cm^2). (See figures A-8 and A-9).

- **Storeroom off C-102**

  - Large area floor smears showed no significant loose contamination.

- Full scans with hand-held NE Electra instrument lower walls and floor showed only two spots of elevated total beta/gamma activity on the floor, under the stairs (see fig A-10), confirmed by the SRA floor survey.

- Results of a floor survey with the SRA monitor may be found in Appendix E The floor surface meets release criteria except for two spots of elevated beta/gamma activity under the stairs.

- **Room D-109** Main Workroom

  - A total of 70 smears, both large and small-area, showed generally low levels of loose contamination on most surfaces in this room. No significant loose alpha contamination was detected. A smear of the east brick wall picked up 5448 dpm/100 cm^2 beta/gamma. The highest individual spot of loose beta/gamma contamination measured 1565 ∓ 87 dpm/100 cm^2. Smears of the shielded glove box on the north wall showed a moderately high level of beta/gamma contamination on the front surface (16,699 dpm/100 cm^2) and interior floor (8787 dpm/100 cm^2). Swab surveys of each of the 68 fuel storage holes were field-checked for loose activity with negative results.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, glove box, hoods, fuel storage hole tops and in selected locations on upper walls, ceilings, and ducts. All lower wall surfaces were found to be contaminated with total beta/gamma activity, with spots up to 600,000 dpm/100 cm^2. Isolated areas of alpha contamination up to 400 dpm/100 cm^2 on the walls (as measured on top of paint layer). The shielded glove box on the north wall bears high levels of contamination, up to 495,000 dpm/100 cm^2 beta/gamma and 200 dpm/100 cm^2 alpha. The source storage hole platform is generally contaminated (under paint), up to 120,000 dpm/100 cm^2 beta/gamma and 500 dpm/100 cm^2 alpha. Detailed total activity survey maps are found in figs A-11 through A-15.

  - The Canberra ISOCS germanium detector gamma spectrometer system was used to identify and quantify gamma-emitting nuclides at one sample area of the floor, with a circular area of about 1 square meter. The sample location, in the center of the room, was chosen as typical of the generally uniform activity on the floor. Based on the assumption that the activity is concentrated in the top 0.5 cm layer of concrete, the result was that the gamma activity in the floor can be attributed to a surface concentration of

79,000 dpm/100 cm^2 Cs-137 only (Appendix E, msmt #30101). No other nuclides were detected in significant quantities. As a result of this and the data taken at other locations with ISOCS, we have corrected all floor survey data to account for the apparent self-absorption of low-energy betas from Cs-137 imbedded in the top layer of concrete covered by paint. Cs-137 appears to be the dominant contaminant throughout the facility floors. It is important to note again that the NE Electra detectors, which have proportional counters sensitive primarily to beta radiation, were found to give only about a 10% response to the Cs-137 imbedded in the floor, due most likely to surface self-absorption.

- Each of the 68 tube storage holes was surveyed by lowering separately a low-level gamma exposure meter and a surface contamination instrument probe slowly down the entire length (see Figure C-15 and Table C-1). Holes numbered 1 through 31 each contain an assembly of four stacked source holders, while hole 32 contains one source holder. Holes 33 through 68 are empty. Boreholes showing no gross gamma fields above 30 microR/hr can be considered releasable. Those meeting this release criterion are numbers 1, 4, 5, 6-13, 15-21, 23-25, 27-30, 32-48, 50-57, and 50-68. On the other hand, holders which show definite evidence of activation or internal contamination are found in boreholes 2-6, 8-9, 11-28, and 30-31. These holders are not releasable.

- A 100% floor survey was made with the SRA monitor. Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 35,743 dpm/100 cm^2. After correction of the efficiency to account for self-absorption of Cs-137 betas, the average net surface activity becomes 94,125 dpm/100 cm^2. Significant concentrations of activity are found along the south wall, around the doorways into the North Corridor, with hot spots as high as 631,900 dpm/100 cm^2 beta/gamma. Virtually no part of the floor is releasable without remediation.

- A total of 10 paint samples was obtained from wall and the floor. Sample locations included hot spots observed in the wall and floor surveys. The maximum alpha contamination remaining in place on one hot spot after paint removal is 53 dpm/100 cm^2 (sample #57P). Beta/gamma levels measured after paint removal were generally increased. One sample was analyzed by ACL for PCB content, and showed high levels of Aroclor 1016/1242 and Aroclor 1254. Paint sample results are contained in Appendix G.

- Two cement sample cores were obtained from the floor, one from the reference position in the center of the room used for ISOCS analysis and one in the doorway leading to cells 4A and 4B. After sectioning and preliminary screening, the top layers of each sample were sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The central floor reference core showed 113 pCi/gm Cs-137 and 5 pCi/gm Bi-214, concentrated in the top 1-inch section. The core taken near a hot spot in the doorway to Cells 4A and 4B showed 190 pCi/gm Cs-137 and 9 pCi/gm Bi-214, again all concentrated in the top 1-inch section of cement.

- **Room D-101** Hot Storage and Workroom

  - A total of 45 smears, both large and small-area, showed generally low levels of loose contamination on most surfaces in this room. One large area smear of the floor picked up 59 dpm/100 cm^2 alpha. No other significant loose alpha activity was detected. The overhead crane was found to be contaminated at 4944 dpm/100 cm^2 beta/gamma. The highest uncorrected gross level of loose beta/gamma contamination was 9983 dpm/100 cm^2 on a door handle. Elsewhere in this room loose contamination is minimal.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, the shielding divider and in selected locations on upper walls, ceilings, and ducts. All wall surfaces were found to be contaminated with total beta/gamma and alpha activity, with spots up to 450,000 dpm/100 cm^2 beta/gamma and 235,000 dpm/100 cm^2 alpha. The HEPA air intake filter and duct are highly contaminated with both beta/gamma and alpha emitters. Detail total activity survey maps are found in figs A-16 through A-21.

  - The Canberra ISOCS germanium detector gamma spectrometer system was used to identify and quantify gamma-emitting nuclides at one hot spot on the floor of this room (Appendix E, Msmt #30108). Only Cs-137 was detected, at a computed activity level of 2.3×10^6 dpm/100 cm^2.

  - A 100% floor survey was made with the SRA monitor. Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 109,651 dpm/100 cm^2. After correction of efficiency to account for surface self-absorption, the average net surface activity becomes

288,748 dpm/100 cm^2 beta/gamma. The highest uncorrected gross activity seen in a 100 cm^2 area is 3.1 x 10^6 dpm beta/gamma with the ISOCS measurement cited above. None of this floor is releasable.

- A total of 16 paint samples was obtained from walls, divider floor. Sample locations included hot spots observed in the wall and floor surveys. The maximum alpha contamination remaining in place on one hot spot after paint removal is 489 dpm/100 cm^2 (sample #50P). Beta/gamma levels measured after paint removal were generally increased. Paint sample results are contained in Appendix G.

- Two cement sample cores were obtained from the floor, one from the northeast sector and one along a deep crack near the doorway Room D-109. After sectioning and preliminary screening, the top layers of each sample were sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The core from the northeast floor sector showed 3635 pCi/gm Cs-137 and 4 pCi/gm Co-60, concentrated in the top 1-inch section. The core taken in the floor crack showed 440 pCi/gm Cs-137 and 9 pCi/gm Bi-214, all concentrated in the top 1-inch section of cement.

- **West Corridor (Corridor No. 2)**

  - Seven large area smears on the floor and walls of this corridor showed no loose contamination above release.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, the shielding divider and in selected locations on upper walls. Numerous isolated areas bearing elevated surface activity were noted and recorded (see figure A-22 for map). Activities up to 250 dpm/100 cm^2 and 126,000 dpm/100 cm^2 beta/gamma were detected.

  - A 100% floor survey was made with the SRA monitor. The corridor was divided into survey units (north and south). Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 38,410 dpm/100 cm^2 (101,146 after correction for Cs-137) in the south half and 11025 dpm/100 cm^2 (94,125 after correction for Cs-137) in the north half. No appreciable alpha activity was detected on the floor. The highest

uncorrected gross beta/gamma activity seen in an individual 100 cm^2 area was 609,500 dpm. Most of the floor exceeds release limits.

- One cement sample core was obtained from the floor, outside the door to Cell 3. After sectioning and preliminary screening, the top 1-inch layer was sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The result was 20 pCi/g Cs-137, 0.8 pCi/g Bi-214, and 0.3 pCi/g Co-60, all in the top 1-inch layer.

- **North Corridor** Access to Cells 1, 2, 4A, and 4B.

  - A total of 52 large area smears, both large and small-area, showed mostly moderate levels of loose contamination, with several areas exceeding release limits for beta/gamma. A few areas showed marginal levels of loose alpha contamination. See Appendix H for details.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, door surfaces, and in selected locations on upper walls and ceilings. Detailed hot spot maps are found in figs A-23 through A-27. All wall surfaces were found to be highly and widely contaminated with total beta/gamma and alpha activity, with spots up to 400,000 dpm/100 cm^2 beta/gamma and 959 dpm/100 cm^2 alpha.

  - The Canberra ISOCS germanium detector gamma spectrometer system was used to identify and quantify gamma-emitting nuclides at one hot spot on the floor of this corridor, adjacent to the door to Cell 4A (Appendix E, Msmts #30103 and #30104). Only Cs-137 was detected, at a computed activity level of 1.1×10^6 dpm/100 cm^2.

  - A 100% floor survey was made with the SRA monitor. The area was divided into three survey units for analysis. Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 93,189 dpm/100 cm^2. After correction of the correction to account for the preponderance of Cs-137 activity, the average net surface activity becomes 245,088 dpm/100 cm^2. The highest uncorrected gross activity seen in a 100 cm^2 area is 4.1×10^6 dpm. All of this floor area exceeds release limits for total beta/gamma activity.

  - A total of 10 paint samples was obtained from walls and floor. Sample locations included hot spots observed in the wall and floor surveys. The

maximum alpha contamination remaining in place on one hot spot after paint removal is 28,100 dpm/100 cm^2 (sample #76P), indicative of painted-over alpha contamination on the south wall and also on the floor. Beta/gamma levels measured after paint removal were increased in some cases. Paint sample results are contained in Appendix G.

- Two cement sample cores were obtained from the floor, one at hot spots outside the entrances to Caves 1 and 2. After sectioning and preliminary screening, the top layers of each sample were sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The core from the hot spot outside Cave 1 showed 2590 pCi/gm Cs-137, 8 pCi/g Bi-214, 0.7 pCi/gm Co-60, concentrated in the top 1-inch section. The core taken from the hot spot outside Cave 2 showed 2424 pCi/gm Cs-137 and 8 pCi/gm Co-60, all concentrated in the top 1-inch section of cement.

- **Caves 1 and 2**

  - A total of 28 smears, both large and small-area, showed generally low levels of loose surface contamination in these two caves, except on the crane in Cave 1, and the duct opening in Cave 2, both of which were above release limits. The duct opening in Cave 2 showed 40,830 dpm/100 cm^2 beta/gamma. See Appendix H for details of smear data.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all interior surfaces. Fixed contamination is ubiquitous on the walls and fixtures. Detailed maps of the prominent activities are found in figures A-28 through A-34. A detailed survey of the exterior west wall of Cave 2 is found in figure A-35. Activities up to 350,000 dpm/100 cm^2 beta/gamma and 290 dpm/100 cm ^{2}alpha were noted.

  - A total of 9 paint samples was obtained from walls and floors of these two cells. Sample locations included hot spots observed in the wall and floor surveys. The maximum alpha contamination remaining in place on one hot spot after paint removal is 59 dpm/100 cm^2 (sample #30P). Beta/gamma levels measured after paint removal were generally increased. Paint sample results are contained in Appendix G.

- **Caves 4A and 4B**

  - A total of 17 large area smears showed mostly moderate levels of loose contamination on the interior surfaces of these caves. However, in Cave 4B, a floor smear picked up 12,526 dpm/100 cm^2 beta/gamma, and a smear of the east wall picked up 46,258 dpm/100 cm^2 loose beta/gamma. Also, the east and west interior walls of 4B show 500-1000 dpm/100 cm^2 loose alpha.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over the interior floors, walls, and fixtures in these caves (see figures A-36 through A-43 for detailed survey maps). All surfaces were found contaminated to varying degrees with fixed alpha and beta/gamma activity, with spots up to 560,000 dpm/100 cm^2 beta/gamma and 2500 dpm/100 cm^2 alpha.

  - A total of 9 paint samples was obtained from wall and the floor. Sample locations included hot spots observed in the wall and floor surveys. Only minimal amounts of alpha contamination were found under the paint, but up to 8000 dpm/100 cm^2 beta/gamma was found under the paint on the floor of Cell

- **Cave 3**

  - A total of 35 smears, both large and small-area, showed generally low levels of loose contamination on the floor, east and west walls. The north wall, containing the doors to Cells A, B, and C, showed significant loose contamination, up to 25,960 dpm/100 cm^2 beta/gamma and 67 dpm/100 cm^2 alpha. The south wall also bears loose beta/gamma contamination, up to 7200 dpm/100 cm^2 alpha. (See Appendix H for details of smear data).

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all walls, doors, and selected locations on upper walls. All wall surfaces and cave doors were found to be contaminated with total beta/gamma activity, with spots up 990,000 kdpm/100 cm^2. Alpha activity up to 1400 dpm/100 cm^2 was observed (as measured on top of paint layer). Detailed survey maps are found in Figures A-44 through A-47.

  - A scan of the top of the roof of Cave 3, including ducts, cable and connecting south wall for showed high levels of beta/gamma activity, up

to 72,500 dpm/100 cm^2 on a duct (probably attributable to internal contamination).

- The Canberra ISOCS germanium detector gamma spectrometer system was used to identify gamma-emitting nuclides at two locations (Appendix E, measurements #30106 and #30107). A hot spot at the bottom of the Cell A door and another on the south wall were both determined to be due to Cs-137.

- A 100% floor survey was made with the SRA monitor. Maps and data may be found in Appendix E. As calibrated with a Sr-Y90 source, the SRA survey showed an average net beta/gamma floor activity of 161,000 dpm/100 cm^2 beta/gamma. After correction of the correction to account for the preponderance of Cs-137 activity, the average net surface activity becomes 423,967 dpm/100 cm^2 beta/gamma. The entire floor is above release limits. The highest uncorrected gross activity seen in any 100 square centimeter area is 3.84 x 10^6 dpm/100 cm^2 beta/gamma. Activity is concentrated primarily toward the east end of the room.

- Two paint samples were obtained from floor. The maximum alpha contamination remaining in place on one hot spot after paint removal is 68 dpm/100 cm^2 (sample #30P). Beta/gamma levels measured after paint removal were increased. Paint sample results are contained in Appendix G.

- One cement sample core was obtained from the floor, along a crack near the west door. After sectioning and preliminary screening, two layers of the sample were sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The top 1-inch layer showed 149 pCi/g Cs-137, 11 pCi/g Bi-214, and 3.4 pCi/gm Co-60. Results from a deeper layer verified that this activity resides strictly in the surface inch layer.

- **Cells A, B, and C**

  - A total of 28 large area smears were taken on the floors, walls, and fixtures in these three cells. Levels of loose contamination were found to be moderate, but exceeding release limits in several locations. In Cell A, a floor smear (#304S) showed 9392 dpm/100 cm^2 beta/gamma; the remote manipulator 11,477 dpm/100 cm^2; the open transfer door 119, 048 dpm/100 cm^2 beta/gamma and 113 dpm/100 cm^2 alpha. In Cell B a

smear of the ductwork a picked up 9681 dpm/100 cm^2 beta/gamma. In Cell C loose beta/gamma contamination measuring 14,030 dpm/100 cm^2 was found on the north wall. (See Appendix H for details of smear data).

- Gamma exposure readings in these cells showed only slightly elevated fields, about 100 microR/hr.

- **Loading Dock**

  - A total of 15 large area smears showed no significant levels of loose alpha or beta/gamma. (see Appendix H for details of smear data).

  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, doors, floors, and selected locations on upper walls. The north, east, and west were found to bear fixed beta/gamma contamination as high as 100,000 dpm/100 cm^2. Both the dock and driveway floors bear numerous hot spots, with beta/gamma activities up to 25,000 dpm/100 cm^2 and loose alpha activities up to 130 dpm/100 cm^2 . (Detailed survey maps are found in Figures A-49 through A-52).

  - One cement sample core was obtained from the dock floor, at the location of a hot spot near the steps to the driveway level. After sectioning and preliminary screening, two layers of the sample were sent to ACL for gamma spectrometry analysis (See Appendix F for discussion of cement samples). The top 1-inch layer contained 35 pCi/g Cs-137 and 1.5 pCi/g Bi-214. Results from a deeper layer verified that this activity resides strictly in the surface inch layer.

- **Room C-115** Office and Main Entry

  - Full floor and lower wall scans for total surface activity were made with hand-held NE Electra instruments. Also, a scan of a portion of the floor was made with the SRA Monitor. No significant alpha or beta/gamma surface activity was detected.

- **Stairwell No. 2** (Northwest corner of building)

  - Two large area smears of the steps showed no significant loose contamination (see Appendix H for data).

- Full scans for total surface activity were made with hand-held NE Electra instruments and over steps and lower walls. No significant activity was detected above background.

- This stairwell was found to be releasable without remediation.

Second Floor

- **Fan Loft**

  - A total of 44 large area smears of floor and ductwork interiors showed mostly low levels of loose contamination. Ducts from Room D-109 contained high levels of loose alpha contamination (1889 dpm/100 cm^2) and beta/gamma contamination (10,902 dpm/100 cm^2). (See Appendix H for smear data details).

  - Full scans for total surface activity were made with hand-held NE Electra instruments and over walls, floors, fixtures, and selected locations on upper walls. All wall surfaces were found to be free of any significant contamination. The floor was determined to be largely uncontaminated, with the exception of isolated beta/gamma hot spots. Several of the hot spots appeared to be coincident with the deposition of small stalagmites under apparent small roof leaks, leading to the concern that the older sub-layers of the roof may be contaminated. Alpha activity up to 1400 dpm/100 cm^2 was observed (as measured on top of paint layer). (Detailed survey maps are found in Figures A-44 through A-47).

  - A 100% floor survey was made with the SRA monitor. The floor was divided into three survey units for analysis. Maps and data may be found in Appendix E. As calibrated with a SrY-90 source and corrected for response to Cs-137, the SRA survey showed an average net beta/gamma floor activity of 2270 dpm/100 cm^2. The highest uncorrected gross activity seen in any 100 square centimeter area is 3.51×10^6 dpm/100 cm^2 beta/gamma. More than 90% of the floor area is releasable.

  - The fan unit filters and ducts are contaminated.

Third Floor

- **Room D-335** Penthouse Laboratory (Elevator Motor Room)
  - A total of 16 large are smears of the floor, sub-floor, walls, and sink showed no loose contamination in this room.
  - Full scans for total surface activity were made with hand-held NE Electra instruments over all lower walls, plumbing fixtures, selected locations on upper walls and ducts, and the scrap pieces on the floor. No significant contamination or activation was detected above background.
  - No radiological remediation is required to release this room.

Service Floor

- **Room D-031 and adjoining corridor**
  - A total of 14 large area smears of floor and walls showed no significant loose contamination above background.
  - Full scans for total surface activity were made with hand-held NE Electra instruments over lower walls and piping. Evidence of several radioactive leaks were found and tagged on pipes in the corridor, corresponding to the position of hot spots on the floor. A radioactive pipe was detected and tagged.
  - A 100% floor survey was made with the SRA monitor. Maps and data may be found in Appendix E. The area was divided into two survey units for analysis. As calibrated with a Sr-Y90 source, the SRA survey showed no net surface activity in Room D-031, and an average net beta/gamma floor activity of 7637 dpm/100 cm^2 on the floor of the adjoining corridor, concentrated primarily in to areas under leaks. The highest uncorrected gross activity seen on any 100 square centimeter area in the corridor floor is 69,000 dpm/100 cm^2. Approximately 8% of the floor area in the corridor requires remediation for release.

- **Retention tank room**

  - Four large area smears of floor, walls, and tank exteriors showed no significant loose contamination above background.

  - Full scans for total surface activity were made with hand-held NE Electra instruments over floor, lower walls, piping, and tanks. No significant surface contamination was detected.

  - Results of an ACL analysis of a sample of water from the sump were as follows. From gamma spectrometry, less than 0.2 pCi/g each of Ra-226, Bi-214, and Th-232. From gross alpha/beta counting, less than 4 pCi/g alpha and less than 7 pCi/g beta-emitter. Considering only radiological contents, the sump is releasable. However, ACL analysis showed 205 micrograms/liter of mercury in the residual water, which will have to be disposed properly.

  - The retention tanks have been on a regular PFS clean-out schedule. Records show no recent evidence of radiological content in the water.

  - Pipes leading to retention tanks were not opened. However, activity in the pipes as seen closer to their origins makes all these pipes suspect for internal contamination.

Roof

- **Rooftop**

  - A total of 20 large area smears of rooftop, vents, edges, and fans showed no significant loose contamination above background.

  - Scans for total surface activity were made with hand-held NE Electra instruments on and around roof vents, and along roof edges. No significant activity was detected above background.

  - As discussed in the summary of fan loft surveys, there is reason to suspect the possibility of roof contamination which may have been covered over with new roofing in recent years. Before this building could be released, the upper layers of roofing should be removed in selected locations to search for possible contamination on older surfaces.

Beneath building

- **Service trench** under hot cell areas.

  - The central trench, pipes, and accessible adjacent areas were 100% scanned for total surface activity with NE Electra instruments. Considerable contamination was found, concentrated in areas of probably fluid leakage from the hot cell work areas on the first floor. Several drain pipes were also found to be contaminated. Figures A-53, A-54, and A-55 contain detailed maps of activities and locations. The highest uncorrected gross surface activity seen, 764,000 dpm/100 cm^2 beta/gamma and 1600 dpm/100 cm^2 alpha activities, was at location #2 (under the decontamination sink drain in Room-D109).

  - Six locations were selected for taking smears and soil samples, as shown in figure A-54. The large area smears showed significant loose surface contamination only in location #2 of figure A-54 (2522 dpm/100 cm^2 beta/gamma, 14 dpm/100 cm^2 alpha).

  - Soil samples of the top 3.5" at locations #1, 2, 3, 4, and 5 and 3.5" layers down to a depth of 14" at location #6 (figure A-54) were sent to ACL for gamma spectrometry. All soil samples contained significant amounts of Cs-137 (up to 680 pCi/g). Several contained Co-60 (up to 243 pCi/g at location #5) and Am-241 (up to 60,300 pCi/g at location #5). Penetration of activity into the soil fell off rapidly with depth, and was down to 4 pCi/g Cs-137 at a depth of 1 foot.

  - One soil sample (#5HCEL) , from location #6 (figure A-54), received alpha spectrometry and full beta analysis. Results identified contributions to alpha activity mostly from U-238 and U-233/234, with small amounts of Pu-238, Pu-239/240, U-232, and U-235/236. (See Appendix ___ for report).

  - A potentially major problem turned up when an undocumented, severed drain pipe which penetrates the east wall of the service trench was found to be internally contaminated with 25,000 dpm/100 cm^2 beta/gamma activity. The route and ultimate terminus of this pipe is unknown, and could not be found described in existing building construction or site utilities documentation. Site remediation would require full exploration of this drain pipe out of the building.

- Radon levels were determined by analysis of four air grab samples. Rn-222 levels were found to be from 22.8 pCi/l to 35.9 pCi/l, corresponding to about 0.5 DAC. Radon remediation should be implemented or appropriate respiratory protection should be worn for further entry into this area.

Exterior grounds

- Full scans of the ground surface out to 20 feet from the foundation and out 100 feet along the suspected path of an undocumented drain pipe were made with high-sensitivity side-shielded PRM5-3/PG2 gamma scintillation detectors. Two spots of slightly elevated activity were found, one near the east door, and another about 30 feet to the west of the service trench entrance. Nothing else remarkable was detected.

- Soil samples were obtained at seven locations, including two locations where slightly elevated surface activity had been detected. (See Appendix I for details). Sample depths ranged from 3 ft to 10 ft. The cores were divided into 1-foot samples, bagged and pre-screened for gamma activity in the shielded NaI detector chamber. No remarkable gamma activities were observed in the pre-screening process. Selected 1-ft plugs were sent to ACL for gamma spectrometry analysis. The only significant activity seen was Cs-137 (4.4 pCi/g) in the first 1-foot interval from sample SB-3 (near the trench entry). Tritium analysis was also performed on a sample from SB-6 (near the southwest corner of the building), with null results. In general, no evidence of significant soil contamination outside the building was found, except for the small amount of superficial Cs-137 at one location described above.

2.0 Results of Hazardous Materials Surveys

Tests for lead and PCB's in paint, hazardous chemicals in sump water and soil, and the results of an asbestos survey are summarized here. Detailed reports may be found in Appendix I.

Lead in Paint:

In-situ lead analysis of paint was conducted in 28 locations, representing all types of paint used in the facility. All but two of the test were positive for lead content, ranging from 0.004 mg/cm^2

to 1.1 mg/cm^2. Recommendations on remediation and safety precautions to be taken are contained in the Industrial Hygiene Report by D. Lucas and R. Utesh dated 12/23/97, copied in Appendix I.

PCB's in Paint:

PCB analysis of one representative floor paint sample from Room C-102 was performed by ACL. The report indicates 453 ppm Aroclor 1016/1242, and 3650 ppm Aroclor 1254. This is an unexpected result from what had been considered a routine check. It may be advisable to test more samples before planning paint removal and disposal.

Asbestos:

Analysis of 40 suspect samples were tested for asbestos content by ESH-Industrial Hygiene. Most were identified as asbestos containing. Appropriate precautions should be taken during removal of these materials. See the Industrial Report by D.R. Lucas and R.C. Utesh dated 1/16/98 in Appendix I for details.

Sump Water Analysis:

A sample of water standing in the drain sump in the retention tank room was tested by ACL for heavy metals, volatile organic, semivolatile compounds, and Di-n-butylphthalate, bis(2-Ethylhexyl)phthalate. No radionuclide concentrations above release limits were detected. But mercury contamination of 205 micrograms/liter was found in the residual sump fluid, giving rise to the possibility of mercury contamination in the retention tanks.*

Shield Window Fluid Leak Analysis:

A sample of the fluid and evaporate, expected to be an aqueous solution of $ZnBr_2$, on the floor under the exterior of the viewing window of Cell A was sent to ACL for chemical analysis. The presence of zinc and Bromine were verified, consistent with a 77% solution of $ZnBr_2$, with no other toxic materials, acids, etc. detected.

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* The source of the mercury is unknown.

3.0 Nuclide Inventory

The dominant floor contaminant was determined to be Cs-137, from in-situ and cement sample gamma spectrometry. No other nuclides in significant quantities, except near a few isolated hot spots were observed on the floor. From the detailed floor survey activity files supplied by Shonka Research Associates we compiled a total activity inventory, corrected for self-absorption, assuming Cs-137 within the top 0.5 cm layer of cement, under the paint. Table 2 contains a list of these results by floor survey unit for each room.

The total floor area surveyed is 1.09×10^7 cm^2, with a total of 2.32 millicuries of Cs-137.

Other nuclides detected in small quantities inside the building are: Am-241, Bi-214, Eu-154, Eu-155, and Pu-238. Only a relatively small number of wall and cell surface samples were analyzed in detail, however, so that individual hot areas and spots could contain significant quantities of these or other nuclides depending on what may have been spilled or splashed.

Soil samples were found to contain Pu-238, Pu-239, Pu-240, U-235/236, and U-238.

One paint sample contained NG-94 and Sr-90.

Due to the non-uniform nature of soil and wall contamination, and the relatively small quantities of nuclides observed, no attempt was made to perform a nuclide inventory for these areas. A much more detailed survey, with more samples and surface measurements would be required to establish a nuclide survey with reasonable levels of confidence.

4.0 Unexpected Results

- Our limited knowledge of the work processes that have taken place in this building led us to expect large amounts of Plutonium and Co-60 on the floors. These were not found, however. The wide distribution of Cs-137 was a surprise, although we had heard of Cs source spills.

- The two undocumented and contaminated drains in the service trench area provided a surprise when no record of their existence could be found in plant facility files. The routing and destination of these drains outside of the facility remain unknown. Many important facility blueprints could not be located, despite repeated searches through ANL-E Plant Facility Services archives. Missing drawings include construction drawings of the caves and cells, as well as utility details.

- Evidence of possible contamination seepage from the roof onto the fan loft floor has led to speculation that old underlayers of the roof may still be contaminated, and may have been covered during roof repair. Investigation of this possibility was out of the scope of this present characterization survey project.

- Lead and PCB contents of the interior paints were found to be high, which was not anticipated.

- Radon-222 levels in the service trench up to 0.5 DAC are higher than expected, leading to the advisability of remediation or respiratory protection for any further entries.

TABLE 3 Inventory of Cs-137 on Floors

Room	Unit	Area cm**2	Activity Corrected for Self-Absorption, Curies	Room Total, Curies
C-102	B-102A	3.95E+05	3.12E-05	
	B-102B	6.81E+05	2.31E-05	
	B-102C	5.87E+05	1.86E-05	
	TOTAL			7.29E-05
	BKG			
CAVE 3	B-CAVE3N	2.14E+05		4.13E-04
D-109	B-109A	5.36E+06		5.10E-04
West Corridor-SOUTH	B-C2N	1.75E+05		
West Corridor-NORTH	B-C2S	2.04E+05		
	TOTAL			1.07E-04
North Corridor	B-NCORA	3.55E+05		
	B-NCORB	4.56E+04		
	B-NCORC	2.01E+05		
	TOTAL			6.73E-04
Storeroom off C-102	STOR1	121850		
	STOR2	3.89E+04		
	TOTAL			1.67E-05
LOFT	LOFTA	4.63E+05		
	LOFTB	6.34E+05		
	LOFT C	5.21E+05		
	TOTAL**			4.24E-05
D-031	BASE2	2.97E+05		
Service floor corridor	BASE1	2.84E+05	9.87E-06	9.87E-06
D-101	101	3.65E+05		4.97E-04
TOTAL AREA		1.09E+07	square cm	
TOTAL ACTIVITY				2.32E-03 CURIES Cs-137

APPENDIX A:

PHOTOGRAPHS

FIGURE A-1 Building 301 Exterior, Southeast

FIGURE A-2 Building 301 Exterior, South Side

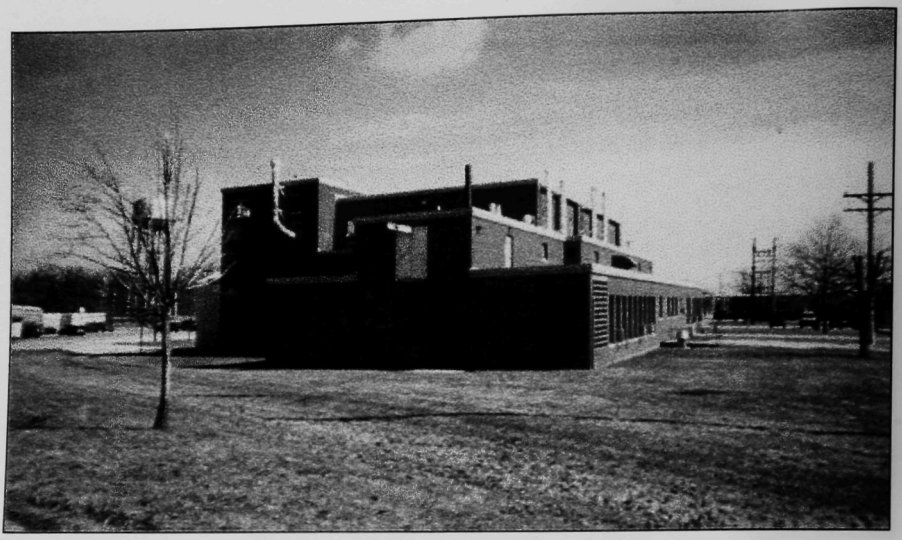


FIGURE A-3 Building 301 Exterior, Southwest

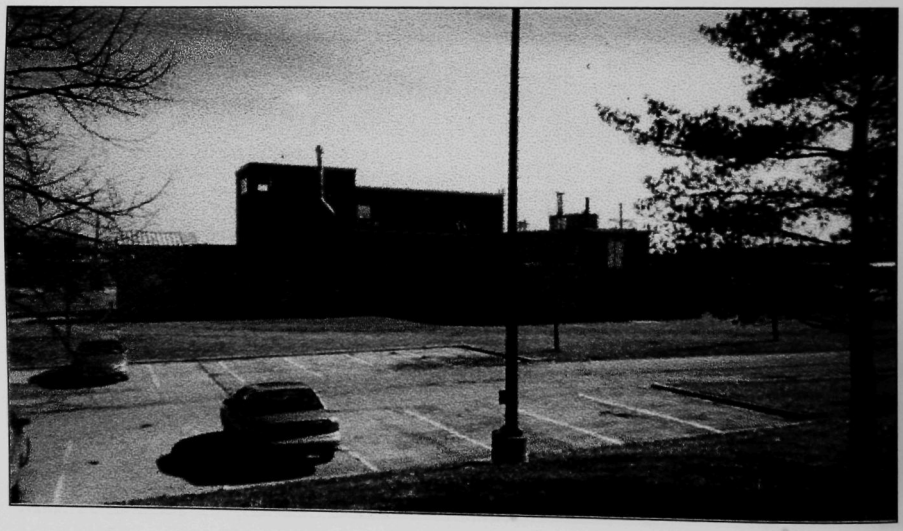


FIGURE A-4 Building 301 Exterior, Northeast

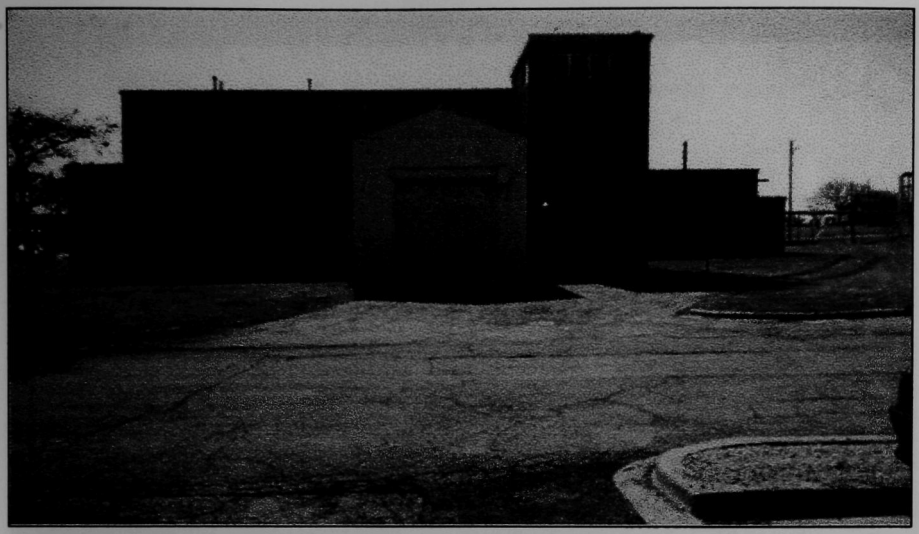


FIGURE A-5 Building 301 Exterior, North Side

FIGURE A-6 Building 301 Exterior, Northeast

FIGURE A-7 Plutonium Machining in Cell A in 1956, Featured on Cover of *American Machinist* (Ref. Fig. A-13)

FIGURE A-8 Room C-102, Northeast

FIGURE A-9 Room C-102, Showing East Side of Cave 5

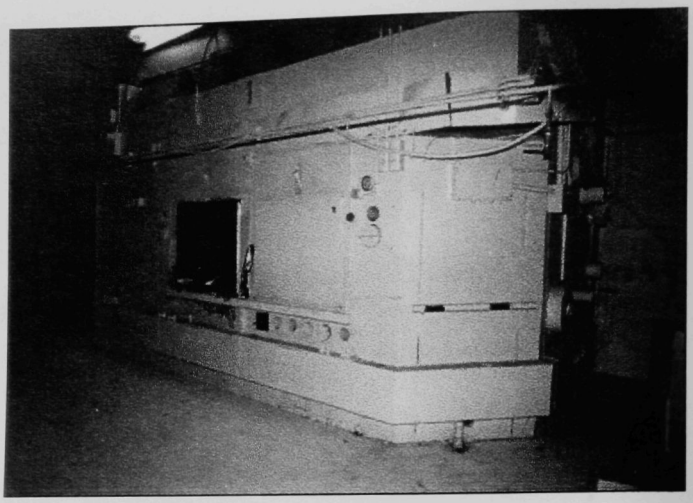


FIGURE A-10 Room C-102, North Wall, Exterior of Cave 2

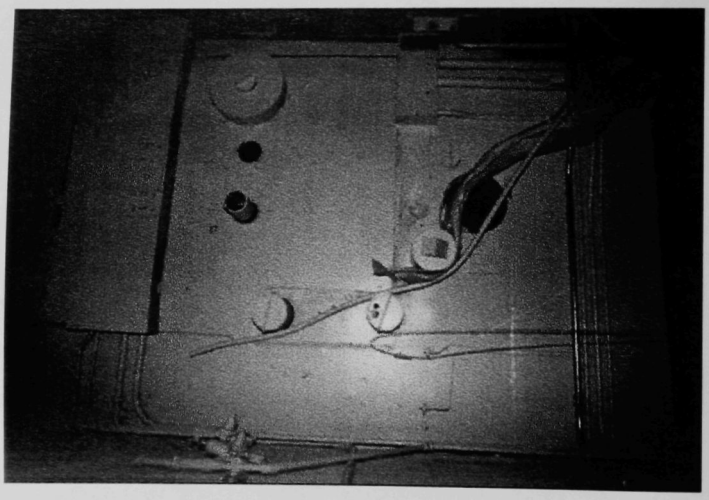


FIGURE A-11 Room C-102, North Wall, Exterior of East Wall of Cave 2

FIGURE A-12 Room C-102, North Wall, Facing Caves 4A and 4B

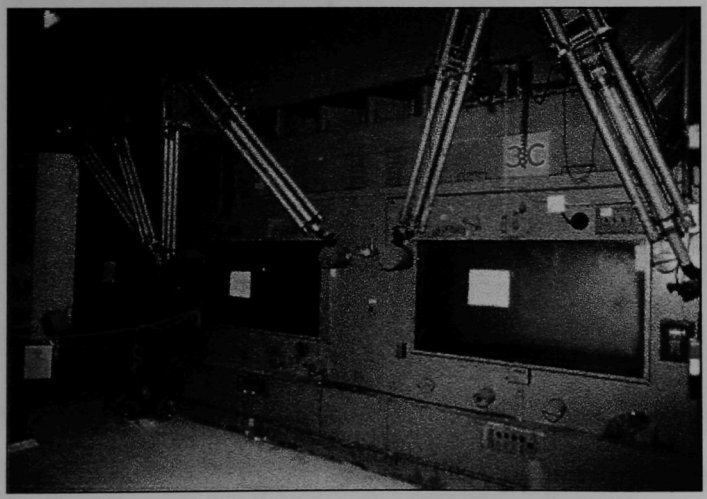


FIGURE A-13 Room C-102, South Wall, Facing Cells A, B, and C (Ref. Fig. A-7)

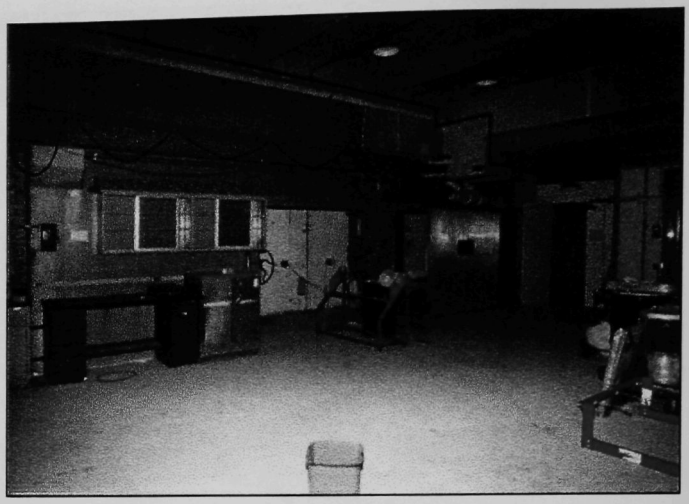


FIGURE A-14 Room D-109, Southwest Corner

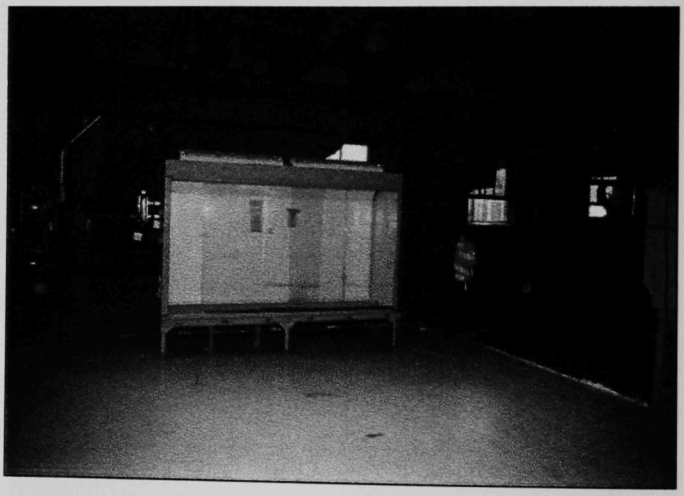


FIGURE A-15 Room D-109, North Wall

FIGURE A-16 Room D-109, East End

FIGURE A-17 Room D-109, South Wall

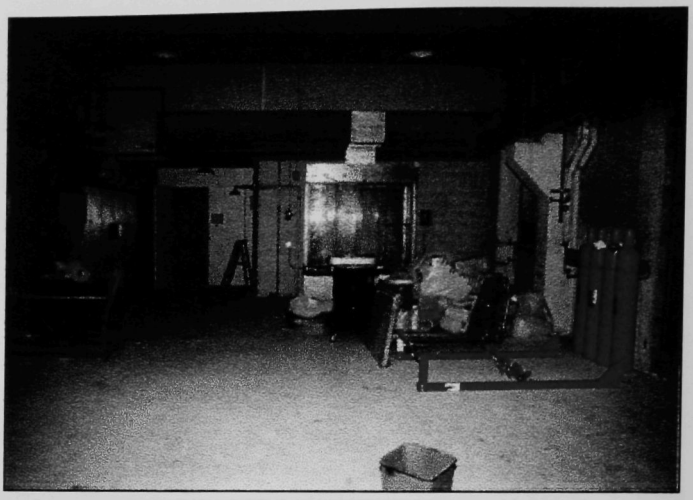


FIGURE A-18 Room D-109, West End

FIGURE A-19 Room D-109, Northeast Corner

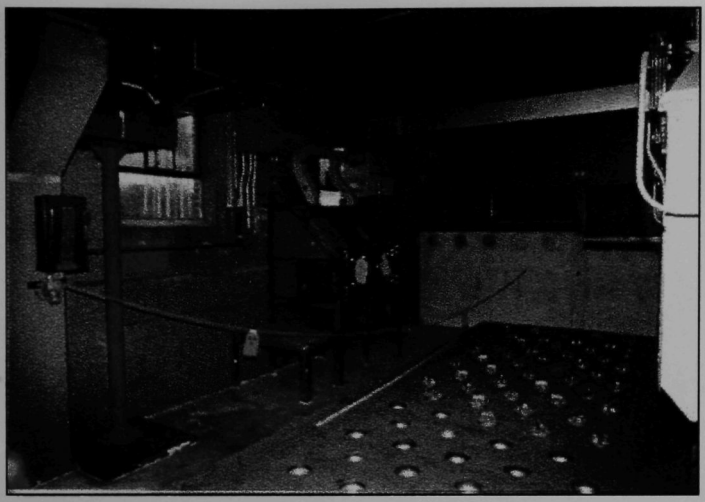


FIGURE A-20 Room D-109, Northeast Corner, Shielded Glovebox and Fuel Storage Area

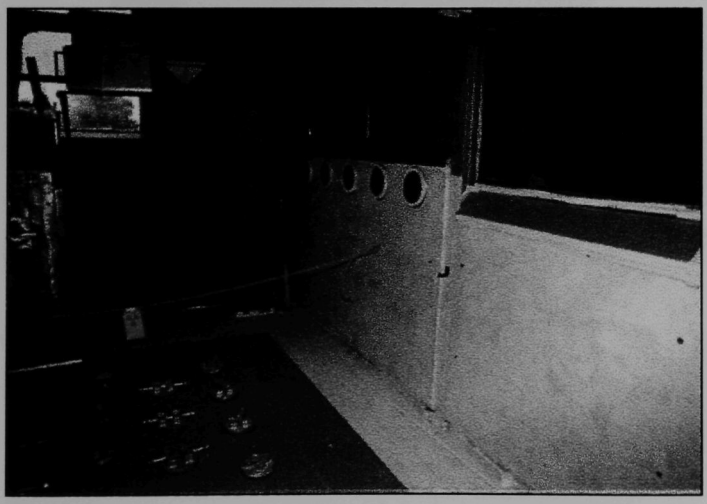


FIGURE A-21 Room D-109, Northeast Corner, Windows into Room D-101

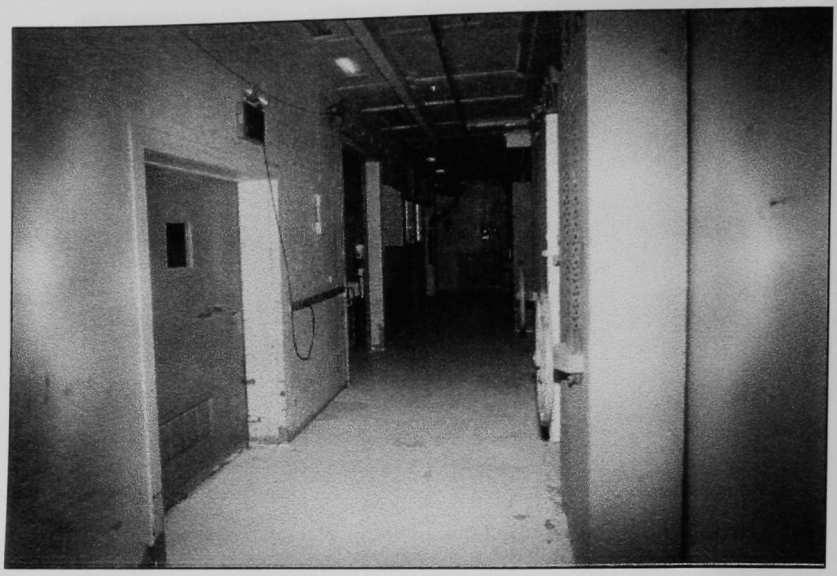


FIGURE A-22 North Corridor, Viewed to East from Cave 4B

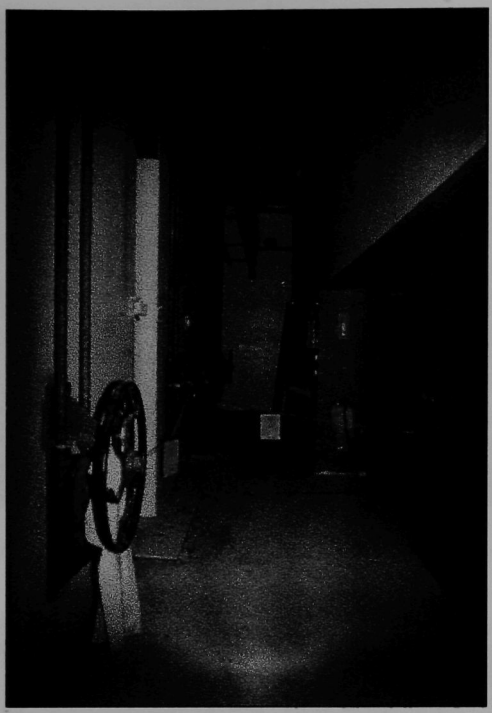


FIGURE A-23 North Corridor, Viewed to West from Cave 2

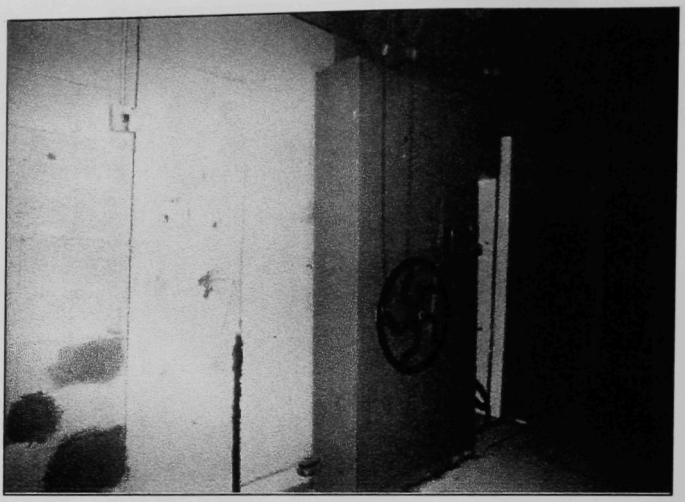


FIGURE A-24 North Corridor, South Wall, Entrance to Cave 1 from East

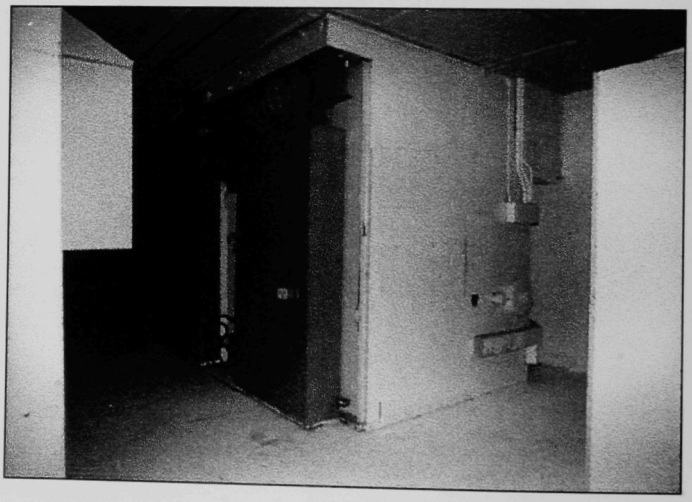


FIGURE A-25 North Corridor, South Wall, Entrance to Cave 1 from West

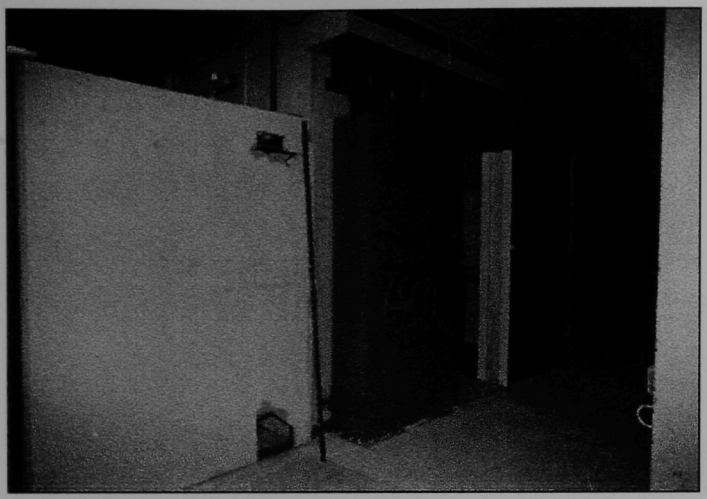


FIGURE A-26 North Corridor, South Wall, Entrance to Cave 2

FIGURE A-27 Cave 2, Southwest Interior Corner

FIGURE A-28 Cave 3, from Entry to West Corridor

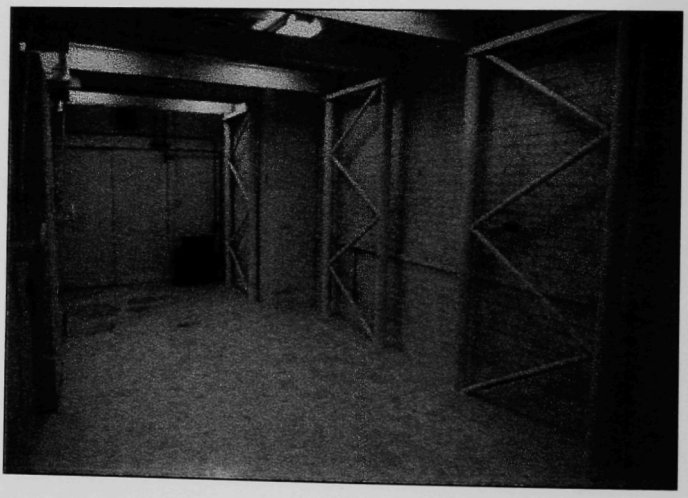


FIGURE A-29 Cave 3, Southeast Corner

FIGURE A-30 Opening Door to Cell A Inside Tent

FIGURE A-31 Cell A Door Entry, Initial Exposure Survey

FIGURE A-32 Fan Loft HEPA Units, North End

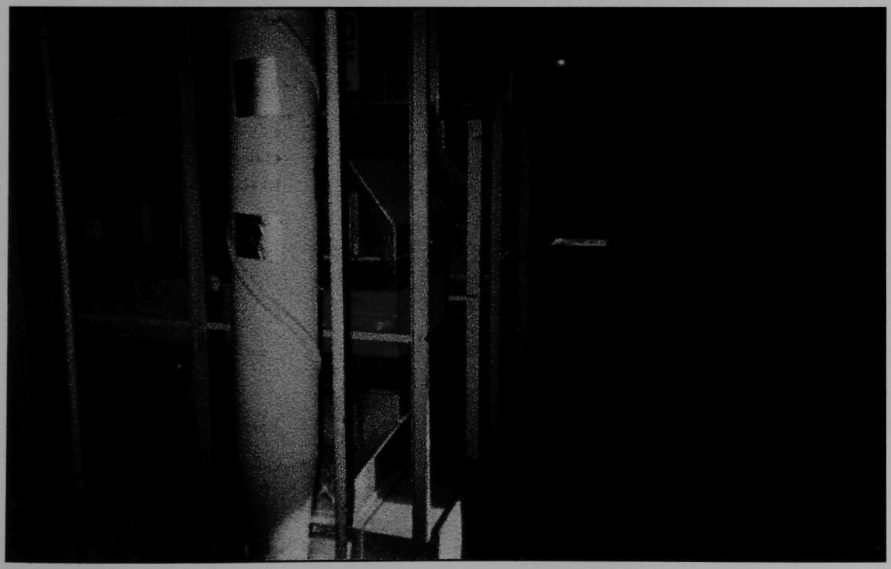


FIGURE A-33 Fan Loft HEPA Units, South Central

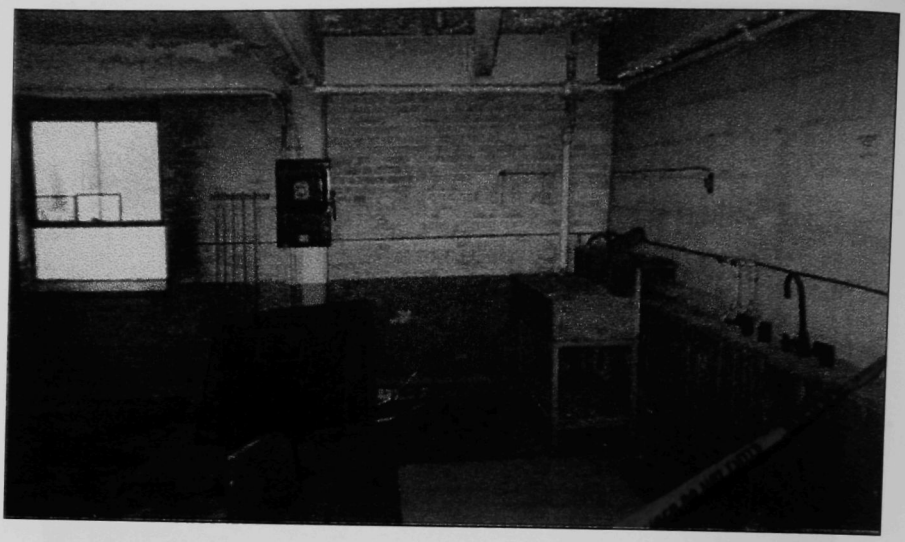


FIGURE A-34 Room D-335, Northwest Corner

FIGURE A-35 Room D-335, Southwest Corner

FIGURE A-36 Service Floor, Corridor Leading North to Room D-031

FIGURE A-37 Service Floor, Corridor to Room D-031, North End

FIGURE A-38 Service Floor, Corridor to Room D-031, East Wall Near Ceiling. Evidence of Leakage from Ground Floor, and Contaminated Pipe

FIGURE A-39 Service Floor, Corridor to Room D-031. Survey of Pipe Stub on West Wall

FIGURE A-40 Retention Tank Room

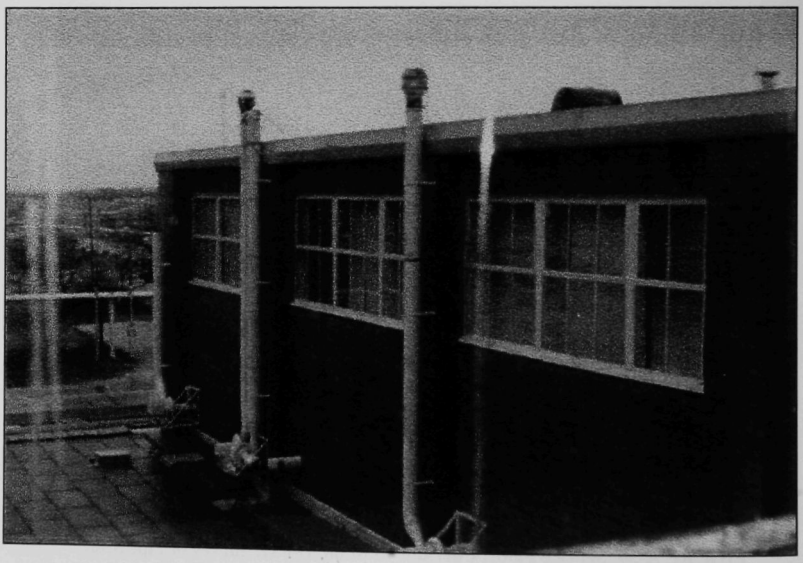


FIGURE A-41 Portion of Roof

FIGURE A-42 Service Trench, Preparation for Confined Space Entry

FIGURE A-43 Service Trench, Confined Space Entry

FIGURE A-44 Service Trench, South Side, Viewed Toward West

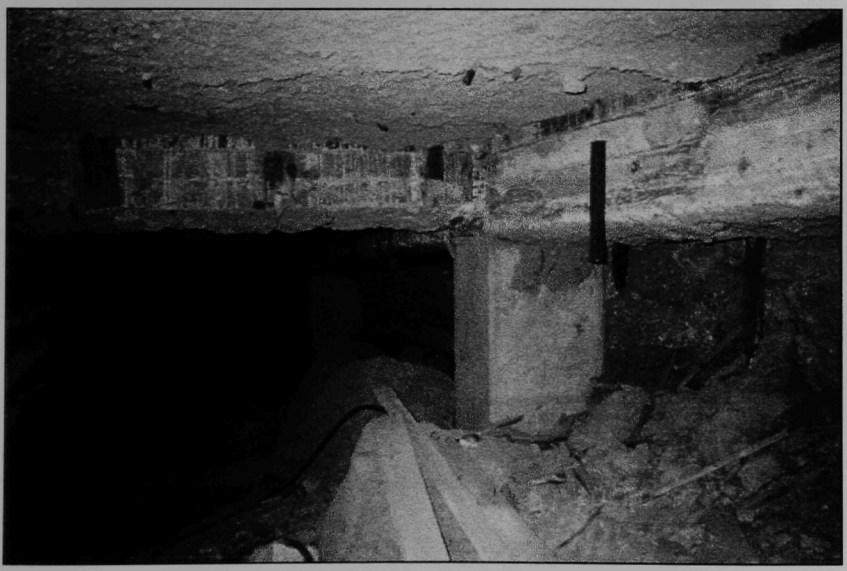


FIGURE A-45 Service Trench, Central Part of South Side, Toward West

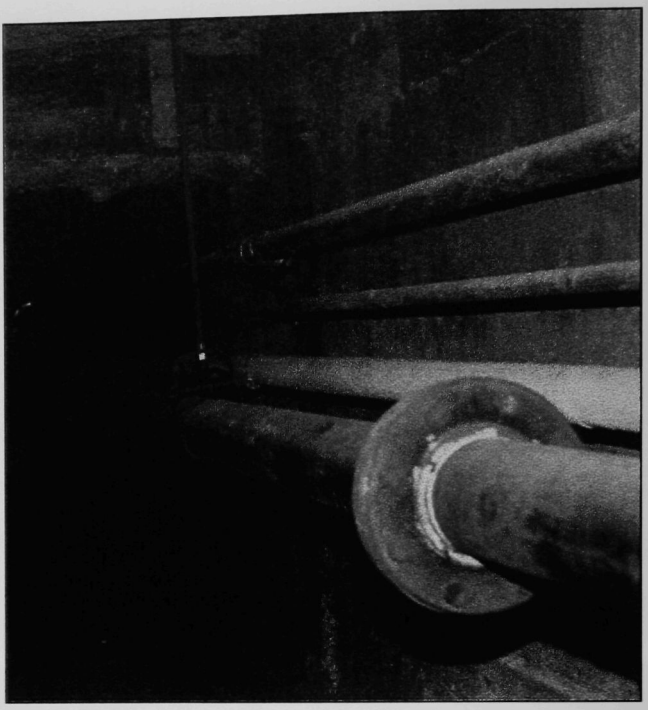


FIGURE A-46 Service Trench, South Side, Pipes Leading West

FIGURE A-47 Service Trench, South Side, Pipe to First Floor

FIGURE A-48 Service Trench, West Wall, Pipes through Wall. Large Pipe Leads to Retention Tanks

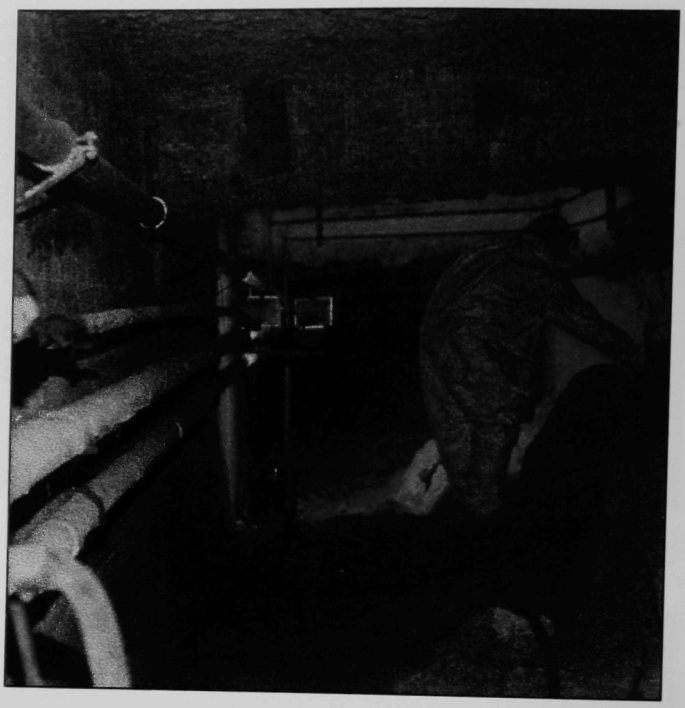


FIGURE A-49 Service Trench, North Side

FIGURE A-50 Service Trench, Pipes in Northwest Corner

FIGURE A-51 Service Trench, Detail of Pipes in Northwest Corner

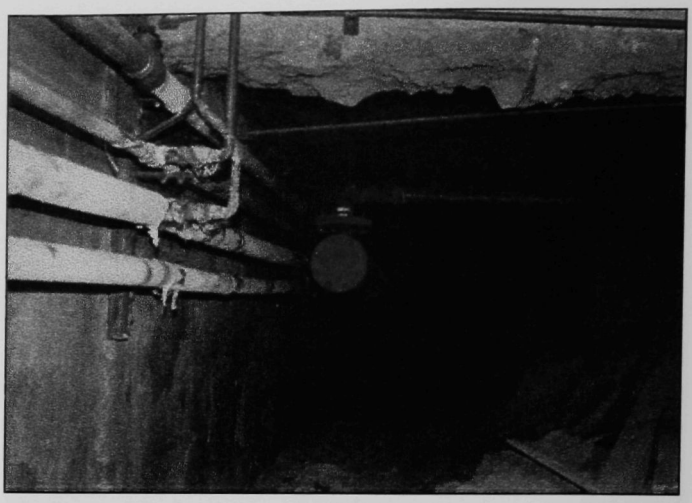


FIGURE A-52 Service Trench, North Side, Pipes Leading to Room D-109

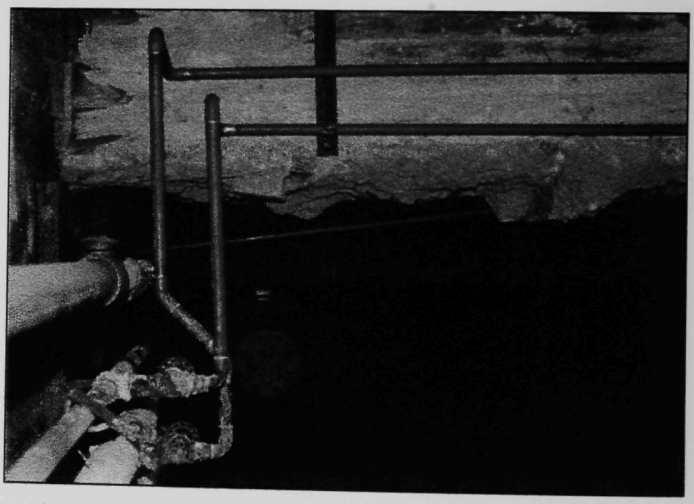


FIGURE A-53 Service Trench, North Side, Detail of Pipes Leading to Room D-109

FIGURE A-54 Service Trench, North Side, Drain Line from Room D-109

FIGURE A-55 Service Trench, North Side, Detail of Drain Line from Room D-109

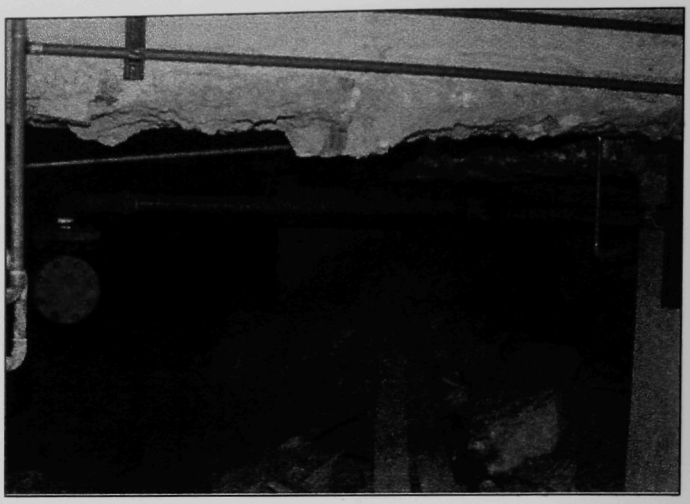


FIGURE A-56 Service Trench, North Side, Detail of Terminus of Drain Line from Room D-109

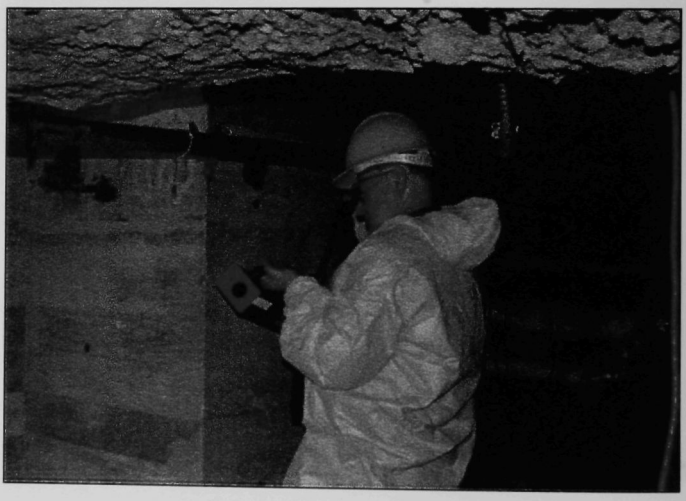


FIGURE A-57 Service Trench, Southeast Corner

FIGURE A-58 Service Trench, East Wall, Contaminated Drain Line to Outside, with undocumented Routing and Destination

FIGURE A-59 Service Trench, Entrance Pit, Opening of Undocumented Drain

FIGURE A-60 Soil Coring Rig

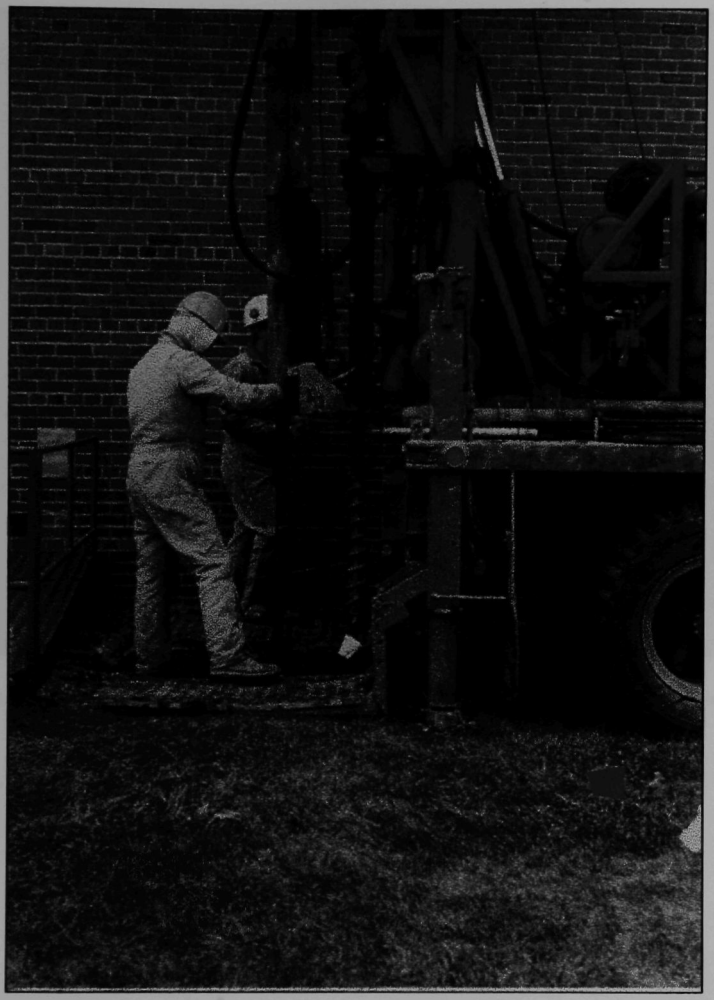


FIGURE A-61 Soil Coring Operation, Exterior East Wall Near Pit Entry (location of sample SB-3)

FIGURE A-62 Initial Field Scan of Soil Core Section

FIGURE A-63 Typical Soil Core as Removed

FIGURE A-64 Field Survey of Soil Core

FIGURE A-65 Soil Coring on Loading Dock Floor

FIGURE A-66 Assembled Soil Cores from Exterior Grounds

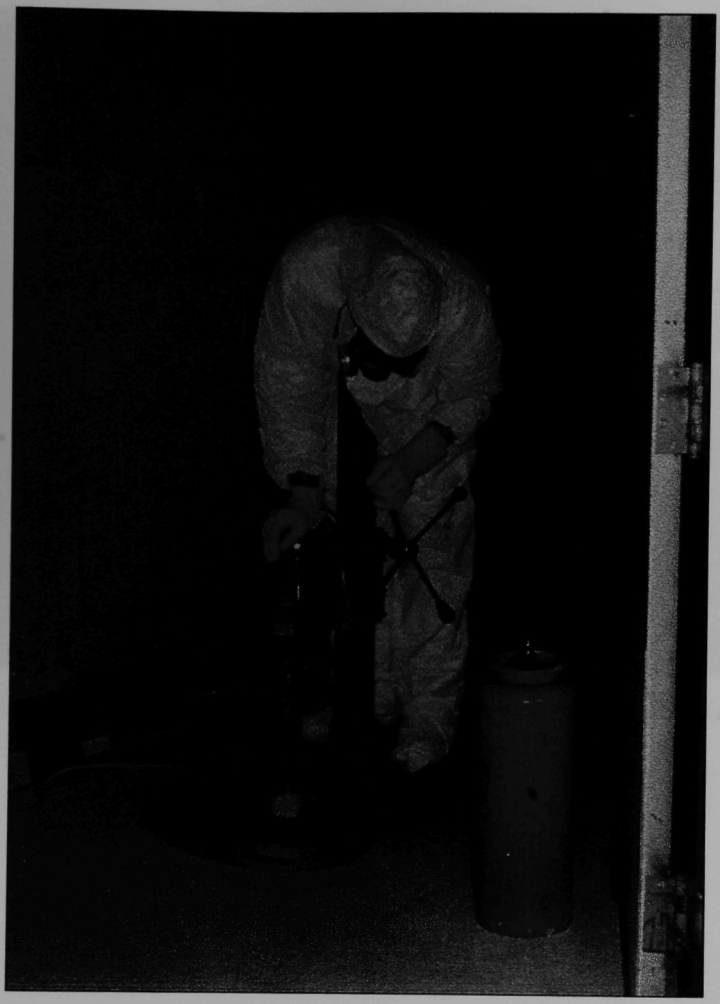


FIGURE A-67 Cement Coring Operation

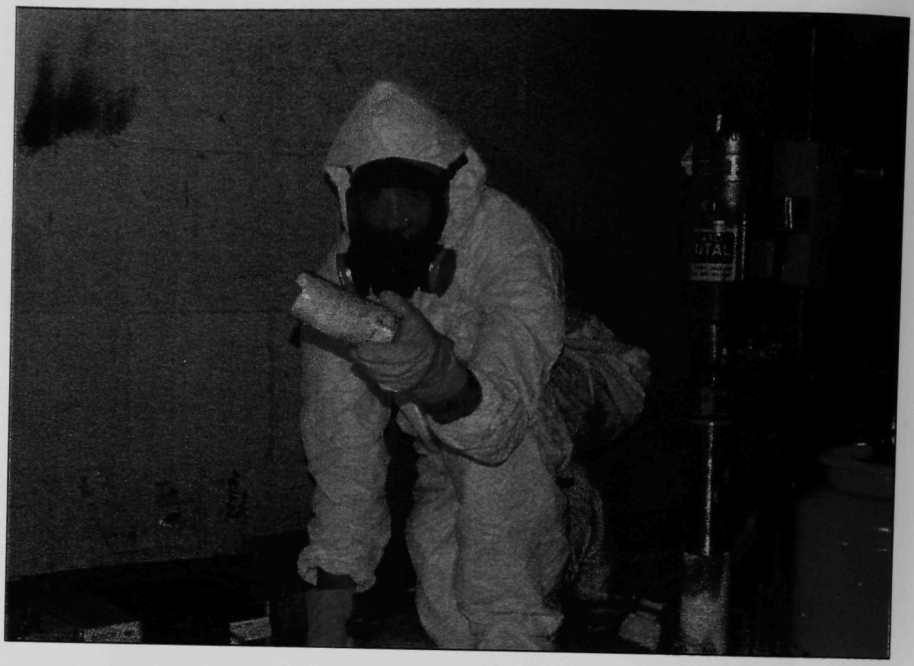


FIGURE A-68 Cement Core Plug as Removed

FIGURE A-69 Assembled Cement Cores, Bagged and Labeled

APPENDIX B:

LOOSE ACTIVITY SMEAR DATA

This appendix contains the following information pertaining to the laboratory counting of smears throughout the facility:

- listing of all results of smear counting for total loose alpha and beta/gamma, with location coordinates and sample identification,

- background and source standard calibration data for Tennelec automated counter.

Position coordinates (x, y, z) are in feet, relative to the southwest corner of area, with x and y in the horizontal plane of the floor and z indicating elevation above floor.

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	C-102 East	Cable tray east	13.7,8		68S		144.7 ± 31.4
LA Smear	C-102 East	East Wall	20,21 light fxtr		71S		79.2 ± 26.1
LA Smear	C-102 East	North Wall	10,6 manip hole		95S		719.2 ± 60.0
LA Smear	C-102 East	North Wall	10,9 manip hole		96S		1,851.3 ± 93.7
LA Smear	C-102 East	North Wall	10,12 manip hole		97S		404.9 ± 46.5
LA Smear	C-102 East	North Wall	10,34 manip hole		98S		62.0 ± 24.4
LA Smear	C-102 East	North Wall	10,37 manip hole		99S		43.0 ± 22.6
LA Smear	C-102 East	North Wall	10,40 manip hole		100S		72.8 ± 25.4
LA Smear	C-102 East	North Wall	10,43 manip hole		101S		207.3 ± 35.5
SA Smear	C-102 East	Rails	30,20		116S		79.2 ± 26.1
SA Smear	C-102 East	Roof	31,37		120S		44.7 ± 22.9
LA Smear	C-102 East	South Wall	14,49 cable try		81S		92.3 ± 27.3
LA Smear	C-102 East	West Wall	11.5,9		60S		45.7 ± 23.3
LA Smear	C-102 East	West Wall	2,3		103S		331.1 ± 42.7
LA Smear	C-102 East	West Wall	3,3		104S		93.0 ± 27.2
				Minimum			43.0 ± 22.6
				Maximum			1,851.3 ± 93.7
				Average			284.7 ± 35.7
				Standard Deviation			455.4 ± 18.6
				Count			15
LA Smear	C-102 West	3A manipulator	Left & right hand		166S		438.7 ± 48.2
LA Smear	C-102 West	Cable tray	11,16,13.5		160S		106.1 ± 28.2
LA Smear	C-102 West	Duct	10,23.5,16		153S		68.0 ± 25.0
LA Smear	C-102 West	East Wall	3,3		126S		82.8 ± 26.5
LA Smear	C-102 West	East Wall	6,3		127S		347.0 ± 43.7
LA Smear	C-102 West	East Wall	3,8		128S		67.3 ± 25.1
LA Smear	C-102 West	Light	12,30,17		152S		89.4 ± 26.9
LA Smear	C-102 West	North Wall	4,25	4A	134S		61.3 ± 24.5
LA Smear	C-102 West	North Wall	5,18	Center	135S		45.8 ± 23.0
LA Smear	C-102 West	North Wall	5,8		137S		50.6 ± 23.5
LA Smear	C-102 West	North Wall	.4,24.2	over cell #3	161S	21.79 ± 13.55	1,776.7 ± 92.0
LA Smear	C-102 West	Open hole		#2 on map	170S		51.8 ± 23.6
LA Smear	C-102 West	Open hole		#21 on map	169S		1,564.9 ± 86.5
LA Smear	C-102 West	South Wall	5,5	3A	142S		935.1 ± 67.8
				Minimum		21.79 ± 13.55	45.8 ± 23.0
				Maximum		21.79 ± 13.55	1,776.7 ± 92.0
				Average		21.79 ± 13.55	406.1 ± 40.3
				Standard Deviation		0.00 ± 0.00	568.8 ± 23.5
				Count		1	15
SA Smear	Cave 1	Crane			196S	96.52 ± 28.00	8,481.1 ± 197.7
SA Smear	Cave 1	Crane Rail			204S	27.77 ± 15.28	251.3 ± 38.2
SA Smear	Cave 1	Door	upper		197S		644.2 ± 57.1
SA Smear	Cave 1	East Wall	lower		202S		60.8 ± 24.3
SA Smear	Cave 1	Face	15,47		122S		43.5 ± 22.8
LA Smear	Cave 1	HEPA	area o/s hepa		64S		132.8 ± 30.5
SA Smear	Cave 1	North Wall	upper		203S		259.7 ± 38.7
SA Smear	Cave 1	North Wall	upper	Elect. fixture	206S		57.3 ± 24.0
SA Smear	Cave 1	North Wall	upper		207S		1,709.7 ± 90.2
SA Smear	Cave 1	South Wall	upper		200S	19.44 ± 12.92	914.4 ± 67.0
SA Smear	Cave 1	South Wall		shelf	205S	13.19 ± 10.81	473.9 ± 49.8
SA Smear	Cave 1	South Wall	lower	Left side	208S		5,645.4 ± 161.7
LA Smear	Cave 1	South Wall	lower	Right side	209S		247.8 ± 38.0
SA Smear	Cave 1	Top	32,47		121S		73.2 ± 25.6
				Minimum		13.19 ± 10.81	43.5 ± 22.8
				Maximum		96.52 ± 28.00	8,481.1 ± 197.7
				Average		39.23 ± 16.75	1,356.8 ± 61.8
				Standard Deviation		33.48 ± 6.68	2,429.7 ± 51.9
				Count		4	15
LA Smear	Cave 2	East Wall		Duct opening	210S	163.63 ± 36.29	40,830.8 ± 432.5
LA Smear	Cave 2	East Wall	3,3	Cell 2	222S		315.3 ± 41.9
LA Smear	Cave 2	East Wall	5,2	Cell 2	223S		992.7 ± 69.7
LA Smear	Cave 2	North Door	3,4		212S	21.96 ± 13.55	1,095.1 ± 73.0
LA Smear	Cave 2	North Wall	5,8		211S		220.1 ± 36.3
LA Smear	Cave 2	South Wall	10,7		218S		49.8 ± 23.3
LA Smear	Cave 2	South Wall	7,5		219S		490.3 ± 50.6
LA Smear	Cave 2	West wall	18,39.2,10		150S	23.60 ± 14.15	503.7 ± 51.2

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	Cave 2	West Wall	9,3	Cell 2	214S		114.1 ± 28.9
LA Smear	Cave 2	West Wall	7,1	Cell 2	217S	36.54 ± 17.33	284.3 ± 40.2
				Minimum		21.96 ± 13.55	49.8 ± 23.3
				Maximum		163.63 ± 36.29	40,830.8 ± 432.5
				Average		61.43 ± 20.33	4,489.6 ± 84.7
				Standard Deviation		59.27 ± 9.33	12,118.2 ± 116.9
				Count		4	10
LA Smear	Cave 3	By North Wall	0,10	Crane opening	226S		4,094.2 ± 138.0
LA Smear	Cave 3	Door rail	5,2.5	Near ceiling	245S	21.92 ± 13.55	1,780.7 ± 92.0
LA Smear	Cave 3	Door rail	10,6.6	Near ceiling	246S	51.08 ± 20.42	5,447.4 ± 158.8
LA Smear	Cave 3	Door rail	7,10.5	Near ceiling	247S	26.08 ± 14.73	3,748.6 ± 132.1
LA Smear	Cave 3	Door rail	8,14.5	Near ceiling	249S	34.42 ± 16.84	4,572.4 ± 145.7
LA Smear	Cave 3	Door rail	7,18	Near ceiling	250S		2,110.5 ± 99.9
LA Smear	Cave 3	Door rail	8,22.5	Near ceiling	251S	19.83 ± 12.92	1,660.5 ± 89.0
LA Smear	Cave 3	East Wall	under side door	Cell C	244S		76.0 ± 25.7
LA Smear	Cave 3	East Wall	8,4		273S		106.1 ± 28.2
LA Smear	Cave 3	East Wall	2.8,8		274S		398.9 ± 46.2
LA Smear	Cave 3	East Wall	2,3		275S	23.60 ± 14.15	1,321.6 ± 79.7
LA Smear	Cave 3	East Wall	3,6		276S		389.4 ± 45.8
LA Smear	Cave 3	Floor	0,0.1	By east wall	224S		290.6 ± 40.5
LA Smear	Cave 3	Floor	0,15	N. wall door	227S		73.9 ± 25.5
LA Smear	Cave 3	Floor	0,24	S. W. Corner	228S		82.3 ± 26.3
LA Smear	Cave 3	Floor	0,23	N.W. corner	229S		143.0 ± 31.1
LA Smear	Cave 3	Floor	6.5,6.5		242S		116.5 ± 29.1
LA Smear	Cave 3	Floor	6.5,13		277S		240.3 ± 37.6
LA Smear	Cave 3	Floor	9.8,26		278S		432.0 ± 47.9
LA Smear	Cave 3	Floor	6.5,19.5		279S		121.3 ± 29.5
SA Smear	Cave 3	Floor	9.8,16.25		280S		177.2 ± 33.5
SA Smear	Cave 3	Floor	3,7		281S		58.2 ± 24.1
SA Smear	Cave 3	Floor	9.8,6.5		283S		353.4 ± 43.9
LA Smear	Cave 3	Floor	3.3,3.3		241S		46.3 ± 22.9
LA Smear	Cave 3	North Wall	2,6		231S		4,272.8 ± 140.9
LA Smear	Cave 3	North Wall	6,12		232S	42.35 ± 18.72	25,960.8 ± 345.0
LA Smear	Cave 3	North Wall	5,19		233S	67.35 ± 23.46	20,772.8 ± 308.7
LA Smear	Cave 3	North Wall	6.5,23.5		234S		2,137.0 ± 100.4
LA Smear	Cave 3	North Wall	under left door	Cave A	243S		241.5 ± 37.7
LA Smear	Cave 3	North Wall	7,16.5		248S	21.92 ± 13.55	4,379.5 ± 142.7
LA Smear	Cave 3	North Wall	8,8.5		253S		939.0 ± 67.9
SA Smear	Cave 3	North Wall		under mid door	282S	26.13 ± 14.73	3,829.6 ± 133.5
LA Smear	Cave 3	Pump	4,24		252S		75.9 ± 25.8
LA Smear	Cave 3	Roof	4,23		162S		300.5 ± 41.3
LA Smear	Cave 3	Roof	3.7,19.5		163S		513.6 ± 51.8
LA Smear	Cave 3	Roof	2.5,16		164S		550.5 ± 53.4
LA Smear	Cave 3	Roof	6.2,13		165S		519.5 ± 52.0
LA Smear	Cave 3	Roof	3.4,12	Cable tray	171S		73.1 ± 25.8
LA Smear	Cave 3	Roof	2.1,14	N. wall duct	175S		180.2 ± 34.0
LA Smear	Cave 3	Roof	5,0	S. wall duct	176S		144.5 ± 31.5
LA Smear	Cave 3	Roof	3.2,7.5		177S		195.7 ± 35.0
LA Smear	Cave 3	Roof	6,4.2		178S		3,914.8 ± 135.0
LA Smear	Cave 3	Roof	3.5,.9		179S		387.4 ± 45.9
LA Smear	Cave 3	Roof	7.5,6,7.5	W. overhd light	183S		66.0 ± 25.2
LA Smear	Cave 3	Roof	9.5,23,7.5	East light	184S		236.2 ± 37.6
LA Smear	Cave 3	Roof	2.3,24		185S		1,692.1 ± 89.8
LA Smear	Cave 3	Roof	4.5,16.6		186S		839.8 ± 64.6
LA Smear	Cave 3	Roof	1.8,10		187S		423.1 ± 47.6
LA Smear	Cave 3	Roof	2.5,8.4		188S		606.4 ± 55.7
SA Smear	Cave 3	Roof	7,6.3		189S		1,602.9 ± 87.5
SA Smear	Cave 3	Roof	2.8,6.5		190S	19.71 ± 12.92	2,662.4 ± 111.8
SA Smear	Cave 3	Roof	6.3,3		191S		301.7 ± 41.4
SA Smear	Cave 3	Roof	6.7,1.7		192S		977.9 ± 69.3
SA Smear	Cave 3	Roof	7.3,8.3		193S		313.6 ± 42.0
SA Smear	Cave 3	Roof	7.3,12.3		194S		8,754.0 ± 200.9
SA Smear	Cave 3	Roof	7.3,20.9		195S		361.2 ± 44.6
LA Smear	Cave 3	South Wall	0,6	By pipe	225S		456.1 ± 49.0
LA Smear	Cave 3	South Wall	6.8,1		239S		256.1 ± 38.5
LA Smear	Cave 3	South Wall	5,7		240S	31.94 ± 16.34	7,200.1 ± 182.3

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	Cave 3	South Wall	7,12		271S		696.6 ± 59.1
LA Smear	Cave 3	South Wall	4,17.5		272S		663.2 ± 57.8
LA Smear	Cave 3	West Wall	7,2		235S		83.5 ± 26.4
LA Smear	Cave 3	West Wall	1,4		236S		171.6 ± 33.1
LA Smear	Cave 3	West Wall	2,6.5		237S		673.9 ± 58.3
LA Smear	Cave 3	West Wall	4,7		238S		322.8 ± 42.3
				Minimum		19.71 ± 12.92	46.3 ± 22.9
				Maximum		67.35 ± 23.46	25,960.8 ± 345.0
				Average		32.19 ± 16.02	1,947.5 ± 73.0
				Standard Deviation		14.05 ± 3.18	4,247.8 ± 62.4
				Count		12	65
LA Smear	Cave 4A	East Wall	8.7,3.4		44S		677.1 ± 58.5
LA Smear	Cave 4A	East Wall	hot spot plate over port		718S		1,177.5 ± 75.6
SA Smear	Cave 4A	South Wall	8.7,2.0		40S		1,186.7 ± 75.8
SA Smear	Cave 4A	South Wall	5.8,5.5	metal plate	41S	17.75 ± 12.25	100.9 ± 28.0
LA Smear	Cave 4A	South Wall	3.0,2.4		42S	32.33 ± 16.34	292.6 ± 40.7
LA Smear	Cave 4A	South Wall	4.0,7.6		43S		123.6 ± 29.8
SA Smear	Cave 4A	West Wall	5.3,5.8	filter	36S	701.08 ± 74.96	2,462.8 ± 107.6
				Minimum		17.75 ± 12.25	100.9 ± 28.0
				Maximum		701.08 ± 74.96	2,462.8 ± 107.6
				Average		250.39 ± 34.52	860.2 ± 59.4
				Standard Deviation		318.74 ± 28.65	779.2 ± 26.9
				Count		3	7
SA Smear	Cave 4B	East Wall	2.1,1.4	filter	34S	486.50 ± 62.46	1,678.3 ± 89.4
SA Smear	Cave 4B	East Wall	5.3,5.5		35S		100.9 ± 28.0
LA Smear	Cave 4B	East Wall	10,3		265S	171.92 ± 37.20	46,258.1 ± 460.3
LA Smear	Cave 4B	East Wall	3,4		267S		150.9 ± 31.8
LA Smear	Cave 4B	East Wall	5,6		268S	521.92 ± 64.69	2,058.1 ± 98.7
LA Smear	Cave 4B	Floor	3,2		258S		272.4 ± 39.6
LA Smear	Cave 4B	Floor	5,6		259S	55.25 ± 21.22	381.9 ± 45.5
LA Smear	Cave 4B	Floor	4,4		260S	38.58 ± 17.80	383.1 ± 45.5
LA Smear	Cave 4B	Floor	1,8		262S		12,525.9 ± 240.0
LA Smear	Cave 4B	Floor	1,1		270S	13.58 ± 10.81	305.7 ± 41.5
LA Smear	Cave 4B	Floor	4,4		255S	34.42 ± 16.84	197.4 ± 35.0
SA Smear	Cave 4B	North Wall	.2,0		33S		54.5 ± 23.9
LA Smear	Cave 4B	North Wall	7,4		261S	13.58 ± 10.81	933.1 ± 67.7
LA Smear	Cave 4B	South Wall	2,4		256S	46.92 ± 19.59	240.2 ± 37.7
LA Smear	Cave 4B	South Wall	6,5		257S		222.4 ± 36.6
LA Smear	Cave 4B	West Wall	4,2		263S	1,065.67 ± 92.40	3,284.3 ± 123.9
LA Smear	Cave 4B	West Wall	8,2		264S	349.00 ± 52.93	1,277.1 ± 78.5
				Minimum		13.58 ± 10.81	54.5 ± 23.9
				Maximum		1,065.67 ± 92.40	46,258.1 ± 460.3
				Average		254.30 ± 36.98	4,136.7 ± 89.6
				Standard Deviation		315.22 ± 26.00	10,918.9 ± 105.9
				Count		11	17
LA Smear	Cave 5	Ceiling	entire ceiling		49S		53.3 ± 23.7
LA Smear	Cave 5	Door Rails			79S		45.8 ± 23.0
LA Smear	Cave 5	Filter bank			50S	28.17 ± 15.28	65.2 ± 24.9
LA Smear	Cave 5	Floor			51S	17.75 ± 12.25	97.4 ± 27.7
LA Smear	Cave 5	West Port			80S		51.8 ± 23.6
				Minimum		17.75 ± 12.25	45.8 ± 23.0
				Maximum		28.17 ± 15.28	97.4 ± 27.7
				Average		22.96 ± 13.77	62.7 ± 24.6
				Standard Deviation		5.21 ± 1.51	18.4 ± 1.6
				Count		2	5
LA Smear	Cell A	Door			308S		120.3 ± 29.6
LA Smear	Cell A	Ductwork			312S		823.9 ± 64.0
LA Smear	Cell A	East Wall			305S		1,623.9 ± 88.0
LA Smear	Cell A	Floor			304S		9,321.5 ± 207.3
LA Smear	Cell A	Manipulator			310S	22.17 ± 13.55	11,407.2 ± 229.1
LA Smear	Cell A	North Wall			309S	26.33 ± 14.72	3,023.9 ± 119.0
LA Smear	Cell A	Open transfer		door	313S	111.75 ± 30.01	118,977.4 ± 737.9
LA Smear	Cell A	South Wall			307S		4,451.3 ± 143.8
LA Smear	Cell A	West Wall			306S		850.1 ± 64.9
				Minimum		22.17 ± 13.55	120.3 ± 29.6
				Maximum		111.75 ± 30.01	118,977.4 ± 737.9

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
				Average		53.42 ± 19.43	16,733.3 ± 187.1
				Standard Deviation		41.28 ± 7.50	36,340.4 ± 204.6
				Count		3	9
LA Smear	Cell B	Door			288S		322.7 ± 42.4
LA Smear	Cell B	Door	Edge		291S		166.7 ± 33.0
LA Smear	Cell B	Door	Edges		311S		173.9 ± 33.5
LA Smear	Cell B	Ductwork			292S	15.92 ± 11.55	9,610.8 ± 210.4
LA Smear	Cell B	East Wall			285S		807.2 ± 63.4
LA Smear	Cell B	Floor			284S		1,023.9 ± 70.8
LA Smear	Cell B	Manipulator			290S		1,850.1 ± 93.7
LA Smear	Cell B	Port			293S		615.5 ± 56.0
LA Smear	Cell B	South Wall			287S		483.4 ± 50.3
LA Smear	Cell B	West Wall			286S		181.0 ± 33.9
				Minimum		15.92 ± 11.55	166.7 ± 33.0
				Maximum		15.92 ± 11.55	9,610.8 ± 210.4
				Average		15.92 ± 11.55	1,523.5 ± 68.7
				Standard Deviation		0.00 ± 0.00	2,740.2 ± 50.7
				Count		1	10
LA Smear	Cell C	Door			324S		66.7 ± 25.1
LA Smear	Cell C	Door edges			330S		141.7 ± 31.2
LA Smear	Cell C	East Wall			327S		860.8 ± 65.3
LA Smear	Cell C	Floor			329S		253.6 ± 38.5
LA Smear	Cell C	Manipulator			331S	43.00 ± 18.71	4,001.3 ± 136.5
LA Smear	Cell C	North Wall			325S	13.83 ± 10.81	13,959.6 ± 253.3
LA Smear	Cell C	South Wall			326S		137.0 ± 30.8
LA Smear	Cell C	West Wall			328S		1,166.7 ± 75.2
				Minimum		13.83 ± 10.81	66.7 ± 25.1
				Maximum		43.00 ± 18.71	13,959.6 ± 253.3
				Average		28.42 ± 14.76	2,573.4 ± 82.0
				Standard Deviation		14.58 ± 3.95	4,473.7 ± 73.3
				Count		2	8
LA Smear	D-101	3R	Handle of Right door		366S		9,983.2 ± 214.4
LA Smear	D-101	Crane	Overhead crane	motor	371S		3,379.6 ± 125.6
LA Smear	D-101	Crane	Overhead crane		372S		628.4 ± 56.5
LA Smear	D-101	Crane	Overhead crane	rail	373S		4,943.9 ± 151.4
LA Smear	D-101	East Wall	1,18	Floor	349S		53.7 ± 23.6
LA Smear	D-101	East Wall	4,2	Floor	351S		57.3 ± 24.0
LA Smear	D-101	East Wall	3.3,3.3		352S		579.6 ± 54.5
LA Smear	D-101	East Wall	3.3,9.8		354S		46.3 ± 22.9
LA Smear	D-101	East Wall	3.3,26		360S		210.5 ± 35.7
LA Smear	D-101	Floor	3,3		378S		253.4 ± 38.4
LA Smear	D-101	Floor	12,6		379S		126.0 ± 29.8
LA Smear	D-101	Floor	27,3		381S	15.71 ± 11.55	160.5 ± 32.4
LA Smear	D-101	Floor	9,9		382S		67.7 ± 25.0
LA Smear	D-101	Floor	21,12		383S		60.5 ± 24.3
LA Smear	D-101	Floor	6,12		385S		71.3 ± 25.3
LA Smear	D-101	Floor	15,12		386S		73.6 ± 25.5
LA Smear	D-101	Floor	18,6		387S	59.46 ± 21.99	342.7 ± 43.4
LA Smear	D-101	Floor	24,9		388S		83.2 ± 26.4
SA Smear	D-101	Middle wall	1,19	East side floor	346S		464.4 ± 49.4
LA Smear	D-101	Middle wall	1,22	West side floor	350S	17.35 ± 12.25	85.8 ± 26.6
LA Smear	D-101	Middle wall	West side		376S		311.7 ± 41.7
LA Smear	D-101	Middle wall	East side		377S		67.7 ± 25.0
LA Smear	D-101	North Wall	3.3,3.3		355S		384.3 ± 45.5
LA Smear	D-101	North Wall	3.3,6.5		356S		95.1 ± 27.4
LA Smear	D-101	North Wall	3.3,9.8		357S		180.8 ± 33.8
LA Smear	D-101	North Wall	3.3,13		358S		103.4 ± 28.1
LA Smear	D-101	North Wall		Ventilation unit	359S	19.88 ± 12.92	
LA Smear	D-101	South Wall	3.3,3.3		361S		191.5 ± 34.5
LA Smear	D-101	South Wall	3.3,.3		362S		857.0 ± 65.1
LA Smear	D-101	South Wall	3.3,16.3		363S		430.8 ± 47.8
LA Smear	D-101	South Wall	Door handle on	left door	374S		393.9 ± 46.0
LA Smear	D-101	South Wall	Door track		375S		87.9 ± 26.8
SA Smear	D-101	West Wall	0,16	Floor	344S		246.6 ± 38.0
SA Smear	D-101	West Wall	0,20.5	Floor	345S		247.8 ± 38.0
LA Smear	D-101	West Wall	6.5,19.5		367S		1,474.8 ± 84.0

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	D-101	West Wall	6.5,22.8		368S		372.4 ± 44.9
LA Smear	D-101	West Wall	3.3,26		369S		108.2 ± 28.4
LA Smear	D-101	West Wall	3.3,22.3		370S		168.9 ± 33.0
LA Smear	D-101	West Wall	7.5,13 cable 4'	from left end	384S		2,936.7 ± 117.2
				Minimum		15.71 ± 11.55	46.3 ± 22.9
				Maximum		59.46 ± 21.99	9,983.2 ± 214.4
				Average		28.10 ± 14.68	798.2 ± 48.9
				Standard Deviation		18.17 ± 4.25	1,814.4 ± 39.6
				Count		4	38
LA Smear	D-109	Column	11,37.4		461S		139.1 ± 30.8
LA Smear	D-109	Crane beam	12,29.5		459S		516.5 ± 51.7
LA Smear	D-109	Crane cable	8,36		460S		19,765.3 ± 301.2
LA Smear	D-109	Crane trolley	10.5,29.5	Brace	457S		78.4 ± 25.9
LA Smear	D-109	Duct	11.3,73		423S		62.0 ± 24.4
LA Smear	D-109	East Wall	8.5,28.6		399S		81.1 ± 26.1
LA Smear	D-109	East Wall	0,26	Hot spot	401S		180.2 ± 34.0
LA Smear	D-109	East Wall	3,13	Brick wall	405S	21.79 ± 13.55	5,448.1 ± 158.9
SA Smear	D-109	East Wall	5.3,6	Glass	447S		926.0 ± 67.4
SA Smear	D-109	East Wall	12.6,18.4		449S		402.2 ± 46.4
LA Smear	D-109	Floor	14,24		392S		49.8 ± 23.4
LA Smear	D-109	Floor	14,40		393S		52.1 ± 23.6
LA Smear	D-109	Floor	under cabinet	0,49	1015S	22.17 ± 13.55	239.3 ± 37.7
LA Smear	D-109	Hood 1	Floor		709S	138.46 ± 33.42	477.5 ± 50.1
LA Smear	D-109	Hood 2	Floor		714S		138.2 ± 30.9
LA Smear	D-109	Hood 2	Left side		716S		54.9 ± 24.0
LA Smear	D-109	hood 3-vac.	Floor		699S	15.54 ± 11.55	176.3 ± 33.6
LA Smear	D-109	Hood 4-vac.	Floor		704S	1,063.46 ± 92.31	7,171.5 ± 182.0
LA Smear	D-109	Hood 4-vac.	Left side		705S	73.88 ± 24.50	231.1 ± 37.2
LA Smear	D-109	Hood 4-vac.	Right side		706S	655.13 ± 72.47	1,887.0 ± 94.6
LA Smear	D-109	Hood 4-vac.	Back inside wall		707S	173.88 ± 37.43	243.0 ± 37.9
SA Smear	D-109	North Wall	0,23	Bot. rollup door	411S		85.0 ± 26.9
LA Smear	D-109	North Wall	8,36.5	side of glv duct	420S		154.0 ± 32.2
LA Smear	D-109	North Wall	Glv box o/s wind	exterior	433S		1,418.9 ± 82.5
LA Smear	D-109	North Wall	Glv box o/s right	exterior	434S		224.8 ± 36.6
LA Smear	D-109	North Wall	Glv box o/s bttm	exterior	435S		2,437.9 ± 107.1
LA Smear	D-109	North Wall	Glv box front	exterior	436S	17.79 ± 12.25	16,698.6 ± 276.9
LA Smear	D-109	North Wall	Glv box top	exterior	437S		173.6 ± 33.3
LA Smear	D-109	North Wall	Glv box left side	exterior	438S		92.7 ± 27.2
LA Smear	D-109	North Wall	Glv box window	Interior	439S		615.3 ± 55.9
LA Smear	D-109	North Wall	Glv box top	Interior	440S		1,383.2 ± 81.5
LA Smear	D-109	North Wall	Glv box face	Interior	441S		2,037.9 ± 98.2
LA Smear	D-109	North Wall	Glv box right side	Interior	442S		4,257.0 ± 140.7
LA Smear	D-109	North Wall	Glv box floor	Interior	443S	13.63 ± 10.81	8,786.7 ± 201.2
LA Smear	D-109	Shelf	4,20		456S	19.88 ± 12.92	359.3 ± 44.2
LA Smear	D-109	South crane	9,19.5	Rail support	463S		109.3 ± 28.5
LA Smear	D-109	South Wall	5,30	On door	396S		48.9 ± 23.2
LA Smear	D-109	South Wall	37,8	Top of cabinet	397S		54.9 ± 23.7
LA Smear	D-109	S. crane rail	10.4,6		452S		53.4 ± 23.6
LA Smear	D-109	S. crane rail	10.4,18		453S		135.5 ± 30.6
LA Smear	D-109	West Wall	Vac hood duct ex		406S		70.7 ± 25.6
SA Smear	D-109	West Wall	10.5,14	Top of hood	446S		50.5 ± 23.8
				Minimum		13.63 ± 10.81	48.9 ± 23.2
				Maximum		1,063.46 ± 92.31	19,765.3 ± 301.2
				Average		201.42 ± 30.43	1,846.9 ± 65.8
				Standard Deviation		326.25 ± 26.35	4,148.3 ± 66.6
				Count		11	42
LA Smear	D-109	Storage Hole	H-1	hole	877S		104.9 ± 28.3
LA Smear	D-109	Storage Hole	H-1A	holder	878S		93.0 ± 27.4
LA Smear	D-109	Storage Hole	H-2	hole	879S		196.5 ± 35.0
LA Smear	D-109	Storage Hole	H-2A	holder	880S		1,801.3 ± 92.5
LA Smear	D-109	Storage Hole	H-3	hole	881S		239.4 ± 37.7
LA Smear	D-109	Storage Hole	H-7	hole	889S		121.5 ± 29.7
LA Smear	D-109	Storage Hole	H-7A	holder	890S		93.0 ± 27.4
LA Smear	D-109	Storage Hole	H-8A	holder	892S		253.7 ± 38.5
LA Smear	D-109	Storage Hole	H-9	hole	893S		100.1 ± 28.0
LA Smear	D-109	Storage Hole	H-9A	holder	894S	61.38 ± 22.37	129.9 ± 30.3

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	D-109	Storage Hole	H-10	hole	895S		143.0 ± 31.3
LA Smear	D-109	Storage Hole	H-10A	holder	896S		268.0 ± 39.4
LA Smear	D-109	Storage Hole	H-11	hole	897S		633.4 ± 56.8
LA Smear	D-109	Storage Hole	H-11A	holder	898S		318.0 ± 42.2
LA Smear	D-109	Storage Hole	H-12	hole	899S		98.9 ± 27.9
LA Smear	D-109	Storage Hole	H-12A	holder	900S		575.1 ± 54.4
LA Smear	D-109	Storage Hole	H-13	hole	901S		200.1 ± 35.2
LA Smear	D-109	Storage Hole	H-13A	holder	902S		135.8 ± 30.7
LA Smear	D-109	Storage Hole	H-14	hole	903S		403.7 ± 46.6
LA Smear	D-109	Storage Hole	H-14A	holder	904S		553.7 ± 53.4
LA Smear	D-109	Storage Hole	H-15	hole	905S		72.7 ± 25.6
LA Smear	D-109	Storage Hole	H-15A	holder	906S		107.3 ± 28.5
LA Smear	D-109	Storage Hole	H-16	hole	907S	15.54 ± 11.55	572.7 ± 54.3
LA Smear	D-109	Storage Hole	H-16A	holder	908S	15.54 ± 11.55	218.0 ± 36.3
LA Smear	D-109	Storage Hole	H-17	hole	909S		698.9 ± 59.3
LA Smear	D-109	Storage Hole	H-17A	holder	910S		41.8 ± 22.7
LA Smear	D-109	Storage Hole	H-18	hole	911S		59.6 ± 24.4
LA Smear	D-109	Storage Hole	H-18A	holder	912S		144.2 ± 31.4
LA Smear	D-109	Storage Hole	H-19	hole	913S	123.88 ± 31.63	548.9 ± 53.2
LA Smear	D-109	Storage Hole	H-19A	holder	914S	28.04 ± 15.28	178.7 ± 33.8
LA Smear	D-109	Storage Hole	H-20	hole	915S	23.88 ± 14.15	398.9 ± 46.3
LA Smear	D-109	Storage Hole	H-20A	holder	916S		46.5 ± 23.2
LA Smear	D-109	Storage Hole	H-21	hole	917S		164.4 ± 32.8
LA Smear	D-109	Storage Hole	H-21A	holder	918S	13.46 ± 10.81	121.5 ± 29.7
LA Smear	D-109	Storage Hole	H-22	hole	919S	15.54 ± 11.55	2,087.0 ± 99.3
LA Smear	D-109	Storage Hole	H-22A	holder	920S		639.4 ± 57.0
LA Smear	D-109	Storage Hole	H-23	hole	921S		120.3 ± 29.6
LA Smear	D-109	Storage Hole	H-23A	holder	922S	13.46 ± 10.81	291.8 ± 40.7
LA Smear	D-109	Storage Hole	H-24	hole	923S	50.96 ± 20.42	525.1 ± 52.2
LA Smear	D-109	Storage Hole	H-24A	holder	924S		688.2 ± 58.9
LA Smear	D-109	Storage Hole	H-25	hole	925S		102.5 ± 28.2
LA Smear	D-109	Storage Hole	H-25A	holder	926S		129.9 ± 30.3
LA Smear	D-109	Storage Hole	H-26	hole	927S		104.9 ± 28.3
LA Smear	D-109	Storage Hole	H-26A	holder	928S		178.7 ± 33.8
LA Smear	D-109	Storage Hole	H-27	hole	929S		223.9 ± 36.7
LA Smear	D-109	Storage Hole	H-27A	holder	930S	38.46 ± 17.80	283.4 ± 40.3
LA Smear	D-109	Storage Hole	H-28	hole	931S		1,875.1 ± 94.3
LA Smear	D-109	Storage Hole	H-28A	holder	932S		1,068.0 ± 72.2
LA Smear	D-109	Storage Hole	H-29	hole	933S		141.8 ± 31.2
LA Smear	D-109	Storage Hole	H-29A	holder	934S		162.0 ± 32.6
LA Smear	D-109	Storage Hole	H-30	hole	935S		4,226.3 ± 140.2
LA Smear	D-109	Storage Hole	H-30A	holder	936S		220.3 ± 36.5
LA Smear	D-109	Storage Hole	H-31	hole	937S		254.9 ± 38.6
LA Smear	D-109	Storage Hole	H-31A	holder	938S		663.2 ± 57.9
LA Smear	D-109	Storage Hole	H-32	hole	939S		651.3 ± 57.5
LA Smear	D-109	Storage Hole	H-32A	holder	940S		198.9 ± 35.1
LA Smear	D-109	Storage Hole	H-33	hole	941S		87.0 ± 26.9
LA Smear	D-109	Storage Hole	H-34	hole	943S		320.3 ± 42.3
LA Smear	D-109	Storage Hole	H-34A	holder	944S		409.6 ± 46.9
LA Smear	D-109	Storage Hole	H-35	hole	945S		1,506.1 ± 84.9
LA Smear	D-109	Storage Hole	H-35A	holder	946S	34.29 ± 16.84	2,353.7 ± 105.3
LA Smear	D-109	Storage Hole	H-36	hole	947S	15.54 ± 11.55	209.6 ± 35.8
LA Smear	D-109	Storage Hole	H-36A	holder	948S		51.3 ± 23.6
LA Smear	D-109	Storage Hole	H-38	hole	951S		148.9 ± 31.7
LA Smear	D-109	Storage Hole	H-38A	holder	952S		113.2 ± 29.0
LA Smear	D-109	Storage Hole	H-39A	holder	954S		5,408.4 ± 158.3
LA Smear	D-109	Storage Hole	H-40	hole	955S		63.2 ± 24.8
LA Smear	D-109	Storage Hole	H-41	hole	957S		173.9 ± 33.5
LA Smear	D-109	Storage Hole	H-42	hole	959S	20.08 ± 12.91	76.3 ± 25.9
LA Smear	D-109	Storage Hole	H-43	hole	961S		71.5 ± 25.5
LA Smear	D-109	Storage Hole	H-43A	holder	962S		584.6 ± 54.8
LA Smear	D-109	Storage Hole	H-44	hole	963S		44.1 ± 22.9
LA Smear	D-109	Storage Hole	H-44A	holder	964S		56.0 ± 24.1
LA Smear	D-109	Storage Hole	H-45	hole	965S		204.8 ± 35.5
LA Smear	D-109	Storage Hole	H-45A	holder	966S		420.3 ± 47.4
LA Smear	D-109	Storage Hole	H-46	hole	967S		115.5 ± 29.2

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	D-109	Storage Hole	H-48	hole	971S		222.7 ± 36.6
LA Smear	D-109	Storage Hole	H-48A	holder	972S		67.9 ± 25.2
LA Smear	D-109	Storage Hole	H-49	hole	973S		1,002.4 ± 70.1
LA Smear	D-109	Storage Hole	H-49A	holder	974S		57.2 ± 24.2
LA Smear	D-109	Storage Hole	H-50A	holder	976S		54.8 ± 24.0
LA Smear	D-109	Storage Hole	H-51	hole	977S		63.2 ± 24.8
LA Smear	D-109	Storage Hole	H-52A	holder	980S		339.3 ± 43.3
LA Smear	D-109	Storage Hole	H-55	hole	985S		53.6 ± 23.9
LA Smear	D-109	Storage Hole	H-55A	holder	986S		798.9 ± 63.1
LA Smear	D-109	Storage Hole	H-56	hole	987S		198.9 ± 35.1
LA Smear	D-109	Storage Hole	H-56A	holder	988S		102.4 ± 28.2
LA Smear	D-109	Storage Hole	H-57	hole	989S		108.4 ± 28.6
LA Smear	D-109	Storage Hole	H-57A	holder	990S		319.1 ± 42.2
LA Smear	D-109	Storage Hole	H-58	hole	991S		51.3 ± 23.6
LA Smear	D-109	Storage Hole	H-58A	holder	992S		283.4 ± 40.3
LA Smear	D-109	Storage Hole	H-59A	holder	994S		128.6 ± 30.2
LA Smear	D-109	Storage Hole	H-60	hole	995S		50.1 ± 23.5
LA Smear	D-109	Storage Hole	H-62A	holder	1000S		237.0 ± 37.5
LA Smear	D-109	Storage Hole	H-64	hole	1003S		90.5 ± 27.2
LA Smear	D-109	Storage Hole	H-64A	holder	1004S		191.7 ± 34.7
LA Smear	D-109	Storage Hole	H-65A	holder	1006S		87.0 ± 26.9
LA Smear	D-109	Storage Hole	H-66A	holder	1008S		95.3 ± 27.6
LA Smear	D-109	Storage Hole	H-67	hole	1009S		295.3 ± 40.9
LA Smear	D-109	Storage Hole	H-67A	holder	1010S		164.3 ± 32.8
LA Smear	D-109	Storage Hole	H-68	hole	1011S		154.8 ± 32.1
				Minimum		13.46 ± 10.81	41.8 ± 22.7
				Maximum		123.88 ± 31.63	5,408.4 ± 158.3
				Average		33.57 ± 15.66	418.9 ± 41.4
				Standard Deviation		28.87 ± 5.69	760.7 ± 23.0
				Count		14	101
LA Smear	Dock	Floor	4,8		471S		64.8 ± 25.1
LA Smear	Dock	Floor	Crane control		472S		402.9 ± 46.6
LA Smear	Dock	Floor	31,21		474S		50.5 ± 23.8
LA Smear	Fan Loft	Air exhaust 7-1		HEPA unit	507S		49.8 ± 23.4
LA Smear	Fan Loft	Air exhaust 9A	Cave 4B	HEPA filter bank	505S		75.9 ± 25.8
LA Smear	Fan Loft	Air exhaust 10-2	Cave 4A	HEPA filter bank	504S		62.8 ± 24.6
LA Smear	Fan Loft	Ductwork interior	Cave 4B-1	Up stream	479S	15.71 ± 11.55	634.3 ± 56.7
LA Smear	Fan Loft	Ductwork interior	Cave 4B-2	Up stream	481S		349.8 ± 43.8
LA Smear	Fan Loft	Ductwork interior	Cave 4A-1	Up stream	483S		1,234.3 ± 77.2
LA Smear	Fan Loft	Ductwork interior	Cave 4A-2	Up stream	485S		488.7 ± 50.6
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25-1	Up stream	487S		145.8 ± 31.5
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25-2	Up stream	489S	28.25 ± 15.28	518.5 ± 51.9
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24-1	Up stream	491S	19.92 ± 12.92	175.6 ± 33.6
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24-2	Up stream	493S		100.6 ± 28.1
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6-2	Up stream	497S		708.9 ± 59.7
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6-1	Up stream	499S		539.9 ± 52.9
LA Smear	Fan Loft	Ductwork interior	D109-1	Up stream	511S	1,888.67 ± 122.98	10,901.8 ± 224.0
LA Smear	Fan Loft	Ductwork interior	D109-2	Up stream	513S	932.42 ± 86.43	4,175.6 ± 139.4
LA Smear	Fan Loft	Floor	6,48	Corridor A	515S		79.5 ± 26.1
				Minimum		15.71 ± 11.55	49.8 ± 23.4
				Maximum		1,888.67 ± 122.98	10,901.8 ± 224.0
				Average		576.99 ± 49.83	1,092.6 ± 55.0
				Standard Deviation		744.76 ± 46.28	2,483.6 ± 47.9
				Count		5	19
LA Smear	North Corridor	By cave 2	0,35	Hot spot door	546S	36.58 ± 17.33	66,725.6 ± 552.7
LA Smear	North Corridor	Cave 2	4,22		529S		2,643.3 ± 111.5
LA Smear	North Corridor	Cave 2	4,4		574S		240.2 ± 37.7
LA Smear	North Corridor	Cave 2	Left door		575S		1,284.3 ± 78.7
LA Smear	North Corridor	Cave 2	Above left door		576S		895.0 ± 66.4
LA Smear	North Corridor	Cave 2	10,15	Hot spot	577S		3,727.1 ± 131.8
LA Smear	North Corridor	Cave 2	Right door top		578S	15.67 ± 11.55	2,250.9 ± 103.0
LA Smear	North Corridor	Cave 2	Right door		579S	24.00 ± 14.15	2,956.9 ± 117.7
LA Smear	North Corridor	Cave 4	North grey wall	sliding door	536S	17.63 ± 12.25	2,114.8 ± 100.0
LA Smear	North Corridor	Cave 4A	Left door		538S	15.54 ± 11.55	10,425.5 ± 219.1
LA Smear	North Corridor	Cave 4A	Right door		539S		5,480.2 ± 159.4
LA Smear	North Corridor	Cave 4A	Under left and	right door	540S		358.8 ± 44.4

Elevated Smear Sample Data from Building 301 Hot Cells

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	North Corridor	Cave 4A	15,30	I-beam	541S		875.5 ± 65.9
LA Smear	North Corridor	Cave 4A	Wheel left		542S		1,798.1 ± 92.5
LA Smear	North Corridor	Cave 4A	Wheel right		543S		611.2 ± 55.9
LA Smear	North Corridor	Cave 4A floor	6.5,15.7		654S		140.2 ± 31.0
LA Smear	North Corridor	Cave 4A N. wall	4,15	sliding door	648S	13.58 ± 10.81	1,777.1 ± 91.9
LA Smear	North Corridor	Cave 4B	Left door		530S		1,060.0 ± 72.0
LA Smear	North Corridor	Cave 4B	Right door		531S		827.9 ± 64.2
LA Smear	North Corridor	Cave 4B	15,15	I-beam	534S	15.54 ± 11.55	379.0 ± 45.5
LA Smear	North Corridor	Cave 4B	Under left and	right door	537S		173.1 ± 33.5
LA Smear	North Corridor	Cave 4B	Wheel left		544S		781.4 ± 62.5
LA Smear	North Corridor	Cave 4B	Wheel right		545S		325.5 ± 42.7
LA Smear	North Corridor	Cave 4B floor	4.8,10		652S		84.3 ± 26.6
LA Smear	North Corridor	Cave 4B floor	6.5,8		653S		155.7 ± 32.1
LA Smear	North Corridor	Cave 4B N. wall	4,23	switch box	649S		896.2 ± 66.5
LA Smear	North Corridor	Cave 4B W wall	4,25 side	opening door	650S		29,328.3 ± 366.7
LA Smear	North Corridor	Door tops	8,50		572S		665.2 ± 58.0
LA Smear	North Corridor	North Wall	4,3		533S		9,336.2 ± 207.4
LA Smear	North Corridor	North Wall	15,15		535S		546.9 ± 53.2
LA Smear	North Corridor	North Wall	6.5,38		561S		2,169.7 ± 101.2
LA Smear	North Corridor	North Wall	5,47.5	middle door pnl	562S	22.00 ± 13.55	10,605.4 ± 221.0
LA Smear	North Corridor	North Wall	5.5,52 2 feet E.	of mid door panl	563S	17.83 ± 12.25	5,858.9 ± 164.7
LA Smear	North Corridor	North Wall	3,74.5 Right of	book case	565S		70.8 ± 25.5
LA Smear	North Corridor	North Wall	4.5,82.5 East	door panel side	566S		4,693.5 ± 147.6
LA Smear	North Corridor	North Wall	5,88.5 East door	panel end	567S		716.1 ± 60.0
LA Smear	North Corridor	North Wall	4,8	Cell 4b	568S		1,068.8 ± 72.2
LA Smear	North Corridor	North Wall	4,3	Cell 4b	569S		8,549.8 ± 198.5
LA Smear	North Corridor	South Wall	4.5,15	Cell 1 E. door	557S		320.8 ± 42.4
LA Smear	North Corridor	South Wall	4,39	Cell 2 handle	558S		1,400.6 ± 82.1
LA Smear	North Corridor	South Wall	3,54 between	Cells 2 & 4A	559S		678.0 ± 58.5
LA Smear	North Corridor	South Wall	5.5,68	Cell 4 door	560S		1,280.4 ± 78.6
LA Smear	North Corridor	West Wall	5,5		532S	23.88 ± 14.15	3,113.6 ± 120.7
LA Smear	North Corridor	West Wall	4,6	Cell 4B	548S		2,241.1 ± 102.8
LA Smear	North Corridor	West Wall	3.5,13		573S		5,024.8 ± 152.6
				Minimum		13.58 ± 10.81	70.8 ± 25.5
				Maximum		36.58 ± 17.33	66,725.6 ± 552.7
				Average		20.23 ± 12.91	4,370.1 ± 107.1
				Standard Deviation		6.48 ± 1.84	10,567.2 ± 94.0
				Count		10	45
LA Smear	Retention Tank	Tank #1	and piping		580S		181.6 ± 33.9
LA Smear	Retention Tank	Tank #2	and piping		581S		223.2 ± 36.6
LA Smear	Service Floor	D-031	8,25	pipe asbestos	607S		189.9 ± 34.5
LA Smear	Underground Pit	#1	see map		689S		105.7 ± 28.3
LA Smear	Underground Pit	#2	see map		690S	13.58 ± 10.81	2,522.4 ± 108.9
LA Smear	Underground Pit	#3	see map		691S		75.9 ± 25.8
LA Smear	West Corridor	Duct #2	Over door		520S		61.3 ± 24.5
LA Smear	West Corridor	East Wall	5,24		549S		182.8 ± 34.1
LA Smear	West Corridor	North Wall	4,2		551S		256.6 ± 38.7
				Minimum		13.58 ± 10.81	61.3 ± 24.5
				Maximum		13.58 ± 10.81	2,522.4 ± 108.9
				Average		13.58 ± 10.81	422.1 ± 40.6
				Standard Deviation		0.00 ± 0.00	745.2 ± 24.6
				Count		1	9
			Summary of Building 301 Hot Cells Elevated Smear Samples				
				Minimum		13.19 ± 10.81	41.8 ± 22.6
				Maximum		1,888.67 ± 122.98	118,977.4 ± 737.9
				Average		119.74 ± 22.65	1,950.8 ± 64.7
				Standard Deviation		286.03 ± 21.30	7,756.0 ± 71.1
				Count		88	428
				% contaminated		11.3	55.2

Smear Sample Data from Building 301 Hot Cells Counted on the Tennelec

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha		Beta	
LA Smear	Dock	Floor	4,8		471S	−1.13 ±	4.09	64.8 ±	25.1
LA Smear	Dock	Floor	Crane control		472S	3.04 ±	5.78	402.9 ±	46.6
LA Smear	Dock	Floor	Electric box		473S	0.96 ±	4.09	2.9 ±	18.6
LA Smear	Dock	Floor	31,21		474S	3.04 ±	5.78	50.5 ±	23.8
LA Smear	Dock	Floor	30,4.3		475S	−1.13 ±	4.09	26.7 ±	21.3
LA Smear	Dock	Floor	13,0		476S	0.96 ±	4.09	2.9 ±	18.6
LA Smear	Dock	Floor	10,21		477S	−1.13 ±	4.09	13.6 ±	19.9
LA Smear	Dock	Floor	13,20.5		478S	5.13 ±	7.08	19.5 ±	20.6
LA Smear	Dock	Man hole	Bottom		1013S	−0.75 ±	4.09	4.8 ±	18.6
LA Smear	Dock	Man hole	Sides		1014S	1.33 ±	4.09	7.2 ±	18.9
				Minimum		−1.13 ±	4.09	−15.0 ±	16.3
				Maximum		5.13 ±	7.08	402.9 ±	46.6
				Average		0.76 ±	4.67	41.3 ±	21.9
				Standard Deviation		1.99 ±	0.93	92.3 ±	6.5
				Count		17		17	
LA Smear	Fan Loft	Air exhaust 7−1		HEPA unit	507S	1.08 ±	4.09	49.8 ±	23.4
LA Smear	Fan Loft	Air exhaust 7−2		HEPA unit	508S	1.08 ±	4.09	23.6 ±	20.7
LA Smear	Fan Loft	Air exhaust 7−3		HEPA unit	509S	1.08 ±	4.09	−0.2 ±	17.9
LA Smear	Fan Loft	Air exhaust 7−4		HEPA unit	510S	−1.00 ±	4.09	9.3 ±	19.0
LA Smear	Fan Loft	Air exhaust 8	Cave 3	HEPA filter bank	506S	1.08 ±	4.09	34.3 ±	21.8
LA Smear	Fan Loft	Air exhaust 9A	Cave 4B	HEPA filter bank	505S	3.17 ±	5.78	75.9 ±	25.8
LA Smear	Fan Loft	Air exhaust 10−2	Cave 4A	HEPA filter bank	504S	−1.00 ±	4.09	62.8 ±	24.6
LA Smear	Fan Loft	Air exhaust 12	Cave 5	HEPA filter bank	501S	−1.00 ±	4.09	−1.4 ±	17.7
LA Smear	Fan Loft	Air exhaust 19−1	and 19−2	HEPA filter	516S	−1.00 ±	4.09	−1.4 ±	17.7
LA Smear	Fan Loft	Air exhaust 24−1	Cave 1	HEPA filter bank	502S	−1.00 ±	4.09	12.8 ±	19.5
LA Smear	Fan Loft	Air exhaust 25−1	Cave 2	HEPA filter bank	503S	1.08 ±	4.09	22.4 ±	20.6
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24−1	Up stream	491S	19.92 ±	12.92	175.6 ±	33.6
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24−1	Downstream	492S	3.25 ±	5.78	−1.8 ±	17.9
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24−2	Up stream	493S	3.25 ±	5.78	100.6 ±	28.1
LA Smear	Fan Loft	Ductwork interior	Cave 1, 24−2	Downstream	494S	3.25 ±	5.78	4.2 ±	18.6
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25−1	Up stream	487S	7.42 ±	8.17	145.8 ±	31.5
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25−1	Downstream	488S	3.25 ±	5.78	−0.6 ±	18.0
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25−2	Up stream	489S	28.25 ±	15.28	518.5 ±	51.9
LA Smear	Fan Loft	Ductwork interior	Cave 2, 25−2	Downstream	490S	−0.92 ±	4.09	−11.3 ±	16.6
LA Smear	Fan Loft	Ductwork interior	Cave 4A−1	Up stream	483S	7.38 ±	8.17	1234.3 ±	77.2
LA Smear	Fan Loft	Ductwork interior	Cave 4A−1	Downstream	484S	−0.92 ±	4.09	26.8 ±	21.2
LA Smear	Fan Loft	Ductwork interior	Cave 4A−2	Up stream	485S	3.25 ±	5.78	488.7 ±	50.6
LA Smear	Fan Loft	Ductwork interior	Cave 4A−2	Downstream	486S	1.17 ±	4.09	0.6 ±	18.2
LA Smear	Fan Loft	Ductwork interior	Cave 4B−1	Up stream	479S	15.71 ±	11.55	634.3 ±	56.7
LA Smear	Fan Loft	Ductwork interior	Cave 4B−1	Downstream	480S	1.13 ±	4.09	7.0 ±	18.6
LA Smear	Fan Loft	Ductwork interior	Cave 4B−2	Up stream	481S	5.29 ±	7.08	349.8 ±	43.8
LA Smear	Fan Loft	Ductwork interior	Cave 4B−2	Downstream	482S	1.13 ±	4.09	−3.8 ±	17.2
LA Smear	Fan Loft	Ductwork interior	Cave 5	Up stream	495S	1.17 ±	4.09	−6.5 ±	17.2
LA Smear	Fan Loft	Ductwork interior	Cave 5	Downstream	496S	1.17 ±	4.09	0.6 ±	18.2
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6−1	Up stream	499S	1.17 ±	4.09	539.9 ±	52.9
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6−1	Downstream	500S	−0.92 ±	4.09	11.3 ±	19.5
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6−2	Up stream	497S	3.25 ±	5.78	708.9 ±	59.7
LA Smear	Fan Loft	Ductwork interior	Cell ABC, 6−2	Downstream	498S	−0.92 ±	4.09	0.6 ±	18.2
LA Smear	Fan Loft	Ductwork interior	D109−1	Up stream	511S	1888.67 ±	122.98	10901.8 ±	224.0
LA Smear	Fan Loft	Ductwork interior	D109−2	Up stream	513S	932.42 ±	86.43	4175.6 ±	139.4
LA Smear	Fan Loft	Ductwork interior	D109−2	Down stream	514S	3.25 ±	5.78	32.8 ±	21.8
LA Smear	Fan Loft	Floor	6,48	Corridor A	515S	−1.00 ±	4.09	79.5 ±	26.1
LA Smear	Fan Loft	Floor	6,50	Corridor B	518S	1.08 ±	4.09	6.9 ±	18.8
LA Smear	Fan Loft	Floor	6,90	Corridor B	517S	1.08 ±	4.09	0.9 ±	18.0
LA Smear	Fan Loft	Floor	7,20	Hallway	512S	1.08 ±	4.09	−6.2 ±	17.1
				Minimum		−1.00 ±	4.09	−11.3 ±	16.6
				Maximum		1,888.67 ±	122.98	10,901.8 ±	224.0
				Average		73.42 ±	10.43	510.1 ±	35.0
				Standard Deviation		324.90 ±	22.15	1,798.0 ±	37.8
				Count		40		40	
LA Smear	North Corridor	By cave 2	0,35	Hot spot door	546S	36.58 ±	17.33	66725.6 ±	552.7
LA Smear	North Corridor	Cave 2	4,22		529S	0.96 ±	4.09	2643.3 ±	111.5
LA Smear	North Corridor	Cave 2	4,4		574S	1.08 ±	4.09	240.2 ±	37.7
LA Smear	North Corridor	Cave 2	Left door		575S	11.50 ±	10.01	1284.3 ±	78.7
LA Smear	North Corridor	Cave 2	Above left door		576S	7.33 ±	8.17	895.0 ±	66.4
LA Smear	North Corridor	Cave 2	10,15	Hot spot	577S	7.33 ±	8.17	3727.1 ±	131.8

Smear Sample Data from Building 301 Hot Cells Counted on the Tennelec

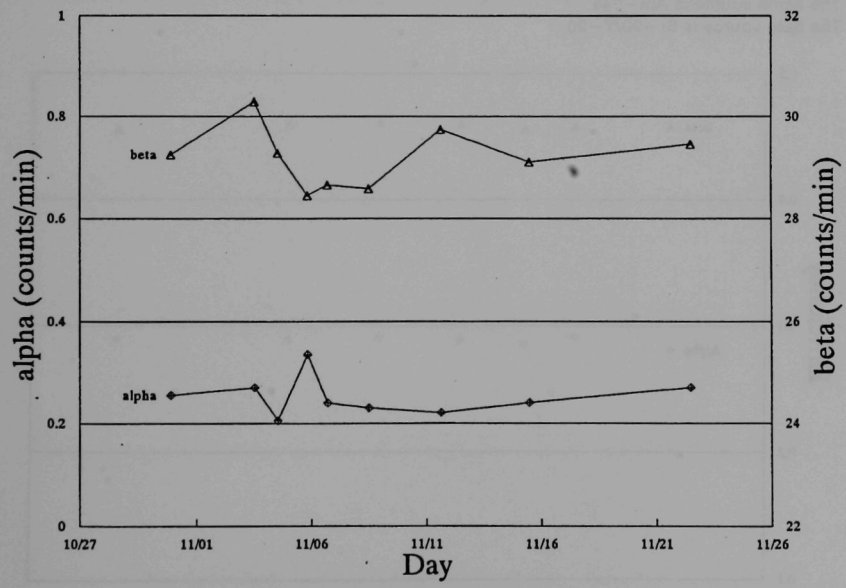
Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta
LA Smear	North Corridor	Cave 2	Right door top		578S	15.67 ± 11.55	2250.9 ± 103.0
LA Smear	North Corridor	Cave 2	Right door		579S	24.00 ± 14.15	2956.9 ± 117.7
LA Smear	North Corridor	Cave 4	North grey wall	sliding door	536S	17.63 ± 12.25	2114.8 ± 100.0
LA Smear	North Corridor	Cave 4A	Left door		538S	15.54 ± 11.55	10425.5 ± 219.1
LA Smear	North Corridor	Cave 4A	Right door		539S	7.21 ± 8.17	5480.2 ± 159.4
LA Smear	North Corridor	Cave 4A	Under left and	right door	540S	0.96 ± 4.09	358.8 ± 44.4
LA Smear	North Corridor	Cave 4A	15,30	I-beam	541S	7.21 ± 8.17	875.5 ± 65.9
LA Smear	North Corridor	Cave 4A	Wheel left		542S	5.13 ± 7.08	1798.1 ± 92.5
LA Smear	North Corridor	Cave 4A	Wheel right		543S	9.29 ± 9.14	611.2 ± 55.9
LA Smear	North Corridor	Cave 4A floor	4.8,24.3	concrete	651S	1.08 ± 4.09	41.4 ± 22.6
LA Smear	North Corridor	Cave 4A floor	6.5,15.7		654S	1.08 ± 4.09	140.2 ± 31.0
LA Smear	North Corridor	Cave 4A N. wall	4,15	sliding door	648S	13.58 ± 10.81	1777.1 ± 91.9
LA Smear	North Corridor	Cave 4B	Left door		530S	11.38 ± 10.01	1060.0 ± 72.0
LA Smear	North Corridor	Cave 4B	Right door		531S	5.13 ± 7.08	827.9 ± 64.2
LA Smear	North Corridor	Cave 4B	15,15	I-beam	534S	15.54 ± 11.55	379.0 ± 45.5
LA Smear	North Corridor	Cave 4B	Under left and	right door	537S	7.21 ± 8.17	173.1 ± 33.5
LA Smear	North Corridor	Cave 4B	Wheel left		544S	7.21 ± 8.17	781.4 ± 62.5
LA Smear	North Corridor	Cave 4B	Wheel right		545S	3.04 ± 5.78	325.5 ± 42.7
LA Smear	North Corridor	Cave 4B floor	4.8,10		652S	5.25 ± 7.08	84.3 ± 26.6
LA Smear	North Corridor	Cave 4B floor	6.5,8		653S	11.50 ± 10.01	155.7 ± 32.1
LA Smear	North Corridor	Cave 4B N. wall	4,23	switch box	649S	1.08 ± 4.09	896.2 ± 66.5
LA Smear	North Corridor	Cave 4B W wall	4,25 side	opening door	650S	9.42 ± 9.13	29328.3 ± 366.7
LA Smear	North Corridor	Door tops	8,50		572S	3.17 ± 5.78	665.2 ± 58.0
LA Smear	North Corridor	Duct #1	6,18	By light	523S	1.17 ± 4.09	4.2 ± 18.6
LA Smear	North Corridor	Duct #1	6,23	By column	525S	−0.92 ± 4.09	17.3 ± 20.2
LA Smear	North Corridor	Duct #1	6,31	Hall entrance	527S	−0.92 ± 4.09	6.6 ± 18.9
LA Smear	North Corridor	Duct #2	3,18	By light	524S	1.17 ± 4.09	22.0 ± 20.7
LA Smear	North Corridor	Duct #2	3,23	By column	526S	−0.92 ± 4.09	−0.6 ± 18.0
LA Smear	North Corridor	Duct #2	6,31	Hall entrance	528S	3.25 ± 5.78	26.8 ± 21.2
LA Smear	North Corridor	East Wall	5.5,4		555S	−0.92 ± 4.09	32.8 ± 21.8
LA Smear	North Corridor	East Wall	4,41		570S	1.08 ± 4.09	31.9 ± 21.6
LA Smear	North Corridor	North Wall	4,3		533S	0.96 ± 4.09	9336.2 ± 207.4
LA Smear	North Corridor	North Wall	15,15		535S	11.38 ± 10.01	546.9 ± 53.2
LA Smear	North Corridor	North Wall	6.5,38		561S	3.25 ± 5.78	2169.7 ± 101.2
LA Smear	North Corridor	North Wall	5,47.5	middle door pnl	562S	22.00 ± 13.55	10605.4 ± 221.0
LA Smear	North Corridor	North Wall	5.5,52 2 feet E.	of mid door panl	563S	17.83 ± 12.25	5858.9 ± 164.7
LA Smear	North Corridor	North Wall	9,67	over bookcase	564S	1.17 ± 4.09	19.7 ± 20.4
LA Smear	North Corridor	North Wall	3,74.5 Right of	book case	565S	1.17 ± 4.09	70.8 ± 25.5
LA Smear	North Corridor	North Wall	4.5,82.5 East	door panel side	566S	9.50 ± 9.13	4693.5 ± 147.6
LA Smear	North Corridor	North Wall	5,88.5 East door	panel end	567S	3.25 ± 5.78	716.1 ± 60.0
LA Smear	North Corridor	North Wall	4,8	Cell 4b	568S	1.08 ± 4.09	1068.8 ± 72.2
LA Smear	North Corridor	North Wall	4,3	Cell 4b	569S	5.25 ± 7.08	8549.8 ± 198.5
LA Smear	North Corridor	South end hall	3,7	Duct 2	521S	1.17 ± 4.09	10.1 ± 19.3
LA Smear	North Corridor	South end hall	6,7	Duct 1 port	522S	1.17 ± 4.09	16.1 ± 20.0
LA Smear	North Corridor	South Wall	6.5,9		556S	3.25 ± 5.78	14.9 ± 19.9
LA Smear	North Corridor	South Wall	4.5,15	Cell 1 E. door	557S	1.17 ± 4.09	320.8 ± 42.4
LA Smear	North Corridor	South Wall	4,39	Cell 2 handle	558S	9.50 ± 9.13	1400.6 ± 82.1
LA Smear	North Corridor	South Wall	3,54 between	Cells 2 & 4A	559S	3.25 ± 5.78	678.0 ± 58.5
LA Smear	North Corridor	South Wall	5.5,68	Cell 4 door	560S	3.25 ± 5.78	1280.4 ± 78.6
LA Smear	North Corridor	West Wall	5,5		532S	23.88 ± 14.15	3113.6 ± 120.7
LA Smear	North Corridor	West Wall	4,6	Cell 4B	548S	5.33 ± 7.08	2241.1 ± 102.8
LA Smear	North Corridor	West Wall	2,42		571S	−1.00 ± 4.09	14.0 ± 19.6
LA Smear	North Corridor	West Wall	3.5,13		573S	5.25 ± 7.08	5024.8 ± 152.6
				Minimum		−1.00 ± 4.09	−0.6 ± 18.0
				Maximum		36.58 ± 17.33	66,725.6 ± 552.7
				Average		6.76 ± 7.28	3,337.5 ± 86.5
				Standard Deviation		7.45 ± 3.27	9,412.6 ± 90.1
				Count		59	59
LA Smear	Retention Tank	Pump	W-ret1-1		582S	−1.06 ± 4.09	−0.6 ± 17.9
LA Smear	Retention Tank	Sump	in corner unit 9		583S	1.02 ± 4.09	−6.5 ± 17.1
LA Smear	Retention Tank	Tank #1	and piping		580S	1.02 ± 4.09	181.6 ± 33.9
LA Smear	Retention Tank	Tank #2	and piping		581S	3.10 ± 5.78	223.2 ± 36.6
				Minimum		−1.06 ± 4.09	−6.5 ± 17.1
				Maximum		3.10 ± 5.78	223.2 ± 36.6
				Average		1.02 ± 4.52	99.4 ± 26.4
				Standard Deviation		1.47 ± 0.73	104.0 ± 9.0

Smear Sample Data from Building 301 Hot Cells Counted on the Tennelec

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha		Beta	
				Count		4		4	
LA Smear	Roof	Lower	10,30		585S	−1.00 ±	4.09	16.4 ±	19.9
LA Smear	Roof	Lower	0,29		592S	1.08 ±	4.09	8.1 ±	18.9
LA Smear	Roof	Lower	3,37		593S	1.08 ±	4.09	2.1 ±	18.2
LA Smear	Roof	Lower	10,3		601S	1.08 ±	4.09	2.1 ±	18.2
LA Smear	Roof	Lower	0,16	A/C fans	602S	−1.00 ±	4.09	−7.4 ±	16.9
LA Smear	Roof	Lower	55,25	3 caps	603S	−1.00 ±	4.09	4.5 ±	18.5
LA Smear	Roof	Upper	49,40		586S	3.17 ±	5.78	6.9 ±	18.8
LA Smear	Roof	Upper	86,40		587S	1.08 ±	4.09	14.0 ±	19.6
LA Smear	Roof	Upper	77,25		588S	−1.00 ±	4.09	6.9 ±	18.8
LA Smear	Roof	Upper	49,25		589S	−1.00 ±	4.09	16.4 ±	19.9
LA Smear	Roof	Upper	21,20		590S	7.33 ±	8.17	6.9 ±	18.8
LA Smear	Roof	Upper	42,10		591S	5.25 ±	7.08	−12.2 ±	16.3
LA Smear	Roof	Upper	35,50	Hot spot	594S	3.17 ±	5.78	21.2 ±	20.4
LA Smear	Roof	Upper	30,36	Vent	595S	−1.00 ±	4.09	28.3 ±	21.2
LA Smear	Roof	Upper	56,36	Tall white stack	596S	−1.00 ±	4.09	6.9 ±	18.8
LA Smear	Roof	Upper	56,37	Green vent	597S	1.08 ±	4.09	16.4 ±	19.9
LA Smear	Roof	Upper	12,0	white vents	598S	3.17 ±	5.78	−2.6 ±	17.6
LA Smear	Roof	Upper	45,0	Vents−tall ones	599S	1.08 ±	4.09	10.5 ±	19.2
LA Smear	Roof	Upper	75,0	2 vents,broken	600S	5.25 ±	7.08	6.9 ±	18.8
LA Smear	Roof	Upper	12,40		584S	−1.00 ±	4.09	15.2 ±	19.7
				Minimum		−1.00 ±	4.09	−12.2 ±	16.3
				Maximum		7.33 ±	8.17	28.3 ±	21.2
				Average		1.29 ±	4.85	8.4 ±	18.9
				Standard Deviation		2.46 ±	1.26	9.3 ±	1.1
				Count		20		20	
LA Smear	Service Floor	D−031	Floor		604S	1.02 ±	4.09	23.2 ±	20.7
LA Smear	Service Floor	D−031	North wall		605S	5.19 ±	7.08	12.5 ±	19.5
LA Smear	Service Floor	D−031	South wall		606S	1.02 ±	4.09	3.0 ±	18.3
LA Smear	Service Floor	D−031	8,25	pipe asbestos	607S	1.02 ±	4.09	189.9 ±	34.5
LA Smear	Service Floor	D−031	West wall		608S	−1.06 ±	4.09	−4.2 ±	17.4
LA Smear	Service Floor	D−031	Sink drain		609S	−1.06 ±	4.09	−17.3 ±	15.6
LA Smear	Service Floor	D−031	E. wall		614S	3.10 ±	5.78	−18.4 ±	15.4
LA Smear	Service Floor	D−031 S. wall	0,18	Hot spot	610S	−1.06 ±	4.09	−1.8 ±	17.7
LA Smear	Service Floor	East Wall	0,16		611S	−1.06 ±	4.09	−1.8 ±	17.7
LA Smear	Service Floor	East Wall	0,44		612S	−1.06 ±	4.09	1.8 ±	18.2
LA Smear	Service Floor	East Wall	0,19		613S	1.02 ±	4.09	−8.9 ±	16.8
LA Smear	Service Floor	East Wall	12,51	Peeled paint	617S	1.08 ±	4.09	−0.2 ±	17.9
LA Smear	Service Floor	East Wall	9,51	Pipes	618S	−1.00 ±	4.09	5.7 ±	18.6
LA Smear	Service Floor	Floor	0,44	Middle	615S	−1.06 ±	4.09	−7.7 ±	16.9
LA Smear	Service Floor	Floor	0,25		621S	5.25 ±	7.08	8.1 ±	18.9
LA Smear	Service Floor	Floor	0,26	By compressor	622S	−1.00 ±	4.09	−0.2 ±	17.9
LA Smear	Service Floor	Floor	0,17	Maint. rm drain	625S	−0.92 ±	4.09	−6.5 ±	17.2
LA Smear	Service Floor	Floor	0,7	Maint rm S wall	626S	−0.92 ±	4.09	−8.9 ±	16.9
LA Smear	Service Floor	Floor	0,16	Maint rm compr	627S	−0.92 ±	4.09	−1.8 ±	17.9
LA Smear	Service Floor	Floor	0,2	By drain	628S	1.17 ±	4.09	−3.0 ±	17.7
LA Smear	Service Floor	Floor	16,13		629S	1.17 ±	4.09	6.6 ±	18.9
LA Smear	Service Floor	Middle floor	0,2	to maint shop	623S	−1.00 ±	4.09	35.5 ±	22.0
LA Smear	Service Floor	On pipe	9,10		620S	11.50 ±	10.01	18.8 ±	20.2
LA Smear	Service Floor	Plate metal	9.4,2		624S	1.08 ±	4.09	−3.8 ±	17.4
LA Smear	Service Floor	West Wall	8,44	Black drain	616S	3.10 ±	5.78	−0.6 ±	17.9
LA Smear	Service Floor	West Wall	4.5,13	Random	619S	−1.00 ±	4.09	−0.2 ±	17.9
				Minimum		−1.06 ±	4.09	−18.4 ±	15.4
				Maximum		11.50 ±	10.01	189.9 ±	34.5
				Average		0.91 ±	4.68	8.4 ±	18.7
				Standard Deviation		2.82 ±	1.38	38.0 ±	3.5
				Count		26		26	
LA Smear	Stairwell 2	Basement			634S	−1.00 ±	4.09	15.2 ±	19.7
LA Smear	Stairwell 2	Level 1			630S	−0.92 ±	4.09	3.0 ±	18.5
LA Smear	Stairwell 2	Level 2			632S	−1.00 ±	4.09	−2.6 ±	17.6
LA Smear	Stairwell 2	Level 3			633S	−1.00 ±	4.09	22.4 ±	20.6
LA Smear	Stairwell 2	Level 4			635S	−1.00 ±	4.09	4.5 ±	18.5
LA Smear	Stairwell 2	Level 5			636S	−1.00 ±	4.09	4.5 ±	18.5
LA Smear	Stairwell 2	Level 6	Stair 6	Hot spot	631S	−0.92 ±	4.09	−3.0 ±	17.7
LA Smear	Stairwell 2	Level 6			637S	−1.00 ±	4.09	10.5 ±	19.2
LA Smear	Stairwell 2	Level 7			638S	−1.00 ±	4.09	4.5 ±	18.5

Background Data from Tennelec for 301 Hot Cells

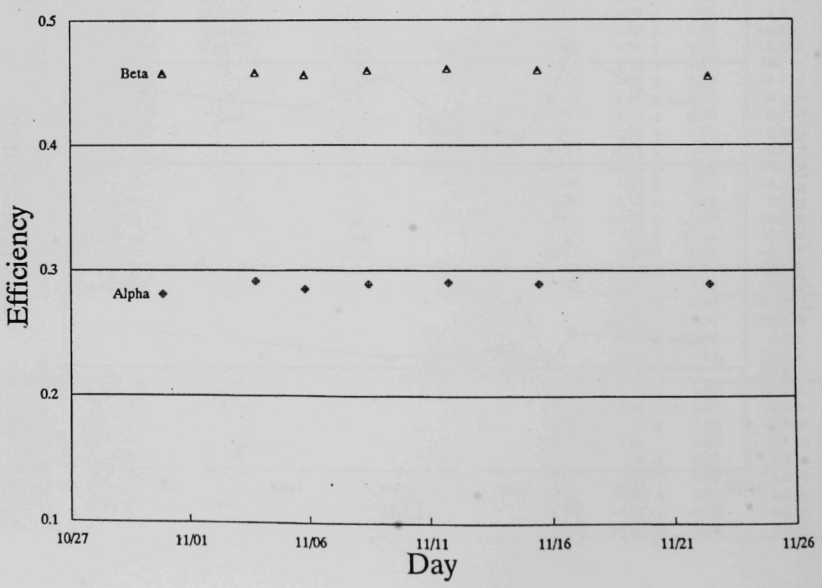
Clock Real Time Day		Time	Count Time (min)	counts/min alpha		beta	
THU	10/30/97	21:31:53	200	0.255 ±	0.036	29.25 ±	0.38
MON	11/03/97	12:50:06	200	0.270 ±	0.037	30.30 ±	0.39
TUE	11/04/97	13:06:53	200	0.205 ±	0.032	29.28 ±	0.38
WED	11/05/97	19:58:38	200	0.335 ±	0.041	28.45 ±	0.38
THU	11/06/97	16:56:07	200	0.240 ±	0.035	28.65 ±	0.38
SAT	11/08/97	11:45:18	200	0.230 ±	0.034	28.58 ±	0.38
TUE	11/11/97	15:03:59	200	0.220 ±	0.033	29.75 ±	0.39
SAT	11/15/97	11:21:34	200	0.240 ±	0.035	29.11 ±	0.38
SAT	11/22/97	11:31:36	200	0.270 ±	0.037	29.46 ±	0.38
			Minimum	0.205 ±	0.032	28.45 ±	0.38
			Maximum	0.335 ±	0.041	30.30 ±	0.39
			Average	0.252 ±	0.035	29.20 ±	0.38
			Standard Deviation	0.036 ±	0.002	0.56 ±	0.00
			Count	9		9	



Source Data from Tennelec for 301 Hot Cells

Real Time			counts/min		efficiency		% cross talk	
Day	Time		alpha	beta	alpha	beta	a to ß	ß to a
THU	10/30/97	21:34:05	15,600 ± 88	7,760 ± 62	0.281		33.2	
THU	10/30/97	21:36:15	3 ± 1	44,042 ± 148		0.457		0.0068
MON	11/03/97	18:33:52	16,196 ± 90	7,358 ± 61	0.291		31.2	
MON	11/03/97	18:36:02	14 ± 3	44,090 ± 148		0.458		0.0317
WED	11/05/97	20:00:49	15,844 ± 89	7,525 ± 61	0.285		32.2	
WED	11/05/97	20:02:59	3 ± 1	43,898 ± 148		0.456		0.0068
SAT	11/08/97	11:47:30	16,054 ± 90	7,377 ± 61	0.289		31.5	
SAT	11/08/97	11:49:39	4 ± 1	44,227 ± 149		0.459		0.0090
TUE	11/11/97	18:43:21	16,142 ± 90	7,289 ± 60	0.290		31.1	
TUE	11/11/97	18:45:31	12 ± 2	44,366 ± 149		0.461		0.0259
SAT	11/15/97	11:23:45	16,080 ± 90	7,397 ± 61	0.289		31.5	
SAT	11/15/97	11:25:55	14 ± 3	44,247 ± 149		0.459		0.0305
SAT	11/22/97	11:33:47	16,076 ± 90	7,518 ± 61	0.289		31.9	
SAT	11/22/97	11:35:57	9 ± 2	43,765 ± 148		0.454		0.0194
		Minimum	3 ± 1	7,289 ± 60	0.281	0.454	31.1	0.0068
		Maximum	16,196 ± 90	44,366 ± 149	0.291	0.461	33.2	0.0317
		Average	8,003 ± 46	25,775 ± 105	0.288	0.458	31.8	0.0186
		Standard Deviation	7,996 ± 44	18,316 ± 44	0.003	0.002	0.7	0.0103
		Count	14	14	7	7	7	7

The alpha source is Am−241
The beta source is Sr−90/Y−90



APPENDIX C:

SURFACE ACTIVITY SURVEY MAPS

This appendix contains comprehensive data from the surveys of total surface activity of all surfaces except for the floors. Included are:

- Maps of walls and other vertical surfaces indicating the major concentrations of total alpha and beta/gamma surface radioactivity.

- A listing of exposure and surface activity data taken in the storage tubes in Room D-109.

It is important to note that virtually all the surface contamination observed is contained beneath layers of paint, and may be absorbed to some extent into the surface. Low-energy beta emitters, such as Cs-137, will be subject to surface self-absorption and attenuation by the paint, with the results that hand-held instruments with proportional counters (NE Electra) will demonstrate an effectively reduced efficiency to such nuclides. While the floors appear to be contaminated predominantly with Cs-137, other nuclides may be present on the walls and cave surfaces. Thus, the activity values shown on these maps may need to be increased by a factor of as much as 2-10 for estimates of activity contained in the surface layers of walls.

APPENDIX C

Total Surface Activity Survey Maps

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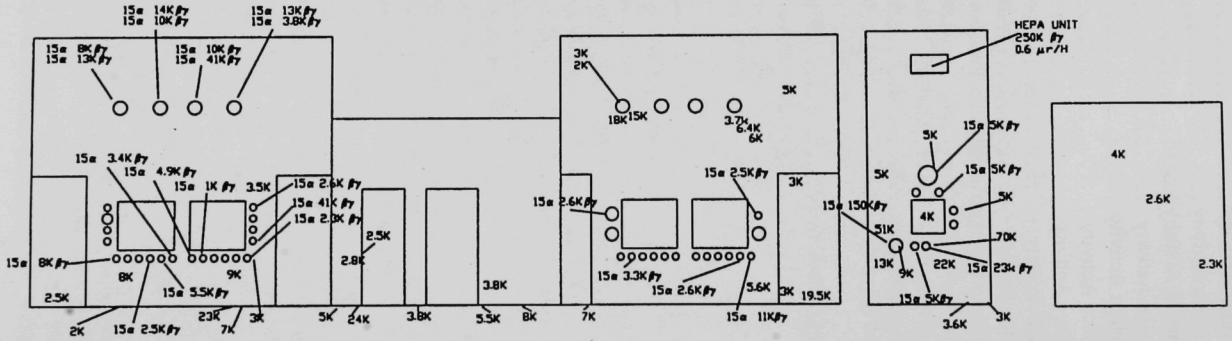
C-54 Access Trench, Enlarged View, Total Surface Activity C-58
C-55 Fan Loft (Floor), Total Surface Area C-59



BUILDING 301 C102E NORTH WALL

NE DIRECT dis/min 100cm²

FIGURE C-1 Room C-102-East, North Wall, Total Surface Activity

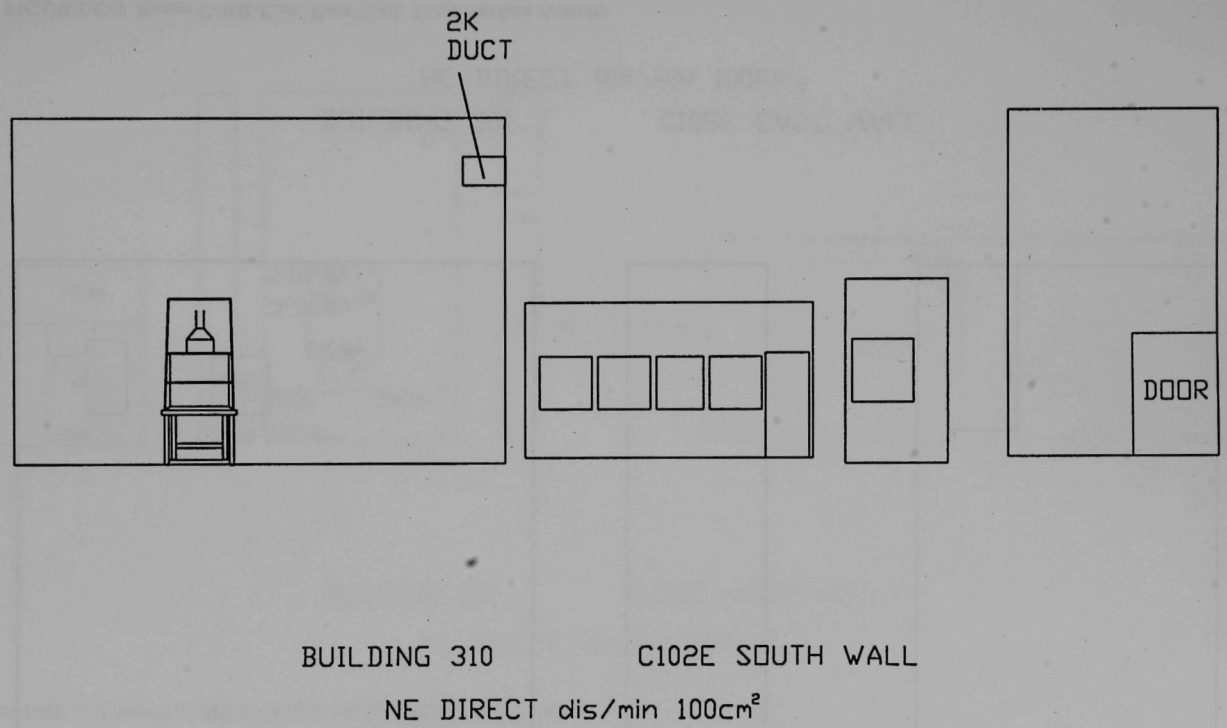
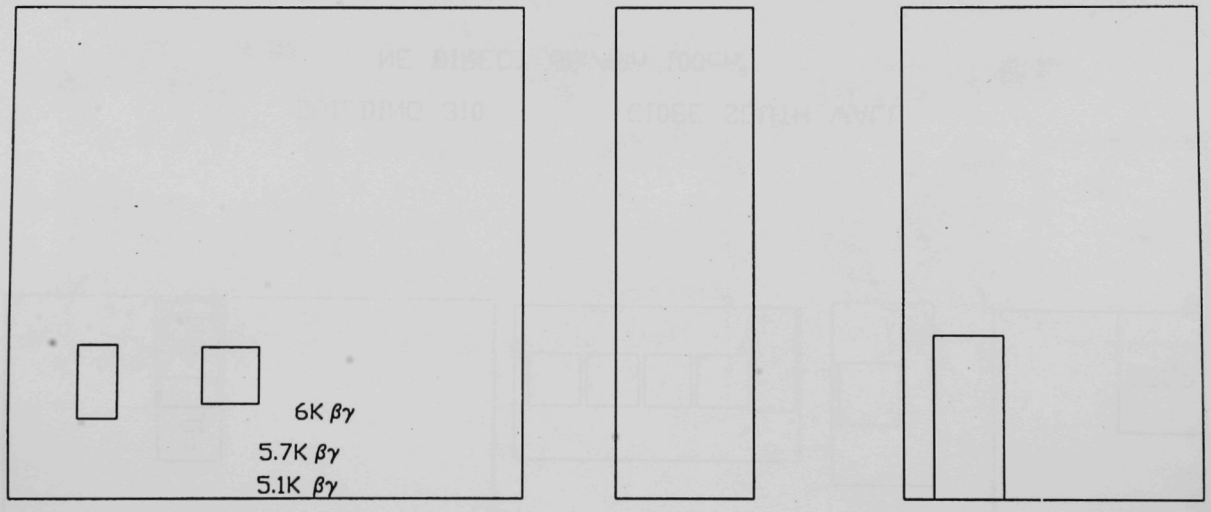


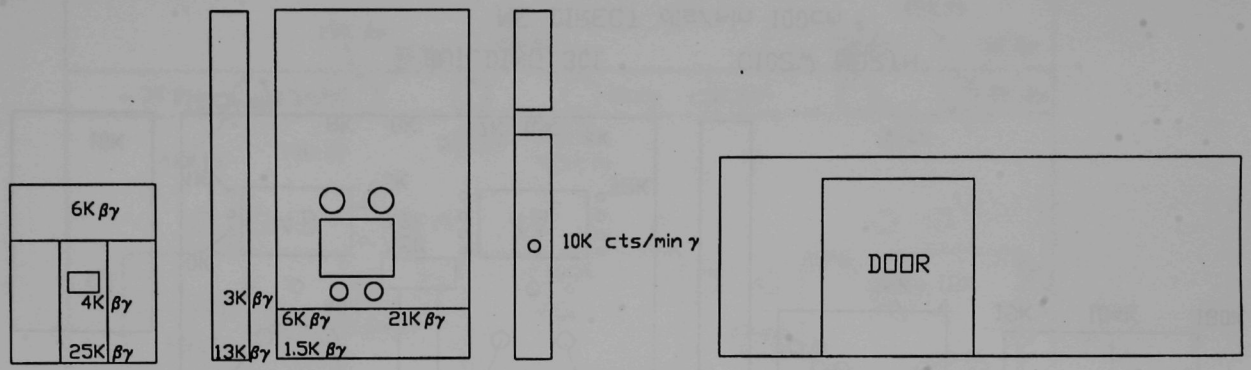
FIGURE C-2 Room C-102-East, South Wall, Total Surface Activity



BUILDING 301 C102E EAST WALL

NE DIRECT dis/min 100cm²

FIGURE C-3 Room C-102-East, East Wall, Total Surface Activity



BUILDING 301 C102E WEST WALL

NE DIRECT dis/min 100cm²

FIGURE C-4 Room C-102-East, West Wall, Total Surface Activity

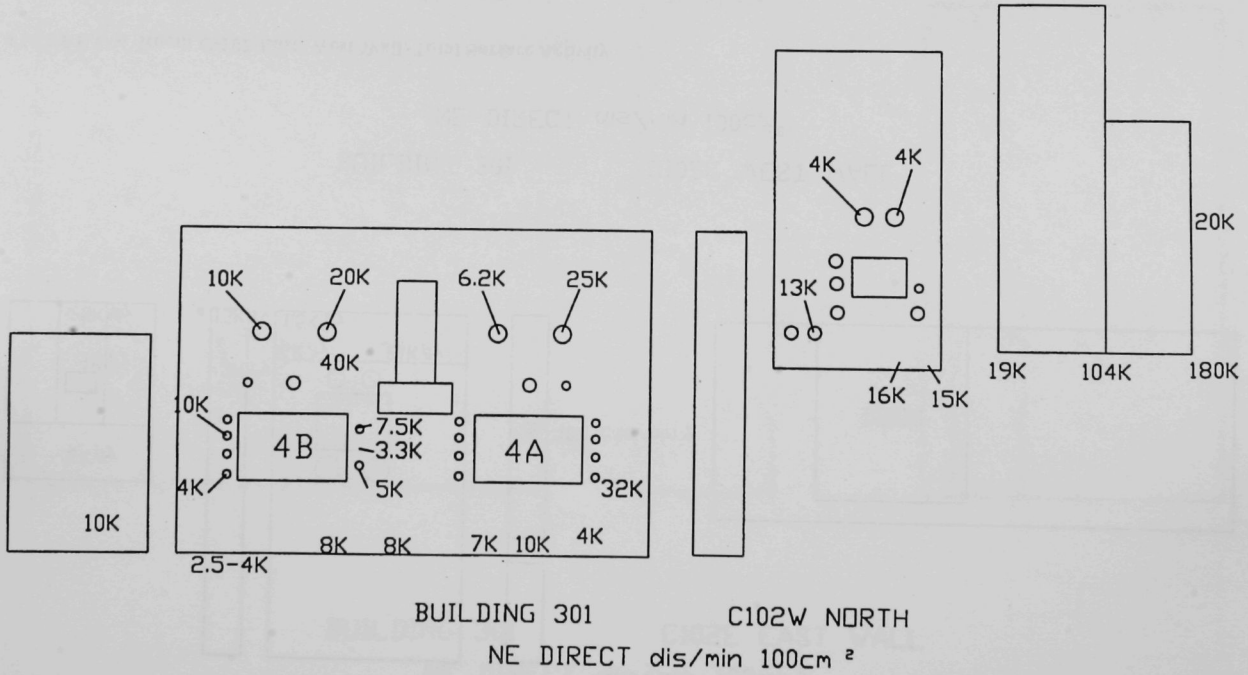
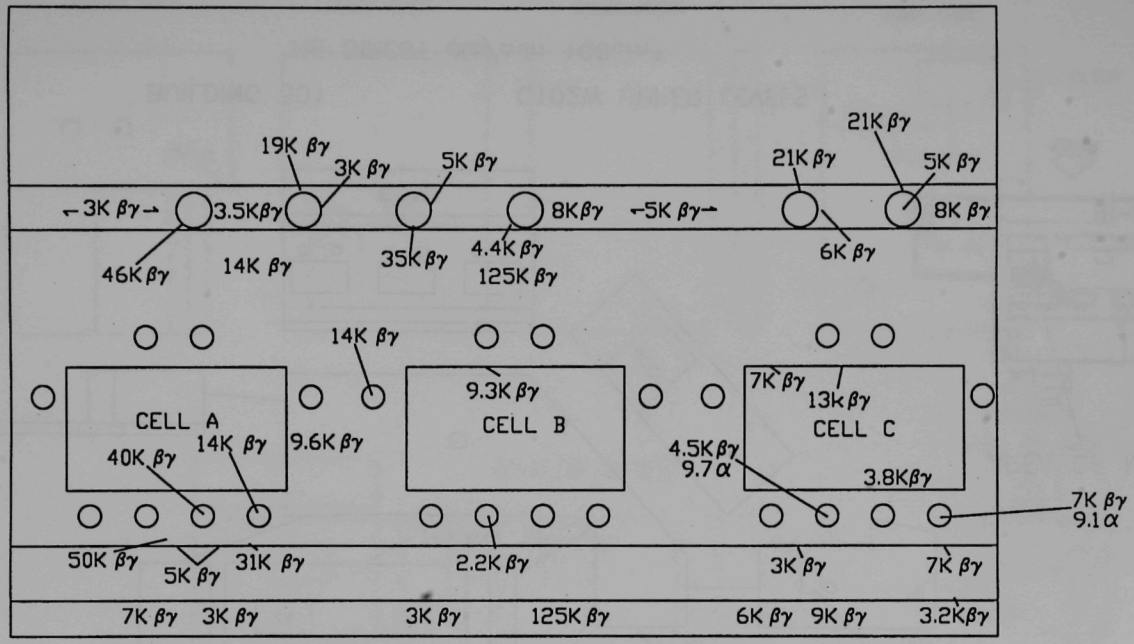


FIGURE C-5 Room C-102-West, North Wall, Total Surface Activity



BUILDING 301 C102W SOUTH WALL

NE DIRECT dis/min 100cm²

FIGURE C-6 Room C-102-West, South Wall, Total Surface Activity

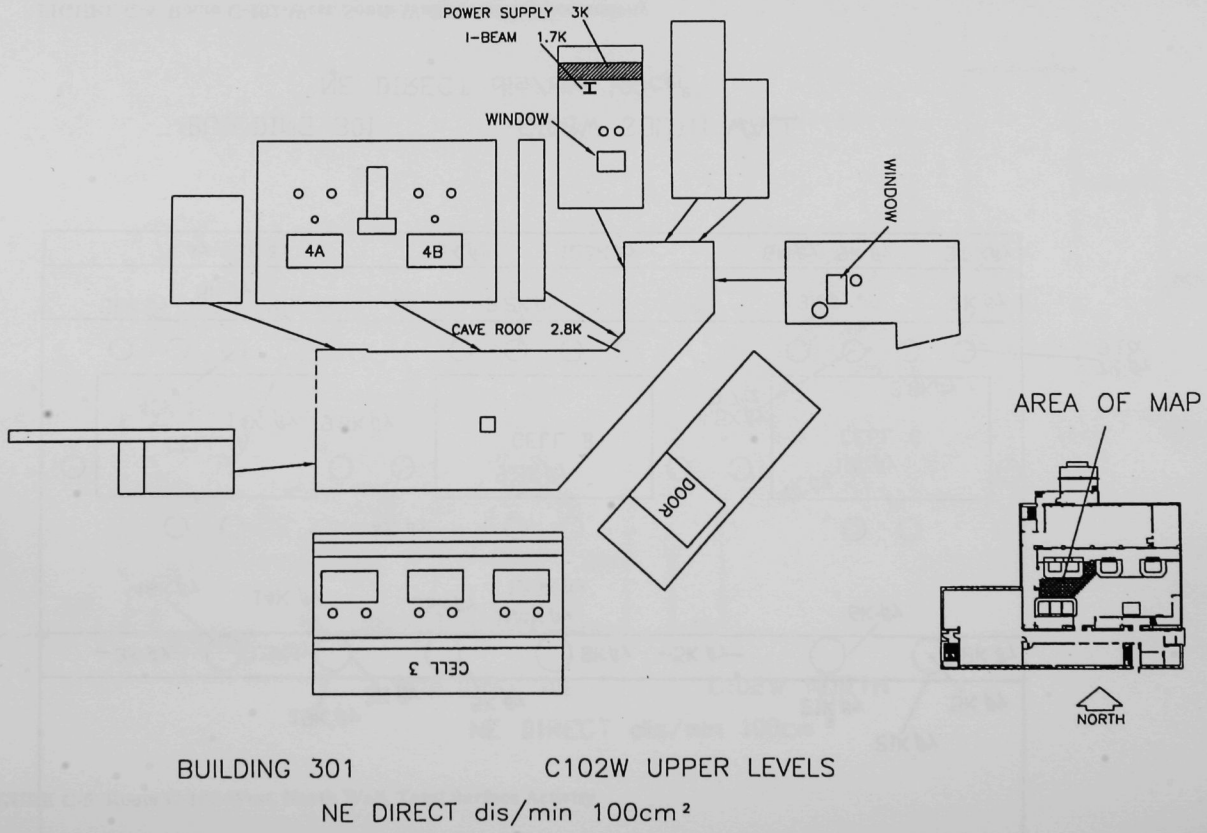


FIGURE C-7 Room C-102-West, Upper Levels, Total Surface Activity

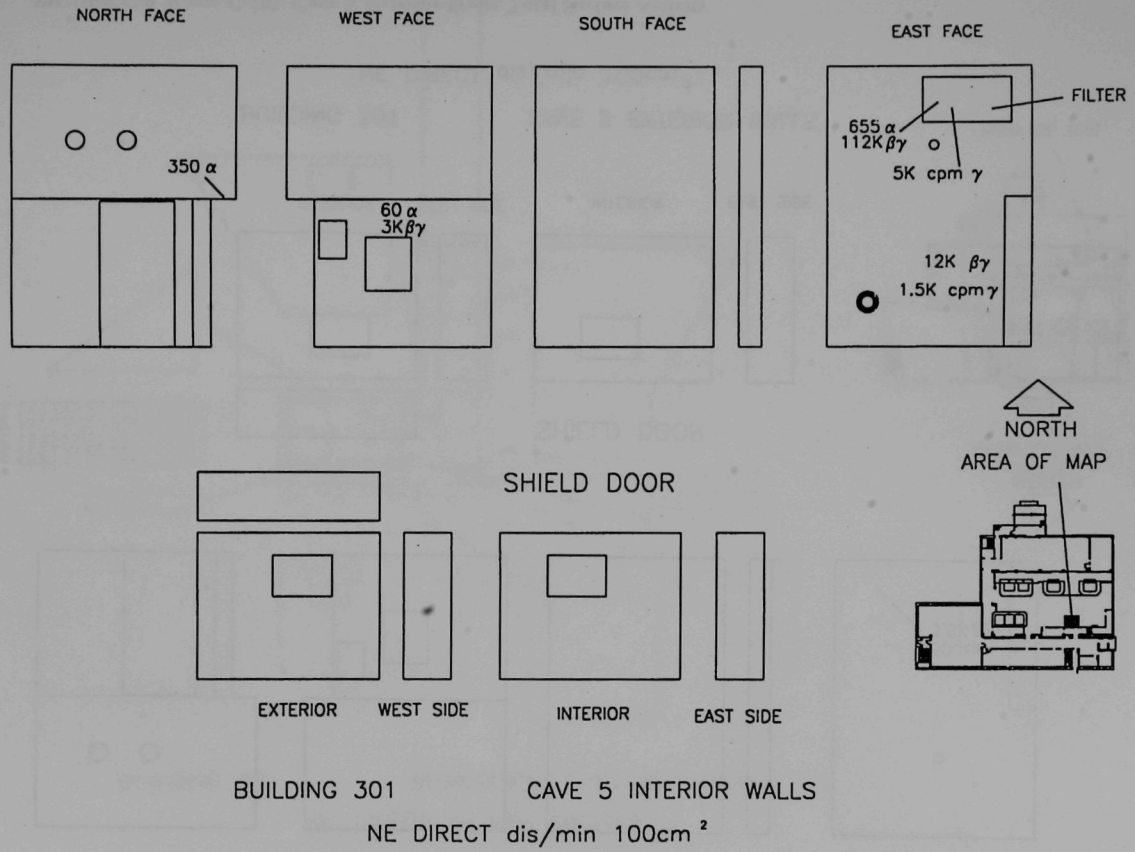


FIGURE C-8 Room C-102, Cave 5, Interior Walls, Total Surface Activity

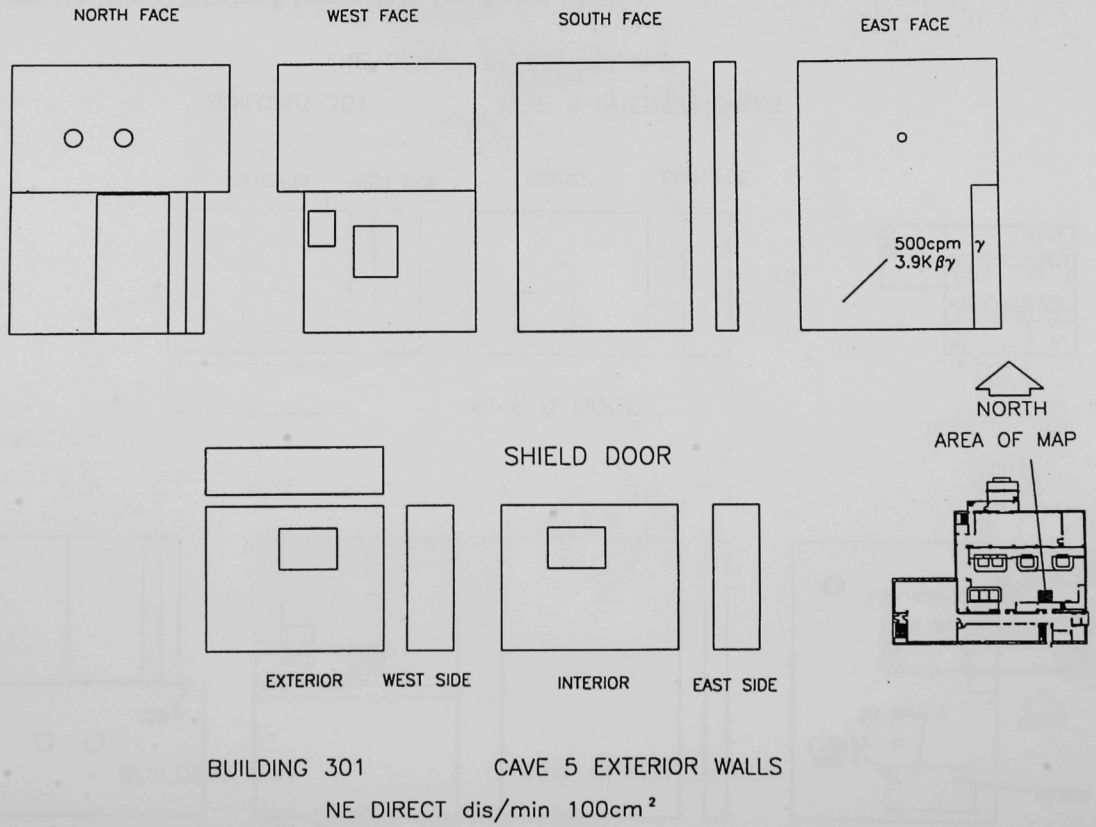
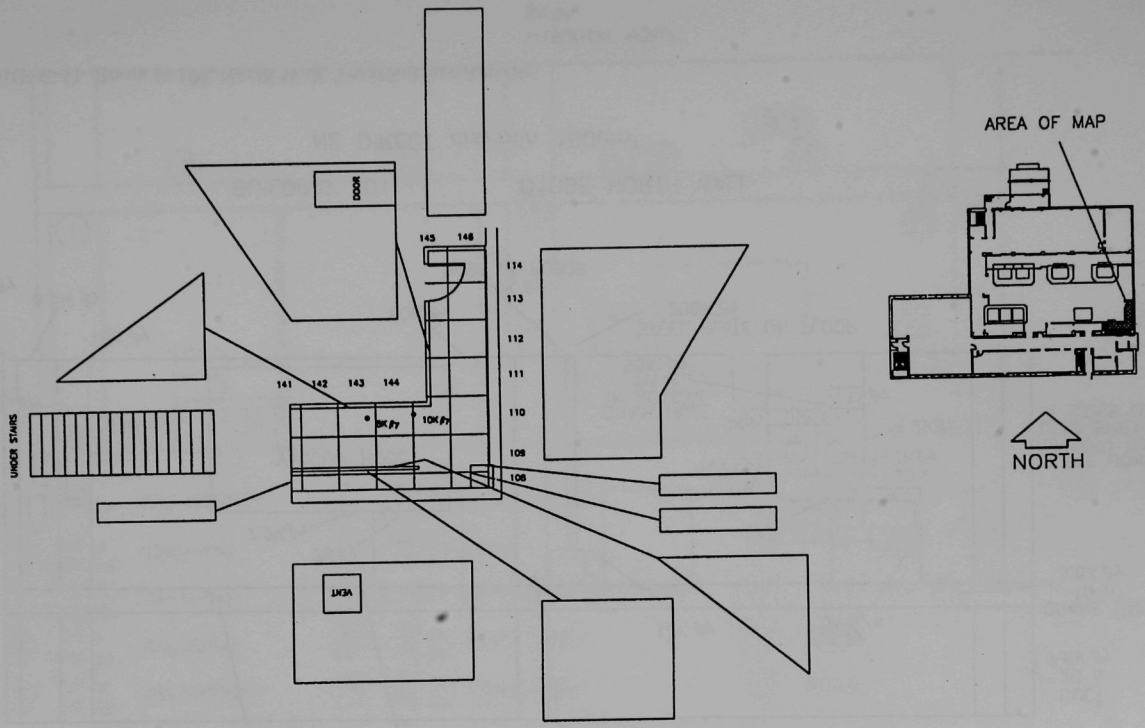


FIGURE C-9 Room C-102, Cave 5, Exterior Walls, Total Surface Activity



BUILDING 301 STOREROOM–ENTRANCE FROM C102

NE DIRECT dis/min 100cm²

FIGURE C-10 Storeroom off C-102, Total Surface Activity

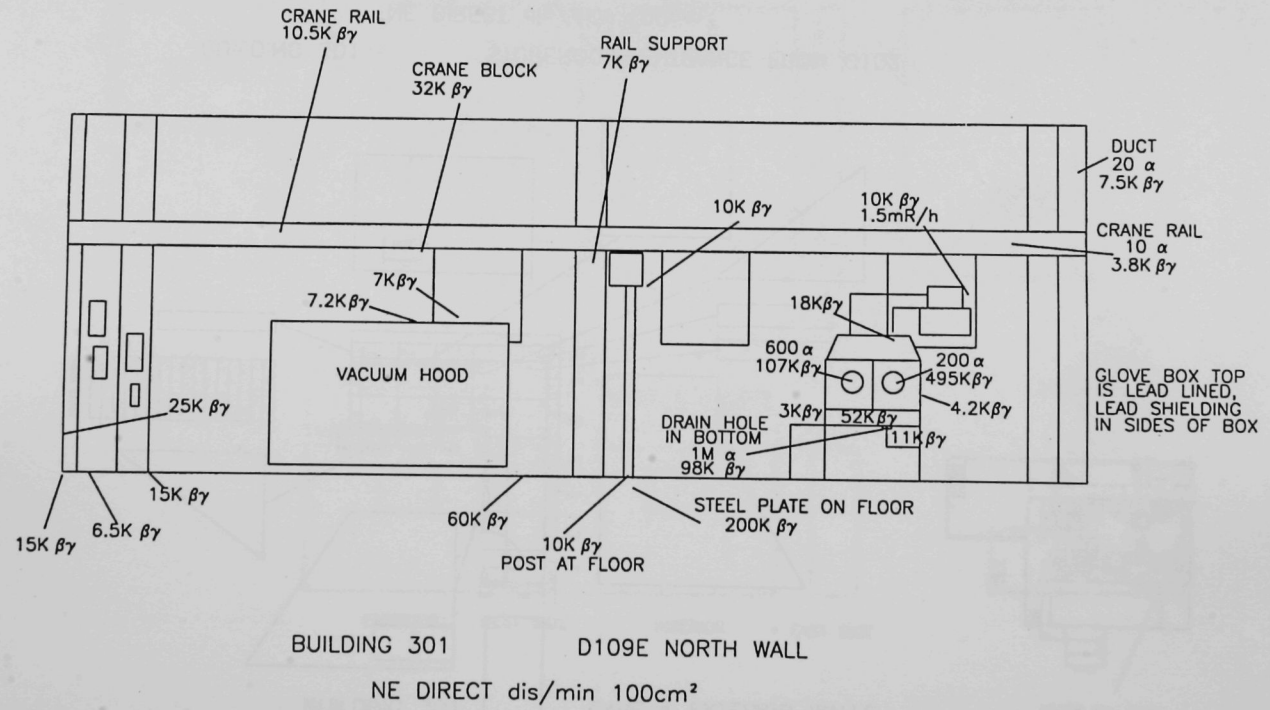


FIGURE C-11 Room D-109, North Wall, Total Surface Activity

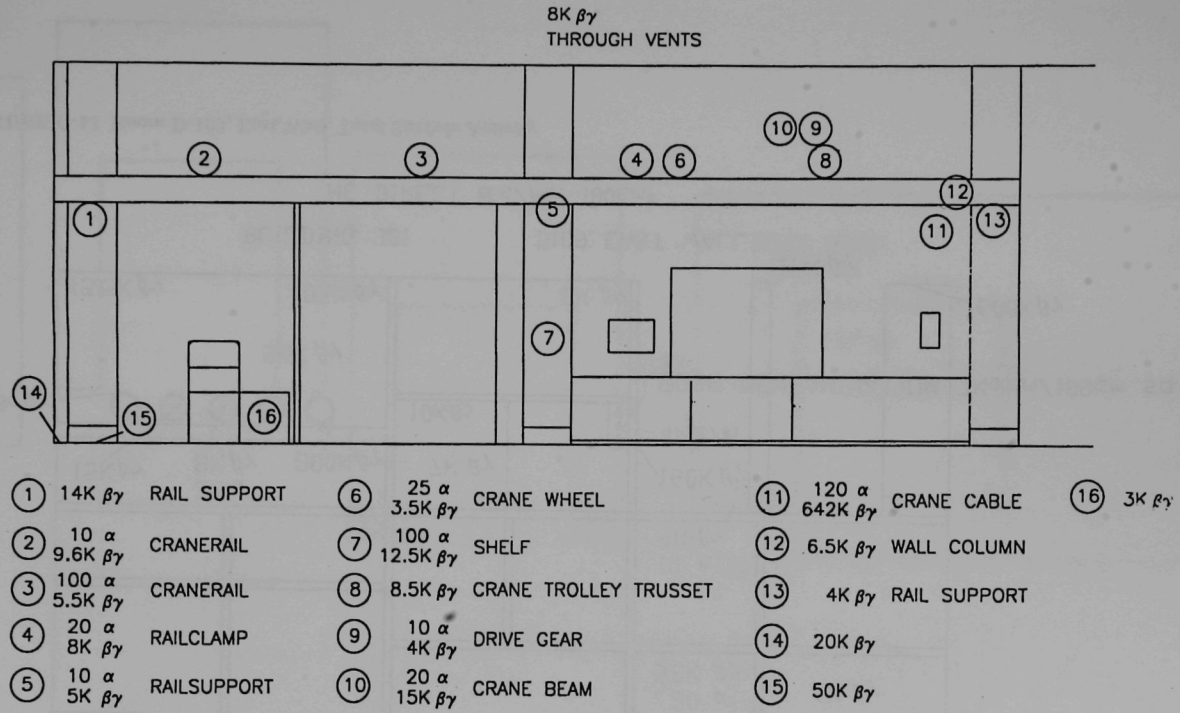


FIGURE C-12 Room D-109, South Wall, Total Surface Activity

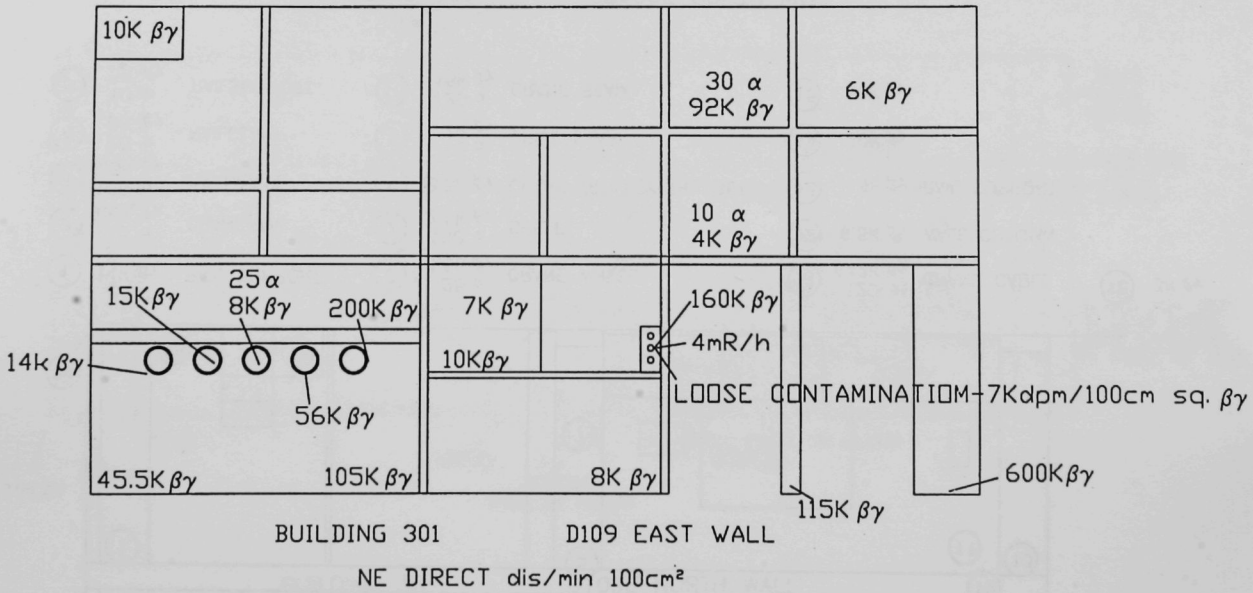
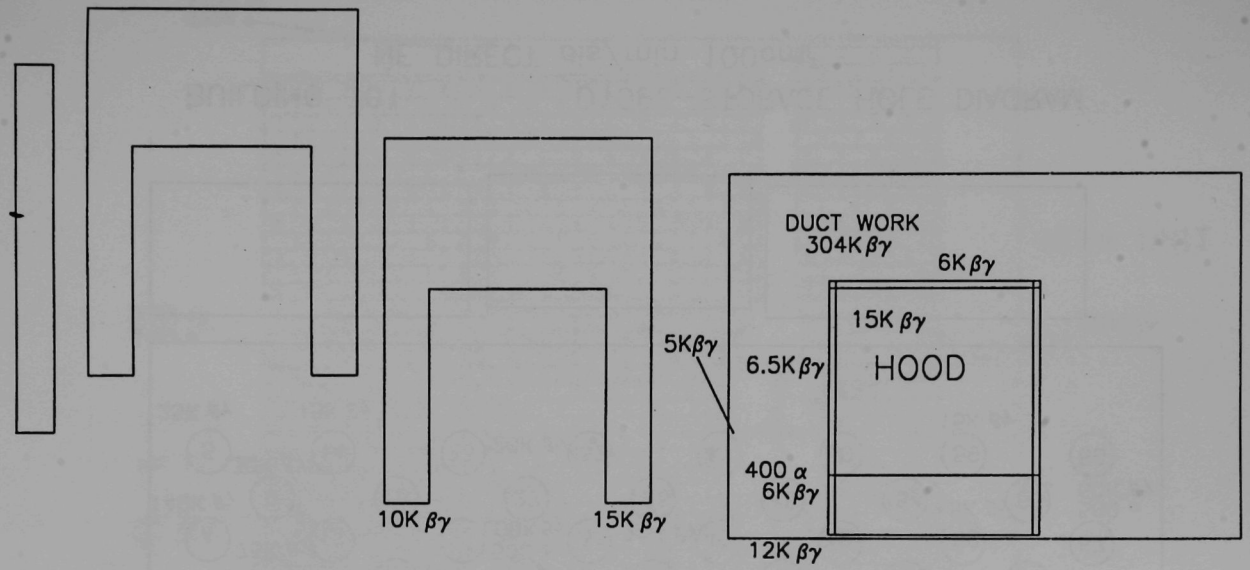


FIGURE C-13 Room D-109, East Wall, Total Surface Activity



BUILDING 301 D109W WEST WALL

NE DIRECT dis/min 100cm²

FIGURE C-14 Room D-109, West Wall, Total Surface Activity

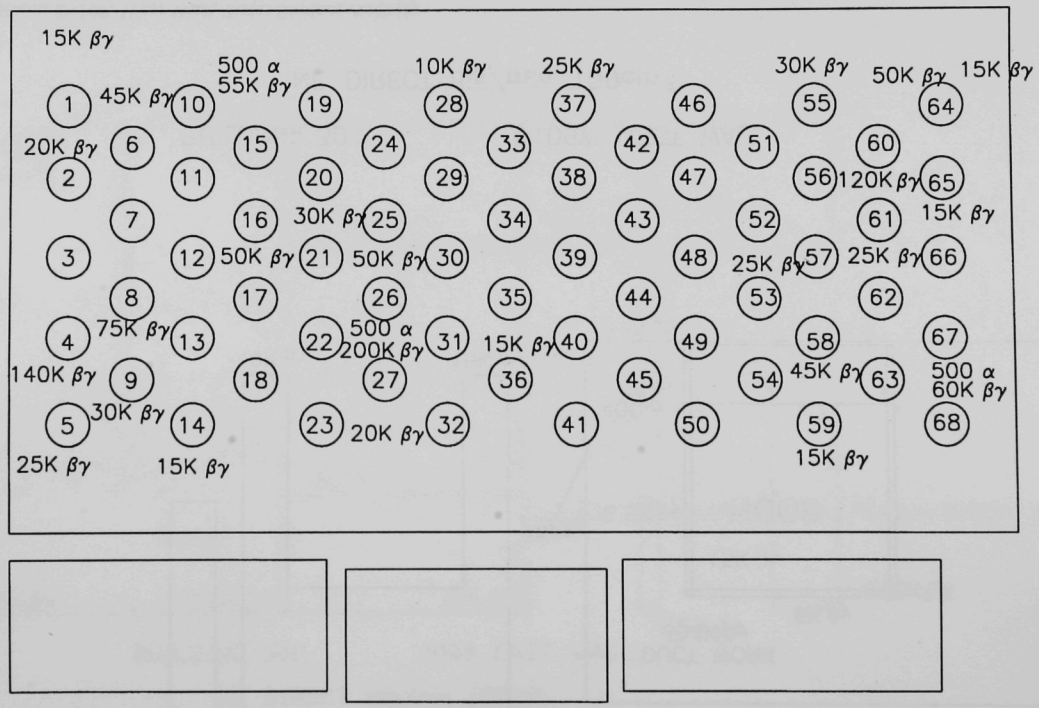


FIGURE C-15 Room D-109, Storage Holes, Total Surface Activity

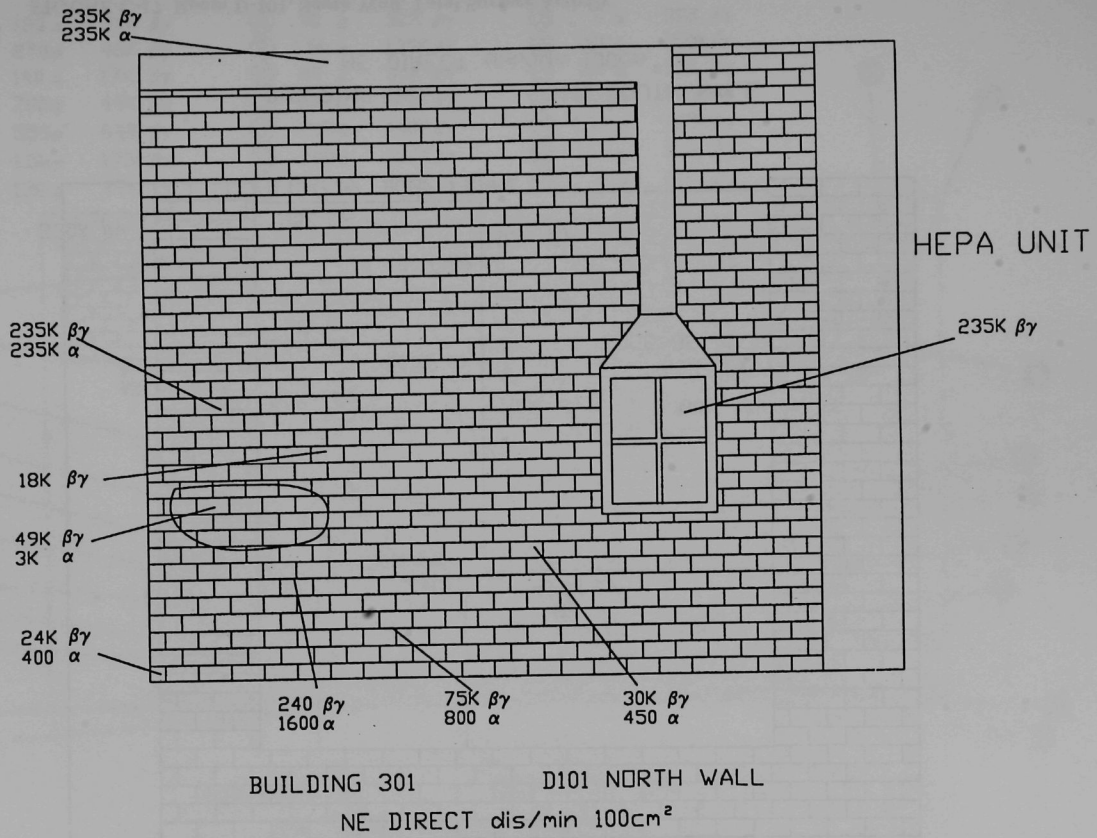


FIGURE C-16 Room D-101, North Wall, Total Surface Activity

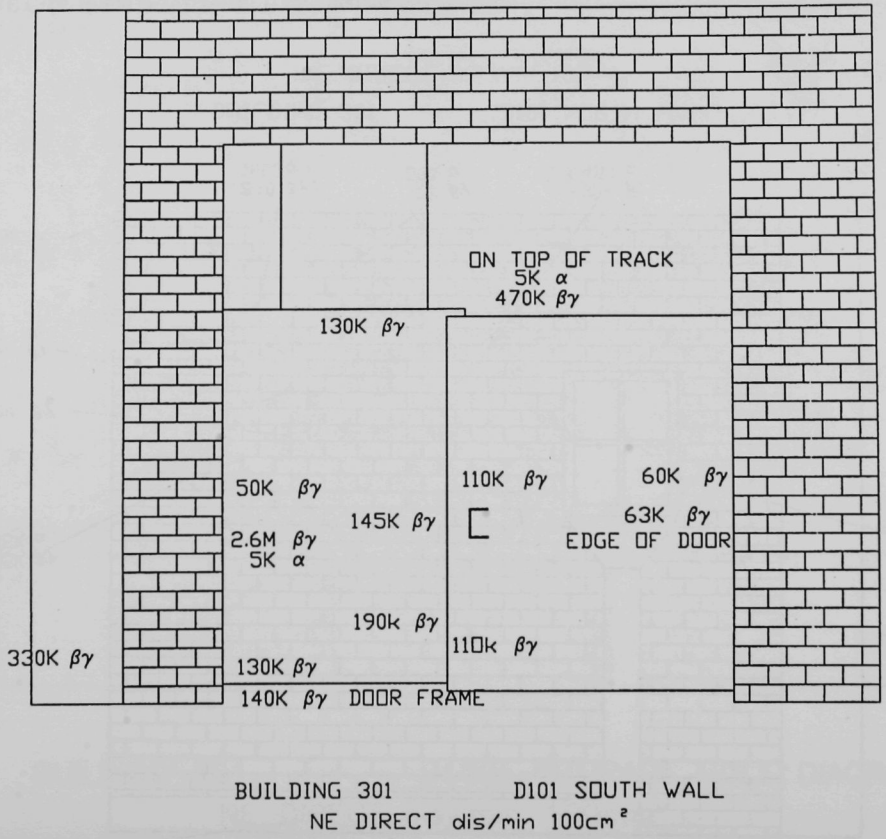
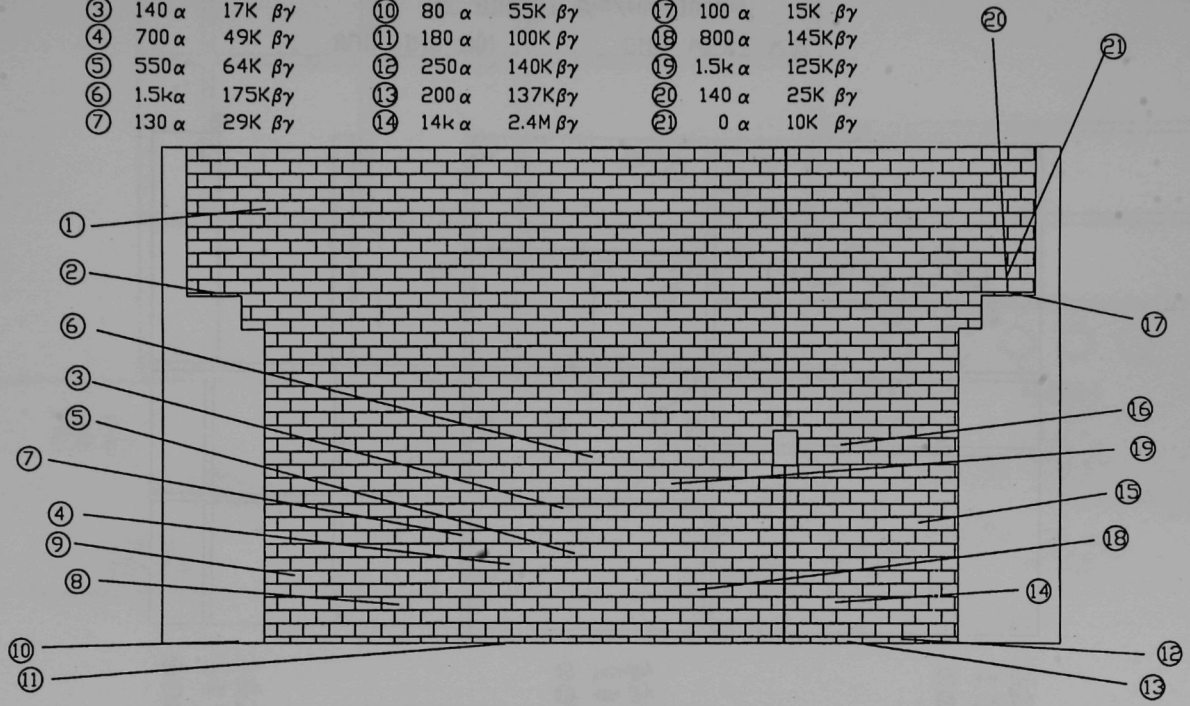


FIGURE C-17 Room D-101, South Wall, Total Surface Activity

1	180 α	32K βγ	8	90 α	32K βγ	15	0 α	28K βγ
2	270 α	40K βγ	9	1.5k α	130K βγ	16	200 α	150K βγ
3	140 α	17K βγ	10	80 α	55K βγ	17	100 α	15K βγ
4	700 α	49K βγ	11	180 α	100K βγ	18	800 α	145K βγ
5	550 α	64K βγ	12	250 α	140K βγ	19	1.5k α	125K βγ
6	1.5k α	175K βγ	13	200 α	137K βγ	20	140 α	25K βγ
7	130 α	29K βγ	14	14k α	2.4M βγ	21	0 α	10K βγ

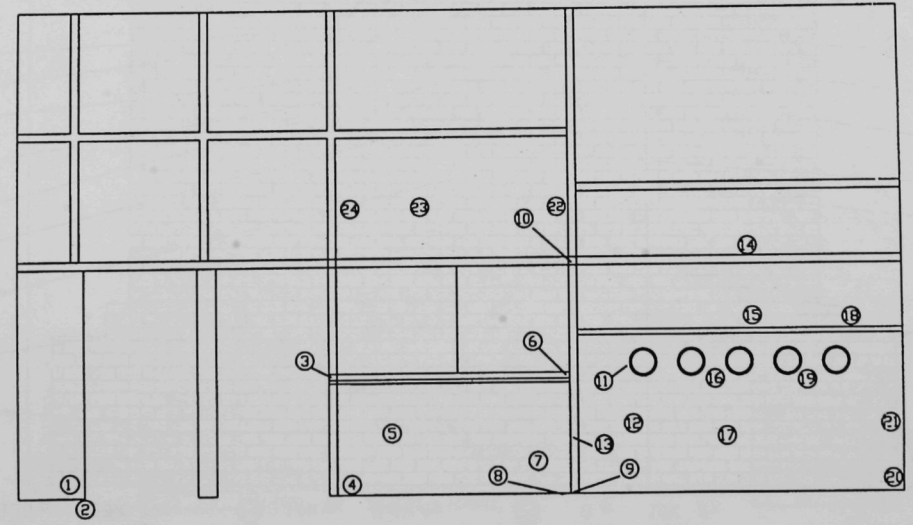


BUILDING 301 D101 EAST WALL

NE DIRECT dis/min 100cm ^{2}

FIGURE C-18 Room D-101, East Wall, Total Surface Activity

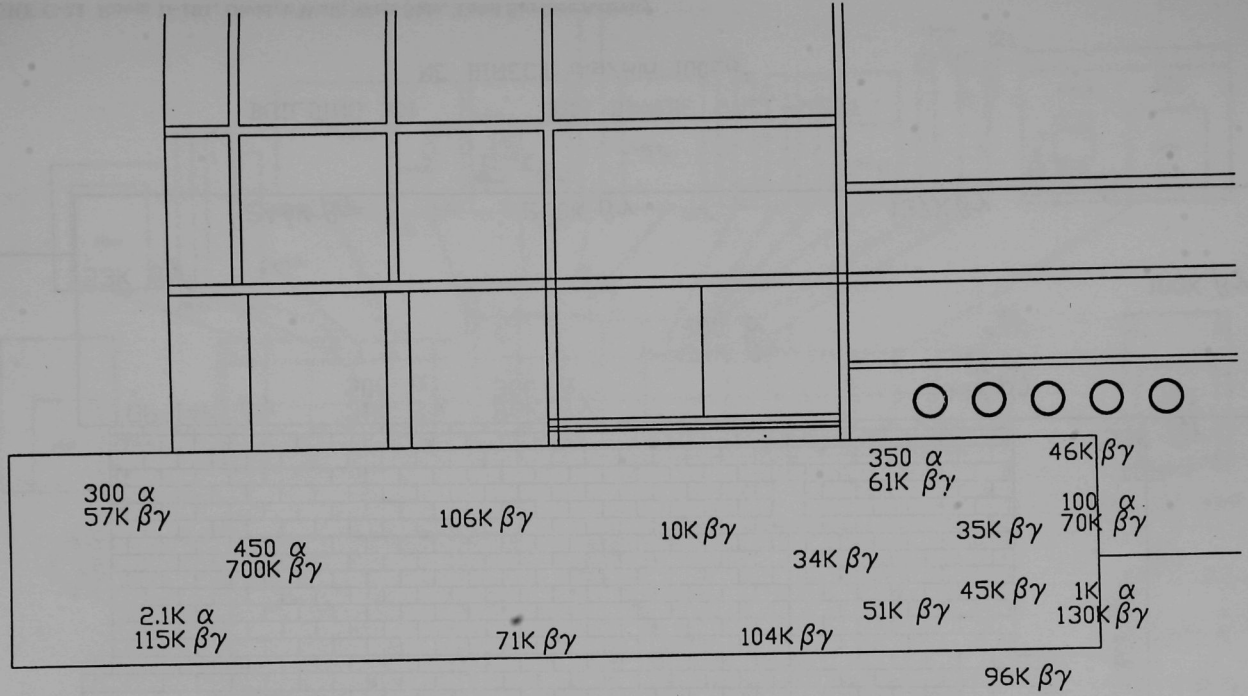
① 30K $\beta\gamma$
② 1.3M $\beta\gamma$ 1k α
③ 23K $\beta\gamma$
④ 155K$\beta\gamma$
⑤ 23K $\beta\gamma$
⑥ 83K $\beta\gamma$
⑦ 18K $\beta\gamma$
⑧ 210K$\beta\gamma$
⑨ 160k$\beta\gamma$
⑩ 50k $\beta\gamma$
⑪ 270k$\beta\gamma$
⑫ 160k$\beta\gamma$
⑬ 310k$\beta\gamma$
⑭ 53k $\beta\gamma$
⑮ 40k $\beta\gamma$
⑯ 145k$\beta\gamma$
⑰ 94K $\beta\gamma$ 200α
⑱ 51K $\beta\gamma$
⑲ 72K $\beta\gamma$
⑳ 128K$\beta\gamma$
㉑ 77K $\beta\gamma$
㉒ 58K $\beta\gamma$
㉓ 70K $\beta\gamma$
㉔ 49K $\beta\gamma$



BUILDING 301 D101 WEST WALL

NE DIRECT dis/min 100cm^2

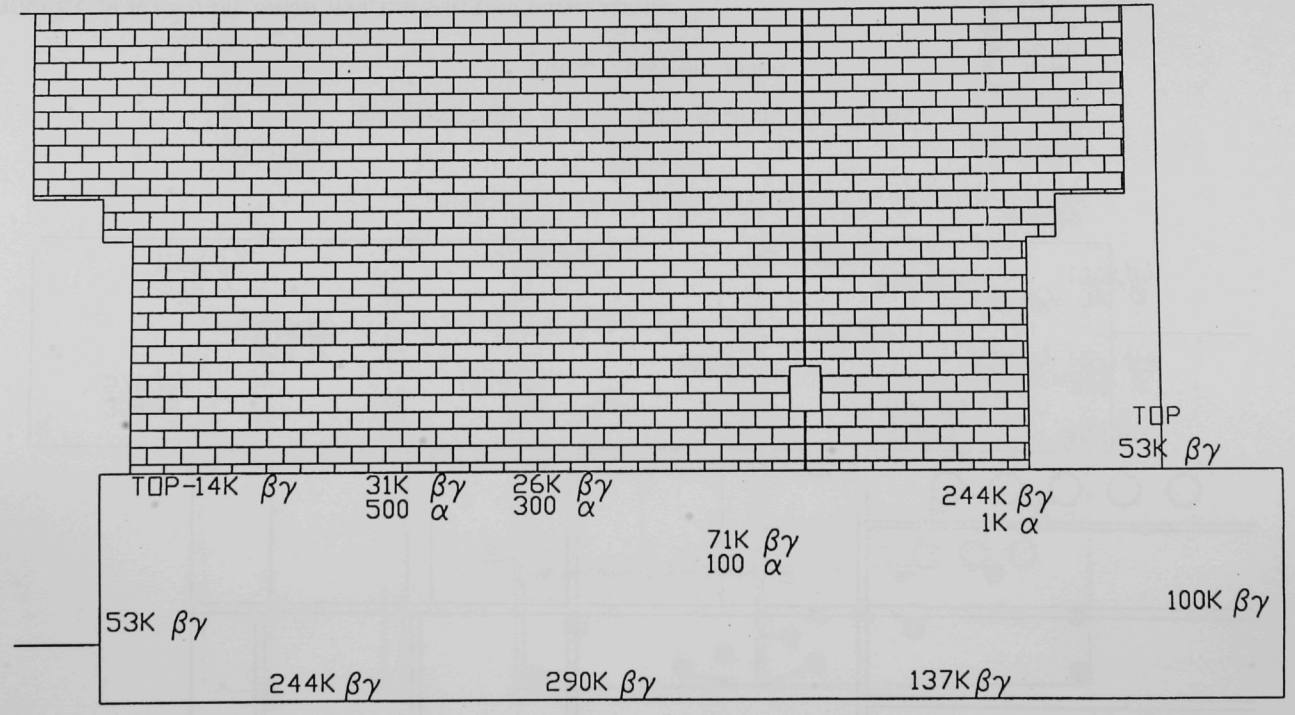
FIGURE C-19 Room D-101, West Wall, Total Surface Activity



BUILDING 301 D101 DIVIDE WALL-EAST

NE DIRECT dis/min 100cm²

FIGURE C-20 Room D-101, Divider Wall, East Side, Total Surface Activity



BUILDING 301 D101 DIVIDE WALL-WEST

NE DIRECT dis/min 100cm²

FIGURE C-21 Room D-101, Divider Wall, West Side, Total Surface Activity

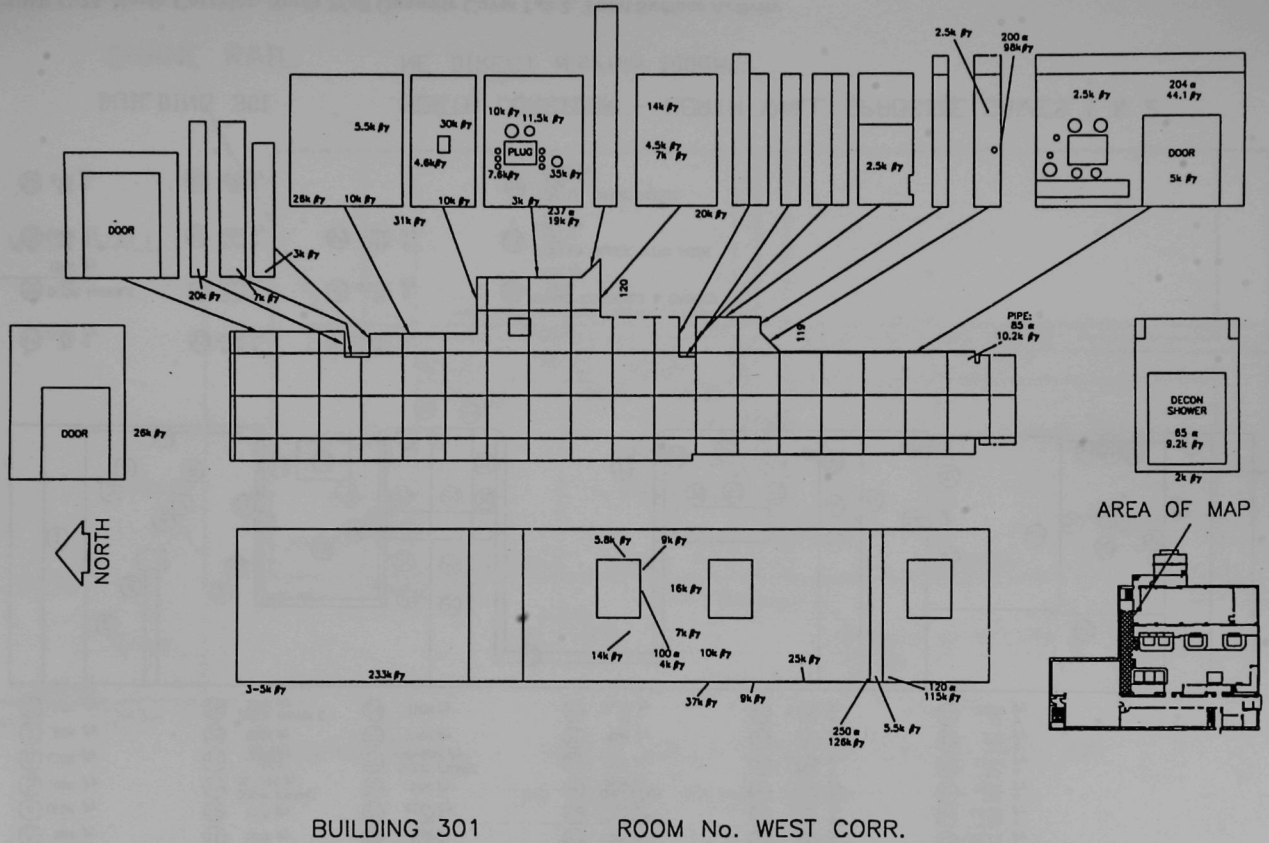


FIGURE C-22 West Corridor (Corridor No. 2), Total Surface Activity

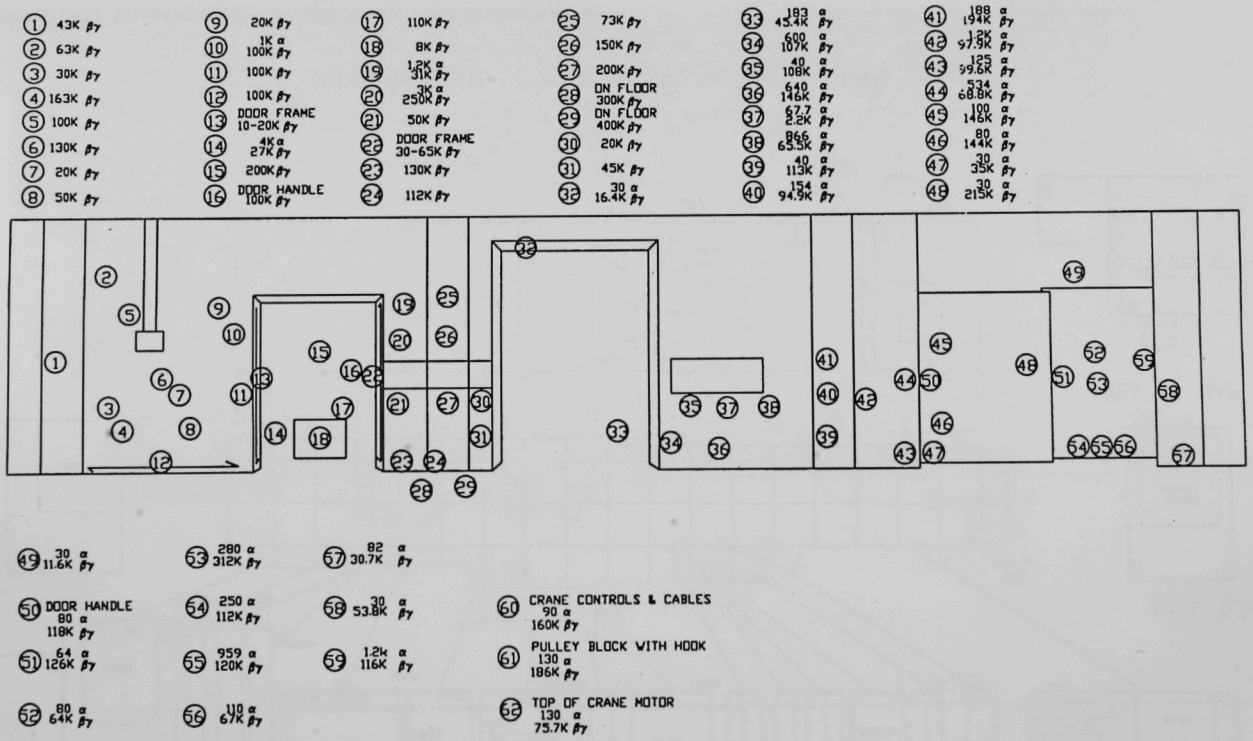


FIGURE C-23 North Corridor, North Wall Opposite Caves 1 & 2, Total Surface Activity

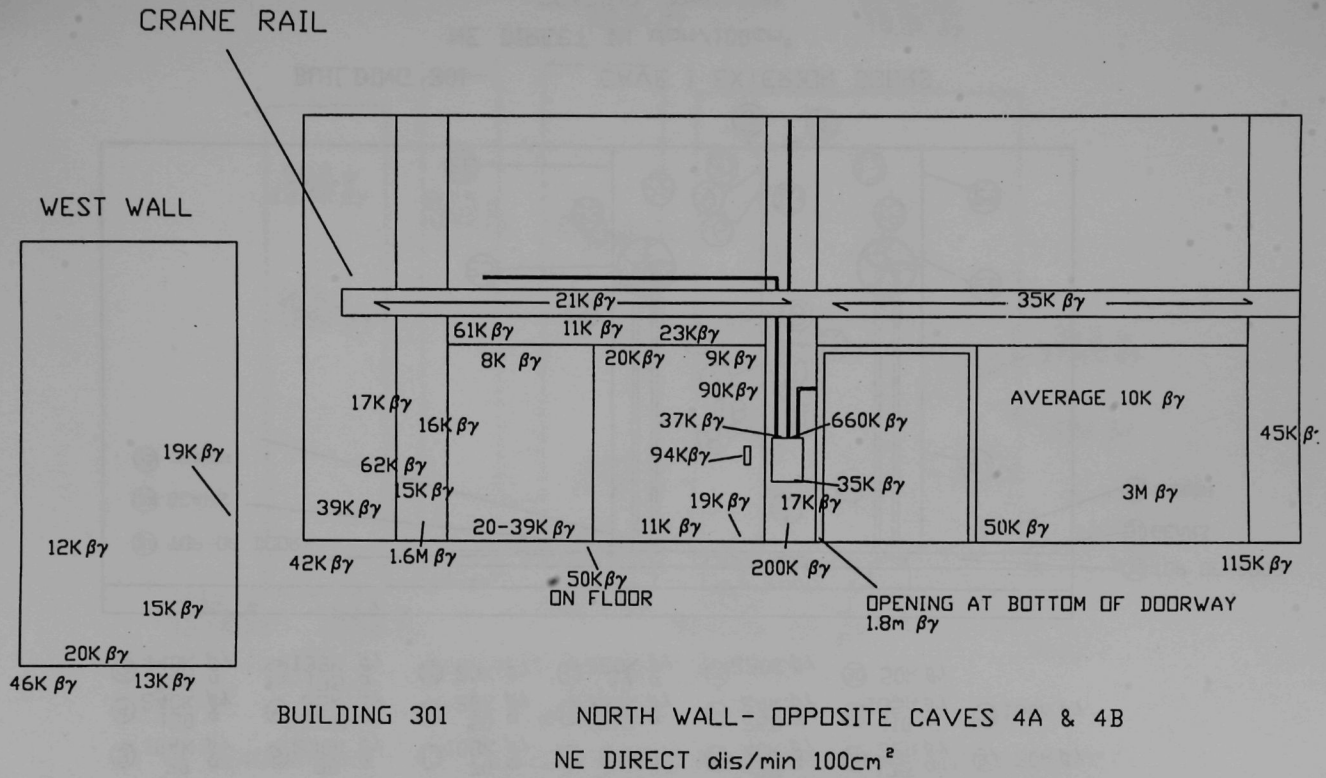
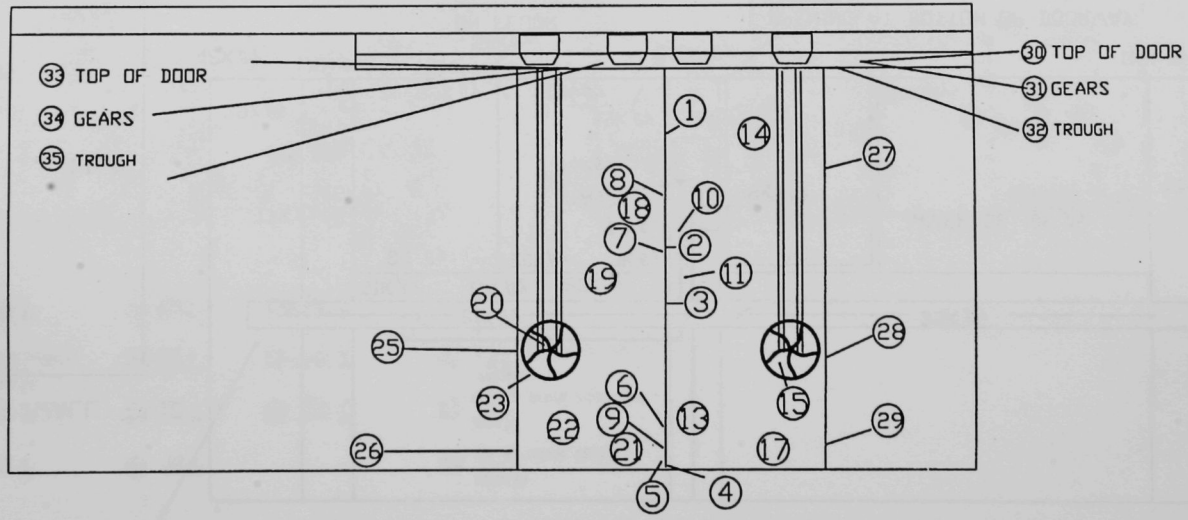


FIGURE C-24 North Corridor, North Wall Opposite Caves 4A & 4B, Total Surface Activity

① 16K $\beta\gamma$	⑥ 6.7K $\beta\gamma$	⑪ 165K $\beta\gamma$	⑯ 397 α 78K $\beta\gamma$	㉑ 60 α 175k $\beta\gamma$	㉖ 125 α 112k $\beta\gamma$	㉛ 50k $\beta\gamma$
② 100 α 200K $\beta\gamma$	⑦ 290 α 75K $\beta\gamma$	⑫ 120 α 460K $\beta\gamma$	⑰ 65 α 85K $\beta\gamma$	㉒ 660 α 139K $\beta\gamma$	㉗ 115 α 32k $\beta\gamma$	㉜ 120k $\beta\gamma$
③ 20 α 104K $\beta\gamma$	⑧ 30 α 230K $\beta\gamma$	⑬ 70 α 108K $\beta\gamma$	⑱ 24K $\beta\gamma$	㉓ 25 α 40K $\beta\gamma$	㉘ 175 α 32k $\beta\gamma$	㉝ 30k $\beta\gamma$
④ 150 α 240K $\beta\gamma$	⑨ 3.7K α 65K $\beta\gamma$	⑭ 50 α 28K $\beta\gamma$	⑲ 912 α 380K $\beta\gamma$	㉔ 265 α 24K $\beta\gamma$	㉙ 110 α 135k $\beta\gamma$	㉞ 150K $\beta\gamma$
⑤ 225 α 140K $\beta\gamma$	⑩ 135 α 133K $\beta\gamma$	⑮ 20K $\beta\gamma$	⑳ 40 α 220K $\beta\gamma$	㉕ 220K $\beta\gamma$	㉚ 50k $\beta\gamma$	



BUILDING 301 CAVE 1 EXTERIOR DOORS

NE DIRECT IN dpm/100cm²

FIGURE C-25 North Corridor, Cave 1 Exterior Doors, Total Surface Activity

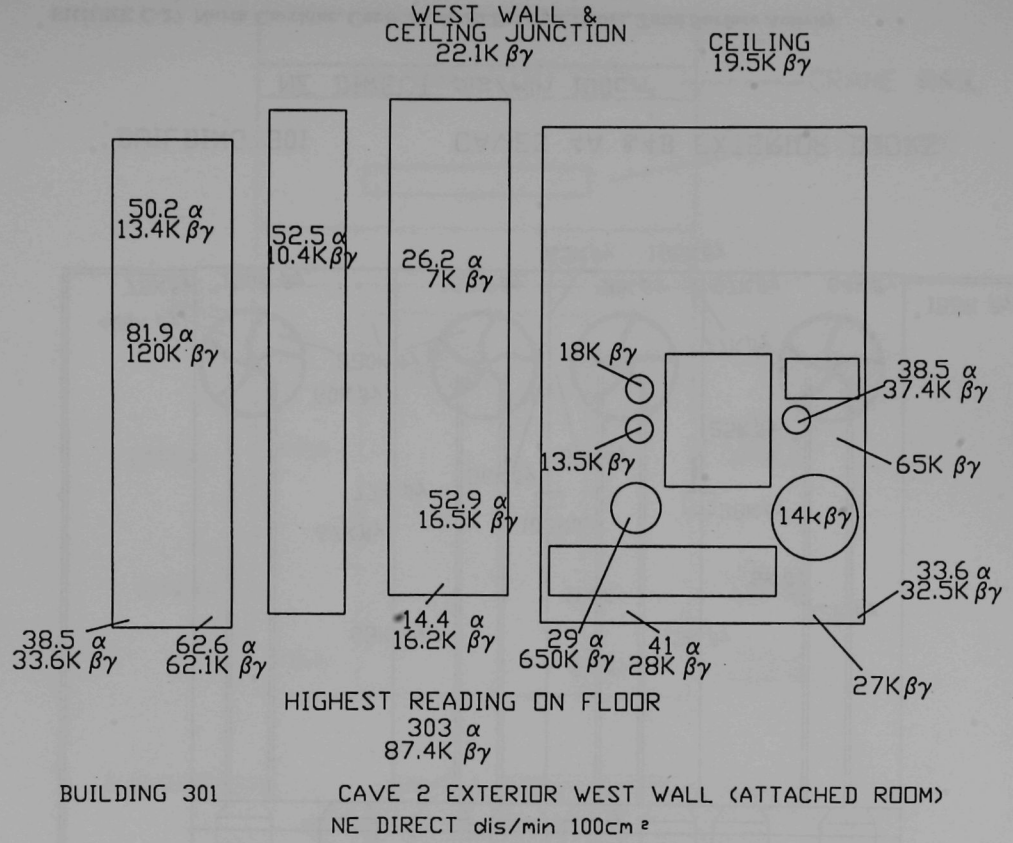
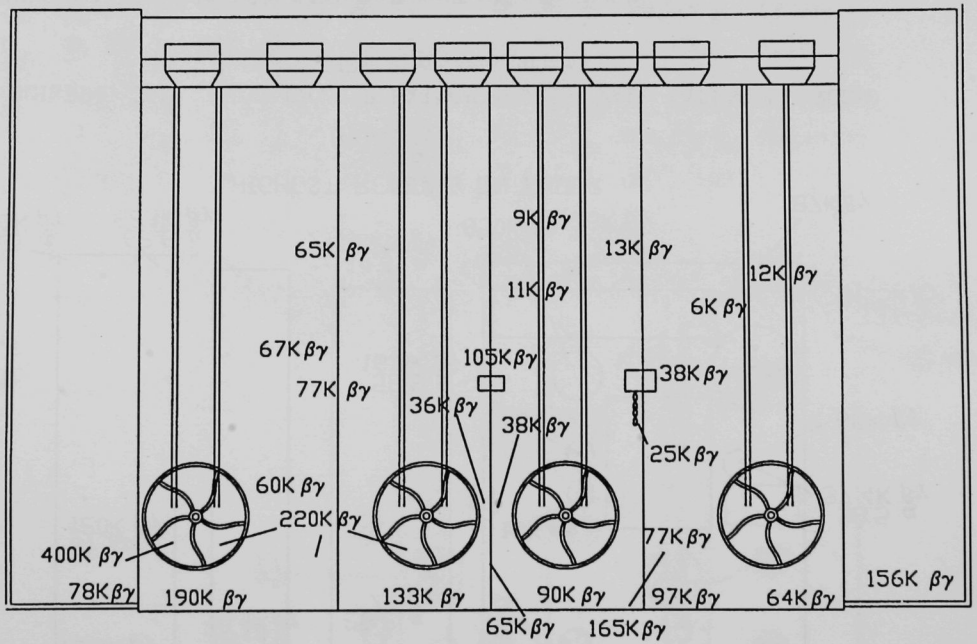


FIGURE C-26 North Corridor, Cave 2 Exterior Doors, Total Surface Activity



BUILDING 301 CAVES 4A &4B EXTERIOR DOORS

NE DIRECT dis/min 100cm²

FIGURE C-27 North Corridor, Caves 4A & 4B Exterior Doors, Total Surface Activity

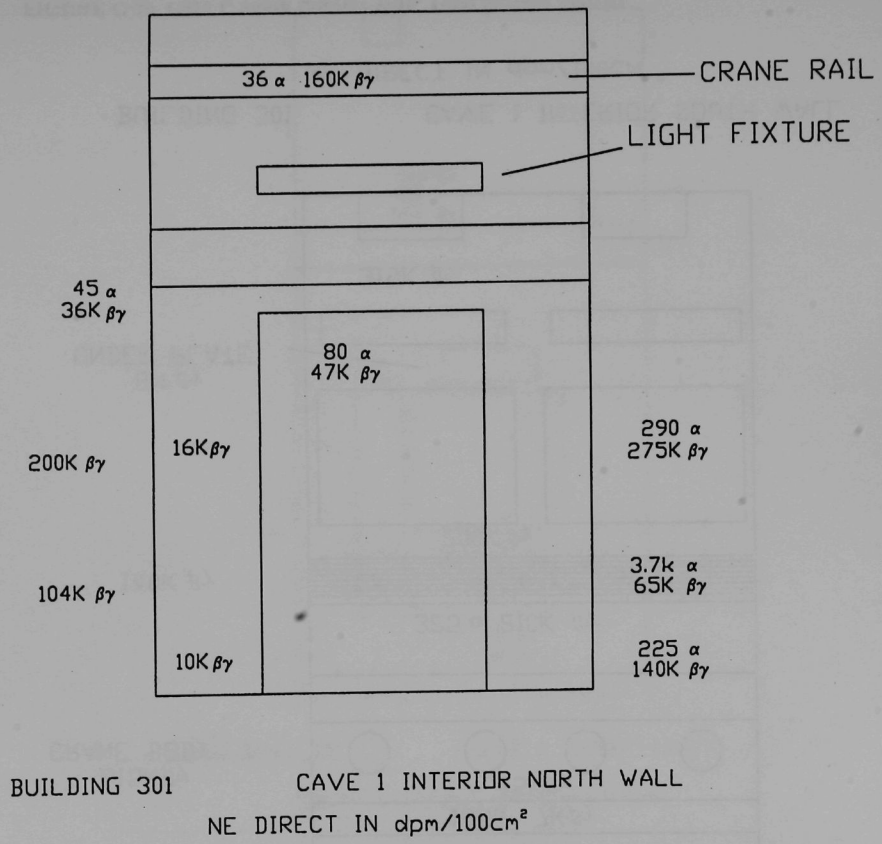


FIGURE C-28 Cave 1, North Interior Wall, Total Surface Activity

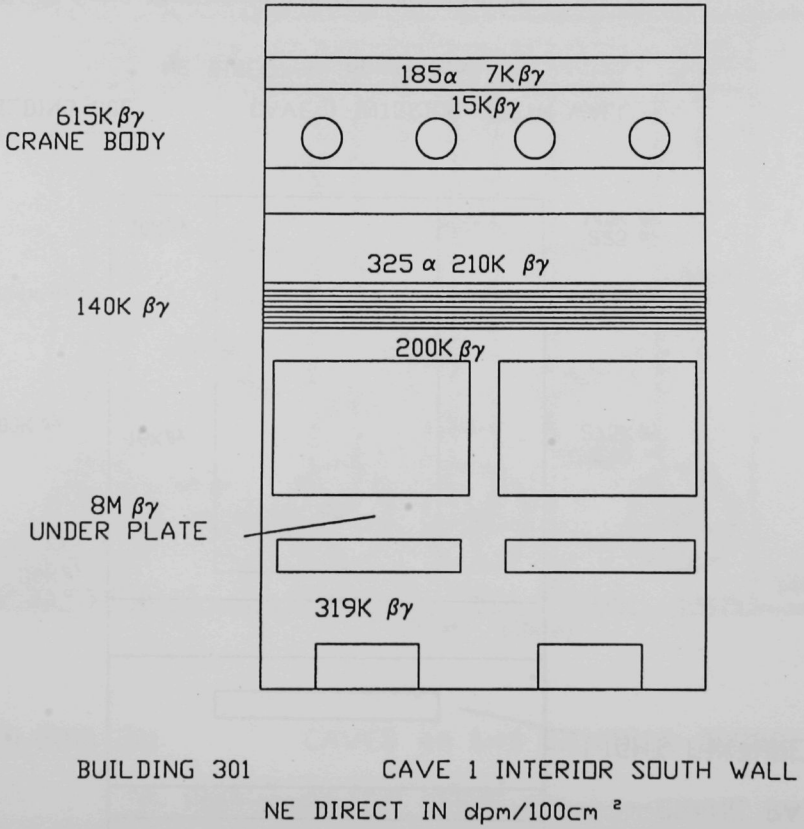
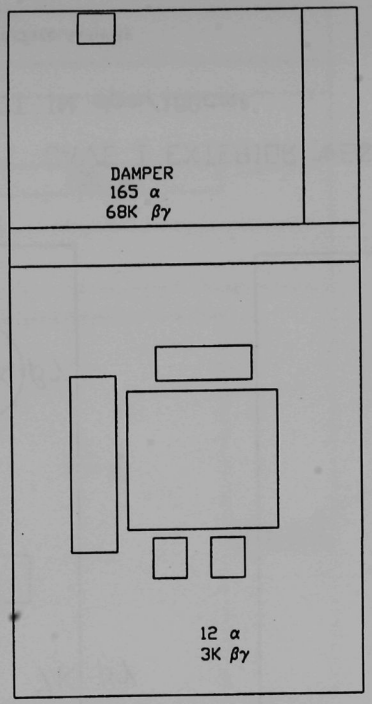


FIGURE C-29 Cave 1, South Interior Wall, Total Surface Activity



BUILDING 301 CAVE 1 INSIDE-EAST

CAVE 1 DIRECT IN dpm/100cm²

FIGURE C-30 Cave 1, East Interior Wall, Total Surface Activity

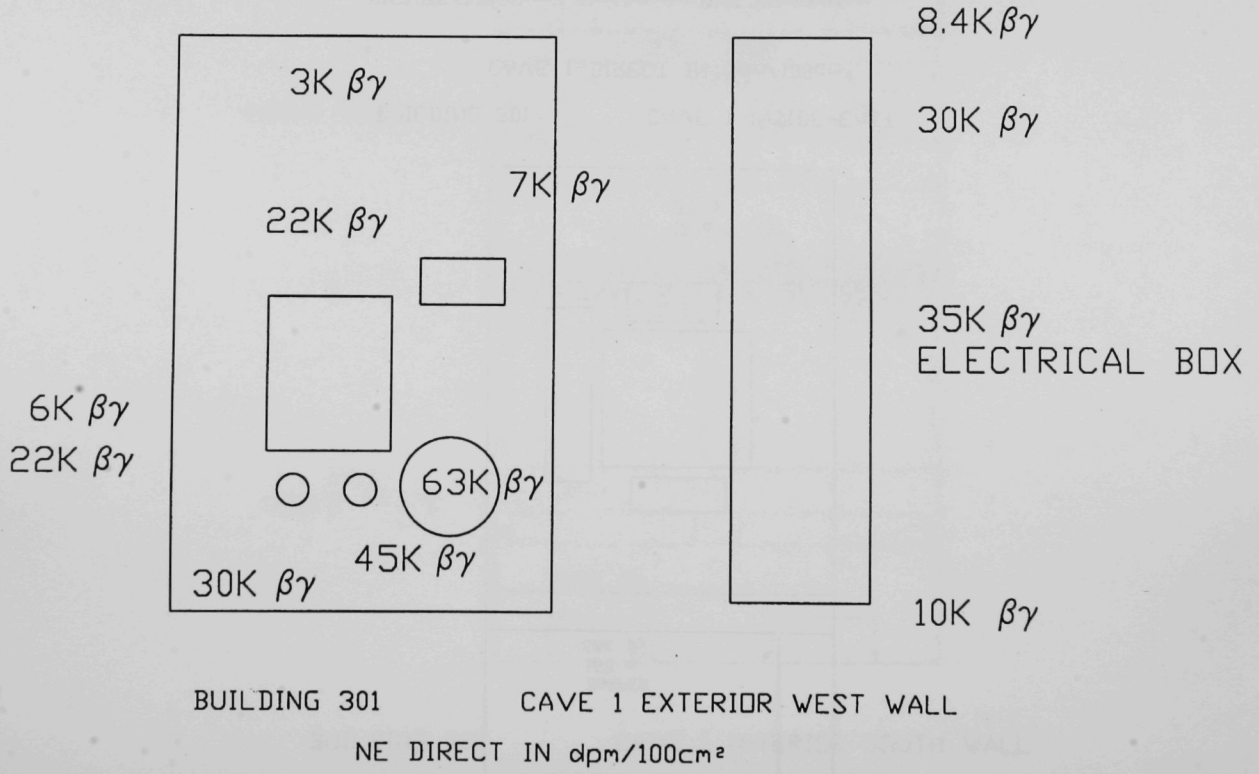
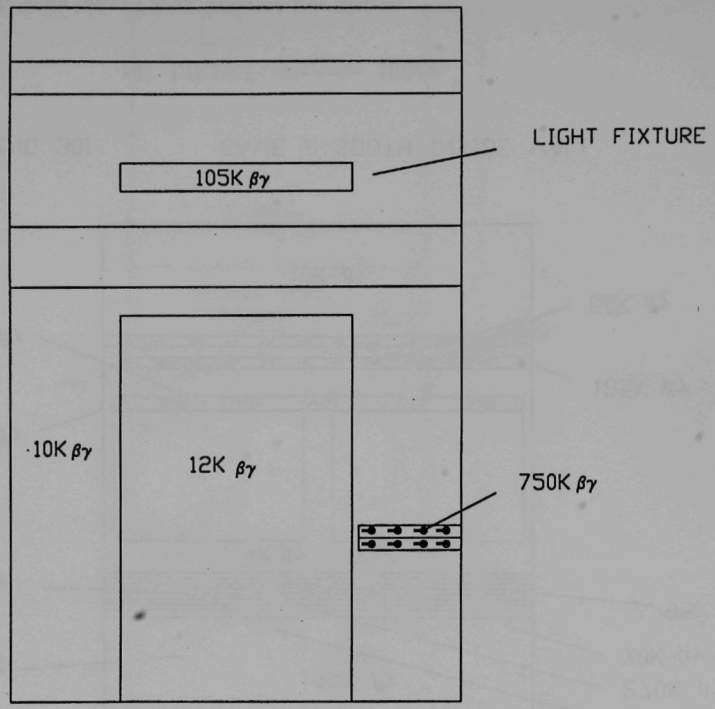


FIGURE C-31 Cave 1, West Interior Wall, Total Surface Activity



BUILDING 301 CAVE 2 INTERIOR NORTH WALL

NE DIRECT dis/min 100cm²

FIGURE C-32 Cave 2, North Interior Wall, Total Surface Activity

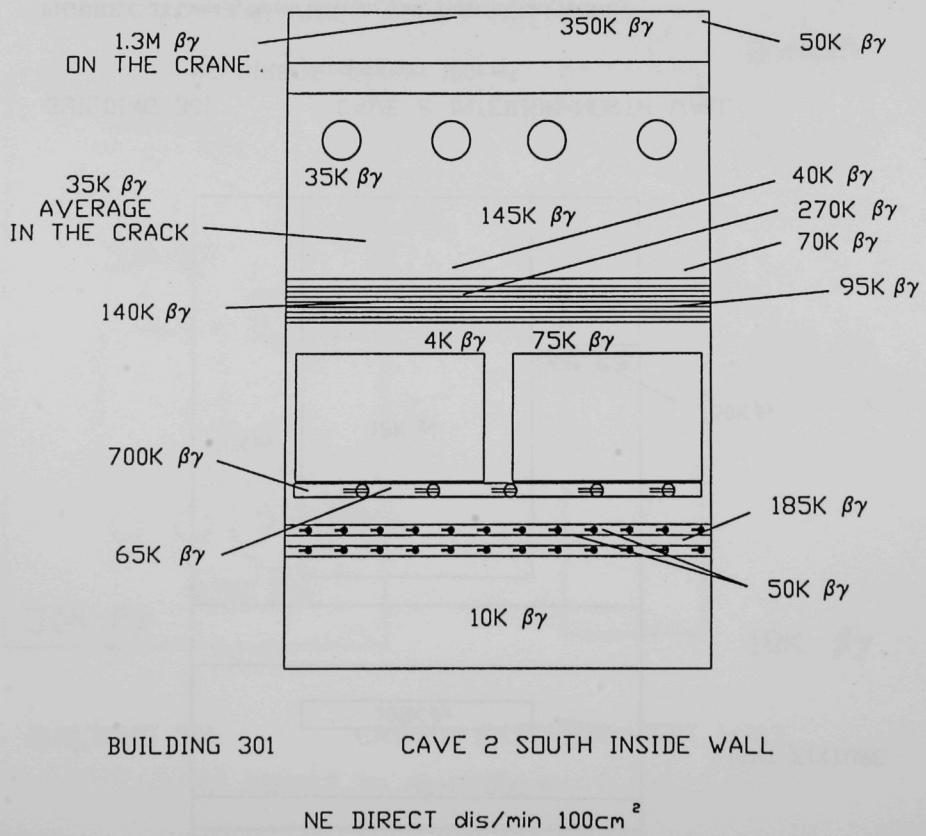
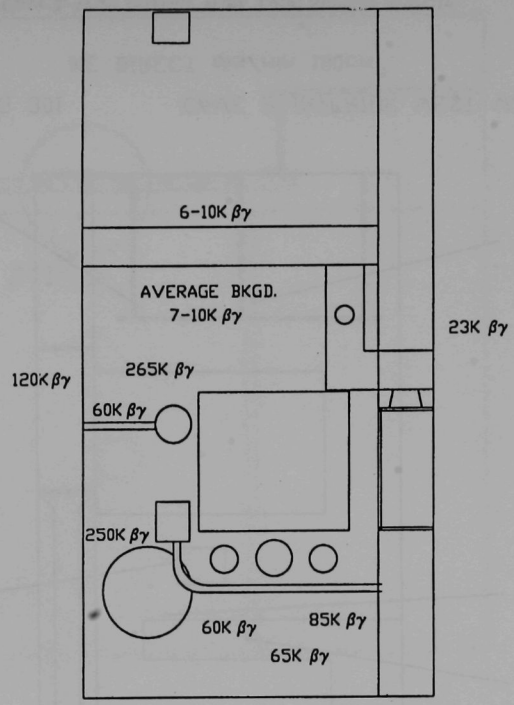


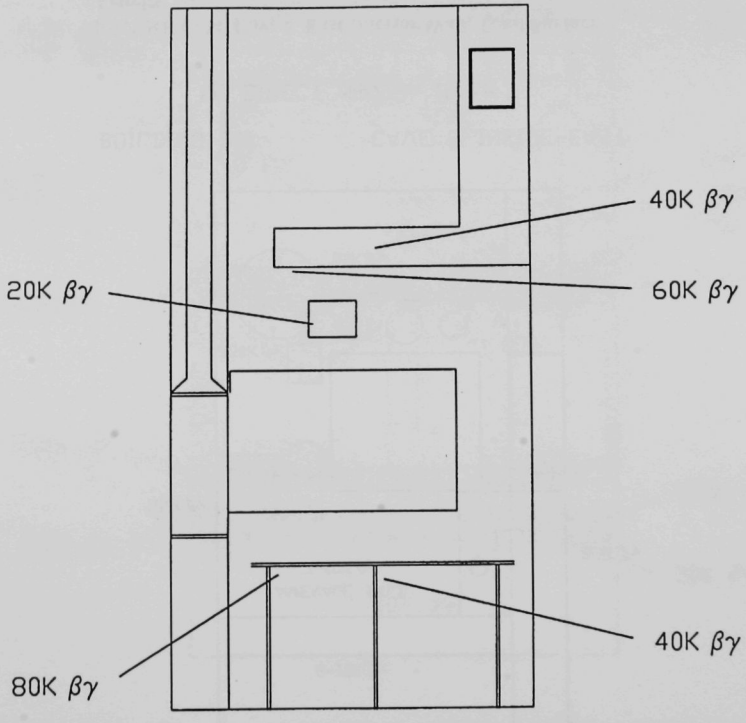
FIGURE C-33 Cave 2, South Interior Wall, Total Surface Activity



BUILDING 301 CAVE 2 INSIDE-EAST

NE DIRECT dis/min 100cm ^{2}

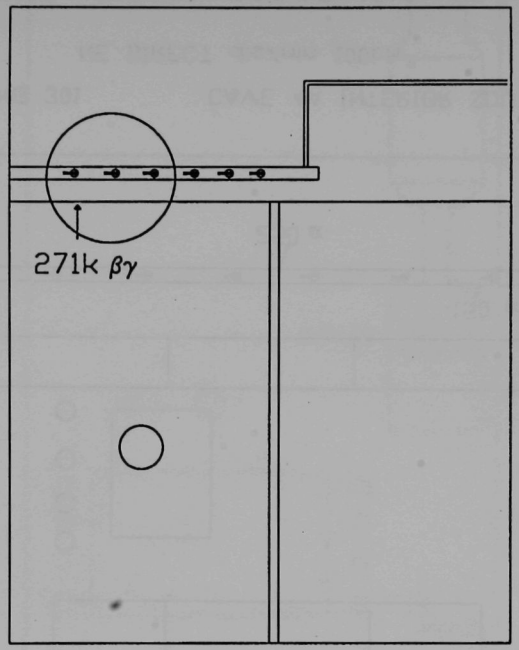
FIGURE C-34 Cave 2, East Interior Wall, Total Surface Activity



BUILDING 301 CAVE 2 INTERIOR WEST WALL

NE DIRECT dis/min 100cm²

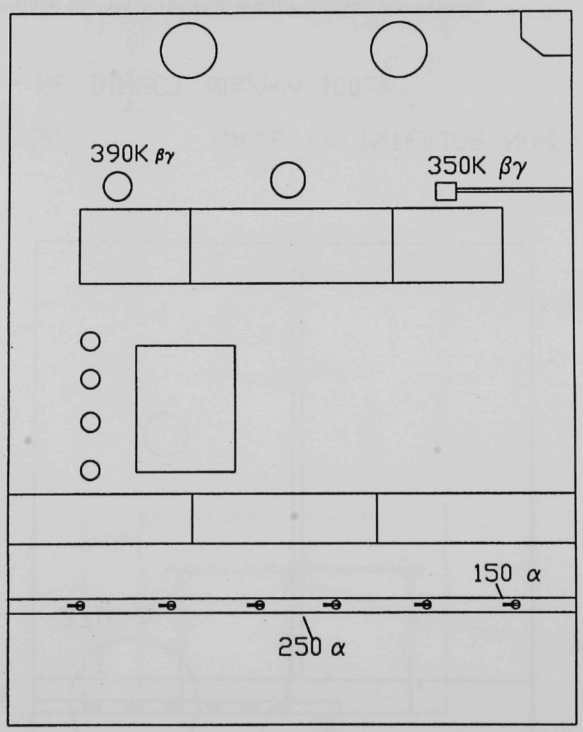
FIGURE C-35 Cave 2, West Interior Wall, Total Surface Activity



BUILDING 301 CAVE 4A INTERIOR NORTH WALL

NE DIRECT dis/min 100cm²

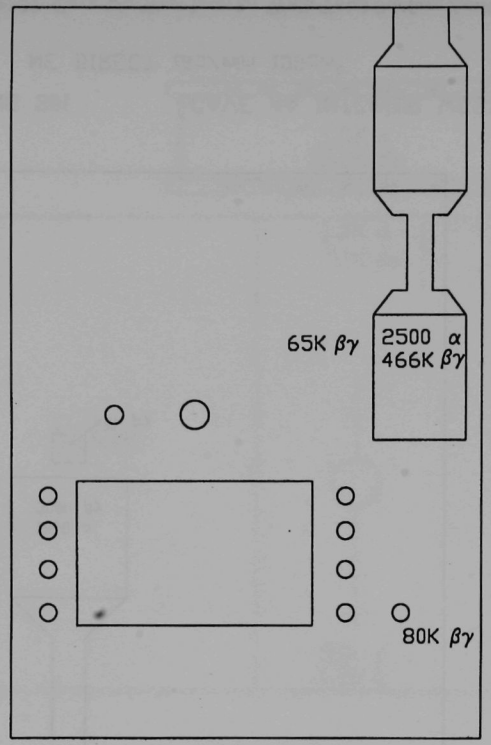
FIGURE C-36 Cave 4A, North Interior Wall, Total Surface Activity



BUILDING 301 CAVE 4A INTERIOR SOUTH WALL

NE DIRECT dis/min 100cm²

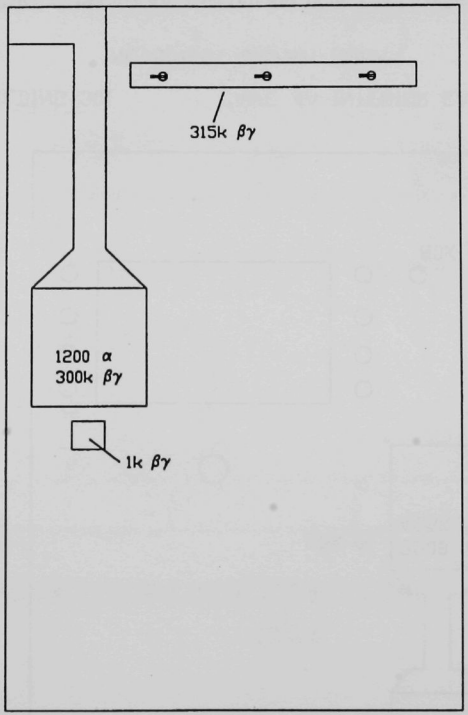
FIGURE C-37 Cave 4A, South Interior Wall, Total Surface Activity



BUILDING 301 CAVE 4A INTERIOR EAST WALL

NE DIRECT dis/min 100cm²

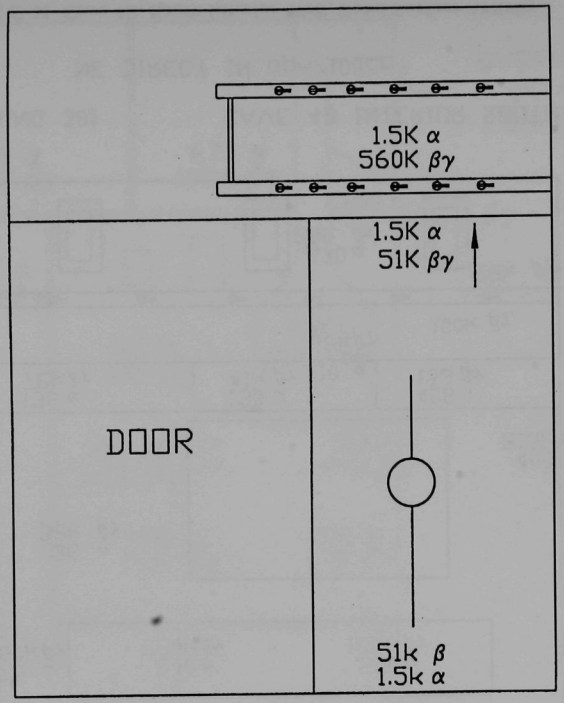
FIGURE C-38 Cave 4A, East Interior Wall, Total Surface Activity



BUILDING 301 CAVE 4A INTERIOR WEST WALL

NE DIRECT dis/min 100cm²

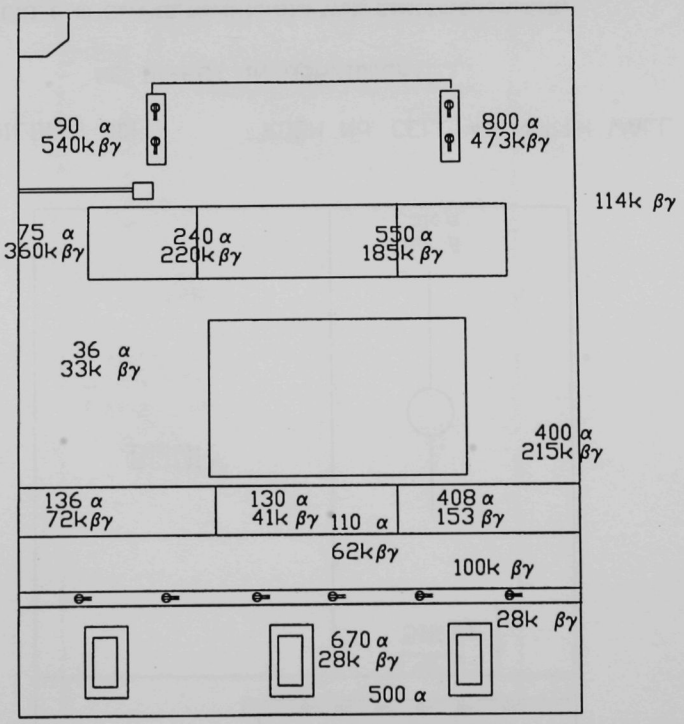
FIGURE C-39 Cave 4A, West Interior Wall, Total Surface Activity



BUILDING 301 ROOM No. CELL 4B NORTH WALL

NE DIRECT IN dpm/100cm²

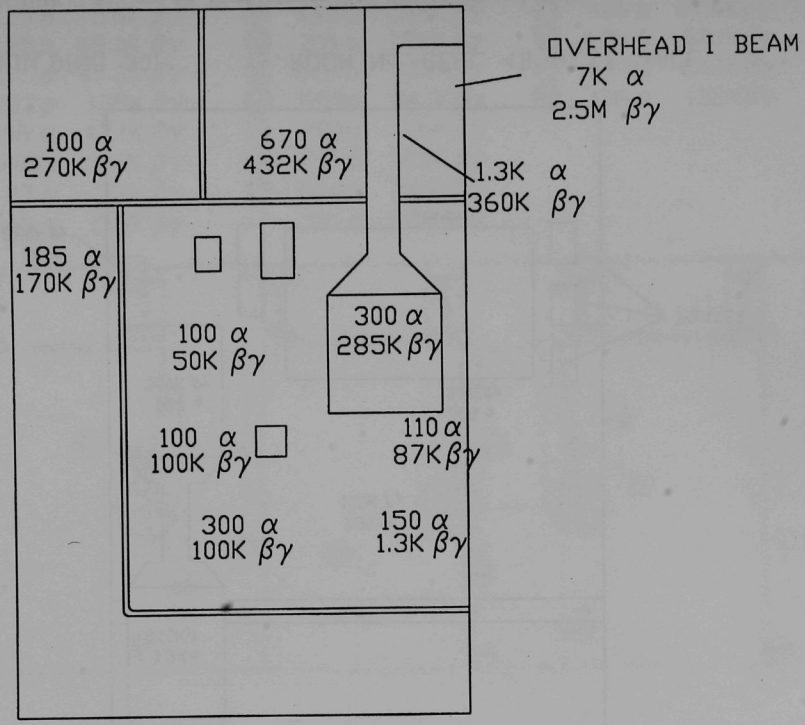
FIGURE C-40 Cave 4B, North Interior Wall, Total Surface Activity



BUILDING 301 CAVE 4B INTERIOR SOUTH WALL

NE DIRECT IN dpm/100cm²

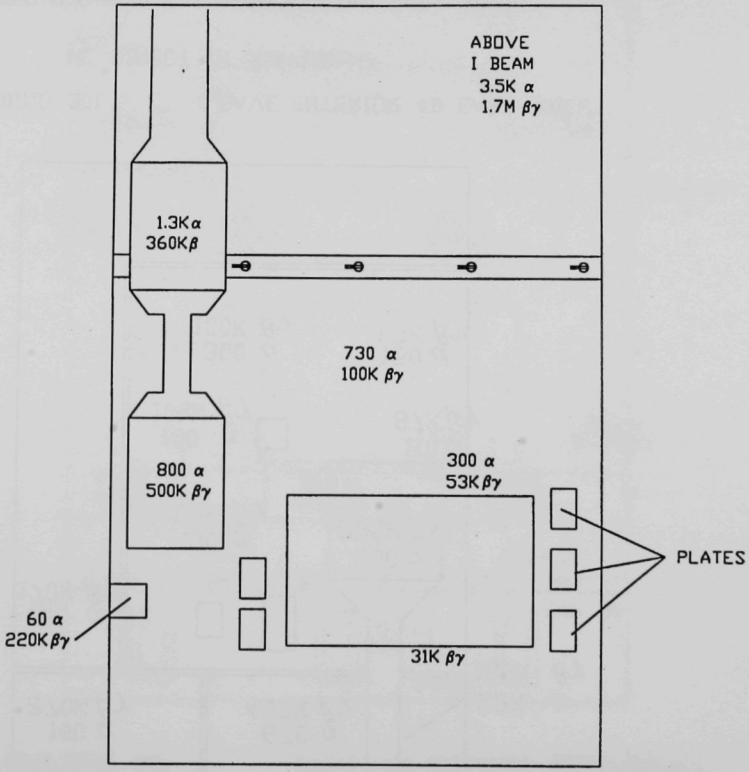
FIGURE C-41 Cave 4B, South Interior Wall, Total Surface Activity



BUILDING 301 CAVE INTERIOR 4B EAST WALL

NE DIRECT IN dpm/100cm²

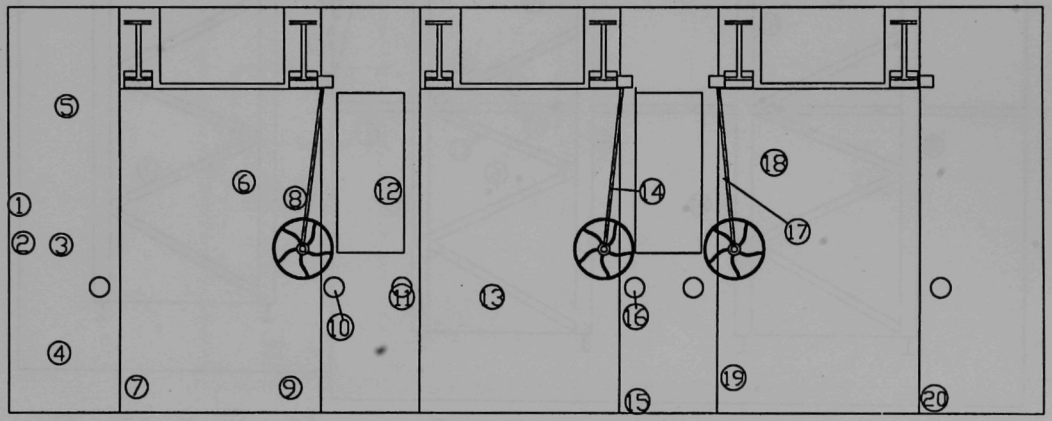
FIGURE C-42 Cave 4B, East Interior Wall, Total Surface Activity



BUILDING 301 ROOM No. CELL 4B WEST WALL

FIGURE C-43 Cave 4B, West Interior Wall, Total Surface Activity

①	135 α	5.6K βγ	⑨	143 α	138K βγ	⑰	106 α	87.6K βγ
②	125 α	69.3K βγ	⑩	231 α	122K βγ	⑱	4.9k α	620K βγ
③	57.7α	47.3K βγ	⑪	67.7α	352Kβγ	⑲	347 α	245K βγ
④	222α	135K βγ	⑫	699α	84.1Kβγ	⑳	106 α	132K βγ
⑤	106 α	47.1K βγ	⑬	289α	1.6M βγ			
⑥	1400α	333K βγ	⑭	154 α	129K βγ			
⑦	77 α	101K βγ	⑮	86.6α	244Kβγ			
⑧	143 α	138K βγ		106 α	67.8Kβγ			

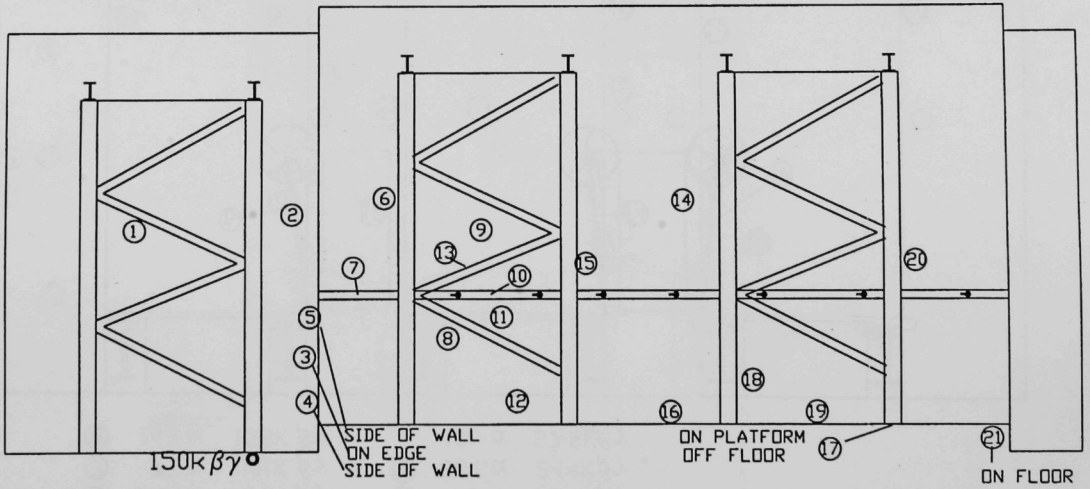


BUILDING 301 CAVE 3 INTERIOR NORTH WALL

NE DIRECT IN dpm/100cm²

FIGURE C-44 Cave 3, North Interior Wall, Total Surface Activity

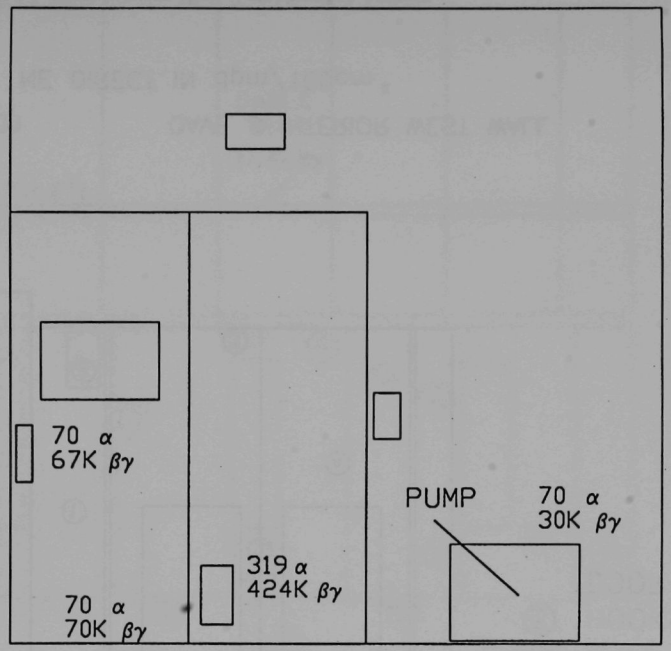
①	1.9K	α	K	βγ	⑧	88.9	α	92K	βγ	⑮	90	α	68K	βγ
②	23.3K	α	2.2M	βγ	⑨	4m	α	990K	βγ	⑯	111	α	115K	βγ
③	133	α	74K	βγ	⑩	90	α	65K	βγ	⑰	60	α	150K	βγ
④	150	α	51K	βγ	⑪	1.1M	α	66K	βγ	⑱	270	α	2mM	βγ
⑤	300	α	160K	βγ	⑫	800	α	175K	βγ	⑲	200	α	97K	βγ
⑥	150	α	41K	βγ	⑬	400	α	45K	βγ	⑳	90	α	30K	βγ
⑦	39	α	K	βγ	⑭	45	α	45K	βγ	㉑	o	α	65K	βγ



BUILDING 301 CAVE 3 INTERIOR SOUTH WALL

NE DIRECT IN dpm/100cm²

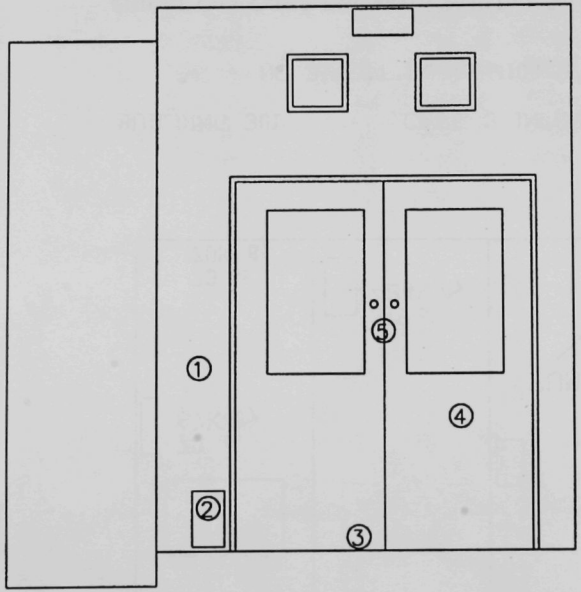
FIGURE C-45 Cave 3, South Interior Wall, Total Surface Activity



BUILDING 301 CAVE 3 INTERIOR EAST WALL

NE DIRECT IN dpm/100cm²

FIGURE C-46 Cave 3, East Interior Wall, Total Surface Activity



① 111α 51Kβγ
② 155α 125Kβγ
③ 222α 50Kβγ
④ 200α 250Kβγ
⑤ HOOKS ON DOOR 100Kβγ

BUILDING 301 CAVE 3 INTERIOR WEST WALL

NE DIRECT IN dpm/100cm²

FIGURE C-47 Cave 3, West Interior Wall, Total Surface Activity

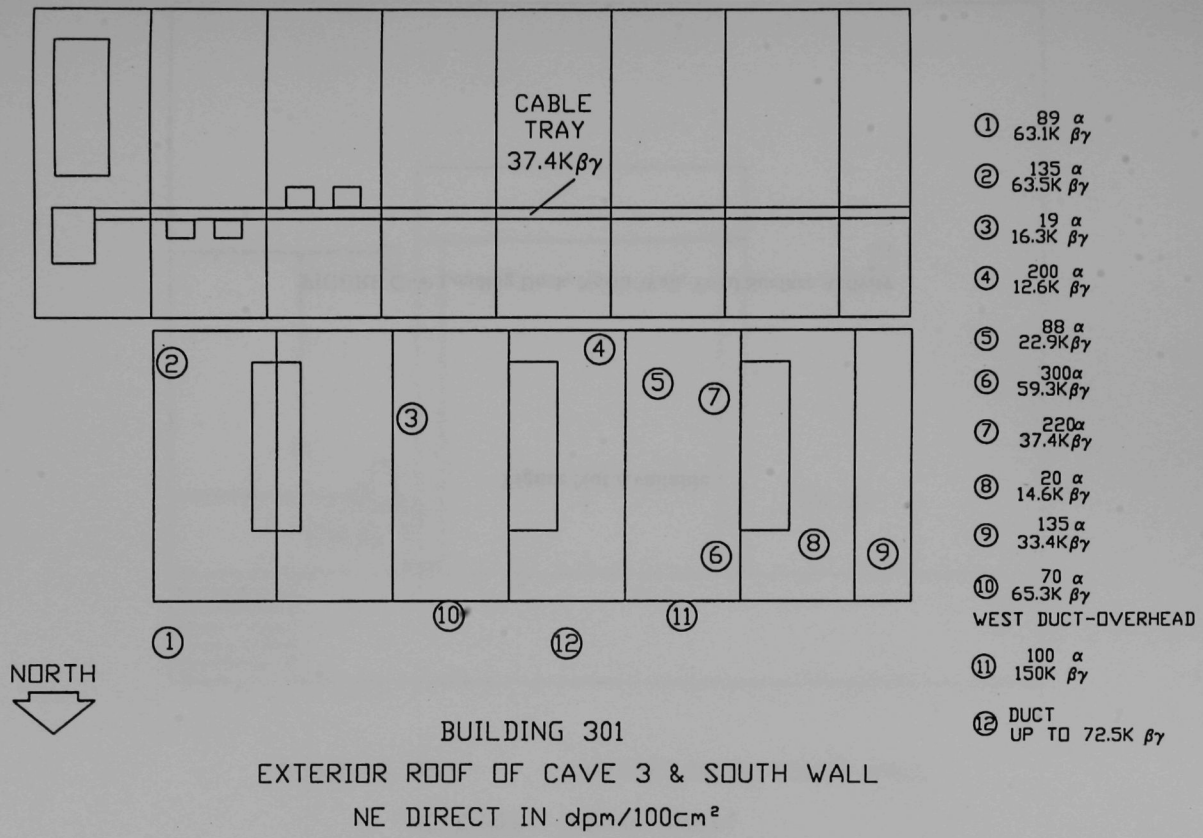
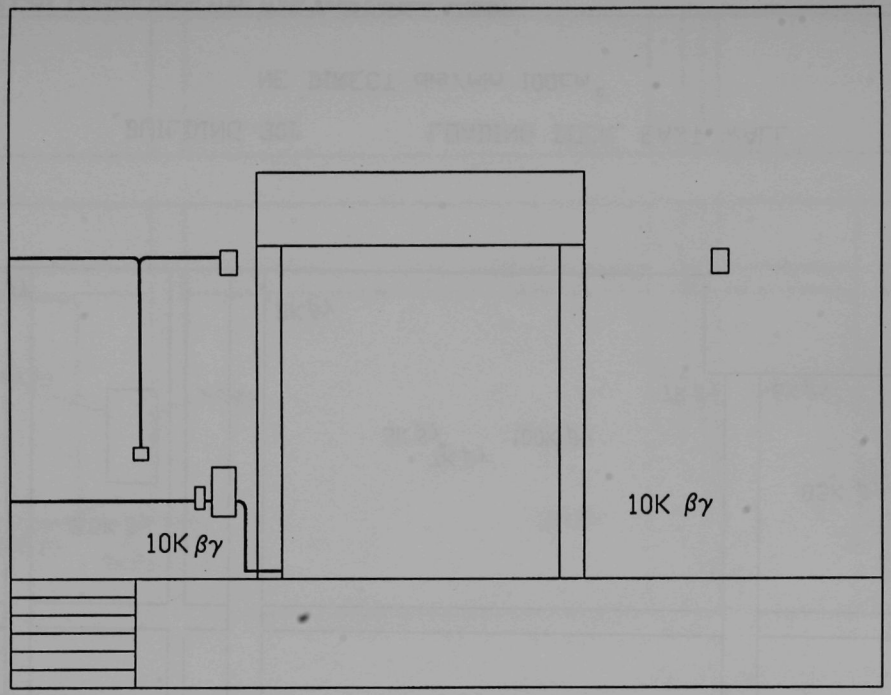


FIGURE C-48 Cave 3, Exterior Roof and South Wall, Total Surface Activity

Figure Not Available

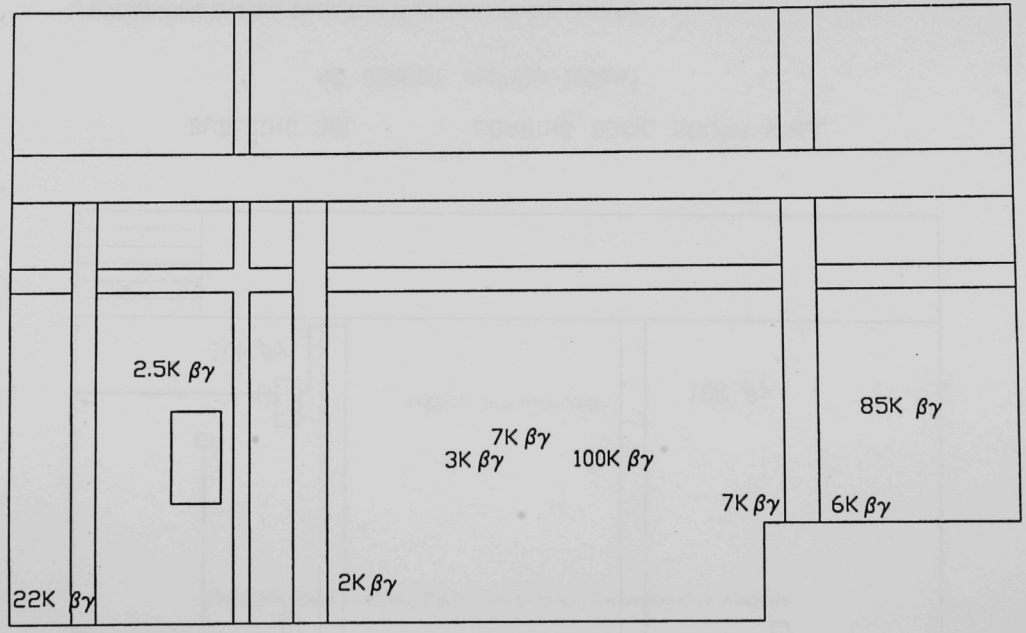
FIGURE C-49 Loading Dock, North Wall, Total Surface Activity



BUILDING 301 LOADING DOCK, SOUTH WALL

NE DIRECT dis/min 100cm²

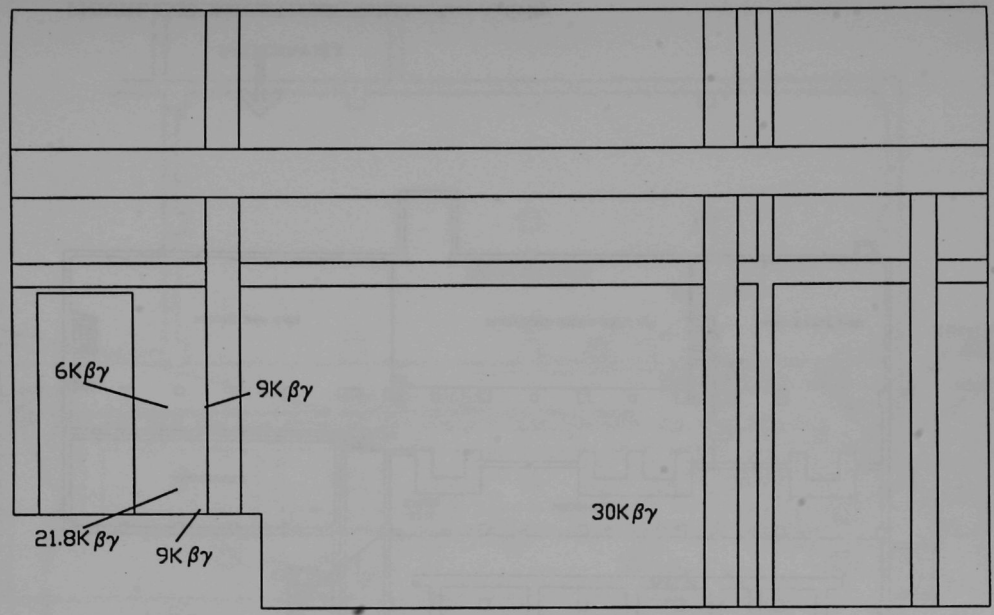
FIGURE C-50 Loading Dock, East Wall, Total Surface Activity



BUILDING 301 LOADING DOCK, EAST WALL

NE DIRECT dis/min 100cm²

FIGURE C-51 Loading Dock, West Wall, Total Surface Activity



UP TO 8' COMPLETED

BUILDING 301 LOADING DOCK, WEST WALL

NE DIRECT dis/min 100cm²

FIGURE C-52 Loading Dock, Floor, Total Surface Activity

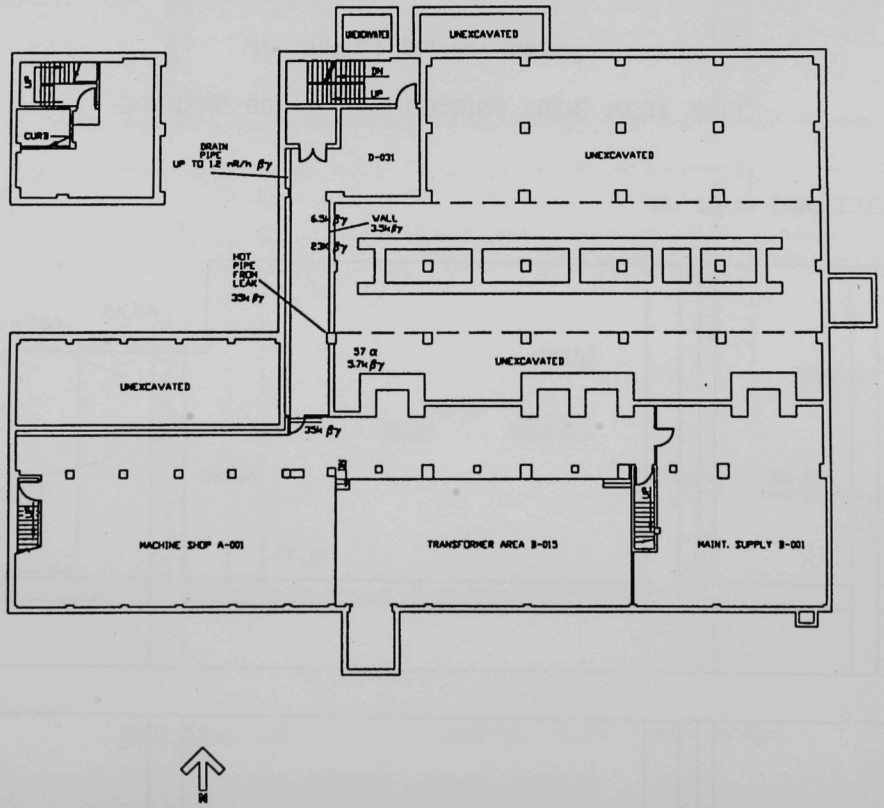


FIGURE C-53 Access Trench, Total Surface Activity

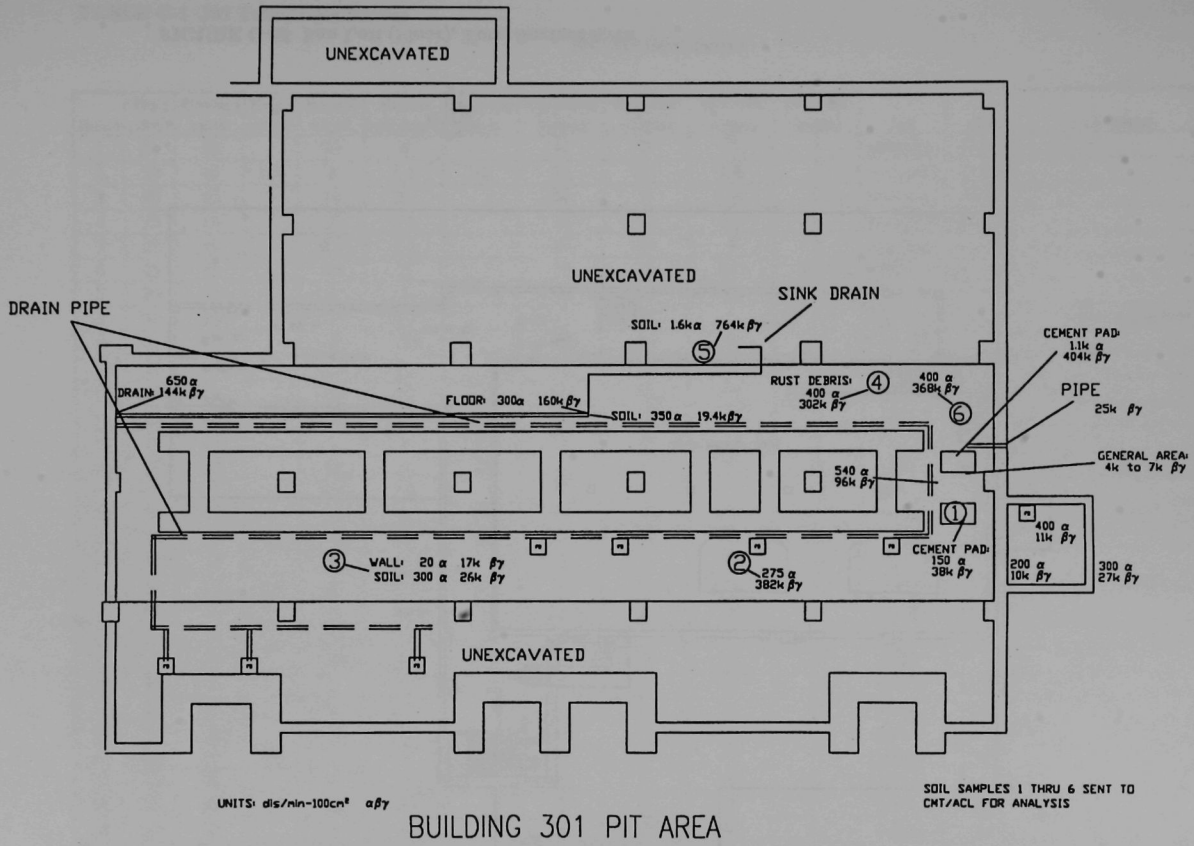


FIGURE C-54 Access Trench, Enlarged View, Total Surface Activity

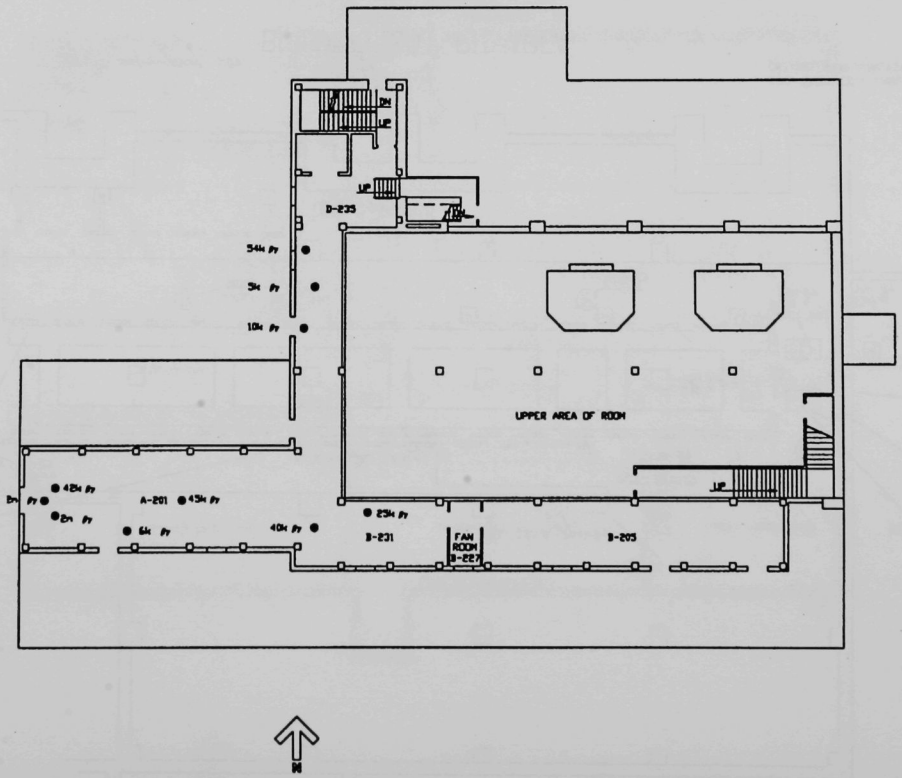


FIGURE C-55 Fan Loft (Floor), Total Surface Area

TABLE C-1 301 Tube Holes Survey

301 Tube Holes Survey

Hole #	Top γ µR/hr	Bottom γ µR/hr	High γ µR/hr	Top αβγ kcpm	Bottom αβγ kcpm	High αβγ kcpm	Top holder (kdpm)	#2 holder (kdpm)	#3 holder (kdpm)	#4 holder (kdpm)	Init	Date	Comments
1	20	10		25	6		6	8	25	6	MROC/LHSJr	11/5/97	
2	50	40	140	3	1.5	25	33	30	200	6	MROC/LHSJr	11/5/97	
3	20	50		10	25		20	6	200	45	MROC/LHSJr	11/5/97	
4	20	10		3	0.5		16	60	25	6	MROC/LHSJr	11/5/97	
5	20	15		0.5	2.5		30	40	6	6	MROC/LHSJr	11/5/97	
6	25	15		10	2		10	15	110	2200	MROC/LHSJr	11/5/97	
7	20	10		8	2		20	20	21	23	MROC/LHSJr	11/5/97	
8	20	10		3	0.5		25	65	6	6	MROC/LHSJr	11/5/97	1" water on bottom
9	20	10		4	10	4	40	16	50	25	MROC/LHSJr	11/5/97	
10	20	10		2.5	0.3		10	17	6	6	MROC/LHSJr	11/5/97	
11	20	15		10	10		110	45	40	6	MROC/LHSJr	11/5/97	
12	20	10		5	0.3	10	80	12	12	8	MROC	11/5/97	
13	25	15		5	5	25	12	44	7	7	MROC	11/5/97	
14	25	50		12	25	35	10	15	60	10	MROC	11/5/97	
15	20	15		3.5	3.5		42	40	15	15	MROC	11/5/97	
16	20	15		3.5	3	10	45	35	25	15	MROC	11/5/97	
17	20	15	25	10	2.5	20	100	42	42	15	MROC	11/5/97	
18	20	10		3	0.3		20	10	90	50	MROC	11/5/97	
19	20	15	20	4	0.3	10	4	4.5	20	150	MROC	11/5/97	holder #3 200 dpm α
20	20	15		15	2	3	26	70	24	30	MROC	11/5/97	
21	20	10		0.5	0.3	3	80	16	40	12	MROC	11/5/97	
22	30	40		100	50		33	30	98	12	MROC	11/5/97	
23	20	15		5	0.5		6	12	44	11	MROC	11/5/97	
24	20	10		10	0.3		10	33	12	45	MROC	11/6/97	
25	15	10		1.5	3		10	70	45	8	MROC	11/6/97	
26	20	30	60	10	4		108	80	30	95	MROC	11/6/97	
27	20	20		4	2.5		80	20	40	45	MROC	11/6/97	
28	20	95		10	25		8	13	25	160	MROC	11/6/97	
29	20	10		5	4		10	5	14	8	MROC	11/6/97	

uR meter :1653 Pac 4G: 913 NE: 1680

TABLE C-1 (Cont.)

301 Tube Holes Survey

Hole #	Top γ μR/hr	Bottom γ μR/hr	High γ μR/hr	Top αβγ kcpm	Bottom αβγ kcpm	High αβγ kcpm	Top holder (kdpm)	#2 holder (kdpm)	#3 holder (kdpm)	#4 holder (kdpm)	Init	Date	Comments
30	20	15		15	2.5	25	50	20	150	10	MROC/LHSJr	11/6/97	
31	25	2500		25	300		30	30	15	15	MROC/LHSJr	11/6/97	
32	10	10		5	4					50	MROC/LHSJr	11/6/97	
33	10	10		0.3	0.45						MROC/LHSJr	11/6/97	
34	10	25		2.5	20	5					MROC/LHSJr	11/6/97	
35	20	15		10	20						MROC/LHSJr	11/6/97	
36	15	10		3	1	25					MROC/LHSJr	11/6/97	
37	15	10		1.5	0.3						MROC/LHSJr	11/6/97	
38	15	10		4	10						MROC/LHSJr	11/6/97	
39	15	10		3	0.4						MROC/LHSJr	11/6/97	
40	20	10		2	0.4						MROC/LHSJr	11/6/97	
41	15	10		5	0.4						MROC/LHSJr	11/6/97	
42	20	10		2	0.5						MROC/LHSJr	11/6/97	
43	15	15		4.5	2.5	5					MROC/LHSJr	11/6/97	
44	20	10		2	0.5						MROC/LHSJr	11/6/97	
45	20	15	30	2	0.5	2.5					MROC/LHSJr	11/6/97	
46	20	10		2.5	0.4						MROC/LHSJr	11/6/97	
47	10	10		4	0.3						MROC/LHSJr	11/6/97	
48	10	10	15	3	0.3	5					MROC/LHSJr	11/6/97	
49	15	10		10	3	150					MROC/LHSJr	11/6/97	
50	15	15		3	0.3						MROC/LHSJr	11/6/97	
51	15	10		1.5	0.4						MROC/LHSJr	11/6/97	
52	20	15		1	2						MROC/LHSJr	11/6/97	
53	15	10		0.5	0.3						MROC/LHSJr	11/6/97	
54	10	10		0.3	0.1						MROC/LHSJr	11/6/97	
55	10	10	15	3	0.5	10					MROC/LHSJr	11/6/97	
56	10	10		30	2						MROC/LHSJr	11/6/97	
57	20	10		25	0.3						MROC/LHSJr	11/6/97	
58	30	15		40	2						MROC/LHSJr	11/6/97	

uR meter :1653 Pac 4G: 913 NE: 1680

Page 2

TABLE C-1 (Cont.)

301 Tube Holes Survey

Hole #	Top γ μR/hr	Bottom γ μR/hr	High γ μR/hr	Top αβγ kcpm	Bottom αβγ kcpm	High αβγ kcpm	Top holder (kdpm)	#2 holder (kdpm)	#3 holder (kdpm)	#4 holder (kdpm)	Init	Date	Comments
59	15	10		2	0.3						MROC/LHSJr	11/6/97	
60	10	10	15	1	3.5						MROC/LHSJr	11/6/97	
61	10	10	15	0.5	3						MROC/LHSJr	11/6/97	
62	15	10		2.5	0.4						MROC/LHSJr	11/6/97	
63	10	10		0.3	0.1						MROC/LHSJr	11/6/97	
64	15	30		3	15						MROC/LHSJr	11/6/97	
65	20	15		3	0.5						MROC/LHSJr	11/6/97	
66	15	10		1.5	0.5						MROC/LHSJr	11/6/97	
67	10	10		5	10						MROC/LHSJr	11/6/97	
68	10	10		4	0.5						MROC/LHSJr	11/6/97	

uR meter :1653 Pac 4G: 913 NE: 1680

APPENDIX D:

CANBERRA ISOCS GAMMA SPECTROMETRY REPORT

ISOCS [*IN SITU* OBJECT COUNTING SYSTEM] PORTABLE GAMMA SPECTROSCOPY INSTRUMENT

CHICAGO PILE 5 (CP-5) RESEARCH REACTOR LARGE-SCALE DEMONSTRATION PROJECT

SUBMITTED BY:

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800 RESEARCH PARKWAY
MERIDEN, CT 06450

JANUARY 15, 1998

CANBERRA

ISOCS [*IN SITU* OBJECT COUNTING SYSTEM] PORTABLE GAMMA SPECTROSCOPY INSTRUMENT

CHICAGO PILE 5 (CP-5) RESEARCH REACTOR LARGE-SCALE DEMONSTRATION PROJECT

SUMMARY

The objective of the Large-Scale Demonstration Project (LSDP) is to select and demonstrate potentially beneficial technologies at the Argonne National Laboratory-East (ANL) Chicago Pile-5 (CP-5) Research Reactor. The purpose of the LSDP is to demonstrate that by using innovative and improved decontamination and decommissioning (D&D) technologies, significant benefits can be achieved when compared with baseline D&D technologies. A major part of the D&D effort is the characterization of the type, extent and level of contamination. This report describes a demonstration of Canberra Industries' ISOCS [*In Situ* Object Counting System] instrument for assessing gamma emitting contaminants in and/or on various sized and shaped objects.

The ISOCS instrument consists of a germanium (HPGe) detector, adjustable shield and collimator, equipment cart, portable multi-channel analyzer (MCA), laptop computer and special efficiency calibration software. The system may be taken into the field, used to count and analyze samples, identify radionuclides and provide immediate results. The more common method of collecting samples for laboratory analysis is expensive, time consuming, may add to personnel exposures and can be unreliable, especially if the distribution of the contamination is non-uniform. *In situ* measurements can reduce these problems, be performed at lower cost, and produce results nearly instantaneously. The traditional problem of constructing calibration sources for each object to be counted is eliminated by use of the ISOCS mathematical efficiency calibration process, which can be performed in the field, if needed.

In situ measurements were performed at several locations within the CP-5 Research Reactor and at locations in accelerator and hot cell facilities. Objects which were assayed included contaminated concrete floors, contaminated concrete walls, fuel pool walls, waste storage containers, activated accelerator components and miscellaneous activated pieces. Quantitative and qualitative results were derived using the ISOCS efficiencies and Genie-PC analysis.

TECHNOLOGY DESCRIPTION

ISOCS is a portable gamma spectroscopy instrument designed to identify and quantify gamma-emitting radionuclides in various sized and shaped objects in the field.

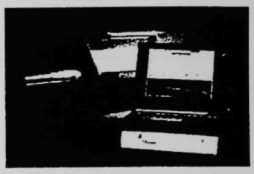


Figure 1. Detector, InSpector, MCA, and Portable Computer

The instrument consists if the following components:

- HPGe detector of the appropriate type, size, and shape for the application.
- A Multi-Attitude Cryostat to allow the detector to be pointed in any direction.
- Sets of 25mm and 50mm shields, each with various angle collimators, to define the field of view of the HPGe detector and to reduce interference from other sources.
- A cart to move the equipment, mount the detector, and to point it at the object to be measured.
- The InSpector, a portable electronics package that includes the High Voltage Power Supply, amplifier, Analog-to-Digital Converter and Multi-Channel Analyzer.
- Portable laptop computer for sample information input, InSpector control, and data acquisition, analysis and storage.
- GeniePC Gamma Spectroscopy software for spectral analysis and nuclide identification.

- ISOCS Efficiency Calibration software to allow the user to derive efficiencies for objects being counted.

Initial start-up requires about four hours for detector cool down and assembly of the cart and detector mounting components. Thereafter, the system can be moved from location to location, set up and operated within a few minutes. Efficiencies for the objects to be assayed may be generated prior to, or after, field measurements, or while data are being collected as described below. Following completion of counting, data are analyzed and stored. Results may be viewed in the field within two minutes of completion of counting.

Figure 2. ISOCS Shield and Detector

The ISOCS mathematical efficiency calibration routine produces a unique calibration for each detector, using that detector's specific characteristics. The software provides a set of nine generic object templates which include boxes, cylinders, circular and rectangular stacked planes, pipes, spheres, and wells. Each template has many parameters that can be used to create variations that best represent the object to be counted. The process is quick and simple. The user selects the appropriate template, detector, and collimator to be used. Parameters, such as material composition and density, and source distribution, are entered and the efficiency vs. energy curve calculated. This process may take from one minute for simple geometries to 10 minutes for more complex configurations. The curve is stored in the appropriate GeniePC file for use when analyzing spectra. The ISOCS efficiency software has been validated with constructed standards and with MCNP calculations.

DEMONSTRATION PERFORMANCE

The purpose of the project measurements was to demonstrate the value of the instrument for performing high quality *in situ* gamma spectroscopy. The advantages of *in situ* measurements over the more traditional combination of gross measurements and sampling, followed by laboratory analysis (baseline technologies) include:

- Identification of nuclide specific contaminants.
- Reduction of large potential errors from non-homogeneous source distributions.
- Reduction of cost associated with sampling and laboratory analyses.
- Elimination of time delays between sampling and analysis results.
- Improved safety by elimination of sampling in hazardous conditions.
- Derivation of total activity and average concentrations in difficult to sample objects.

Measurements were made at several locations within the CP-5 Research Reactor, at a deactivated accelerator facility, and at a hot cell facility where D&D is scheduled. In each case, the task was to identify the contaminants present and to obtain an estimate of the level of contamination in, or on, the objects using the ISOCS efficiency calibration software for quantitative determinations. At CP-5, the ISOCS assessment of floor contamination may be compared to measurements made with gross activity instruments, such as beta detection systems (GM tubes or gas proportional counters), or with gamma counting using NaI(Tl) detectors. These gross measurements, however, are not reliably quantitative, as many uncertainties exist in determining the nuclide and distribution and, therefore, the efficiency. Because these areas are difficult and unreliable to sample for laboratory measurement, no other quantitative comparisons are available.

Over a period of approximately two work days, a total of 28 *in situ* measurements were completed at the three different facilities. Whenever possible, the *in situ* results are compared to gross surface activity measurements. Gross measurements are typically made with beta detecting devices which, for ease and durability of source preparation, have been calibrated with beta emitting nuclides such as Sr-90 deposited on smooth metal or plastic surfaces. These common calibration sources, however, rarely represent actual counting geometries.

In addition, gross activity meters are used in a scanning mode and require sufficient time over relatively small measurement locations for complete detector response. These characteristics should be compared to ISOCS measurements which are nuclide specific, average readings over larger areas, and can account for geometry problems such as absorption and/or attenuation of photons.

Due to the limited time allocated for site measurements, the ISOCS system was configured for basic *in situ* measurements. Improvement in the quality of results can be obtained by the use of different assay strategies for specific conditions. For example, measurements of activity in the shielded cask could be improved by taking readings from different angles and distances. This was not possible during the demonstration due to restrictions placed on movement because of radiological conditions. Measurements taken in elevated background locations could be better corrected by collecting a set of completely shielded acquisitions at critical locations for background subtraction. Again, not possible during the demonstration due to the schedule. For nuclides with multiple energy photopeaks, actual depth of contamination can be derived from the ratio of peaks (i.e. differential peak absorption). Nuclides of this type were not present at CP-5. Depth may also be evaluated by acquiring several spectra of the object from different directions. All of these techniques, while not employed for this study, are available to refine and enhance results.

RESULTS

The project results are shown below for each measurement location. Included is a description of the geometry, nuclide identification, and activity result. One sigma counting errors are reported with each result. Other errors associated with geometries and efficiencies may range from a few percent to values estimated at +/- 50%, depending upon how well the selected efficiency geometries represent actual configurations. When alternate geometries were analyzed, results are reported.

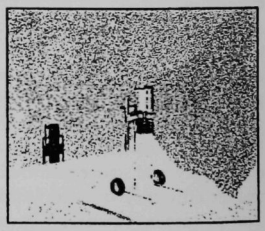
CP501: Measurement of surface contamination in the truck dock area of the CP-5 facility.

The contamination is on a concrete surface, covered with herculite to prevent the spread of any loose contamination, extending over an area of about five meters by nine meters. Contamination is known to be non-uniform with elevated hot spots in one quarter of the area. This acquisition was performed with the detector centered in the contaminated area at a height of one meter with 25mm thick shielding and 180 degree collimation. The objective of this measurement was to obtain a total surface activity and average contamination level over the entire contaminated area. Contamination levels, as measured with a beta sensitive gas proportional counter, ranged from 20,000 to 320,000 dpm/100 cm^2.

CP501: ISOCS Reported Results	
Cs-137	4.9 E5 dpm/100cm^2 +/- 3%
Co-60	1.1 E3 dpm/100cm^2 +/- 4%

The efficiency used was for a rectangular plane with an assumed contamination layer of 0.5cm in concrete. Although the actual depth of contamination is not known, this is not a very sensitive calibration factor. If, instead of a depth of 0.5cm, the contamination is assumed to be 1.0cm or 0.1cm, the results only vary by less than 10%. The contamination level for Cs-137 for an assumed 1.0cm layer is 530,000 dpm/100cm^2, and for a 0.1cm layer is 455,000 dpm/100cm^2.

CP502: Measurement of surface contamination in the truck dock area of the CP-5 facility.



The contamination is on a concrete floor, covered with herculite to prevent the spread of any loose contamination. The detector was placed in the approximate center of the quadrant containing the highest levels of contamination at one meter and collimated with the 25mm, 30 degree collimator in an effort to focus on the elevated areas. Contaminations levels, as measured with a gas proportional counter, averaged 300,000 dpm/100cm^2.

CP502: ISOCS Reported Results	
Cs-137	2.9 E6 dpm/100cm² +/- 3%
Co-60	2.2 E4 dpm/100cm² +/- 3%

The efficiency was a circular plane, 3m diameter, with activity assumed to be in a 0.5cm layer of concrete. ISOCS results higher than survey meter results may be explained by likely beta absorption in the concrete and herculite layers biasing the proportional counting results low. Argonne reported that the lab analyses were a factor of ten higher than field surface measurements for similar surfaces at the Bldg 301 facility.

CP503: Measurement of surface contamination in the truck dock of the CP-5 facility.
The contamination is on a concrete floor covered with herculite to prevent the spread of any loose contamination. The detector was placed at a location midway between the highest levels and the lower levels, at a height of one meter and collimated with the 25mm, 30 degree collimator. Estimated levels from gas proportional measurements are 100,000 to 200,000 dpm/100cm².

CP503: ISOCS Reported Results	
Cs-137	1.9 E0 dpm/100cm² +/- 5%
Co-60	7.7 E3 dpm/100cm² +/- 7%

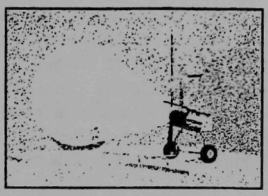
Efficiency was a circular plane, 3m diameter with a layer of 0.5cm concrete activity

CP504: Measurement of surface contamination in the truck dock of the CP-5 facility.
The contamination is on a concrete floor covered with herculite to prevent the spread of any loose contamination. The detector was placed over the low activity end of the contaminated area, at a height of one meter, and shielded with the 25mm, 30 degree collimator. Proportional counter levels ranged from 5000 to 75,000 dpm/100cm².

CP504: ISOCS Reported Results	
Cs-137	3.8 E5 dpm/100cm² +/- 3%
Co-60	6.0 E3 dpm/100 cm² +/- 5%

Efficiency was a circular plane, 3m diameter with 0.5 cm layer of concrete activity

CP505: Measurement of surface contamination in the truck dock of the CP-5 facility.
The contamination is on a wall adjacent to the contaminated floor. The wall is concrete with an area of contamination about 142cm x 44cm and is covered with herculite. The detector was mounted horizontally to view the wall at a distance of 130cm with the 25mm, 30 degree shield/collimator. The levels of contamination on the wall were not previously well defined.



CP505: ISOCS Reported Results	
Cs-137	1.9 E6 dpm/100cm² +/- 5%
Co -60	9.9 E4 dpm/100cm² +/- 5%

Efficiency was a rectangular plane the size of the wall with a 0.5 cm layer of activity in concrete.

CP506: Measurement of surface contamination in the truck dock of the CP-5 facility.
The location is the same as with CP505. The detector, however, was moved closer to the wall surface. The detector to wall distance was 43cm, with the 25mm 30 degree collimator/shield in place.

CP506: ISOCS Reported Results	
Cs-137	2.6 E6 dpm/100cm² +/- 4%
Co-60	2.2 E4 dpm/100cm² +/- 7%

Efficiency was for the same wall area, but at 43cm distance, rather than the 130cm distance for CP505. Results of the two wall measurements

were reasonably consistent and probably within the overall measurement errors. The peak areas for this acquisition were less than for the first, suggesting that some of the wall area was cut off by moving closer to it. The efficiency accounted for this, however.

CP507: Measurement of surface contamination in the truck dock of the CP-5 facility.
The contamination is the covered floor as described in CP501 through CP504. The detector was placed over the highest location of contamination, as with CP502, at a height of one meter, except the shield was 25mm with the 180 degree collimator. Contamination levels from proportional counter measurements were 200,000 to 300,000 dpm/100 cm2 near the detector.

CP507: ISOCS Reported Results	
Cs-137	2.7 E6 dpm/100cm^2 +/- 4%
Co-60	1.3 E4 dpm/100cm^2 +/- 4%

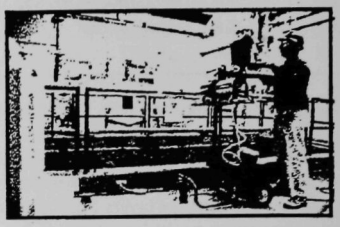
Efficiency was for the rectangular plane area with a 0.5cm concrete layer of activity, with 180 degree collimator. Average levels for the entire area would be biased high by the elevated readings directly beneath the detector.

CP508: Measurement of surface contamination in the truck dock of the CP-5 facility.
The surface is the covered floor as described in CP501 through CP504. The detector was placed over the location of lowest contamination, as in CP504, except that the shield was the 25mm with the 180 degree collimator. Detector height was one meter.

CP508: ISOCS Reported Results	
Cs-137	8.9 E4 dpm/100cm^2 +/- 3%

Efficiency was for the rectangular plane area with 0.5cm concrete layer and 180 degree collimator.

CP509: Assessment of activity in waste containers in the fuel pool area of the CP-5 facility.



The activity is contained in four 55-gallon drums stored in a shielded cask. Measurements were made from across the fuel pool, at a distance of 4m, with the detector shielded with the 25mm, 30 degree collimator. The cask is 8 ft diameter by 5 ft high, and has a wall thickness of 2 inches of lead. External dose rates are 5 mR/hr at 6 ft from the cask. The highest level drum is located in the center of the cask.

CP509: ISOCS Reported Results	
Co-60	0.18 Ci +/- 3%
Cs-137	0.03 Ci +/- 10%

Efficiency was for a pipe source, to simulate the 55-gallon drum in the center of the cask, with an attenuator of 2 inches Pb. The activity was assumed to be distributed throughout the drum. Although, at that distance, the source geometry probably did not make much difference. As an approximate confirmation of this activity, calculations show that a 0.2Ci Co-60 source attenuated by 2 inches of Pb, would yield an exposure rate of about 4 mR/hr at a distance of 2m (with build-up). This exposure rate is consistant with those measured around the cask.

CP510: Measurement of surface contamination in the fuel pool area of the CP-5 facility.
The activity is on the surface of the fuel pool walls, which are concrete covered with SS. The measurement location was at the midpoint of the pool length at the top opposite the fuel cask. The detector was shielded with the 25mm, 30 degree

collimator and pointed down the opposite wall such that the center line of the detector was aimed 3 feet below the top of the fuel pool wall. There are no other measurements for these walls.

CP510: ISOCS Reported Results	
Co-60	5.3 E5 dpm/100m^2 +/- 3%
Cs-137	3.5 E4 dpm/100cm^2 +/- 27%

Efficiency was for a large surface area of about 3 E5cm^2, at a distance of 3.3m from the detector. Subsequent calculations and efficiency runs have shown that the collimator did not effectively shield the storage cask and, in fact, the detector had a clear view of part of the cask. Therefore, these readings are known to be biased high due to contribution from the cask activity. This was anticipated as a possibility and additional measurements were taken as described below.

CP511: Measurement of surface contamination in the fuel pool area of the CP-5 facility.
The measurement is at the same location as CP510, except that the detector was shielded with the 50mm, 30 degree collimator, and was pointed (angled) further down the opposite wall in an effort to obtain better shielding of the storage cask at the top of the pool. The center line of the detector was aimed 3m below the top of the fuel pool wall.

CP511: ISOCS Reported Results	
Co-60	1.5 E5 dpm/100cm^2 +/- 3%

Efficiency is for a large surface area approximately 7 E5cm^2, at a distance of 4.2m from the detector. This geometry has been shown to provide shielding from all direct outside sources such as the cask. However, some penetration of the collimator is possible for high energy photons such as those from C0-60, and a contribution from the storage cask via penetration of the collimator is possible. This contribution can be estimated by counting with a completely shielded detector, which was not performed at CP-5 due to time limitations, or by calibrating for the shielded drum even though it is shielded by the collimator, and correcting for the interference.

CP512: Measurement of surface contamination in the fuel pool area of the CP-5 facility.
The contamination is on the fuel pool walls. The measurement location is opposite that for CP510 and CP511 (i.e. from the side where the storage cask is located, but behind a concrete shield to prevent contribution from the cask). The detector is located near the end of the pool length, shielded with the 50mm, 90 degree collimator, and pointed with a center line 10ft below the top of the fuel pool.

CP512: ISOCS Reported Results	
Co-60	2.2 E4 dpm/100cm^2 +/- 10%
Cs-137	9.0 E3 dpm/100cm^2 +/- 6%

Efficiency was for a surface area, 5 E5 cm^2, as above. This is the optimum shielded geometry, probably gives the best results for the fuel pool walls, and suggests that much of the CP511 result was from shield leakage.

CP513: Measurement of surface contamination in the fuel pool area of the CP-5 facility.
The contamination is on the fuel pool walls. The measurement location is from the end of the fuel pool, viewing the opposite end and floor of the pool, with the detector center line near the bottom of the pool wall at the floor. The detector was shielded with the 50 mm, 90 degree collimator.

CP513: ISOCS Reported Results	
Co-60	6.8 E4 dpm/100cm^2 +/- 3%
Cs-137	3.0 E4 dpm/100cm^2 +/- 8%

Efficiency was for a large rectangular plane. This geometry was difficult to estimate, in terms of area viewed, due to the angular planes of the floor and walls. The results should be considered gross estimates only.

ACC01: Measurement of activation activity at an accelerator facility.

The activity is contained in a set of accelerator "Dees" which have been inactive for several years. The Dees are metal blocks 130cm by 46cm in area, with a depth of about 30cm. The activity is known to be contained within these components as a result of activation from accelerator particles, but the depth and/or location is unknown. The detector was set at a distance of 240cm with the 25mm, 90 degree collimator. Exposure rates near the Dees were 200 uR/hr, and not high enough to find any hot spots or elevated areas.

ISOCS Reported Results

ACC01: Geometry 1 - 30cm depth

Na-22	1.2 E1 pCi/g +/- 25%
Mn-54	3.8 E2 pCi/g +/- 3%
Co-60	4.1 E3 pCi/g +/- 3%
Zn-65	5.1 E2 pCi/g +/- 4%

ACC01: Geometry 2 - 5cm depth

Na-22	1.4 E1 pCi/g +/- 28%
Mn-54	4.2 E2 pCi/g +/- 3%
Co-60	4.8 E3 pCi/g +/- 2%
Zn-65	5.8 E2 pCi/g +/- 4%

Quantitative results depend on the assumptions made concerning the volume of the Dees that are activated. Two geometries were tested - one assuming the entire volume is activated, and the second assuming a 5cm depth of activation. The source geometry was a rectangle block of SS with a thickness of source (activation layer) of 30cm or 5cm. The results show similar concentrations for each geometry, although total source volume and activity would be different. Unfortunately, there was insufficient activity to allow for analysis of multiple lines to determine which activation depth is most appropriate.

ACC02: Measurement of activated components at an accelerator facility.

The activity is in the form of activated components and parts which have been stored in 5-gallon pails as waste for disposal. The detector was place 188cm from the pail and shielded with the 25mm, 30 degree collimator.

ACC02: ISOCS Reported Results

Na-22	8.7 E1 pCi/g +/- 1%
Co-60	1.1 E3 pCi/g +/- 4%

Efficiency was a pipe simulating a 5-gallon pail filled with SS components. Since the pail was not solid SS, the density was adjusted to account for empty space in the pail. These changes made some differences in the final numbers (i.e. +/- 40%).

ACC03: Measurement of activation activity at an accelerator facility.

Measurement of the activated Dees, as ACC01, except that the detector distance is 188cm and the angle is slightly different.

ACC03: ISOCS Reported Results

Na-22	1.2 E2 pCi/g +/- 4%
Mn-54	5.1 E1 pCi/g +/- 2%
Co-60	3.3 E3 pCi/g +/- 2%
Zn-65	7.4 E1 pCi/g +/- 14%
Cs-137	8.0 E1 pCi/g +/- 9%

Efficiency was the 5cm activation depth in a rectangular block of SS. Results are similar to those from ACC01

ACC04: Measurement of activation activity at an accelerator facility.

Same as ACC01 and ACC03 except that the angle is different and the distance is 193cm.

ACC04: ISOCS Reported Results	
Na-22	2.0 E1 pCi/g +/- 40%
Mn-54	2.7 E1 pCi/g +/- 22%
Co-60	3.7 E3 pCi/g +/- 2%
Zn-65	1.7 E2 pCi/g +/- 9%

Efficiency was the same as with ACC01 and ACC03, with similar results.

ACC05: Measurement of activated components at an accelerator facility.
Measurement of stainless steel cannisters containing charcoal. Cannisters are 53cm tall by 15cm diameter, with two side-by-side. The detector was placed at a distance of 75 cm and was shielded with the 50mm, 90 degree collimator. There were low count rates with hand-held survey instruments at contact with the columns.

ACC05: ISOCS Reported Results	
Co-60	9.0 E2 pCi/g +/- 2%

Efficiency was a pipe geometry with a SS casing and charcoal interior, uniform activity. Following this assay, the column was removed and a background counted at this location, with an activity equal to 10% of the column activity reported.

ACC06: Measurement of activated components at an accelerator facility.
Activity is assumed to be on the surface of a vacuum pump assembly, possibly the meter faces. The assembly is 69cm x 61cm x 61cm. The detector was positioned 68cm from the meter faces with the 50mm, 90 degree collimator. There were low count rates with hand-held instruments on the face.

ACC06: ISOCS Reported Results	
Co-60	2.8 E6 dpm/100cm^2 +/- 4%
Eu-152	2.0 E3 dpm/100 cm^2 +/- 11%

Efficiency was a rectangle plane with surface contamination/activation. The background for this item was similar to that for ACC05 and was equivalent to the estimated surface contamination. Therefore, it is concluded that activity on the meter faces is below the detection limits of the *in situ* system.

30101: Measurement of surface contamination at a hot cell facility.
The contamination is on a concrete floor which has been painted to fix removable contamination. The location is in the back room behind the hot cells, where floor contamination is general and somewhat uniform. The detector was set at one meter with the 25mm, 30 degree collimator. Levels with hand-held beta-gamma (GM tube) detectors averaged about 6000 dpm/100cm^2.

30101: ISOCS Reported Results	
Cs-137	7.9 E4 dpm/100 cm^2 +/- 3%

Efficiency was a circular plane, 3m diameter, with 0.5cm concrete layer of concrete activity. At this facility, Argonne reported the ratio of laboratory analysis to survey meter readings to be 10:1. This is consistant with ISOCS results.

30102: Measurement of activity on a smear in the hot cell facility.
The smear was mounted 4cm from the face of the detector and counted for total activity. Survey meter readings for the smear were 45,000 cpm alpha and 4000 cpm gamma with a scintillation detector.

30102: ISOCS Reported Results	
Cs-137	5.5 E-4 uCi (20,000 dpm) +/- 13%

Efficiency was a circular plane, cellulose, surface activity. If the scintillation detector is 10% efficient for Cs-137 gammas, the *in situ* results would be consistant within the uncertainties of the measurement geometries (possibly +/- 50%).

30103: Measurement of surface contamination at an accelerator facility.
The contamination was a hot spot on the floor, painted over, near the entrance to Cave No. 4A. The detector was at one meter with the 50mm, 30 degree collimator and the hot spot is about 35cm diameter. Results of survey meter readings were "175k" and "280k" cpm at hot spot locations (written on the floor). It is assumed these are beta-gamma readings.

30103: ISOCS Reported Results	
Cs-137	4.4 E4 dpm/100cm² +/- 5%

Efficiency was a circular plane with 0.5cm concrete layer activity. The hot spots, as measured with survey meters, were probably higher than *in situ* results, possibly 1-2 E6 dpm/100 cm² depending on the area of the probes. ISOCS averaged these hot spots over the entire area viewed.

30104: Measurement of surface contamination at an accelerator facility.
The measurement is the same as 30103, except that the detector was lowered to a height of 56cm., with the 50mm, 30 degree shield, and centered over the 200k cpm hot spot.

30104: ISOCS Reported Results	
Cs-137	1.1 E6 dpm/100cm² +/- 5%

Efficiency was a circular plane 600cm² (area of the hot spot) with 0.5cm concrete layer of activity. Results are closer to survey meter readings because the elevated readings are averaged over smaller areas.

30105: Measurement of surface contamination at an accelerator facility.
The contamination is a hot spot on the floor adjacent to the Cave No. 4A door. The spot is approximately 20cm in diameter. The detector was placed at a height of 56cm, with the 50mm, 30 degree shield. There were no floor readings from survey meters.

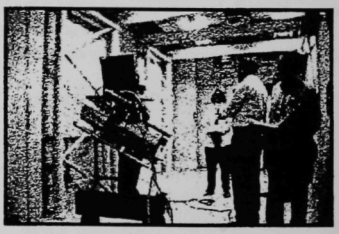
30105: ISOCS Reported Results	
Cs-137	7.7 E5 dpm/100cm² +/- 4%

30106: Measurement of activity at a hot cell facility.
Measurement of a location of elevated dose readings (1 mR/hr) at the bottom of Cell A door. Readings may be from contamination on the floor or due to streaming from the hot cell interior. The detector was set at 183cm with the 50mm, 30 degree collimator.

There are no assessments with which the *in situ* readings may be compared.

30106: ISOCS Reported Results	
Cs-137	1.0 E0 uCi +/- 10%

30107: Measurement of surface contamination at a hot cell facility.



Location is a hot spot on the wall of Cave No.3. The detector was positioned 69cm away with the 50 mm, 30 degree collimator. The spot is about 5cm diameter.

30107: ISOCS Reported Results	
Cs-137	6.9 E-2 uCi +/- 9%(150,000 dpm) over the hot spot

Efficiency was a circular plane 5cm diameter.

30108: Measurement of surface contamination at a hot cell facility.
The contamination is a hot spot on the concrete floor, covered with paint, in the Clean-up Room. The spot diameter is about 33cm and reads 100 uR/hr at 1cm with a NaI(Tl) microR meter. The detector was at 1m, with the 50 mm, 30 degree collimator.

30108: ISOCS Reported Results	
Cs-137	2.3 E6 dpm/100cm^2 +/- 3%

Efficiency was a circular plane 33cm dia with 0.5cm concrete activity. Comparison with exposure rate readings near a planar source are difficult.

30109: Measurement of surface contamination at a hot cell facility.
The contamination is on the floor, covered with paint, in the front cell area. General levels are low - near MDA for hand-held instruments. The detector was at 1m, with the 50 mm, 30 degree collimator.

30109: ISOCS Reported Results	
Cs-137	5.0 E2 dpm/100 cm^2

Efficiency was a circular plane source, area 3 m^2, with 0.5cm concrete activity layer. This activity may be below the LLD for GM tube instruments doing scanning surveys.

CONCLUSIONS

The ISOCS system was able to provide assessments of a variety of items and components in three different radiological facilities. When alternate survey or measurement data were available and reliable, results were comparable. ISOCS was able to perform measurements at locations where access was difficult - such as along the surface of the fuel pool where workers would have to be suspended to perform manual surveys - or where sampling is not practical - such as with the accelerator Dees.

ISOCS efficiencies can be generated at the time of acquisition or after measurements, as was the case for most of the measurements performed for this study. Spectral data may also be displayed and/or reported at the time of acquisition or viewed later. Examples of efficiency curves and spectral data are attached.

In addition to ISOCS providing accurate and reliable results in real time, the system also proved to be less expensive and time consuming than traditional sample collecting methods.

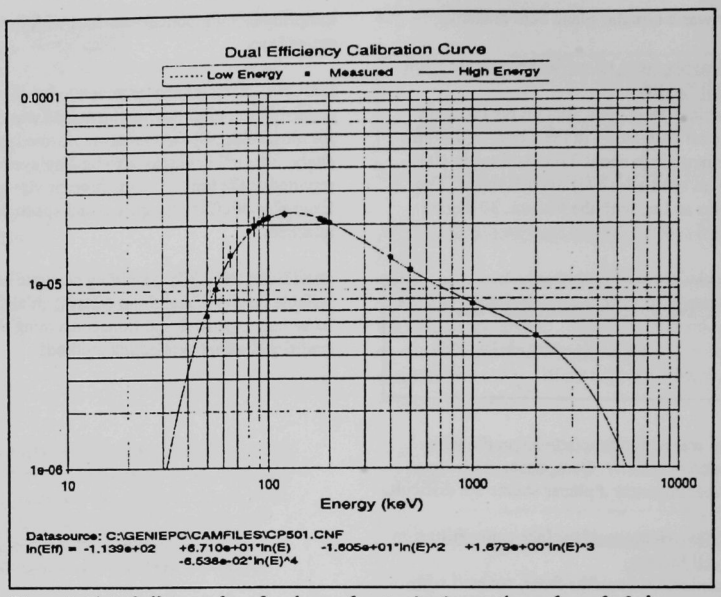


Figure 3. Plot of efficiency for a 5cm layer of contamination on the surface of a 3m² concrete circular plane (CP5 floor). Units are counts/gamma.

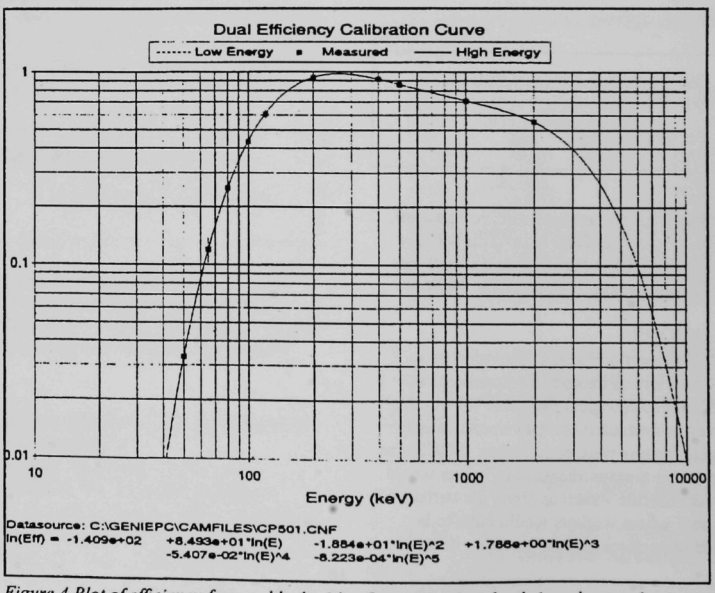


Figure 4.Plot of efficiency for a ss block with a 5cm activation depth (accelerator dees). Units are counts/gamma/gram.

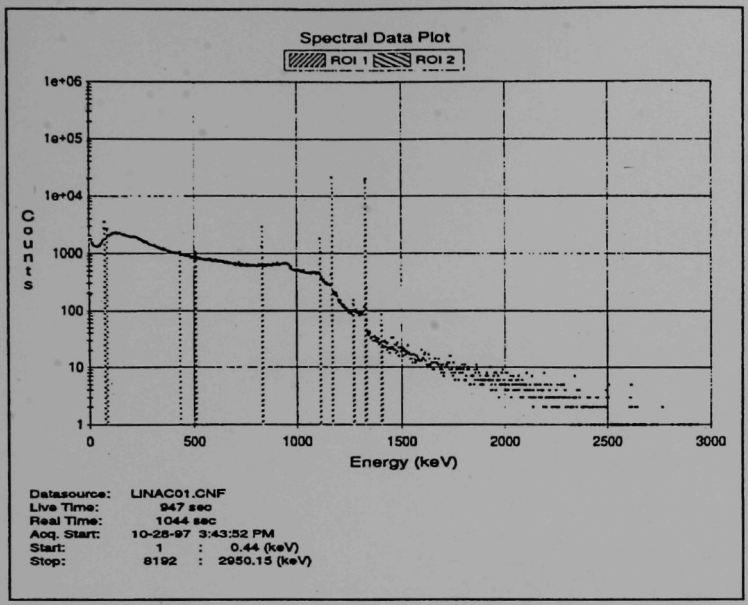


Figure 5. Spectral plot of accelerator activated components, showing Co-60, Zn-65, Mn-54, and Na-22 photopeaks.

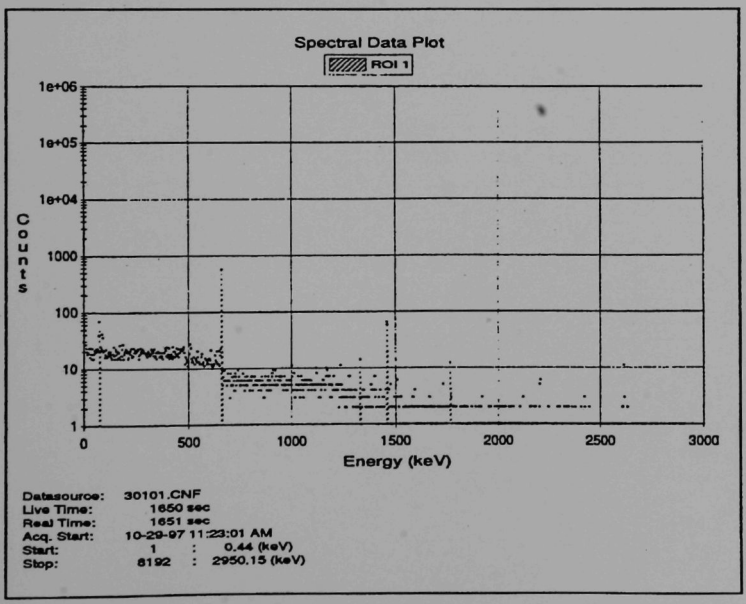


Figure 6. Spectral plot of contaminated floor in CP5 facility, showing photopeaks for Cs-137 and naturally occurring radionuclides in concrete.

APPENDIX E:

FLOOR SURVEY DATA

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As part of the DOE-funded Large Scale Demonstration Project at ANL-E, centered on the ANL-E CP-5 Reactor decontamination and decommissioning project, Shonka Research Associates, Inc. (SRA) were contracted to perform detailed floor surveys. SRA demonstrated a new method of detailed mapping of surface radioactivity, using their Surface Contamination Monitor (SCM) instrument.

The SCM system consists of a 4-ft to 6-ft wide position-sensitive proportional counter with a forward motion measuring sensor and integral computer, which moves along with the system. The system is capable of spatial resolution down to about 5 cm x 5 cm. The detectors may be biased and the signal discrimination may be adjusted to take either alpha particle or beta/gamma surveys. The instrument is motor-driven and hand-guided. Individual survey passes are then "stitched" together by the operator to construct one contiguous data file for a survey unit. Real-time color graphical images of "hot spots" are visible to the operator as they are passed over with the detector. Data is resolved to the size of one "pixel" which is 5 cm x 5 cm (25 cm^2).

Figures E-1 through E-6 contain maps showing the location and reference point for each survey unit. Note that some rooms and corridors are divided into more than one survey unit, for ease of analysis and presentation.

After completing the survey data acquisition, SRA prepared computer files for each survey unit, containing data tables and graphical figures. We have extracted, re-processed, and compiled this information into Figures E-7 through E-74 and Tables E-1 through E-14.

Three types of figures are shown. For each survey unit, a "contour" map depicting total beta/gamma activity in intensity of color and a three-dimensional representational map of total beta/gamma activity are intended to help locate and visualize the distribution of beta/gamma hot spots and general contamination levels. These are followed by a map indicating which areas have activities in excess of pre-determined release limits, either for a 1 square meter average or 100 cm^2 hot spot. The release limit values used in these figures were, for 1 m^2 / 100 cm^2 averages: 5000/15000 dpm/100 cm^2 beta/gamma and 1000/3000 dpm/100 cm^2 alpha. Since alpha activity was found to be at minimal or negligible levels on most floor areas, only activity distribution maps are included for location of alpha surface contamination.

The beta/gamma surveys were made with calibration to a Cs-137 standard. As discussed elsewhere in this report, gamma spectrometry both in-situ and on cement samples, indicated that the floor contamination consists predominantly of Cs-137, and that a multiplicative correction factor of 2.63 should be applied to the SCM beta/gamma data. SCM detection efficiency is reduced, most likely to due self-absorption of the low-energy Cs-137 beta particles in the top layer of cement covered by paint through which the measurement must be made. The beta/gamma data presented in this section has not been corrected for self-absorption, and has not been corrected for background.

However, a measured background level of 2800 dpm/100 cm^2 was subtracted from the total count rates for the maps depicting non-releasable areas. Also, we took background into account in calculating the floor Cs-137 nuclide inventories described elsewhere in this report.

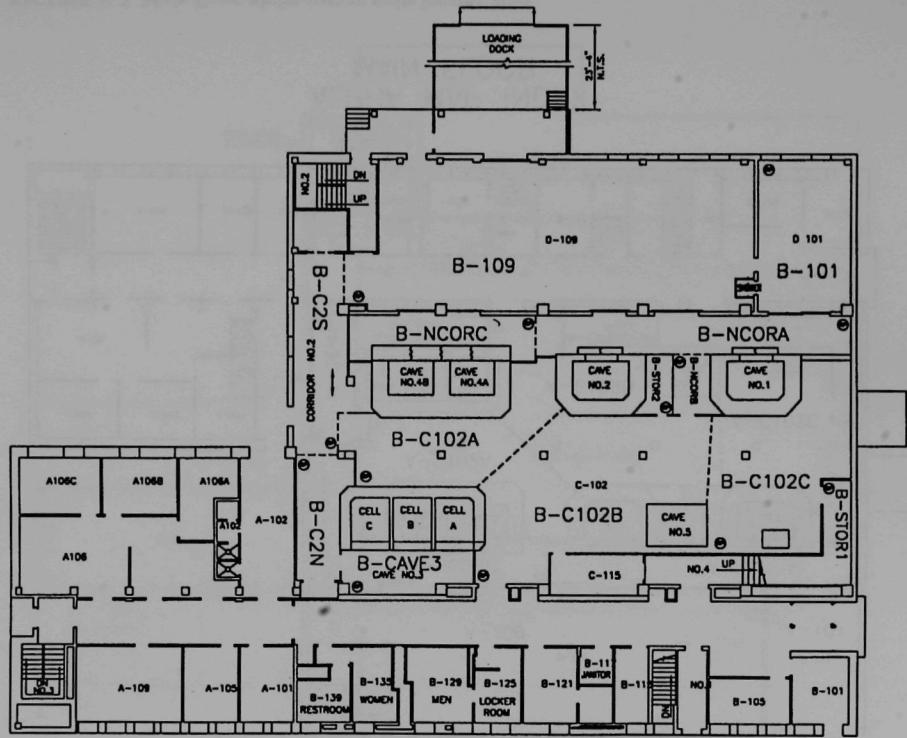
For the alpha surveys, calibration was performed with an ANL-E Am-241 standard, as used with the ANL-E DABRAS system. Copies of the SRA survey certificate, Cs-137 source certificate, and instrument efficiency measurement data are included in this section. Also included is a copy of a technical memorandum from SRA explaining the measurement analysis methodology and statistical analysis.

APPENDIX E

Floor Survey Maps and Data

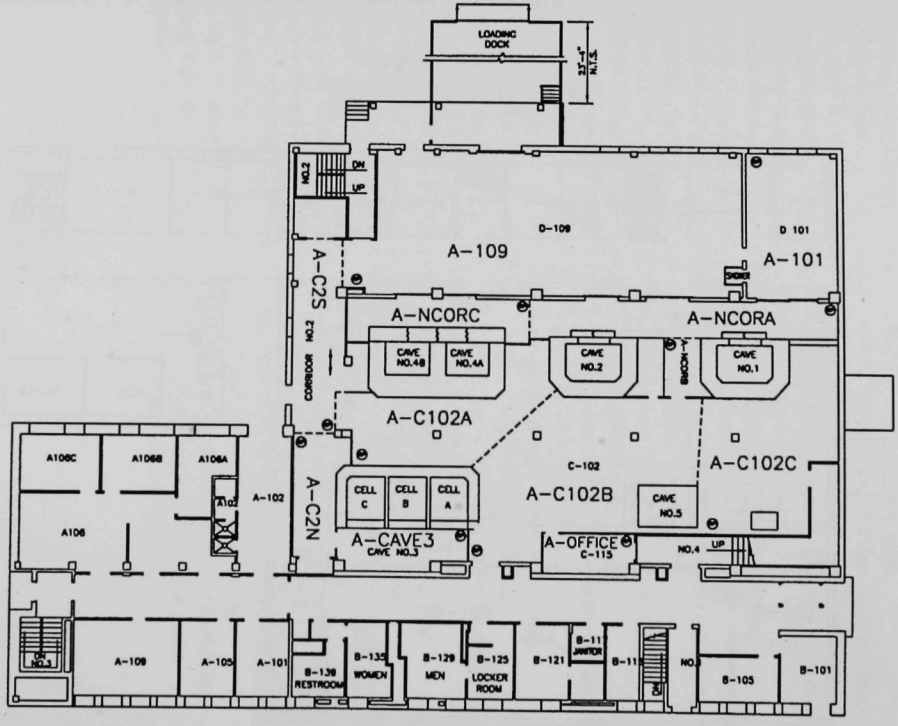
Figure E-1 Main floor, beta/gamma survey units locator map.
Figure E-2 Main floor, alpha survey units locator map.
Figure E-3 Fan loft, beta/gamma survey units locator map.
Figure E-4 Fan loft, alpha survey units locator map.
Figure E-5 Service floor, beta/gamma survey units locator map.
Figure E-6 Service floor, alpha survey units locator map.
Figure E-7 Room C-102, unit B-C102A, beta/gamma activity, contour map.
Figure E-8 Room C-102, unit B-C102A, beta/gamma activity, 3-d map.
Figure E-9 Room C-102, unit B-C102A, beta/gamma activity, non-releasable areas.
Figure E-10 Room C-102, unit B-C102A, alpha activity map.
Figure E-11 Room C-102, unit B-C102B, beta/gamma activity, contour map.
Figure E-12 Room C-102, unit B-C102B, beta/gamma activity, 3-d map.
Figure E-13 Room C-102, unit B-C102B, beta/gamma activity, non-releasable areas.
Figure E-14 Room C-102, unit B-C102B, alpha activity map.
Figure E-15 Room C-102, unit B-C102C, beta/gamma activity, contour map.
Figure E-16 Room C-102, unit B-C102C, beta/gamma activity, 3-d map.
Figure E-17 Room C-102, unit B-C102C, beta/gamma activity, non-releasable areas.
Figure E-18 Room C-102, unit A-C102C, alpha activity map.
Figure E-19 Storeroom, unit B-STOR1, beta/gamma activity, contour map.
Figure E-20 Storeroom, unit B-STOR1, beta/gamma activity, 3-d map.
Figure E-21 Storeroom, unit B-STOR1, beta/gamma activity, non-releasable areas.
Figure E-22 Storeroom 2, unit B-STOR2, beta/gamma activity, contour map.
Figure E-23 Storeroom 2, unit B-STOR2, beta/gamma activity, 3-d map.
Figure E-24 Storeroom 2, unit B-STOR2, beta/gamma activity, non-releasable areas.
Figure E-25 Room D-109, unit B-109, beta/gamma activity, contour map.
Figure E-26 Room D-109, unit B-109, beta/gamma activity, 3-d map.
Figure E-27 Room D-109, unit B-109, beta/gamma activity, non-releasable areas.
Figure E-28 Room D-109, unit A-109, alpha activity map.
Figure E-29 Room D-101, unit B-D101, beta/gamma activity, contour map.
Figure E-30 Room D-101, unit B-D101, beta/gamma activity, 3-d map.
Figure E-31 Room D-101, unit A-D101, alpha activity map.
Figure E-32 West corridor, south end, unit B-C2N, beta/gamma activity, contour map.
Figure E-33 West corridor, south end, unit B-C2N, beta/gamma activity, 3-d map.
Figure E-34 West corridor, south end, unit B-C2N, beta/gamma activity, non-releasable areas map.
Figure E-35 West corridor, south end, unit A-C2N, alpha activity map.
Figure E-36 West corridor, north end, unit B-C2S, beta/gamma activity, contour map.
Figure E-37 West corridor, north end, unit B-C2S, beta/gamma activity, 3-d map.
Figure E-38 West corridor, north end, unit B-C2S, beta/gamma activity, non-releasable areas map.
Figure E-39 West corridor, north end, unit A-C2S, alpha activity map.
Figure E-40 North corridor, unit B-NCORA, beta/gamma activity, contour map.

Figure E-41 North corridor, unit B-NCORA, beta/gamma activity, 3-d map.
Figure E-42 North corridor, unit B-NCORA, beta/gamma activity, non-releasable areas map.
Figure E-43 North corridor, unit A-NCORA, alpha activity map.
Figure E-44 North corridor, unit B-NCORB, beta/gamma activity, contour map.
Figure E-45 North corridor, unit B-NCORB, beta/gamma activity, 3-d map.
Figure E-46 North corridor, unit B-NCORB, beta/gamma activity, non-releasable areas map.
Figure E-47 North corridor, unit A-NCORB, alpha activity map.
Figure E-48 North corridor, unit B-NORC, beta/gamma activity, contour map.
Figure E-49 North corridor, unit B-NORC, beta/gamma activity, 3-d map.
Figure E-50 North corridor, unit B-NORC, beta/gamma activity, non-releasable areas map.
Figure E-51 North corridor, unit A-NORC, alpha activity map.
Figure E-52 Cave 3, unit B-CAVE3, beta/gamma activity, contour map.
Figure E-53 Cave 3, unit B-CAVE3, beta/gamma activity, 3-d map.
Figure E-54 Cave 3, unit B-CAVE3, beta/gamma activity, non-releasable areas map.
Figure E-55 Cave 3, unit A-CAVE3, alpha activity map.
Figure E-56 Fan loft, unit B-LOFTA, beta/gamma activity, contour map.
Figure E-57 Fan loft, unit B-LOFTA, eta/gamma activity, 3-d map.
Figure E-58 Fan loft, unit B-LOFTA, beta/gamma activity, non-releasable areas map.
Figure E-59 Fan loft, unit A-LOFTA, alpha activity map.
Figure E-60 Fan loft, unit B-LOFTB, beta/gamma activity, contour map.
Figure E-61 Fan loft, unit B-LOFTB, beta/gamma activity, 3-d map.
Figure E-62 Fan loft, unit B-LOFTB, beta/gamma activities, non-releasable areas map.
Figure E-63 Fan loft, unit A-LOFTB, alpha activity map.
Figure E-64 Fan loft, unit B-LOFTC, beta/gamma activity, contour map.
Figure E-65 Fan loft, unit B-LOFTC, beta/gamma activity, 3-d map.
Figure E-66 Fan loft, unit B-LOFTC, beta/gamma activity, non-releasable areas map.
Figure E-67 Fan loft, unit A-LOFTC, alpha activity map.
Figure E-68 Service floor corridor, unit B-BASE1, beta/gamma activity, contour map.
Figure E-69 Service floor corridor, unit B-BASE1, beta/gamma activity, 3-d map.
Figure E-70 Service floor corridor, unit B-BASE1, beta/gamma activity, non-releasable areas map.
Figure E-71 Service floor corridor, unit A-BASE1, alpha activity map.
Figure E-72 Room D-031, unit B-BASE2, beta/gamma activity, contour map.
Figure E-73 Room D-031, unit B-BASE2, beta/gamma activity, 3-d map.
Figure E-74 Room D-031, unit A-BASE2, alpha activity map.



BETA MAP INDEX
MAIN FLOOR

FIGURE E-1 Main floor, beta/gamma survey units locator map



ALPHA MAP INDEX
MAIN FLOOR

FIGURE E-2 Main floor, alpha survey units locator map

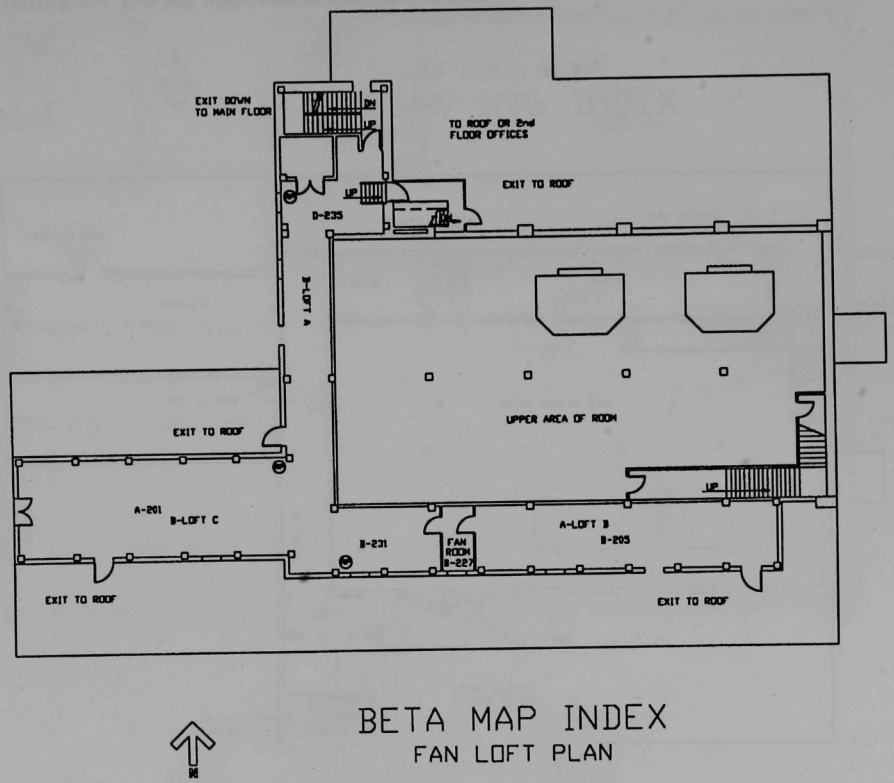


FIGURE E-3 Fan loft, beta/gamma survey units locator map

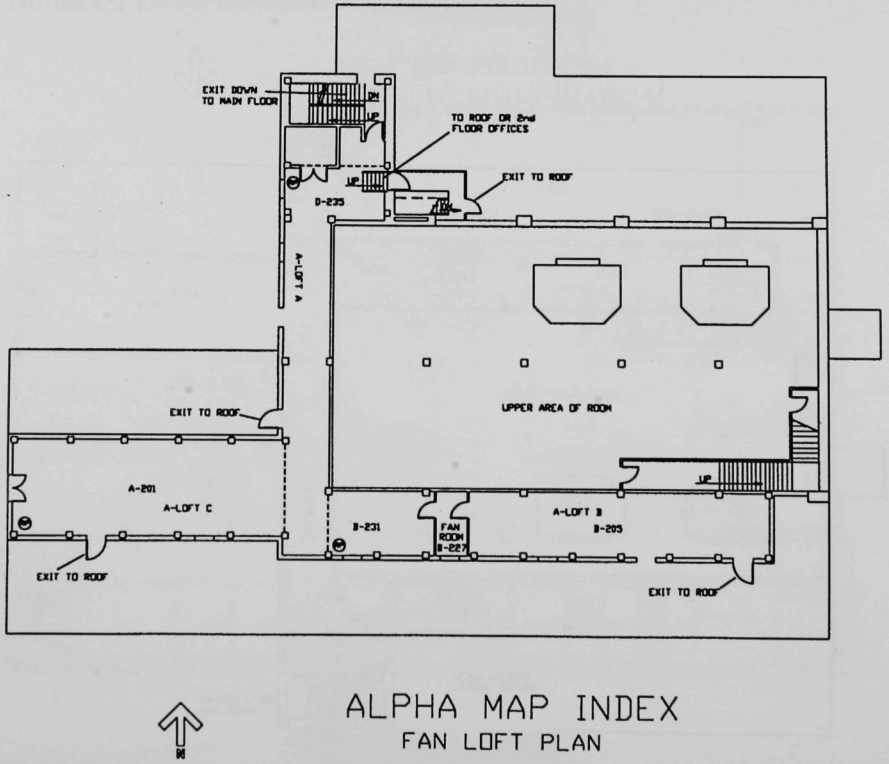


FIGURE E-4 Fan loft, alpha survey units locator map

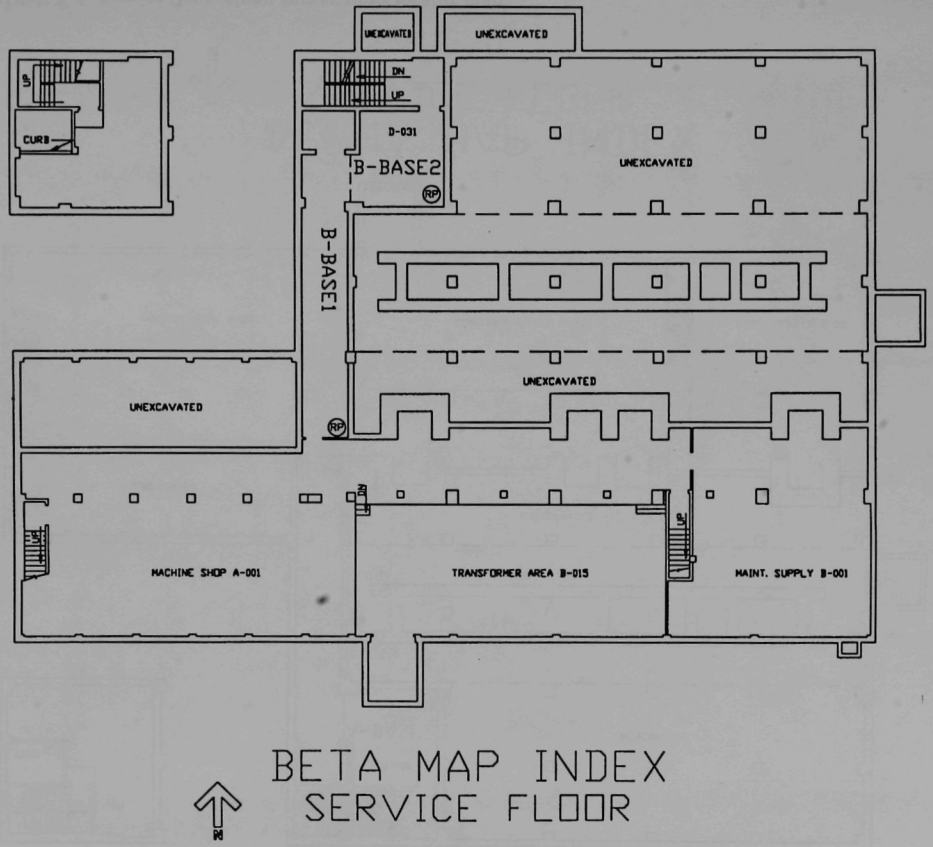


FIGURE E-5 Service floor, beta/gamma survey units locator map

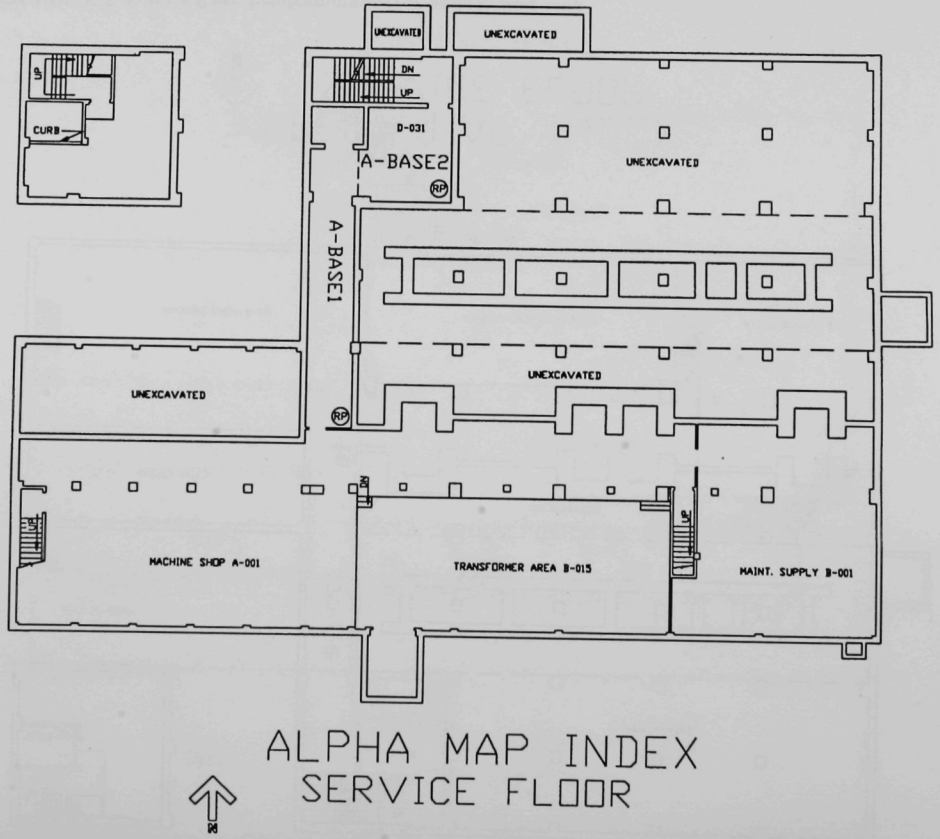


FIGURE E-6 Service floor, alpha survey units locator map

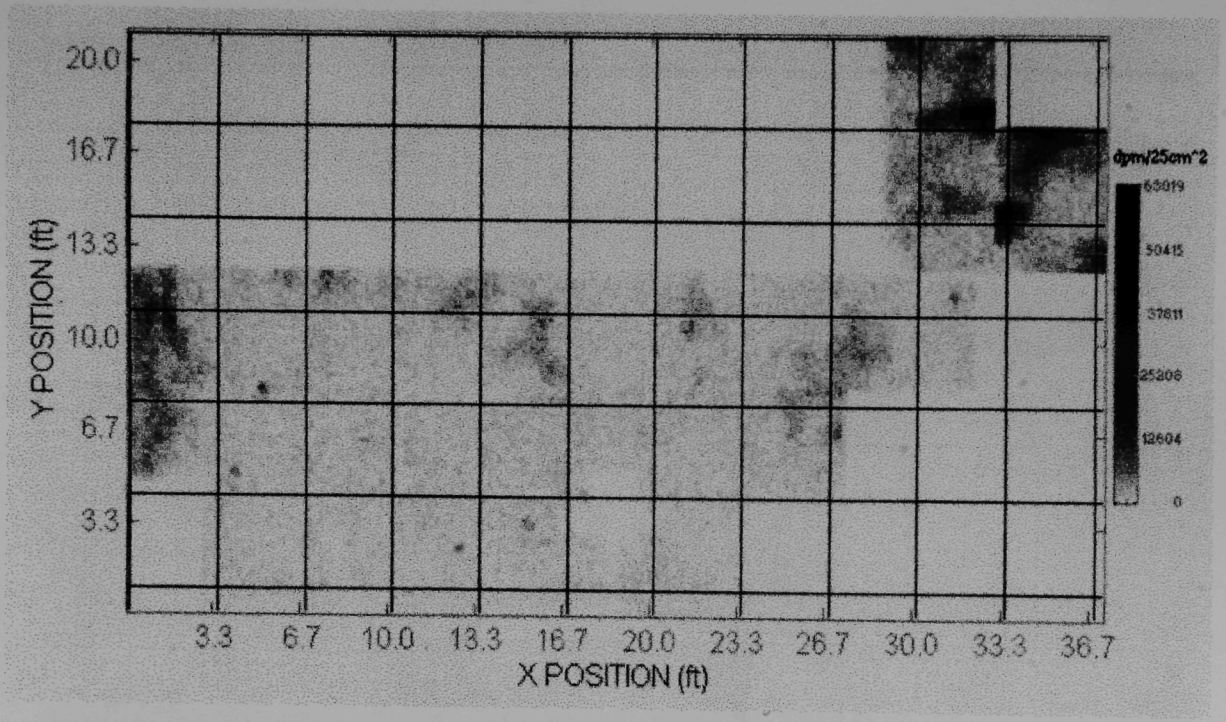


FIGURE E-7 Floor survey, Room C-102, survey unit B-C102A. Total beta/gamma surface activity in dpm/25 cm^2 vs position relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

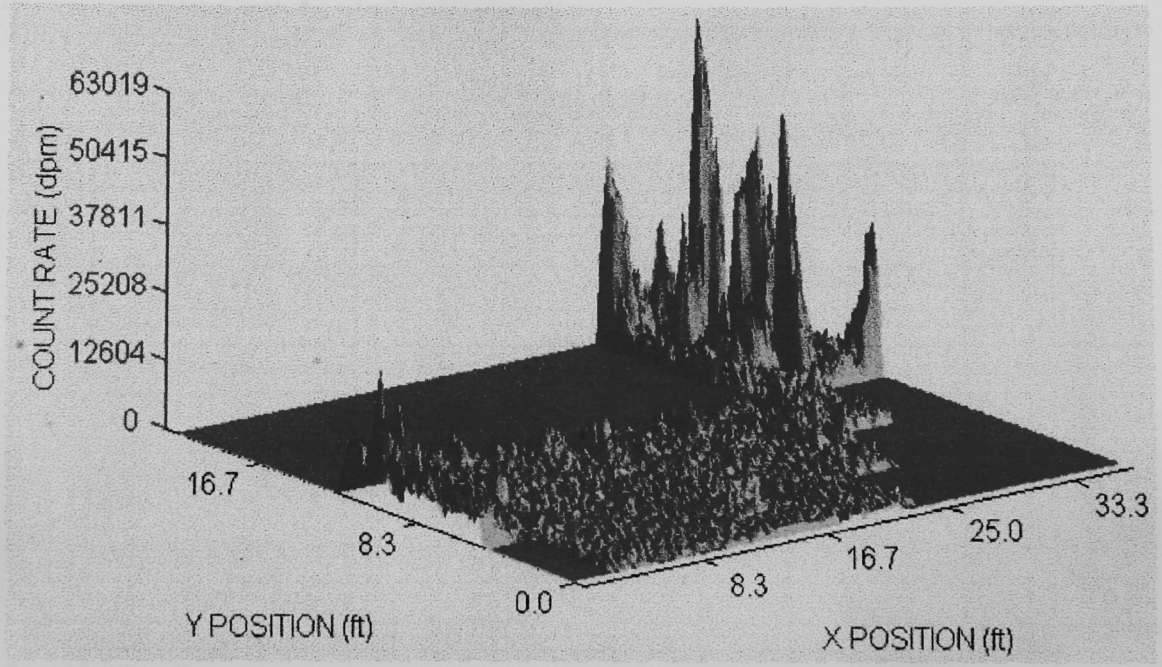


FIGURE E-8 Floor survey, Room C-102, unit B-C102A. Total beta/gamma surface activity in dpm/25 cm^2 versus position relative to reference point in SW corner of room. Compass north is ⇑.

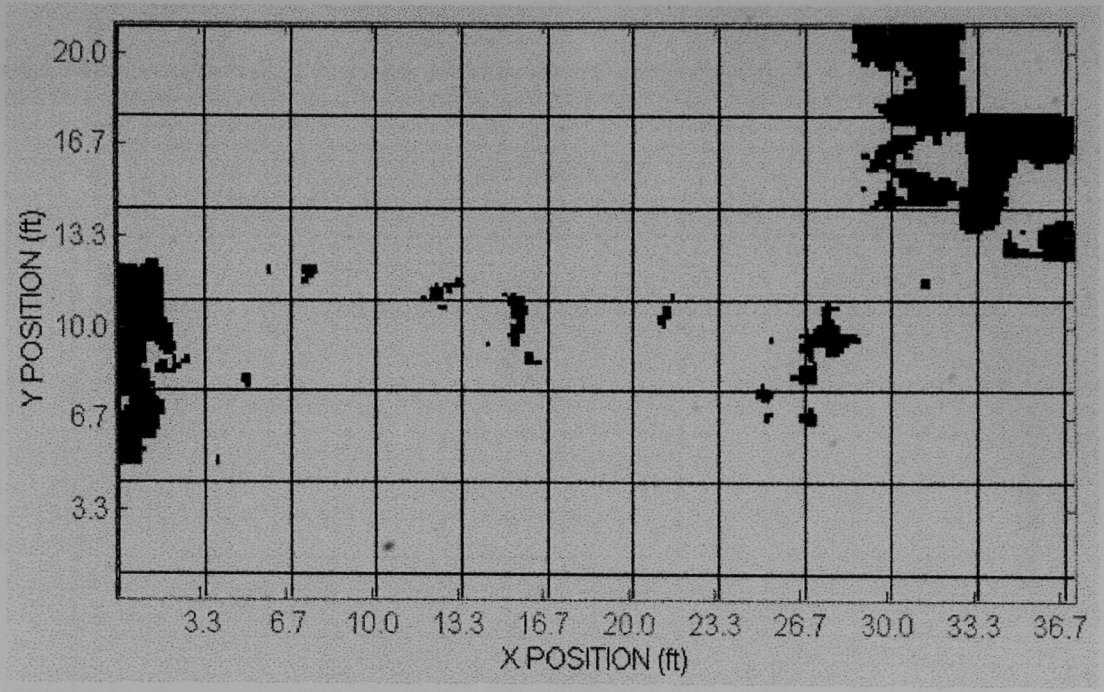


FIGURE E-9 Floor survey, Room C-102, survey unit B-C102A, non-releasable areas. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in SW corner, with a 1-meter grid overlay. Compass north is ⇑.

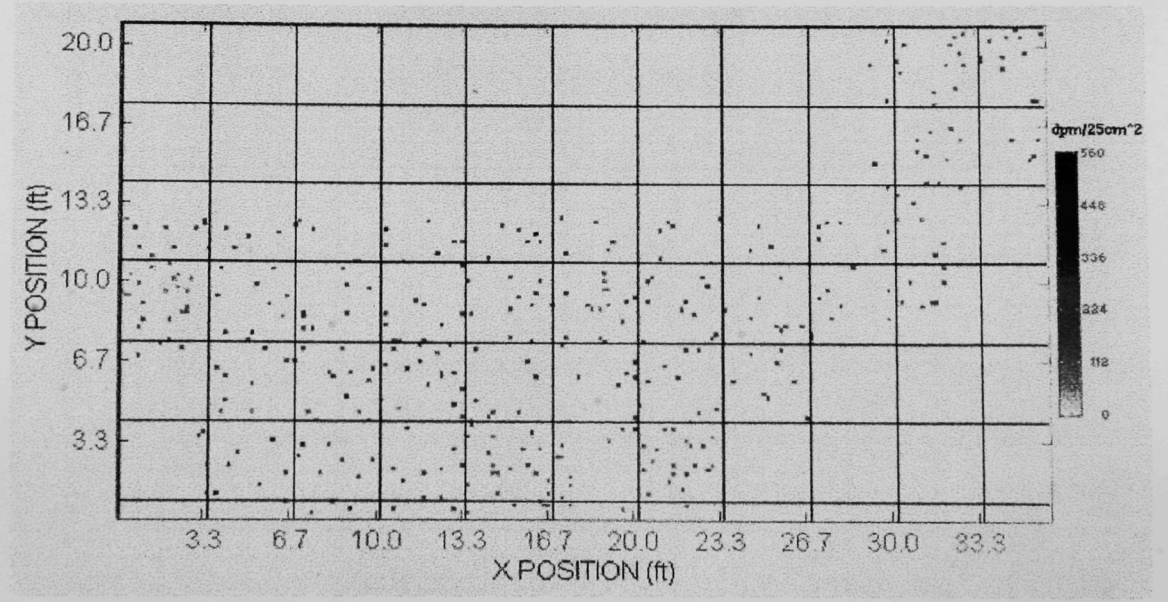


FIGURE E-10 Floor survey, Room C-102, survey unit A-C102A. Total alpha surface activity in dpm/25cm^2 vs position relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

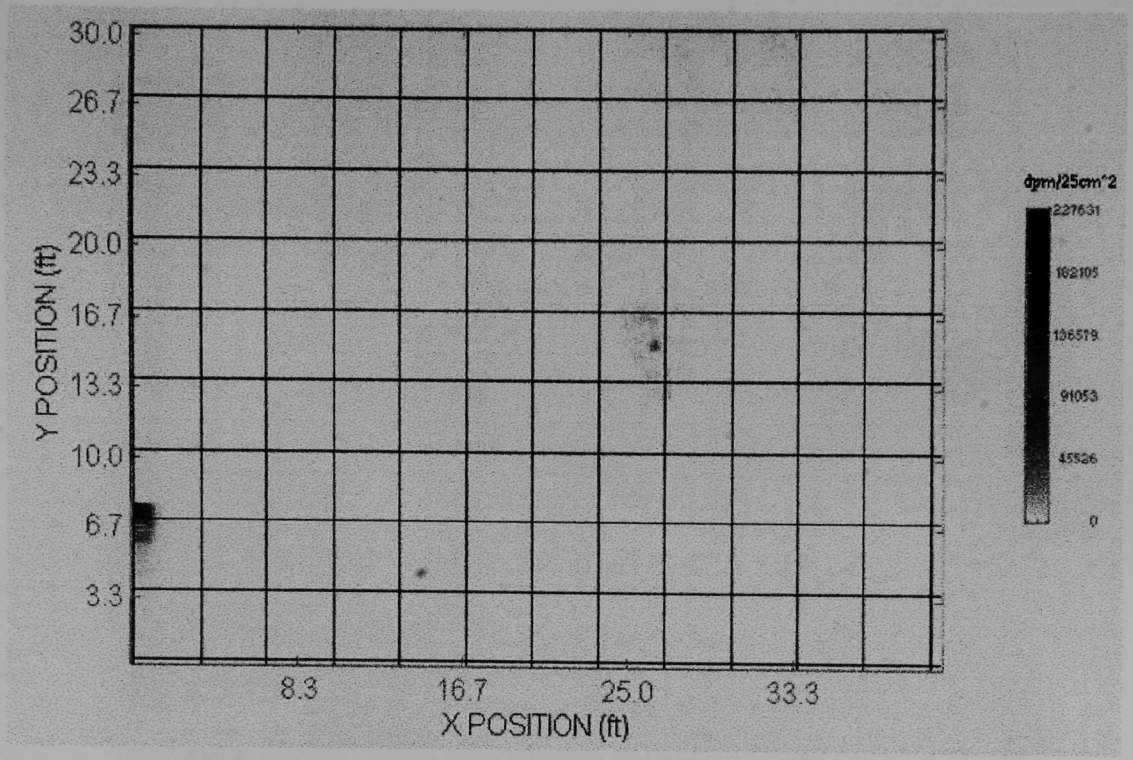


FIGURE E-11 Floor survey, Room C-102, unit B-C102B. Contour plot of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner, with 1-meter grid overlay. Compass north is ⇑.

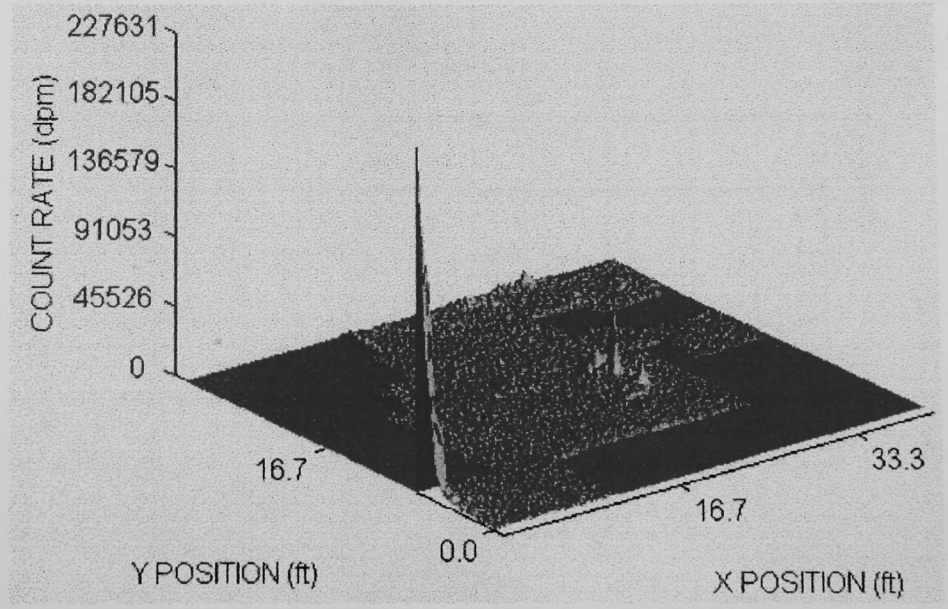


FIGURE E-12 Floor survey, unit B-C102B. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of room. Compass north is ⇑.

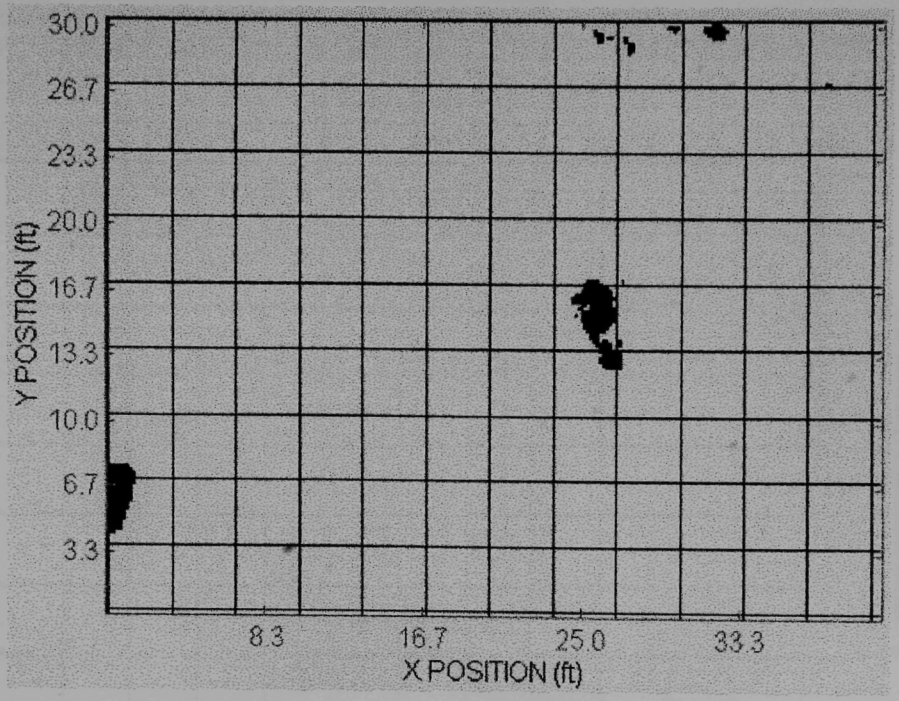


FIGURE E-13 Floor survey, Room C-102, unit B-C102B, non-releasable areas. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in SW corner. Compass north is ⇑.

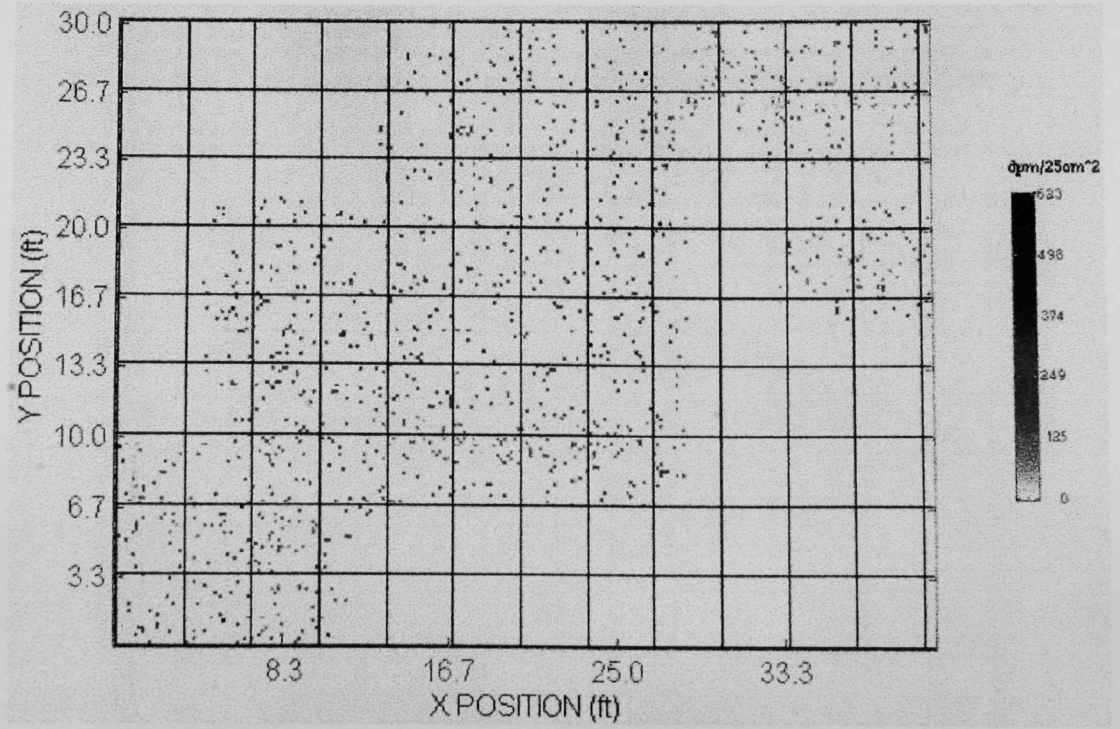


FIGURE E-14 Floor survey, Room C-102, survey unit A-C102B. Total alpha surface activity in dpm/25cm^2 vs position relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

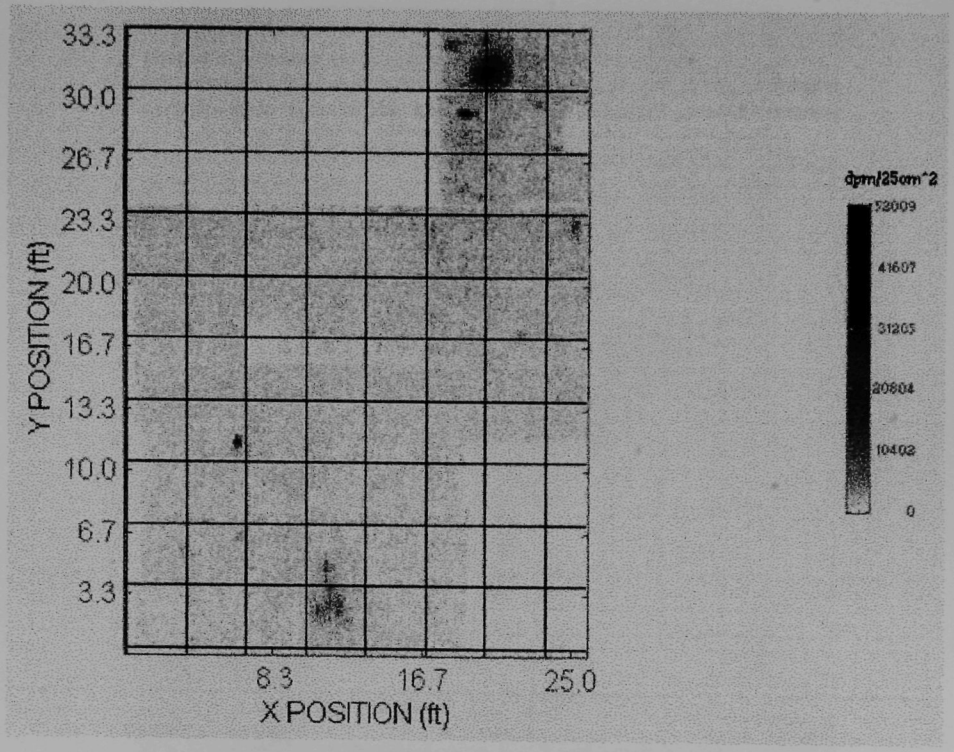


FIGURE E-15 Floor survey, Room C-102, unit B-C102C. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

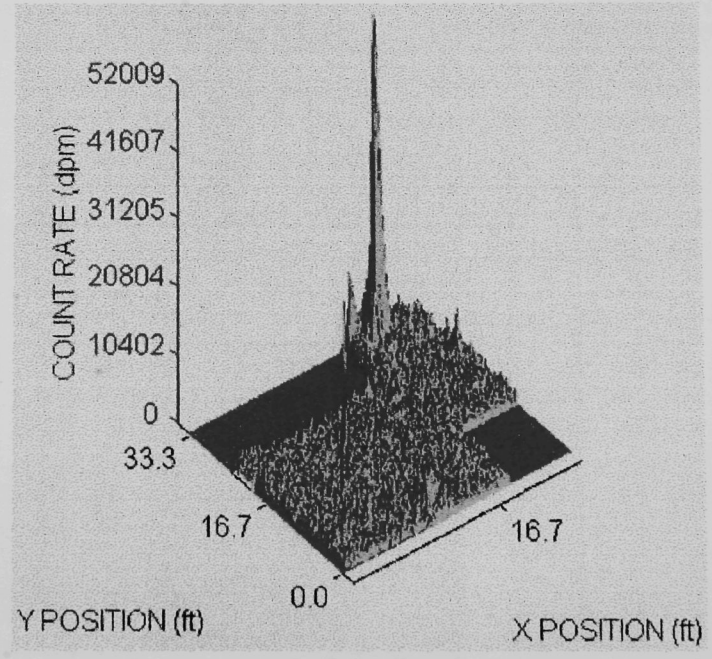


FIGURE E-16 Floor survey, Room C-102, unit B-C102C. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position relative to reference in SW corner of room. Compass north is ⇑.

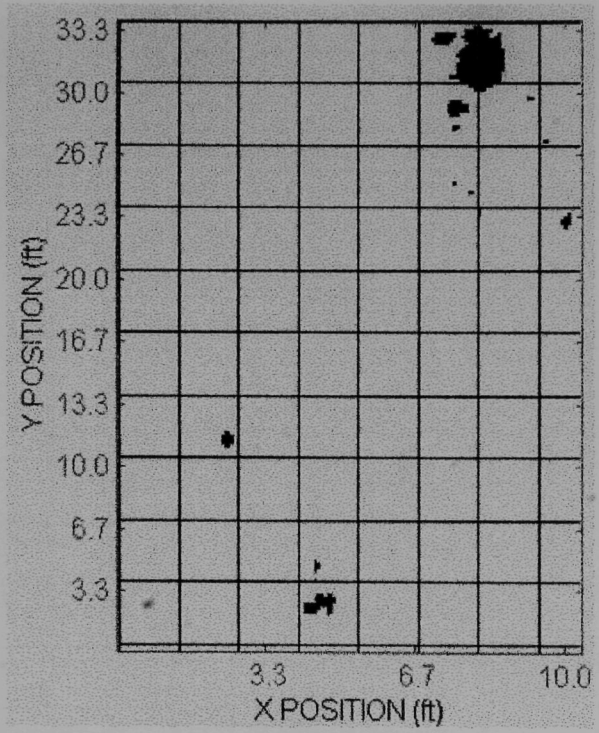


FIGURE E-17 Floor survey, Room C-102, unit B-C102D, non-releasable area. Areas shown in black have total surface beta/gamma above release limits. Locations are shown in feet relative to reference point in SW corner, with 1-meter grid overlay. Compass north is ⇑.

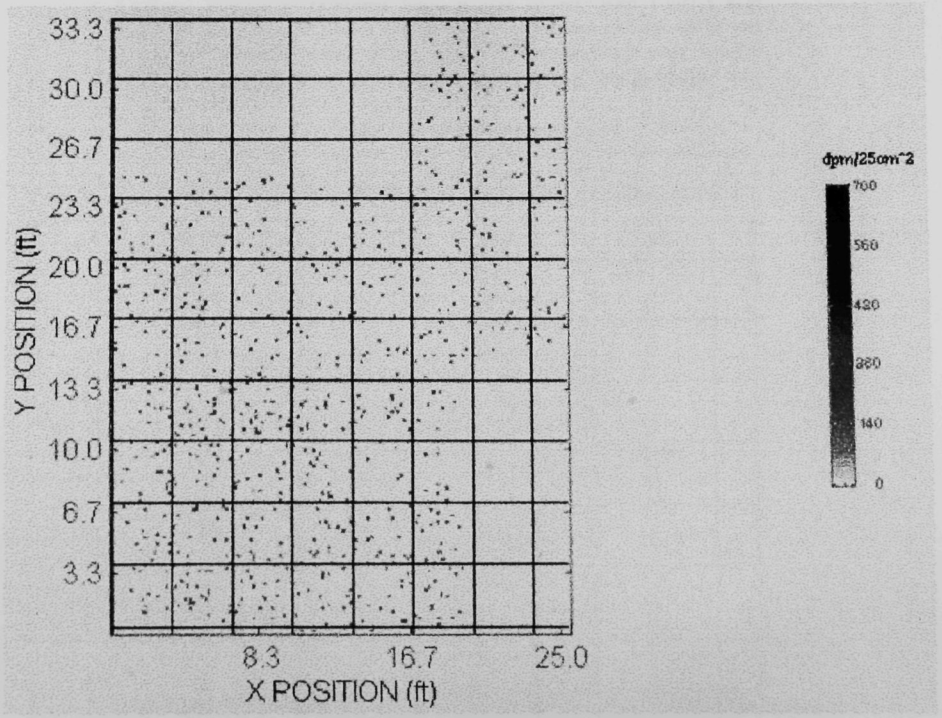


FIGURE E-18 Floor survey, Room C-102, unit B-C102C. Total alpha surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner, with 1-meter grid overlay. Compass north is ⇑.

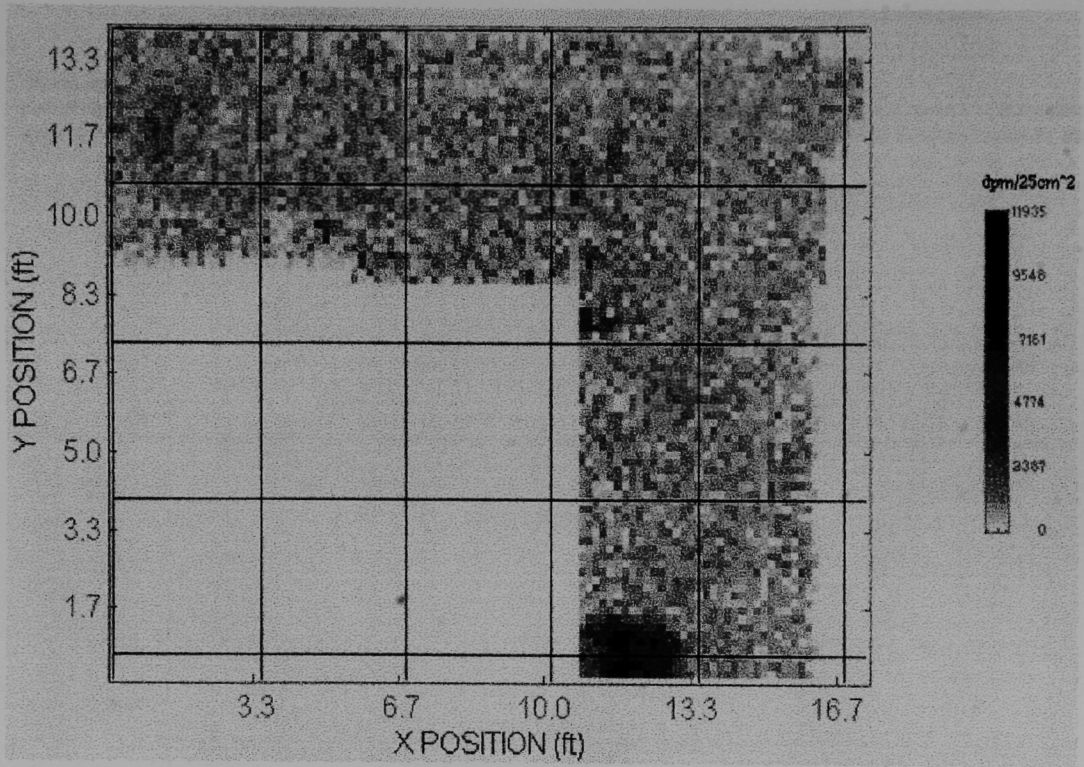


FIGURE E-19 Floor survey, storeroom off C-102, survey unit B-STOR1. Contour plot of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in "virtual" SW corner of rectangular survey unit, with 1-meter grid overlay. Compass North is ↑.

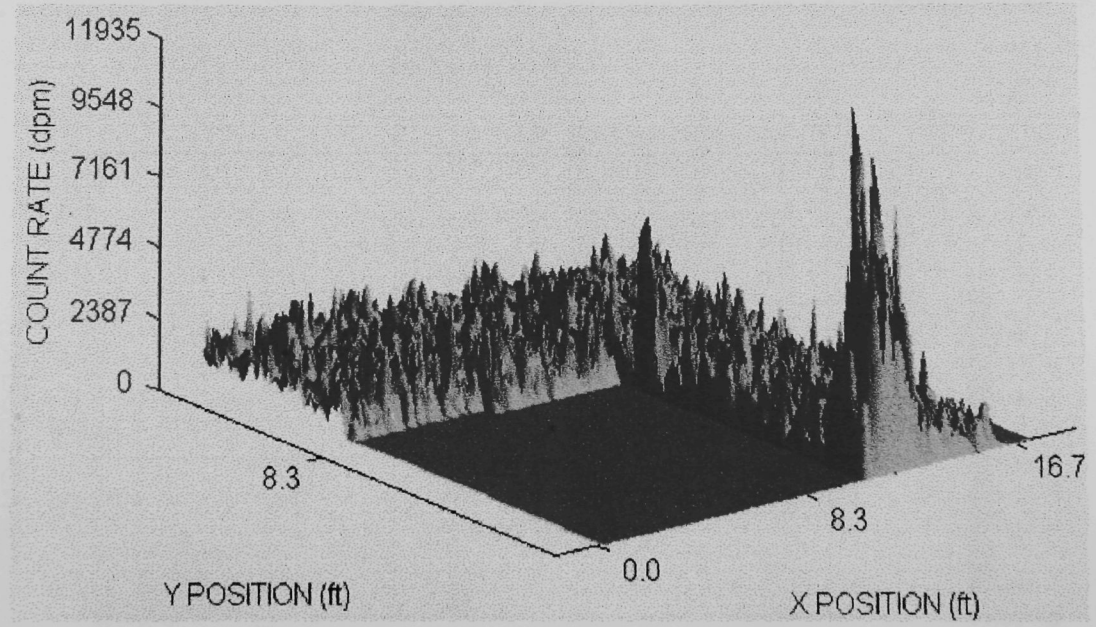


FIGURE E-20 Floor survey, storeroom off C-102, survey unit B-STOR1. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference in "virtual" SW corner of rectangular survey unit. Compass north is ↑.

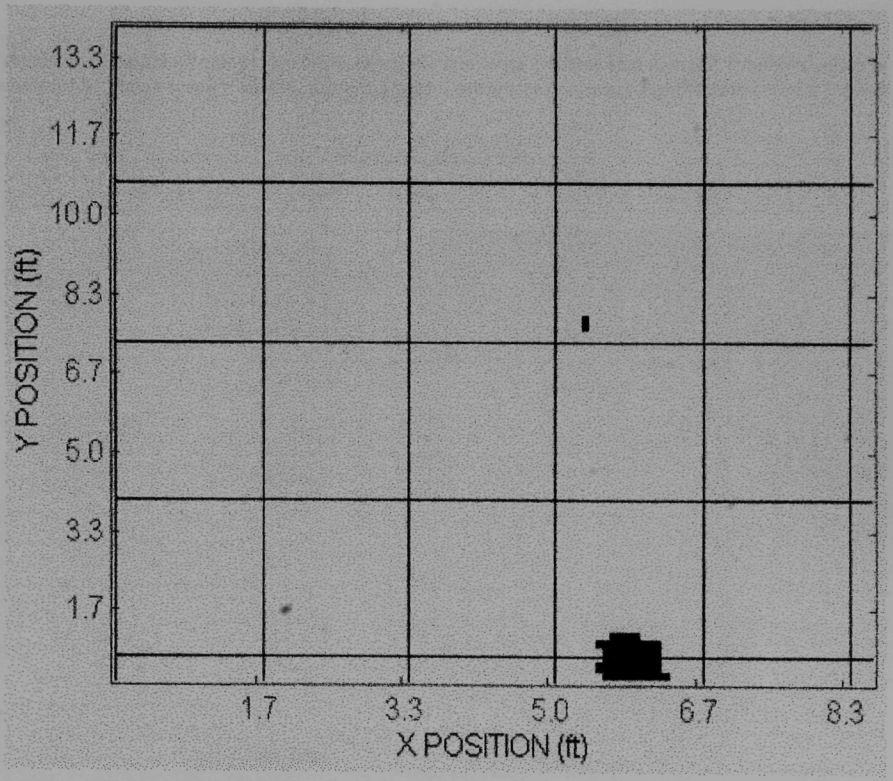


FIGURE E-21 Floor survey, storeroom off C-102, survey unit B-STOR1. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in "virtual" SW corner of rectangular survey unit, with 1-meter grid overlay. Compass North is ↑.

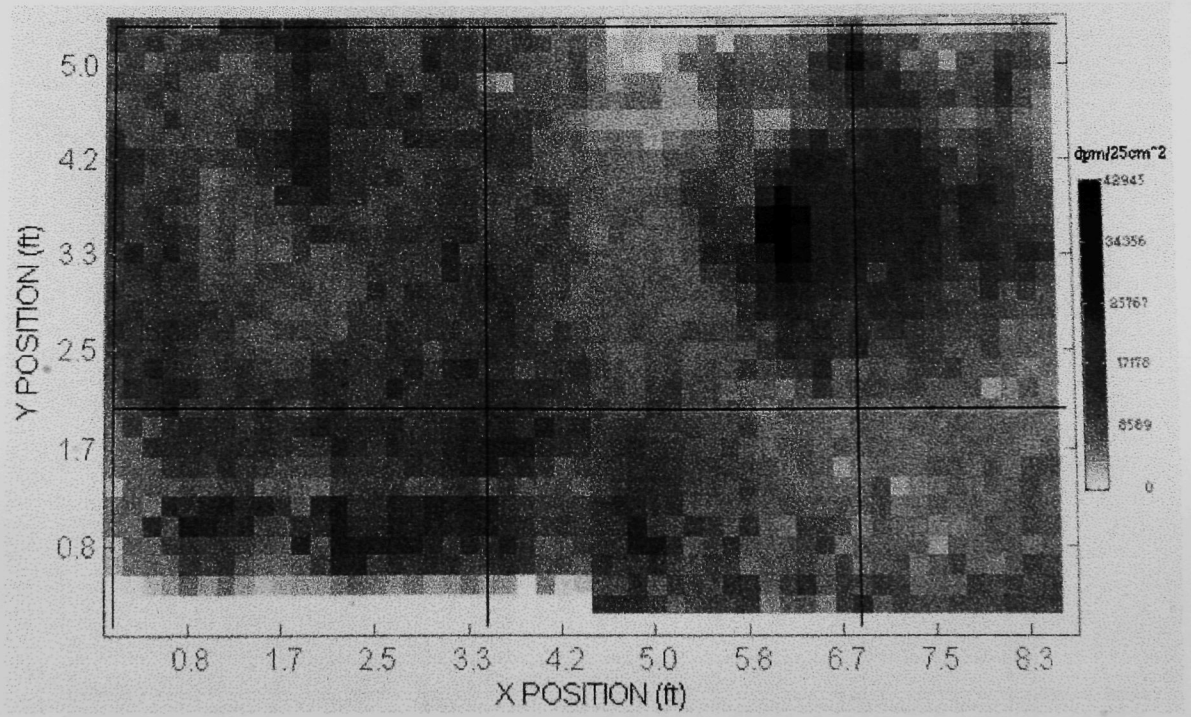


FIGURE E-22 Floor survey, Storeroom #2, survey unit B-STOR2. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of survey unit, with 1-meter grid overlay. Compass North is ⇒.

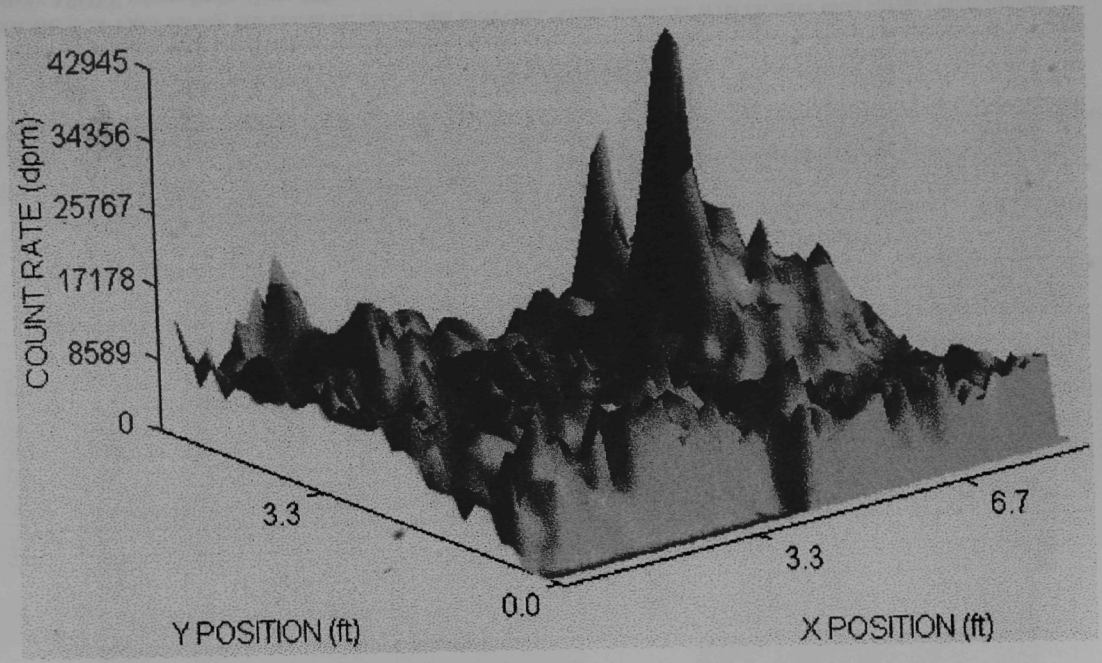


FIGURE E-23 Floor survey, Storeroom #2, survey unit B-STOR2. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference in SE corner of area. Compass North is ⇒.

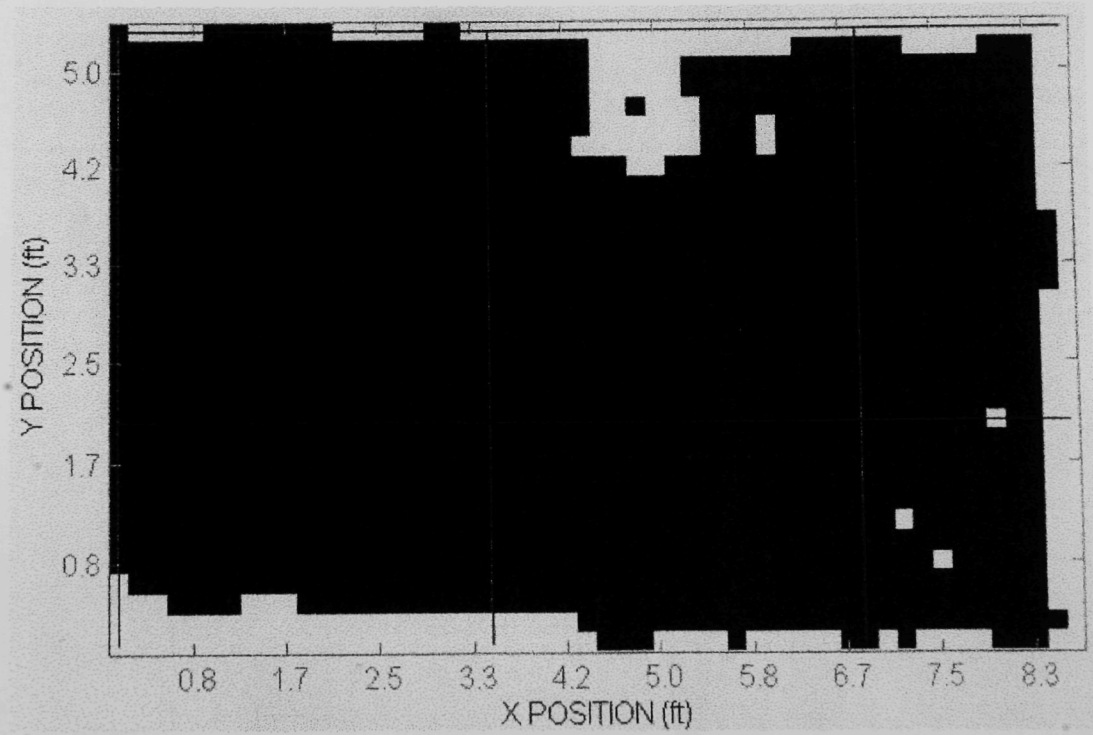


FIGURE E-24 Floor survey, Storeroom #2, survey unit B-STOR2. Areas shown in WHITE have total surface beta/gamma activity ABOVE release limits. (Note different color scheme for this plot). Locations are shown in feet relative to reference point in SE corner of survey unit. Compass North is ⇒.

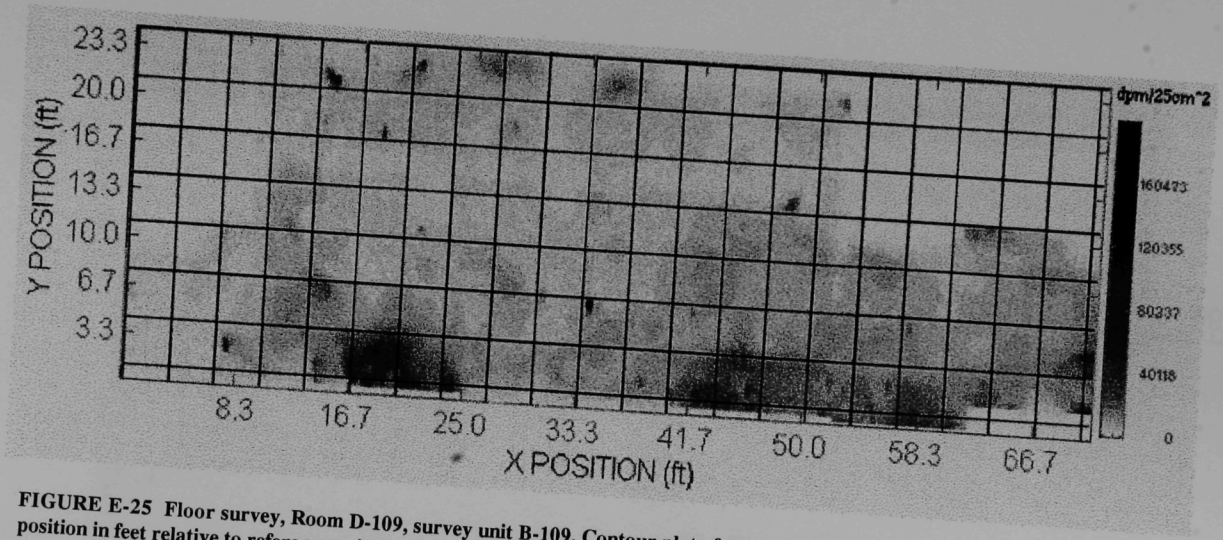


FIGURE E-25 Floor survey, Room D-109, survey unit B-109. Contour plot of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner, with 1-meter grid overlay. Compass north is ⇑.

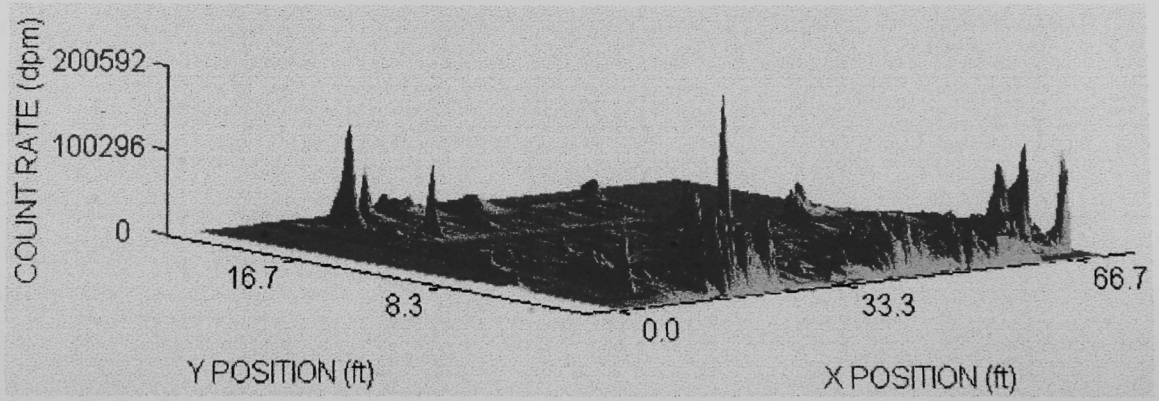


FIGURE E-26 Floor survey, Room D-109, survey unit B-109. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of room. Compass north is ⇑.

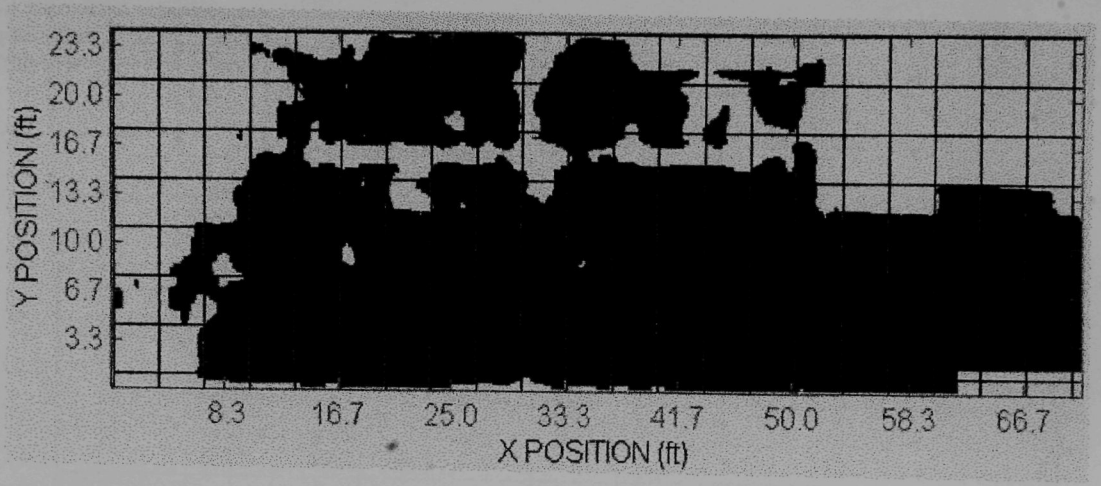


FIGURE E-27 Floor survey, Room D-109, survey unit B-109A, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in SW corner, with a 1-meter grid overlay. Compass north is ⇑.

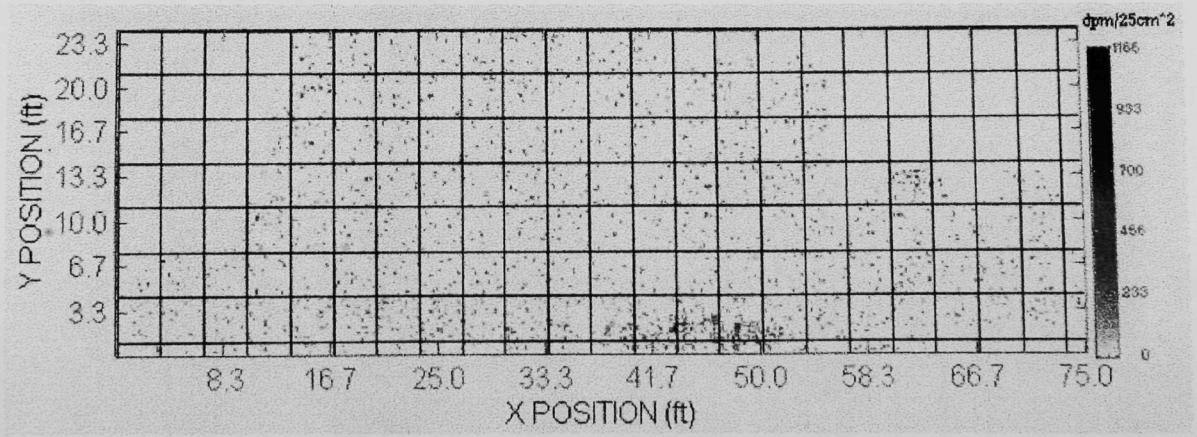


FIGURE E-28 Floor survey, Room D-109, survey unit A-109A. Total alpha surface activity in dpm/25 cm^2 vs position in feet relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

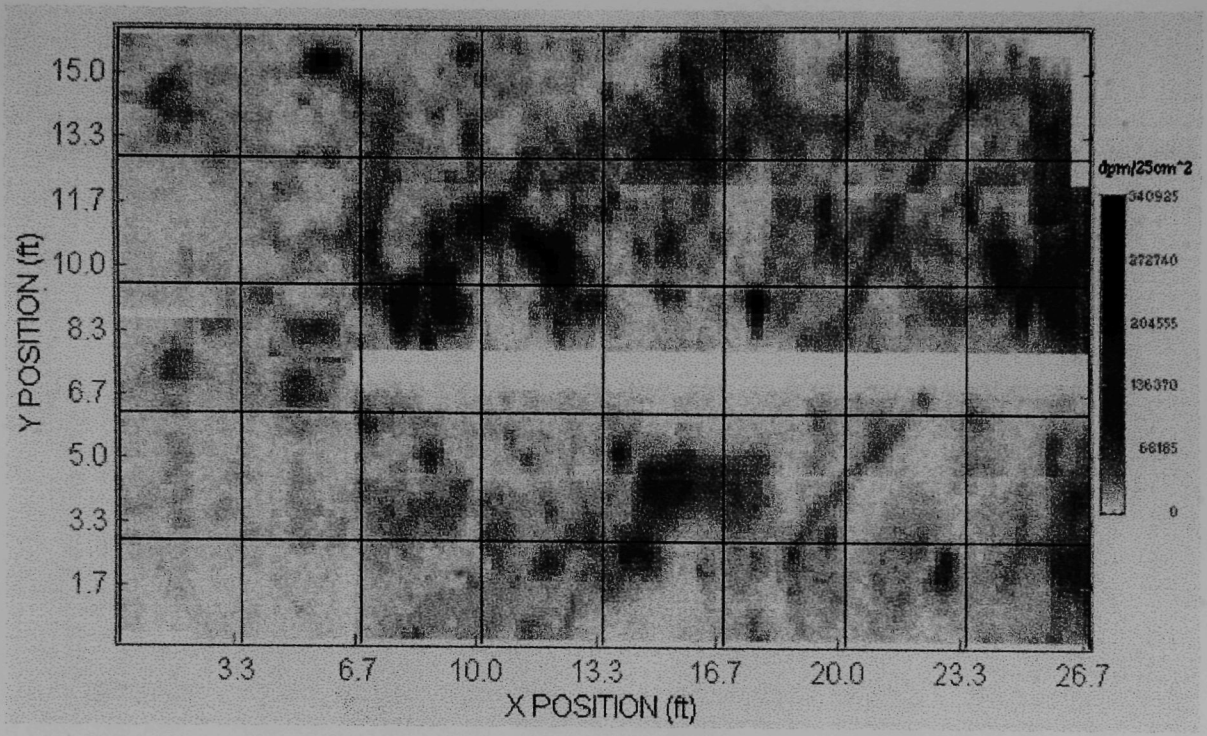


FIGURE E-29 Floor survey, Room D-101, survey unit B-D101. Contour plot of total beta/gamma activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of room, with 1-meter grid overlay. Compass north is ⇐.

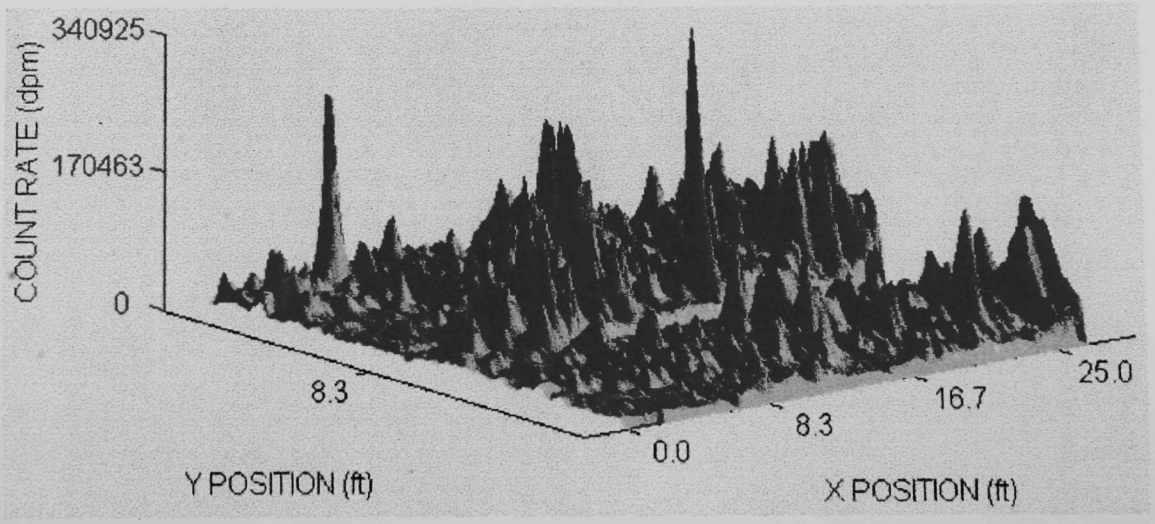


FIGURE E-30 Floor survey, Room D-101, survey unit B-D101. Three-dimensional representation of total surface beta/gamma activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of room. Compass north is ⇐.

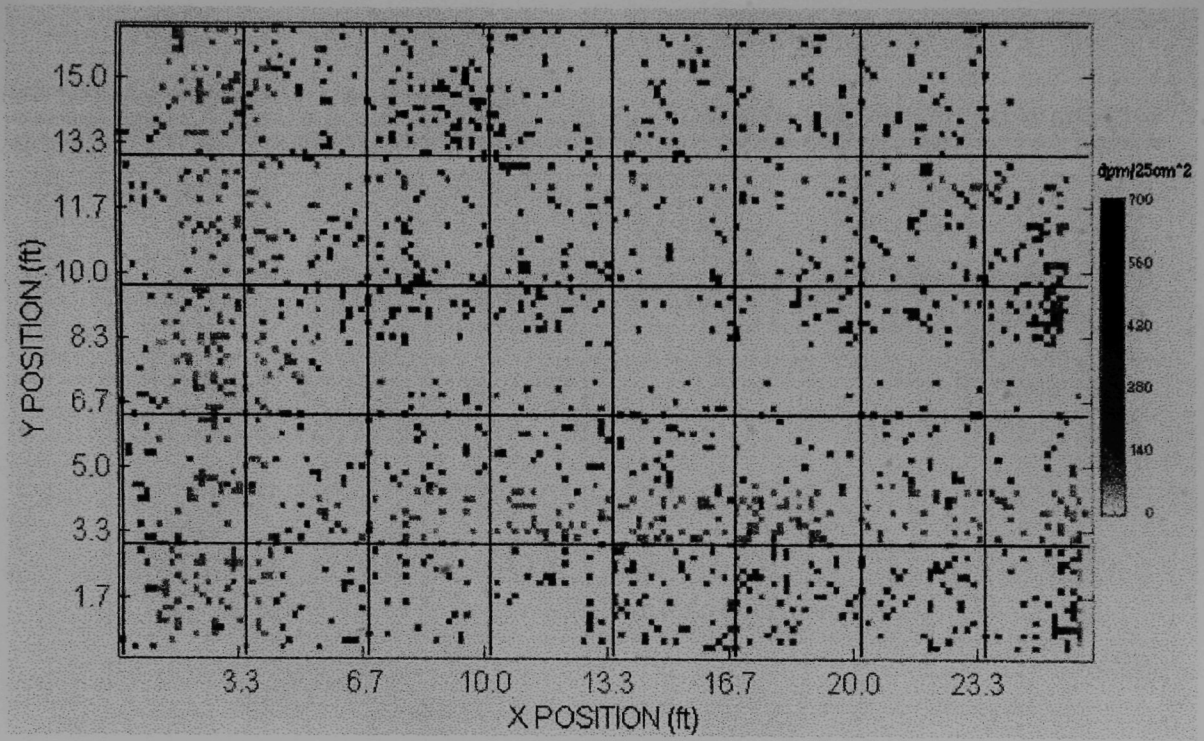


FIGURE E-31 Floor survey, Room D-101, survey unit A-D101. Distribution of total alpha surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of room, with 1-meter grid overlay. Compass North is ⇐.

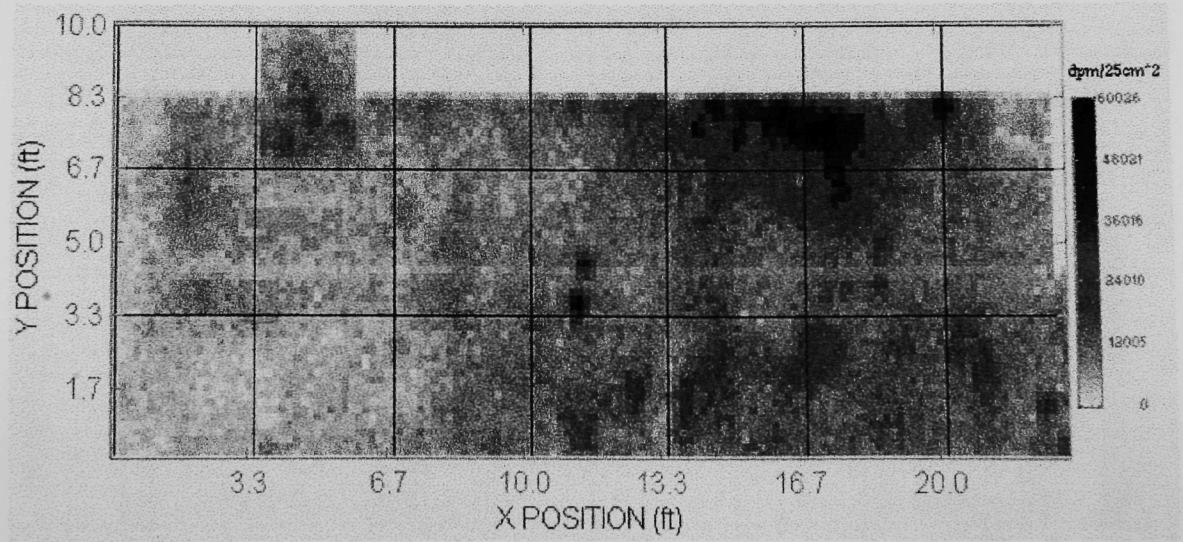


FIGURE E-32 Floor survey, south end of West Corridor, survey unit B-C2N. Contour map of total beta/gamma surface activity in units of dpm/25 cm^2 vs position in feet relative to reference point in NW corner of area, with 1-meter grid overlay. Darker area (higher activity) is outside door to Cell 3. Compass north is ←.

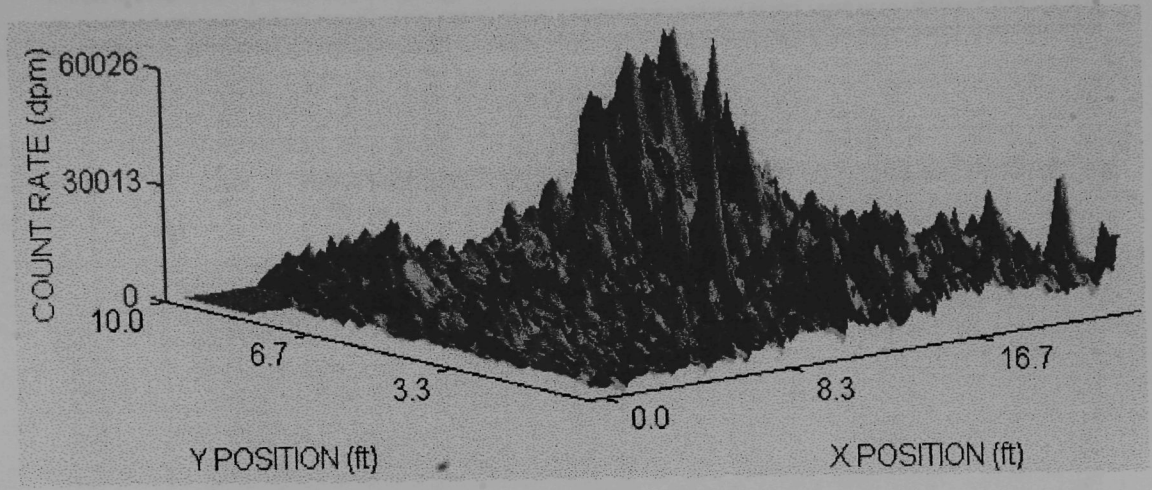


FIGURE E-33 Floor survey, south end of West Corridor, survey unit B-C2N. Three-dimensional representation of total beta/gamma surface activity in units of dpm/25 cm^2 vs position in feet relative to reference point in NW corner of area. Greatest activity levels are present outside door to Cell 3. Compass north is ←.

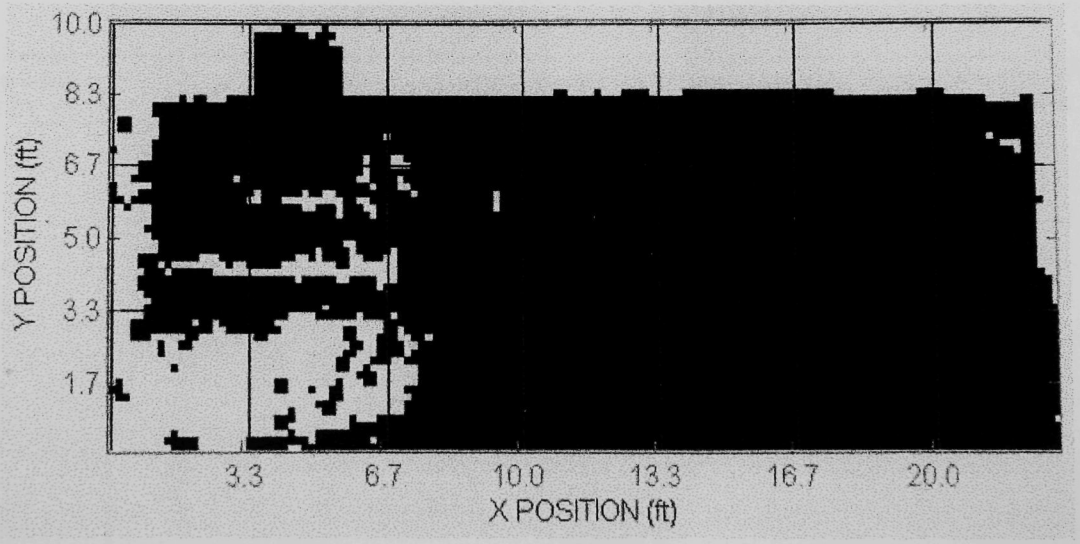


FIGURE E-34 Floor survey, south end of West Corridor, survey unit B-C2N, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in NW corner of area, with a 1-meter grid overlay. Compass north is ←.

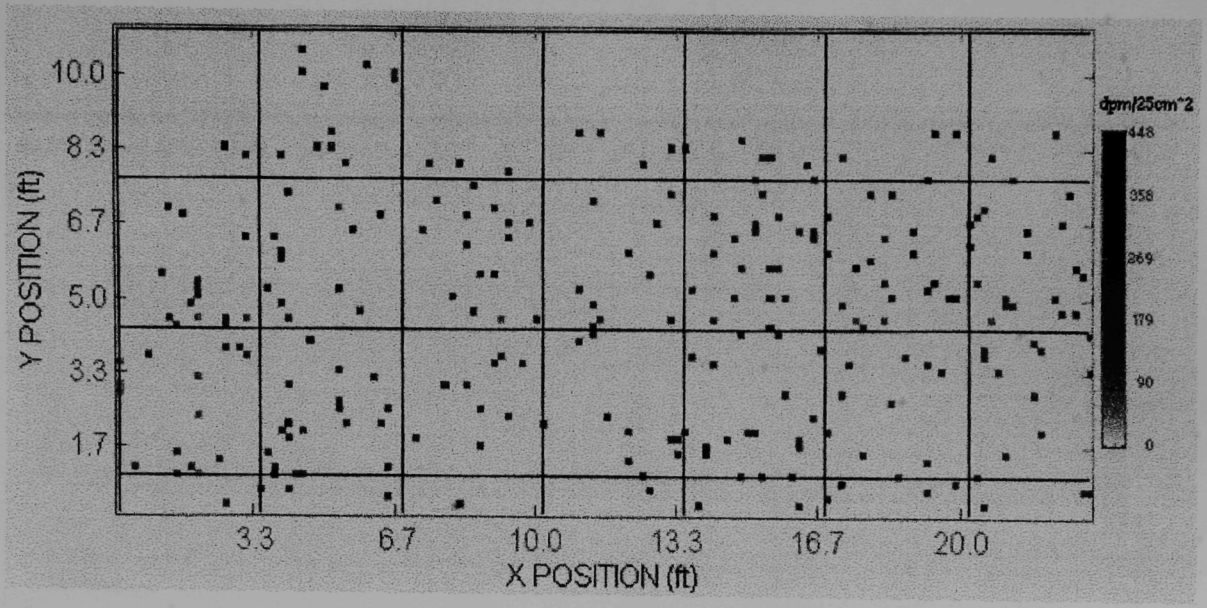


FIGURE E-35 Floor survey, south end of West Corridor, survey unit B-C2N. Total alpha surface activity in units of dpm/25 cm^2 vs position in feet relative to reference point in NW corner, with 1-meter grid overlay. Compass north is ←.

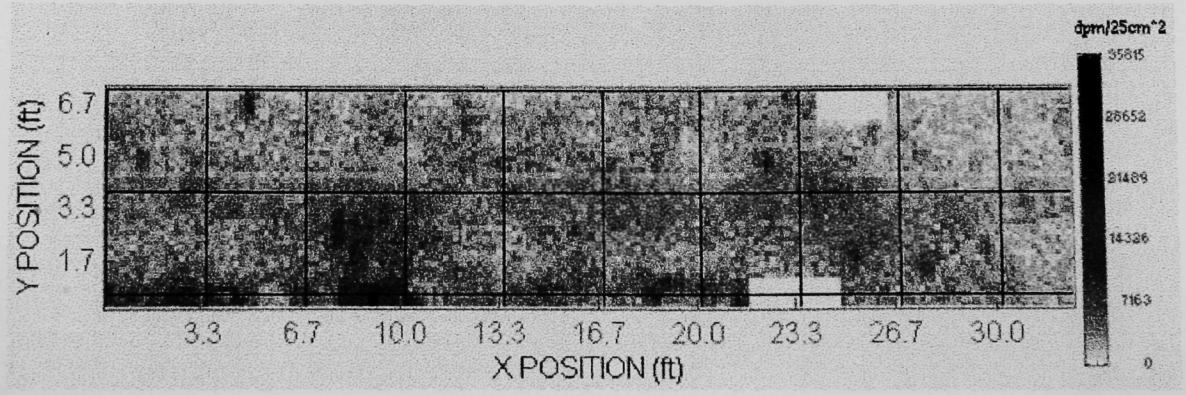


FIGURE E-36 Floor survey, north end of West Corridor, survey unit B-C2S. Contour map of total beta/gamma surface activity in units of dpm/25 cm^2 vs position in feet relative to reference point in SE corner of area, with 1-meter grid overlay. Compass north is ⇒.

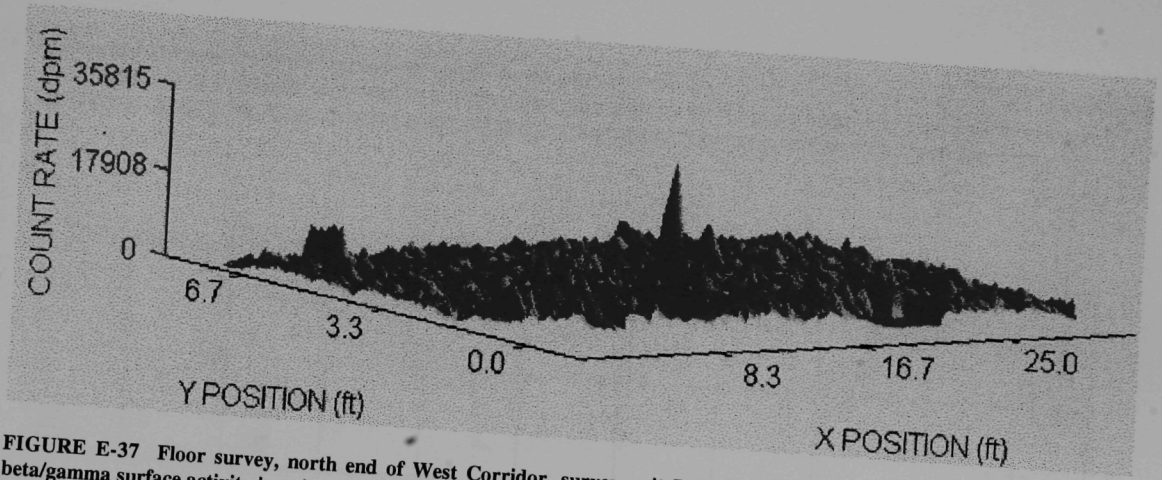


FIGURE E-37 Floor survey, north end of West Corridor, survey unit B-C2S. Three-dimensional representation of total beta/gamma surface activity in units of dpm/25 cm^2 vs position in feet relative to reference point in SE corner of area. Compass north is ⇒.

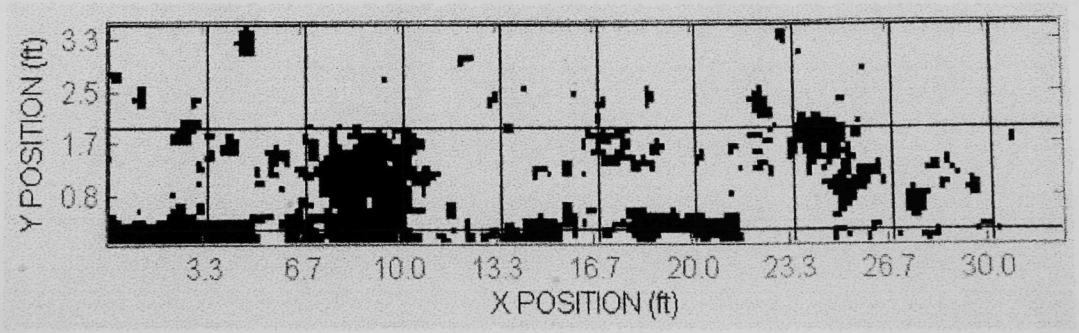


FIGURE E-38 Floor survey, north end of West Corridor, survey unit B-C2S, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in SE corner of area, with a 1-meter grid overlay. Compass north is ⇒.

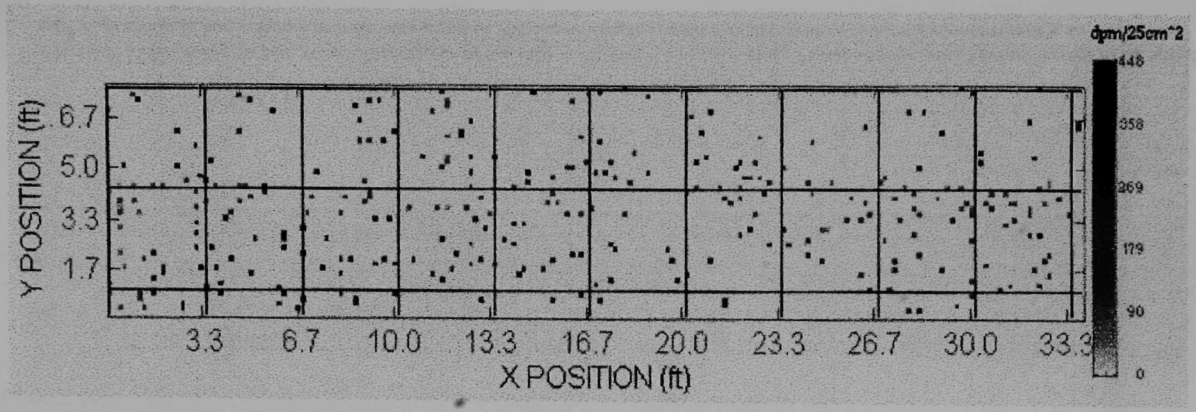


FIGURE E-39 Floor survey, north end of West Corridor, survey unit B-C2S. Total alpha surface activity in units of dpm/25 cm^2 relative to reference point in SE corner, with 1-meter grid overlay. Compass north is ⇒.

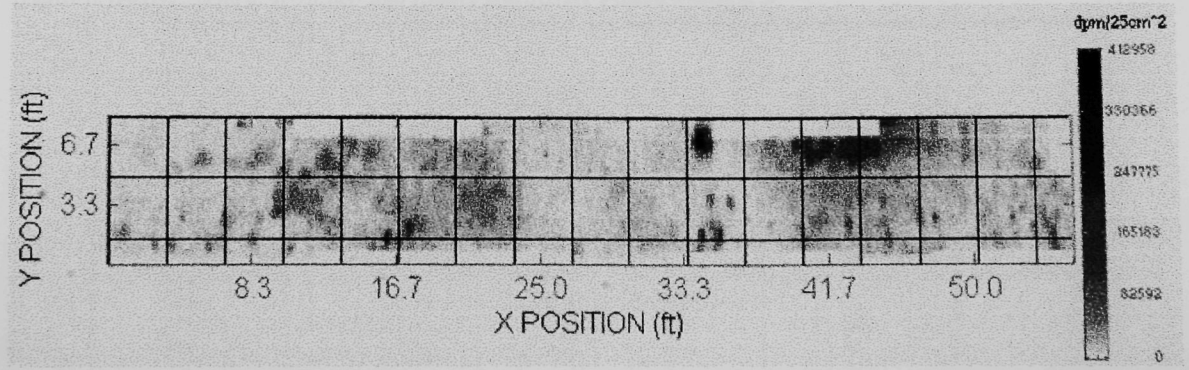


FIGURE E-40 Floor survey, North Corridor, survey unit B-NCORA. Contour plot of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NE corner of area, with 1-meter grid overlay. Compass north is ⇓.

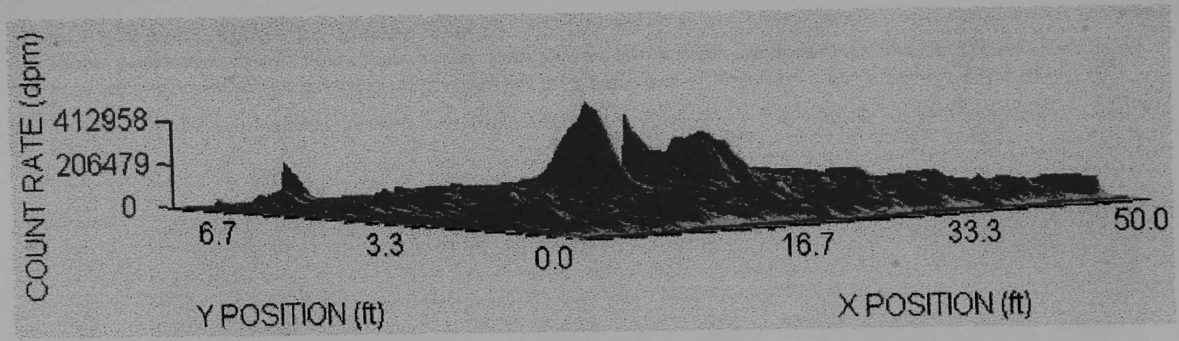


FIGURE E-41 Floor survey, North Corridor, survey unit B-NCORA. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm2 vs position in feet relative to reference point in NE corner of area. Compass north is ↓.

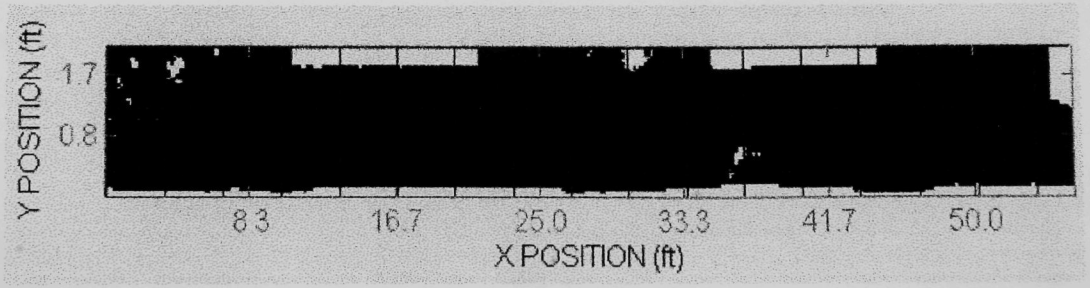


FIGURE E-42 Floor survey, North Corridor, survey unit B-NCORA, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in NE corner of area, with 1-meter grid overlay. Compass north is ↓.

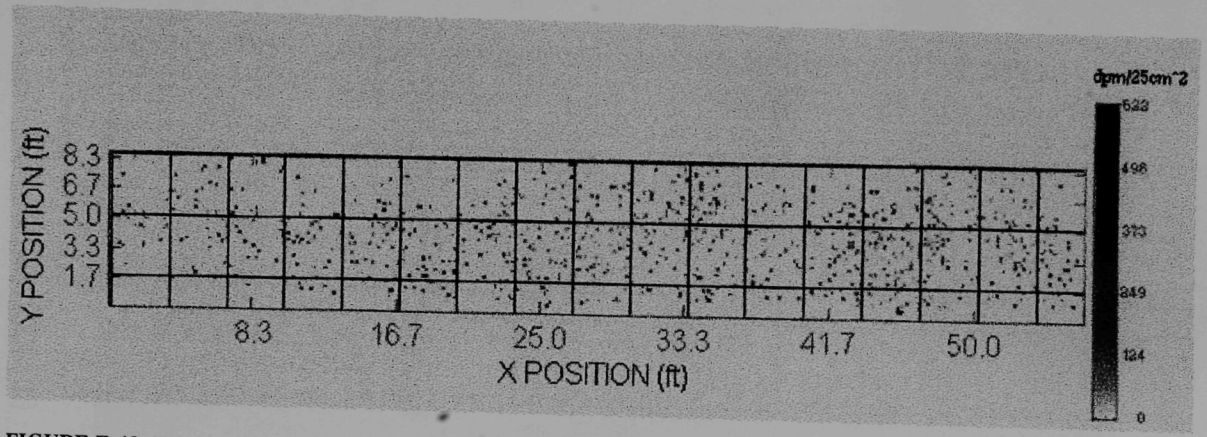


FIGURE E-43 Floor survey, North Corridor, survey unit A-NCORA. Total alpha surface activity in dpm/25cm2 vs position in feet relative to reference in NE corner, with 1-meter grid overlay. Compass north is ↓.

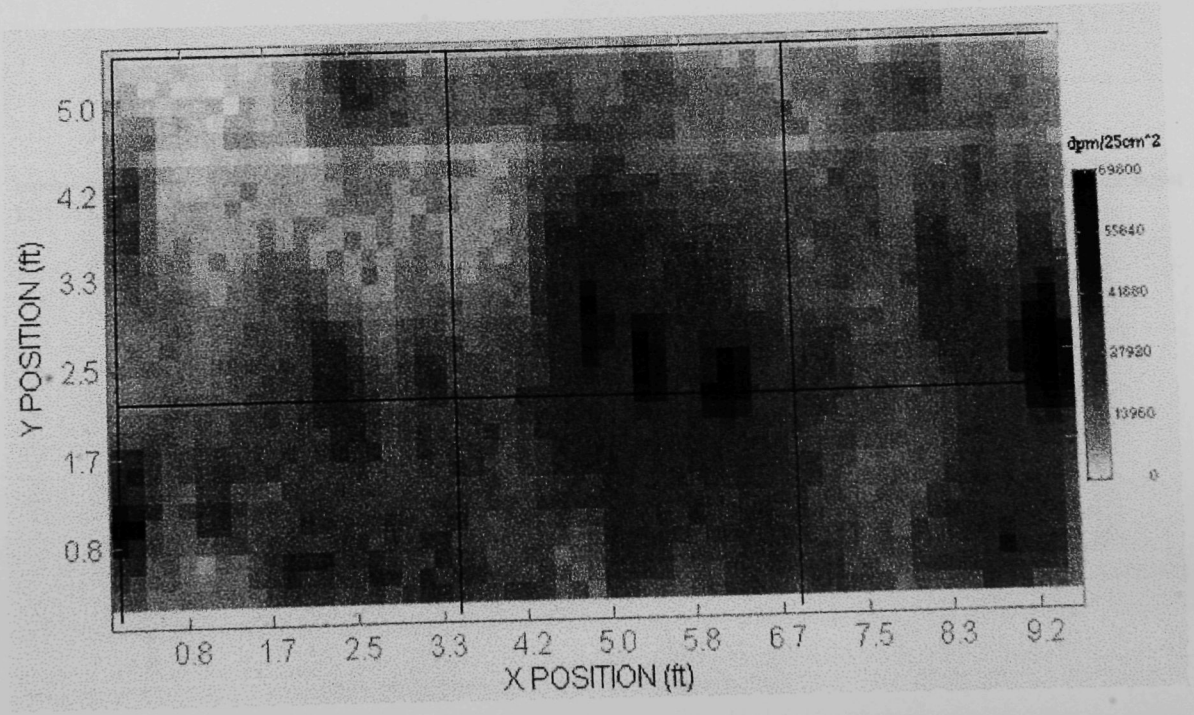


FIGURE E-44 Floor survey, North Corridor, survey unit B-NCORB. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of survey unit, with 1-meter grid overlay. Compass north is ←.

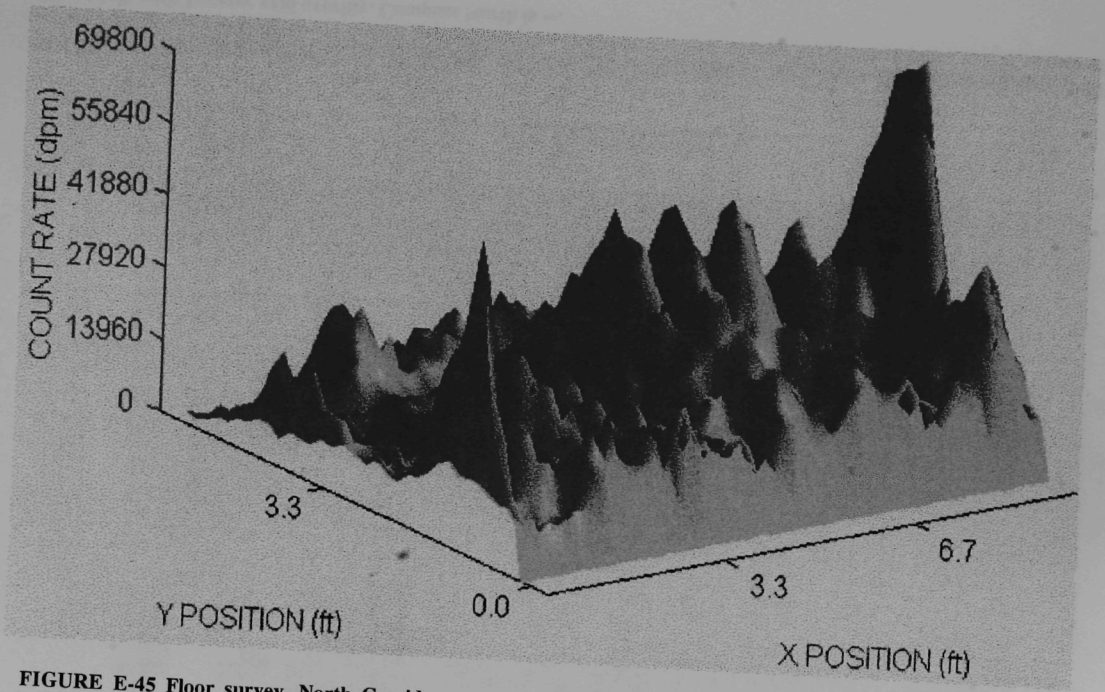


FIGURE E-45 Floor survey, North Corridor, survey unit B-NCORB. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference to reference point in NW corner of survey unit. Compass north is ←.

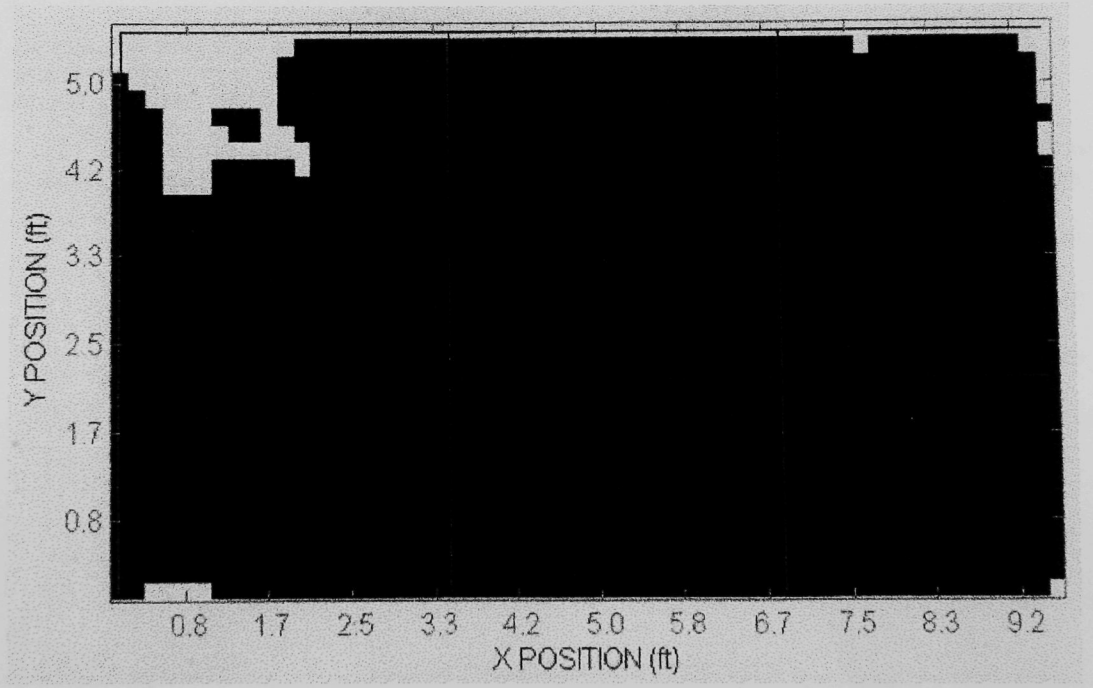


FIGURE E-46 Floor survey, North Corridor, survey unit B-NCORB, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in NW corner of survey unit, with 1-meter grid overlay. Compass North is ←.

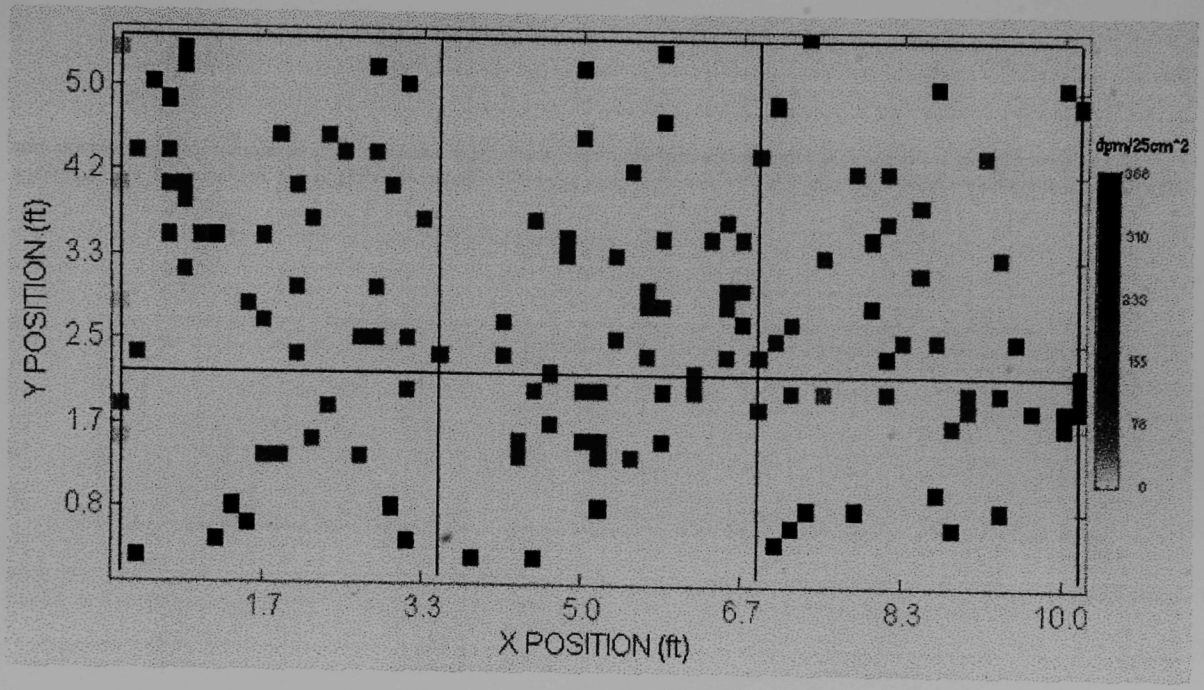


FIGURE E-47 Floor survey, North Corridor, survey unit A-NORCB. Total alpha surface activity in dpm/25 cm^2 vs position in feet relative to reference in NW corner of survey unit. Compass North is ←.

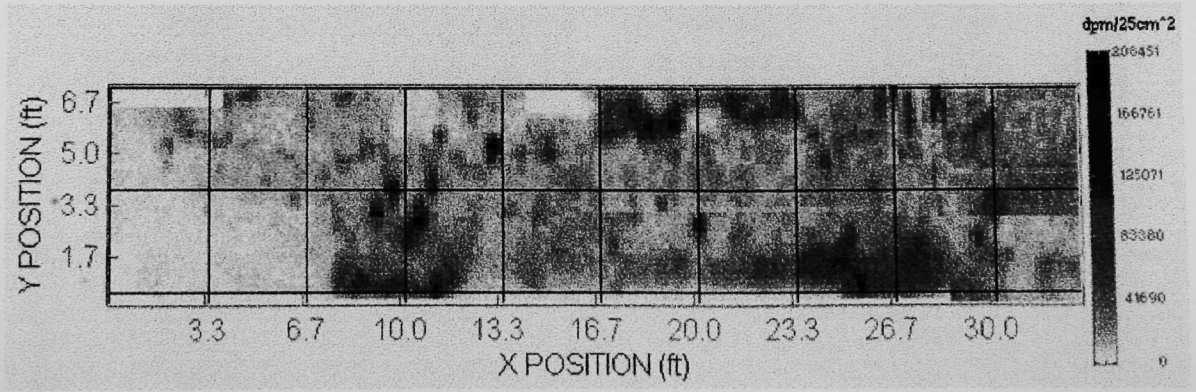


FIGURE E-48 Floor survey, North Corridor, survey unit B-NCORC. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NE corner of survey unit, with 1-meter grid overlay. Compass north is ↓.

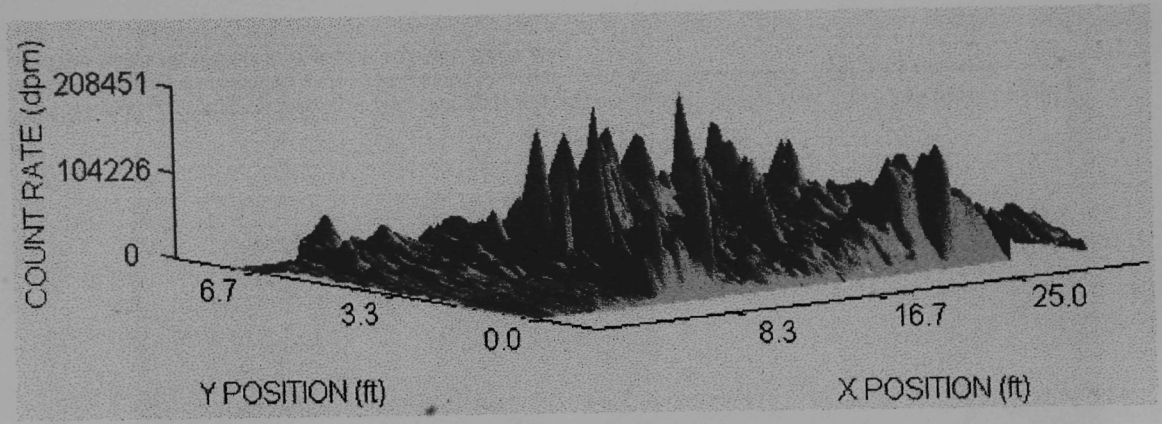


FIGURE E-49 Floor survey, North Corridor, survey unit B-NORC. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NE corner of survey unit. Compass north is ↓.

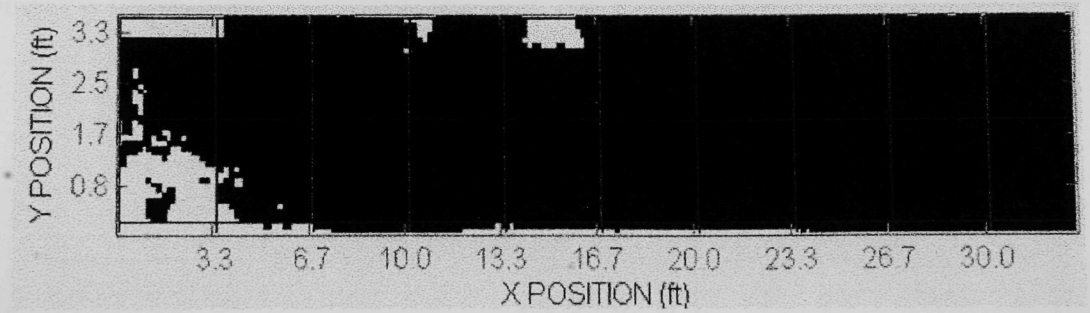


FIGURE E-50 Floor survey, North Corridor, survey unit B-NCORC, non-releasable area. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in NE corner of survey unit, with 1-meter grid overlay. Compass North is ↓.

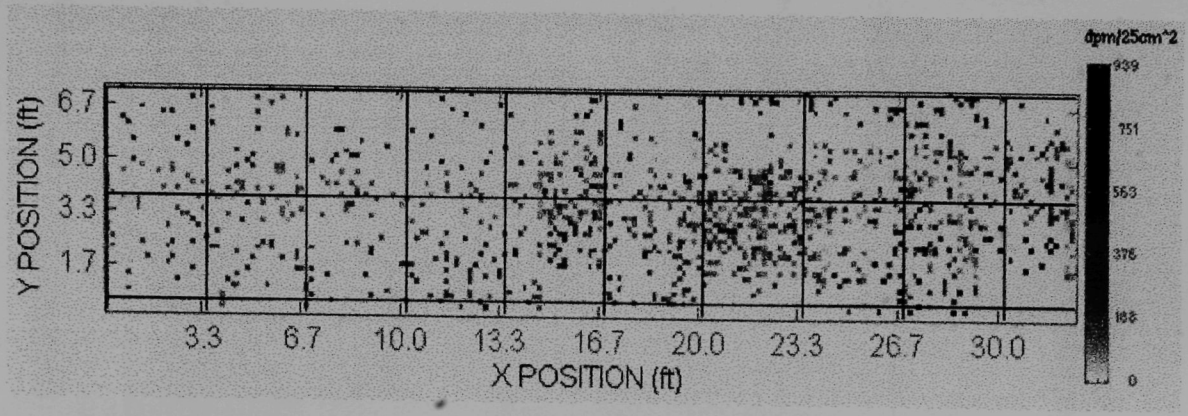


FIGURE E-51 Floor survey, North Corridor, survey unit A-NCORC. Distribution of total alpha surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NE corner of survey unit, with 1-meter grid overlay. Compass north is ↓.

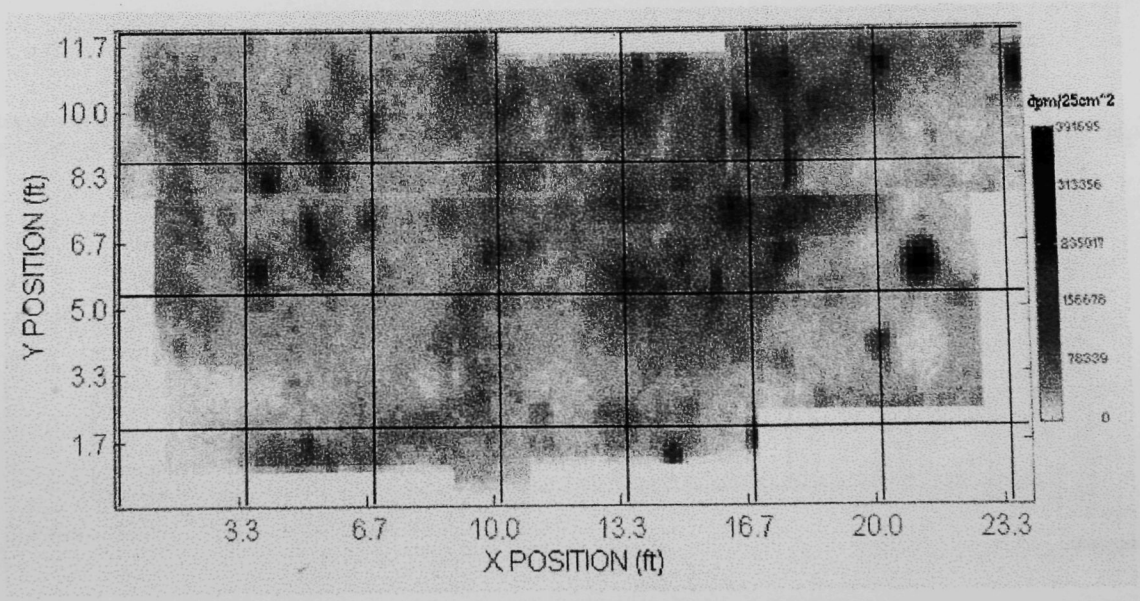


FIGURE E-52 Floor survey, Cave 3, survey unit B-CAVE3. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner, with 1-meter grid overlay. Compass north is ⇑.

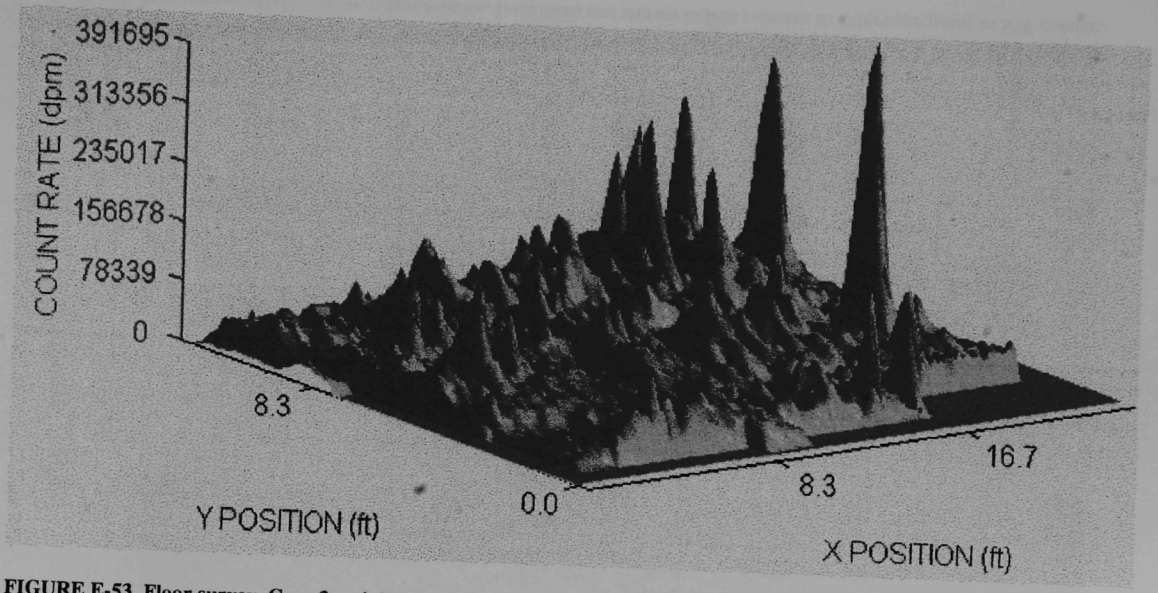


FIGURE E-53 Floor survey, Cave 3, unit B-CAVE3. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 versus position in feet relative to reference point in SW corner of room. Compass north is ⇑.

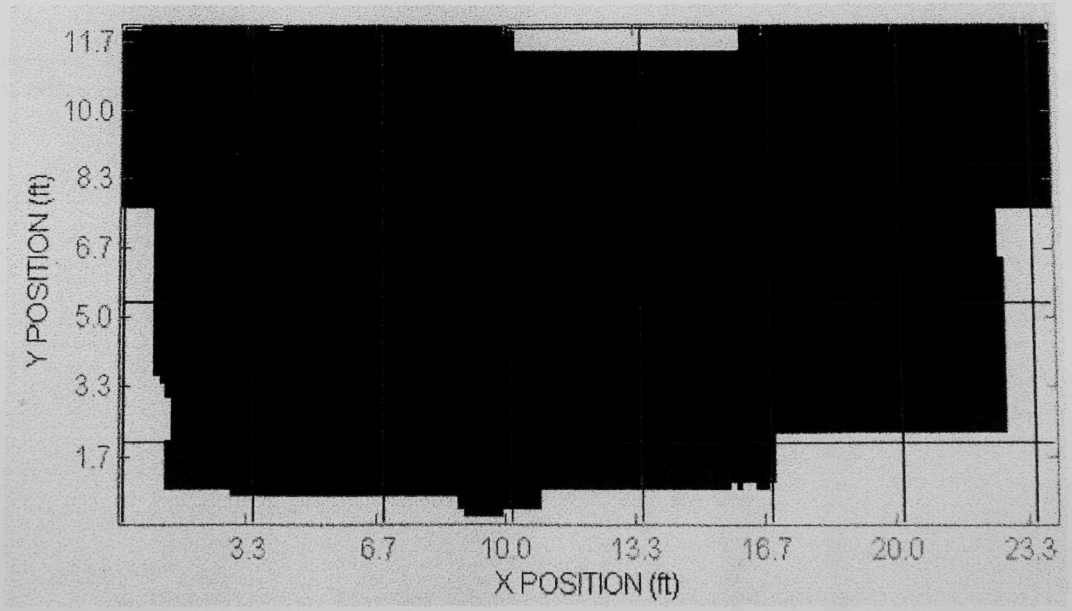


FIGURE E-54 Floor survey, Cave 3, survey unit B-CAVE3, non-releasable areas. Areas shown in black have total surface beta/gamma activity above release limits. Locations are shown in feet relative to reference point in SW corner, with a 1-meter grid overlay. Compass north is ⇑.

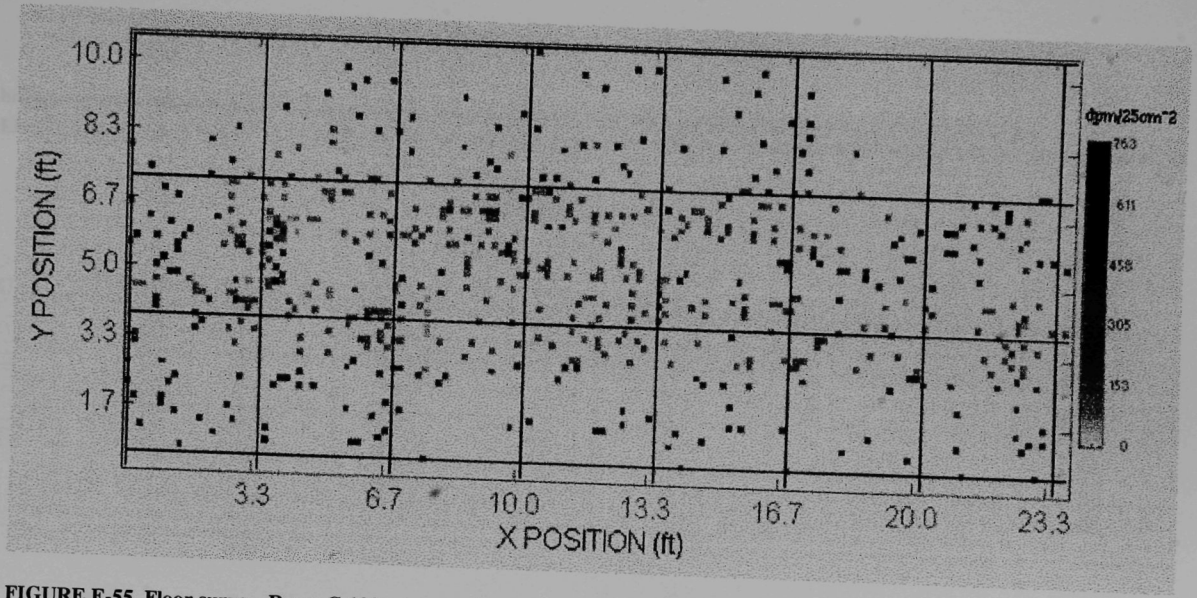


FIGURE E-55 Floor survey, Room C-102, survey unit A-CAVE3. Total alpha surface activity in dpm/25 cm^2 vs position relative to reference in SW corner, with 1-meter grid overlay. Compass north is ⇑.

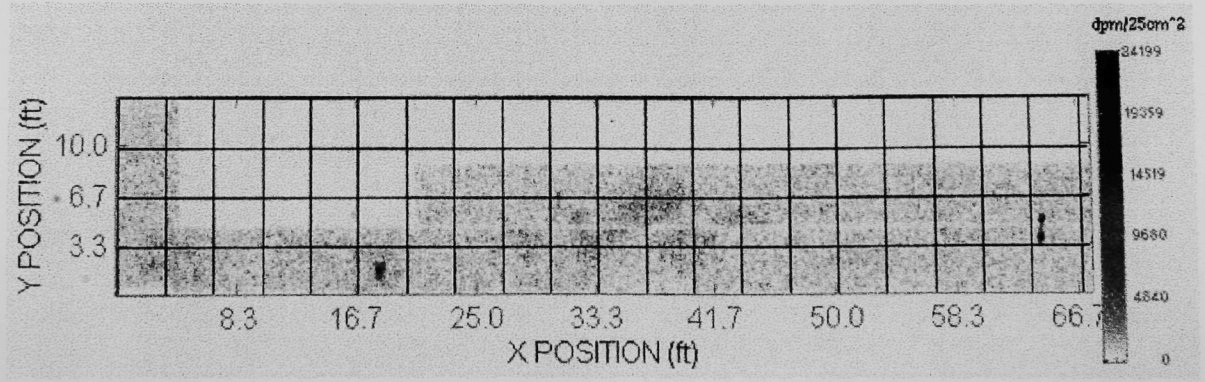


FIGURE E-56 Floor survey, Fan Loft, survey unit B-LOFTA. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of survey unit, with 1-meter grid overlay. Compass north is ←.

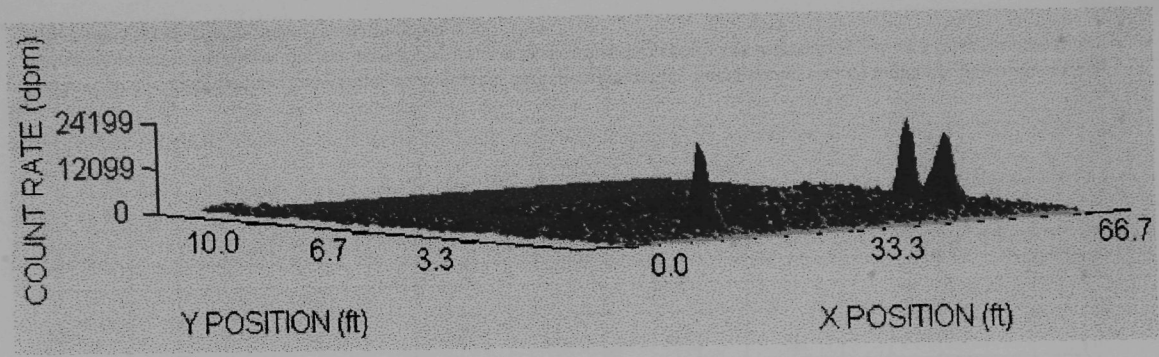


FIGURE E-57 Floor survey, Fan Loft, survey unit B-LOFTA. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of room. Compass north is ←.

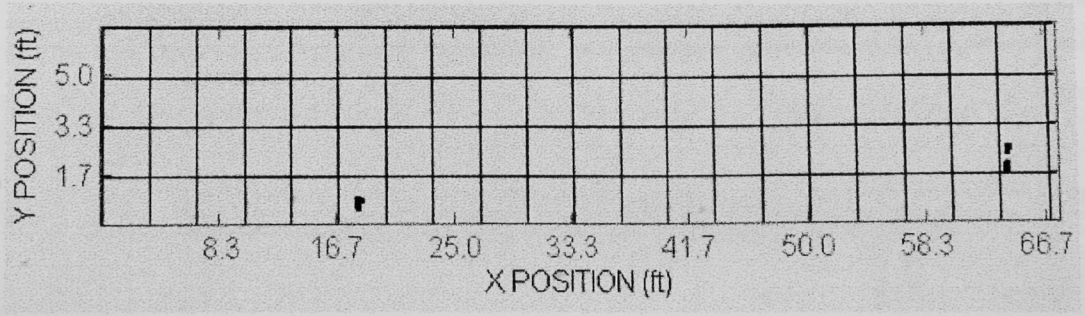


FIGURE E-58 Floor survey, Fan Loft, survey unit B-102A, non-releasable areas. Areas shown in black have total surface beta/gamma activities above release limits. Locations are shown in feet relative to reference point in NW corner of survey unit, with 1-meter grid overlay. Compass north is ←.

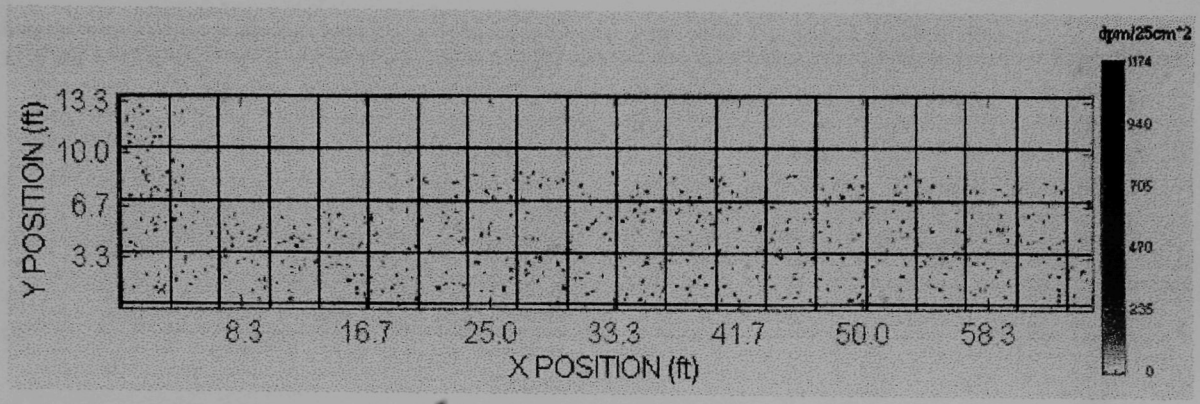


FIGURE E-59 Floor survey, Fan Loft, survey unit A-LOFTA. Distribution of total surface alpha activity in dpm/25 cm^2 vs position in feet relative to reference point in NW corner of survey unit, with 1-meter grid overlay. Compass north is ←.

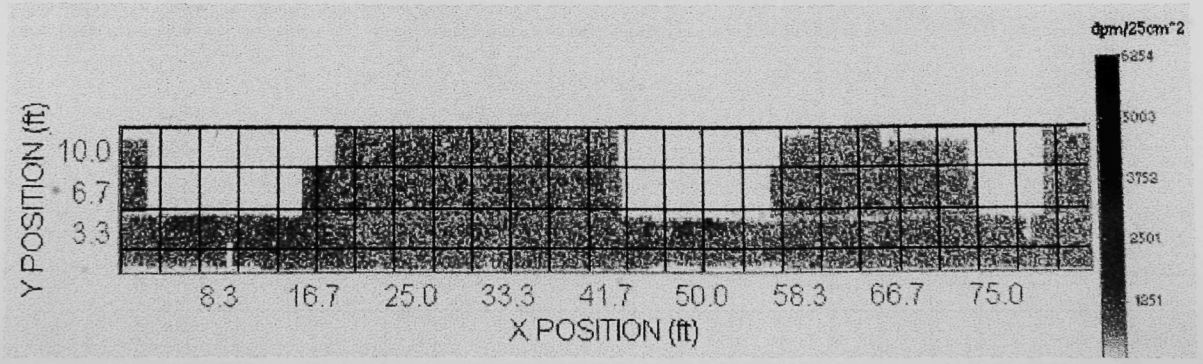


FIGURE E-60 Floor survey, Fan Loft, survey unit B-LOFTB. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass North is ↑.

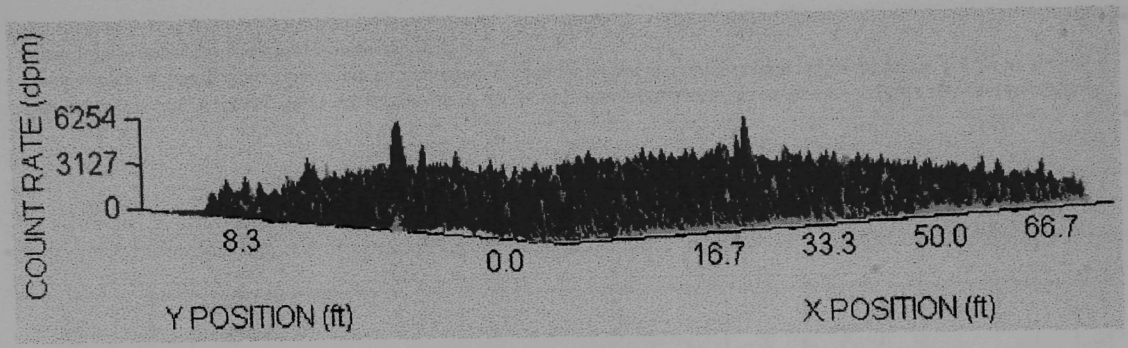


FIGURE E-61 Floor survey, Fan Loft, survey unit B-LOFTB. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey area. Compass North is ↑.

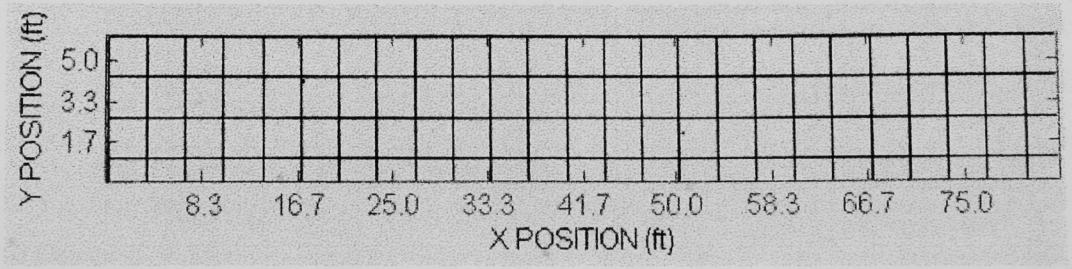


FIGURE E-62 Floor survey, Fan Loft, survey unit B-102B, non-releasable areas. Areas shown in black have total surface beta/gamma activities above release limits. Locations are shown in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass North is ↑.

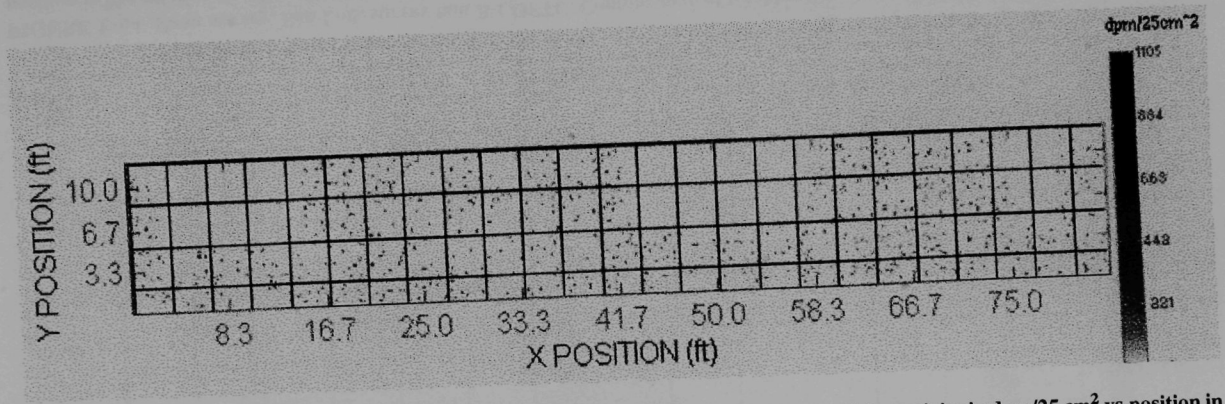


FIGURE E-63 Floor survey, Fan Loft, survey unit A-LOFTB. Distribution of total surface alpha activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass North is ↑.

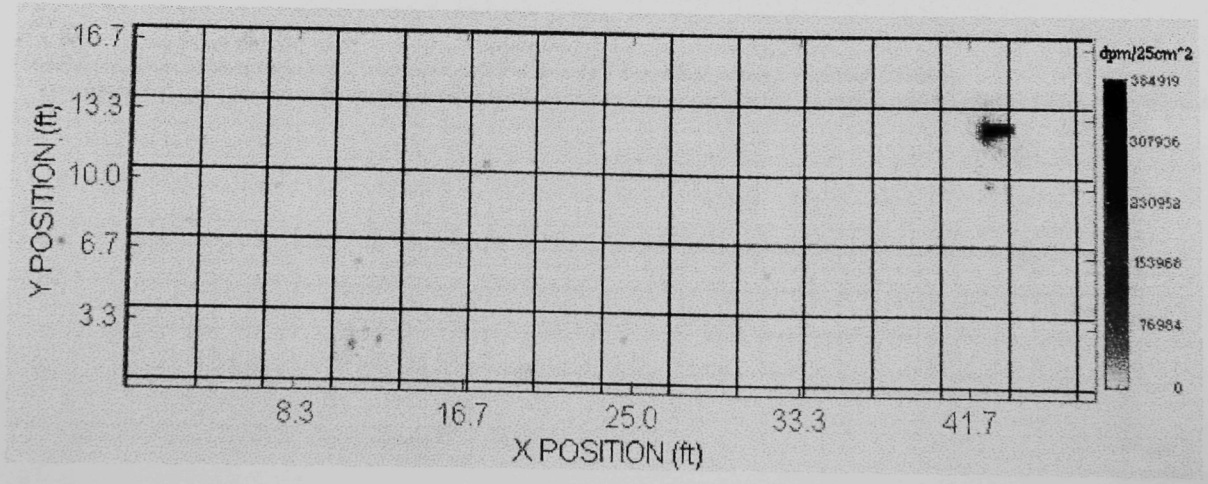


FIGURE E-64 Floor survey, Fan Loft, survey unit B-LOFTC. Contour map of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass North is ↑.

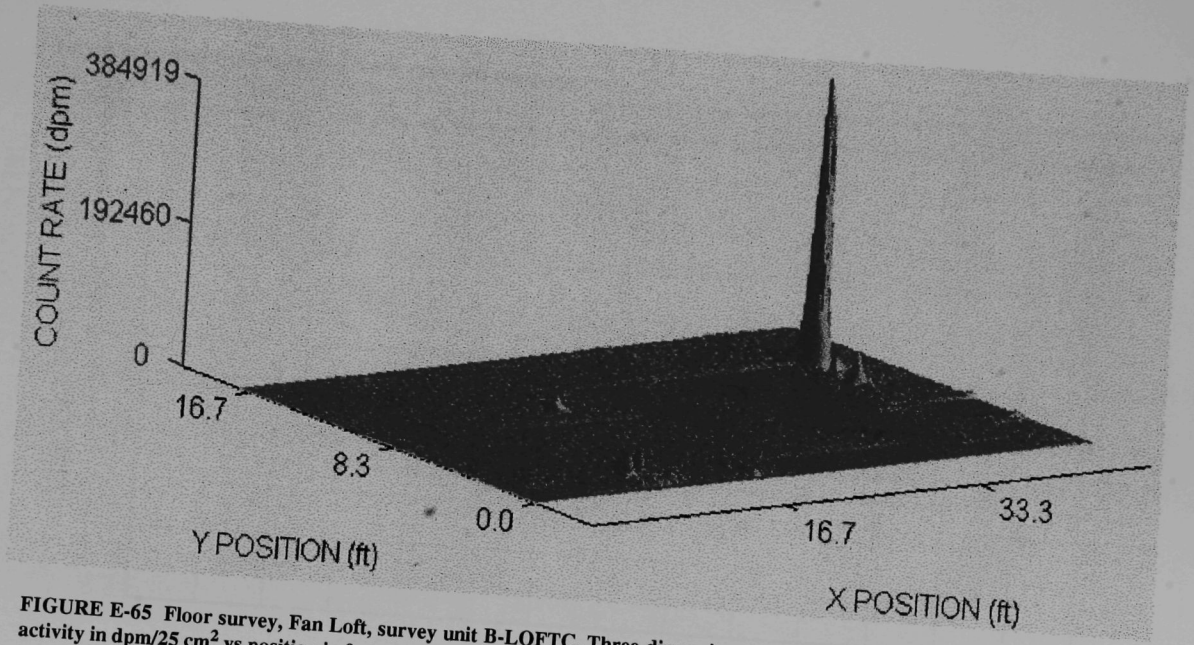


FIGURE E-65 Floor survey, Fan Loft, survey unit B-LOFTC. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey unit. Compass North is ⇑.

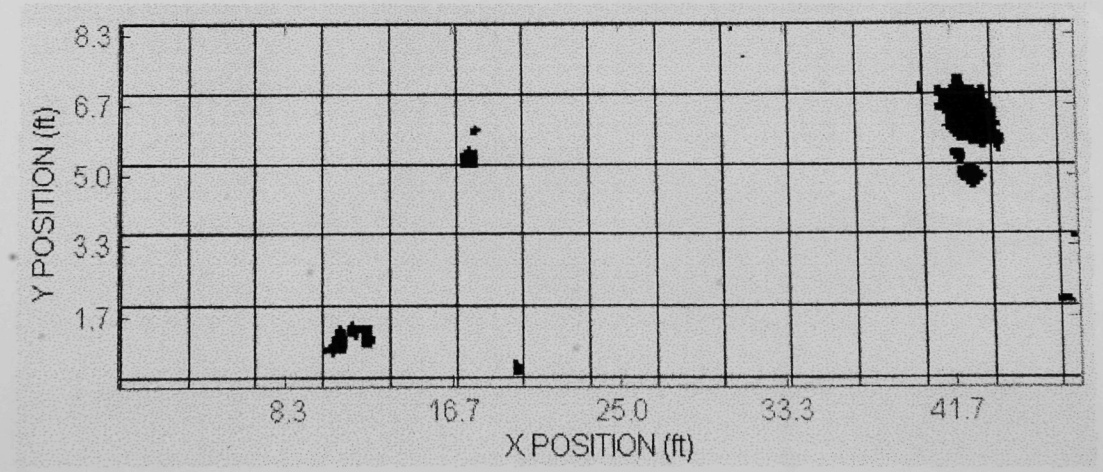


FIGURE E-66 Floor survey, Fan Loft, survey unit B-LOFTC, non-releasable areas. Areas shown in black have total surface beta/gamma activities above release limits. Locations are shown in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass north is ⇑.

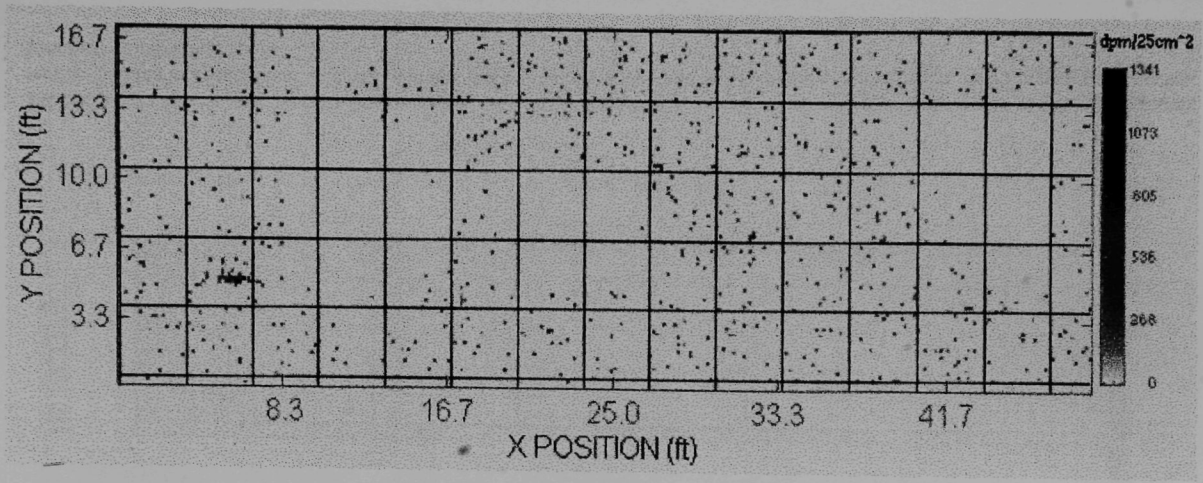


FIGURE E-67 Floor survey, Fan Loft, survey unit A-LOFTC. Distribution of total surface alpha activity in dpm/25 cm^2 vs position in feet relative to reference point in SW corner of survey unit, with 1-meter grid overlay. Compass North is ⇑.

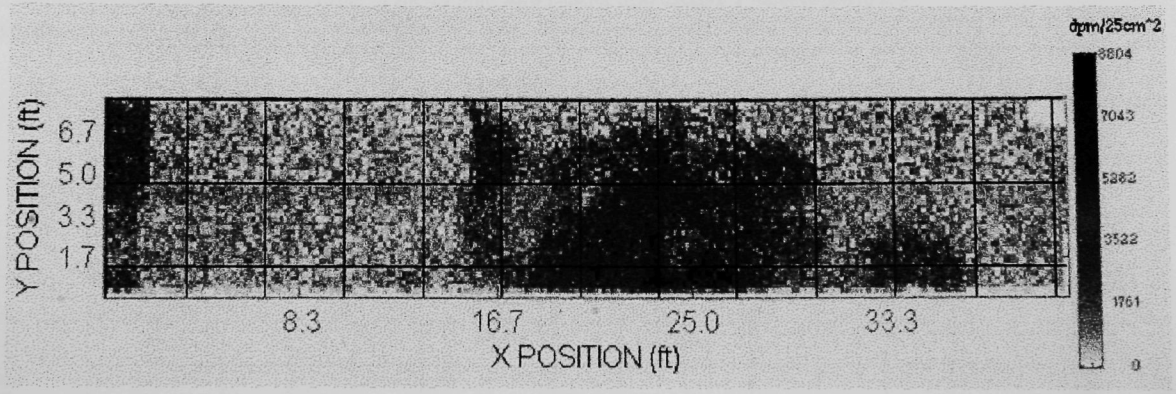


FIGURE E-68 Floor survey, service floor corridor adjacent to Rom D-031, survey unit B-BASE1. Contour plot of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of survey area, with 1-meter grid overlay. Compass North is ⇒.

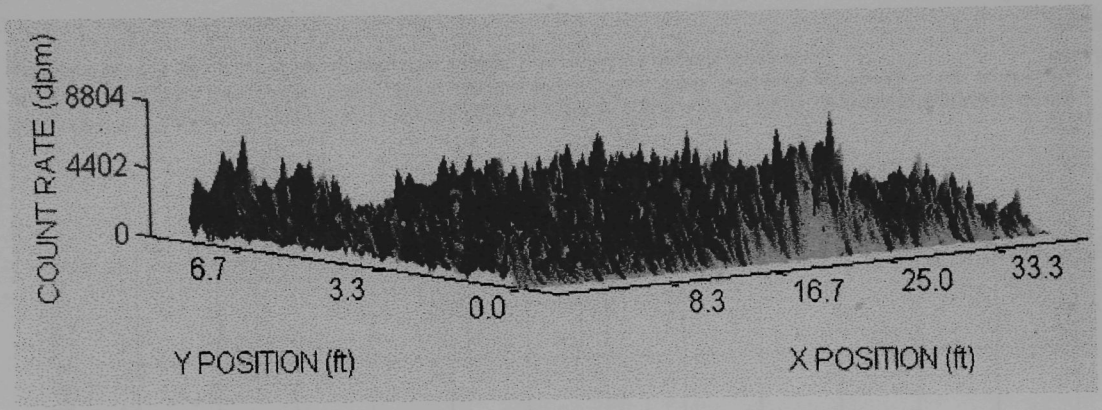


FIGURE E-69 Floor survey, service floor corridor adjacent to Room D-031, unit B-BASE1. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of survey unit. Compass North is ⇒.

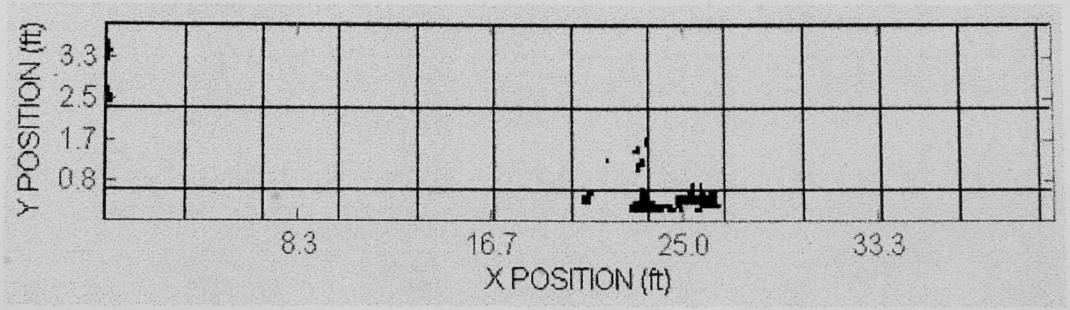


FIGURE E-70 Floor survey, Service Floor Corridor adjacent to Room D-031, unit B-BASE1, non-releasable areas. Areas shown in black have total surface beta/gamma activities above release limits. Locations are shown in feet relative to reference point in SE corner of survey unit, with 1-meter grid overlay. Compass North is ⇒.

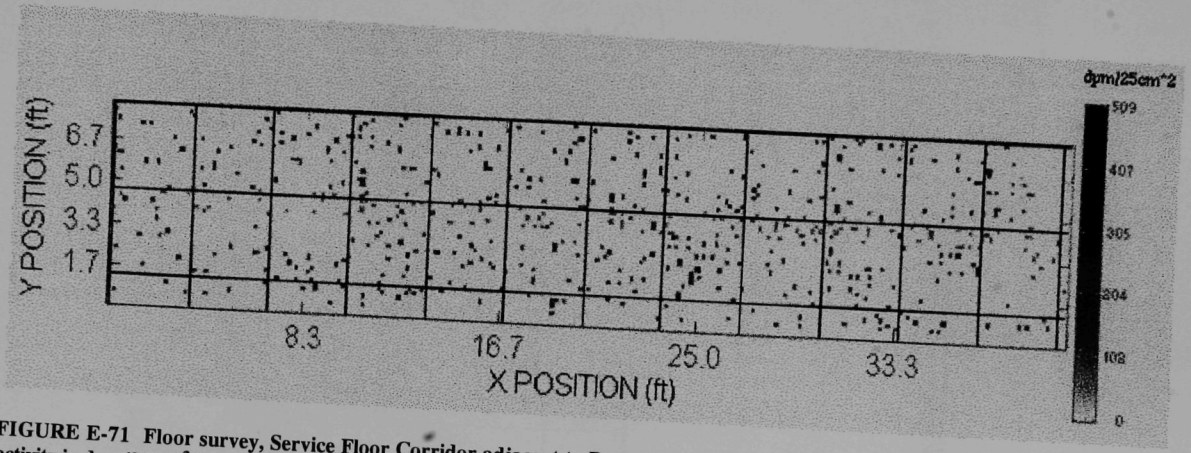


FIGURE E-71 Floor survey, Service Floor Corridor adjacent to Room D-031, unit A-BASE1. Distribution of total surface alpha activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of survey unit, with 1-meter grid overlay. Compass North is ⇒.

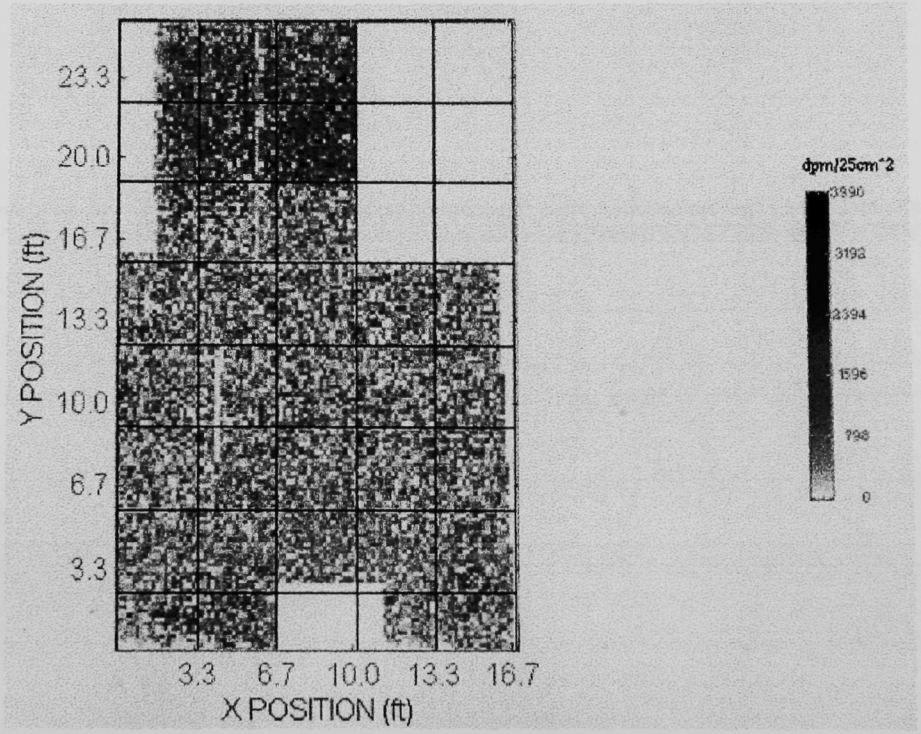


FIGURE E-72 Floor survey, Room D-031, survey unit B-BASE2. Contour plot of total beta/gamma activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of room, with 1-meter grid overlay. Compass north is ⇒.

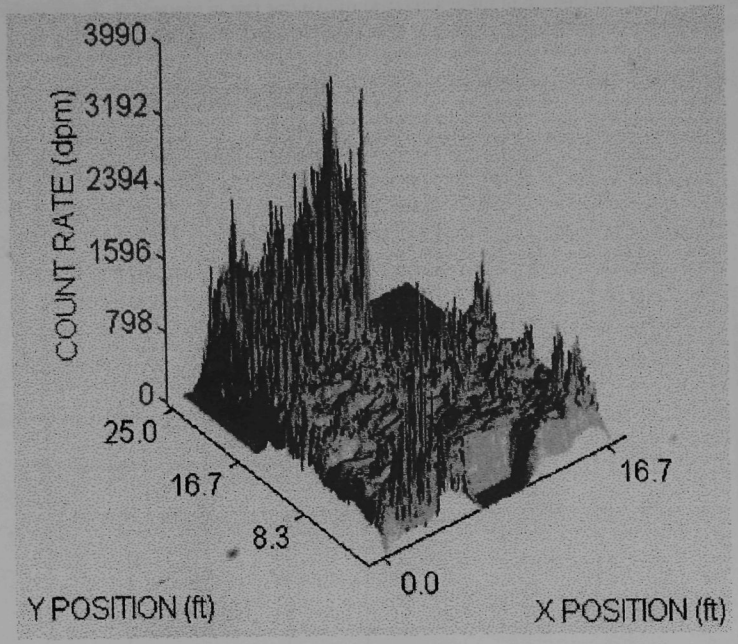


FIGURE E-73 Floor survey, Room D-031, survey unit B-BASE2. Three-dimensional representation of total beta/gamma surface activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of room. Kalman smoothing filter applied. Compass north is ⇒.

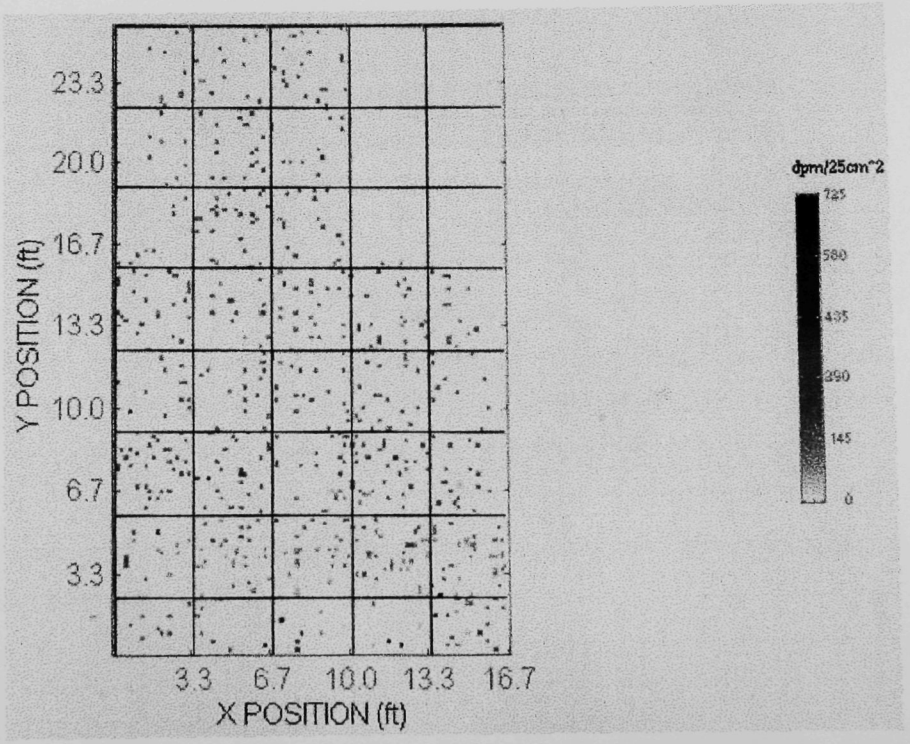


FIGURE E-74 Floor survey, Room D-031, survey unit A-BASE2. Distribution of total surface alpha activity in dpm/25 cm^2 vs position in feet relative to reference point in SE corner of room, with 1-meter grid overlay. Compass north is ⇒.

TABLE E-1 Floor Survey Data, Room C-102, Unit B-C102A, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(12,1) and Grids (12,1)-(12,7) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,7) **Mean: 29,877** Max: 124,085 Min: 0 Std: 24512.9 Pix:180	Meter: (10,7) **Mean: 51,234** Max: 238,635 Min: 0 Std: 44074.0 Pix:340	Meter: (11,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,6) **Mean: 13,685** Max: 30,443 Min: 0 Std: 7613.4 Pix:180	Meter: (10,6) **Mean: 24,294** Max: 179,923 Min: 7,484 Std: 19370.3 Pix:400	Meter: (11,6) **Mean: 43,566** Max: 151,657 Min: 7,627 Std: 33476.6 Pix:400	Meter: (12,6) **Mean: 19,352** Max: 33,736 Min: 10,991 Std: 6995.6 Pix:60
Meter: (1,5) **Mean: 19,446** Max: 52,821 Min: 0 Std: 12674.2 Pix:180	Meter: (2,5) **Mean: 8,571** Max: 20,571 Min: 0 Std: 4764.8 Pix:180	Meter: (3,5) **Mean: 9,951** Max: 25,444 Min: 0 Std: 5809.7 Pix:180	Meter: (4,5) **Mean: 9,073** Max: 23,584 Min: 0 Std: 5533.6 Pix:180	Meter: (5,5) Mean: 7,586 Max: 18,932 Min: 0 Std: 4719.2 Pix:180	Meter: (6,5) Mean: 3,759 Max: 6,294 Min: 0 Std: 2096.1 Pix:180	Meter: (7,5) Mean: 6,495 Max: 18,891 Min: 0 Std: 4080.5 Pix:180	Meter: (8,5) Mean: 5,086 Max: 11,018 Min: 0 Std: 2851.1 Pix:180	Meter: (9,5) Mean: 6,762 Max: 16,978 Min: 0 Std: 4069.5 Pix:279	Meter: (10,5) **Mean: 10,799** Max: 126,074 Min: 0 Std: 14308.5 Pix:337	Meter: (11,5) **Mean: 20,608** Max: 82,112 Min: 0 Std: 13418.5 Pix:220	Meter: (12,5) **Mean: 52,024** Max: 100,710 Min: 0 Std: 33171.4 Pix:33
Meter: (1,4) **Mean: 23,379** Max: 74,054 Min: 3,726 Std: 12762.3 Pix:400	Meter: (2,4) Mean: 7,244 Max: 33,189 Min: 3,315 Std: 3219.5 Pix:400	Meter: (3,4) Mean: 5,842 Max: 10,767 Min: 2,732 Std: 1579.1 Pix:400	Meter: (4,4) Mean: 5,536 Max: 18,129 Min: 908 Std: 2798.6 Pix:397	Meter: (5,4) **Mean: 9,544** Max: 27,176 Min: 1,539 Std: 5427.0 Pix:400	Meter: (6,4) Mean: 4,866 Max: 11,831 Min: 1,491 Std: 1447.2 Pix:400	Meter: (7,4) **Mean: 7,958** Max: 25,299 Min: 3,093 Std: 3590.3 Pix:400	Meter: (8,4) **Mean: 8,469** Max: 19,610 Min: 1,602 Std: 3884.6 Pix:400	Meter: (9,4) **Mean: 13,180** Max: 29,574 Min: 0 Std: 6794.9 Pix:352	Meter: (10,4) Mean: 6,134 Max: 9,552 Min: 0 Std: 3031.0 Pix:221	Meter: (11,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) **Mean: 15,006** Max: 42,278 Min: 0 Std: 9842.2 Pix:368	Meter: (2,3) Mean: 5,401 Max: 22,388 Min: 1,790 Std: 2183.2 Pix:400	Meter: (3,3) Mean: 5,459 Max: 11,941 Min: 1,572 Std: 1676.0 Pix:400	Meter: (4,3) Mean: 5,054 Max: 9,273 Min: 1,231 Std: 1524.4 Pix:381	Meter: (5,3) Mean: 5,276 Max: 10,943 Min: 2,288 Std: 1392.4 Pix:400	Meter: (6,3) Mean: 5,358 Max: 12,210 Min: 0 Std: 2121.8 Pix:360	Meter: (7,3) Mean: 5,185 Max: 10,386 Min: 2,061 Std: 1322.9 Pix:400	Meter: (8,3) Mean: 7,758 Max: 20,028 Min: 3,022 Std: 3301.9 Pix:400	Meter: (9,3) **Mean: 9,764** Max: 31,845 Min: 0 Std: 4921.5 Pix:80	Meter: (10,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 3,829 Max: 8,060 Min: 0 Std: 1488.5 Pix:62	Meter: (2,2) Mean: 4,266 Max: 8,064 Min: 993 Std: 1199.2 Pix:400	Meter: (3,2) Mean: 4,292 Max: 9,161 Min: 1,060 Std: 1169.2 Pix:400	Meter: (4,2) Mean: 4,217 Max: 7,457 Min: 1,492 Std: 1134.9 Pix:400	Meter: (5,2) Mean: 5,221 Max: 16,458 Min: 0 Std: 2215.0 Pix:390	Meter: (6,2) Mean: 4,404 Max: 8,789 Min: 0 Std: 2296.4 Pix:280	Meter: (7,2) Mean: 4,500 Max: 9,229 Min: 1,225 Std: 1402.4 Pix:400	Meter: (8,2) Mean: 2,671 Max: 6,216 Min: 0 Std: 1241.5 Pix:76	Meter: (9,2) Mean: 927 Max: 1,763 Min: 0 Std: 149.7 Pix:8	Meter: (10,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 2,639 Max: 3,689 Min: 0 Std: 880.5 Pix:15	Meter: (2,1) Mean: 3,150 Max: 6,304 Min: 0 Std: 1619.2 Pix:100	Meter: (3,1) Mean: 3,131 Max: 5,433 Min: 0 Std: 1541.3 Pix:100	Meter: (4,1) Mean: 3,255 Max: 5,794 Min: 0 Std: 1264.0 Pix:100	Meter: (5,1) Mean: 4,395 Max: 7,049 Min: 1,001 Std: 1075.7 Pix:100	Meter: (6,1) Mean: 4,476 Max: 8,354 Min: 895 Std: 1797.7 Pix:109	Meter: (7,1) Mean: 4,065 Max: 6,644 Min: 0 Std: 1437.6 Pix:114	Meter: (8,1) Mean: 2,851 Max: 4,364 Min: 0 Std: 711.1 Pix:8	Meter: (9,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (10,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-2 Floor Survey Data, Room C-102, Unit A-C102A, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(11,1) and Grids (11,1)-(11,7) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,7) Mean: 14 Max: 294 Min: 0 Std: 40.0 Pix:180	Meter: (10,7) Mean: 18 Max: 266 Min: 0 Std: 53.0 Pix:400	Meter: (11,7) Mean: 39 Max: 546 Min: 0 Std: 97.9 Pix:300
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,6) Mean: 7 Max: 294 Min: 0 Std: 30.9 Pix:180	Meter: (10,6) Mean: 14 Max: 243 Min: 0 Std: 51.0 Pix:388	Meter: (11,6) Mean: 16 Max: 380 Min: 0 Std: 54.3 Pix:240
Meter: (1,5) Mean: 34 Max: 508 Min: 0 Std: 67.8 Pix:220	Meter: (2,5) Mean: 21 Max: 279 Min: 0 Std: 53.1 Pix:220	Meter: (3,5) Mean: 13 Max: 508 Min: 0 Std: 46.6 Pix:220	Meter: (4,5) Mean: 28 Max: 307 Min: 0 Std: 62.3 Pix:220	Meter: (5,5) Mean: 29 Max: 466 Min: 0 Std: 68.8 Pix:220	Meter: (6,5) Mean: 24 Max: 279 Min: 0 Std: 55.1 Pix:220	Meter: (7,5) Mean: 18 Max: 509 Min: 0 Std: 51.9 Pix:220	Meter: (8,5) Mean: 12 Max: 243 Min: 0 Std: 38.9 Pix:220	Meter: (9,5) Mean: 25 Max: 294 Min: 0 Std: 68.5 Pix:301	Meter: (10,5) Mean: 22 Max: 294 Min: 0 Std: 58.7 Pix:290	Meter: (11,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,4) Mean: 31 Max: 354 Min: 0 Std: 67.1 Pix:395	Meter: (2,4) Mean: 27 Max: 559 Min: 0 Std: 90.2 Pix:400	Meter: (3,4) Mean: 24 Max: 534 Min: 0 Std: 81.1 Pix:400	Meter: (4,4) Mean: 19 Max: 409 Min: 0 Std: 73.6 Pix:400	Meter: (5,4) Mean: 20 Max: 266 Min: 0 Std: 67.4 Pix:400	Meter: (6,4) Mean: 21 Max: 281 Min: 0 Std: 59.9 Pix:400	Meter: (7,4) Mean: 24 Max: 508 Min: 0 Std: 74.7 Pix:400	Meter: (8,4) Mean: 18 Max: 497 Min: 0 Std: 68.1 Pix:400	Meter: (9,4) Mean: 26 Max: 560 Min: 0 Std: 72.2 Pix:310	Meter: (10,4) Mean: 34 Max: 408 Min: 0 Std: 57.7 Pix:180	Meter: (11,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) Mean: 29 Max: 266 Min: 0 Std: 46.4 Pix:125	Meter: (2,3) Mean: 19 Max: 294 Min: 0 Std: 61.7 Pix:400	Meter: (3,3) Mean: 27 Max: 534 Min: 0 Std: 81.2 Pix:400	Meter: (4,3) Mean: 43 Max: 591 Min: 0 Std: 103.1 Pix:400	Meter: (5,3) Mean: 16 Max: 280 Min: 0 Std: 61.0 Pix:400	Meter: (6,3) Mean: 20 Max: 294 Min: 0 Std: 58.3 Pix:296	Meter: (7,3) Mean: 20 Max: 266 Min: 0 Std: 66.3 Pix:400	Meter: (8,3) Mean: 18 Max: 546 Min: 0 Std: 68.2 Pix:400	Meter: (9,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:40	Meter: (10,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 39 Max: 449 Min: 0 Std: 35.3 Pix:40	Meter: (2,2) Mean: 21 Max: 311 Min: 0 Std: 75.8 Pix:400	Meter: (3,2) Mean: 22 Max: 330 Min: 0 Std: 73.8 Pix:400	Meter: (4,2) Mean: 20 Max: 311 Min: 0 Std: 70.4 Pix:400	Meter: (5,2) Mean: 27 Max: 388 Min: 0 Std: 69.7 Pix:400	Meter: (6,2) Mean: 14 Max: 295 Min: 0 Std: 46.0 Pix:354	Meter: (7,2) Mean: 31 Max: 396 Min: 0 Std: 60.7 Pix:362	Meter: (8,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:20	Meter: (9,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:2	Meter: (10,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:8	Meter: (2,1) Mean: 7 Max: 239 Min: 0 Std: 38.6 Pix:80	Meter: (3,1) Mean: 56 Max: 430 Min: 0 Std: 120.5 Pix:80	Meter: (4,1) Mean: 26 Max: 215 Min: 0 Std: 62.3 Pix:80	Meter: (5,1) Mean: 34 Max: 295 Min: 0 Std: 71.8 Pix:80	Meter: (6,1) Mean: 13 Max: 111 Min: 0 Std: 31.9 Pix:80	Meter: (7,1) Mean: 9 Max: 121 Min: 0 Std: 27.4 Pix:70	Meter: (8,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (10,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-3A Floor Survey Data, Room C-102, Unit B-C102B, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 Averaged Over one Square Meter. Grid Coordinates (x,y) are in Meters From Reference Point. Grids (1,1) - (13,1) and Grids (13,1) - (13,10) are not a Full one Square Meter. Pix Denotes number of 5 cm x 5 cm Pixels in Grid. Bold Text Denotes Grids Which Exceed Release Limits, After Background Subtraction

Meter: (1,8) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,8) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (3,8) Mean: 5,745 Max: 9,895 Min: 0 Std: 2136.4 Pix:60	Meter: (4,8) Mean: 6,282 Max: 12,544 Min: 0 Std: 3477.1 Pix:240	Meter: (5,8) Mean: 4,166 Max: 10,849 Min: 775 Std: 1471.8 Pix:392	Meter: (6,8) Mean: 3,895 Max: 7,597 Min: 1,132 Std: 1280.3 Pix:400	Meter: (7,8) Mean: 4,841 Max: 9,429 Min: 2,007 Std: 1273.4 Pix:400	Meter: (8,8) Mean: 5,398 Max: 9,557 Min: 2,109 Std: 1368.9 Pix:400	Meter: (9,8) Mean: 4,522 Max: 8,151 Min: 0 Std: 2076.7 Pix:328	Meter: (10,8) Mean: 4,170 Max: 8,397 Min: 0 Std: 2270.7 Pix:228	Meter: (11,8) Mean: 298 Max: 609 Min: 0 Std: 79.2 Pix:20	Meter: (12,8) Mean: 619 Max: 1,524 Min: 0 Std: 163.1 Pix:20	Meter: (13,8) Mean: 398 Max: 284 Min: 0 Std: 52.7 Pix:2
Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,7) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (3,7) Mean: 6,450 Max: 13,347 Min: 0 Std: 3355.9 Pix:198	Meter: (4,7) Mean: 5,675 Max: 10,540 Min: 1,627 Std: 1570.8 Pix:400	Meter: (5,7) Mean: 5,025 Max: 8,103 Min: 1,493 Std: 1191.5 Pix:400	Meter: (6,7) Mean: 4,496 Max: 7,512 Min: 1,326 Std: 1150.1 Pix:400	Meter: (7,7) Mean: 4,583 Max: 8,672 Min: 1,658 Std: 1250.6 Pix:400	Meter: (8,7) Mean: 5,321 Max: 22,184 Min: 826 Std: 2825.2 Pix:400	Meter: (9,7) Mean: 4,971 Max: 19,224 Min: 1,323 Std: 1911.6 Pix:400	Meter: (10,7) Mean: 4,563 Max: 7,876 Min: 0 Std: 2067.1 Pix:302	Meter: (11,7) Mean: 3,855 Max: 7,062 Min: 1,354 Std: 905.0 Pix:400	Meter: (12,7) Mean: 3,605 Max: 7,622 Min: 1,559 Std: 913.5 Pix:400	Meter: (13,7) Mean: 4,522 Max: 5,969 Min: 0 Std: 1915.4 Pix:40
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,6) Mean: 1,101 Max: 1,242 Min: 0 Std: 76.2 Pix:2	Meter: (3,6) Mean: 6,005 Max: 15,874 Min: 1,648 Std: 1997.2 Pix:382	Meter: (4,6) Mean: 5,126 Max: 14,108 Min: 2,326 Std: 1696.0 Pix:400	Meter: (5,6) Mean: 4,670 Max: 10,756 Min: 1,473 Std: 1424.2 Pix:400	Meter: (6,6) Mean: 4,070 Max: 7,796 Min: 1,165 Std: 1220.6 Pix:400	Meter: (7,6) Mean: 4,612 Max: 8,608 Min: 853 Std: 1327.8 Pix:400	Meter: (8,6) **Mean: 19,923** Max: 143,547 Min: 2,842 Std: 19236.8 Pix:400	Meter: (9,6) **Mean: 7,849** Max: 23,185 Min: 1,540 Std: 3400.7 Pix:400	Meter: (10,6) Mean: 4,126 Max: 7,272 Min: 0 Std: 1993.7 Pix:120	Meter: (11,6) Mean: 3,164 Max: 6,471 Min: 0 Std: 1756.3 Pix:280	Meter: (12,6) Mean: 3,269 Max: 10,967 Min: 0 Std: 2057.4 Pix:280	Meter: (13,6) Mean: 2,636 Max: 3,713 Min: 0 Std: 1055.3 Pix:19
Meter: (1,5) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,5) Mean: 2,368 Max: 3,728 Min: 0 Std: 531.8 Pix:20	Meter: (3,5) Mean: 4,804 Max: 10,761 Min: 1,438 Std: 1372.3 Pix:400	Meter: (4,5) Mean: 4,682 Max: 9,558 Min: 1,632 Std: 1471.1 Pix:400	Meter: (5,5) Mean: 4,293 Max: 7,217 Min: 1,752 Std: 914.7 Pix:400	Meter: (6,5) Mean: 4,349 Max: 7,247 Min: 1,309 Std: 1048.1 Pix:400	Meter: (7,5) Mean: 4,517 Max: 8,200 Min: 2,123 Std: 990.8 Pix:400	Meter: (8,5) Mean: 7,689 Max: 36,809 Min: 2,466 Std: 4702.4 Pix:400	Meter: (9,5) Mean: 5,119 Max: 49,580 Min: 1,690 Std: 5458.4 Pix:400	Meter: (10,5) Mean: 3,557 Max: 5,967 Min: 0 Std: 1742.0 Pix:120	Meter: (11,5) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (12,5) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (13,5) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0
Meter: (1,4) **Mean: 153,569** Max: 773,586 Min: 0 Std: 117320.0 Pix:80	Meter: (2,4) Mean: 3,225 Max: 6,112 Min: 0 Std: 1285.2 Pix:69	Meter: (3,4) Mean: 4,615 Max: 9,078 Min: 1,875 Std: 1234.5 Pix:387	Meter: (4,4) Mean: 4,059 Max: 6,806 Min: 1,668 Std: 1084.8 Pix:400	Meter: (5,4) Mean: 4,081 Max: 7,265 Min: 801 Std: 1109.9 Pix:400	Meter: (6,4) Mean: 4,510 Max: 8,446 Min: 941 Std: 1361.0 Pix:400	Meter: (7,4) Mean: 4,625 Max: 8,243 Min: 1,040 Std: 1389.0 Pix:384	Meter: (8,4) Mean: 4,351 Max: 6,980 Min: 1,739 Std: 971.5 Pix:400	Meter: (9,4) Mean: 3,993 Max: 7,757 Min: 943 Std: 1265.8 Pix:400	Meter: (10,4) Mean: 3,907 Max: 6,850 Min: 0 Std: 1801.2 Pix:105	Meter: (11,4) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (12,4) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (13,4) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0
Meter: (1,3) **Mean: 37,016** Max: 409,695 Min: 1,035 Std: 71391.6 Pix:400	Meter: (2,3) Mean: 4,109 Max: 8,792 Min: 1,284 Std: 1428.9 Pix:400	Meter: (3,3) Mean: 3,860 Max: 7,054 Min: 972 Std: 1083.2 Pix:400	Meter: (4,3) Mean: 3,389 Max: 7,834 Min: 0 Std: 1986.1 Pix:226	Meter: (5,3) Mean: 2,601 Max: 4,649 Min: 0 Std: 525.9 Pix:14	Meter: (6,3) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (7,3) Mean: 3,766 Max: 5,351 Min: 0 Std: 613.7 Pix:10	Meter: (8,3) Mean: 2,529 Max: 4,471 Min: 0 Std: 587.2 Pix:20	Meter: (9,3) Mean: 1,889 Max: 3,314 Min: 0 Std: 436.0 Pix:20	Meter: (10,3) Mean: 1,245 Max: 1,626 Min: 0 Std: 139.6 Pix:5	Meter: (11,3) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (12,3) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (13,3) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0
Meter: (1,2) Mean: 4,915 Max: 13,492 Min: 941 Std: 2074.9 Pix:400	Meter: (2,2) Mean: 3,806 Max: 6,631 Min: 881 Std: 1160.8 Pix:400	Meter: (3,2) Mean: 3,630 Max: 6,870 Min: 852 Std: 1109.4 Pix:400	Meter: (4,2) Mean: 3,264 Max: 6,474 Min: 0 Std: 1850.7 Pix:225	Meter: (5,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (6,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (7,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (8,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (9,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (10,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (11,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (12,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (13,2) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0
Meter: (1,1) Mean: 4,647 Max: 5,910 Min: 3,090 Std: 781.6 Pix:40	Meter: (2,1) Mean: 3,658 Max: 5,385 Min: 1,257 Std: 1201.2 Pix:40	Meter: (3,1) Mean: 3,524 Max: 5,961 Min: 1,346 Std: 1104.8 Pix:40	Meter: (4,1) Mean: 2,889 Max: 4,642 Min: 0 Std: 1684.5 Pix:24	Meter: (5,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (6,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (7,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (8,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (9,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (10,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (11,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (12,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (13,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0

TABLE E-3 B Floor Survey Data, Room C-102, Unit B-C102B, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(13,1) and Grids (13,1)-(13,10) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,10) Mean: 7,354 Max: 17,394 Min: 0 Std: 4300.1 Pix:240	Meter: (6,10) Mean: 5,522 Max: 10,620 Min: 1,120 Std: 1693.1 Pix:400	Meter: (7,10) Mean: 5,558 Max: 13,699 Min: 1,587 Std: 1709.0 Pix:400	Meter: (8,10) Mean: 6,724 Max: 22,935 Min: 1,741 Std: 3732.4 Pix:400	Meter: (9,10) **Mean: 8,657** Max: 22,732 Min: 2,902 Std: 3638.6 Pix:400	Meter: (10,10) **Mean: 10,838** Max: 36,222 Min: 4,260 Std: 5148.1 Pix:400	Meter: (11,10) Mean: 7,149 Max: 13,839 Min: 2,070 Std: 1726.4 Pix:400	Meter: (12,10) Mean: 6,816 Max: 19,147 Min: 1,839 Std: 2182.4 Pix:400	Meter: (13,10) Mean: 7,439 Max: 10,144 Min: 1,790 Std: 1942.6 Pix:60
Meter: (1,9) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,9) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,9) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,9) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,9) Mean: 4,124 Max: 7,520 Min: 0 Std: 1433.0 Pix:352	Meter: (6,9) Mean: 4,804 Max: 8,524 Min: 2,350 Std: 1047.5 Pix:400	Meter: (7,9) Mean: 5,208 Max: 9,180 Min: 2,691 Std: 1171.3 Pix:400	Meter: (8,9) Mean: 5,192 Max: 9,080 Min: 2,269 Std: 1182.4 Pix:400	Meter: (9,9) Mean: 5,074 Max: 9,227 Min: 0 Std: 2504.8 Pix:301	Meter: (10,9) Mean: 6,009 Max: 13,966 Min: 0 Std: 3662.9 Pix:189	Meter: (11,9) Mean: 5,248 Max: 15,426 Min: 0 Std: 2359.1 Pix:360	Meter: (12,9) Mean: 5,764 Max: 15,001 Min: 0 Std: 3027.8 Pix:336	Meter: (13,9) Mean: 5,656 Max: 7,844 Min: 0 Std: 2550.0 Pix:26

TABLE E-4A Floor Survey Data, Room C-102, Unit A-C102B, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(13,1) and grids (3,1)-(13,10) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,8) Mean: 30 Max: 294 Min: 0 Std: 40.4 Pix:104	Meter: (3,8) Mean: 52 Max: 373 Min: 0 Std: 67.3 Pix:160	Meter: (4,8) Mean: 33 Max: 710 Min: 0 Std: 71.0 Pix:182	Meter: (5,8) Mean: 26 Max: 391 Min: 0 Std: 75.0 Pix:380	Meter: (6,8) Mean: 39 Max: 450 Min: 0 Std: 81.1 Pix:373	Meter: (7,8) Mean: 31 Max: 280 Min: 0 Std: 82.0 Pix:400	Meter: (8,8) Mean: 33 Max: 462 Min: 0 Std: 88.0 Pix:400	Meter: (9,8) Mean: 40 Max: 656 Min: 0 Std: 81.5 Pix:208	Meter: (10,8) Mean: 80 Max: 223 Min: 0 Std: 28.0 Pix:18	Meter: (11,8) Mean: 37 Max: 402 Min: 0 Std: 64.3 Pix:200	Meter: (12,8) Mean: 40 Max: 386 Min: 0 Std: 62.6 Pix:179	Meter: (13,8) Mean: 47 Max: 179 Min: 0 Std: 46.2 Pix:21
Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,7) Mean: 24 Max: 420 Min: 0 Std: 56.9 Pix:266	Meter: (3,7) Mean: 32 Max: 380 Min: 0 Std: 81.4 Pix:400	Meter: (4,7) Mean: 19 Max: 399 Min: 0 Std: 63.3 Pix:400	Meter: (5,7) Mean: 44 Max: 628 Min: 0 Std: 104.9 Pix:400	Meter: (6,7) Mean: 36 Max: 457 Min: 0 Std: 82.0 Pix:400	Meter: (7,7) Mean: 36 Max: 546 Min: 0 Std: 96.7 Pix:400	Meter: (8,7) Mean: 52 Max: 697 Min: 0 Std: 115.2 Pix:400	Meter: (9,7) Mean: 31 Max: 450 Min: 0 Std: 66.4 Pix:220	Meter: (10,7) Mean: 17 Max: 148 Min: 0 Std: 15.6 Pix:38	Meter: (11,7) Mean: 25 Max: 298 Min: 0 Std: 56.3 Pix:400	Meter: (12,7) Mean: 33 Max: 326 Min: 0 Std: 63.5 Pix:400	Meter: (13,7) Mean: 34 Max: 179 Min: 0 Std: 51.9 Pix:60
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,6) Mean: 51 Max: 606 Min: 0 Std: 99.5 Pix:300	Meter: (3,6) Mean: 51 Max: 546 Min: 0 Std: 103.0 Pix:400	Meter: (4,6) Mean: 39 Max: 775 Min: 0 Std: 102.1 Pix:400	Meter: (5,6) Mean: 48 Max: 606 Min: 0 Std: 112.4 Pix:400	Meter: (6,6) Mean: 27 Max: 311 Min: 0 Std: 78.9 Pix:400	Meter: (7,6) Mean: 28 Max: 508 Min: 0 Std: 88.6 Pix:400	Meter: (8,6) Mean: 61 Max: 684 Min: 0 Std: 127.4 Pix:400	Meter: (9,6) Mean: 33 Max: 546 Min: 0 Std: 71.9 Pix:220	Meter: (10,6) Mean: 47 Max: 148 Min: 0 Std: 15.6 Pix:14	Meter: (11,6) Mean: 41 Max: 659 Min: 0 Std: 76.3 Pix:140	Meter: (12,6) Mean: 38 Max: 329 Min: 0 Std: 60.5 Pix:140	Meter: (13,6) Mean: 47 Max: 179 Min: 0 Std: 46.3 Pix:21
Meter: (1,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,5) Mean: 18 Max: 510 Min: 0 Std: 54.7 Pix:300	Meter: (3,5) Mean: 50 Max: 559 Min: 0 Std: 103.5 Pix:400	Meter: (4,5) Mean: 39 Max: 396 Min: 0 Std: 83.3 Pix:400	Meter: (5,5) Mean: 42 Max: 559 Min: 0 Std: 95.6 Pix:400	Meter: (6,5) Mean: 26 Max: 254 Min: 0 Std: 67.9 Pix:400	Meter: (7,5) Mean: 41 Max: 476 Min: 0 Std: 89.9 Pix:400	Meter: (8,5) Mean: 28 Max: 266 Min: 0 Std: 71.1 Pix:400	Meter: (9,5) Mean: 28 Max: 394 Min: 0 Std: 54.5 Pix:237	Meter: (10,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (13,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,4) Mean: 48 Max: 400 Min: 0 Std: 87.6 Pix:340	Meter: (2,4) Mean: 18 Max: 279 Min: 0 Std: 59.3 Pix:385	Meter: (3,4) Mean: 45 Max: 518 Min: 0 Std: 89.5 Pix:400	Meter: (4,4) Mean: 42 Max: 441 Min: 0 Std: 92.2 Pix:400	Meter: (5,4) Mean: 33 Max: 394 Min: 0 Std: 71.8 Pix:400	Meter: (6,4) Mean: 48 Max: 430 Min: 0 Std: 87.9 Pix:400	Meter: (7,4) Mean: 39 Max: 483 Min: 0 Std: 81.9 Pix:400	Meter: (8,4) Mean: 43 Max: 523 Min: 0 Std: 95.1 Pix:400	Meter: (9,4) Mean: 51 Max: 762 Min: 0 Std: 97.0 Pix:240	Meter: (10,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (13,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) Mean: 37 Max: 311 Min: 0 Std: 83.9 Pix:400	Meter: (2,3) Mean: 42 Max: 559 Min: 0 Std: 98.5 Pix:400	Meter: (3,3) Mean: 47 Max: 467 Min: 0 Std: 83.6 Pix:400	Meter: (4,3) Mean: 46 Max: 453 Min: 0 Std: 80.4 Pix:227	Meter: (5,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,3) Mean: 18 Max: 153 Min: 0 Std: 11.4 Pix:18	Meter: (8,3) Mean: 28 Max: 253 Min: 0 Std: 18.8 Pix:20	Meter: (9,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:12	Meter: (10,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (13,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 48 Max: 825 Min: 0 Std: 119.7 Pix:400	Meter: (2,2) Mean: 47 Max: 622 Min: 0 Std: 109.9 Pix:400	Meter: (3,2) Mean: 39 Max: 405 Min: 0 Std: 81.0 Pix:400	Meter: (4,2) Mean: 29 Max: 466 Min: 0 Std: 63.2 Pix:180	Meter: (5,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (10,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (13,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (7,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (9,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (10,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (11,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (12,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (13,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-4B Floor Survey Data, Room C-102, Unit A-C102B, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(13,1) and grids (3,1)-(13,10) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,10) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,10) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (3,10) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (4,10) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (5,10) Mean: 28 Max: 415 Min: 0 Std: 69.0 Pix:280	Meter: (6,10) Mean: 35 Max: 466 Min: 0 Std: 93.2 Pix:400	Meter: (7,10) Mean: 27 Max: 269 Min: 0 Std: 65.1 Pix:400	Meter: (8,10) Mean: 34 Max: 430 Min: 0 Std: 84.9 Pix:400	Meter: (9,10) Mean: 25 Max: 546 Min: 0 Std: 69.2 Pix:400	Meter: (10,10) Mean: 28 Max: 238 Min: 0 Std: 56.5 Pix:400	Meter: (11,10) Mean: 30 Max: 430 Min: 0 Std: 70.6 Pix:400	Meter: (12,10) Mean: 32 Max: 351 Min: 0 Std: 76.8 Pix:400	Meter: (13,10) Mean: 42 Max: 453 Min: 0 Std: 102.1 Pix:60
Meter: (1,9) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (2,9) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (3,9) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (4,9) Mean: 95 Max: 430 Min: 0 Std: 44.8 Pix:30	Meter: (5,9) Mean: 20 Max: 508 Min: 0 Std: 69.5 Pix:370	Meter: (6,9) Mean: 36 Max: 453 Min: 0 Std: 85.8 Pix:386	Meter: (7,9) Mean: 34 Max: 432 Min: 0 Std: 84.1 Pix:400	Meter: (8,9) Mean: 43 Max: 447 Min: 0 Std: 94.2 Pix:400	Meter: (9,9) Mean: 42 Max: 355 Min: 0 Std: 74.9 Pix:330	Meter: (10,9) Mean: 42 Max: 447 Min: 0 Std: 76.0 Pix:302	Meter: (11,9) Mean: 48 Max: 609 Min: 0 Std: 93.2 Pix:400	Meter: (12,9) Mean: 21 Max: 235 Min: 0 Std: 45.6 Pix:351	Meter: (13,9) Mean: 31 Max: 180 Min: 0 Std: 46.6 Pix:32

TABLE E-5A Floor Survey Data, Room C-102, Unit B-C102C, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(8,1) and grids (8,1)-(8,11) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,8) Mean: 5,725 Max: 9,403 Min: 2,526 Std: 1340.9 Pix:400	Meter: (2,8) Mean: 5,046 Max: 8,034 Min: 2,508 Std: 1081.6 Pix:400	Meter: (3,8) Mean: 4,451 Max: 8,354 Min: 2,090 Std: 1158.2 Pix:400	Meter: (4,8) Mean: 4,620 Max: 8,583 Min: 1,924 Std: 1175.0 Pix:400	Meter: (5,8) Mean: 6,191 Max: 12,316 Min: 1,193 Std: 1744.1 Pix:400	Meter: (6,8) **Mean: 7,816** Max: 14,526 Min: 3,881 Std: 1811.2 Pix:400	Meter: (7,8) Mean: 6,551 Max: 19,639 Min: 3,029 Std: 1793.9 Pix:400	Meter: (8,8) **Mean: 7,810** Max: 29,013 Min: 3,455 Std: 3768.2 Pix:300
Meter: (1,7) Mean: 5,357 Max: 8,132 Min: 0 Std: 1843.8 Pix:352	Meter: (2,7) Mean: 5,075 Max: 10,186 Min: 1,792 Std: 1547.8 Pix:384	Meter: (3,7) Mean: 4,774 Max: 9,411 Min: 0 Std: 1771.3 Pix:367	Meter: (4,7) Mean: 5,169 Max: 9,456 Min: 2,389 Std: 1117.2 Pix:400	Meter: (5,7) Mean: 5,523 Max: 9,585 Min: 2,388 Std: 1234.4 Pix:400	Meter: (6,7) Mean: 6,138 Max: 12,608 Min: 2,089 Std: 1777.2 Pix:400	Meter: (7,7) Mean: 5,391 Max: 11,939 Min: 2,196 Std: 1488.0 Pix:400	Meter: (8,7) Mean: 5,406 Max: 10,090 Min: 2,372 Std: 1439.7 Pix:300
Meter: (1,6) Mean: 4,183 Max: 6,711 Min: 0 Std: 1731.7 Pix:329	Meter: (2,6) Mean: 4,626 Max: 8,407 Min: 1,319 Std: 1396.7 Pix:382	Meter: (3,6) Mean: 4,178 Max: 8,370 Min: 0 Std: 2071.4 Pix:323	Meter: (4,6) Mean: 3,962 Max: 7,253 Min: 597 Std: 1360.1 Pix:400	Meter: (5,6) Mean: 4,156 Max: 8,273 Min: 519 Std: 1605.6 Pix:400	Meter: (6,6) Mean: 5,096 Max: 9,301 Min: 2,012 Std: 1284.8 Pix:400	Meter: (7,6) Mean: 5,073 Max: 12,102 Min: 1,514 Std: 1436.9 Pix:400	Meter: (8,6) Mean: 4,939 Max: 8,956 Min: 1,381 Std: 1479.2 Pix:300
Meter: (1,5) Mean: 4,025 Max: 6,930 Min: 0 Std: 1871.3 Pix:306	Meter: (2,5) Mean: 6,354 Max: 91,037 Min: 690 Std: 9401.4 Pix:389	Meter: (3,5) Mean: 4,522 Max: 9,601 Min: 2,120 Std: 1149.2 Pix:400	Meter: (4,5) Mean: 4,241 Max: 7,604 Min: 1,651 Std: 1103.1 Pix:400	Meter: (5,5) Mean: 4,110 Max: 6,732 Min: 1,816 Std: 962.5 Pix:400	Meter: (6,5) Mean: 3,860 Max: 7,287 Min: 0 Std: 1423.9 Pix:358	Meter: (7,5) Mean: 4,267 Max: 7,383 Min: 0 Std: 2105.3 Pix:260	Meter: (8,5) Mean: 4,579 Max: 7,888 Min: 0 Std: 2266.4 Pix:195
Meter: (1,4) Mean: 3,616 Max: 7,466 Min: 0 Std: 1874.0 Pix:280	Meter: (2,4) Mean: 4,107 Max: 8,354 Min: 1,437 Std: 1258.2 Pix:400	Meter: (3,4) Mean: 4,622 Max: 10,395 Min: 1,194 Std: 1651.7 Pix:400	Meter: (4,4) Mean: 3,978 Max: 7,963 Min: 1,723 Std: 1091.1 Pix:400	Meter: (5,4) Mean: 4,071 Max: 7,606 Min: 1,348 Std: 1148.6 Pix:400	Meter: (6,4) Mean: 3,997 Max: 8,097 Min: 0 Std: 1986.7 Pix:288	Meter: (7,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) Mean: 4,220 Max: 13,827 Min: 0 Std: 2301.1 Pix:290	Meter: (2,3) Mean: 4,649 Max: 14,336 Min: 1,821 Std: 1799.2 Pix:400	Meter: (3,3) Mean: 4,908 Max: 9,656 Min: 1,526 Std: 1400.5 Pix:400	Meter: (4,3) Mean: 6,254 Max: 25,120 Min: 1,799 Std: 3371.0 Pix:400	Meter: (5,3) Mean: 3,768 Max: 7,295 Min: 1,110 Std: 1050.5 Pix:400	Meter: (6,3) Mean: 4,054 Max: 7,749 Min: 0 Std: 1878.9 Pix:298	Meter: (7,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 3,037 Max: 5,669 Min: 0 Std: 1385.4 Pix:320	Meter: (2,2) Mean: 3,395 Max: 6,780 Min: 1,033 Std: 984.3 Pix:400	Meter: (3,2) Mean: 4,367 Max: 8,735 Min: 1,068 Std: 1397.6 Pix:383	Meter: (4,2) **Mean: 9,664** Max: 27,254 Min: 2,983 Std: 5484.5 Pix:400	Meter: (5,2) Mean: 4,087 Max: 7,668 Min: 1,522 Std: 1170.0 Pix:400	Meter: (6,2) Mean: 3,672 Max: 8,299 Min: 0 Std: 1799.7 Pix:280	Meter: (7,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 644 Max: 1,054 Min: 0 Std: 291.1 Pix:16	Meter: (2,1) Mean: 1,091 Max: 2,518 Min: 0 Std: 570.9 Pix:20	Meter: (3,1) Mean: 1,445 Max: 2,577 Min: 0 Std: 674.5 Pix:21	Meter: (4,1) Mean: 5,532 Max: 7,459 Min: 1,223 Std: 1664.1 Pix:40	Meter: (5,1) Mean: 4,542 Max: 5,838 Min: 852 Std: 1263.2 Pix:40	Meter: (6,1) Mean: 3,948 Max: 5,056 Min: 0 Std: 1500.1 Pix:28	Meter: (7,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-5B Floor Survey Data, Room C-102, Unit B-C102C, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(8,1) and Grids (8,1)-(8,11) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,11) **Mean: 22,037** Max: 169,749 Min: 0 Std: 21648.9 Pix:320	Meter: (7,11) **Mean: 25,999** Max: 192,075 Min: 4,902 Std: 29523.0 Pix:400	Meter: (8,11) Mean: 6,694 Max: 10,902 Min: 2,456 Std: 1384.7 Pix:300
Meter: (1,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,10) **Mean: 15,724** Max: 176,503 Min: 0 Std: 18622.5 Pix:320	Meter: (7,10) **Mean: 9,197** Max: 31,559 Min: 4,403 Std: 3380.4 Pix:400	Meter: (8,10) Mean: 7,117 Max: 20,016 Min: 0 Std: 3905.6 Pix:183
Meter: (1,9) Mean: 3,307 Max: 7,373 Min: 0 Std: 1145.2 Pix:40	Meter: (2,9) Mean: 1,881 Max: 4,733 Min: 0 Std: 681.3 Pix:41	Meter: (3,9) Mean: 2,480 Max: 6,726 Min: 0 Std: 1071.7 Pix:60	Meter: (4,9) Mean: 2,489 Max: 5,973 Min: 0 Std: 1034.1 Pix:60	Meter: (5,9) Mean: 5,562 Max: 13,315 Min: 0 Std: 2355.0 Pix:60	Meter: (6,9) **Mean: 8,446** Max: 19,871 Min: 0 Std: 4027.7 Pix:332	Meter: (7,9) Mean: 6,866 Max: 17,249 Min: 487 Std: 2262.1 Pix:390	Meter: (8,9) Mean: 6,068 Max: 9,491 Min: 0 Std: 1773.3 Pix:285

TABLE E-6A Floor Survey Data, Room C-102, Unit A-C102C, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(8,1) and grids (8,1)-(8,11) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,8) Mean: 45 Max: 589 Min: 0 Std: 101.4 Pix:400	Meter: (2,8) Mean: 26 Max: 430 Min: 0 Std: 84.5 Pix:400	Meter: (3,8) Mean: 26 Max: 332 Min: 0 Std: 73.5 Pix:400	Meter: (4,8) Mean: 23 Max: 490 Min: 0 Std: 73.5 Pix:400	Meter: (5,8) Mean: 29 Max: 403 Min: 0 Std: 80.2 Pix:400	Meter: (6,8) Mean: 30 Max: 559 Min: 0 Std: 79.0 Pix:400	Meter: (7,8) Mean: 19 Max: 331 Min: 0 Std: 60.1 Pix:400	Meter: (8,8) Mean: 23 Max: 254 Min: 0 Std: 65.1 Pix:240
Meter: (1,7) Mean: 59 Max: 577 Min: 0 Std: 115.9 Pix:400	Meter: (2,7) Mean: 47 Max: 500 Min: 0 Std: 106.5 Pix:390	Meter: (3,7) Mean: 22 Max: 476 Min: 0 Std: 71.2 Pix:370	Meter: (4,7) Mean: 31 Max: 415 Min: 0 Std: 79.1 Pix:400	Meter: (5,7) Mean: 29 Max: 534 Min: 0 Std: 82.6 Pix:400	Meter: (6,7) Mean: 24 Max: 311 Min: 0 Std: 76.2 Pix:400	Meter: (7,7) Mean: 19 Max: 248 Min: 0 Std: 50.0 Pix:400	Meter: (8,7) Mean: 12 Max: 228 Min: 0 Std: 40.6 Pix:240
Meter: (1,6) Mean: 32 Max: 330 Min: 0 Std: 83.1 Pix:364	Meter: (2,6) Mean: 34 Max: 574 Min: 0 Std: 94.3 Pix:389	Meter: (3,6) Mean: 33 Max: 330 Min: 0 Std: 85.2 Pix:362	Meter: (4,6) Mean: 23 Max: 311 Min: 0 Std: 73.3 Pix:380	Meter: (5,6) Mean: 31 Max: 546 Min: 0 Std: 86.0 Pix:380	Meter: (6,6) Mean: 49 Max: 622 Min: 0 Std: 111.2 Pix:371	Meter: (7,6) Mean: 27 Max: 419 Min: 0 Std: 61.3 Pix:280	Meter: (8,6) Mean: 19 Max: 243 Min: 0 Std: 47.9 Pix:168
Meter: (1,5) Mean: 29 Max: 330 Min: 0 Std: 74.0 Pix:360	Meter: (2,5) Mean: 72 Max: 700 Min: 0 Std: 137.9 Pix:400	Meter: (3,5) Mean: 63 Max: 690 Min: 0 Std: 127.9 Pix:400	Meter: (4,5) Mean: 44 Max: 534 Min: 0 Std: 102.6 Pix:400	Meter: (5,5) Mean: 36 Max: 410 Min: 0 Std: 88.2 Pix:400	Meter: (6,5) Mean: 29 Max: 409 Min: 0 Std: 73.3 Pix:270	Meter: (7,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,4) Mean: 51 Max: 526 Min: 0 Std: 103.3 Pix:335	Meter: (2,4) Mean: 37 Max: 279 Min: 0 Std: 80.5 Pix:400	Meter: (3,4) Mean: 41 Max: 393 Min: 0 Std: 92.0 Pix:390	Meter: (4,4) Mean: 40 Max: 863 Min: 0 Std: 103.6 Pix:400	Meter: (5,4) Mean: 18 Max: 495 Min: 0 Std: 72.2 Pix:400	Meter: (6,4) Mean: 26 Max: 294 Min: 0 Std: 51.9 Pix:215	Meter: (7,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) Mean: 43 Max: 311 Min: 0 Std: 86.1 Pix:320	Meter: (2,3) Mean: 35 Max: 763 Min: 0 Std: 94.9 Pix:400	Meter: (3,3) Mean: 36 Max: 486 Min: 0 Std: 85.7 Pix:370	Meter: (4,3) Mean: 35 Max: 350 Min: 0 Std: 85.0 Pix:400	Meter: (5,3) Mean: 36 Max: 617 Min: 0 Std: 94.8 Pix:400	Meter: (6,3) Mean: 49 Max: 294 Min: 0 Std: 86.9 Pix:324	Meter: (7,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 42 Max: 390 Min: 0 Std: 78.1 Pix:280	Meter: (2,2) Mean: 53 Max: 559 Min: 0 Std: 103.5 Pix:400	Meter: (3,2) Mean: 53 Max: 622 Min: 0 Std: 113.9 Pix:400	Meter: (4,2) Mean: 37 Max: 447 Min: 0 Std: 88.1 Pix:400	Meter: (5,2) Mean: 40 Max: 561 Min: 0 Std: 99.3 Pix:400	Meter: (6,2) Mean: 55 Max: 717 Min: 0 Std: 111.9 Pix:340	Meter: (7,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:14	Meter: (2,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:20	Meter: (3,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:20	Meter: (4,1) Mean: 93 Max: 243 Min: 0 Std: 105.9 Pix:40	Meter: (5,1) Mean: 37 Max: 239 Min: 0 Std: 74.5 Pix:40	Meter: (6,1) Mean: 18 Max: 195 Min: 0 Std: 44.3 Pix:34	Meter: (7,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (8,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-6B Floor Survey Data, Room C-102, Unit A-C102C, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(8,1) and grids (8,1)-(8,11) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,11) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,11) Mean: 29 Max: 279 Min: 0 Std: 74.4 Pix:380	Meter: (7,11) Mean: 36 Max: 689 Min: 0 Std: 97.8 Pix:400	Meter: (8,11) Mean: 45 Max: 481 Min: 0 Std: 94.7 Pix:240
Meter: (1,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,10) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (6,10) Mean: 33 Max: 732 Min: 0 Std: 96.2 Pix:380	Meter: (7,10) Mean: 33 Max: 599 Min: 0 Std: 86.4 Pix:400	Meter: (8,10) Mean: 24 Max: 388 Min: 0 Std: 54.0 Pix:150
Meter: (1,9) Mean: 36 Max: 510 Min: 0 Std: 57.8 Pix:140	Meter: (2,9) Mean: 41 Max: 294 Min: 0 Std: 61.0 Pix:140	Meter: (3,9) Mean: 70 Max: 805 Min: 0 Std: 96.1 Pix:140	Meter: (4,9) Mean: 11 Max: 254 Min: 0 Std: 31.0 Pix:140	Meter: (5,9) Mean: 19 Max: 508 Min: 0 Std: 56.0 Pix:140	Meter: (6,9) Mean: 27 Max: 400 Min: 0 Std: 78.1 Pix:384	Meter: (7,9) Mean: 20 Max: 355 Min: 0 Std: 61.8 Pix:400	Meter: (8,9) Mean: 47 Max: 508 Min: 0 Std: 102.2 Pix:240

TABLE E-7 Floor Survey Data, Storeroom, Unit B-STOR1, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(6,4) and Grids (5,5)-(6,5) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,5) Mean: 4,619 Max: 9,352 Min: 1,957 Std: 1134.3 Pix:400	Meter: (2,5) Mean: 4,003 Max: 7,593 Min: 270 Std: 982.8 Pix:400	Meter: (3,5) Mean: 3,509 Max: 6,723 Min: 778 Std: 1026.2 Pix:400	Meter: (4,5) Mean: 3,484 Max: 7,554 Min: 802 Std: 1174.0 Pix:400	Meter: (5,5) Mean: 3,276 Max: 5,683 Min: 0 Std: 1043.1 Pix:382	Meter: (6,5) Mean: 3,297 Max: 5,208 Min: 0 Std: 1547.8 Pix:34
Meter: (1,4) Mean: 3,807 Max: 6,462 Min: 0 Std: 2105.3 Pix:220	Meter: (2,4) Mean: 4,040 Max: 9,316 Min: 0 Std: 2290.0 Pix:234	Meter: (3,4) Mean: 4,223 Max: 7,484 Min: 0 Std: 2076.8 Pix:260	Meter: (4,4) Mean: 4,509 Max: 20,080 Min: 0 Std: 2178.2 Pix:372	Meter: (5,4) Mean: 3,548 Max: 6,106 Min: 0 Std: 1309.2 Pix:353	Meter: (6,4) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,3) Mean: 4,076 Max: 7,116 Min: 0 Std: 1729.7 Pix:320	Meter: (5,3) Mean: 3,468 Max: 5,962 Min: 0 Std: 1507.9 Pix:340	Meter: (6,3) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,2) Mean: 6,521 Max: 41,069 Min: 0 Std: 6363.6 Pix:320	Meter: (5,2) Mean: 3,327 Max: 5,496 Min: 0 Std: 1405.1 Pix:340	Meter: (6,2) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,1) **Mean: 21,618** Max: 34,072 Min: 0 Std: 10023.0 Pix:48	Meter: (5,1) Mean: 3,893 Max: 5,024 Min: 0 Std: 1521.0 Pix:51	Meter: (6,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-8 Floor Survey Data, Storeroom #2, Unit B-STOR2, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(3,1) and grids (3,1)-(3,2) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,2) **Mean: 34,654** Max: 62,883 Min: 21,936 Std: 6551.7 Pix:400	Meter: (2,2) **Mean: 32,328** Max: 140,060 Min: 7,062 Std: 20313.3 Pix:400	Meter: (3,2) **Mean: 40,887** Max: 73,315 Min: 7,960 Std: 14880.0 Pix:220
Meter: (1,1) **Mean: 35,139** Max: 53,426 Min: 0 Std: 14703.4 Pix:200	Meter: (2,1) **Mean: 33,260** Max: 51,618 Min: 0 Std: 10262.3 Pix:214	Meter: (3,1) **Mean: 27,959** Max: 37,984 Min: 9,593 Std: 5690.1 Pix:121

TABLE E-9A Floor Survey Data, Room D-109, Unit B-D109, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(22,1) and grids (22,1)-(22,8) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,4) **Mean:** **14,341** Max: 24,005 Min: 0 Std: 6966.3 Pix:140	Meter: (2,4) **Mean:** **21,058** Max: 58,794 Min: 0 Std: 11895.2 Pix:216	Meter: (3,4) **Mean:** **22,206** Max: 110,122 Min: 11,210 Std: 11933.1 Pix:400	Meter: (4,4) **Mean:** **37,610** Max: 105,521 Min: 14,812 Std: 12449.6 Pix:400	Meter: (5,4) **Mean:** **33,987** Max: 91,371 Min: 17,739 Std: 12682.8 Pix:400	Meter: (6,4) **Mean:** **21,638** Max: 36,600 Min: 11,672 Std: 5197.0 Pix:400	Meter: (7,4) **Mean:** **28,383** Max: 99,147 Min: 15,919 Std: 9567.4 Pix:400	Meter: (8,4) **Mean:** **31,002** Max: 71,767 Min: 16,380 Std: 8240.9 Pix:400	Meter: (9,4) **Mean:** **34,838** Max: 92,276 Min: 14,650 Std: 15796.7 Pix:400	Meter: (10,4) **Mean:** **24,025** Max: 79,771 Min: 10,385 Std: 7813.0 Pix:400	Meter: (11,4) **Mean:** **26,791** Max: 93,852 Min: 10,571 Std: 10959.9 Pix:400	Meter: (12,4) **Mean:** **29,754** Max: 63,540 Min: 18,071 Std: 7757.4 Pix:400	Meter: (13,4) **Mean:** **46,119** Max: 80,027 Min: 23,793 Std: 11016.0 Pix:400	Meter: (14,4) **Mean:** **43,154** Max: 88,219 Min: 22,567 Std: 12885.9 Pix:400	Meter: (15,4) **Mean:** **37,670** Max: 74,321 Min: 23,246 Std: 7783.6 Pix:400	Meter: (16,4) **Mean:** **37,477** Max: 56,674 Min: 10,005 Std: 9131.0 Pix:385	Meter: (17,4) **Mean:** **40,506** Max: 81,650 Min: 21,290 Std: 12100.8 Pix:400	Meter: (18,4) **Mean:** **35,231** Max: 91,643 Min: 18,983 Std: 9596.7 Pix:400	Meter: (19,4) **Mean:** **31,641** Max: 46,774 Min: 17,119 Std: 5454.9 Pix:400	Meter: (20,4) **Mean:** **38,558** Max: 67,992 Min: 23,990 Std: 8209.5 Pix:400	Meter: (21,4) **Mean:** **45,234** Max: 115,642 Min: 26,872 Std: 12805.4 Pix:400	Meter: (22,4) **Mean:** **55,140** Max: 91,659 Min: 36,925 Std: 11626.3 Pix:100
Meter: (1,3) **Mean:** **16,755** Max: 101,769 Min: 7,096 Std: 10602.3 Pix:400	Meter: (2,3) **Mean:** **17,581** Max: 30,752 Min: 7,463 Std: 4039.0 Pix:400	Meter: (3,3) **Mean:** **19,957** Max: 38,721 Min: 8,754 Std: 4714.5 Pix:400	Meter: (4,3) **Mean:** **49,959** Max: 97,690 Min: 15,970 Std: 18666.0 Pix:400	Meter: (5,3) **Mean:** **57,539** Max: 134,815 Min: 27,451 Std: 21358.9 Pix:400	Meter: (6,3) **Mean:** **45,906** Max: 122,049 Min: 15,549 Std: 19424.5 Pix:400	Meter: (7,3) **Mean:** **44,320** Max: 123,564 Min: 15,825 Std: 15984.6 Pix:400	Meter: (8,3) **Mean:** **33,165** Max: 58,275 Min: 9,596 Std: 9683.8 Pix:400	Meter: (9,3) **Mean:** **35,439** Max: 94,341 Min: 19,736 Std: 10787.5 Pix:400	Meter: (10,3) **Mean:** **29,838** Max: 102,259 Min: 15,237 Std: 11595.3 Pix:400	Meter: (11,3) **Mean:** **57,795** Max: 631,942 Min: 19,769 Std: 68602.1 Pix:400	Meter: (12,3) **Mean:** **41,013** Max: 86,527 Min: 23,819 Std: 9806.5 Pix:400	Meter: (13,3) **Mean:** **43,232** Max: 129,563 Min: 21,376 Std: 13646.8 Pix:400	Meter: (14,3) **Mean:** **54,823** Max: 156,220 Min: 25,970 Std: 21577.7 Pix:400	Meter: (15,3) **Mean:** **44,775** Max: 94,005 Min: 23,953 Std: 14432.6 Pix:400	Meter: (16,3) **Mean:** **53,341** Max: 110,447 Min: 32,726 Std: 12304.7 Pix:400	Meter: (17,3) **Mean:** **50,493** Max: 98,073 Min: 25,652 Std: 13931.0 Pix:400	Meter: (18,3) **Mean:** **44,105** Max: 126,265 Min: 26,590 Std: 13425.3 Pix:400	Meter: (19,3) **Mean:** **37,901** Max: 61,330 Min: 21,075 Std: 7093.1 Pix:400	Meter: (20,3) **Mean:** **48,969** Max: 81,047 Min: 28,063 Std: 10126.4 Pix:400	Meter: (21,3) **Mean:** **62,086** Max: 221,984 Min: 26,007 Std: 30488.3 Pix:400	Meter: (22,3) **Mean:** **147,540** Max: 316,807 Min: 62,989 Std: 71831.3 Pix:100
Meter: (1,2) **Mean:** **12,034** Max: 23,063 Min: 6,155 Std: 3117.1 Pix:400	Meter: (2,2) **Mean:** **14,703** Max: 25,028 Min: 7,914 Std: 2730.8 Pix:400	Meter: (3,2) **Mean:** **42,501** Max: 278,577 Min: 13,045 Std: 34331.5 Pix:400	Meter: (4,2) **Mean:** **43,697** Max: 126,013 Min: 17,354 Std: 16650.3 Pix:400	Meter: (5,2) **Mean:** **75,638** Max: 244,583 Min: 30,799 Std: 35103.8 Pix:400	Meter: (6,2) **Mean:** **215,245** Max: 443,469 Min: 74,162 Std: 80309.4 Pix:400	Meter: (7,2) **Mean:** **125,061** Max: 296,144 Min: 53,738 Std: 53530.1 Pix:400	Meter: (8,2) **Mean:** **65,668** Max: 300,869 Min: 28,521 Std: 45423.4 Pix:400	Meter: (9,2) **Mean:** **40,597** Max: 95,538 Min: 16,657 Std: 11679.9 Pix:400	Meter: (10,2) **Mean:** **40,710** Max: 138,548 Min: 11,949 Std: 15744.1 Pix:400	Meter: (11,2) **Mean:** **46,742** Max: 96,535 Min: 21,133 Std: 14820.8 Pix:400	Meter: (12,2) **Mean:** **52,219** Max: 161,050 Min: 31,658 Std: 16066.6 Pix:400	Meter: (13,2) **Mean:** **102,722** Max: 297,476 Min: 36,699 Std: 50638.3 Pix:400	Meter: (14,2) **Mean:** **128,924** Max: 245,831 Min: 53,162 Std: 33987.4 Pix:400	Meter: (15,2) **Mean:** **94,396** Max: 150,384 Min: 57,978 Std: 18404.6 Pix:400	Meter: (16,2) **Mean:** **72,485** Max: 174,214 Min: 46,918 Std: 17937.2 Pix:400	Meter: (17,2) **Mean:** **73,809** Max: 205,833 Min: 34,630 Std: 26636.4 Pix:400	Meter: (18,2) **Mean:** **87,617** Max: 162,395 Min: 35,532 Std: 29048.6 Pix:400	Meter: (19,2) **Mean:** **70,346** Max: 151,551 Min: 0 Std: 28644.3 Pix:350	Meter: (20,2) **Mean:** **62,273** Max: 104,874 Min: 0 Std: 28200.3 Pix:300	Meter: (21,2) **Mean:** **58,652** Max: 277,743 Min: 0 Std: 33481.2 Pix:300	Meter: (22,2) **Mean:** **124,770** Max: 356,135 Min: 0 Std: 77243.4 Pix:61
Meter: (1,1) **Mean:** **11,905** Max: 21,607 Min: 0 Std: 6260.8 Pix:80	Meter: (2,1) **Mean:** **15,165** Max: 27,134 Min: 0 Std: 7270.4 Pix:80	Meter: (3,1) **Mean:** **22,116** Max: 43,087 Min: 0 Std: 11653.4 Pix:80	Meter: (4,1) **Mean:** **28,333** Max: 51,277 Min: 0 Std: 14647.4 Pix:80	Meter: (5,1) **Mean:** **49,190** Max: 115,586 Min: 0 Std: 28934.0 Pix:80	Meter: (6,1) **Mean:** **182,478** Max: 348,704 Min: 0 Std: 98908.3 Pix:80	Meter: (7,1) **Mean:** **190,420** Max: 322,623 Min: 0 Std: 93493.6 Pix:80	Meter: (8,1) **Mean:** **116,118** Max: 339,725 Min: 0 Std: 99512.7 Pix:80	Meter: (9,1) **Mean:** **26,075** Max: 39,486 Min: 0 Std: 12279.9 Pix:80	Meter: (10,1) **Mean:** **29,531** Max: 85,750 Min: 0 Std: 19741.2 Pix:80	Meter: (11,1) **Mean:** **34,667** Max: 66,962 Min: 0 Std: 19168.3 Pix:80	Meter: (12,1) **Mean:** **30,126** Max: 45,085 Min: 0 Std: 15274.4 Pix:80	Meter: (13,1) **Mean:** **116,986** Max: 208,817 Min: 0 Std: 65321.7 Pix:80	Meter: (14,1) **Mean:** **164,230** Max: 256,760 Min: 0 Std: 75908.4 Pix:80	Meter: (15,1) **Mean:** **81,102** Max: 125,525 Min: 0 Std: 38864.2 Pix:80	Meter: (16,1) **Mean:** **99,467** Max: 182,305 Min: 0 Std: 45326.3 Pix:89	Meter: (17,1) **Mean:** **102,989** Max: 159,964 Min: 26,574 Std: 30132.6 Pix:100	Meter: (18,1) **Mean:** **173,268** Max: 212,664 Min: 60,384 Std: 39291.7 Pix:100	Meter: (19,1) **Mean:** **113,674** Max: 153,525 Min: 0 Std: 52986.9 Pix:50	Meter: (20,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,1) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0

TABLE E-9B Floor Survey Data, Room D-109, Unit B-D109, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(22,1) and Grids (22,1)-(22,8) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,8) **Mean:** **10,511** Max: 17,015 Min: 0 Std: 5305.6 Pix:160	Meter: (4,8) **Mean:** **15,029** Max: 39,871 Min: 3,181 Std: 6539.2 Pix:400	Meter: (5,8) **Mean:** **33,621** Max: 414,061 Min: 1,778 Std: 58619.1 Pix:400	Meter: (6,8) **Mean:** **23,310** Max: 98,048 Min: 4,737 Std: 13706.7 Pix:400	Meter: (7,8) **Mean:** **34,097** Max: 206,476 Min: 9,338 Std: 25198.0 Pix:400	Meter: (8,8) **Mean:** **40,666** Max: 120,417 Min: 10,345 Std: 23512.8 Pix:400	Meter: (9,8) **Mean:** **35,879** Max: 107,592 Min: 8,791 Std: 16167.9 Pix:400	Meter: (10,8) **Mean:** **15,020** Max: 48,310 Min: 5,465 Std: 6745.8 Pix:400	Meter: (11,8) **Mean:** **41,843** Max: 115,904 Min: 5,267 Std: 21102.8 Pix:400	Meter: (12,8) **Mean:** **23,023** Max: 46,179 Min: 0 Std: 11951.3 Pix:279	Meter: (13,8) **Mean:** **18,646** Max: 28,917 Min: 0 Std: 9810.5 Pix:180	Meter: (14,8) **Mean:** **18,507** Max: 33,414 Min: 0 Std: 10061.9 Pix:180	Meter: (15,8) **Mean:** **19,506** Max: 34,909 Min: 0 Std: 10294.0 Pix:180	Meter: (16,8) **Mean:** **39,071** Max: 111,808 Min: 0 Std: 20934.6 Pix:108	Meter: (17,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (18,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,7) **Mean:** **12,023** Max: 19,979 Min: 0 Std: 5879.7 Pix:146	Meter: (4,7) **Mean:** **15,221** Max: 32,013 Min: 5,451 Std: 4085.6 Pix:400	Meter: (5,7) **Mean:** **25,975** Max: 128,014 Min: 9,167 Std: 15485.3 Pix:400	Meter: (6,7) **Mean:** **28,254** Max: 246,359 Min: 11,654 Std: 25859.0 Pix:400	Meter: (7,7) **Mean:** **25,776** Max: 76,445 Min: 12,830 Std: 8903.2 Pix:400	Meter: (8,7) **Mean:** **21,394** Max: 88,251 Min: 10,539 Std: 8434.5 Pix:400	Meter: (9,7) **Mean:** **26,889** Max: 109,575 Min: 10,409 Std: 13063.1 Pix:400	Meter: (10,7) **Mean:** **20,754** Max: 75,909 Min: 8,499 Std: 8141.7 Pix:400	Meter: (11,7) **Mean:** **23,786** Max: 42,527 Min: 11,929 Std: 4393.5 Pix:400	Meter: (12,7) **Mean:** **21,147** Max: 33,505 Min: 12,223 Std: 3374.1 Pix:400	Meter: (13,7) **Mean:** **20,214** Max: 52,218 Min: 9,078 Std: 7888.1 Pix:400	Meter: (14,7) **Mean:** **14,215** Max: 43,291 Min: 5,445 Std: 6328.6 Pix:400	Meter: (15,7) **Mean:** **21,964** Max: 55,450 Min: 10,520 Std: 8457.2 Pix:400	Meter: (16,7) **Mean:** **14,833** Max: 72,883 Min: 0 Std: 9815.0 Pix:234	Meter: (17,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (18,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,6) **Mean:** **17,245** Max: 30,953 Min: 0 Std: 8649.0 Pix:162	Meter: (4,6) **Mean:** **21,551** Max: 51,336 Min: 8,358 Std: 9398.3 Pix:400	Meter: (5,6) **Mean:** **20,635** Max: 59,971 Min: 2,127 Std: 10285.2 Pix:400	Meter: (6,6) **Mean:** **18,153** Max: 64,127 Min: 2,215 Std: 7823.1 Pix:400	Meter: (7,6) **Mean:** **16,807** Max: 31,826 Min: 3,300 Std: 6221.6 Pix:400	Meter: (8,6) **Mean:** **19,017** Max: 50,950 Min: 2,898 Std: 6649.0 Pix:400	Meter: (9,6) **Mean:** **19,688** Max: 58,595 Min: 1,924 Std: 8537.0 Pix:400	Meter: (10,6) **Mean:** **15,201** Max: 27,593 Min: 1,831 Std: 5597.8 Pix:400	Meter: (11,6) **Mean:** **24,460** Max: 61,517 Min: 3,743 Std: 9102.2 Pix:400	Meter: (12,6) **Mean:** **18,443** Max: 45,794 Min: 3,891 Std: 7176.1 Pix:400	Meter: (13,6) **Mean:** **19,424** Max: 38,544 Min: 3,351 Std: 6806.0 Pix:400	Meter: (14,6) **Mean:** **18,505** Max: 86,358 Min: 882 Std: 11534.5 Pix:400	Meter: (15,6) **Mean:** **24,909** Max: 213,435 Min: 2,321 Std: 29160.2 Pix:400	Meter: (16,6) **Mean:** **23,027** Max: 43,120 Min: 0 Std: 12301.8 Pix:210	Meter: (17,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (18,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,5) **Mean:** **11,829** Max: 17,448 Min: 0 Std: 3141.4 Pix:30	Meter: (3,5) **Mean:** **18,144** Max: 33,228 Min: 0 Std: 9573.8 Pix:235	Meter: (4,5) **Mean:** **37,940** Max: 99,783 Min: 9,927 Std: 13065.9 Pix:400	Meter: (5,5) **Mean:** **27,853** Max: 45,206 Min: 8,227 Std: 5817.4 Pix:400	Meter: (6,5) **Mean:** **22,516** Max: 39,797 Min: 12,218 Std: 4580.1 Pix:400	Meter: (7,5) **Mean:** **20,464** Max: 119,469 Min: 8,631 Std: 13113.3 Pix:400	Meter: (8,5) **Mean:** **21,071** Max: 48,430 Min: 11,387 Std: 4990.2 Pix:400	Meter: (9,5) **Mean:** **23,529** Max: 62,494 Min: 12,618 Std: 7016.7 Pix:400	Meter: (10,5) **Mean:** **20,594** Max: 51,915 Min: 8,436 Std: 5572.1 Pix:400	Meter: (11,5) **Mean:** **30,035** Max: 52,513 Min: 16,120 Std: 6969.8 Pix:400	Meter: (12,5) **Mean:** **25,646** Max: 80,858 Min: 14,327 Std: 7530.1 Pix:400	Meter: (13,5) **Mean:** **36,384** Max: 91,454 Min: 20,767 Std: 9499.1 Pix:400	Meter: (14,5) **Mean:** **43,594** Max: 76,364 Min: 25,547 Std: 9269.5 Pix:400	Meter: (15,5) **Mean:** **37,880** Max: 75,189 Min: 11,862 Std: 11366.2 Pix:400	Meter: (16,5) **Mean:** **36,960** Max: 71,661 Min: 0 Std: 19471.6 Pix:284	Meter: (17,5) **Mean:** **40,746** Max: 77,857 Min: 0 Std: 21960.1 Pix:180	Meter: (18,5) **Mean:** **28,756** Max: 69,485 Min: 0 Std: 15548.8 Pix:180	Meter: (19,5) **Mean:** **49,539** Max: 160,506 Min: 0 Std: 29046.2 Pix:360	Meter: (20,5) **Mean:** **45,288** Max: 91,910 Min: 0 Std: 16083.9 Pix:368	Meter: (21,5) **Mean:** **40,620** Max: 73,695 Min: 0 Std: 19416.7 Pix:288	Meter: (22,5) **Mean:** **37,180** Max: 51,319 Min: 0 Std: 19364.6 Pix:45

TABLE E-10A Floor Survey Data, Room D-109, Unit AD-109, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(23,1) and grids (23,1)-(23,8) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,4) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:20	Meter: (2,4) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:20	Meter: (3,4) Mean: 16 Max: 233 Min: 0 Std: 31.9 Pix:115	Meter: (4,4) Mean: 57 Max: 722 Min: 0 Std: 111.7 Pix:400	Meter: (5,4) Mean: 46 Max: 433 Min: 0 Std: 102.5 Pix:400	Meter: (6,4) Mean: 33 Max: 399 Min: 0 Std: 87.5 Pix:400	Meter: (7,4) Mean: 36 Max: 520 Min: 0 Std: 93.7 Pix:400	Meter: (8,4) Mean: 32 Max: 448 Min: 0 Std: 84.0 Pix:400	Meter: (9,4) Mean: 22 Max: 629 Min: 0 Std: 75.5 Pix:400	Meter: (10,4) Mean: 49 Max: 461 Min: 0 Std: 101.0 Pix:400	Meter: (11,4) Mean: 39 Max: 486 Min: 0 Std: 96.1 Pix:400	Meter: (12,4) Mean: 17 Max: 254 Min: 0 Std: 61.4 Pix:400	Meter: (13,4) Mean: 20 Max: 266 Min: 0 Std: 66.2 Pix:400	Meter: (14,4) Mean: 40 Max: 671 Min: 0 Std: 101.5 Pix:400	Meter: (15,4) Mean: 23 Max: 311 Min: 0 Std: 76.0 Pix:400	Meter: (16,4) Mean: 27 Max: 508 Min: 0 Std: 85.2 Pix:400	Meter: (17,4) Mean: 46 Max: 395 Min: 0 Std: 106.7 Pix:380	Meter: (18,4) Mean: 59 Max: 970 Min: 0 Std: 151.3 Pix:400	Meter: (19,4) Mean: 42 Max: 606 Min: 0 Std: 110.2 Pix:400	Meter: (20,4) Mean: 39 Max: 549 Min: 0 Std: 105.9 Pix:400	Meter: (21,4) Mean: 30 Max: 311 Min: 0 Std: 82.9 Pix:400	Meter: (22,4) Mean: 45 Max: 311 Min: 0 Std: 99.4 Pix:400	Meter: (23,4) Mean: 13 Max: 223 Min: 0 Std: 24.1 Pix:40
Meter: (1,3) Mean: 41 Max: 748 Min: 0 Std: 148.8 Pix:400	Meter: (2,3) Mean: 55 Max: 773 Min: 0 Std: 145.8 Pix:400	Meter: (3,3) Mean: 22 Max: 323 Min: 0 Std: 64.1 Pix:399	Meter: (4,3) Mean: 42 Max: 641 Min: 0 Std: 110.0 Pix:380	Meter: (5,3) Mean: 12 Max: 294 Min: 0 Std: 55.0 Pix:380	Meter: (6,3) Mean: 50 Max: 854 Min: 0 Std: 126.0 Pix:380	Meter: (7,3) Mean: 33 Max: 521 Min: 0 Std: 90.5 Pix:380	Meter: (8,3) Mean: 40 Max: 311 Min: 0 Std: 93.9 Pix:380	Meter: (9,3) Mean: 51 Max: 799 Min: 0 Std: 120.2 Pix:380	Meter: (10,3) Mean: 39 Max: 560 Min: 0 Std: 101.8 Pix:380	Meter: (11,3) Mean: 33 Max: 561 Min: 0 Std: 100.3 Pix:380	Meter: (12,3) Mean: 29 Max: 266 Min: 0 Std: 74.6 Pix:380	Meter: (13,3) Mean: 25 Max: 508 Min: 0 Std: 83.1 Pix:380	Meter: (14,3) Mean: 35 Max: 478 Min: 0 Std: 87.6 Pix:380	Meter: (15,3) Mean: 30 Max: 559 Min: 0 Std: 86.0 Pix:380	Meter: (16,3) Mean: 40 Max: 741 Min: 0 Std: 110.8 Pix:394	Meter: (17,3) Mean: 31 Max: 266 Min: 0 Std: 79.8 Pix:399	Meter: (18,3) Mean: 36 Max: 546 Min: 0 Std: 105.9 Pix:400	Meter: (19,3) Mean: 93 Max: 622 Min: 0 Std: 153.7 Pix:400	Meter: (20,3) Mean: 36 Max: 533 Min: 0 Std: 87.6 Pix:400	Meter: (21,3) Mean: 49 Max: 597 Min: 0 Std: 105.0 Pix:400	Meter: (22,3) Mean: 32 Max: 654 Min: 0 Std: 84.3 Pix:400	Meter: (23,3) Mean: 39 Max: 486 Min: 0 Std: 89.6 Pix:192
Meter: (1,2) Mean: 38 Max: 458 Min: 0 Std: 77.8 Pix:355	Meter: (2,2) Mean: 29 Max: 243 Min: 0 Std: 62.6 Pix:400	Meter: (3,2) Mean: 38 Max: 414 Min: 0 Std: 81.6 Pix:400	Meter: (4,2) Mean: 46 Max: 508 Min: 0 Std: 99.9 Pix:400	Meter: (5,2) Mean: 72 Max: 730 Min: 0 Std: 119.6 Pix:400	Meter: (6,2) Mean: 68 Max: 607 Min: 0 Std: 117.2 Pix:400	Meter: (7,2) Mean: 69 Max: 508 Min: 0 Std: 108.7 Pix:400	Meter: (8,2) Mean: 80 Max: 646 Min: 0 Std: 122.5 Pix:400	Meter: (9,2) Mean: 62 Max: 662 Min: 0 Std: 112.4 Pix:400	Meter: (10,2) Mean: 72 Max: 905 Min: 0 Std: 138.0 Pix:400	Meter: (11,2) Mean: 69 Max: 1,112 Min: 0 Std: 139.6 Pix:400	Meter: (12,2) Mean: 96 Max: 982 Min: 0 Std: 158.0 Pix:400	Meter: (13,2) Mean: 154 Max: 3,031 Min: 0 Std: 358.5 Pix:400	Meter: (14,2) Mean: 275 Max: 1,819 Min: 0 Std: 368.9 Pix:400	Meter: (15,2) Mean: 214 Max: 2,618 Min: 0 Std: 365.0 Pix:400	Meter: (16,2) Mean: 101 Max: 1,175 Min: 0 Std: 184.6 Pix:400	Meter: (17,2) Mean: 68 Max: 565 Min: 0 Std: 126.6 Pix:400	Meter: (18,2) Mean: 56 Max: 658 Min: 0 Std: 124.3 Pix:400	Meter: (19,2) Mean: 34 Max: 400 Min: 0 Std: 84.9 Pix:395	Meter: (20,2) Mean: 55 Max: 914 Min: 0 Std: 110.6 Pix:300	Meter: (21,2) Mean: 40 Max: 387 Min: 0 Std: 71.8 Pix:300	Meter: (22,2) Mean: 78 Max: 559 Min: 0 Std: 107.4 Pix:276	Meter: (23,2) Mean: 92 Max: 414 Min: 0 Std: 89.1 Pix:70
Meter: (1,1) Mean: 45 Max: 576 Min: 0 Std: 95.6 Pix:85	Meter: (2,1) Mean: 16 Max: 175 Min: 0 Std: 45.5 Pix:100	Meter: (3,1) Mean: 60 Max: 396 Min: 0 Std: 108.4 Pix:100	Meter: (4,1) Mean: 37 Max: 254 Min: 0 Std: 77.8 Pix:100	Meter: (5,1) Mean: 74 Max: 534 Min: 0 Std: 126.6 Pix:100	Meter: (6,1) Mean: 40 Max: 361 Min: 0 Std: 84.5 Pix:100	Meter: (7,1) Mean: 48 Max: 476 Min: 0 Std: 96.5 Pix:100	Meter: (8,1) Mean: 44 Max: 266 Min: 0 Std: 83.8 Pix:100	Meter: (9,1) Mean: 38 Max: 266 Min: 0 Std: 78.4 Pix:100	Meter: (10,1) Mean: 69 Max: 499 Min: 0 Std: 107.7 Pix:100	Meter: (11,1) Mean: 61 Max: 466 Min: 0 Std: 107.0 Pix:100	Meter: (12,1) Mean: 170 Max: 709 Min: 0 Std: 189.3 Pix:100	Meter: (13,1) Mean: 178 Max: 742 Min: 0 Std: 178.3 Pix:100	Meter: (14,1) Mean: 295 Max: 1,099 Min: 0 Std: 258.7 Pix:100	Meter: (15,1) Mean: 407 Max: 2,014 Min: 0 Std: 423.7 Pix:100	Meter: (16,1) Mean: 190 Max: 1,083 Min: 0 Std: 230.0 Pix:100	Meter: (17,1) Mean: 34 Max: 350 Min: 0 Std: 92.6 Pix:108	Meter: (18,1) Mean: 133 Max: 883 Min: 0 Std: 198.2 Pix:120	Meter: (19,1) Mean: 54 Max: 577 Min: 0 Std: 125.2 Pix:114	Meter: (20,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (21,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (22,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0	Meter: (23,1) Mean: 0 Max: 0 Min: 0 Std: 0 Pix:0

TABLE E-10B Floor Survey Data, Room D-109, Unit A-D109, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(23,1) and grids (23,1)-(23,8) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (5,8) Mean: 54 Max: 630 Min: 0 Std: 116.8 Pix:380	Meter: (6,8) Mean: 47 Max: 701 Min: 0 Std: 129.5 Pix:400	Meter: (7,8) Mean: 30 Max: 660 Min: 0 Std: 90.6 Pix:400	Meter: (8,8) Mean: 25 Max: 685 Min: 0 Std: 103.4 Pix:400	Meter: (9,8) Mean: 35 Max: 538 Min: 0 Std: 95.7 Pix:400	Meter: (10,8) Mean: 42 Max: 720 Min: 0 Std: 98.5 Pix:400	Meter: (11,8) Mean: 32 Max: 439 Min: 0 Std: 88.6 Pix:400	Meter: (12,8) Mean: 43 Max: 589 Min: 0 Std: 113.7 Pix:400	Meter: (13,8) Mean: 37 Max: 466 Min: 0 Std: 65.1 Pix:204	Meter: (14,8) Mean: 12 Max: 243 Min: 0 Std: 29.5 Pix:120	Meter: (15,8) Mean: 37 Max: 279 Min: 0 Std: 50.0 Pix:120	Meter: (16,8) Mean: 25 Max: 233 Min: 0 Std: 40.8 Pix:120	Meter: (17,8) Mean: 27 Max: 233 Min: 0 Std: 28.4 Pix:54	Meter: (18,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (23,8) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,7) Mean: 29 Max: 457 Min: 0 Std: 47.9 Pix:128	Meter: (5,7) Mean: 58 Max: 884 Min: 0 Std: 130.9 Pix:396	Meter: (6,7) Mean: 29 Max: 432 Min: 0 Std: 88.0 Pix:400	Meter: (7,7) Mean: 39 Max: 417 Min: 0 Std: 101.4 Pix:400	Meter: (8,7) Mean: 31 Max: 624 Min: 0 Std: 99.9 Pix:400	Meter: (9,7) Mean: 50 Max: 730 Min: 0 Std: 117.3 Pix:400	Meter: (10,7) Mean: 37 Max: 546 Min: 0 Std: 89.7 Pix:400	Meter: (11,7) Mean: 36 Max: 532 Min: 0 Std: 96.6 Pix:400	Meter: (12,7) Mean: 33 Max: 606 Min: 0 Std: 95.4 Pix:400	Meter: (13,7) Mean: 21 Max: 294 Min: 0 Std: 57.1 Pix:400	Meter: (14,7) Mean: 29 Max: 487 Min: 0 Std: 70.5 Pix:400	Meter: (15,7) Mean: 23 Max: 279 Min: 0 Std: 54.1 Pix:400	Meter: (16,7) Mean: 27 Max: 457 Min: 0 Std: 61.9 Pix:400	Meter: (17,7) Mean: 51 Max: 345 Min: 0 Std: 67.6 Pix:210	Meter: (18,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (23,7) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (4,6) Mean: 70 Max: 494 Min: 0 Std: 84.0 Pix:160	Meter: (5,6) Mean: 51 Max: 641 Min: 0 Std: 120.8 Pix:400	Meter: (6,6) Mean: 44 Max: 1,009 Min: 0 Std: 118.5 Pix:380	Meter: (7,6) Mean: 38 Max: 591 Min: 0 Std: 102.7 Pix:400	Meter: (8,6) Mean: 19 Max: 329 Min: 0 Std: 75.7 Pix:400	Meter: (9,6) Mean: 29 Max: 350 Min: 0 Std: 87.3 Pix:400	Meter: (10,6) Mean: 41 Max: 839 Min: 0 Std: 113.0 Pix:400	Meter: (11,6) Mean: 22 Max: 279 Min: 0 Std: 76.2 Pix:400	Meter: (12,6) Mean: 18 Max: 330 Min: 0 Std: 69.1 Pix:400	Meter: (13,6) Mean: 21 Max: 559 Min: 0 Std: 81.3 Pix:400	Meter: (14,6) Mean: 41 Max: 641 Min: 0 Std: 102.2 Pix:400	Meter: (15,6) Mean: 54 Max: 546 Min: 0 Std: 119.6 Pix:400	Meter: (16,6) Mean: 26 Max: 508 Min: 0 Std: 86.6 Pix:400	Meter: (17,6) Mean: 39 Max: 508 Min: 0 Std: 73.8 Pix:230	Meter: (18,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (19,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (20,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (21,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (22,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (23,6) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0
Meter: (1,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (2,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:0	Meter: (3,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:30	Meter: (4,5) Mean: 42 Max: 609 Min: 0 Std: 80.8 Pix:232	Meter: (5,5) Mean: 34 Max: 348 Min: 0 Std: 87.4 Pix:400	Meter: (6,5) Mean: 43 Max: 497 Min: 0 Std: 103.9 Pix:372	Meter: (7,5) Mean: 34 Max: 388 Min: 0 Std: 95.0 Pix:400	Meter: (8,5) Mean: 42 Max: 742 Min: 0 Std: 122.7 Pix:400	Meter: (9,5) Mean: 27 Max: 431 Min: 0 Std: 82.2 Pix:400	Meter: (10,5) Mean: 54 Max: 701 Min: 0 Std: 130.1 Pix:400	Meter: (11,5) Mean: 30 Max: 591 Min: 0 Std: 88.7 Pix:400	Meter: (12,5) Mean: 23 Max: 559 Min: 0 Std: 75.9 Pix:400	Meter: (13,5) Mean: 22 Max: 350 Min: 0 Std: 75.5 Pix:400	Meter: (14,5) Mean: 59 Max: 884 Min: 0 Std: 138.6 Pix:400	Meter: (15,5) Mean: 31 Max: 533 Min: 0 Std: 86.6 Pix:400	Meter: (16,5) Mean: 50 Max: 520 Min: 0 Std: 103.6 Pix:400	Meter: (17,5) Mean: 33 Max: 440 Min: 0 Std: 73.0 Pix:276	Meter: (18,5) Mean: 28 Max: 311 Min: 0 Std: 47.1 Pix:110	Meter: (19,5) Mean: 182 Max: 1,245 Min: 0 Std: 221.8 Pix:300	Meter: (20,5) Mean: 69 Max: 1,417 Min: 0 Std: 125.8 Pix:150	Meter: (21,5) Mean: 28 Max: 329 Min: 0 Std: 59.9 Pix:190	Meter: (22,5) Mean: 42 Max: 311 Min: 0 Std: 84.6 Pix:270	Meter: (23,5) Mean: 0 Max: 0 Min: 0 Std: .0 Pix:10

TABLE E-11 Floor Survey Data, Room D-101, Unit B-D101, Total Beta/Gamma Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(9,1) and grids (9,1)-(9,5) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,5) **Mean: 92,530** Max: 283,274 Min: 0 Std: 49954.2 Pix:374	Meter: (2,5) **Mean: 98,762** Max: 950,713 Min: 28,441 Std: 112657.0 Pix:400	Meter: (3,5) **Mean: 90,951** Max: 272,641 Min: 25,293 Std: 47655.7 Pix:400	Meter: (4,5) **Mean: 82,815** Max: 217,589 Min: 33,561 Std: 29108.9 Pix:400	Meter: (5,5) **Mean: 169,296** Max: 416,281 Min: 25,112 Std: 91127.0 Pix:400	Meter: (6,5) **Mean: 138,169** Max: 300,640 Min: 20,450 Std: 61418.0 Pix:400	Meter: (7,5) **Mean: 115,471** Max: 243,884 Min: 22,615 Std: 45452.3 Pix:400	Meter: (8,5) **Mean: 152,041** Max: 468,901 Min: 0 Std: 95543.8 Pix:305	Meter: (9,5) Mean: 0 Max: 1,161 Min: 1,161 Std: .0 Pix:0
Meter: (1,4) **Mean: 44,539** Max: 128,412 Min: 15,884 Std: 18007.1 Pix:400	Meter: (2,4) **Mean: 74,083** Max: 181,117 Min: 27,669 Std: 28446.8 Pix:400	Meter: (3,4) **Mean: 158,842** Max: 563,890 Min: 53,279 Std: 90380.7 Pix:400	Meter: (4,4) **Mean: 222,997** Max: 883,943 Min: 50,741 Std: 181852.0 Pix:400	Meter: (5,4) **Mean: 132,981** Max: 368,441 Min: 50,458 Std: 64248.1 Pix:400	Meter: (6,4) **Mean: 115,859** Max: 348,802 Min: 30,837 Std: 60454.0 Pix:400	Meter: (7,4) **Mean: 137,407** Max: 422,676 Min: 50,428 Std: 61440.8 Pix:400	Meter: (8,4) **Mean: 255,987** Max: 616,619 Min: 0 Std: 136826.0 Pix:385	Meter: (9,4) Mean: 0 Max: 1,467 Min: 1,467 Std: .0 Pix:0
Meter: (1,3) **Mean: 75,435** Max: 238,083 Min: 14,716 Std: 40839.4 Pix:387	Meter: (2,3) **Mean: 97,847** Max: 252,228 Min: 12,824 Std: 47230.2 Pix:395	Meter: (3,3) **Mean: 196,226** Max: 635,720 Min: 0 Std: 159759.0 Pix:300	Meter: (4,3) **Mean: 89,297** Max: 419,894 Min: 0 Std: 75514.6 Pix:300	Meter: (5,3) **Mean: 59,274** Max: 201,417 Min: 0 Std: 37160.0 Pix:300	Meter: (6,3) **Mean: 124,488** Max: 1,180,460 Min: 0 Std: 143582.0 Pix:300	Meter: (7,3) **Mean: 95,991** Max: 230,382 Min: 0 Std: 57746.9 Pix:300	Meter: (8,3) **Mean: 203,278** Max: 658,746 Min: 0 Std: 167511.0 Pix:300	Meter: (9,3) Mean: 0 Max: 1,131 Min: 1,131 Std: .0 Pix:0
Meter: (1,2) **Mean: 55,407** Max: 99,624 Min: 25,218 Std: 15375.6 Pix:400	Meter: (2,2) **Mean: 56,466** Max: 110,355 Min: 22,920 Std: 17246.1 Pix:400	Meter: (3,2) **Mean: 97,817** Max: 260,003 Min: 37,567 Std: 40072.4 Pix:400	Meter: (4,2) **Mean: 82,117** Max: 214,051 Min: 34,157 Std: 33250.6 Pix:400	Meter: (5,2) **Mean: 167,923** Max: 440,131 Min: 28,510 Std: 102626.0 Pix:400	Meter: (6,2) **Mean: 106,741** Max: 261,382 Min: 28,830 Std: 59864.7 Pix:400	Meter: (7,2) **Mean: 73,374** Max: 223,995 Min: 20,350 Std: 36739.5 Pix:400	Meter: (8,2) **Mean: 108,870** Max: 406,788 Min: 32,111 Std: 71298.3 Pix:400	Meter: (9,2) Mean: 0 Max: 1,521 Min: 1,521 Std: .0 Pix:0
Meter: (1,1) **Mean: 37,238** Max: 65,331 Min: 0 Std: 11805.0 Pix:307	Meter: (2,1) **Mean: 40,846** Max: 103,699 Min: 6,192 Std: 14895.1 Pix:320	Meter: (3,1) **Mean: 72,500** Max: 137,033 Min: 27,425 Std: 19142.6 Pix:320	Meter: (4,1) **Mean: 106,367** Max: 254,208 Min: 19,766 Std: 40488.1 Pix:320	Meter: (5,1) **Mean: 100,436** Max: 484,667 Min: 9,896 Std: 91121.0 Pix:320	Meter: (6,1) **Mean: 95,014** Max: 268,511 Min: 24,517 Std: 37611.9 Pix:320	Meter: (7,1) **Mean: 113,327** Max: 542,211 Min: 23,782 Std: 78942.7 Pix:320	Meter: (8,1) **Mean: 156,721** Max: 575,446 Min: 24,258 Std: 115900.0 Pix:320	Meter: (9,1) Mean: 0 Max: 1,209 Min: 1,209 Std: .0 Pix:0

TABLE E-12 Floor Survey Data, Room D-101, Unit A-D101, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(8,1) and grids (8,1)-(8,5) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,5) Mean: 64 Max: 534 Min: 0 Std: 106.6 Pix:400	Meter: (2,5) Mean: 79 Max: 730 Min: 0 Std: 132.1 Pix:400	Meter: (3,5) Mean: 166 Max: 1,166 Min: 0 Std: 216.3 Pix:400	Meter: (4,5) Mean: 73 Max: 900 Min: 0 Std: 140.0 Pix:400	Meter: (5,5) Mean: 85 Max: 730 Min: 0 Std: 150.4 Pix:400	Meter: (6,5) Mean: 83 Max: 730 Min: 0 Std: 151.7 Pix:400	Meter: (7,5) Mean: 76 Max: 497 Min: 0 Std: 135.9 Pix:400	Meter: (8,5) Mean: 33 Max: 215 Min: 0 Std: 42.2 Pix:100
Meter: (1,4) Mean: 63 Max: 457 Min: 0 Std: 98.8 Pix:400	Meter: (2,4) Mean: 84 Max: 671 Min: 0 Std: 133.1 Pix:400	Meter: (3,4) Mean: 87 Max: 699 Min: 0 Std: 140.0 Pix:400	Meter: (4,4) Mean: 96 Max: 995 Min: 0 Std: 160.2 Pix:400	Meter: (5,4) Mean: 66 Max: 1,263 Min: 0 Std: 150.9 Pix:400	Meter: (6,4) Mean: 58 Max: 466 Min: 0 Std: 104.4 Pix:400	Meter: (7,4) Mean: 82 Max: 861 Min: 0 Std: 146.9 Pix:400	Meter: (8,4) Mean: 134 Max: 679 Min: 0 Std: 144.1 Pix:244
Meter: (1,3) Mean: 82 Max: 508 Min: 0 Std: 105.3 Pix:393	Meter: (2,3) Mean: 81 Max: 710 Min: 0 Std: 119.4 Pix:365	Meter: (3,3) Mean: 121 Max: 699 Min: 0 Std: 154.4 Pix:300	Meter: (4,3) Mean: 95 Max: 627 Min: 0 Std: 125.4 Pix:300	Meter: (5,3) Mean: 41 Max: 467 Min: 0 Std: 79.9 Pix:300	Meter: (6,3) Mean: 77 Max: 764 Min: 0 Std: 128.9 Pix:300	Meter: (7,3) Mean: 76 Max: 881 Min: 0 Std: 125.2 Pix:300	Meter: (8,3) Mean: 166 Max: 1,064 Min: 0 Std: 188.4 Pix:225
Meter: (1,2) Mean: 75 Max: 732 Min: 0 Std: 126.1 Pix:400	Meter: (2,2) Mean: 69 Max: 651 Min: 0 Std: 117.6 Pix:400	Meter: (3,2) Mean: 68 Max: 457 Min: 0 Std: 104.9 Pix:400	Meter: (4,2) Mean: 84 Max: 681 Min: 0 Std: 119.7 Pix:400	Meter: (5,2) Mean: 91 Max: 579 Min: 0 Std: 123.9 Pix:400	Meter: (6,2) Mean: 80 Max: 514 Min: 0 Std: 123.3 Pix:400	Meter: (7,2) Mean: 96 Max: 1,263 Min: 0 Std: 161.1 Pix:400	Meter: (8,2) Mean: 70 Max: 508 Min: 0 Std: 106.5 Pix:340
Meter: (1,1) Mean: 94 Max: 574 Min: 0 Std: 117.0 Pix:340	Meter: (2,1) Mean: 81 Max: 757 Min: 0 Std: 124.3 Pix:340	Meter: (3,1) Mean: 73 Max: 601 Min: 0 Std: 122.4 Pix:340	Meter: (4,1) Mean: 68 Max: 657 Min: 0 Std: 120.9 Pix:340	Meter: (5,1) Mean: 118 Max: 610 Min: 0 Std: 142.3 Pix:340	Meter: (6,1) Mean: 128 Max: 574 Min: 0 Std: 148.0 Pix:340	Meter: (7,1) Mean: 128 Max: 753 Min: 0 Std: 173.3 Pix:340	Meter: (8,1) Mean: 137 Max: 852 Min: 0 Std: 155.5 Pix:273

TABLE E-13 Floor Survey Data, West Corridor, South End, Unit B-C2N. Total beta/gamma activity, for each grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(7,1) and grids (7,1)-(7,3) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,3) **Mean: 21,544** Max: 38,536 Min: 0 Std: 12050.5 Pix:200	Meter: (2,3) **Mean: 37,312** Max: 80,340 Min: 0 Std: 18366.9 Pix:340	Meter: (3,3) **Mean: 29,136** Max: 50,576 Min: 0 Std: 15356.6 Pix:200	Meter: (4,3) **Mean: 47,301** Max: 83,230 Min: 0 Std: 25722.4 Pix:200	Meter: (5,3) **Mean: 113,931** Max: 207,654 Min: 0 Std: 63351.9 Pix:200	Meter: (6,3) **Mean: 105,177** Max: 231,766 Min: 0 Std: 64153.6 Pix:200	Meter: (7,3) **Mean: 40,068** Max: 168,057 Min: 0 Std: 25921.9 Pix:160
Meter: (1,2) **Mean: 23,898** Max: 47,584 Min: 9,914 Std: 8630.6 Pix:400	Meter: (2,2) **Mean: 20,917** Max: 31,666 Min: 11,734 Std: 3592.3 Pix:400	Meter: (3,2) **Mean: 26,928** Max: 42,718 Min: 11,547 Std: 6196.7 Pix:400	Meter: (4,2) **Mean: 35,987** Max: 175,308 Min: 18,983 Std: 16947.1 Pix:400	Meter: (5,2) **Mean: 53,248** Max: 90,210 Min: 26,601 Std: 14482.6 Pix:400	Meter: (6,2) **Mean: 61,994** Max: 156,740 Min: 26,257 Std: 26275.0 Pix:400	Meter: (7,2) **Mean: 38,193** Max: 63,717 Min: 0 Std: 11776.4 Pix:332
Meter: (1,1) **Mean: 15,193** Max: 28,901 Min: 8,045 Std: 3576.4 Pix:400	Meter: (2,1) **Mean: 16,457** Max: 36,233 Min: 8,223 Std: 3722.4 Pix:400	Meter: (3,1) **Mean: 28,618** Max: 48,111 Min: 10,332 Std: 7520.2 Pix:400	Meter: (4,1) **Mean: 45,318** Max: 94,781 Min: 20,685 Std: 13151.1 Pix:400	Meter: (5,1) **Mean: 54,400** Max: 95,537 Min: 23,878 Std: 12677.1 Pix:400	Meter: (6,1) **Mean: 55,036** Max: 102,333 Min: 36,451 Std: 12032.4 Pix:400	Meter: (7,1) **Mean: 49,300** Max: 108,648 Min: 28,775 Std: 14045.9 Pix:360

TABLE E-14 Floor Survey Data, North Corridor, South End, Unit A-C2N, Total Alpha Activity, for Each Grid. Units are dpm/100 cm^2 averaged over one square meter. Grid coordinates (x,y) are in meters from reference point. Grids (1,1)-(7,1) and grids (7,1)-(7,4) are not a full one square meter. Pix denotes number of 5 cm x 5 cm pixels in grid. Bold text denotes grids which exceed release limits, after background subtraction.

Meter: (1,4) Mean: 25 Max: 311 Min: 0 Std: 40.0 Pix:96	Meter: (2,4) Mean: 27 Max: 279 Min: 0 Std: 67.0 Pix:316	Meter: (3,4) Mean: 16 Max: 233 Min: 0 Std: 32.3 Pix:134	Meter: (4,4) Mean: 29 Max: 207 Min: 0 Std: 41.7 Pix:120	Meter: (5,4) Mean: 31 Max: 367 Min: 0 Std: 45.7 Pix:120	Meter: (6,4) Mean: 28 Max: 294 Min: 0 Std: 46.9 Pix:120	Meter: (7,4) Mean: 17 Max: 215 Min: 0 Std: 31.4 Pix:102
Meter: (1,3) Mean: 29 Max: 447 Min: 0 Std: 78.6 Pix:324	Meter: (2,3) Mean: 28 Max: 466 Min: 0 Std: 81.7 Pix:400	Meter: (3,3) Mean: 31 Max: 350 Min: 0 Std: 77.5 Pix:400	Meter: (4,3) Mean: 18 Max: 254 Min: 0 Std: 60.3 Pix:400	Meter: (5,3) Mean: 38 Max: 430 Min: 0 Std: 85.1 Pix:400	Meter: (6,3) Mean: 42 Max: 574 Min: 0 Std: 99.4 Pix:400	Meter: (7,3) Mean: 46 Max: 503 Min: 0 Std: 97.3 Pix:341
Meter: (1,2) Mean: 21 Max: 358 Min: 0 Std: 61.9 Pix:400	Meter: (2,2) Mean: 38 Max: 671 Min: 0 Std: 97.5 Pix:400	Meter: (3,2) Mean: 20 Max: 392 Min: 0 Std: 62.8 Pix:400	Meter: (4,2) Mean: 20 Max: 466 Min: 0 Std: 73.8 Pix:400	Meter: (5,2) Mean: 36 Max: 508 Min: 0 Std: 94.9 Pix:400	Meter: (6,2) Mean: 21 Max: 223 Min: 0 Std: 63.5 Pix:400	Meter: (7,2) Mean: 20 Max: 400 Min: 0 Std: 64.0 Pix:360
Meter: (1,1) Mean: 19 Max: 215 Min: 0 Std: 54.4 Pix:100	Meter: (2,1) Mean: 50 Max: 447 Min: 0 Std: 102.9 Pix:100	Meter: (3,1) Mean: 10 Max: 215 Min: 0 Std: 43.5 Pix:100	Meter: (4,1) Mean: 18 Max: 254 Min: 0 Std: 61.3 Pix:100	Meter: (5,1) Mean: 39 Max: 243 Min: 0 Std: 79.5 Pix:100	Meter: (6,1) Mean: 50 Max: 414 Min: 0 Std: 102.4 Pix:100	Meter: (7,1) Mean: 31 Max: 407 Min: 0 Std: 79.6 Pix:90

SHONKA RESEARCH ASSOCIATES, INC.

Characterization Report

ANL Building 301 Hot Cell Area

Floor characterization surveys were conducted between November 17 and November 21, 1997 of the Hot Cell Area of Building 301 at the Argonne National Laboratory. These surveys were conducted using SRA's Surface Contamination Monitor (SCM) serial number SCM-2. Calibration of the instrument and daily source checks were performed in accordance with SRA procedures SCM-003, Rev. 1; and SCM-002, Rev. 0; respectively. These procedures are intended to meet the requirements of American National Standards Institute standard ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration", as might be applied to non-hand-held, computerized data acquisition systems. All calibrations were performed using suitable sources having calibrations traceable to the National Institute of Standards and Technology. For beta surveys, the calibration standard was a ^{137}Cs standard having a nominal activity of 203,130 dpm dispersed over 100 cm^2. For alpha surveys, the calibration standard was an ^{241}Am standard having a nominal activity of 400,200 dpm dispersed over 100 cm^2. The ^{137}Cs source serial number was 96CS1002676. The ^{241}Am source serial number was DP 148.

The characterization reports and associated data contained herein have been reviewed and found to be in compliance with the requirements specified in the SRA QA manual and contract number 972942401.

Surveys performed by: _____ 12/03/97
Thomas R. Sukalac — Date
Lead Technician

Technical review by: _____ 12/05/97
Joseph J. Shonka — Date
Research Director

QA review by: Deborah B. Shonka 12/05/97
Deborah B. Shonka — Date
President

SRA
Shonka Research Associates, Inc.

December 17, 1997

TO: Bruce Murdoch

FROM: Joseph Shonka

SUBJECT: Backgrounds and Detection Limits for Building 301 Survey

CC: Al Justus

The SCM was calibrated using the ANL source for alpha radiation and SRA's source for beta radiation. The calibration certificate for SRA's source is enclosed. The SRA procedure used for calibrating the SCM was provided to ANL earlier, and the data sheets from the 301 survey are enclosed as well. The SRA source was inter-compared to an ANL source from a different vendor. The inter-comparison indicated a calibration difference of less than 1%, well within the relative errors of the two sources.

With your guidance, and for purposes of report generation, we have used reporting limits of 5,000 dpm per 100 cm^2 averaged over one square meter (5,000 average dpa) with a secondary reporting limit of no more than 15,000 dpm per 100 cm^2 maximum in any square meter (15,000 maximum dpa) for beta radiation. We intentionally have created a new terminology "reporting limit" that is not described in regulatory requirements, to avoid confusion with the traditional term "release limits". These limits correspond to a limit for fixed plus removable surface contamination. Reporting limits of 1,000 average dpa and 3,000 maximum dpa for alpha were also used.

Our reports provide data as gross equivalent contamination, with background left in the data and interpreted as if it were contamination of a similar nature to the calibration source used. Beta backgrounds were measured as 2813 dpa (± 289 dpa), and alpha backgrounds were 52 dpa (± 13 dpa). These backgrounds were added to the reporting limits asserted above for reporting using automated software routines. We prefer to handle the data this way to avoid asserting negative values when a given measurement lies below an average.

To our knowledge, there are no formal reporting limits for characterization surveys that are imposed by regulatory requirements, although an assertion of "no action required" would dictate that free release limits be used. Some authors have suggested that, in order to demonstrate that a reporting limit has been met, a detection limit of one quarter of the limit should be demonstrated (NUREG/CR-5849, 1992). This is a significant increase in technical requirements over past practice, in which the release limits themselves were interpreted as instrumentation performance requirements. This memorandum discusses the detection limits that the Building 301 survey achieved, and compares them to the reporting limits.

Interpretation of release limits and survey requirements have varied through the years. In the distant past, the release limits were viewed as acceptable levels of radioactive materials that

THE SOURCE INC.

Radiation Standards and Check Sources

2810 Siler Lane, Santa Fe, NM 87501
Business: (505) 473-9538
FAX: (505) 473-5805

Certificate of Calibration
(Gamma Source)

Ref. PO# 084-96

The Cesium 137 gamma source was compared with a calibrated NIST gamma source 91CS2504550 used in establishing tracebility. The comparison was completed using a sodium iodide detector.

The activity of the source on 06/18/97 was 0.0915 . The overall uncertainty of the measurement and the activity of the source is ± 10%.
beta per minute 62,200

Serial No. 96CS1002676
Model No. S-CS-100

Active Diameter 10x10cm
Mounting Material Plastic
Cover Mylar

Total Diameter 12x12cm
Thickness 7mm

Michael A. Ortiz . . . . . Calibration Manager

Charles L. Gonzales . . . Quality Assurance Manager

_____ leak test results (uCi)

The overall uncertainty of the measurement is three times the value found from combining quadratically the sum of the overall uncertainty reported by NIST in the radioactive measurements assurance program; the standard deviation of the mean for the NIST standard as measured in the system used for calibration; and the standard deviation of the mean for the source measurements.

GC008-95

SCM Procedure 003

Appendix A
Efficiency Measurement Documentation

Technician: Sukalac

Date: 11/17/97

Detector Configuration : 52" ~~recent~~ Standard

High Voltage : ~~1800~~ 1600

Detctor Position Slope : 2.015748

Detctor Position Intercept : -0.515615

Calibration Source Information

Type (Name) : CS 137

Serial No.: SRA 96CS100 2676

Activity: 203.130

Uncertainty : 5%

Calibration Date : 6/18/97

Detector	Position Start Channel	Position Stop Channel	Overall Efficiency (%)
Detector #1	1	2043	19.95
Detector #2	—	N/A	—
Detector #3	—	N/A	—
Detector #4	—	N/A	—
Detector #5	—	N/A	—

* Place N/A in all blocks of non applicable detectors

SCM Procedure 007

Appendix A
Baseline Detector Response Check Measurements

Technician : Sukalac

Date: 11/17/97 1430

Detector Configuration : 52" ~~[illegible]~~ Standard

High Voltage Setting: 1807

Calibration Source: CS-137 96 CS 100 2676

Detector	Total Counts	Total Background Subtracted Counts
Background for entire Array	6263	N/A
Detector #1	$\frac{51352 + 50572}{2} = 50962$	44 699
Detector #2	N/A	
Detector #3	N/A	
Detector #4	N/A	
Detector #5	N/A	

enter N/A for all non-existing detectors

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/18/97 0935

Detector Configuration: 52" Recount

High Voltage Setting: 1807

Calibration Source: CS 137

Baseline Source Check Information

Date : 11/17/97 1430

Detector Configuration: 52" standard

High Voltage Setting : 1807

Calibration Source : CS-137 SL CS100

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	215833 + 212551 = 214193 / 2	N/A	N/A	N/A
Detector #1	630384 + 627126 = 628755	41 478	44 699	7.2 %
Detector #2			N/A	
Detector #3			N/A	
Detector #4			N/A	
Detector #5			N/A	

SCM Procedure 003

Appendix A
Efficiency Measurement Documentation

Technician: Sukalac

Date: 11/19/97

Detector Configuration : 28" Standard

High Voltage : 1807

Detctor Position Slope : 2.976744

Detctor Position Intercept : -1.00584

Calibration Source Information

Type (Name) : CS-137

Serial No.: 96 CS 100 2676

Activity: 203 130 dpm

Uncertainty : 5%

Calibration Date : 6/18/97

Detector	Position Start Channel	Position Stop Channel	Overall Efficiency (%)
Detector #1	1	2043	21.67
Detector #2	—	N/A	—
Detector #3	—	N/A	—
Detector #4	—	N/A	—
Detector #5	—	N/A	—

* Place N/A in all blocks of non applicable detectors

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/19/97 0800

Detector Configuration: 52" standard

High Voltage Setting: 1800

Calibration Source: CS-137 96 CS 100 2676 (SRA)

Baseline Source Check Information

Date : 11/17/97 1430

Detector Configuration: standard

High Voltage Setting : 1807

Calibration Source : CS-137 96 CS 100 2676

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	$\frac{26471 + 26414}{2} = 26443$	N/A	N/A	N/A
Detector #1	66580	40 137	44 699	10%
Detector #2	—	—	N/A	—
Detector #3	—	—	N/A	—
Detector #4	—	—	N/A	—
Detector #5	—	—	N/A	—

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/19/97 1005

Detector Configuration: 52" standard

High Voltage Setting: 1800

Calibration Source: CS 137 SEA

Baseline Source Check Information

Date : 11/17/97 1430

Detector Configuration: 52" standard

High Voltage Setting : 1807

Calibration Source : CS-137 9L CS 100 2676

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	9,888	N/A	N/A	N/A
Detector #1	51524	42335	44 699	-5.3%
Detector #2		N/A		
Detector #3		N/A		
Detector #4		N/A		
Detector #5		N/A		

11/19: 1120

4090

50691 43601 44 699 -2.5%

SCM Procedure 007

Appendix A
Baseline Detector Response Check Measurements

Technician : Sukalac

Date: 11/19/97 0510

Detector Configuration : 28" Standard

High Voltage Setting: 1500

Calibration Source: CS 137 (SRA) 96 CS 100 2676

Detector	Total Counts	Total Background Subtracted Counts
Background for entire Array	2359.5	N/A
Detector #1	45119	42760
Detector #2	N/A	
Detector #3	N/A	
Detector #4	N/A	
Detector #5	N/A	

enter N/A for all non-existing detectors

SCM Procedure 007

Appendix A
Baseline Detector Response Check Measurements

Technician : S. Kakac

Date: 11/20/97

Detector Configuration : 28" Standard

High Voltage Setting: 1340

Calibration Source: Am 241 (DP148)

Detector	Total Counts	Total Background Subtracted Counts
Background for entire Array	19.5	N/A
Detector #1	106717.5	106698
Detector #2	N/A	
Detector #3	N/A	
Detector #4	N/A	
Detector #5	N/A	

enter N/A for all non-existing detectors

114288

SCM Procedure 007

Appendix A
Baseline Detector Response Check Measurements

Technician : Sukalac

Date: 11/20/97 0920

Detector Configuration : 52" Standard

High Voltage Setting: 1340

Calibration Source: Am 241 (DP 148)

Detector	Total Counts	Total Background Subtracted Counts
Background for entire Array	37	N/A
Detector #1	110851	110814
Detector #2	N/A	
Detector #3	N/A	
Detector #4	N/A	
Detector #5	N/A	

enter N/A for all non-existing detectors

SCM Procedure 003

Appendix A
Efficiency Measurement Documentation

Technician: Sukalak

Date: 11/20/97 0800

Detector Configuration : 28" Standard

High Voltage : 1340

Detctor Position Slope : 2.976744

Detctor Position Intercept : -1.00584

Calibration Source Information

Type (Name) : AM 241

Serial No.: DP 148

Activity: 400200 dpm

Uncertainty : 5%

Calibration Date : 10/14/93

Detector	Position Start Channel	Position Stop Channel	Overall Efficiency (%)
Detector #1	1	2043	25.74
Detector #2	—	N/A	—
Detector #3	—	N/A	—
Detector #4	—	N/A	—
Detector #5	—	N/A	—

* Place N/A in all blocks of non applicable detectors

SCM Procedure 003

Appendix A
Efficiency Measurement Documentation

Technician: Sukalac

Date: 11/20/97 0920

Detector Configuration : 52" recount

High Voltage : 1340

Detctor Position Slope : 2.015748

Detctor Position Intercept : -0.519619

Calibration Source Information

Type (Name) : Am 241

Serial No.: DP 148

Activity: 400200 dpm

Uncertainty : 5

Calibration Date : 10/14/93

Detector	Position Start Channel	Position Stop Channel	Overall Efficiency (%)
Detector #1	1	2043	27.5%
Detector #2	—	N/A	—
Detector #3	—	N/A	—
Detector #4	—	N/A	—
Detector #5	—	N/A	—

* Place N/A in all blocks of non applicable detectors

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/21/97

Detector Configuration: 52" Standard

High Voltage Setting: 1340

Calibration Source: Am 241 (DP 148)

Baseline Source Check Information

Date : 11/20/97

Detector Configuration: 52" Standard

High Voltage Setting : 1340

Calibration Source : Am 241 (DP 148)

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	35	N/A	N/A	N/A
Detector #1	114078	114043	110814	2.91%
Detector #2		N/A		
Detector #3		N/A		
Detector #4		N/A		
Detector #5		N/A		

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/21/97 11:00

Detector Configuration: 28" Standard

High Voltage Setting: ~~1500~~ 1340

Calibration Source: Am 241 (DP 148)

Baseline Source Check Information

Date : 11/20/97

Detector Configuration: 28" standard

High Voltage Setting : 1340

Calibration Source : Am 241 (DP148)

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	21	N/A	N/A	N/A
Detector #1	101804	101783	106655	4.6%
Detector #2			N/A	
Detector #3			N/A	
Detector #4			N/A	
Detector #5			N/A	

SCM Procedure 007

Appendix B
Daily Detector Response Check

Technician : Sukalac

Date : 11/21/97 1130

Detector Configuration: 28" Standard

High Voltage Setting: 1600

Calibration Source: CS-137 (SRM) 96CS100 2676

Baseline Source Check Information

Date : 11/15/97 @ 1510

Detector Configuration: 28" Standard

High Voltage Setting : 1600

Calibration Source : CS 137 96 CS 100 2676

Detector	Total Counts	Total Background Subtracted Counts	Total Baseline Background Subtracted Counts	Percent Difference from Baseline Measurement
Background for entire Array	2076	N/A	N/A	N/A
Detector #1	46666	44590	42760	4.28%
Detector #2	—	N/A	—	—
Detector #3	—	N/A	—	—
Detector #4	—	N/A	—	—
Detector #5	—	N/A	—	—

APPENDIX F:

PAINT SAMPLE DATA

Paint Sample Data from Building 301 Hot Cells Counted on the Tennelec

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta	gross dpm before alpha	gross dpm before beta	gross dpm after alpha	gross dpm after beta
Paint Scrape	335	East Wall	4,4.6		87P	3.17 ± 5.78	10.5 ± 19.2				
Paint Scrape	335	North Wall	7.6,4.9		85P	−1.00 ± 4.09	50.9 ± 23.5				
Paint Scrape	335	South Wall	15,5.3		86P	−1.00 ± 4.09	180.7 ± 33.9				
Paint Scrape	335	West Wall	13,2.1		88P	1.08 ± 4.09	16.4 ± 19.9				
				Minimum		−1.00 ± 4.09	10.5 ± 19.2				
				Maximum		3.17 ± 5.78	180.7 ± 33.9				
				Average		0.56 ± 4.52	64.6 ± 24.1				
				Standard Deviation		1.73 ± 0.73	68.8 ± 5.9				
				Count		4	4				
Paint Scrape	C−102 East	Floor	29.1,42.6		9P	−1.00 ± 4.09	568.8 ± 54.0	24.3	11,900	19	10,400
Paint Scrape	C−102 East	Floor	30.3,15		10P	3.17 ± 5.78	230.7 ± 37.1	24.3	2,684	72.8	2,532
Paint Scrape	C−102 East	South Wall	3.9,2.7		12P	3.17 ± 5.78	4.5 ± 18.5	4.9	1,822	24.3	1,727
Paint Scrape	C−102 East	South Wall	3.9,25.7		13P	1.08 ± 4.09	6.9 ± 18.8	14.6	1,556	14.6	1,444
Paint Scrape	C−102 East	West Wall	10.9,1.5		14P	−1.00 ± 4.09	39.0 ± 22.3	4.9	1,380	9.7	1,313
				Minimum		−1.00 ± 4.09	4.5 ± 18.5	4.9	1,380	9.7	1,313
				Maximum		3.17 ± 5.78	568.8 ± 54.0	24.3	11,900	72.8	10,400
				Average		1.08 ± 4.77	170.0 ± 30.1	14.6	3,868	28.1	3,483
				Standard Deviation		1.86 ± 0.83	216.3 ± 13.8	8.7	4,041	22.9	3,484
				Count		5	5	5	5	5	5
Paint Scrape	C−102 West	East Wall	2.8,6.6		20P	34.42 ± 16.84	129,387.8 ± 769.5	39	264,000	19.4	64,600
Paint Scrape	C−102 West	Floor	19.1,35.8		21P	1.08 ± 4.09	4,361.7 ± 142.4	0	26,900	9.7	30,100
Paint Scrape	C−102 West	Floor	19,34		22P	−1.00 ± 4.09	11,181.9 ± 226.8	9.7	50,100	24.3	59,700
Paint Scrape	C−102 West	Floor	15.3,33.9		23P	24.00 ± 14.15	2,986.7 ± 118.2	19.4	72,400	24.3	80,300
Paint Scrape	C−102 West	Floor	2.7,5.7		24P	−1.00 ± 4.09	21.2 ± 20.4	14.6	1,902	19.4	1,976
Paint Scrape	C−102 West	South Wall	4.8,14.9		18P	−1.00 ± 4.09	49.8 ± 23.4	14.6	1,394	9.7	1,384
Paint Scrape	C−102 West	South Wall	3,6.7		19P	−1.00 ± 4.09	353.3 ± 44.0	29.1	7,726	29.1	6,563
Paint Scrape	C−102 West	West Wall	4.8,2.6		17P	1.08 ± 4.09	3.3 ± 18.3	4.7	1,727	9.7	1,731
				Minimum		−1.00 ± 4.09	3.3 ± 18.3	0.0	1,394	9.7	1,384
				Maximum		34.42 ± 16.84	129,387.8 ± 769.5	39.0	264,000	29.1	80,300
				Average		7.07 ± 6.94	18,543.2 ± 170.4	16.4	53,269	18.2	30,794
				Standard Deviation		13.07 ± 4.98	42,046.9 ± 236.8	11.9	83,321	7.2	30,735
				Count		8	8	8	8	8	8
Paint Scrape	Cave 1		5.2,49.5		16P	1.08 ± 4.09	40.2 ± 22.5	19.4	1,508	19.4	1,566
Paint Scrape	Cave 1	East Wall	3.7,1.2		11P	1.08 ± 4.09	10,179.5 ± 216.5	29.1	48,700	14.6	31,800
Paint Scrape	Cave 1	East Wall	2.3,1.3		26P	1.08 ± 4.09	216.4 ± 36.2	24.3	2,641	14.6	5,687
Paint Scrape	Cave 1	Floor	3.2,2.9		25P	28.17 ± 15.28	2,681.9 ± 112.2	14.6	20,100	588	25,000
				Minimum		1.08 ± 4.09	40.2 ± 22.5	14.6	1,508	14.6	1,566
				Maximum		28.17 ± 15.28	10,179.5 ± 216.5	29.1	48,700	588.0	31,800
				Average		7.85 ± 6.89	3,279.5 ± 96.8	21.9	18,237	159.2	16,013
				Standard Deviation		11.73 ± 4.84	4,118.3 ± 77.1	5.4	19,069	247.6	12,702
				Count		4	4	4	4	4	4

Paint Sample Data from Building 301 Hot Cells Counted on the Tennelec

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta	gross dpm before alpha	gross dpm before beta	gross dpm after alpha	gross dpm after beta
Paint Scrape	Cave 2	East Wall	2.6,.8		28P	21.92 ± 13.55	59,840.2 ± 523.4	19.4	40,600	19.4	19,500
Paint Scrape	Cave 2	Floor	4,2.8		27P	34.42 ± 16.84	114,285.5 ± 723.2	53.8	488,000	58.8	607,000
Paint Scrape	Cave 2	Wall	4.6,22		15P	−1.00 ± 4.09	40.2 ± 22.5	24.3	1,317	9.7	1,263
				Minimum		−1.00 ± 4.09	40.2 ± 22.5	19.4	1,317	9.7	1,263
				Maximum		34.42 ± 16.84	114,285.5 ± 723.2	53.8	488,000	58.8	607,000
				Average		18.44 ± 11.49	58,055.3 ± 423.0	32.5	176,639	29.3	209,254
				Standard Deviation		14.67 ± 5.40	46,657.5 ± 294.8	15.2	220,749	21.2	281,347
				Count		3	3	3	3	3	3
Paint Scrape	Cave 3	Floor	4,8.7		29P	9.42 ± 9.13	15,840.2 ± 269.7	58.3	82,400	58.3	72,600
Paint Scrape	Cave 3	Floor	9.2,20		30P	1.08 ± 4.09	8,464.0 ± 197.6	58.6	437,000	68.4	478,000
				Minimum		1.08 ± 4.09	8,464.0 ± 197.6	58.3	82,400	58.3	72,600
				Maximum		9.42 ± 9.13	15,840.2 ± 269.7	58.6	437,000	68.4	478,000
				Average		5.25 ± 6.61	12,152.1 ± 233.7	58.5	259,700	63.4	275,300
				Standard Deviation		4.17 ± 2.52	3,688.1 ± 36.1	0.1	177,300	5.1	202,700
				Count		2	2	2	2	2	2
Paint Scrape	Cave 4A	East Wall	2.7,2.2		3P	1.08 ± 4.09	872.4 ± 65.6	9.7	2,037	29	1,947
Paint Scrape	Cave 4A	East Wall			78P	−1.13 ± 4.09	1,650.1 ± 88.7				
Paint Scrape	Cave 4A	North Wall	2.6,26.5		4P	3.17 ± 5.78	210.5 ± 35.8	24.3	2,360	19.4	2,104
Paint Scrape	Cave 4A	o/s floor	11.2,23.8		1P	1.08 ± 4.09	47.4 ± 23.2	9.7	1,832	0	1,801
Paint Scrape	Cave 4A	o/s floor	17,32.5		2P	5.25 ± 7.08	1,227.1 ± 77.0	9.7	21,500	9.7	8,000
				Minimum		−1.13 ± 4.09	47.4 ± 23.2	9.7	1,832	0.0	1,801
				Maximum		5.25 ± 7.08	1,650.1 ± 88.7	24.3	21,500	29.0	8,000
				Average		1.89 ± 5.03	801.5 ± 58.1	13.4	6,932	14.5	3,463
				Standard Deviation		2.16 ± 1.22	604.0 ± 24.8	6.3	8,413	10.8	2,622
				Count		5	5	4	4	4	4
Paint Scrape	Cave 4B	North Wall	0.6,12.5		7P	1.08 ± 4.09	47.4 ± 23.2	38.8	1,313	14.6	1,242
Paint Scrape	Cave 4B	North Wall	5.3,9.4		8P	−1.00 ± 4.09	3,290.2 ± 124.0	9.7	7,098	0	4,300
Paint Scrape	Cave 4B	o/s floor	11.2,9.4		5P	5.25 ± 7.08	160.5 ± 32.5	9.7	2,724	9.7	2,434
Paint Scrape	Cave 4B	o/s floor	11.5,18.8		6P	−1.00 ± 4.09	54.5 ± 23.9	9.7	1,781	0	1,832
				Minimum		−1.00 ± 4.09	47.4 ± 23.2	9.7	1,313	0.0	1,242
				Maximum		5.25 ± 7.08	3,290.2 ± 124.0	38.8	7,098	14.6	4,300
				Average		1.08 ± 4.84	888.1 ± 50.9	17.0	3,229	6.1	2,452
				Standard Deviation		2.55 ± 1.29	1,387.6 ± 42.4	12.6	2,291	6.3	1,147
				Count		4	4	4	4	4	4
Paint Scrape	D−101	Central Wall	3,8	East Side	50P	50.96 ± 20.42	10,843.0 ± 223.4	273	92,900	489	76,600
Paint Scrape	D−101	Central Wall	3.8,8.7	West Side	51P	3.04 ± 5.78	2,622.7 ± 111.0	73.9	65,500	62.5	51,200
Paint Scrape	D−101	East Wall	4.3,11.9	1st of 3 samples	55P	−1.13 ± 4.09	727.5 ± 60.4	28.4	4,400	5.7	4,000
Paint Scrape	D−101	East Wall	4.3,11.9	2nd of 3 samples	55P	3.04 ± 5.78	677.5 ± 58.5				
Paint Scrape	D−101	East Wall	4.3,11.9	3rd of 3 samples	55P	7.21 ± 8.17	620.3 ± 56.2				
Paint Scrape	D−101	East Wall	.3,26.2	Left corner	56P	11.38 ± 10.01	7,270.3 ± 183.2	366	339,000	74.1	215,000
Paint Scrape	D−101	Floor	1.6,5.6		43P	7.21 ± 8.17	3,284.6 ± 123.9	62.6	93,100	79.7	110,000
Paint Scrape	D−101	Floor	16.5,.4		44P	0.96 ± 4.09	337.0 ± 43.2	90.9	12,100	56.8	12,800
Paint Scrape	D−101	Floor	22,8.4		45P	0.96 ± 4.09	2,965.6 ± 117.8	45.5	59,900	39.8	71,100
Paint Scrape	D−101	Floor	25.7,13.3		46P	7.21 ± 8.17	8,987.0 ± 203.5	56.9	62,500	22.8	73,200
Paint Scrape	D−101	Floor	17.5,9.7		47P	11.38 ± 10.01	14,066.8 ± 254.3	17.1	153,000	22.8	186,000
Paint Scrape	D−101	Floor	13.8,16.7		48P	7.21 ± 8.17	970.3 ± 69.0	11.4	23,100	22.7	23,400

Paint Sample Data from Building 301 Hot Cells Counted on the Tennelec

Type	Room	Location	Coordinate X,Y,Z	Item Number	No.	dis/min Alpha	dis/min Beta	gross dpm before alpha	gross dpm before beta	gross dpm after alpha	gross dpm after beta
Paint Scrape	D−101	Floor	7,9.3		49P	0.96 ± 4.09	1,432.3 ± 82.9	62.6	65,700	119	72,600
Paint Scrape	D−101	North Wall	5,1.6		54P	−1.13 ± 4.09	7,050.1 ± 180.5	415	18,300	34.1	2,600
Paint Scrape	D−101	West Wall	2.3,11.4		52P	−1.13 ± 4.09	2,606.1 ± 110.6	5.7	26,500	17.1	22,000
Paint Scrape	D−101	West Wall	4.1,18.9		53P	17.63 ± 12.25	31,093.0 ± 377.5	51.4	282,000	28.6	322,000
				Minimum		−1.13 ± 4.09	337.0 ± 43.2	5.7	4,400	5.7	2,600
				Maximum		50.96 ± 20.42	31,093.0 ± 377.5	415.0	339,000	489.0	322,000
				Average		7.86 ± 7.59	5,972.1 ± 141.0	111.5	92,714	76.8	88,750
				Standard Deviation		12.27 ± 4.18	7,634.7 ± 88.1	130.3	97,338	118.1	89,333
				Count		16	16	14	14	14	14
Paint Scrape	D−109	East Wall	3.6,7.8	Top	62P	0.96 ± 4.09	364.4 ± 44.6	23.7	43,700	5.9	39,500
Paint Scrape	D−109	East Wall	3.7,15.4		66P	0.96 ± 4.09	75.1 ± 25.8	11.8	2,900	41.4	2,500
Paint Scrape	D−109	Floor	1.3,52.5		57P	0.96 ± 4.09	2,781.1 ± 114.2	71.1	45,700	53.3	49,400
Paint Scrape	D−109	Floor	12.5,47.7		58P	0.96 ± 4.09	2,103.7 ± 99.7	136	31,400	142	33,400
Paint Scrape	D−109	Floor	23,55	Front side	59P	5.13 ± 7.08	5,770.3 ± 163.4	243	171,000	392	191,000
Paint Scrape	D−109	Floor	4.6,19.5		60P	−1.13 ± 4.09	2,550.1 ± 109.5	11.8	42,800	29.6	48,800
Paint Scrape	D−109	Floor	1.6,68.5		61P	17.63 ± 12.25	36,816.8 ± 410.7	143	704,000	114	881,000
Paint Scrape	D−109	North Wall	2.6,26.9		64P	13.46 ± 10.81	12,837.0 ± 243.0	82.9	15,100	23.7	4,300
Paint Scrape	D−109	South Wall	.9,44.3	Face	63P	3.04 ± 5.78	60.8 ± 24.5	35.5	33,200	41.4	33,800
Paint Scrape	D−109	South Wall	20.8,2.2		65P	−1.13 ± 4.09	97.7 ± 27.8	29.6	2,400	23.7	1,900
				Minimum		−1.13 ± 4.09	60.8 ± 24.5	11.8	2,400	5.9	1,900
				Maximum		17.63 ± 12.25	36,816.8 ± 410.7	243.0	704,000	392.0	881,000
				Average		4.08 ± 6.05	6,345.7 ± 126.3	78.8	109,220	86.7	128,560
				Standard Deviation		6.06 ± 2.92	10,815.2 ± 115.7	71.2	203,403	109.5	256,132
				Count		10	10	10	10	10	10
Paint Scrape	North Corridor	East Wall	4.5,3.7	4B	77P	−1.13 ± 4.09	206.1 ± 35.6	45.5	3,500	17	2,800
Paint Scrape	North Corridor	Floor	6.8,89.7		69P	0.96 ± 4.09	2,623.9 ± 111.0	5.7	38,600	11.4	42,200
Paint Scrape	North Corridor	Floor	3.3,73.6		70P	9.29 ± 9.14	6,893.0 ± 178.5	28.4	84,800	34.1	107,000
Paint Scrape	North Corridor	Floor	54.3,7.1		71P	5.13 ± 7.08	38,826.3 ± 421.8	40	391,000	80	436,000
Paint Scrape	North Corridor	Floor	1,42.1		72P	138.46 ± 33.42	311,366.8 ± 1,193.4	15,000	7,400,000	12,100	7,100,000
Paint Scrape	North Corridor	Floor	6.3,11		73P	34.29 ± 16.84	32,395.3 ± 385.3	4,800	741,000	131	148,000
Paint Scrape	North Corridor	North Wall	3.7,36.3	4A	75P	55.13 ± 21.22	8,190.6 ± 194.4	3,000	43,300	1,800	19,600
Paint Scrape	North Corridor	South Wall	5.4,50.8 Center	1st of 2 samples	76P	3.04 ± 5.78	1,620.3 ± 87.9	51	24,700	28,400	14,500
Paint Scrape	North Corridor	South Wall	5.4,50.8 Center	2nd of 2 sample	76P	−1.13 ± 4.09	1,460.8 ± 83.7				
Paint Scrape	North Corridor	West Wall	3.6,6		74P	−1.13 ± 4.09	600.1 ± 55.4	17	4,400	17	3,200
				Minimum		−1.13 ± 4.09	206.1 ± 35.6	5.7	3,500	11.4	2,800
				Maximum		138.46 ± 33.42	311,366.8 ± 1,193.4	15,000.0	7,400,000	28,400.0	7,100,000
				Average		24.29 ± 10.99	40,418.3 ± 274.7	2,554.2	970,144	4,732.3	874,811
				Standard Deviation		41.97 ± 9.37	91,266.9 ± 331.2	4,694.4	2,285,280	9,157.2	2,204,747
				Count		10	10	9	9	9	9
Summary of Building 301 Hot Cells Paint Scrapings											
				Minimum		−1.13 ± 4.09	3.3 ± 18.3	0.0	1,313	0.0	1,242
				Maximum		138.46 ± 33.42	311,366.8 ± 1,193.4	15,000.0	7,400,000	28,400.0	7,100,000
				Average		8.24 ± 7.17	13,123.9 ± 147.8	412.1	202,062	726.2	189,385
				Standard Deviation		19.52 ± 5.27	41,869.3 ± 196.2	1,979.6	927,586	3,829.4	891,220
				Count		71	71	63	63	63	63

REQUEST FOR TECHNICAL SERVICES

Analytical Chemistry Laboratory/Argonne National Laboratory

DATE 1/27/98			
SUBMITTED BY (Print Name): Dolores C Geraghty	DIVISION: ES&H/HP	LOCATION: 20 D	PHONE: 3552
COST CODE NUMBER: 95234-18-234	COST CODE AUTHORIZATION (Signature): Dolores C Geraghty		
NAME OF PROGRAM/PROJECT SUPPORTING THIS WORK: 301 Characterization			
REPORT RESULTS TO: (Print Names) M. J. Robinet	DIVISION: ES&H-HP	LOCATION: 201	PHONE: 3326
Bruce Murdoch	DIVISION: ES&H-HP	LOCATION: 360	PHONE: 4905
Dolores Geraghty	DIVISION: ES&H-HP	LOCATION: 200	PHONE: 3552

It is agreed that publication of the data resulting from this analysis will provide appropriate acknowledgment for the analysts involved.

DESCRIBE TECHNICAL SERVICE NEEDED (Identify specific procedures to be used, if required):

Samples: 10 HCEL, 11 HCEL, 12 HCEL, 13 HCEL
γ Spec

Sample 14 HCEL: Gross α & β, pH, Total Metals
Sump Pump Water VOC, Semi Volatiles

Sample 22 HCEL: Paint Sample for PCB

ANALYTICAL REQUIREMENTS (Accuracy, Detection Limits; Subject to Regulatory Holding Times; etc.):

SAMPLE DESCRIPTION (Approximate Composition, Solvent, etc.):
10 HCEL - Smear, 11 HCEL - Smear - filter media,
12 HCEL - BRICK, 13 HCEL - Smear, 14 HCEL - Sump pump water
22 HCEL - PAINT CHIPS

INFORMATION BELOW IS IMPORTANT TO ENSURING THE SAFETY OF ANALYSTS WORKING WITH YOUR SAMPLES. PLEASE BE COMPLETE.

RADIOACTIVITY:	TYPE:	LEVEL (dpm ~~cm²/hr~~)
☐ NO	☐ DISPERSIBLE	ALPHA 1150
☒ YES	☐ NONDISPERSIBLE	BETA 9.5K
☐ DON'T KNOW	☒ LOOSE IN PACKAGE	GAMMA

SPM TRANSFER DOCUMENT NO.:

HEALTH PHYSICS SURVEY BY (Signature): D. C. Geraghty

POTENTIAL HEALTH HAZARD OR SPECIAL WASTE DISPOSAL (Carcinogenic, toxic, etc.): ☐ NO ☐ YES
DESCRIBE:
None

SAMPLE ORIGIN (Sample history, source, manufacturer, etc.):
301 Characterization Hot Cells

SPECIAL HANDLING REQUIRED: ☒ NO ☐ YES
DESCRIBE:

REMARKS (If more space is necessary, continue on back):

Submitter's Sample No.	ACL Sample No.
10 HCEL	
11 HCEL	
12 HCEL	
13 HCEL	
14 HCEL	
22 HCEL	

FOR ACL OFFICE USE ONLY

ANALYSTS ASSIGNED:	ESTIMATED HOURS:	DATE REPORTED:

ANL-60 (5-96)

ACL 200 Rev.

APPENDIX G:

CONCRETE SAMPLE DATA

This appendix contains the following information pertaining to 3-inch diameter concrete bore samples taken from the first level floors:

- locator map for the ten sample locations (numbers in circles)
- noteboook entries for preliminary gamma activity scan data with NE, PG2, and shielded NaI detector chamber, to selected candidates for laboratory gamma spectrometry
- service request for analytical services from ANL-E ACL for gamma spectrometry
- gamma spectrometry report on the selected samples.

Photographs of the coring process and of the collected samples may be found in Appendix A.

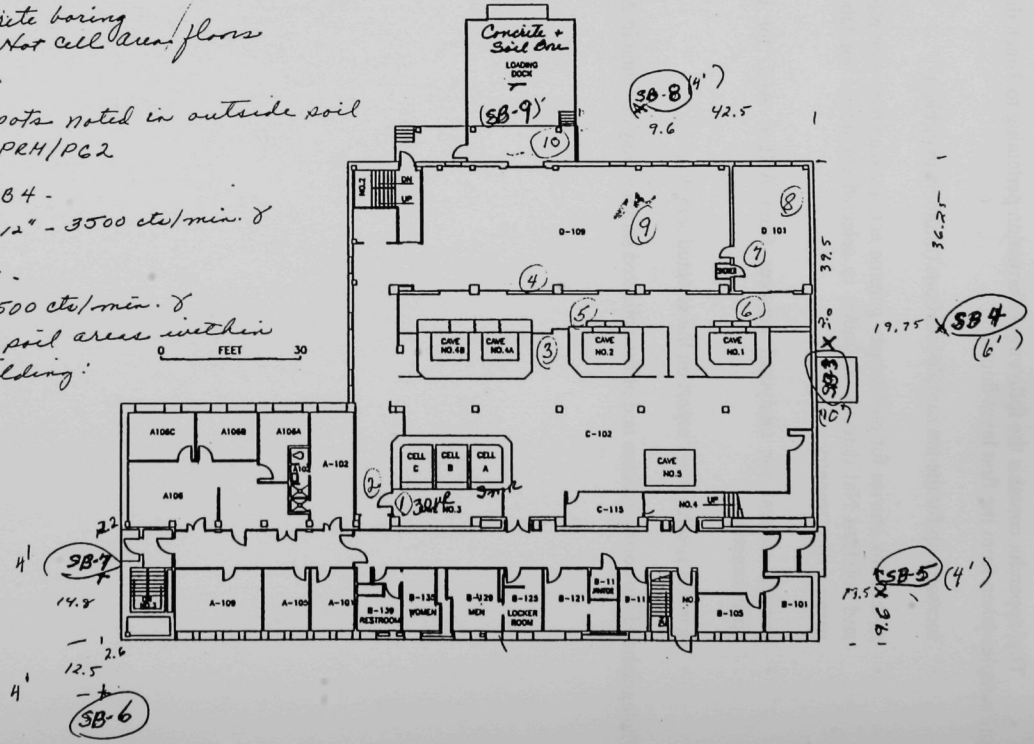
Dec 97 MRDC
Soil Boring Positions

Dec-5, 1997
Concrete boring
in Hot cell area floors

2 Hot Spots noted in outside soil
with PRM/PCZ

(1) Area by SB4 -
~ 12" x 12" - 3500 cts/min. γ

(2) By SB7 -
3"x3" - 500 cts/min. γ
all other soil areas within
30' of building:
NCD γ



G-4

1/8/87 N. C. Geraghty

5 Min. Bkgd. Count 1467

Sample #	Net Reading Dis/Min (Mid) NE	σ	PC2	Shield NaI	Ch/Min NaI			
Core 1								NE 1697 (in Mn) Bkgd. 11.8 dpm 1272 dpm.
Section 1	18.3K	40	3K	2500-(1470)		23HCEL		PC2 al(280) Bkgd. 500 ct/m
" 2	962	48	500.0	1541-(1470)				Nal in Pb pot. ±14 with Al & Screw
" 3	490	48	500.0	1435-(1470)		24HCEL		5 Min Count 1470
								← Core 3 near door (circle)
Core 2	NE σ	~	PC2	Nal	Nal	25HCEL		W Corridor
Section 1	3.883	66.9	0	1755-(1470)				
" 2	439	12	0	1429-(1470)				
" 3	374	18	0	1500-(1470)				
" 4	100	11.7	0	1492-(1470)				← bubble from core
Core 3	NE σ	~	PC2	NAI		~~15HCEL~~		N-C C-102 ± WEST
Section 1	4274	6.8	500	1796 (1470)				
" 2	100	0	0	1475-(1470)				
Core 4	σ	~						D-109 door by cells
Section 1	22.8K	60	3000	3206 - 1470		27H σ		
2	68	0	0	1501 - 1470				
3	60	24	0	1447 - 1470				
Core 5	σ	~						
Section 1	28.2K	40	3500	3642 - 1470		29HCEL		N Corridor
2	165	30	0	1485 - 1470				by Cave 2 do
3	138	0	0	1506 - 1470				near hatch spc
4	111	24	0	1500 - 1470		29HCEL		
Core 6	σ	~						N Corrido
Section 1	21K	60	2800	2435 - 1470		30HCEL	33cm	by Cave 1 d
2	0	60	0	1477 - 1470				
3	50	36	0	1524 - 1470				
4	38	18	0	1444 - 1470				

1/8/97 Continued from Page 7 D. C. Hedges

	BR	α	PC2	NAT SMin	NAT 1Min	
Core 7						
Section 1	17.4K	7	3500	1402-1470	31HCEL	D101
2	657	6	0	1513-1470		Crack by D.
3	310	6	0	1526-1470		
4	650	0	0	1472-1470		
Core 8						
Section 1	5230	6	500	1708-1470	32HCEL	D101
2	10	0	0	1404-1470		
3	0	0	0	1454-1470		
Core 9						
Section 1	1732	18	200	1465-1470	33HCEL	D-109
2	100	6	0	1407-1470	34HCEL	(Mod by Conbe
3	0	30	0	1448-1470		
4	235	0	0	1394-1470		
Core 10						
Section 1	1146	6	100	1340-1470	35HCEL	Loading Dock
2	8	0	0	1465-1470		(Upper)
3	518	6	0	1516-1470	36HCEL	
Core SB9 — Loading Dock						
Section 1	302	30	100	1381-1470		Loading Dock
2	140	0	0	1484-1470		(Lower)
3	81	6	0	1435-1470		

4 Area cut around core so soil sample could be taken

REQUEST FOR TECHNICAL SERVICES

Analytical Chemistry Laboratory/Argonne National Laboratory

DATE: 1/27/98

SUBMITTED BY (Print Name)	DIVISION	LOCATION	PHONE
DOLORES C. GERAGHTY	ESH/HP	20D	3552

COST CODE NUMBER: 95234-18-234

COST CODE AUTHORIZATION (Signature): Dolores C Geraghty

NAME OF PROGRAM/PROJECT SUPPORTING THIS WORK: 301 Characterization

REPORT RESULTS TO: (Print Names)	DIVISION	LOCATION	PHONE
H. J. Roberet	ESH-HP	201	3326
Bruce Murdock	ESH-HP	360	4905
Dolores Geraghty	ESH-HP	20D	3552

It is agreed that publication of the data resulting from this analysis will provide appropriate acknowledgment for the analysts involved.

DESCRIBE TECHNICAL SERVICE NEEDED (Identify specific procedures to be used, if required):

γ Spec

ANALYTICAL REQUIREMENTS (Accuracy, Detection Limits; Subject to Regulatory Holding Times; etc.):

SAMPLE DESCRIPTION (Approximate Composition, Solvent, etc.):

Concrete samples

INFORMATION BELOW IS IMPORTANT TO ENSURING THE SAFETY OF ANALYSTS WORKING WITH YOUR SAMPLES. PLEASE BE COMPLETE.

RADIOACTIVITY:	TYPE:	LEVEL (dpm ~~[illegible]~~):
☐ NO	☐ DISPERSIBLE	ALPHA 200
☒ YES	☐ NONDISPERSIBLE	BETA 4 to 22K
☐ DON'T KNOW	☐ LOOSE IN PACKAGE	GAMMA

SPM TRANSFER DOCUMENT NO.:

HEALTH PHYSICS SURVEY BY (Signature): D. C. Geraghty

POTENTIAL HEALTH HAZARD OR SPECIAL WASTE DISPOSAL (Carcinogenic, toxic, etc.): ☒ NO ☐ YES
DESCRIBE:

SAMPLE ORIGIN (Sample history, source, manufacturer, etc.):

Hot Cells 301 - Floor Concrete

SPECIAL HANDLING REQUIRED: ☒ NO ☐ YES
DESCRIBE:

REMARKS (If more space is necessary, continue on back):

Submitter's Sample No.	ACL Sample No.
23 HCEL	Core 1 Section 1
24 HCEL	Core 1 Section 3
25 HCEL	Core 2 Section 1
26 HCEL	Core 3 Section 1
27 HCEL	Core 4 Section 1
28 HCEL	Core 5 Section 1
29 HCEL	Core 5 Section 4
30 HCEL	Core 6 Section 1
31 HCEL	Core 7 Section 1
32 HCEL	Core 8 Section 1
33 HCEL	Core 9 Section 1
34 HCEL	Core 9 Section 2
35 HCEL	Core 10 Section 1
36 HCEL	Core 10 Section 3
37 HCEL	Core 5 B 9 Section 1

FOR ACL OFFICE USE ONLY

ANALYSTS ASSIGNED:	ESTIMATED HOURS:	DATE REPORTED:

ACL Job No.

ANL-80 (5-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Concrete, 301 Characterization — Date Received: 1/28/98

Submitted by: Dolores Geraghty, ESH/HP — Date Reported: 2/17/98

Submitter's Sample No.	ACL Sample No.	Weight of Sample (g)	Gamma Spec.; (pCi/g) ^{60}Co	^{137}Cs	^{214}Bi
23 HCEL	98-8099-01	302	3.40 ± 0.20	149 ± 7	11.0 ± 1.1
24 HGEL	-02	364	< 0.2	1.7 ± 0.2	6.7 ± 0.7
25 HCEL	-03	97	0.30 ± 0.03	20.0 ± 1.0	0.77 ± 0.08
26 HCEL	-04	256	< 0.2	123 ± 6	2.6 ± 0.3
27 HCEL	-05	356	1.2 ± 0.1	113 ± 6	4.9 ± 0.5
28 HCEL	-06	227	< 0.2	2424 ± 121	8.1 ± 1.2
29 HCEL	-07	415	< 0.2	< 0.2	< 0.2
30 HCEL	-08	117	0.70 ± 0.11	2590 ± 130	8.1 ± 1.2
31 HCEL	-09	179	3.6 ± 0.4	3635 ± 180	< 0.2
32 HCEL	-10	145	< 0.2	440 ± 22	9.1 ± 1.4
33 HCEL	-11	174	< 0.2	190 ± 10	8.8 ± 0.9
34 HCEL	-12	402	< 0.2	< 0.2	0.83 ± 0.08
35 HCEL	-13	217	< 0.2	58.4 ± 2.9	1.5 ± 0.1
36 HCEL	-14	337	< 0.2	< 0.2	< 0.2
37 HCEL	-15	112	< 0.2	< 0.2	< 0.2

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call T. TenKate at 2- 4291.

Reference(s): CMT Logbook No. 1498, p. 42
CMT Logbook No. 1110, Det. 2, 4, 7, 11, p. 81.

es To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, D. Bowers, F. Martino, T. TenKate

Analyst(s): T. TenKate

T

/law
2/17/98
CMT-84 (9-96)

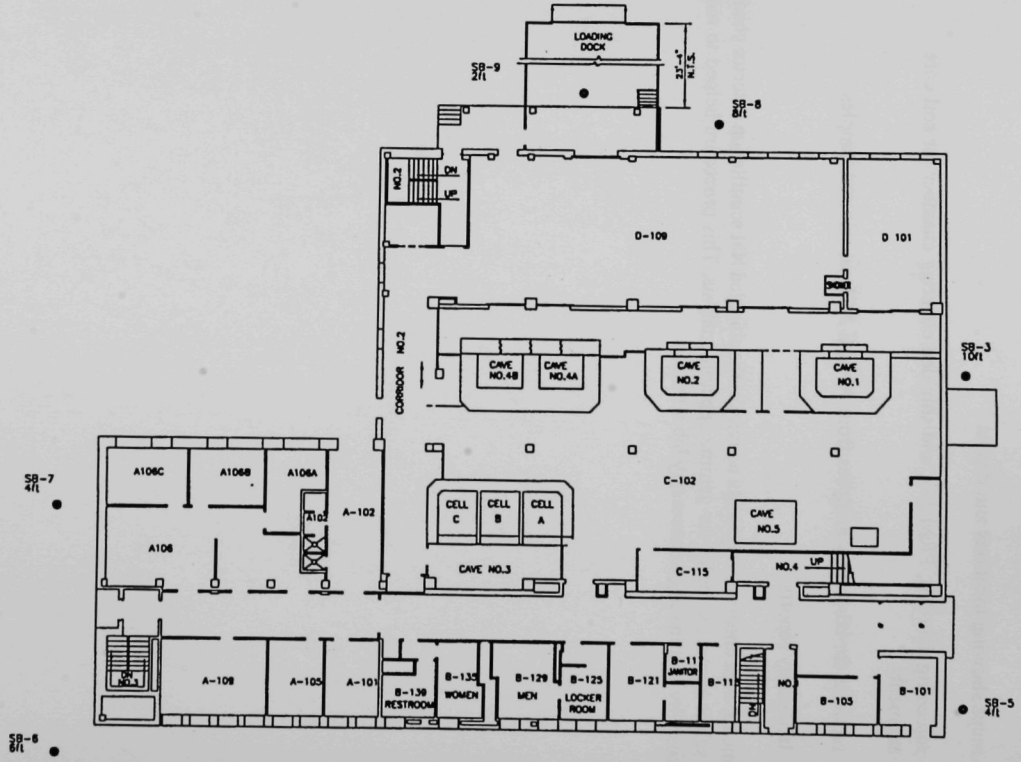
APPENDIX H:

SOIL SAMPLE DATA

This Appendix contains the following documentation for soil samples taken both outside the building and in the service trench:

- maps showing locations and depths
- screening data NE, PRM 5-3, and shielded counting chamber for soil core segments
- requests for laboratory analyses from ANL-E ACL on selected samples
- laboratory reports.

Sample segments were checked for gamma activity in the shielded NaI scintillation detector chamber in order to select suspect samples for gamma spectral analysis. This procedure helped to reduce laboratory costs by eliminating unnecessary lab work.



BUILDING 301
EXTERIOR SOIL BORE LOCATIONS AND DEPTHS

301 soil samples

SB- #	Depth (feet)	NE ct (1min) (dpm)	PRM5-3 /PG2 (cpm)	NaI (5min)	NaI (cpm)	Date	Init	Comment
9	0-1	1275	500	1560	312	12/06/97	LHSJr	
9	1-2	1350	500	1640	328	12/06/97	LHSJr	
8	0-1	1200	500	1680	336	12/06/97	LHSJr	
8	1-2	1300	500	1725	345	12/06/97	LHSJr	
8	2-3	1275	500	1660	332	12/06/97	LHSJr	
8	3-4	1470	500	1770	354	12/06/97	LHSJr	
8	4-4.8	1450	500	1625	325	12/06/97	LHSJr	
7	0-1	1670	500	1480	296	12/10/97	LHSJr	
7	1-2	1515	500	1576	315.2	12/10/97	LHSJr	
7	2-3	1440	500	1500	300	12/10/97	LHSJr	
7	3-4	1645	500	1560	312	12/10/97	LHSJr	
6	0-1	1560	500	1475	295	12/10/97	LHSJr	
6	1-2	1495	500	1650	330	12/10/97	LHSJr	
6	2-3	1480	500	1640	328	12/10/97	LHSJr	
6	3-4	1710	500	1625	325	12/10/97	LHSJr	
6	4-5	1525	500	1610	322	12/10/97	LHSJr	
6	5-5.9	1675	500	1590	318	12/10/97	LHSJr	
5	0-1	1660	500	1675	335	12/10/97	LHSJr	
5	1-2	1540	500	1680	336	12/10/97	LHSJr	
5	2-3	1500	500	1670	334	12/10/97	LHSJr	
5	3-3.7	1470	500	1520	304	12/10/97	LHSJr	
4	0-1	1515	500	1665	333	12/10/97	LHSJr	
4	1-2	1400	500	1490	298	12/10/97	LHSJr	
4	2-3	1450	500	1580	316	12/10/97	LHSJr	
3	0-1	1670	500	1575	315	12/10/97	LHSJr	
3	1-2	2000	500	1900	380	12/10/97	LHSJr	
3	2-3	1745	500	1610	322	12/10/97	LHSJr	
3	3-4	1460	500	1620	324	12/10/97	LHSJr	
3	4-5	1690	500	1805	361	12/10/97	LHSJr	

301 soil samples

SB- #	Depth (feet)	NE ct (1min) (dpm)	PRM5-3 /PG2 (cpm)	NaI (5min)	NaI (cpm)	Date	Init	Comment
3	5-6	1750	500	1650	330	12/10/97	LHSJr	
3	6-7	1400	500	1600	320	12/10/97	LHSJr	
3	7-8	1350	500	1540	308	12/10/97	LHSJr	
3	8-9	1540	500	1690	338	12/10/97	LHSJr	
3	9-9.6	1460	500	1695	339	12/10/97	LHSJr	

REQUEST FOR TECHNICAL SERVICES

Analytical Chemistry Laboratory/Argonne National Laboratory

DATE: 12/16/97

SUBMITTED BY (Print Name)	DIVISION	LOCATION	PHONE
DOLORES GERAGHTY	ES H/HP	200	3552

COST CODE NUMBER: 95 234 18 234

COST CODE AUTHORIZATION (Signature): Dolores C Geraghty

NAME OF PROGRAM/PROJECT SUPPORTING THIS WORK: 301 HOT Cell CHARACTERIZATION

REPORT RESULTS TO: (Print Names)	DIVISION	LOCATION	PHONE
Bruce Murdoch	ES H/HP	360	4905
Mac Rabiejet	ES H/HP	201	3376
Dolores C Geraghty	ES H/HP	200	3552

It is agreed that publication of the data resulting from this analysis will provide appropriate acknowledgment for the analysts involved.

DESCRIBE TECHNICAL SERVICE NEEDED (Identify specific procedures to be used, if required):

8 Spec (7) soil samples

plus sample 18 HCL SB6 (1'-2') needs Tritium analysis -

ANALYTICAL REQUIREMENTS (Accuracy, Detection Limits; Subject to Regulatory Holding Times; etc.):

Test weight of sample

SAMPLE DESCRIPTION (Approximate Composition, Solvent, etc.):

Soil

INFORMATION BELOW IS IMPORTANT TO ENSURING THE SAFETY OF ANALYSTS WORKING WITH YOUR SAMPLES. PLEASE BE COMPLETE.

RADIOACTIVITY:	TYPE:	LEVEL (dpm or mR/h):
☐ NO	☒ DISPERSIBLE	ALPHA
☐ YES	☐ NONDISPERSIBLE	BETA
☒ DON'T KNOW	☐ LOOSE IN PACKAGE	GAMMA

SPM TRANSFER DOCUMENT NO.:

HEALTH PHYSICS SURVEY BY (Signature):

POTENTIAL HEALTH HAZARD OR SPECIAL WASTE DISPOSAL (Carcinogenic, toxic, etc.): ☐ NO ☐ YES
DESCRIBE:

SAMPLE ORIGIN (Sample history, source, manufacturer, etc.):

301 environmental soil samples

SPECIAL HANDLING REQUIRED: ☐ NO ☐ YES
DESCRIBE:

REMARKS (If more space is necessary, continue on back):

RUSH

Submitter's Sample No.	ACL Sample No.
~~9 HCL SB3 (1'-2')~~	
~~10 HCL SB3 (4'-7.5')~~	
15 HCL SB3 (1'-2')	
16 HCL SB3 (4'-7.5')	
17 HCL SB3 (9'-9'6")	
18 HCL SB6 (1'-2')	
19 HCL SB7 (2'-3')	
20 HCL SB8 (1'-2')	
21 HCL SB8 (3'-4')	

FOR ACL OFFICE USE ONLY

ANALYSTS ASSIGNED:	ESTIMATED HOURS:	DATE REPORTED:

ANL-80 (5-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: 301 Hot Cell Characterization, Soil Samples — Date Received: 12/17/97

Submitted by: Dolores Geraghty, ESH/HP — Date Reported: 12/19/97

Submitter's Sample No.	ACL Sample No.	Gamma Spec.; (pCi/g)			
		^{226}Ra	^{214}Bi	^{137}Cs	Weight of sample (g)
15 HCL SB3 (1' - 2')	98-8057-01	0.52 ± 0.05	0.39 ± 0.04	4.36 ± 0.13	136.26
16 HCL SB3 (4' - 7'5")	-02	1.15 ± 0.12	0.84 ± 0.08	<0.2	131.21
17 HCL SB3 (9' - 9'6")	-03	0.71 ± 0.06	0.88 ± 0.07	<0.2	153.26
18 HCL SB6 (1' - 2')	-04	1.48 ± 0.15	1.00 ± 0.10	<0.2	124.27
19 HCL SB7 (2' - 3')	-05	0.37 ± 0.03	0.46 ± 0.04	0.22 ± 0.02	145.91
20 HCL SB8 (1' - 2')	-06	0.88 ± 0.04	0.83 ± 0.02	<0.2	164.84
21 HCL SB8 (3' - 4')	-07	1.25 ± 0.09	0.82 ± 0.07	<0.2	158.91

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call T. TenKate at 2- 4291 .

eference(s): CMT Logbook No. 1498, p. 22; CMT Logbook No. 938, Det. 3, p. 159; CMT Logbook No. 1110, Det. 2, 4, 7, 11, pp. 65, 57.

Copies To: D. Geraghty, B. Murdoch, M. Robinet, D. Green, D. Bowers, F. Martino, T. TenKate, L. Smith

Analyst(s): T. TenKate

TT

/law
12/22/97

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: ANL-East Hot Cell Characterization Soil — Date Received: 12/16/97

Submitted by: D. Geraghty, ESH-HP, 200 — Date Reported: 12/23/97

Submitter's Sample No.	ACL Sample No.	Tritium and Percent Moisture	
		^{3}H (pCi/g soil)	% Moisture
18 HCL SB6	98-8057-01	< 0.58	8.2

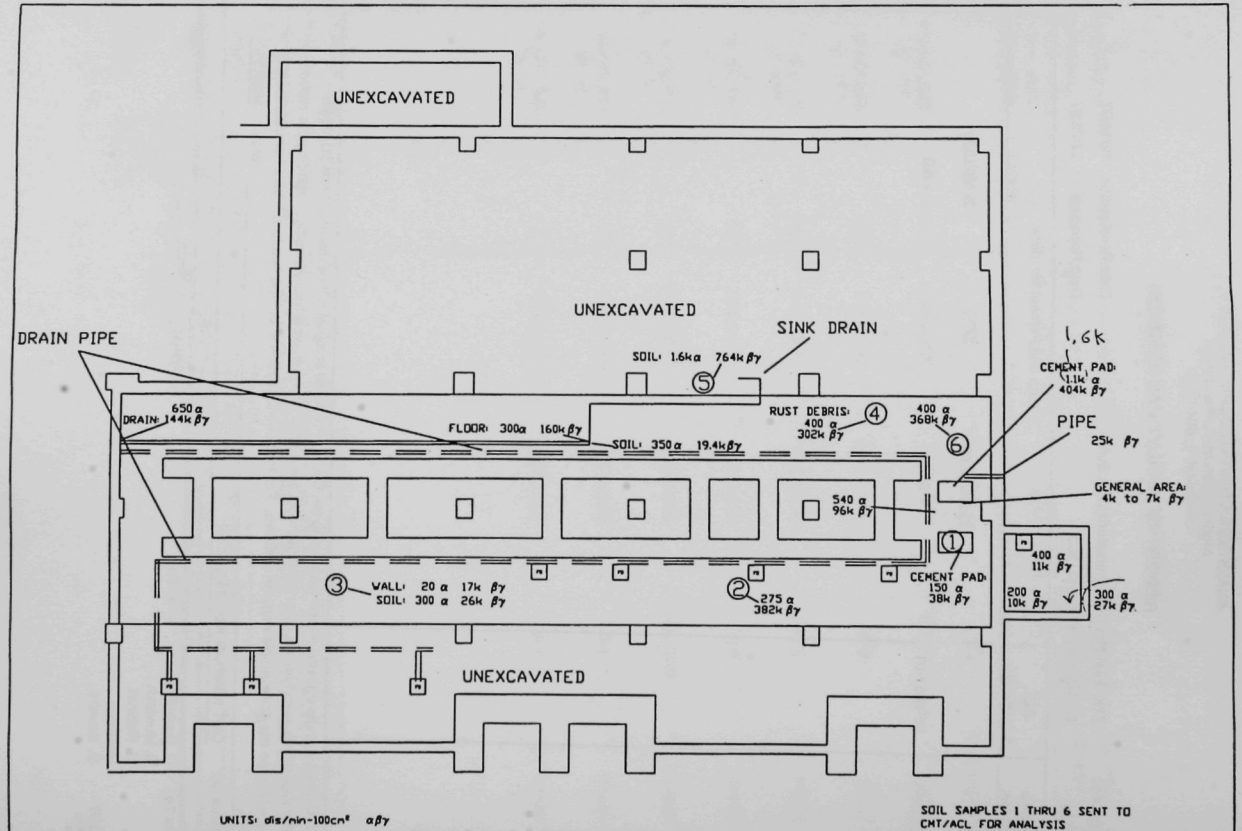
NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. Smith at 2- 1890 .

Reference(s): CMT Notebook No. 1493, p. 34.

Copies To: D. Geraghty, B. Murdoch, M. Robinet, D. Green, D. Bowers, L. Smith

Analyst(s): L. Smith

/law
12/23/97
CMT-84 (9-96)



BUILDING 301 PIT AREA

301 Hot Cells 50:1 21 Oct 97

A	1 HCEL	#1	@ Twins	13:10	33 k d/m β/γ	~~21 Oct 97~~
B	2 HCEL	#2	N.E. Side Bed	13:20	48 k d/m	
C	3 HCEL	#3	N. Side W	13:30	6 k	
G	4 HCEL	#4	Debris	13:50	210 k	
F	5 HCEL	#5	Dirt Clump	14:20	850 k	
H	6 HCEL-1	#5	0-3.5"	10:00	305 k	
	6 HCEL-2		3.5-7.0"	10:20	2500	
	6 HCEL-3		7.0-10.5"	10:40	3200	
	6 HCEL-4		10.5"-14.0	11:00	600	
	7 HCEL	Cove 4 Roof		30 Oct 97	18:00	1700 Magnetite
	8 HCEL	Cove 3 Roof tape		30 Oct 97	18:30	20 k
	9 HCEL	SS Glove Box Drain		31 Oct 97	09:30	45 k α, 11 k β

QUEST FOR TECHNICAL SERVICES

Analytical Chemistry Laboratory/Argonne National Laboratory

DATE: 31 Oct 97

SUBMITTED BY (Print Name)	DIVISION	LOCATION	PHONE
Dolores Geraghty	BSH/HP	200	2-3552

COST CODE NUMBER: 95 234 18-234

COST CODE AUTHORIZATION (Signature): Dolores C. Geraghty

NAME OF PROGRAM/PROJECT SUPPORTING THIS WORK: ATSR

REPORT RESULTS TO: (Print Names)	DIVISION	LOCATION	PHONE
Charlotte Sholeen	BSH/HP	306	2-6179
Mac Robinet	BSH/HP	201	2-3326
Dolores Geraghty	BSH/HP	200	2-3552

It is agreed that publication of the data resulting from this analysis will provide appropriate acknowledgment for the analysts involved.

DESCRIBE TECHNICAL SERVICE NEEDED (Identify specific procedures to be used, if required):

γ-SPEC

EXCEPT:

5-HCEL - α SPEC, Pure Beta Analysis

ANALYTICAL REQUIREMENTS (Accuracy, Detection Limits; Subject to Regulatory Holding Times; etc.):

SAMPLE DESCRIPTION (Approximate Composition, Solvent, etc.):

SOIL, SMEARS.

INFORMATION BELOW IS IMPORTANT TO ENSURING THE SAFETY OF ANALYSTS WORKING WITH YOUR SAMPLES. PLEASE BE COMPLETE.

RADIOACTIVITY:	TYPE:	LEVEL (dpm or mR/h):
☐ NO	☒ DISPERSIBLE	ALPHA 4710 45kdpm
☒ YES	☐ NONDISPERSIBLE	BETA 1470 850k
☐ DON'T KNOW	☐ LOOSE IN PACKAGE	GAMMA S

SPM TRANSFER DOCUMENT NO.:

HEALTH PHYSICS SURVEY BY (Signature): [signature]

POTENTIAL HEALTH HAZARD OR SPECIAL WASTE DISPOSAL (Carcinogenic, toxic, etc.): ☐ NO ☐ YES

DESCRIBE:

SEE ATTACHED MAP FOR LOCATIONS

SAMPLE ORIGIN (Sample history, source, manufacturer, etc.):

316-ATSR
301-Hot Cells

SPECIAL HANDLING REQUIRED: ☐ NO ☐ YES

DESCRIBE:

ask for chemical analysis

Magnetic

REMARKS (If more space is necessary, continue on back):

~~Cave 3 Roof Tape~~

Cave 3 Roof Tape

Glove Box SMEAR

Submitter's Sample No.	ACL Sample No.
28-ATSR-T	
28-ATSR-C	
28-ATSR-B	
29-ATSR-T	
29-ATSR-C	
29-ATSR-B	
	MAP #
1 HCEL	= A
2 HCEL	= B
3 HCEL	= C
4 HCEL	= G
*5 HCEL	= ~~H~~ F
6 HCEL-1	= H 0-3.5
6 HCEL-2	= H 3.5-7.0
6 HCEL-3	= H 7.0-10.5
6 HCEL-4	= H 10.5-14.0
7 HCEL	= Cave 4 Roof
8 HCEL	smear
9 HCEL	smear

FOR ACL OFFICE USE ONLY

ANALYSTS ASSIGNED:	ESTIMATED HOURS:	DATE REPORTED:

ANL-80 (5-96)

ACL 329 Rev

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Soils and Smears, "301" Date Received: 11/6/97

Submitted by: Dolores Geraghty, ESH/HP, 200 Date Reported: 12/1/97

Submitter's Sample No.	ACL Sample No.	Gamma Spec.; (pCi/g)		
		^{241}Am	^{137}Cs	^{60}Co
1HCEL	98-8025-09	15.4 ± 0.6	(3.63 ± 0.07) x 10^2	6.3 ± 0.4
2HCEL	-10	3.8 ± 0.4	(3.51 ± 0.07) x 10^3	5.9 ± 0.9
3HCEL	-11	<0.2	(6.80 ± 0.20) x 10^2	<0.2
4HCEL	-12	12.8 ± 1.3	(1.59 ± 0.08) x 10^3	51.1 ± 3.1
5HCEL	-13	(6.03 ± 0.60) x 10^4	(1.48 ± 0.15) x 10^6	(2.43 ± 0.24) x 10^2
6HCEL-1	-14A	1.3 ± 0.2	(2.98 ± 0.06) x 10^2	8.3 ± 0.4
6HCEL-2	-14B	<0.2	56.0 ± 1.1	1.6 ± 0.2
6HCEL-3	-14C	<0.2	21.4 ± 0.4	1.1 ± 0.2
6HCEL-4	-14D	<0.2	4.3 ± 0.2	<0.2
7HCEL	-15	<0.2	50.9 ± 1.0	5.3 ± 0.1
		Gamma Spec.; (pCi/sample)		
		^{60}Co	^{137}Cs	^{241}Am
8HCEL	98-8025-16	(3.40 ± 0.34) x 10^2	(3.55 ± 0.18) x 10^3	59.0 ± 6.0
9HCEL	-17	<10	<10	72.0 ± 14.5

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call T. TenKate at 2- 4291 .

Reference(s): CMT Logbook No. 1498, pg. 13; CMT Logbook No. 938, Det. 3, pp. 155, 157.

opies To: D. Geraghty, C. Sholeen, M. Robinet, D. Green, D. Bowers, D. Graczyk, F. Martino, F. Markun, T. TenKate, L. TenKate

Analyst(s): T. TenKate

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/lac
12/4/97
CMT 84 (3-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Soil
Submitted by: Dolores Geraghty, ESH/HP, 200

Date Received: 11/6/97
Date Reported: 11/7/97

Submitter's Sample No.	ACL Sample No.	Gamma Spec. (DPM/sample)		
		^{137}Cs	^{94}Nb	^{154}Eu
5HCEL	98-8025-13	$(1.48 \pm 0.15) \times 10^{6}$	$(1.40 \pm 0.14) \times 10^{3}$	$(1.16 \pm 0.12) \times 10^{4}$
		^{60}Co	^{241}Am	
		$(2.43 \pm 0.24) \times 10^{2}$	$(6.03 \pm 0.60) \times 10^{4}$	

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call T. TenKate at 2- 4291.

Reference(s): CMT Logbook No. 938, Det. 3, pg. 155; CMT Logbook No. 1110, Det. 2, 4, 7, 11, pg. 61.

Copies To: D. Geraghty, C. Sholeen, M. Robinet, D. Green, D. Graczyk, D. Bowers, F. Martino, F. Markun, T. TenKate

Analyst(s): T. TenKate

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11/7/97
CMT-84 (9-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Soil — Date Received: 11/3/97

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 2/24/98

Submitter's Sample No.	ACL Sample No.	Gross β (pCi/g ± 2σ)
5HCEL	98-8025-13	$(1.01 \pm 0.03) \times 10^3$

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. Smith at 2- 1890 .

Reference(s): CMT Notebook No. 1493, pp. 52, 58.

Copies To: D. Geraghty, C. Sholeen, M. Robinet, D. Green, D. Bowers, F. Martino, L. Smith

Analyst(s): L. Smith

/lac
2/25/98
CMT-84 (9-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material:	Soil, ANL-E ~~ASTR~~ 301 HOT CELL	Date Received:	11/03/97
Submitted by:	Dolores Geraghty, ESH/HP, 200	Date Reported:	04/01/98

Alpha Scan

The analytical sample listed below was a soil sample from ANL-E, ~~ASTR~~ 301 HOT CELL. Following acid digestion, the actinides and lanthanides were separated as a group from the other matrix constituents. A TruSpec™ extraction chromatographic column was utilized for this purpose. The sample was then electrodeposited prior to alpha spectrometry.

The resulting alpha spectrum is attached. Since tracers were not added to the sample, standard alpha sources were counted in the appropriate detectors to define the proper energy calibration for each detector.

Submitters Sample No.	ACL Sample No.	Peak Energy (MeV)	Isotope[1]	% Activity[2]
5HCEL	98-8025-13	4.21	^{238}U	71
		4.44	$^{235/236}U$	1
		4.80	$^{233/234}U$	14
			^{237}Np	
		5.19	$^{239/240}Pu$	5
		5.35	^{232}U	2
			^{210}Po	
		5.52	^{238}Pu	7
			^{241}Am	

[1] Because no elemental separations were performed, alpha emitters of equivalent energies may be present in the spectra, and, therefore, more than one alpha emitter may be listed for each peak. Process knowledge of the data user may be used to eliminate some of the listed nuclides.

[2] This value is based upon the ratio of the counts under the individual peak to the total counts of all the peaks. This value also assumes equivalent electrodeposition efficiencies for all analytes, which is only true to a gross approximation for different elements. Since electrodeposition is matrix dependent, and will vary from sample to sample, no attempt has been made to assign an analytical uncertainty to these values.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded (1) month after the date of this receipt unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. Smith at 2-1890.

Reference(s): CMT Logbook No. 1493, p. 52, 58, 67

/lac
4/1/98

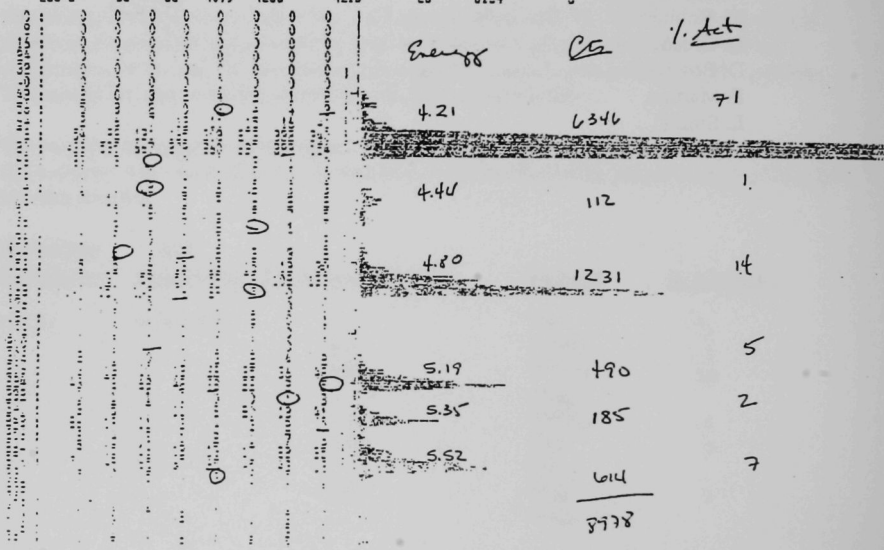
Copies To: D. Geraghty
C. Sholeen
M. Robinet
D. Green
D. Bowers
F. Martino
L. Smith

Analyst (s): L. Smith

R-8085-12 Alpha Scan

SYSTEM LABEL = DETECTOR # 1 05-Dec-1998 08:17:21
CHANNEL ZERO = 1012 keV CALIBRATION = 4.848 keV/ch DETECTOR EFFICIENCY = 21.0 %
BLANK COUNT STARTED 19-Dec-1998 17:58:15 BLANK COUNTING TIME = 1978 minutes live
SAMPLE COUNT STARTED 02-Dec-1998 16:57:47 SAMPLE COUNTING TIME = 2560 minutes live
SAMPLE SIZE = 1 SPIKE ACTIVITY = 0 dpm TOTAL COUNTS IN SPECTRUM = 9169

ISOTOPE	FIRST chan	LAST chan	FIRST KeV	LAST KeV	CENTROID KeV	STD_DEV KeV	SAMPLE counts	BCKGND counts	---------ACTIVITY--------- +/- 2 sigma	RECOVERY %
234-U	147	171	4885	4836	4787	30	1171	5		
239,240-Pu	302	329	5142	5226	5185	24	461	5		
238-Pu	334	376	5297	5555	5530	30	491	36		
237-Np	153	177	4706	4877	4799	29	1309	4		
230-Th	132	158	4563	4747	4706	41	97	6		
232-Th	34	57	3892	4070	4034	17	37	3		
238-U	53	86	4090	4255	4216	26	6154	5		



ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Soil/Residue/Fluid; 301 Characterization Project — Date Received: 4/14/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 5/20/98

Submitter's Sample No.	ACL Sample No.	Gamma Spec.; (pCi/g)					
		^{214}Bi	^{226}Ra	^{232}Th	^{137}Cs	^{60}Co	^{241}Am
38HCEL (Soil)	98-8160-01	0.34 ± 0.02	0.39 ± 0.03	0.44 ± 0.04	12.8 ± 0.6	0.34 ± 0.02	<0.2
39HCEL (Soil)	-02	<0.2	0.36 ± 0.03	<0.2	<0.2	<0.2	<0.2
40HCEL (Residue)	98-8161-01	<0.2	<0.2	<0.2	<0.2	<0.2	52.1 ± 2.6
41HCEL (Fluid)	98-8162-01	0.38 ± 0.05	<0.2	<0.2	0.54 ± 0.03	<0.2	<0.2

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call T. TenKate at 2- 4291 .

Reference(s): CMT Logbook No. 1498, pg. 59; CMT Logbook No. 1110, Det. 2, 4, 7, 11, pg. 91; CMT Logbook No. 938, Det. 3, pg. 169.

...es To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, D. Bowers, D. Graczyk, F. Martino, T. TenKate

Analyst(s): T. TenKate

TL

/lac
5/20/98
CMT-84 (9-96)

APPENDIX I:

LABORATORY AND FIELD TEST REPORTS

ARGONNE
NATIONAL
LABORATORY

INTRA-LABORATORY MEMO

December 23, 1997

To: C. Sholeen — ESH-Health Physics

From: D. Lucas DL — ESH-Industrial Hygiene
R. Utesch RCU — ESH-Industrial Hygiene

Subject: **Industrial Hygiene Survey Summary Report**

Operation Surveyed: Paint Samples

Location Surveyed: Building 301

Material or Hazard Measured: Lead

Method of Measurement: TN-*spectrace* XRF Lead Analyzer
Limit of Detection: 0.0001 mg/cm²

Sample Description and Results:

All painted materials in Building 301 scheduled for demolition in association with the Hot Cell D&D Project were checked for lead using the XRF lead analyzer (15 second sample interval). See table for results. Where possible, lead in paint concentrations were indicated directly on the painted materials.

Applicable Standards:

OSHA Lead Standard - 1926.62 (Construction)

Recommendations:

Demolition or renovation work is required to meet the provisions of the OSHA Lead Standard, which specifies maintaining exposures below 50 $\mu g/m^3$ with certain items triggered at an Action Level of 30 $\mu g/m^3$. No specific definition of "lead-containing paint" is included in the standard.

However, an amendment to the Toxic Substance Control Act (TOSCA), PL 102-550, SEC 1021, Title IV, "Lead Exposure Reduction," defines lead-based paint as a surface coating containing lead in excess of 1 mg/cm^2, or 0.5% lead by weight. The Consumer Product

Industrial Hygiene Survey Summary Report

Recommendations: Continued

Safety Act (CPSA), 16 CFR 1303, defines lead-containing paint as that in excess of 0.06% by weight. The survey results indicate which materials have paint with lead. The Steel Structures Painting Council reports that many contractors use the 0.06% level to define their lead projects. Painted materials with results in excess of the limit of detection for the XRF lead analyzer should be considered lead-containing.

For materials determined to be coated with lead-containing paint, workers should use NIOSH-approved respirators for lead dust or fume during the demolitions activities.

If feasible, the lead-containing paint can be chemically stripped from the area to be cut. The paint must be stripped down to bare metal and expose an area around the projected cut so that the mechanical saw, arc or torch will not come in contact with paint.

The demolition contractor should assure that employees are informed of the Lead Standard requirements ant that good work practices are followed to keep the job site as free as practicable from accumulation of lead.

The results of this survey should be discussed with Mark Kamiya, EMO. He will assist you in determining whether or not the waste from this project will be considered hazardous.

DL/RU:vsa

Date of Survey November 3-4, 1997
Survey by D. Lucas
Analysis by -------

ct: J. Gaston
J. Woodring
R. Wynveen
IH File, Building 301
Lead-ANL Projects

Table: Lead Check Results on Various Paint Materials in Building 301
November 3-4, 1997

Sample Number	Area	Material Description/ Sample Location	Lead Present	Amount (mg/cm^2)
29256	Main Stairwell	Brown Paint on Walls	Y	0.8
29257	C-102	Beige Paint on Floor	Y	0.1
29258	C-102	Beige Paint on Floor	Y	0.1
29259	C-102	White Paint on Walls	Y	0.02
29260	C-102	White Paint on Walls	Y	0.2
29261	C-102	Brown Paint on Glove box	Y	0.7
29262	C-102	White Paint on Cave 5 Door	Y	0.011
29263	C-102	White Paint on Cell (2)	Y	0.2
29264	C-102	White Paint on Large Sliding Door	N	< LOD Neg for Lead
29265	C-102	Grey Paint on Beam	Y	0.002
29266	C-109	Light Brown Paint on Wall	Y	0.06
29267	C-109	Grey Paint on Rear Wall Cell 413	Y	0.001
29268	C-109	Green Paint on Map Tube Holder	Y	0.3
29269	C-109	Grey Paint on Beam/Column	Y	0.09
29270	C-101	Off-White Paint on Brick Wall	N	< LOD Neg for Lead
29271	C-109	Beige Paint on Floor	Y	0.0004
29272	C-109	Grey Paint on Rear Door Cell (2)	Y	0.2
29273	C-109	Light Grey Paint on Wall Between Cells 1 & 2	Y	0.02
29274	Stairwell to Retention Tanks	Dingy Yellow Paint on Walls	Y	0.01
29275	Stairwell to Retention Tanks	Dark Brown Paint on Walls	Y	0.22
29276	Stairwell to Retention Tanks	Dark Brown Paint on Stairwell Banister	Y	0.94

Sample Number	Area	Material Description/ Sample Location	Lead Present	Amount (mg/cm^2)
29277	Retention Tank Area	Grey Paint off Tank 2	Y	1.10
29278	Retention Tank Area	Grey Paint off Tank 1	Y	0.82
29279	Retention Tank Area	White Paint on Wall	Y	0.2
29280	Retention Tank Area	Grey Paint on Floor	Y	0.007
29281	Fan Loft	Grey Paint on Stairwell Banister	Y	0.48
29282	Penthouse	Light Grey Paint on Wall	Y	0.07
29283	Penthouse	Dark Grey Paint on Wall	Y	1.1

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Paint — Date Received: 1/28/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 4/6/98

Submitter's Sample No.	ACL Sample No.	PCB Analysis
22HCEL	98-8102-01	453 ppm Aroclor 1016/1242 3650 ppm Aroclor 1254 Accuracy = ± 20% Precision = ± 10% **NOTE:** Sample preparation was based on EPA-Method 3550A (SW-846, Revision 1, September 1994). Sample analysis was based on EPA-Method 8081 (SW-846, Revision 0, September 1994) for the determination of polychlorinated biphenyls (PCBs) as Aroclors. Surrogate recoveries are within QA limits. Surrogate recovery limits are based upon limits established by CLP.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. Chromizky at 2- 7732 .

Reference(s): Data Recorded in Logbook No. 1403, pp. 183-184; and File Folder in Cabinet in R-129: "PCBSamples:\data\1\040298".

ies To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, A. Boparai, F. Martino, L. Chromizky

Analyst(s): L. Chromizky

/lac
4/7/98
CMT-84 (9-96)

ARGONNE
NATIONAL
LABORATORY

INTRA-LABORATORY MEMO

January 19, 1998

TO: Dolores Geraghty ESH-HP

FROM: Don Nelson ESH-AS

SUBJECT: **301 Paint Chips**

On 11-4-97 Mike O'Connor delivered a bag of paint chips to the lab from the area of cave 3 in building 301. These chips were ashed, dissolved in mineral acids, and the acid solution gamma counted. Separate fractions were removed and analyzed for strontium and the actinides. The results are listed below in dpm (for the entire sample) ± 1 standard deviation.

Cs-137	311000	±	3000
Eu-154	193	±	21
Co-60	64	±	3
Eu-155	60	±	16
Nb-94	45	±	5
Sr-90	268000	±	300
Pu-239 + 240	4200	±	300
Am-241	2150	±	20
Pu-238	360	±	30

DMN/mks

cc: R. Schlenker
C. Sholeen

Date: January 16, 1998

To: C. Sholeen — ESH-HP

From: D. R. Lucas DRL — ESH-Industrial Hygiene
R. C. Utesch RCU — ESH-Industrial Hygiene

Subject: **Industrial Hygiene Survey Summary Report**

Operation Surveyed: Building Material

Location: Bldg. 301

Material or Hazard Measured: Fiber Identification

Method of Measurement: Polarized Light Microscopy with Dispersion Staining

Sample Description and Results:

See attached table: (Bldg. 301)

Applicable Standards: OSHA Asbestos Standard (29CFR1926.1101)

Recommendations:

These samples were collected to determine the fiber content of the material before removal or demolition.

Since most of the materials were identified as asbestos-containing, employees working near the identified materials should be notified and precautions should be taken during the removal of the material. Only PFS-FPE administered licensed asbestos removal contractor or qualified EMO-Waste Management Mechanics can handle, repair, and/or remove asbestos-containing material.

If you or employees have questions regarding results or precaution to be taken, contact Industrial Hygiene (2-3310) or Doug Lucas (2-9781).

Date of Survey: Sept. 1996
Survey by: D. R. Lucas
Laboratory Analyses by: Data Chem

ct: D. Gerachty
J. Gaston
J. Woodring
R. Wynveen
File: Bldg. 301
Asbestos- ANL
Projects

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
001	STEAM SUPPLY PIPE INSULATION	TSI	23759	30-40% CHRYSOTILE
			23760	NA
			23761	NA
002	STEAM SUPPLY PJC	TSI	23762	3-5% CHRYSOTILE / 10-20% AMOSITE
			23763	NA
			23764	NA
003	CONDENSATE RETURN PIPE INSULATION	TSI	23765	5-10% CHRYSOTILE / TRACE AMOSITE
			23766	NA
			23767	NA
004	CONDENDATE RETURN PJC	TSI	23768	5-10% CHRYSOTILE / 5-10% AMOSITE
			23769	NA
			23770	NA
005	DOMESTIC HOT PIPE INSULATION	TSI	23771	50-60% CHYRSOTILE
			23772	NA
			23773	NA
006	DOMESTIC HOT PJC	TSI	23774	20-30% CHRYSOTILE / 1-3% AMOSITE
			23775	NA
			23776	NA

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
007	DOMESTIC HOT RETURN PIPE INSULATION	TSI	23777	50-60% CHRYSOTILE
			23778	NA
			23779	NA
008	DOMESTIC HOT RETURN PJC	TSI	23780	20-30% CHRYSOTILE / 3-5% AMOSITE
			23781	NA
			23782	NA
009	DOMESTIC COLD PIPE INSULATION	TSI	23783	1-3% CHRYSOTILE
			23784	NA
			23785	NA
010	DOMESTIC COLD PJC	TSI	23786	20-30% CHRYSOTILE / TRACE AMOSITE
			23787	NA
			23788	NA
011	LAB HOT PIPE INSULATION	TSI	23789	40-50% CHRYSOTILE
			23790	NA
			23791	NA
012	LAB HOT PJC	TSI	23792	20-30% CHRYSOTILE / 5-10% AMOSITE
			23793	NA
			23794	NA

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
013	LAB COLD PIPE INSULATION	TSI	23795	TRACE CHRYSOTILE
			23796	1-3% CHYRSOTILE
			23797	NA
014	LAB COLD PJC	TSI	23798	30-40% CHRYSOTILE / TRACE AMOSITE
			23799	NA
			23800	NA
015	STORM DRAIN PIPE INSULATION	TSI	23915	1-3% CHRYSOTILE
			23916	NA
			23917	NA
016	STORM DRAIN PJC	TSI	23918	50-60% CHRYSOTILE
			23919	NA
			23920	NA
017	HOT WATER TANK	TSI	23921	10-20% CHRYSOTILE / 5-10% AMOSITE
			23922	NA
			23923	NA
018	HEAT EXCHANGER	TSI	23924	ND
			23925	ND
			23926	ND

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
019	LAB HOT RETURN PIPE INSULATION	TSI	23927	40-50% CHRYSOTILE
			23928	NA
			23929	NA
020	LAB HOT RETURN PJC	TSI	23930	50-60% CHRYSOTILE / TRACE AMOSITE
			23931	NA
			23932	NA
021	LAB DRAIN PIPE INSULATION	TSI	23933	1-3% CHRYSOTILE
			23934	NA
			23935	NA
022	RED CAULK	SM	23936	ND
			23937	ND
			23938	ND
023	9X9 MAROON FLR TILE	FT	23939	3-5% CHRYSOTILE
			23940	NA
			23941	NA
024	9X9 MAROON FLR TILE MASTIC	FTM	23942	5-10% CHRYSOTILE
			23943	NA
			23944	NA

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
025	PINK FILL MATERIAL	SM	23945	ND
			23946	ND
			23947	ND
026	FIRE DOOR	DOOR	XXXXX	ASSUMED ACM
			XXXXX	ASSUMED ACM
			-	
027	HOT WATER TANK	TSI	23948	3-5% CHRYSOTILE / 10-20% AMOSITE
			23949	NA
			23950	NA
028	HEAT EXCHANGER	TSI	23951	20-30% CHRYSOTILE / 10-20% AMOSITE
			23952	NA
			23953	NA
029	AIR CONDITIONER 1-1 BODY INSULATION	TSI	23954	10-20% CHRYSOTILE
			23955	NA
			23956	NA
030	AIR CONDITIONER 1-1 DUCT GASKET	VIB	23957	30-40% CHRYSOTILE
			23958	NA
			23959	NA

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
031	12X12 WHITE FLR TILE - CREAM & GRAY FLECKS	FT	23960	ND
			23961	ND
			23962	ND
032	12X12 WHITE FLR TILE - CREAM & GRAY FLECKS MASTIC	FTM	23963	ND
			23964	ND
			23965	ND
033	BROWN BASEBOARD	BB	23966	ND
			23967	ND
			23968	ND
034	BROWN BASEBOARD MASTIC	BBM	23969	ND
			23970	ND
			23971	ND
035	BROWN/GRAY CARPET MASTIC	CM	23972	ND
			23973	ND
			23974	ND
036	LIGHT BROWN CARPET MASTIC	CM	23975	ND
			23976	ND
			23977	1-3% CHRYSOTILE

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
037	2X4 LAYIN CEILING TILE - SMALL WORMS & DOTS	CT	23978	ND
			23979	ND
			23980	ND
038	DRYWALL	DW	23981	ND
			23982	ND
			23983	ND
039	TAN/BROWN CARPET MASTIC	CM	23984	ND
			23985	ND
			23986	ND
040	RUST CARPET MASTIC	CM	23987	TRACE CHRYSOTILE
			23988	TRACE CHRYSOTILE
			23989	NA
041	9X9 RED FLOOR TILE	FT	23990	3-5% CHRYSOTILE
			23991	NA
			23992	NA
042	9X9 RED FLOOR TILE MASTIC	FTM	23993	10-20% CHRYSOTILE
			23994	NA
			23995	NA

SITE ACM TABLE - SORT BY HSA
ARGONNE NATIONAL LABORATORY

HSA Listing

BUILDING
301

HSA	MATERIAL DESCRIPTION	MATERIAL TYPE	SAMPLE #	RESULT
043	CREAM BASEBOARD	BB	23996	ND
			23997	ND
			23998	ND
044	CREAM BASEBOARD MASTIC	BBM	23999	ND
			24000	ND
			21088	ND

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Sump Water — Date Received: 1/28/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 3/26/98

Submitter's Sample No.	ACL Sample No.	Hg (µg/L)
14 HCEL	98-8101-01	205
	Preparation Blank	< 0.04
		ICV 298 : 1.23 µg/L — Recovery : 98.1%
		1.25 — 100%
		1.22 — 97.6%
		1.22 — 97.6%
		Known concentration of ICV 298 = 1.25 µg/L.
		NOTE: Mercury was determined by Cold Vapor Atomic Absorption (CVAA) according to U.S. EPA Method 7470A, SW-846. Samples were digested according to SOP: ACL -209.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. TenKate at 2- 7398 .

Reference(s): CMT Notebook No. 1262, pp. 155-156 (Hg).

ies To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, D. Graczyk, F. Martino, L. TenKate, ACL 200 File

Analyst(s): L. TenKate

L. TenKate

/law
3/30/98
CMT-84 (9-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Sump Water — Date Received: 1/27/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 3/16/98

Submitter's Sample No.	ACL Sample No.	pH
14 HCEL	98-8101-01	6.66 ± 0.05

Calibration Verification Standard Results:

	Initial	Final
pH 7.00 Buffer	7.00	6.99
pH 4.00 Buffer	4.01	3.98

pH was determined per EPA SW-846 Method 9040, pH Electrometric Measurement.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. TenKate at 2- 7398 .

Reference(s): CMT Notebook No. 1491, p. 24.

ies To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, D. Graczyk; F. Martino; ACL 200 File

Analyst(s): L. TenKate

L. TenKate

/amb
3/17/98
CMT-84 (9-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Water
Submitted by: Dolores Geraghty, ESH/HP, 200

Date Received: 1/28/98
Date Reported: 3/27/98

Submitter's Sample No.	ACL Sample No.	Semivolatile Organic Results		
		Semivolatile Target Compound	Concentration (µg/L)	Q
	Lab Blank (97-1029)	No semivolatile target compounds were detected above the given quantitation limits.		
14HCEL	98-8101-01	Di-n-butylphthalate	130	J
		bis(2-Ethylhexyl)phthatlate	49.2	J

NOTE: Sample preparation is based on EPA-Method 3510 (SW-846, Revision 1, July 1992). The analytical method used is based on EPA-Method 8270A (SW-846, Revision 1, July 1992) for the determination of semivolatile organic compounds. The attached data sheets contain data for one sample and one laboratory blank. The surrogate recoveries are within QC limits for 12 out of 12 values reported.

For some of the compounds found in the sample that are not on the semivolatie target compound list, the table of tentatively identified compounds (TICs) is included. TICs were identified by library search. Quantitation is carried out using total ion chromatogram peak area compared to the peak area of the nearest internal standard.

The EPA-defined qualifiers to be used on the data sheets are as follows:

U - Indicates compound was analyzed for, but not detected above the given quantitation limit.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call Y. Tsai at 2- 7732 .

Reference(s): GC/.MSD 2-Run Logbook No. 2, pg. 69.

ies To: D. Geraghty, B. Murdoch, M. Robinet, D. Green, A. Boparai, D. Graczyk, F. Martino

Analyst(s): Y. Tsai YT

Attachment (10 Pages)

/lac
3/30/98
CMT-84 (9-96)

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Water — Date Received: 1/28/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 3/27/98

Submitter's Sample No.	ACL Sample No.	Semivolatile Organic Results
14HCEL	98-8101-01	J - Indicates an estimated value. This flag is used under the following circumstances: (1) when estimating a concentration for tentatively identified compounds (TICs) where a 1:1 response is assumed, (2) when the mass spectral and retention time data indicate the presence of a compound that meet the SV GC/MS identification criteria, and the results is less than the estimated quantitation limit, but greater than zero. N - Indicates presumptive evidence of a compound. This flag is only used to TICs where the identification is based on a mass spectral library search. B - This flag is used when the analyte is found in the associated blank as well as the sample. It indicates possible blank contamination.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call Y. Tsai at 2- 7732

Reference(s): GC/.MSD 2-Run Logbook No. 2, pg. 69.

pies To: D. Geraghty, B. Murdoch, M. Robinet, D. Green, A. Boparai, D. Graczyk, F. Martino

Analyst(s): Y. Tsai

Attachment (10 Pages)

/lac
3/30/98
CMT-84 (9-96)

Data File: /data/msd2.i/2mar268.b/0401006.d
Report Date: 27-Mar-1998 09:35

TARGET COMPOUNDS

Client Name:
Client Sample ID: Lab Blank
Sample Location:
Lab Sample ID: Lab Blank
Sample Matrix: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info:

Client SDG: 2mar268.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
62-75-9	N-Nitrosodimethylamine	167	U
109-06-8	2-Picoline	167	U
66-27-3	Methyl methansulfonate	333	U
62-50-0	Ethyl methansulfonate	167	U
62-53-3	Aniline	167	U
108-95-2	Phenol	167	U
95-57-8	2-Chlorophenol	167	U
111-44-4	bis(2-Chloroethyl)ether	167	U
541-73-1	1,3-Dichlorobenzene	167	U
106-46-7	1,4-Dichlorobenzene	167	U
95-50-1	1,2-Dichlorobenzene	167	U
100-51-6	Benzyl alcohol	167	U
95-48-7	2-Methylphenol	167	U
108-60-1	bis(2-Chloroisopropyl)ether	167	U
98-86-2	Acetophenone	167	U
621-64-7	N-nitroso-di-n-propylamine	167	U
106-44-5	4-Methylphenol	167	U
67-72-1	Hexachloroethane	167	U
98-95-3	Nitrobenzene	167	U
100-75-4	N-Nitrosopiperidine	167	U
78-59-1	Isophorone	167	U
88-75-5	2-Nitrophenol	167	U
105-67-9	2,4-Dimethyphenol	167	U
111-91-1	bis(2-Chloroethoxy)methane	167	U
120-83-2	2,4-Dichlorophenol	167	U
65-85-0	Benzoic acid	167	U
120-82-1	1,2,4-Trichlorobenzene	167	U
91-20-3	Naphthalene	167	U
122-09-8	a,a-Dimethylphenethylamine	333	U
87-65-0	2,6-Dichlorophenol	167	U
106-47-8	4-Chloroaniline	167	U
87-68-3	Hexachlorobutadiene	167	U
924-16-3	N-Nitrosodibutylamine	167	U
59-50-7	4-Chloro-3-methylphenol	167	U
91-57-6	2-Methylnaphthalene	167	U
95-94-3	1,2,4,5-Tetrachlorobenzene	167	U
77-47-4	Hexachlorocyclopentadiene	333	U

Data File: /data/msd2.i/2mar268.b/0401006.d
Report Date: 27-Mar-1998 09:35

3

TARGET COMPOUNDS

Client Name:
Client Sample ID: Lab Blank
Sample Location:
Lab Sample ID: Lab Blank
Sample Matrix: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info:

Client SDG: 2mar268.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
129-00-0	Pyrene	167	U
60-11-7	p-Dimethylaminoazobenzene	167	U
85-68-7	Butylbenzylphthalate	167	U
56-55-3	Benzo(a)anthracene	167	U
91-94-1	3,3'-Dichlorobenzidine	167	U
218-01-9	Chrysene	167	U
117-81-7	bis(2-Ethylhexyl)phthalate	167	U
117-84-0	Di-n-octylphthalate	167	U
205-99-2	Benzo(b)fluoranthene	167	U
57-97-6	7,12Dimethylbenz(a)anthracen	167	U
207-08-9	Benzo(k)fluoranthene	167	U
50-32-8	Benzo(a)pyrene	167	U
56-49-5	3-Methylcholanthrene	167	U
224-42-0	Dibenz(a,j)acridine	167	U
193-39-5	Indeno(1,2,3-cd)pyrene	167	U
53-70-3	Dibenzo(a,h)anthracene	167	U
191-24-2	Benzo(g,h,i)perylene	167	U
367-12-4	2-Fluorophenol	2670	
4165-62-2	Phenol-d5	2830	
4165-60-0	Nitrobenzene-d5	1470	
321-60-8	2-Fluorobiphenyl	1450	
118-79-6	2,4,6-Tribromophenol	2320	
98904-43-9	Terphenyl-d14	1500	

Data File: /data/msd2.i/2mar268.b/0501007.d
Report Date: 27-Mar-1998 10:17

5

TARGET COMPOUNDS

Client Name: Dolores Geraghty
Client Sample ID: 14HCEL
Sample Location:
Lab Sample ID: 98-8101-01
Sample Matrix: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info:

Client SDG: 2mar268.b
Sample Date:
Sample Point:
Date Received: JAN/28/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
62-75-9	N-Nitrosodimethylamine	167	U
109-06-8	2-Picoline	167	U
66-27-3	Methyl methansulfonate	333	U
62-50-0	Ethyl methansulfonate	167	U
62-53-3	Aniline	167	U
108-95-2	Phenol	167	U
95-57-8	2-Chlorophenol	167	U
111-44-4	bis(2-Chloroethyl)ether	167	U
541-73-1	1,3-Dichlorobenzene	167	U
106-46-7	1,4-Dichlorobenzene	167	U
95-50-1	1,2-Dichlorobenzene	167	U
100-51-6	Benzyl alcohol	167	U
95-48-7	2-Methylphenol	167	U
108-60-1	bis(2-Chloroisopropyl)ether	167	U
98-86-2	Acetophenone	167	U
621-64-7	N-nitroso-di-n-propylamine	167	U
106-44-5	4-Methylphenol	167	U
67-72-1	Hexachloroethane	167	U
98-95-3	Nitrobenzene	167	U
100-75-4	N-Nitrosopiperidine	167	U
78-59-1	Isophorone	167	U
88-75-5	2-Nitrophenol	167	U
105-67-9	2,4-Dimethyphenol	167	U
111-91-1	bis(2-Chloroethoxy)methane	167	U
120-83-2	2,4-Dichlorophenol	167	U
65-85-0	Benzoic acid	167	U
120-82-1	1,2,4-Trichlorobenzene	167	U
91-20-3	Naphthalene	167	U
122-09-8	a,a-Dimethylphenethylamine	333	U
87-65-0	2,6-Dichlorophenol	167	U
106-47-8	4-Chloroaniline	167	U
87-68-3	Hexachlorobutadiene	167	U
924-16-3	N-Nitrosodibutylamine	167	U
59-50-7	4-Chloro-3-methylphenol	167	U
91-57-6	2-Methylnaphthalene	167	U
95-94-3	1,2,4,5-Tetrachlorobenzene	167	U
77-47-4	Hexachlorocyclopentadiene	333	U

Data File: /data/msd2.i/2mar268.b/0501007.d
Report Date: 27-Mar-1998 10:17

7

TARGET COMPOUNDS

Client Name: Dolores Geraghty
Client Sample ID: 14HCEL
Sample Location:
Lab Sample ID: 98-8101-01
Sample Matrix: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info:

Client SDG: 2mar268.b
Sample Date:
Sample Point:
Date Received: JAN/28/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
129-00-0	Pyrene	167	U
60-11-7	p-Dimethylaminoazobenzene	167	U
85-68-7	Butylbenzylphthalate	167	U
56-55-3	Benzo(a)anthracene	167	U
91-94-1	3,3'-Dichlorobenzidine	167	U
218-01-9	Chrysene	167	U
117-81-7	bis(2-Ethylhexyl)phthalate	49.2	J
117-84-0	Di-n-octylphthalate	167	U
205-99-2	Benzo(b)fluoranthene	167	U
57-97-6	7,12Dimethylbenz(a)anthracen	167	U
207-08-9	Benzo(k)fluoranthene	167	U
50-32-8	Benzo(a)pyrene	167	U
56-49-5	3-Methylcholanthrene	167	U
224-42-0	Dibenz(a,j)acridine	167	U
193-39-5	Indeno(1,2,3-cd)pyrene	167	U
53-70-3	Dibenzo(a,h)anthracene	167	U
191-24-2	Benzo(g,h,i)perylene	167	U
367-12-4	2-Fluorophenol	2510	
4165-62-2	Phenol-d5	2700	
4165-60-0	Nitrobenzene-d5	1330	
321-60-8	2-Fluorobiphenyl	1330	
118-79-6	2,4,6-Tribromophenol	2680	
98904-43-9	Terphenyl-d14	1440	

Data File: /data/msd2.i/2mar268.b/0501007.d
Report Date: 27-Mar-1998 10:17

9

RECOVERY REPORT

Client Name: Dolores Geraghty
Sample Matrix: LIQUID
Client ID: 14HCEL
Data Type: MS DATA
SpikeList File: HPMSS.spk
Method File: /data/msd2.i/2mar268.b/yt8270.m
Misc Info:

Client SDG: 2mar268.b
Fraction: SV
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ng	AMOUNT RECOVERED ng	% RECOVERED	LIMITS
$ 4 2-Fluorophenol	200	150	75.21	21-100
$ 7 Phenol-d5	200	162	80.97	10-94
$ 22 Nitrobenzene-d5	100	79.9	79.88	35-114
$ 45 2-Fluorobiphenyl	100	79.6	79.62	43-116
$ 70 2,4,6-Tribromophen	200	161	80.37	10-123
$ 85 Terphenyl-d14	100	86.7	86.74	33-141

* - Values outside of QC limits
Spike Recovery: 0 out of 6 outside limits
0 out of 6 not found

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

ıple Material: Water — Date Received: 1/28/98

Submitted by: D. Geraghty, ESH/HP, 200 — Date Reported: 4/10/98

Submitter's Sample No.	ACL Sample No.	Volatile Organic Analysis (VOA)
14HCEL	98-8101-01	Analysis of this sample for volatile organics was performed using Method 8260 in the U.S. EPA Document SW-846 (Third Edition). Attached are CLP (Contract Laboratory Program)-type reporting forms listing concentrations of Method 8260 target compounds and a recovery for surrogate compounds with which the sample was spiked. The EPA-defined qualifier used on the data sheets is defined as follows: U - Indicates compound was analyzed for, but not detected above the given quantitation limit.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call L. Chromizky at 2- 7732 .

Reference(s): CMT Logbook No. 1418, p. 79; and file folder in cabinet located in Room E-127A.

Copies To: D. Geraghty, M. Robinet, B. Murdoch, D. Green, A. Boparai, F. Martino, L. Chromizky

Analyst(s): L. Chromizky

/law
4/14/98
CMT-84 (9-96)

Attachment
(3 pages)

Data File: /users/chem/msd1.i/1apr098.b/DG.d
Report Date: 10-Apr-1998 13:55

TARGET COMPOUNDS

Client Name: D. Geraghty
Client Sample ID: 14HCEL
Sample Location: 301 hot cells
Lab Sample ID: 98-8101-01
Sample Matrix: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: 14HCEL

Client SDG: 1apr098.b
Sample Date: JAN/27/98
Sample Point: sump pump
Date Received: JAN/28/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
75-71-8	DICHLORODIFLUOROMETHANE	10.0	U
74-87-3	CHLOROMETHANE	10.0	U
75-01-4	VINYL CHLORIDE	10.0	U
74-83-9	BROMOMETHANE	10.0	U
75-00-3	CHLOROETHANE	10.0	U
75-69-4	TRICHLOROFLUOROMETHANE	10.0	U
75-35-4	1 1-DICHLOROETHENE	10.0	U
75-09-2	METHYLENE CHLORIDE	10.0	U
156-60-5	TRANS-1 2-DICHLOROETHENE	10.0	U
75-34-3	1 1-DICHLOROETHANE	10.0	U
594-20-7	2 2-DICHLOROPROPANE	10.0	U
156-59-2	CIS-1,2-DICHLOROETHENE	10.0	U
74-97-5	BROMOCHLOROMETHANE	10.0	U
67-66-3	CHLOROFORM	10.0	U
71-55-6	1 1 1-TRICHLOROETHANE	10.0	U
56-23-5	CARBON TETRACHLORIDE	10.0	U
563-58-6	1 1-DICHLOROPROPENE	10.0	U
71-43-2	BENZENE	10.0	U
107-06-2	1 2-DICHLOROETHANE	10.0	U
79-01-6	TRICHLOROETHENE	10.0	U
78-87-5	1 2-DICHLOROPROPANE	10.0	U
74-95-3	DIBROMOMETHANE	10.0	U
75-27-4	BROMODICHLOROMETHANE	10.0	U
10061-02-06	CIS-1 3-DICHLOROPROPENE	10.0	U
108-88-3	TOLUENE	10.0	U
10061-01-05	TRANS-1 3-DICHLOROPROPENE	10.0	U
79-00-5	1 1 2-TRICHLOROETHANE	10.0	U
127-18-4	TETRACHLOROETHENE	10.0	U
142-28-9	1 3-DICHLOROPROPANE	10.0	U
124-48-1	DIBROMOCHLOROMETHANE	10.0	U
106-93-4	1 2-DIBROMOETHANE	10.0	U
108-90-7	CHLOROBENZENE	10.0	U
630-20-6	1 1 1 2-TETRACHLOROETHANE	10.0	U
100-41-4	ETHYL BENZENE	10.0	U
	m&p-XYLENE	10.0	U
95-47-6	o-XYLENE	10.0	U
100-42-5	STYRENE	10.0	U

Data File: /users/chem/msd1.i/1apr09S.b/DG.d
Report Date: 10-Apr-1998 13:55

TARGET COMPOUNDS

Client Name: D. Geraghty
Client Sample ID: 14HCEL
Sample Location: 301 hot cells
Lab Sample ID: 98-8101-01
Sample Matrix: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: 14HCEL

Client SDG: 1apr098.b
Sample Date: JAN/27/98
Sample Point: sump pump
Date Received: JAN/28/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
75-25-2	BROMOFORM	10.0	U
98-82-8	ISOPROPYLBENZENE	10.0	U
108-86-1	BROMOBENZENE	10.0	U
79-34-5	1 1 2 2-TETRACHLOROETHANE	10.0	U
96-18-4	1 2 3-TRICHLOROPROPANE	10.0	U
103-65-1	n PROPYLBENZENE	10.0	U
95-49-8	2 CHLOROTOLUENE	10.0	U
95-49-8	4 CHLOROTOLUENE	10.0	U
108-67-8	1 3 5-TRIMETHYLBENZENE	10.0	U
98-06-6	TERT BUTYLBENZENE	10.0	U
95-63-6	1,2,4-TRIMETHYLBENZENE	10.0	U
135-98-8	SEC-BUTYLBENZENE	10.0	U
541-73-1	1 3 DICHLOROBENZENE	10.0	U
106-46-7	1 4 DICHLOROBENZENE	10.0	U
99-87-6	p ISOPROPYLTOLUENE	10.0	U
95-50-1	1 2-DICHLOROBENZENE	10.0	U
104-51-8	n BUTYLBENZENE	10.0	U
96-12-8	1 2-DIBROMO-3-CHLOROPROPANE	10.0	U
120-82-1	1 2 4-TRICHLOROBENZENE	10.0	U
87-68-3	HEXACHLOROBUTADIENE	10.0	U
91-20-3	NAPHTHALENE	10.0	U
87-61-6	1 2 3-TRICHLOROBENZENE	10.0	U

Data File: /users/chem/msd1.i/1apr098.b/DG.d
Report Date: 10-Apr-1998 13:55

RECOVERY REPORT

Client Name: D. Geraghty
Sample Matrix: LIQUID
Client ID: 14HCEL
Data Type: MS DATA
SpikeList File: CLPSOILMS.spk
Client SDG: 1apr098.b
Fraction: VOA
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD
Method File: /users/chem/msd1.i/1apr098.b/rcrav2.m
Misc Info: 14HCEL

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 16 DIBROMOFLUOROMETHA	50.0	52.4	104.88	86-118
$ 28 TOLUENE d-8	50.0	48.5	97.04	88-110
$ 45 4 BROMOFLUOROBENZE	50.0	43.5	87.02	86-115

* - Values outside of QC limits
Spike Recovery: 0 out of 3 outside limits
0 out of 3 not found

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

ICP-AES Analysis Report

Spec. No.: 59118

Sample Material: Fluid

Submitted by: Dolores Geraghty ESH/HP/200 Date Received:04-10-98

Reporting Units: ug/g in original sample* Date Reported:05-01-98

ACL Number	Your Number	Zn								
98-8162-01	41 HCEL	215.								

NOTE: Samples will be discarded one (1) month after date of report unless otherwise arranged. When making future inquiries regarding this work, you must reference OUR number(s) above. For further information about the results reported here, please call E. A. Huff at extension 2-3633.
Reference Number: AE Notebook No.1516-p.102

Estimated Accuracy:+/-10%

Copies To: D. Geraghty L. Seifert
M. Robinet D. Green
B. Murdock ACL Office
A. Essling F. Martino
D. Graczyk

Analyst(s): E. Huff
D. Huff
A. Essling

Remarks: Fluid pH=0.95
*Reporting unit correction. Please disregard previous reports.

ANALYTICAL CHEMISTRY LABORATORY
Argonne National Laboratory
Argonne, IL 60439

REPORT OF ANALYTICAL RESULTS

Sample Material: Aqueous Solution — Date Received: 4/10/98

Submitted by: Dolores Geraghty, ESH/HP, 200 — Date Reported: 4/30/98

Submitter's Sample No.	ACL Sample No.	Br^-, mg/g
41 HCEL	98-8162-01	580 580
		Estimated uncertainty is ±10%.

NOTE: Unused sample material will be returned to the Client. Prepared samples will be discarded one (1) month after the date of this report unless other arrangements are made. When making future inquiries regarding this report, please reference the ACL sample number(s) above. For further information about the results reported here, please call F. Smith at 2- 7980 .

Reference(s): F. Smith Notebook No. 1410, p. 139.

ies To: D. Geraghty, L. Seifert, M. Robinet, B. Murdoch, D. Green, D. Graczyk, F. Martino, ACL 200 File

Analyst(s): F. Smith

/amb
5/1/98
CMT-84 (9-96)

ARGONNE
NATIONAL
LABORATORY

INTRA-LABORATORY MEMO

May 29, 1998

To: Bruce Murdoch ESH/HP

From: Alan Justus ESH/HP

Subject: Radon Results for Building 301 Locations

Four Eberline SC-5 (i.e., 500 ml volume) scintillation cells were evacuated to 1 torr (i.e., 99.9 % vacuum) and transported to building 330. Air samples were then immediately drawn through glass fiber prefilters. All four samples, identified simply as SW, NW, NE, and SE, were obtained at approximately 17:00 on 4/8/1998. All were delivered back to me for subsequent counting at approximately 13:00 on 4/9/1998. The results of analysis are detailed in the following table. The radon-222 concentrations at the time of sampling ranged from 23 to 36 pCi/l with overall errors on the order of 10%. The occupational ALI is 4 WLM/year; the DAC would then be 68.4 pCi/l. The samples therefore indicate relatively high concentrations of about one-half of a DAC.

Sample Cell #	301 Location	Bkgd cts/min	Sample Gross cts/min	Sample Net cpm; (% rel. error)	Sample pCi/l[1]	Sample pCi/l, decay corrected[2,3]
1	SW	1207/900	1390/30	44.99(2.8%)	19.56	22.8
3	NW	244/360	2134/30	70.46(2.2%)	30.63	35.9
5	NE	375/900	1808/30	59.85(2.4%)	26.02	30.7
9	SE	228/240	1368/30	44.65(2.8%)	19.41	23.2

[1] at manufacturer's default efficiency of 2.3 net cpm per pCi/l ^{222}Rn.

[2] 30-minute count of sample in Cell #1 started at 13:09, 4/9/98;
30-minute count of sample in Cell #3 started at 13:52, 4/9/98
30-minute count of sample in Cell #5 started at 14:26, 4/9/98;
30-minute count of sample in Cell #9 started at 16:22, 4/9/98.

[3] Rn-222 half-life = 91.75 hours.

ARGONNE NATIONAL LABORATORY

Environmental Management Operations
Environmental Compliance Support Services

FAX - MEMO

Date: November 7, 1997

Total Pages (+ cover page): 18

Attention: Dolores Geraghty

FAX Number: 2-3054

Message:

Dolores:

This is the information that I collected from the hardcopy raw data of the floor drain project. I looked at the raw stuff after I talked to you yesterday, because I couldn't believe that only one floor drain was traced as the spreadsheet data says. This is because the spreadsheet only contains those drains which are incorrectly hooked up, or are discharged directly to surface waters.

As you can see, there are a lot more drains in B-301. Please keep in mind, however, (and please transmit to R. Rose as well) that these data have been found to be less than perfect on a few occasions, and investing total faith in their veracity is a hazardous course.

Call me if you have any questions,

Geoff Pierce
2-2940

Sender: Geoff Pierce

Ext: (630) 252-2940

Confirmation:

Time: 6:20 PM

RJN GROUP

Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date: 1/23/92

Building No. 301

Drain No. 1

Wing No. D

Room No. 109

ANL Personnel Contacted at this building DAVID JONES

Feature Tested:

1 ☐ Floor Drain
2 ☒ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

Drain Discharge Location:

12 ☐ Sanitary MH _____
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump _____
17 ☒ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 9:30 Hr : Min
Begin 9:15 Hr : Min
22 ☒ Total 15 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: DHCO

Building Name: _____

Date 1/23/93

Building No. 301

Drain No. 2

Wing No. D

Room No. 109

Feature Tested:

1 ☐ Floor Drain
2 ☒ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building DAVID JONES

Drain Discharge Location:

12 ☐ Sanitary MH _____
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump _____
17 ☒ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 9:42 Hr : Min
Begin 9:32 Hr : Min
22 ☒ Total 10 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name:

Date 1 / 23 / 92

Building No. 301

Drain No. 3

Wing No. —

Room No. corridor #2

ANL Personnel Contacted at this building DAVID JONES

Feature Tested:

1 ☐ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☒ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe):

Drain Discharge Location:

12 ☐ Sanitary MH
13 ☐ Laboratory MH
14 ☐ Storm MH
15 ☐ Storm Ditch
16 ☐ Sump Pump
17 ☒ Retention Tank
18 ☐ Undetermined
19 ☐ Other (describe):

Test Location:

23 ☐ Column Number
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 9:52 Hr : Min
Begin 9:45 Hr : Min
22 ☒ Total 12 Min

Photo No. if Taken:

26 ☐ Test Location Photo No.
27 ☐ Discharge Location Photo No.

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

RJN GROUP

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date 1/23/96

Building No. 301

Drain No. 4

Wing No. B

Room No. 001

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building DAVID JONE

Drain Discharge Location:

12 ☒ Sanitary MH (03) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 10:10 Hr : Min
Begin 10:00 Hr : Min
22 ☒ Total 10 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name:

Date 1/23/92

Building No. 301

Drain No. 5

Wing No. B

Room No. 001

ANL Personnel Contacted at this building DAVID JONES

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe):

Drain Discharge Location:

12 ☒ Sanitary MH 001 053
13 ☐ Laboratory MH
14 ☐ Storm MH
15 ☐ Storm Ditch
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank
18 ☐ Undetermined
19 ☐ Other (describe):

Test Location:

23 ☐ Column Number
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 10:22 Hr : Min
Begin 10:14 Hr : Min
22 ☒ Total 8 Min

Photo No. if Taken:

26 ☐ Test Location Photo No.
27 ☐ Discharge Location Photo No.

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date 1 / 23 / 90

Building No. 301

Drain No. 6

Wing No. B

Room No. 001

ANL Personnel Contacted at this building DAVID JONES

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 10:30 Hr : Min
Begin 10:25 Hr : Min
22 ☒ Total 5 Min

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date: 1/23/92

Building No. 301

Drain No. 7

Wing No. B

Room No. 001

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building DAVID JONES

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 10:40 Hr : Min
Begin 10:32 Hr : Min
22 ☒ Total 8 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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RJN GROUP

Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date 1/23/92

Building No. 301

Drain No. 8

Wing No. B

Room No. 015

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building DAVID DYES

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 10:51 Hr : Min
Begin 10:43 Hr : Min
22 ☒ Total 8 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO Date 1/23/92
Building Name: _____ Building No. 301
Drain No. 9
Wing No. B
Room No. 01E

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building DAVID JONES

Drain Discharge Location:

12 ☒ Sanitary MH _____
13 ☐ Laboratory MH _____
14 ☒ Storm MH 300-73
15 ☐ Storm Ditch _____
16 ☐ Sump Pump _____
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 11:00 Hr : Min
Begin 10:53 Hr : Min
22 ☒ Total 7 Min

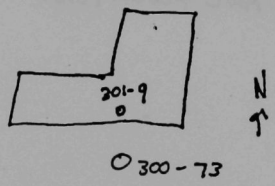
Photo No. if Taken:

26 ☐ Test Location Photo No. 90673
27 ☐ Discharge Location Photo No. 90-11

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch: Below



Drain and sewer are common

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: DH CO

Building Name: _____

Date 1/23/92

Building No. 301

Drain No. 10

Wing No. B

Room No. 015

ANL Personnel Contacted at this building David Sones

Feature Tested:

1 ☐ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☒ Other (describe): Sump Pump

Drain Discharge Location:

12 ☒ Sanitary MH 027053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump _____
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 11:18 Hr : Min
Begin 11:13 Hr : Min
22 ☒ Total 5 Min

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. ____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date 1/23/92

Building No. 301

Drain No. 11

Wing No. B

Room No. 015

Feature Tested:

1 ☐ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☒ Other (describe): Cop drain

ANL Personnel Contacted at this building David Jones

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 11:04 Hr : Min
Begin 11:01 Hr : Min
22 ☒ Total 3 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOORPLAN

Discharge Location Sketch:

Comments:

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Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JH CO

Building Name: _____

Date: 1/23/92

Building No. 301

Drain No. 12

Wing No. A

Room No. 001

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building Dave Jones

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 301-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____ Ft N S E W ____ Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 11:09 Hr : Min
Begin 11:05 Hr : Min
22 ☒ Total 3 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE ANL FLOOR PLAN

Discharge Location Sketch:

Comments:

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RJN GROUP

Argonne Drain Testing Program

Project No. RJN 11-1005-00 RJN Personnel: JHCO

Building Name: _____

Date 1/23/92

Building No. 301

Drain No. 13

Wing No. A

Room No. 001

Feature Tested:

1 ☒ Floor Drain
2 ☐ Slop Sink
3 ☐ Water Fountain
4 ☐ Shower Drain
5 ☐ Washroom Sink
6 ☐ Washroom Comode
7 ☐ Boiler Blowdown
8 ☐ Compressor Discharges
9 ☐ Spill Containment Area
10 ☐ Cooling Tower Drainage Basin
11 ☐ Other (describe): _____

ANL Personnel Contacted at this building Dave Jones

Drain Discharge Location:

12 ☒ Sanitary MH (02) 053
13 ☐ Laboratory MH _____
14 ☐ Storm MH _____
15 ☐ Storm Ditch _____
16 ☐ Sump Pump 300-10
17 ☐ Retention Tank _____
18 ☐ Undetermined _____
19 ☐ Other (describe): _____

Test Location:

23 ☐ Column Number _____
24 ☐ Distance from Column to Drain
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft
25 ☐ Distance from NW Corner of Room
Circle Direction, Enter Length
N S E W ____Ft N S E W ____Ft

Test Type:

20 ☒ Dye
21 ☐ Smoke

Test Time:

End 11:12 Hr : Min
Begin 11:09 Hr : Min
22 ☒ Total 3 Min

Photo No. if Taken:

26 ☐ Test Location Photo No. _____
27 ☐ Discharge Location Photo No. _____

Test Location Sketch:

SEE H/L FLOOR PLAN

Discharge Location Sketch:

Comments:

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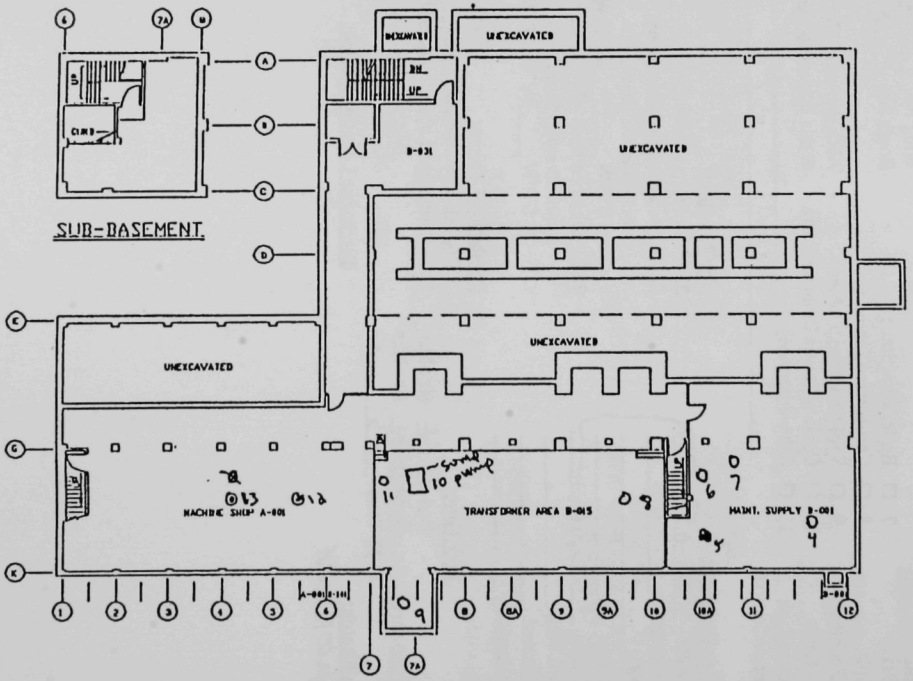


SERVICE FLOOR PLAN

0 300-73

(2) SCALE: 1/0"=1'

053

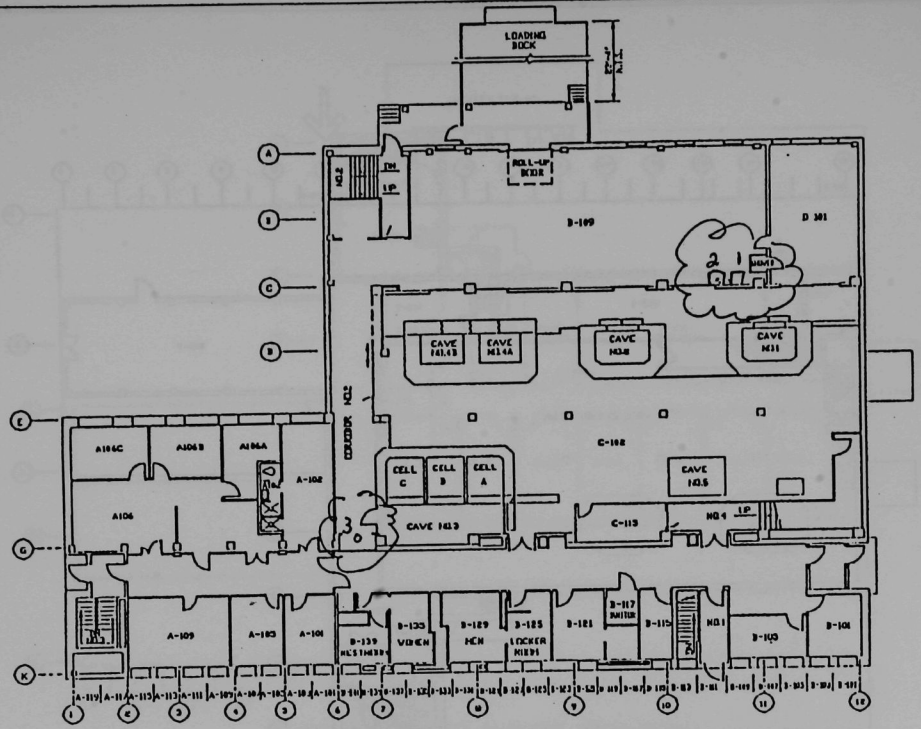
ARCTIC NATIONAL LABORA

REFERENCE DRAW

BUILDING 301

SERVICE FLOOR PLAN

WEST AREA



MAIN FLOOR PLAN

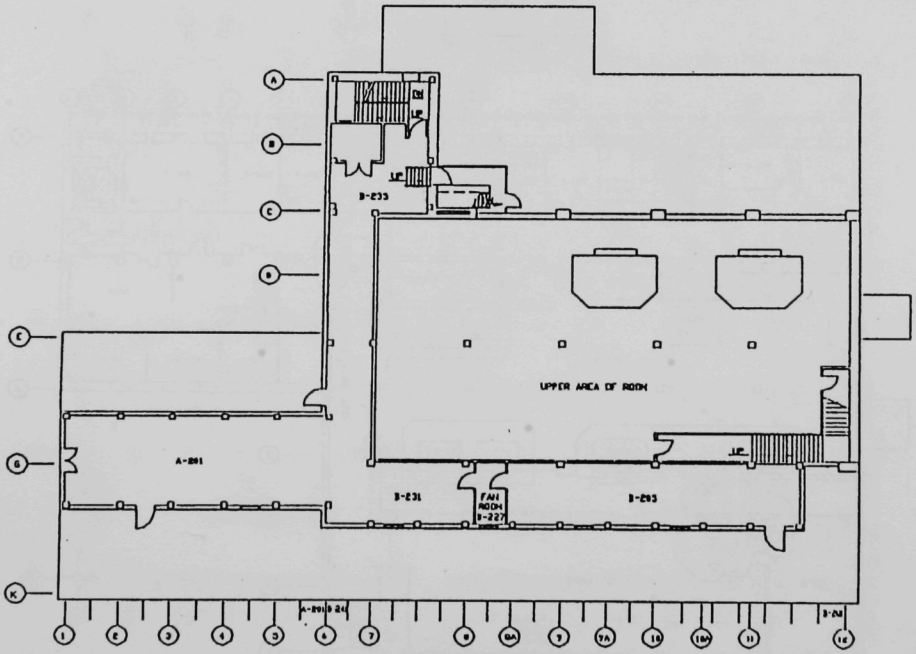
SCALE: 1/8"=1'

N

ARGONNE NATIONAL LABORATORY
FOR OFFICIAL USE ONLY

REFERENCE DRAWING
BUILDING 301
MAIN FLOOR PLAN
WEST AREA

PT-301-43 | 2 | 4



FAN LOFT PLAN

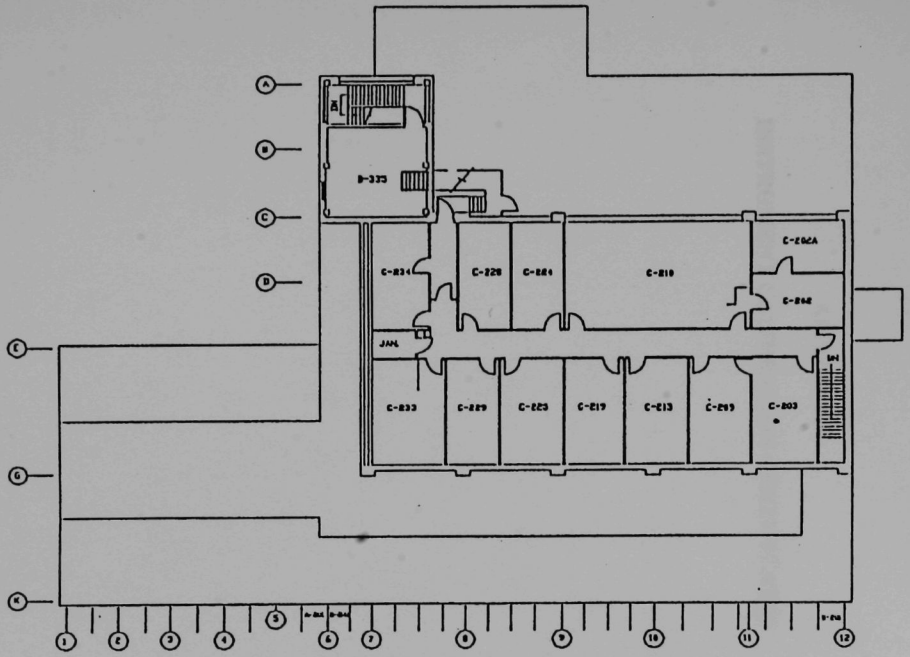
SCALE: 1/0"=1'

ARGONNE NATIONAL LABORATO

REFERENCE DRAWI
BLDG. 301
FAN LOFT PLA

WEST AREA

PE-301-13



SECOND FLOOR & MACHINE ROOM PLAN

SCALE 1/8" = 1'-0"

ARGONNE NATIONAL LABORATORY

REFERENCE DRAWING
BLDG. 301, SECOND FLOOR
AND MACHINE RM. PLAN

APPENDIX J:

INSTRUMENT CALIBRATION CERTIFICATES

Certificate #018-A0
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 182 Procedure#: 018 Configuration: **Scintillator**
Type: ___ 2 mm NaI X 1x1 NaI ___ 2x2 NaI
___ 1x1 plastic ___ 2x2 plastic ___ Other

Unit#: 4489 Mfr/Model: LUDLUM MODEL 12 S/N: 9023
Unit#: 6821 Mfr/Model: EBERLINE PG-1 S/N: NA

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: _____, S/N ____
Source(s): PU239, S/N 7552, Activity 4,150,000 DPM
_____, S/N ____, Activity ____
_____, S/N ____, Activity ____

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

Threshold: 11 mV (typ.: 5 to 10 mV)
Window: ___ mV = ___ % (typ.: 25 to 50% of Threshold mV)
Audible Function Check: ✓

Jerry Letizia 2/4/97
Pre-Calibrator Date

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
X1	400	400	400	0%
X10	4K	4K	4K	0%
X100	40K	40K	40K	0%
X1K	400K	400K	400K	0%

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV-___	PU-239	24K	24K	—
HV-___				
HV-___				

Mode of Operation: HV-___, ✓ (PHA or Gross)
Ambient Background in chosen Operational Mode: 600 cpm

REMARKS: _____

Jerry Letizia 2/4/97
Primary-Calibrator Date

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 140 Procedure#: **018** Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4590 Mfr/Model: **Eberline PRM-5-3** S/N: 2784
Unit#: 2803 Mfr/Model: **Eberline PG-2** S/N: 2775

Pulse Generator, Eberline MP- 1 , S/N 515
Electrostatic KiloVoltmeter: N/A ,S/N_____
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

Threshold: 13 mV (fixed at 5 to 10 mV)
Window: 16 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ✓

[signature] 7-8-97
Pre-Calibrator Date

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
500	400	400	400	0%
5K	4K	4K	4K	0%
50K	40K	40K	40K	0%
500K	400K	400K	400K	0%

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	15K	15K	N/A
HV- 2	Am-241	150K	300K	N/A
HV- 3	U-235	100K	100K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 1K cpm (ref.: > 300 cpm)

REMARKS: _____

[signature] 7-8-97
Primary-Calibrator Date

Certificate #015-A2
rev. 1.1, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 501 Procedure#: 015 Configuration: **Surface Contam**
Type: _X_ 330 ~~sq~~ cm (floor monitor) propane flow prop. ctr.

Unit#: 4601 Mfr/Model: **Eberline PAC-4G-3** S/N: —
Unit#: 7281 Mfr/Model: **Eberline AC-22** S/N: —

Pulse Generator, Eberline MP-1, S/N 200
Electrostatic KiloVoltmeter: Dawson, S/N 15374
Alpha Sources Pu-239, S/N 7686-7534-7687-7688
Beta Source Tc-99, S/N 17

I) MAINTENANCE/PRECALIBRATION:

Batteries: I Cabling: I Mechanical/Cleanliness: I
Probe Window: III Feedthrough Connector: II

Gas Flow - Operate Flame Height: 3/4 inches (ref.: 3/4")
Flush Flame Height: 2.5 inches (ref.: 2")
Threshold: III mV (ref.: 2 mV)
Audible Function Check: OK
Alpha High Voltage: OK Vdc (ref.: 1600 V)

Pre-Calibrator: [illegible] Date: 8/97

II) PRIMARY CALIBRATION:

Range (cpm)	Alpha Standard (dpm/2)	As Found (cpm)	As Left (cpm)	% Diff. Standard vs As Left
0-500 lin	361	200	350	
500-5k log	4.4K	5K+	4.5	
5k-50k lin	24.6K	46K	30K	
50k-500k log	455K	500K+	450K	
Beta Standard:	59K	15K	32K	

V

Alpha Mode Bkgd: 3-4 cpm reading
Beta Mode Bkgd: _____ cpm reading

~~REMARKS:~~ Repair I - tighten, replace bolts II - clean connectors III - replace window IV - reset input timed bolts IIII - re-adjust reg. V - re-cal.

Primary-Calibrator: [illegible] Date: 8/27/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 281 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4421 Mfr/Model: **Eberline PRM-5-3** S/N: 2814
Unit#: 2912 Mfr/Model: **Eberline PG-2** S/N: —

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brawson ,S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: I Cabling: OK Mechanical/Cleanliness: II

III Threshold: 10 mV (fixed at 5 to 10 mV)
Window: 12.5 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: OK

Pre-Calibrator Date 7/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	400	400	
R3	4K	4K	4K	
R4	40K	40K	40K	
R5	400K	400K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	12K	12K	N/A
HV- 2	Am-241	125K	250K	N/A
HV- 3	U-235	125K	48K	N/A — ~~[illegible]~~ 1 at peak

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 150 cpm (ref.: > 300 cpm)

REMARKS: I - replace batteries, II - repair det.
III - re-set window

Primary-Calibrator Date 7/2/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 282 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4696 Mfr/Model: **Eberline PRM-5-3** S/N: 2878
Unit#: 7743 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP- 2 , S/N 774
Electrostatic KiloVoltmeter: _____ ,S/N _____
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

Threshold: 10 mV (fixed at 5 to 10 mV)
Window: 13 mV = 30 % ✓ (ref.: 25% of Threshold mV)
Audible Function Check: ✓

Pre-Calibrator Date 10-10-97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
800	400	400	400	0%
5K	4K	4K	4K	0%
50K	40K	40K	40K	0%
500K	400K	400K	400K	0%

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	10K	10K	N/A
HV- 2	Am-241	225K	225K	N/A
HV- 3	U-235	50K	50K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 1K cpm (ref.: > 300 cpm)

REMARKS: _____

Primary-Calibrator Date 10-10-97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 357 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4742 Mfr/Model: **Eberline PRM-5-3** S/N: 2793
Unit#: 3980 Mfr/Model: **Eberline PG-2** S/N: ____

Pulse Generator, Eberline MP-__1__, S/N 200
Electrostatic KiloVoltmeter: Brawson, S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ok Cabling: ok Mechanical/Cleanliness: fair

Threshold: 13 mV (fixed at 5 to 10 mV)
Window: 16.2 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ok I

Pre-Calibrator _____ Date 9/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	390	400	
R3	4K	3.6K	4K	
R4	40K	3.8K	40K	
R5	400K	370K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	16K	19K	N/A
HV- 2	Am-241	300K	225K	N/A
HV- 3	U-235	60K	75K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 2K cpm (ref.: > 300 cpm)
REMARKS: Refair + SKI-spectra) II - repair HV board

Primary-Calibrator _____ Date 9/3/97

Argonne National Laboratory
Health Physics Instrument Group

Certificate #029-A4
rev. 1.0, Jan. 1994

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 433 Procedure#: 029 Configuration: **uR Field**
Type: _X_ 1x1 plastic scint.

Unit#: 4850 Mfr/Model: **Bicron micro-rem** S/N: A297J

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Gamma Source CS137, S/N 7083

I) MAINTENANCE/PRECALIBRATION:

Mechanical: / Cleanliness: / Batteries: /
Cabling: / Meter Mechanical Zero: /

Meter- Zero: / ; Span: /
Threshold: / mV (not adjustable)
On Plateau?: YES (should respond to Am-241 gammas)
High Voltage: / Vdc (typically near 800 V)
High Voltage OK Indication: OK (within checkband)

Pre-Calibrated by: Jerry Lettieri Date: 3/6/97

II) PRIMARY CALIBRATION:

Range	*****Mid-Field**** Field	As Found	As Left		**Low-Field*** Field	Response		**High-Field** Field	Response
(0 to 200 urem/h)									
230 X 20 x1000	89.78	82	82	230 X 40	42.33	36	230 X 10	172.31	165
230 X 200 x100	9.02	9	9	230 X 400	4.49	4.1	230 X 100	17.55	18.0
270 X 2K x10	1.04	.9	.9	270 X 8K	.498	.4	270 X 800	1.53	1.5

Electronic Calibration, referenced to the x10 range as follows: ___ cpm = ___ urem/h

x1	.09	.09	.09	N/A	N/A	.15	.15
x0.1	.01	.008	.008				

Off-Scale Response?: / (field should be 2x the top range)

Conditions: Pressure 747 ; Temperature 20°C

REMARKS: _____

Primary-Calibrator: Jerry Lettieri Date: 3/27/97
Re-Calibration Due Date: 9/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 243 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit# 4464 Mfr/Model: **Eberline PRM-5-3** S/N: 2947
Unit#: 2446 Mfr/Model: **Eberline PG-2** S/N: ____

Pulse Generator, Eberline MP-1, S/N 200
Electrostatic KiloVoltmeter: Brawson, S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ok Cabling: I Mechanical/Cleanliness: ok

Threshold: 10 mV (fixed at 5 to 10 mV)
Window: 12.5 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ok

Pre-Calibrator _____ Date 7/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	375	400	
R3	4K	3.8K	4K	
R4	40K	40K	40K	
R5	400K	400K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	15K	22K	N/A
HV- 2	Am-241	140K	400K	N/A
HV- 3	U-235	150K	100K	N/A — not for Not gain

II

Mode of Operation: **HV- 1 , Gross**
Ambient Bkgd in chosen Oper. Mode: 2.5K cpm (ref.: > 300 cpm) (-360 -k

REMARKS: I- repair cable connector.
II - re-cal.

Primary Calibrator _____ Date 7/23/97

Argonne National Laboratory
Health Physics Instrument Group

Certificate #029-A1
rev. 1.0, Jan. 1994

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 400 Procedure#: 029 Configuration: **uR Field**
Type: _X_ 1x1 NaI scint.

Unit#: 4903 Mfr/Model: **Eberline PRM-7** S/N: 200

Pulse Generator, Eberline MP-1, S/N 200
Electrostatic KiloVoltmeter: Keithley, S/N 15374
Gamma Source Cs-137, S/N 213

I) MAINTENANCE/PRECALIBRATION:

Mechanical: OK Cleanliness: OK
Batteries: OK Cabling: OK Meter Zero: OK

Threshold: 12 mV (fixed near 15 mV)
PMT Gain Adj.: OK (only if new PMT, then maximize)
On Plateau?: OK (should respond to Am-241 gammas)
High Voltage: 1 Vdc (typically near 1000 V)
Audible Function Check: OK (divides by 16)

Pre-Calibrated by: [signature] Date: 7/3/97

II) PRIMARY CALIBRATION:

Range (uR/h)	*****Mid-Field**** Field	As Found	As Left	**Low-Field*** Field	Response	**High-Field** Field	Response
5000	2.24	2.2	2.2	.9	.9	3.5	3.4
500	.22	.20	.20	.09	.09	.36	.36

Electronic Calibration, referenced to the 500 uR/h range as follows: 90K cpm = 160 uR/h

50	____	16	____	8	____	32	____
25	____	8	____	NA	____	16	____

Off-Scale Response?: ____ (field should be 2x the top range)

Conditions: Pressure 746 ; Temperature 74°F

REMARKS: I- high voltage erratic - re-solder connection

Primary-Calibrator: [signature] Date: 7-9-97
Re-Calibration Due Date: ____

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 504 Procedure#: **015** Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 4963 Mfr/Model: **NE Technology Electra** S/N: 290
Unit#: 7565 Mfr/Model: **NE Technology DP6 A** S/N: 385

Pulse Generator, Eberline MP- 2, S/N 774
Electrostatic KiloVoltmeter: ESD, S/N 950556
Alpha Source: Am241, S/N DY957, Activity 66,170 dpm
Beta Source: Sr90, S/N DN652, Activity 118,300 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: OK Cabling: OK Mechanical/Cleanliness: OK
Battery Voltage (Parameter # 0): 4.5 (ref: > 4)
Threshold: 25 mV (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: OK
HV Calib.: OK (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = ~~930~~ 950 V and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 35.2K Alpha cpm: 22 (e.g., 0.06 % of beta)
ULD (Parameter #6): 2.05 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm ✓
Parameter #A (inhibit bkgd subt): set to ON ✓
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto ✓
Parameter #E (pulse mode): set to dUAL ✓
Parameter #F (ohms): set to S66 ✓

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.7K cpm; 20.7 % efficiency (alpha)
Alpha Mode Bkgd: 4 cpm (ref.: < 7 cpm)
Response to Beta Std: 35.2K cpm; 29.7 % efficiency (beta)
Beta Mode Bkgd: 372 cpm (ref.: < 400 cpm)
Integrate Check: OK Audible Functional Check: OK

Parameter #8 (Units): change from cpm to **dpm** ✓
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Robert Kerr Date: 5/9/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 505 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 9905 Mfr/Model: **NE Technology Electra** S/N: 292
Unit#: 5607 Mfr/Model: **NE Technology DP6A** S/N: 381

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM 241, S/N DV941, Activity 63910 dpm
Beta Source: SR 90, S/N DN631, Activity 104400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.6 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 820, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.7K Alpha cpm: 50 (e.g., <.01 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.3K cpm; .208 % efficiency (alpha)
Alpha Mode Bkgd: 5 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.7K cpm; .299 % efficiency (beta)
Beta Mode Bkgd: 343 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: Jerry Kitzigian Date: 9/8/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 537 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 9977 Mfr/Model: **NE Technology Electra** S/N: 939
Unit#: 7581 Mfr/Model: **NE Technology DP6A** S/N: 315

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DN961, Activity 63910 dpm
Beta Source: SR90, S/N DN631, Activity 104400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.2 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 980, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.5K Alpha cpm: 42 (e.g., .01 % of beta)
ULD (Parameter #6): 2.30 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.9K cpm; .901 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.5K cpm; .297 % efficiency (beta)
Beta Mode Bkgd: 337 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Letizia Date: 10/27/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 792 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6408 Mfr/Model: **NE Technology Electra** S/N: 1830
Unit#: 6499 Mfr/Model: **NE Technology DP6BDD** S/N: 11035

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AMA41, S/N DD761, Activity 63910 dpm
Beta Source: SE490, S/N DN631, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.6 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10000
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 980, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 32.3K Alpha cpm: 29 (e.g., .09 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 µA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 µsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 11.3K cpm; .176 % efficiency (alpha)
Alpha Mode Bkgd: 4 cpm (ref.: < 7 cpm)
Response to Beta Std: 32.8K cpm; .318 % efficiency (beta)
Beta Mode Bkgd: 370 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: [signature] Date: 10/2/97

Certificate #019-A2
rev. 1.1, August 1995

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 881 Procedure#: 019 Configuration: **Neutron Field**
Type: _X_ 9" Hankins Sphere ___ 10" Bonner Sphere
___ Anderson-Braun ___ Leake ___ Other
Unit#: 6270 Mfr/Model: **Eberline ASP-1** S/N: 1811
Unit#: 7747 Mfr/Model: **Ludlum 42-31** S/N: 125728

Pulse Generator, Eberline MP-___/___, S/N 5745
Electrostatic KiloVoltmeter: ESD 8, S/N ES-17368
Neutron Source Cf 252, S/N 01-235
Gamma Source Cs 137, S/N 7083

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

High Voltage: 1550 Vdc (ref.: 1600 V w/ N. Wood G-5-1 tube)
HV Cal: ✓
Threshold: 2 mV (ref.: 2 mV w/ G-5-1) ; Window: Gross
Range Switch Check: ✓ Audible Function Check: ✓
Integrate Function Check: ✓

Dial: X100K to X1 Rate Unit: mrem/h
Dip Switches:
Dead Time: 10 usec Test: Run
Min Sw: Open Hour Sw: Closed
Cal Sw 3: **Closed** Cal Sw 4: **Closed**
Audio: Divide by 1

As Found Std. Current: .48 (ref.: 0.48 if initial setup)
Gamma Insensitivity Check: ✓

Pre-Calibrator Date: 8-15-97

II) PRIMARY CALIBRATION:

Range	Field Intensity (mrem/h)	Source to Detector Distance (cm)	As Found (mrem/h)	As Left (mrem/h)	% Diff. Field vs As Left
x100	16.8	50	16	16	
x10	7.8	75	7.0	7.0	
x10	3.1	125	3.0	3.0	

As Left Std. Current: .50

REMARKS:

Primary-Calibrator Date: 8-15-97

Certificate #015-A1
rev. 1.1, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 919 Procedure#: 015 Configuration: **Surface Contam**
Type: _X_ 61 sq cm propane flow prop. ctr.

Unit# 5403 Mfr/Model: **Eberline PAC-4G-3** S/N: 3885
Unit# 2559 Mfr/Model: **Eberline AC-21** S/N: —

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Rawson , S/N 12048
Alpha Sources Pu239 , S/N 7534, 7686, 7687, 7688
Beta Source Tc99 , S/N 17

I) MAINTENANCE/PRECALIBRATION:

Batteries: ok Cabling: ok Mechanical/Cleanliness: ok
Probe Window: ok Feedthrough Connector: ok

Gas Flow - Operate Flame Height: 1/2 inches (ref.: 3/4")
Flush Flame Height: 2 inches (ref.: 2")
Threshold: 2 mV (ref.: 2 mV)
Audible Function Check: ok
Alpha High Voltage: 1600 Vdc (ref.: 1600 V)

Pre-Calibrator _____ Date 7/97

II) PRIMARY CALIBRATION:

Range (cpm)	Alpha Standard (dpm/2)	As Found (cpm)	As Left (cpm)	% Diff. Standard vs As Left
0-500 lin	367	200	350	
500-5k log	4.4K	3.5	4.5	
5k-50k lin	28K	20K	32K	
50k-500k log	455K	490K	450K	
Beta Standard:	30K	24K	30K	

Alpha Mode Bkgd: 2-3 cpm reading
Beta Mode Bkgd: 120 cpm reading

REMARKS: I- pre-cal

Primary-Calibrator _____ Date 7/9/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 923 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5347 Mfr/Model: **NE Technology Electra** S/N: 931
Unit#: 6881 Mfr/Model: **NE Technology DP6A** S/N: 321

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM 241, S/N D9961, Activity 63960 dpm
Beta Source: SR 90, S/N DN231, Activity 104400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.6 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1075, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.5K Alpha cpm: 22 (e.g., .07% of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.2K cpm; .206% efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.5K cpm; .297% efficiency (beta)
Beta Mode Bkgd: 305 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: Jerry Letizia Date: 10/3/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 914 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5399 Mfr/Model: **NE Technology Electra** S/N: 293
Unit#: 6885 Mfr/Model: **NE Technology DP6A** S/N: 382

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DU961, Activity 63910 dpm
Beta Source: Sr90, S/N DN631, Activity 108400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.3 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 970V, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 29.5K Alpha cpm: 30 (e.g., .1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 µA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 µsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 18.3K cpm; .192 % efficiency (alpha)
Alpha Mode Bkgd: 4 cpm (ref.: < 7 cpm)
Response to Beta Std: 29.5K cpm; .288 % efficiency (beta)
Beta Mode Bkgd: 345 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide).

REMARKS: RE CAL / NEW TUBE

Calibrated by: Jerry Litzinger Date: 7/15/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 931 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5553 Mfr/Model: **NE Technology Electra** S/N: 479
Unit#: 6884 Mfr/Model: **NE Technology DP6A** S/N: 550

Pulse Generator, Eberline MP- 2, S/N 774
Electrostatic KiloVoltmeter: ES18, S/N ES-17368
Alpha Source: Am 241, S/N DU965, Activity 60160 dpm
Beta Source: Sr Y 90, S/N DU636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.2 (ref: > 4)
Threshold: ✓ (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: ✓
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1015, and INHIBIT:___
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 28.1K Alpha cpm: 9 (e.g., <.1 % of beta)
ULD (Parameter #6): 2.1 V (ref: 2.00 V), then INHIBIT:___

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.9K cpm; .212 % efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < 7 cpm)
Response to Beta Std: 28.1K cpm; .297 % efficiency (beta)
Beta Mode Bkgd: 357 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 10-9-97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 960 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5348 Mfr/Model: **NE Technology Electra** S/N: 489
Unit#: 6643 Mfr/Model: **NE Technology DP6B** S/N: 1049

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DU96, Activity 63910 dpm
Beta Source: SR90, S/N DW631, Activity 10d400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.5 (ref: > 4)
Threshold: 25 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 790V, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 33K Alpha cpm: 33 (e.g., .1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.3K cpm; .208 % efficiency (alpha)
Alpha Mode Bkgd: 5 cpm (ref.: < 7 cpm)
Response to Beta Std: 33K cpm; .322 % efficiency (beta)
Beta Mode Bkgd: 370 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: Jerry Letizia Date: 8/6/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 964 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5356 Mfr/Model: **NE Technology Electra** S/N: 507
Unit#: 6915 Mfr/Model: **NE Technology DP6A** S/N: 577

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DU961, Activity 63910 dpm
Beta Source: SR90, S/N DN637, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.6 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 850, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 31.8K Alpha cpm: 3 (e.g., .01 % of beta)
ULD (Parameter #6): 2.4 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.5K cpm; .195 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < 7 cpm)
Response to Beta Std: 31.8K cpm; .310 % efficiency (beta)
Beta Mode Bkgd: 373 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: [signature] Date: 10/2/97

Certificate #017-A1
rev. 1.0, August 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 994 Procedure#: 017 Configuration: Ion Field
Type: _X_ Ionization Chamber

Unit#: 5465 Mfr/Model: Kberline RO-20 S/N: 395

Gamma Source CS137, S/N 7083

I) MAINTENANCE/PRECALIBRATION:

Mechanical: ✓ Cleanliness: ✓
Detector Window: ✓ Meter Zero: ✓
Batteries: Supply ✓ ; Chamber Bias ✓

Jerry Letizia 9/19/97
Pre-Calibrator Date

II) PRIMARY CALIBRATION (Linear Scales):

Range	*****Mid-Field***** Field	As Found	As Left	**Low-Field*** Field	Response	**High-Field** Field	Response
(0 to 5 mR/h)							
x1	1.9	1.9	1.9	1.2	1.1	3.5	3.3
x10	23.4	23.0	23.0	7.8	7.5	36.6	36
x100	234	230	230	88	80	358	350
(0 to 5 R/h)							
x1	2.28	2.3	2.3	.85	.85	4.05	4.1
x10	22.6	22.5	22.5	9.0	9.0	36.1	340

Off-Scale Response?: ✓ (field should be about 100 R/h)

Integrate Mode - N/A

Conditions: Pressure 747 mm Hg ; Temperature 20°C

REMARKS:

Jerry Letizia 9/23/97
Primary-Calibrator Date

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1041 Procedure#: **015** Configuration: **Surface Contam**
Type: **X** Dual Scintillator (**dpm units**)
Unit#: 5485 Mfr/Model: **NE Technology Electra** S/N: 526
Unit#: 6806 Mfr/Model: **NE Technology DP6A** S/N: 595

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N NV961, Activity 63910 dpm
Beta Source: SR90, S/N _____, Activity 106400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.3 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 700, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 32.2K Alpha cpm: 30 (e.g., 0.1 % of beta)
ULD (Parameter #6): 2.0 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.4K cpm; .209 % efficiency (alpha)
Alpha Mode Bkgd: 4 cpm (ref.: < 7 cpm)
Response to Beta Std: 32.2K cpm; .314 % efficiency (beta)
Beta Mode Bkgd: 400 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Letizia Date: 11/6/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1042 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5447 Mfr/Model: **NE Technology Electra** S/N: 580
Unit#: 6807 Mfr/Model: **NE Technology DP6A** S/N: 609

Pulse Generator, Eberline MP-2 S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N B443
Alpha Source: Am241, S/N D0961, Activity 63910 dpm
Beta Source: Sr90, S/N D1631, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.5 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 935, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.9K Alpha cpm: 29 (e.g., <.1 % of beta)
ULD (Parameter #6): 2.95 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.5K cpm; .211 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.9K cpm; .301 % efficiency (beta)
Beta Mode Bkgd: 317 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Lerigia Date: 11/21/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1047 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5787 Mfr/Model: **NE Technology Electra** S/N: 569
Unit#: 6813 Mfr/Model: **NE Technology DP6A** S/N: 607

Pulse Generator, Eberline MP- 2, S/N 774
Electrostatic KiloVoltmeter: E508, S/N 517368
Alpha Source: Am-241, S/N DV 965, Activity 60960 dpm
Beta Source: Sr-90, S/N DV 636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.2 (ref: > 4)
Threshold: 30 mV (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: ✓
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 925, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 28.3K Alpha cpm: 17 (e.g., 2.1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ___

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 11.5 Kcpm; .187 % efficiency (alpha)
Alpha Mode Bkgd: 2 cpm (ref.: < 7 cpm)
Response to Beta Std: 28.3K cpm; .299 % efficiency (beta)
Beta Mode Bkgd: 358 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 10-2-91

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1050 Procedure#: **015** Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5490 Mfr/Model: **NE Technology Electra** S/N: 579
Unit#: 6815 Mfr/Model: **NE Technology DP6A** S/N: 603

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AMA41, S/N DV961, Activity 63910 dpm
Beta Source: Sr90, S/N DV651, Activity 103400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.4 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = _____, and INHIBIT: ___
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm 32.8K Alpha cpm: 32 (e.g., .01 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 10.9K cpm; .170 % efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < 7 cpm)
Response to Beta Std: 32.8K cpm; .320 % efficiency (beta)
Beta Mode Bkgd: 382 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Litizia Date: 10/6/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1052 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5492 Mfr/Model: **NE Technology Electra** S/N: 567
Unit#: 6817 Mfr/Model: **NE Technology DP6A** S/N: 605

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESP 9, S/N 13443
Alpha Source: AM241, S/N DV961, Activity 63910 dpm
Beta Source: SR90, S/N DN651, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.6 (ref: > 4)
Threshold: 25 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 850, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.2K Alpha cpm: 21 (e.g., .07 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.5K cpm; .211 % efficiency (alpha)
Alpha Mode Bkgd: 7 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.2K cpm; .294 % efficiency (beta)
Beta Mode Bkgd: 385 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: Jerry Kitayama Date: 8/18/97

Certificate #029-C1
rev. 1.0, Dec. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1782 Procedure#: 029 Configuration: **uR Field**
Type: _X_ Energy Compensated GM

Unit#: 6486 Mfr/Model: **Eberline ASP-1** S/N: 7463
Unit#: 6575 Mfr/Model: **TGM N378S/BNC** S/N: _____

Pulse Generator, Eberline MP- 1, S/N 545
Electrostatic KiloVoltmeter: _____, S/N _____
Gamma Source Cs137, S/N 7081

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

High Voltage: 450 Vdc (ref.: 450 V)
HV Cal: ✓
Threshold: 28 mV (ref.: 30 mV); Window: Gross
Range Switch Check: ✓ Audible Function Check: ✓
Integrate Function Check: ✓

Dial: X1M to X10 Rate Unit: uR/h
Dip Switches:
Dead Time: ~~200~~ 132 usec Test: Run
Min Sw: Open Hour Sw: Closed
Cal Sw 3: **Closed** Cal Sw 4: **Open**
Audio: Divide by 1

As Found Std. Current: 0.55

Pre-Calibrator _____ Date 9-4-97

II) PRIMARY CALIBRATION:

Range	Field Intensity (uR/h)	Source to Detector Distance (cm)	As Found (uR/h)	As Left (uR/h)	% Diff. Field vs As Left
1K	.5	250x8K	.5	.5	
10K	5.0	150x800	5.0	5.0	
100K	50.0	150x80	52	52	
1M	445	150x8	OVERLOAD		

As Left Std. Current: .55
As Left Dead Time: 132 usec

REMARKS: _____

Primary-Calibrator _____ Date 9/8/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1787 Procedure#: **015** Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6403 Mfr/Model: **NE Technology Electra** S/N: 1798
Unit#: 6444 Mfr/Model: **NE Technology DP6** S/N: 1021

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DJ961, Activity 63910 dpm
Beta Source: SR90, S/N DP631, Activity 108400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.3 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 865, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 33.9K Alpha cpm: 30.1 (e.g., .08 % of beta)
ULD (Parameter #6): 2.0 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 19.2K cpm; .190 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < 7 cpm)
Response to Beta Std: 33.9K cpm; .331 % efficiency (beta)
Beta Mode Bkgd: 306 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Letizia Date: 7/1/97

Certificate #015-A1
rev. 1.1, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 168 Procedure#: 015 Configuration: **Surface Contam**
Type: _X_ 61 sq cm propane flow prop. ctr.

Unit#: 7608 Mfr/Model: **Eberline PAC-4G-3** S/N: 4353
Unit#: 6893 Mfr/Model: **Eberline AC-21** S/N: —

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Rawson ,S/N 12048
Alpha Sources Pu239 ,S/N 7534, 7686, 7687, 7688
Beta Source Tc99 ,S/N 17

I) MAINTENANCE/PRECALIBRATION:

Batteries: II Cabling: ____ Mechanical/Cleanliness: I
Probe Window: ok Feedthrough Connector: ok

Gas Flow - Operate Flame Height: 1/2 inches (ref.: 3/4")
Flush Flame Height: 2 inches (ref.: 2")
I — Threshold: 2 mV (ref.: 2 mV)
Audible Function Check: ok
Alpha High Voltage: 1600 Vdc (ref.: 1600 V)

[signature] 4/10
Pre-Calibrator Date

II) PRIMARY CALIBRATION:

III

Range (cpm)	Alpha Standard (dpm/2)	As Found (cpm)	As Left (cpm)	% Diff. Standard vs As Left
0-500 lin	367	300	358	
500-5k log	4.4K	2.5k	4.5K	
5k-50k lin	29.6K	22K	30K	
50k-500k log	455K	350K	450K	
Beta Standard:	30K(25)	45K	30K	

Alpha Mode Bkgd: 2-3 cpm reading
Beta Mode Bkgd: 252 cpm reading

Repair
~~REMARKS~~: I - 200 reg - & battery disc. II - replace battery
III - re-cal.

[signature] 10/5/97
Primary Calibrator Date

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 96 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit# 4524 Mfr/Model: **Eberline PRM-5-3** S/N: 2912
Unit# 7973 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brawson , S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ok Cabling: ok Mechanical/Cleanliness: ok

Threshold: 10 mV (fixed at 5 to 10 mV)
Window: 12.5 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ok

Pre-Calibrator _____ Date 10/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	400	400	
R3	4K	4K	4K	
R4	40K	40K	40K	
R5	400K	350K	400K	

I —

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	14K	15K	N/A
HV- 2	Am-241	300K	300K	N/A
HV- 3	U-235	5.5K	25K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 600 cpm (ref.: > 300 cpm)
~~REMARKS~~ refers: I - re-cal.

Primary-Calibrator _____ Date 10/2/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 74 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4514 Mfr/Model: **Eberline PRM-5-3** S/N: 2300
Unit#: 200 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brauson , S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

I

Batteries: OK Cabling: OK Mechanical/Cleanliness: OK

Threshold: 14 mV (fixed at 5 to 10 mV)
Window: 17.5 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: OK

[signature] 9/97
Pre-Calibrator Date

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	425	400	
R3	4K	4.9K	4K	
R4	40K	37K	40K	
R5	400K	360K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	10K	10K	N/A
HV- 2	Am-241	110K	200K	N/A
HV- 3	U-235	50K	50K	N/A

II

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 2.5K cpm (ref.: > 300 cpm) 360-4c

~~REMARKS:~~ I - meter movement sticks measurably and re-set zeros
II - re-cal.

[signature] 9/18/97
Primary Calibrator Date

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 69 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 5428 Mfr/Model: **Eberline PRM-5-3** S/N: 2797
Unit#: 7852 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP- 1 , S/N 535
Electrostatic KiloVoltmeter: 5008 , S/N 53-17248
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

Threshold: 8 mV (fixed at 5 to 10 mV)
Window: 10 mV = ✓ % (ref.: 25% of Threshold mV)
Audible Function Check: ✓

Pre-Calibrator _____ Date 8-4-97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
500	400	400	400	0%
5K	4K	4K	4K	0%
50K	40K	40K	40K	0%
500K	400K	400K	400K	0%

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	10K	10K	N/A
HV- 2	Am-241	150K	150K	N/A
HV- 3	U-235	100K	100K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 1K cpm (ref.: > 300 cpm)

REMARKS: _____

Primary-Calibrator _____ Date 8-4-97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 16 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4415 Mfr/Model: **Eberline PRM-5-3** S/N: 2911
Unit#: 4162 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP-1, S/N 200
Electrostatic KiloVoltmeter: Brawson, S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: OK Cabling: I. Mechanical/Cleanliness: I

Threshold: 11 mV (fixed at 5 to 10 mV)
Window: 13.7 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: OK

Pre-Calibrator _____ Date 7/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	400	400	
R3	4K	5K	4K	
R4	40K	45K	40K	
R5	400K	500K	400K	

II

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	3.2K	12K	N/A
HV- 2	Am-241	350K	340K	N/A
HV- 3	U-235	50K	52K	N/A

II

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 200 cpm (ref.: > 300 cpm)

REMARKS: I. attach dose tool to det. & repair cable.
II.- recal

Primary-Calibrator _____ Date 7/3/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 13 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4412 Mfr/Model: **Eberline PRM-5-3** S/N: 2795
Unit#: 7867 Mfr/Model: **Eberline PG-2** S/N: ____

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brawson ,S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: 9 Cabling: ok Mechanical/Cleanliness: ok

Threshold: 11.2 mV (fixed at 5 to 10 mV)
Window: ____ mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ~~ok~~ II

Pre-Calibrator: [signature] Date: 10/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	400	400	
R3	4K	4K	4K	
R4	40K	40K	40K	
R5	400K	400K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	12K	14K	N/A
HV- 2	Am-241	25.6K	25.0K	N/A
HV- 3	U-235	62K	60K	N/A

Mode of Operation: **HV- 1 , Gross**
Ambient Bkgd in chosen Oper. Mode: 600 cpm (ref.: > 300 cpm)

~~REMARKS~~: I - recal Hero.
II - repair SKI

Primary Calibrator: [signature] Date: 10/8/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 169 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4423 Mfr/Model: **Eberline PRM-5-3** S/N: 3017
Unit#: 0199 Mfr/Model: **Eberline PG-2** S/N: _____

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brauson , S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: I Cabling: OK Mechanical/Cleanliness: OK

Threshold: 11 mV (fixed at 5 to 10 mV)
Window: 13.2 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: OK

Pre-Calibrator _____ Date 7/97

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	400	400	
R3	4K	4.25	4K	
R4	40K	40K	40K	
R5	400K	400K	400K	

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	12K	12.5K	N/A
HV- 2	Am-241	250K	275K	N/A
HV- 3	U-235	52K	55K	N/A

Mode of Operation: **HV- 1 , Gross**
Ambient Bkgd in chosen Oper. Mode: 1K cpm (ref.: > 300 cpm)

REMARKS: I - repair & replace battery
II - re-cal.

Primary-Calibrator _____ Date 7/14/97

Certificate #018-A1
rev. 1.0, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 172 Procedure#: 018 Configuration: **Scintillator**
Type: _X_ 2 mm NaI

Unit#: 4612 Mfr/Model: **Eberline PRM-5-3** S/N: 2982
Unit#: 2844 Mfr/Model: **Eberline PG-2** S/N: ___

Pulse Generator, Eberline MP- 1 , S/N 200
Electrostatic KiloVoltmeter: Brawson , S/N 15374
Source(s): Pu-239 ,S/N 7552 ,Activity 4150000 dpm
Am-241 ,S/N 7551 ,Activity 6028000 dpm
U-235 ,S/N 22B6102 ,Activity 1.06 g foil

I) MAINTENANCE/PRECALIBRATION:

Batteries: I Cabling: ok Mechanical/Cleanliness: II

Threshold: 12 mV (fixed at 5 to 10 mV)
Window: 15 mV = 25 % (ref.: 25% of Threshold mV)
Audible Function Check: ok

Pre-Calibrator 7/97 Date

II) PRIMARY CALIBRATION:

Range (cpm)	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
R2	400	325		
R3	4K	4.2K		
R4	40K	5K		
R5	400K	40K		

With PHA in, adjust HV to maximize detector response to isotope of interest:

Mode	Isotope	Response As Found (cpm)	Response As Left (cpm)	Efficiency (If Applicable) (%)
HV- 1	Pu-239	12K	12K	N/A
HV- 2	Am-241	275K	275K	N/A
HV- 3	U-235	50K	50K	N/A

Mode of Operation: **HV- 1** , **Gross**
Ambient Bkgd in chosen Oper. Mode: 2.2K cpm (ref.: > 300 cpm) (366-4

REMARKS: I - batteries II - 2 scaler meter repl. movem

Primary-Calibrator 7/24/97 Date

Certificate #030-A2, Page 1
rev. 1.1, July 1994

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1246 Procedure#: 030 Configuration: **Area Monitor**
Type: Multiplying Ion Chamber in Gamma Field
Unit#: 5686 Mfr/Model: **NucResCorp. IP-100(V3)** S/N: IP3950d1
Readout & Control Unit: **NucResCorp ADM-610A(V7)** S/N: _____

Electrostatic KiloVoltmeter: — , S/N —
Gamma Source: CS137 , S/N 7083

I) MAINTENANCE/PRECALIBRATION:
Mechanical: ✓ Cleanliness: ✓ Other: —
Note: If full precalibration is required, use 2nd page.

II) PRIMARY CALIBRATION:

Depress MODE and SET of ADM-610 while powering ON. SET low range calibration MODE. Enter and SET the calibration field intensity (ref.: 100 mR/h).
Known Field Intensity (mR/h): _____
Start Calibration MODE. When DONE, enter new scale factor.
HV Change? (R4): _____ turns-CW or CCW? _____
Note : " scale factor too **high** " requires **CW**, whereas
" scale factor too **low** " requires **CCW**.
Old Scale Factor: _____ New Scale Factor: _____
Turn ADM-610 OFF, and then ON again. Confirm calibration field reading on ADM: _____ mR/h (ref.: within +/-10%).

Calibration Check:

	Field (mR/h)		ADM Reading (mR/h)	
200 x 100	19.07	(ref.: 20 mR/h)	19.1	(ref.: +/-15 % of field)
200 x 000	9.8	(ref.: 10 mR/h)	10.2	(ref.: +/-15 % of field)

	Field (R/h)		ADM Reading (R/h)	
200 x 4	.391	(ref.: 0.5 R/h)	.416	(ref.: +/-15 % of field)
200 x 0	1.85	(ref.: 2 R/h)	2.08	(ref.: +/-15 % of field)
100 x 0	9	(ref.: 10 R/h)	9.7	(ref.: +/-15 % of field)

REMARKS: _____

Calibrated by: [signature] Date: 7-24-97
Re-Calibration Due Date: _____

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 104 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5488 Mfr/Model: **NE Technology Electra** S/N: ____
Unit#: 1812 Mfr/Model: **NE Technology DP6A** S/N: 662

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 572
Alpha Source: AM241, S/N DV961, Activity 63910 dpm
Beta Source: SR90, S/N DN631, Activity 104400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.0 (ref: > 4)
Threshold: 25 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: 015 ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1000, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 29900 Alpha cpm: 30 (e.g., .1 % of beta) ✓
ULD (Parameter #6): 2.0 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.8K cpm; .200 % efficiency (alpha)
Alpha Mode Bkgd: 6 cpm (ref.: < 7 cpm)
Response to Beta Std: 29.9K cpm; .291 % efficiency (beta)
Beta Mode Bkgd: 338 cpm (ref.: < 400 cpm) ✓
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: ____

Calibrated by: Jerry Letizia Date: 7/15/97

Certificate #016-A4
rev. 0.0, March 1994

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1095 Procedure#: **016** Configuration: **GM Field**
Type: _X_ Energy Compensated

Unit#: 5560 Mfr/Model: **Ludlum 3** S/N: 88773
Unit#: 6768 Mfr/Model: **Eberline HP-270** S/N: _____

Pulse Generator, Eberline MP- 1, S/N 535
Electrostatic KiloVoltmeter: EKO 8, S/N EKS-12568
Gamma Source Cs137, S/N 208310-408

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Handle: ✓
Meter Zero: ✓ Cleanliness: ✓

Threshold: 30 mV (fixed @ approx. 30 to 50 mV)
High Voltage: 900 Vdc (ref.: 900 V)
Audible Function Check: ✓

Pre-Calibrator 7-10-97 Date

II) PRIMARY CALIBRATION (Linear Scales):

Range	*****Mid-Field**** Field	As Found	As Left	**Low-Field*** Field	Response	**High-Field** Field	Response
(0 to 2 mR/h)							
x0.1	.09	.1	.1	N/A	N/A	.15	.15
x1	.99	1.0	1.0	.3	.3	1.49	1.5
x10	8.5	9.0	9.0	3.5	3.5	14.5	14.0
x100	91	90	90	55	30	145	140

Off-Scale Response?: ✓ (field should be about 400 mR/h)

REMARKS: _____

Primary-Calibrator 7-11-97 Date

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1259 Procedure#: **015** Configuration: **Surface Contam**
Type: _X_ Dual Scintillator (**dpm units**)
Unit#: 5497 Mfr/Model: **NE Technology Electra** S/N: 516
Unit#: 6907 Mfr/Model: **NE Technology DP6A** S/N: 544

Pulse Generator, Eberline MP-2, S/N 774
Electrostatic KiloVoltmeter: ES08, S/N ES-12365
Alpha Source: Am241, S/N DV965, Activity 60960 dpm
Beta Source: Sr90, S/N DV636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.3 (ref: > 4)
Threshold: ✓ (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: ✓
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1000, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 26.9K Alpha cpm: 6 (e.g., 0.1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.5K cpm; .205 % efficiency (alpha)
Alpha Mode Bkgd: 5 cpm (ref.: < 7 cpm)
Response to Beta Std: 26.9K cpm; .284 % efficiency (beta)
Beta Mode Bkgd: 350 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 11-15-97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1262 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 5061 Mfr/Model: **NE Technology Electra** S/N: 961
Unit#: 6049 Mfr/Model: **NE Technology DP6B** S/N: 989

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM941, S/N DU961, Activity 65910 dpm
Beta Source: Sr90, S/N DN031, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.4 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 845, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 31.4K Alpha cpm: 30 (e.g., .09 % of beta)
ULD (Parameter #6): 2.0 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.3K cpm; .208 % efficiency (alpha)
Alpha Mode Bkgd: 2 cpm (ref.: ≤ 7 cpm)
Response to Beta Std: 31.4K cpm; .306 % efficiency (beta)
Beta Mode Bkgd: 342 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Letizia Date: 7/28/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1264 Procedure#: 015 Configuration: **Surface Contam**
Type: _X_ Dual Scintillator (**dpm units**)
Unit#: 5663 Mfr/Model: **NE Technology Electra** S/N: 967
Unit#: 6651 Mfr/Model: **NE Technology DP6.8** S/N: 998

Pulse Generator, Eberline MP-1, S/N 535
Electrostatic KiloVoltmeter: ESD8, S/N E5-17368
Alpha Source: Am241, S/N DV965, Activity 60460 dpm
Beta Source: Sr90, S/N DV636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.7 (ref: > 4)
Threshold: ✓ (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: ✓
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1025, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 28K Alpha cpm: 8 (e.g., <.1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 µA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 µsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 2.5K cpm; .205 % efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < 7 cpm)
Response to Beta Std: 28K cpm; .296 % efficiency (beta)
Beta Mode Bkgd: 361 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: Oct 19-97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1265 Procedure#: 015 Configuration: **Surface Contam**
Type: _X_ Dual Scintillator (**dpm units**)
Unit#: 5664 Mfr/Model: **NE Technology Electra** S/N: 973
Unit#: 6652 Mfr/Model: **NE Technology DP6B** S/N: 999

Pulse Generator, Eberline MP-1, S/N 535
Electrostatic KiloVoltmeter: SDR, S/N ES-17568
Alpha Source: Am241, S/N DV965, Activity 60960 dpm
Beta Source: Sr90, S/N DV636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.5 (ref: > 4)
Threshold: 25mv (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 900, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 26.5K Alpha cpm: 8 (e.g., 2.1% of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.4K cpm; .203 % efficiency (alpha)
Alpha Mode Bkgd: 2 cpm (ref.: < 7 cpm) ?
Response to Beta Std: 26.5K cpm; .280 % efficiency (beta)
Beta Mode Bkgd: 367 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 8-26-97

Certificate #025
rev. 1.1, June 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1602 Procedure#: 025 Configuration: **H&S Monitor**
Description: **Manual Hand & Shoe Monitor**
Type: ___ Gas Cart ___ Four-Wheel Cart ✓ Wall-Mount
___ Fixed Floor ___ Glove Box ___ Other

Unit#: 6165 Mfr/Model: EBERLINE RM24 S/N: 113
Unit#: 7397 Mfr/Model: _____ S/N: _____
Unit#: _____ Mfr/Model: _____ S/N: _____
Unit#: _____ Mfr/Model: _____ S/N: _____

Pulse Generator, Eberline MP-2, S/N 775
Electrostatic KiloVoltmeter: ESB9 ,S/N
Alpha Source AM241, S/N DV961, Activity 43000 DPM
Beta Source SR90, S/N DN631, Activity 106000 DPM

I) MAINTENANCE/PRECALIBRATION:

Detector Windows: ✓ Cabling: ✓ Batteries: ✓
Gas Regulator: ✓ Needle Valve: ✓ Other Mechanical: ✓

Threshold: 2 mV (ref.: 2 mV) ; Window: Out ;
Response Time: 5 sec (i.e., 0 to 90%)
HV Calib.: ✓
Audible Function Check: ✓ ; Alarm Function Check: ✓

Range	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Field vs As Left
X1	400	400	400	0 %
X10	4K	4K	4K	0 %
X100	40K	40K	40K	0 %
X1K	400K	400K	400K	0 %

II) PRIMARY CALIBRATION:

Alpha HV: 1600 (typically 900 to 1350 V) ; On Plateau?: YES
Alpha Efficiency: 19 % (hand) ; N/A % (shoe)
Alpha Background: <10 cpm
Alpha Alarm Set Point: 500 cpm (gross or net?)

Beta HV: 1600 (typically 1350 to 1900 V) ; On Plateau?: YES
Beta Efficiency: 22 % (hand) ; N/A % (shoe)
Beta Background: 500 cpm
Beta Alarm Set Point: 5000 cpm (gross or net?)

REMARKS: _____

Calibrated By: Jerry Litzinger Date: 2/27/97

Certificate #029-C1
rev. 1.0, Dec. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1653 Procedure#: **029** Configuration: **uR Field**
Type: _X_ Energy Compensated GM

Unit#: 6151 Mfr/Model: **Eberline ASP-1** S/N: 3075
Unit#: 6203 Mfr/Model: **TGM N378S/BNC** S/N: _____

Pulse Generator, Eberline MP- 2, S/N 794
Electrostatic KiloVoltmeter: ESD 1K, S/N 132796
Gamma Source Cs137, S/N 7083

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

High Voltage: 450 Vdc (ref.: 450 V)
HV Cal: ✓
Threshold: 30 mV (ref.: 30 mV); Window: Gross
Range Switch Check: ✓ Audible Function Check: ✓
Integrate Function Check: ✓

Dial: X1M to X10 Rate Unit: uR/h
Dip Switches:
Dead Time: ~~200~~ 136 usec Test: Run
Min Sw: Open Hour Sw: Closed
Cal Sw 3: **Closed** Cal Sw 4: **Open**
Audio: Divide by 1

As Found Std. Current: 0.55

Pre-Calibrator _____ Date 10-8-97

II) PRIMARY CALIBRATION:

Range	Field Intensity (uR/h)	Source to Detector Distance (cm)	As Found (uR/h)	As Left (uR/h)	% Diff. Field vs As Left
1K	494	250 x 8K	500	500	0
10K	4906	150 x 800	5000	5000	0
100K	52095	150 x 80	52000	52000	0
1M	425366	150 x 8	—	—	—

As Left Std. Current: .55
As Left Dead Time: 136 usec

REMARKS: _____

Primary-Calibrator _____ Date 10-9-97

Certificate #015-A0
rev. 1.0, Nov. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1675 Procedure#: 015 Configuration: **Surface Contam**
Type: ___ 100 sq cm prop. ctr. ___ 100 sq cm dual scint.
___ ZnS Scint ___ Pancake GM X Other: HP100 GAS SEALED

Unit#: 6188 Mfr/Model: EBERLINE E-600 S/N: 152
Unit#: [illegible] Mfr/Model: " " HP-100 S/N: —

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESA 9, S/N 13443
Alpha Source AM241, S/N N9961, Activity 63910
Beta Source SR90, S/N N1631, Activity 101400

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Probe Window: ✓
Rate Unit: cpm
Audible Function Check: ✓; Audio: Divide by 1 (ref.: 1)

Noise Threshold: .5 mV (typ.: PC=2 mV, PMT=10 mV, GM=30 mV)
Secondary Threshold: 60 mV (if applicable)
High Voltage: 1641 Vdc (see specifications table)
Secondary High Voltage: — Vdc (if applicable)

[illegible] 10/15/97
Pre-Calibrator Date

II) PRIMARY CALIBRATION:

Range	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
A	400	400	400	0
B	4K	4K	4K	0
C	40K	40K	40K	0
D	400K	400K	400K	0

Integrate Function Check: ✓ (if applicable)

Response to Alpha Std: 13.55K cpm; 23 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < about 7 cpm)
Response to Beta Std: 43.1K cpm; 48 % efficiency (beta)
Beta Mode Bkgd: 303 cpm (ref.: < about 400 cpm)

REMARKS:

[illegible] 10/15/97
Primary-Calibrator Date

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1680 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6231 Mfr/Model: **NE Technology Electra** S/N: ____
Unit#: 6234 Mfr/Model: **NE Technology DP6B1** S/N: 1394

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DV961, Activity 63910 dpm
Beta Source: SR490, S/N DN631, Activity 109400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.5 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 1050, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 30.6K Alpha cpm: 30 (e.g., <.1 % of beta)
ULD (Parameter #6): 2.4 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.3K cpm; .208 % efficiency (alpha)
Alpha Mode Bkgd: 5 cpm (ref.: < 7 cpm)
Response to Beta Std: 30.6K cpm; .298 % efficiency (beta)
Beta Mode Bkgd: 371 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: ____

Calibrated by: Jerry Litzinger Date: 10/20/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1682 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6233 Mfr/Model: **NE Technology Electra** S/N: 1433
Unit#: 6230 Mfr/Model: **NE Technology DP6BD** S/N: 1431

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DV969, Activity 63910 dpm
Beta Source: SR90, S/N DN631, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.9 (ref: > 4)
Threshold: 25 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ____ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 850, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 31.5K Alpha cpm: 3 (e.g., .01 % of beta)
ULD (Parameter #6): 2.0 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 13.4K cpm; .209 % efficiency (alpha)
Alpha Mode Bkgd: 3 cpm (ref.: < 7 cpm)
Response to Beta Std: 31.5K cpm; .308 % efficiency (beta)
Beta Mode Bkgd: 354 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 6/4/97

Certificate #015-A0
rev. 1.0, Nov. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1687 Procedure#: 015 Configuration: **Surface Contam**
Type: ___ 100 sq cm prop. ctr. ___ 100 sq cm dual scint.
___ ZnS Scint ___ Pancake GM X Other: MP100 GAS SEALED

Unit#: 6251 Mfr/Model: EBERLINE E600 S/N: 158
Unit#: 6190 Mfr/Model: " " HP-100A S/N: —

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source AM241, S/N DN961, Activity 63910 DPM
Beta Source SE90, S/N DN031, Activity 101400 DPM

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Probe Window: ✓
Rate Unit: cpm
Audible Function Check: ✓; Audio: Divide by 1 (ref.: 1)

Noise Threshold: .5 mV (typ.: PC=2 mV, PMT=10 mV, GM=30 mV)
Secondary Threshold: 60 mV (if applicable)
High Voltage: 1650 Vdc (see specifications table)
Secondary High Voltage: — Vdc (if applicable)

Pre-Calibrator [signature] Date 9/26/97

II) PRIMARY CALIBRATION:

Range	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
A	400	400	400	0
U	4K	4K	4K	0
T	40K	40K	40K	0
O	400K	400K	400K	0

Integrate Function Check: ✓ (if applicable)

Response to Alpha Std: 14.04K cpm; 22 % efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < about 7 cpm)
Response to Beta Std: 44.4K cpm; 43 % efficiency (beta)
Beta Mode Bkgd: 300 cpm (ref.: < about 400 cpm)

REMARKS: _____

Primary-Calibrator [signature] Date 9/26/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1697 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6281 Mfr/Model: **NE Technology Electra** S/N: 895
Unit#: 6287 Mfr/Model: **NE Technology DP6B** S/N: 975

Pulse Generator, Eberline MP-1, S/N 545
Electrostatic KiloVoltmeter: ESD 8, S/N ES-17368
Alpha Source: Am241, S/N DV 905, Activity 60960 dpm
Beta Source: Sr90, S/N DV 636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 3.9 (ref: > 4)
Threshold: 25 mV ✓ (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10K
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 886, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 33.8 K Alpha cpm: 26 (e.g., 41 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 10.3K cpm; .169 % efficiency (alpha)
Alpha Mode Bkgd: 1 cpm (ref.: < 7 cpm)
Response to Beta Std: 33.8K cpm; .294 % efficiency (beta)
Beta Mode Bkgd: 533 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: [signature] Date: 6-13-97

Certificate #015-A0
rev. 1.0, Nov. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1771 Procedure#: 015 Configuration: **Surface Contam**
Type: ___ 100 sq cm prop. ctr. ___ 100 sq cm dual scint.
___ ZnS Scint ___ Pancake GM X Other: 100 SQ CM GAS SEALED

Unit#: 5876 Mfr/Model: EBERLINE E600 S/N: 129
Unit#: 6047 Mfr/Model: EBERLINE HP-100 S/N: —

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source AM241, S/N DV961, Activity 63910 DPM
Beta Source SR90, S/N DP631, Activity 102400 DPM

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Probe Window: ✓
Rate Unit: cpm
Audible Function Check: ✓; Audio: Divide by 1 (ref.: 1)

Noise Threshold: .5 mV (typ.: PC=2 mV, PMT=10 mV, GM=30 mV)
Secondary Threshold: 60 mV (if applicable)
High Voltage: 1660 Vdc (see specifications table)
Secondary High Voltage: — Vdc (if applicable)

Jerry Litigio — 9/8/97
Pre-Calibrator — Date

II) PRIMARY CALIBRATION:

Range	Pulser Rate (cpm)	As Found (cpm)	As Left (cpm)	% Diff. Pulser vs As Left
A				
U	400	400	400	0
T	4K	4K	4K	0
O	40K	40K	40K	0
	400K	400K	400K	

Integrate Function Check: ✓ (if applicable)

Response to Alpha Std: 14.59K cpm; 23 % efficiency (alpha)
Alpha Mode Bkgd: 0 cpm (ref.: < about 7 cpm)
Response to Beta Std: 44.7K cpm; 44 % efficiency (beta)
Beta Mode Bkgd: 305 cpm (ref.: < about 400 cpm)

REMARKS:

Jerry Litigio — 9/8/97
Primary-Calibrator — Date

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1758 Procedure#: 015 Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6404 Mfr/Model: **NE Technology Electra** S/N: 1801
Unit#: 6445 Mfr/Model: **NE Technology DP6BDD** S/N: 1605

Pulse Generator, Eberline MP- 2, S/N 775
Electrostatic KiloVoltmeter: ESD 9, S/N 13443
Alpha Source: AM241, S/N DV961, Activity 63910 dpm
Beta Source: SR90, S/N DX631, Activity 102400 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.3 (ref: > 4)
Threshold: 30 (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: 10
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 940, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 32.6K Alpha cpm: 31.1 (e.g., <.1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 μA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 μsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 12.5K cpm; .195 % efficiency (alpha)
Alpha Mode Bkgd: 2 cpm (ref.: < 7 cpm)
Response to Beta Std: 39.6K cpm; .318 % efficiency (beta)
Beta Mode Bkgd: 346 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS: _____

Calibrated by: Jerry Letizia Date: 9/15/97

Certificate #015-D2
rev. 1.2, March 1997

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1791 Procedure#: **015** Configuration: **Surface Contam**
Type: X Dual Scintillator (**dpm units**)
Unit#: 6407 Mfr/Model: **NE Technology Electra** S/N: 1829
Unit#: 6498 Mfr/Model: **NE Technology DP6** S/N: 1634

Pulse Generator, Eberline MP- 1, S/N 545
Electrostatic KiloVoltmeter: ESP, S/N ES-17368
Alpha Source: Am-241, S/N DV965, Activity 60960 dpm
Beta Source: Sr-90, S/N DV636, Activity 94600 dpm

I) MAINTENANCE/PRECALIBRATION:
Window: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓
Battery Voltage (Parameter # 0): 4.1 (ref: > 4)
Threshold: ✓ (verify 25 mV with the MiniPulser)
Count Rate Check @ 10 k cpm: ✓
HV Calib.: ✓ (compare Parameter #3 w/ the Electrostatic)

High Voltage Adjustment:
Temporarily raise ULD. Using Sr-90 source, observe count rate in beta channel as a function of HV. Adjust HV to 50 V above the knee of the plateau. HV = 950, and INHIBIT: ✓
Now bring down the ULD so that count rate in alpha channel is approx. 0.1% or less of count rate in beta channel.
Beta cpm: 28.5K Alpha cpm: 4 (e.g., <.1 % of beta)
ULD (Parameter #6): 2 V (ref: 2.00 V), then INHIBIT: ✓

Parameter Settings:
As the Electra "supervisor" (i.e., the internal switch S1-2 to ON), set the remaining parameters as follows:
Parameter #1 (Alarm Level): OFF, then INHIBIT: ✓
Parameter #4 (Overload Current): 10 µA, then INHIBIT: ✓
Parameter #5 (Deadtime): 3 µsec, then INHIBIT: ✓
Parameter #8 (Units): cpm
Parameter #A (inhibit bkgd subt): set to ON
Parameter #b (inhibit integrate): set to OFF
Parameter #C (rate mode): set to Auto
Parameter #E (pulse mode): set to dUAL
Parameter #F (ohms): set to S66

II) PRIMARY CALIBRATION:
Response to Alpha Std: 9.6K cpm; .157 % efficiency (alpha)
Alpha Mode Bkgd: 6 cpm (ref.: < 7 cpm)
Response to Beta Std: 28.5K cpm; .301 % efficiency (beta)
Beta Mode Bkgd: 253 cpm (ref.: < 400 cpm)
Integrate Check: ✓ Audible Functional Check: ✓

Parameter #8 (Units): change from cpm to **dpm**
Parameter #9 (Efficiencies): enter efficiencies from above
Now set switch S1-2 back to OFF (user), and leave switch S1-3 set to ON (hide). ✓

REMARKS:

Calibrated by: [signature] Date: 9-5-97

Certificate #029-C1
rev. 1.0, Dec. 1993

INSTRUMENT MAINTENANCE/CALIBRATION CERTIFICATE

Set#: 1853 Procedure#: **029** Configuration: **uR Field**
Type: _X_ Energy Compensated GM

Unit#: 6508 Mfr/Model: **Eberline ASP-1** S/N: 2815
Unit#: 6474 Mfr/Model: **TGM N378S/BNC** S/N: 7594

Pulse Generator, Eberline MP-1, S/N 535
Electrostatic KiloVoltmeter: ESI 1K, S/N 932196
Gamma Source Cs137, S/N 7083

I) MAINTENANCE/PRECALIBRATION:

Batteries: ✓ Cabling: ✓ Mechanical/Cleanliness: ✓

High Voltage: 450 Vdc (ref.: 450 V)
HV Cal: ✓
Threshold: 30 mV (ref.: 30 mV); Window: Gross
Range Switch Check: ✓ Audible Function Check: ✓
Integrate Function Check: ✓

Dial: X1M to X10 Rate Unit: uR/h
Dip Switches:
Dead Time: 200 usec Test: Run
Min Sw: Open Hour Sw: Closed
Cal Sw 3: **Closed** Cal Sw 4: **Open**
Audio: Divide by 1

As Found Std. Current: 0.55

Pre-Calibrator 5-27-97 Date

II) PRIMARY CALIBRATION:

Range	Field Intensity (uR/h)	Source to Detector Distance (cm)	As Found (uR/h)	As Left (uR/h)	% Diff. Field vs As Left
1K	.497	250 x 8K	500	500	0
10K	4.93	150 x 800	5000	5000	0
110K	52.4	150 x 80	50000	50000	0
1M	428	150 x 8			

As Left Std. Current: .55
As Left Dead Time: 132 usec

REMARKS:

Robert Kear 5/28/97
Primary-Calibrator Date

APPENDIX K:

PERMITS AND JOB DOCUMENTATION

STATEMENT OF WORK

for
CONCRETE CORING AND SOIL BORINGS FOR
BUILDINGS 301, 315, 316, and 335
October 31, 1997

OVERVIEW:

The Contractor shall provide all materials, labor and equipment as required to perform the coring in the existing concrete block walls; existing concrete walls and floors and the soil borings in and at Buildings 301, 315, 316 and 335 at Argonne National Laboratory(ANL) in 3 PHASES as described below: (EXHIBIT SS illustrates location of each project Building on ANL site.)

SCOPE OF WORK:

PHASE I (The following is the required scope and sequence of work)

A. BUILDING 316; (also refer to EXHIBIT A)
   1. ROOM E101: Perform one(1) 3 inch diameter x 6 inch deep core in the existing 8" thick concrete floor slab. (CORE NO. 1)
   2. ROOM E111: Perform four(4) 3 inch diameter x 6 inch deep cores in the existing 8" deep load bearing concrete block walls(in block webs) at approximately 5 feet above floor. (CORES NO. 2 thru 5)
   3. ROOM E111: Perform one(1) 3 inch diameter x 6 inch deep core in the existing 8" thick concrete floor slab: (CORE NO. 6)
   4. ROOM E102: Perform one(1) 3 inch diameter x 6 inch deep core in the existing 8" thick concrete floor slab: (CORE NO. 7)
   5. EXTERIOR AT E111: Perform two(2) 2 inch diameter x 15'-0" deep split spoon soil borings with continuous sampling: (SB-1 and SB-2)

B. BUILDING 301: (also refer to EXHIBITS B and C)
   1.. Perform six(6) 2 inch diameter split spoon soil borings with continuous sampling as follows: (also refer to EXHIBIT B)
      a). One(1) @ 10'-6" deep in grassy area.(SB-3)
      b). One(1) @ 6'-0" deep in grassy area. (SB-4)
      c). Four(4) @ 4'-6" deep in grassy area.(SB-5 thru SB-8)
      d). Perform one(1) 4 inch diameter hand driven split spoon soil boring with continuous sampling to approximately 3 feet below the existing 8" concrete floor slab and 6" gravel subbase. The lack of necessary clearance in this garage area, precludes the use of a drilling rig. (SB-9)
   2.. Perform ten (10) 3 inch diameter x 6 inch deep cores in the existing 8" thick concretre floor slab (CORES NO. 8 thru 17). (also refer to EXHIBIT C)

PHASE II: This optional work. if exercised by ANL, will be performed seperately and within 90 days after completion of PHASE I:

A. BUILDING 315; S-129; (also refer to EXHIBIT D)
   1. Perform four(4) 3 inch diameter x 6 inch deep cores in the existing 4 ft. thick concrete walls at approximately 9 feet above floor. (CORES NO. 18 thru 21)

B. BUILDING 315: S-103: (also refer to EXHIBIT D)
   1. Perform the same coring work described for S-129 "PHASE II-A) above: (CORES NO. 22 thru 25).

PHASE III: This optional work, if exercised by ANL, will be performed seperately and within 90 days after completion of PHASE I and may or maynot be performed concurrently with PHASE II..

A. BUILDING 335-JUGGERNAULT REACTOR: (also refer to EXHIBITS E and F).

1. Perform two(2) 3 inch diameter x 8 feet deep cores in existing concrete, lead and graphite. Cores shall be horizontal at 25 inches above floor. (CORES NO. 26 and 27).
2. Perform one(1) 3 inch diameter x 5 feet deep core in existing graphite. Core shall be horizontal at 25 inches above floor. (CORE NO. 28).
3. Perform one(1) 3 inch diameter x 11 feet deep in existing concrete. Core shall be vertical from top of reactor: (CORE NO. 29)

GENERAL REQUIREMENTS

1. All concrete shall be assumed to be normal weight of 150lbs/cf., except the concrete in Building 335 shall be assumed as being of 250lbs/cf.
2. All concrete and concrete block coring shall be performed with water/vacuum drill systems, with vacuum units filtered with HEPA filters.
3. The contractor shall provide the water and water dispensers as necessary for the coring operations.
4. The Contractor shall turn over all cored and bored samples to ANL for testing and characterization. ANL(not the Contractor) shall slice all samples into sizes suitable for testing
5. ANL will furnish all containers for the Contractor to dispose of waste water,and materials from the coring operation. ANL will then characterize all waste and dispose of such containers.
6. Since all of the coring work is considered by ANL to be in suspected radiation contamination areas, ANL will survey each and every piece of equipment and all tools prior to leaving a work area. If ANL surveys require more time than scheduled by the Contractor to perform the work, then ANL will reimburse the Contractor a fair and reasonable pre-agreed-upon rental costs and extend the Contract schedule accordingly. If ANL determines to require possession of an item, then the Contractor will be reimbursed the pre-agreed-upon fair and reasonable costs.
7. ANL will relocate or remove items or equipment that interfer with the Contractor's work.
8. ANL will provide 115V, 20Amp receptacles(interior only) for the Contractor's tools and equipment.
9. The Contractor may use the toilet facilities in each building of work, provided they are kept in the same clean condition as existed before the start of work..
10. The Contractor shall park all their vehicles where designated by the CFR.
11. All drill bits for the soil borings shall be steam cleaned prior to their use in coring and recoring.
12. All soil borings shall be performed to achieve continuous samples which shall be turned over to ANL as they are made. ANL will place the samples into ANL provided containers.
13. The Contractor shall plug all cored holes with a minimum of 4" of non-shrink grout similar to Master Builders Masterflow 928 grout. All soil boring holes shall be plugged with surplus bored and new soil material as necessary to fill-up and close openings.
14. ANL will designate and mark the exact location for all coring and soil borings,
15. ANL will locate all existing utilities.

SAFETY REQUIREMENTS

1. The Contractor shall comply with the Requirements in the "APPENDIX A-ARGONNES'S TERMS AND CONDITIONS FOR FIXED PRICE CONSTRUCTION CONTRACTS" 0796 and in "APPENDIX A SUPPLEMENT TO ARGONNE'S TERMS AND CONDITIONS FOR FIXED PRICE CONSTRUCTION CONTRACTS" 0191: for the required Safety Plan: Job Specific Plan: Laboratory Safety Class: Contractor's Safety Representative; Competent Person: OSHA and other Safety requirements.
2. The Contractor shall attend a brief Field Pre-Work meeting after ANL approves their Job-Specific Plan: to review scope, responsibilities, safety, security, emergency actions, schedules and other contractural items.

3. The Contractor's personnel in the coring work area shall wear a full face piece respirator with HEPA filter cartridges. The Contractor shall submit current qualitative Fit Testing Certification and current Medical certification for those personnel required to wear such protection.
4. ANL will not provide any respirator protection nor testing nor certification..
5. The Contractors coring personnel shall wear TY-VEK outter protection which will be furnished by ANL.
6. The Contractor is reminded of the OSHA requirements for full-body harness safety, ladder safety, and scaffold safety requirements when personnel are working at levels where their feet are 6 ft or more above the floor.
7. The contractor is reminded to wear proper clothing, including leather or heavy duty gloves for the work. ANL will reimburse the Contractor for retained clothing per above ITEM 6 under heading GENERAL REQUIREMENTS.

LABORATORY RESPONSIBILTIES

1. In addition to the items described above, ANL will provide:

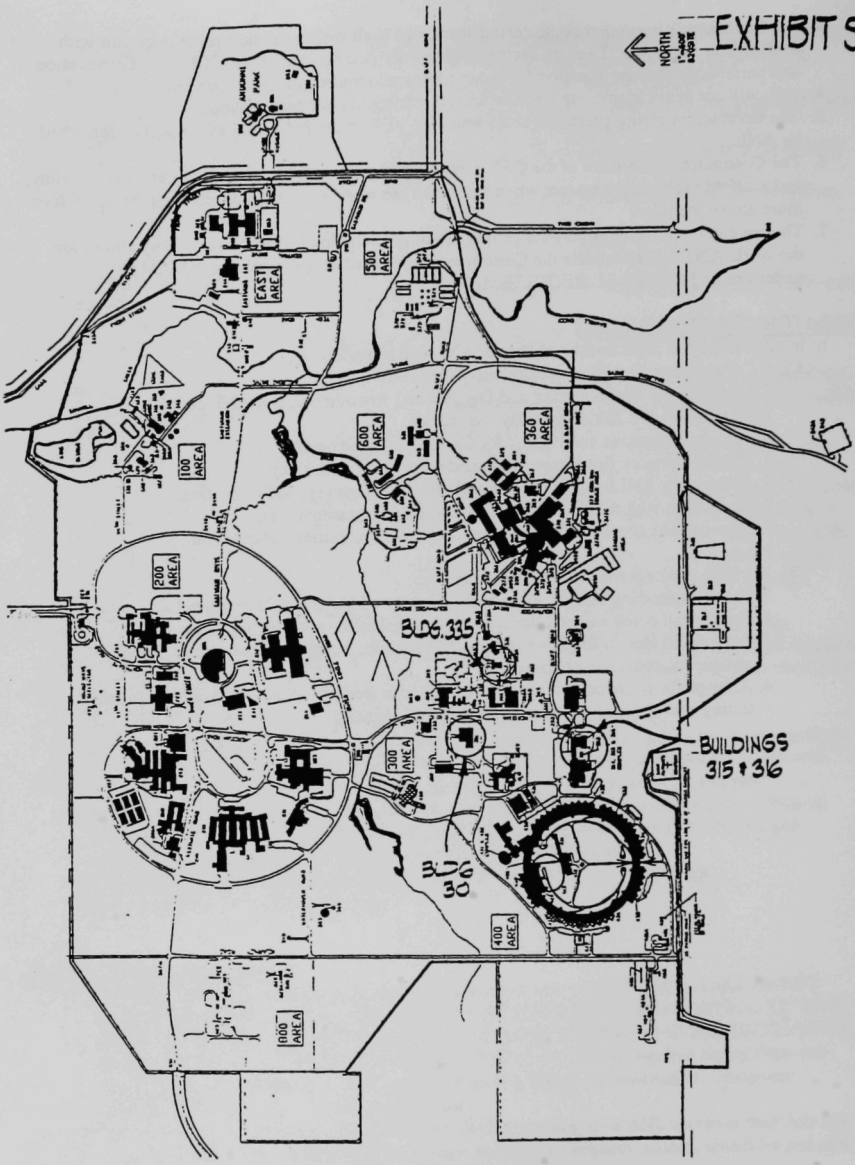
   A). A Construction Field Representative(CFR) to:

   1. Obtain Work Entry, Coring and Digging and any other type of ANL permit.
   2. Obtain Site and Building utility clearances.
   3. Arrange for passes and badges for Contractor's personnel.
   4. Provide periodic field inspections and monitoring of the work.
   5. Arrange for ANL/Health Physics and other ANL surveys and inspections.
   6. Coordinate with ANL's ESH and/or Building Representatives.
   7. Receive and coordinate and act on Contractor's inquiries and questions.

   B) An ESH and/or Building representative(s) to:

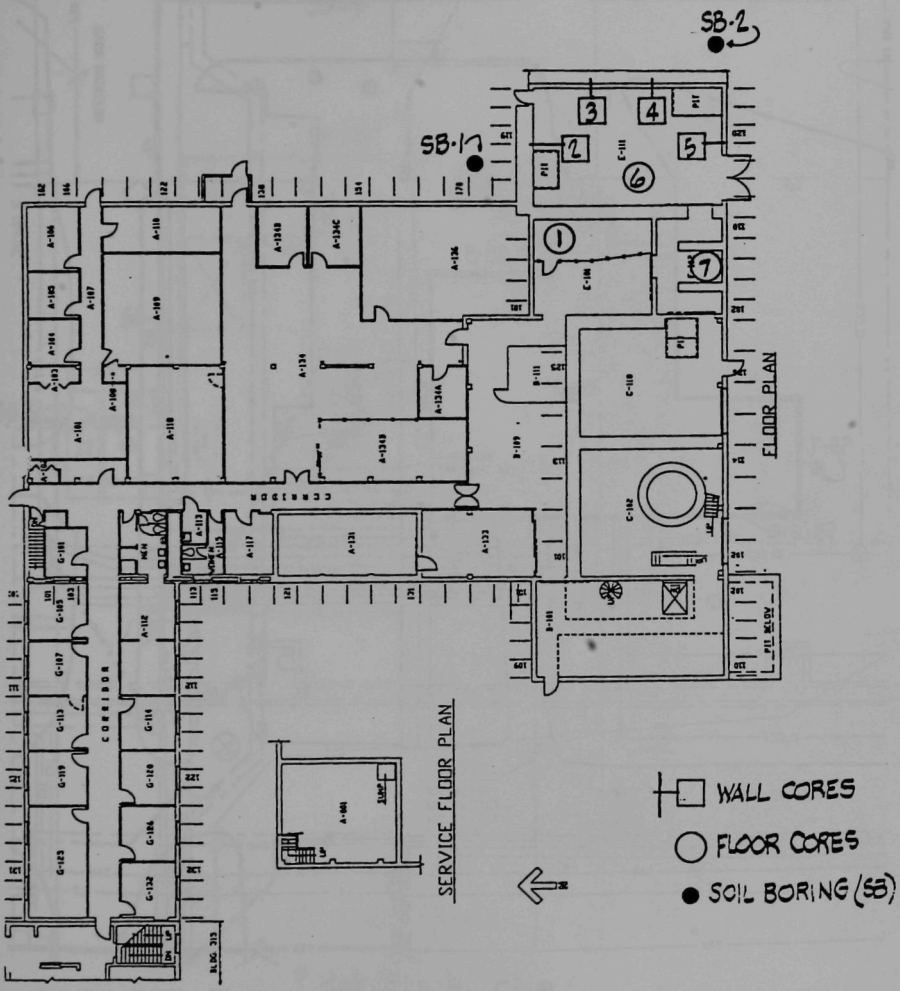
   1. Provide escorting and radiation monitoring of all Contractor's personnel,.
   2. Receive all cored and soil boring samples, residuals, water, debri, and waste.
   3. Perform all Health Physics surveys of all samples, residuals, water, debri, waste, equipment, tools and clothing.
   4. Arrange for waste containers to be provided at work areas and arrange for seperation, testing and disposal of same with other ANL entities.

EXHIBIT SS



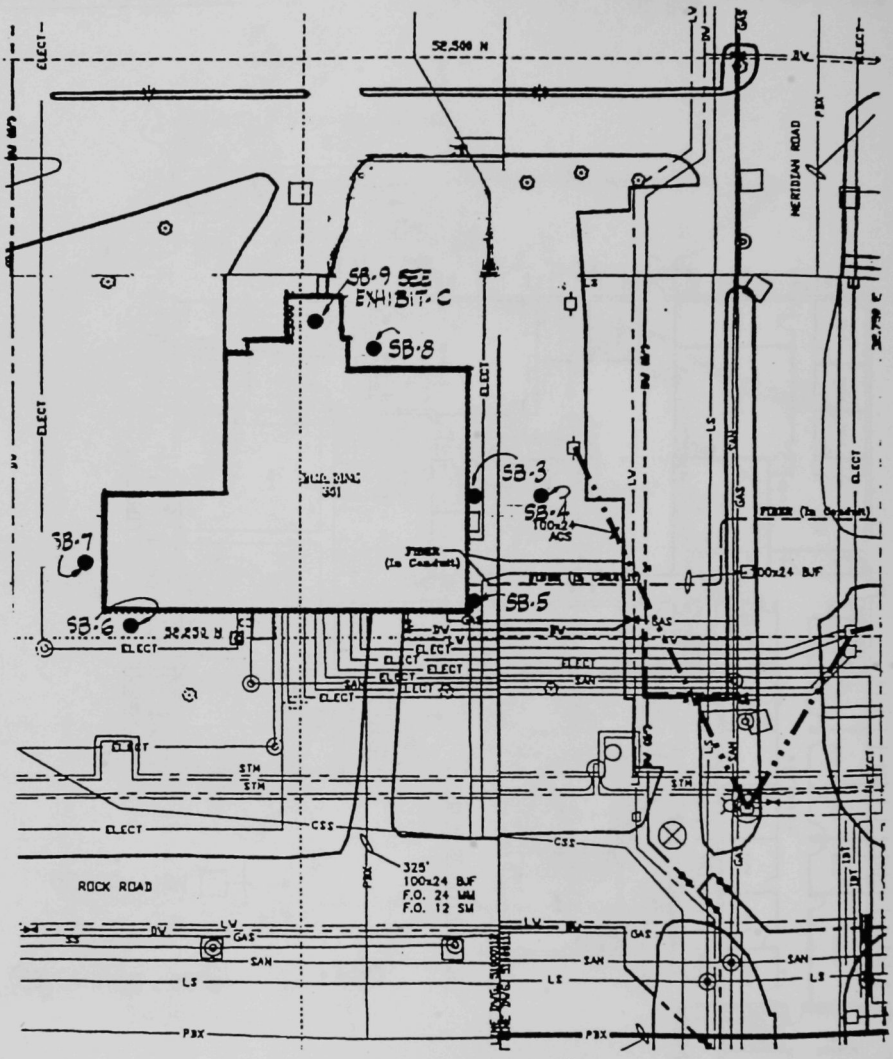
ANL SITE MAP

EXHIBIT-A



BLDG 316

EXHIBIT-B



● SOIL-BORING (SB)

BLDG 301

EXHIBIT-C

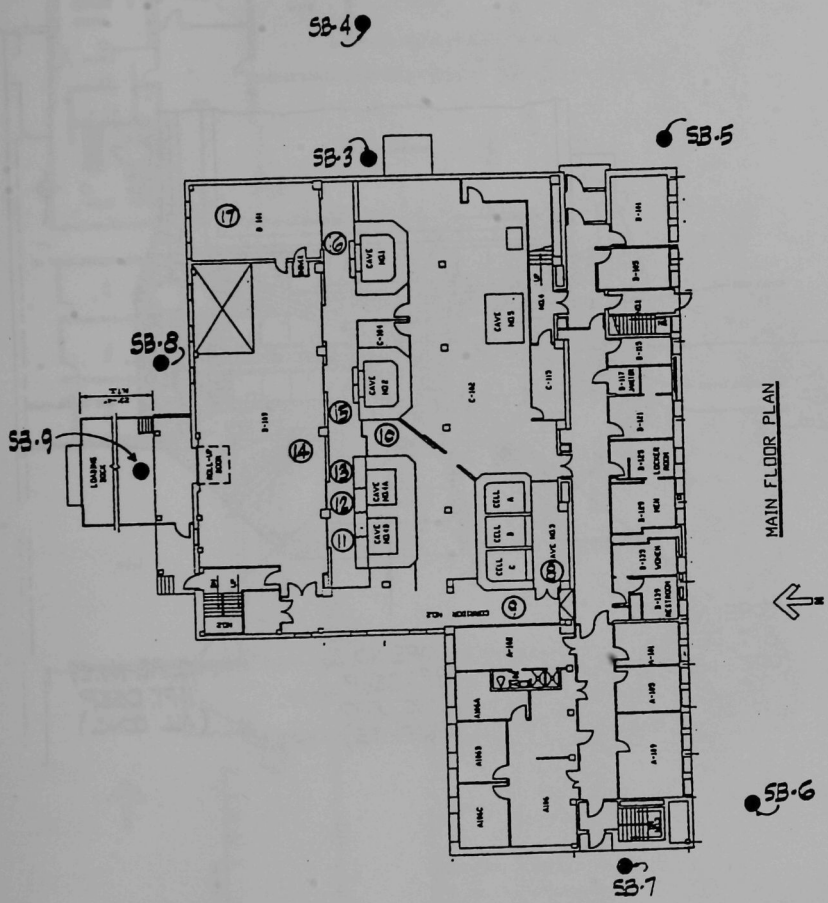

SB-4
SB-3
SB-5
SB-8
SB-9
SB-6
SB-7
MAIN FLOOR PLAN
CELL A
CELL B
CELL C
CAVE NO.1
CAVE NO.2
CAVE NO.3
CAVE NO.4
CAVE NO.5
CAVE NO.6
LOCKER ROOM
VOICE
RESTROOM
HEA
COMMON AREA
LOADING DOCK
ROLL-UP DOOR
A-100
A-101
A-102
A-103
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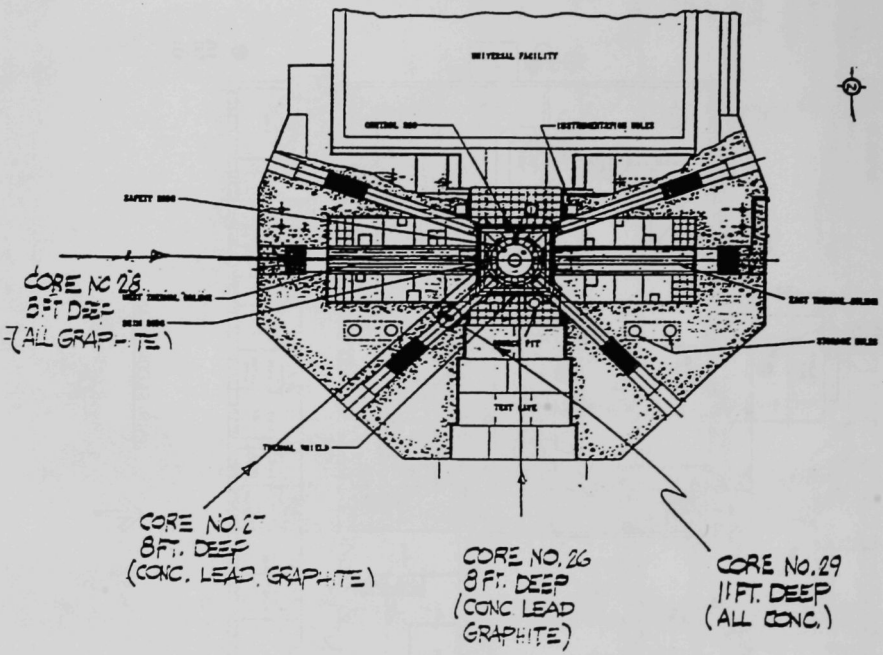
EXHIBIT-F



JUGGERNAUT REACTOR

BLDG·335

EXHIBIT-D

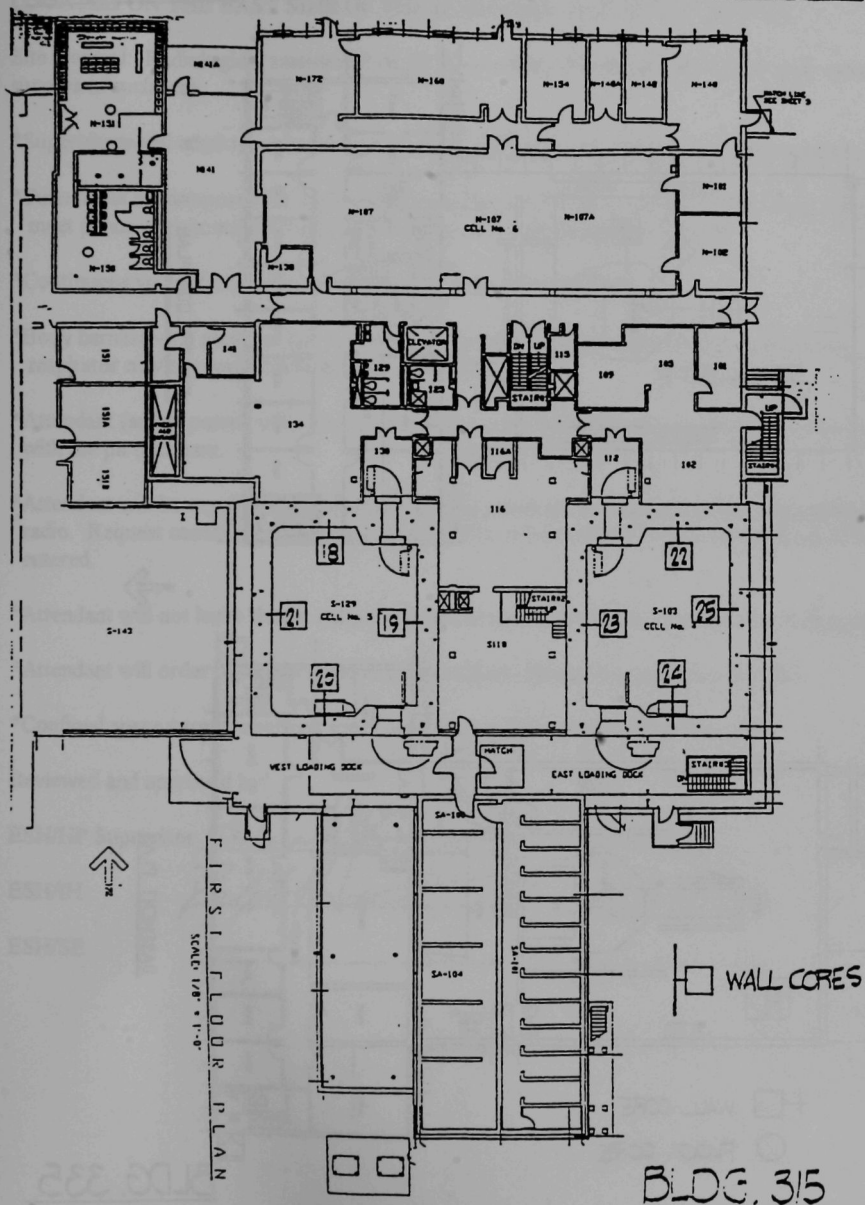

N-172
N-166
N-154
N-148
N-140
N-141A
N-141
N-131
N-130
N-107
N-107 CELL No. 6
N-107A
N-102
N-102
N-138
MATCH LINE SEE SHEET 3
ELEVATOR
DN
UP
STAIRS
129
125
113
109
105
101
151
151A
151B
151C
149
134
130
116A
112
102
116
118
S-129 CELL No. 5
S-103 CELL No.
S-142
18
19
20
21
22
23
24
25
STAIRS
WEST LOADING DOCK
EAST LOADING DOCK
HATCH
SA-104
SA-104
FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"
N
WALL CORES
BLDG. 315

EXHIBIT-E

SEE EXHIBIT-F
FIRST FLOOR PLAN
BASEMENT PLAN
WALL CORE
FLOOR CORE
BLDG. 335

CONFINED SPACE ENTRY PERMIT PROCEDURE FOR BUILDING 301 PIT LOCATED ON THE EAST SIDE OF THE BUILDING. Pit: ~ 12' x 12' x 8' deep.

Site General: Radiological assessment of pit : (--- survey direct with instruments and smear surveys of surfaces).

*Supervisors and employees involved with entry will have received confined space training.

*Tunnel will be monitored for 19.5 - 23.5% oxygen, <10% LEL, <10ppm H2S. If pit fails to meet parameters contact department supervision for additional instructions.

*Continuous ventilation and monitoring as determined by ESH/IH.

*Body harness with attached line for retrieval will be worn. Also, protective clothing and respirator may be worn if determined needed by ESH/HP.

*Attendant (safety person will remain stationed at point of entry and in verbal communication with the pit occupant.

*Attendant will be capable of communicating a 911 emergency to the ANL Fire Department by radio. Request communication check of ANL-FD, advise ANL-FD of location of tunnel being entered.

*Attendant will not leave the pit entrance unless properly relieved or occupant has exited pit.

*Attendant will order occupant to leave pit should any threatening problems develop.

*Confined space permit, confined space procedure will be posted at the job site.

Reviewed and approved by:		Date:
ESH/HP Supervisor	Dolores C. Geraghty	10-20-97
ESH/IH	Ralph Hunt	10/20/97
ESH/SE		

Attachment 2
Chapter 7-4

Confined Space Entry Permit

Page of

This permit must be reissued each workshift or when conditions change.

Date: 10/20/97 Confined Space Number: 1056 Location: 301 Division: ESH/HP

Nature of Work: Inspection ( ) Repair ( ) Cleaning ( ) Other (X)

Description of Work: Survey area in pit (Health Physics Survey)
(Approved procedure must be attached)

Other Permits Required No Valid Until: (6/30/98) : a/p
date time

Hazards of Confined Space: Pit extends a few feet under building - O_2 deficiency.

Answer all questions.

	Yes	No	N/A
1. Were hazards, testing and emergency procedures explained to all members of the crew?	X		
2. Are all lines isolated and/or disconnected?			NA
3. Are all valves locked and tagged?			NA
4. Are all motors and electrical switches in the confined space locked and tagged?			NA
5. Have engulfment hazards been controlled?			NA
6. Has the confined space been decontaminated and purged?			NA
7. Is oxygen at least 19.5% and less than 23.5% by volume?	X		
8. Are combustible gases/vapors less than 10% LEL?			NA
9. Are toxic gas concentrations acceptable?			NA
10. Is forced supply/exhaust ventilation operating?			NA
11. Has adequate illumination been provided?	X		
12. Has a standby person been designated and trained to (a) observe the person working in the confined space and (b) take emergency action if necessary?	X		
13. Is all safety equipment in place?	X		
14. Are retrieval lines and safety harnesses used, if necessary?	X		
15. Is the confined space safe for entry without special clothing?	X		
16. Have the workers involved in this job been given instructions regarding the safe and efficient method of doing the work?	X		
17. Is continuous monitoring necessary?	X		

Explain any "No" answers here. See procedure

How will attendants call fire department in case of emergency? Radio

How will entrants and attendant communicate? In person / verbal

List any special precautions necessary: ~~None~~ See Procedure
Refer to attached procedure as necessary

List safety equipment used: Retrieval Rope

Approved confined space entry procedure must be attached.

I have personally examined the above and attest that entry permit requirements have been met and the above noted precautions are being taken.

Signature of entrant / date	Signature of entrant / date	Signature of entrant / date
21 Oct 97		
Signature of attendant / date	Signature of supervisor / date	
10/21/97	10/21/97	

Keep one copy at worksite. Use the back of this form to record air monitoring data.

ESH-215 (4-93)

April 12, 1998

To: Bruce Murdoch

From: Dolores Geraghty

Subject: Pit Entry for Building 301

Joe Cooney, Bill Knoerzer, and Dolores Geraghty completed an entry into the pit under Building 301 on April 8, 1998.

1. Radon Samples were completed.

2. We tried to probe the 2" pipe that extends from the exterior east wall of pip to determine if the pipe went out into the ground or up the wall to the first floor. We could only probe about 1 foot into the pipe. The pipe was clogged solid with rust debre. A sample of the rust was collected and sent to ACL for analysis. We banged on the pipe with a large pipe wrench and had someone outside to determine if the noise Transferred into the ground. Nothing was heard in the ground. All the noise was in the outside wall. We feel that the pipe ran from the first floor into the drain lines in Pit area. We checked for some evidence of a pipe on the first floor. We could not find Any. The residue in the pipe is contaminated.

3. We also dug out the drain in the entry way of the pit. Two dirt samples were taken and Sent to ACL for Gamma Spec.

4. Photographs were taken of the entry.

Construction Job Specific Requirements

This form is to be completed by the Construction Contractor and submitted to **ESH Safety Engineering** for approval prior to work commencement. In addition this form is to be maintained at the construction site where work is being performed.

JOB TITLE SRA Floor Characterization

CONTRACT NO. 97274240 1 **BUILDING/AREA** 30L & 316

CONTRACTOR

Company Name: Shonka Research Assoc

Project Manager: Joe Shonka

Phone: (770) 509-7606 **Page:** N/A

Superintendent: N/A

Phone: N/A **Page:** N/A

ESH Rep. Thom Sykalac

Phone (770) 509-7606 **Page:** N/A

ANL

Project Manger: Alan Justus

Phone: x 3319

ESH Rep: George Mosho

Phone: 2-6172 **Page:** 630-612-0372

C.F.R. N/A

Phone: N/A **Page:** N/A

Other: Training For Health Physics By G. Mosho

DESIGNATED COMPETENT PERSON

Excavation: N/A
(29CFR:1926.650)

Confined Space: N/A
(29CFR:1926.21)

Scaffolding: N/A
(29CFR:1926.451)

☒ **Approved**

☐ **Approved as noted**

☐ **Not Approved - Resubmit**

ESH-SE **Date:** 11/14/97

- The Contractor ESH Representative must hold an Orientation with all employees prior to work identifying the hazards related to their Scope of Work and have each person sign the Signature Sheet attached.
- Identify location of **Emergency Telephones** and designated **Tornado Shelters** in relationship to the work site and provide phone numbers: **Laboratory Phone 911, Cellular 630-252-1911.**
- Emphasize compliance with **OSHA 29CFR:1926.**
- Utilizing the format on attached pages, identify hazards and safety precautions/procedures to mitigate hazards.

(Dave Wise 2-3836 / 4-1223
Tom Tim 2-6183 / 4-[illegible]8

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B