

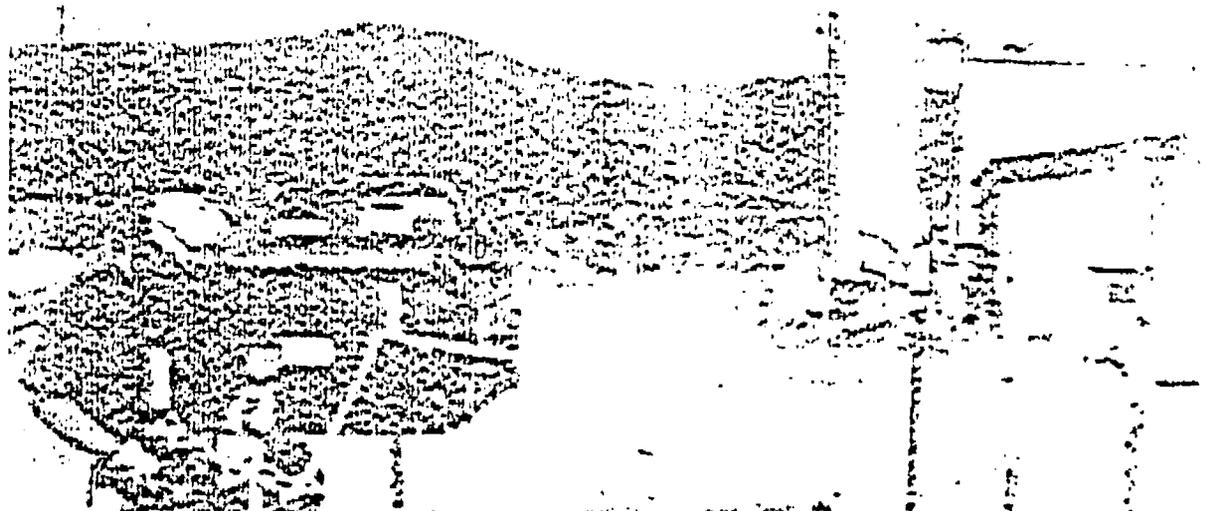
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COMMODORE

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DURATEK



Report on TA-21 Surveys for:

**SWMU 21-006, Underground Seepage Pits
between Buildings 2 and 3;**

**SMWU 21-023, Decommissioned
Septic Systems in Building 3; and**

**SWMU 21-028(b), Active Container
Storage Areas in Building 150**

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1.0 INTRODUCTION AND SCOPE

1.1 Introduction

This report is prepared to document the investigation data gathered for the demolition of the Technical Area (TA) -21 DP West Structures. The work is as described in the memorandum from Troy Eshleman, GTS Duratek Task Leader, to Gary McMath, LANL EM/ER, through Johnny Harper, EM/DND, dated 21 May, 1998, Letter # 7002-300-0010, entitled *Field Implementation Plan for: TA-21 D&D Characterization -ER Project Coordination*. Eight SWMUs related to the TA-21 site remediation are identified. The SWMUs include the following:

- SMWU-21-006(a), an unmarked underground seepage pit approximately 0.1 acre between Building 2 and Building 3. This pit received "bomb" washing water that contained small quantities of plutonium and fission products;
- SMWU 21-006(c), a seepage pit outside Room 322.
- SMWU 21-006(d), a French drain outside Room 322.
- SMWU 21-023(a, b, and d). Three septic tanks located in or near Building 3 on the north side of the corridor. This portion of Building 3 has been demolished.
- SMWU 21-0289(b and c), active container storage areas in Building 150 on the main floor.

1.2 Project Scope

The report covers the results radiological surveys for the seepage pit or french drain between Buildings 2 and 3, identification of septic system tank locations and visual and photographic surveys of the condition of chemical storage locations in Building 150. It is noted that the storage locations in Building 150 are all on the main floor of the building over a full basement. The gamma surveys and GPS locations of the gamma measurements in the areas between the old Building 3 footprint and the existing Building 2 both north and south of the main corridor are given and the probable seepage pit location is identified. These surveys did not locate the seepage pit. However, there is a posted contaminated area adjacent to the south end of the Building 3 footprint that may be the suspect seepage pit. Finally, the location of three septic tanks for Building 3 were to be located. Samples of the soil from under the tank locations were to be collected for analysis. These three septic tanks were marked with stakes by triangulation from existing structural members in the remains of Building 3. The stake

locations are further located by GPS measurements in the New Mexico State Plane.

2.0 BACKGROUND INFORMATION

2.1 Facility Description

The TA21 facility is the plutonium processing facility used for the early atomic bomb effort during WW2. Buildings 2 and 3 were used for plutonium processing and uranium processing. Related nuclides were also present, in particular ^{241}Am . The buildings have been shut down for a number of years and the demolition and remediation of the area is in progress.

TA-21 Buildings 3 and 4 were demolished during 1994-1996. The footprint areas of these structures are the primary areas of interest for the investigation of the septic tanks and the seepage pits. The disturbance of soil and backfill material used will, in some cases and areas, restrict contamination evaluation.

2.1.1 Building 3 Septic Tank Location Description

Three decommissioned septic tanks under or near Building 3 are identified as potential release sites. These are SWMU 21-023(a), (b), and (d). All of these septic tanks were removed in 1966. Tanks (a) and (d) were reportedly not contaminated. No data is available for tank (b).

SWMU 21-023(a), septic tank TA-21-225, was located between two additions to Building 3. The location is shown on Drawing "Existing Underground Utilities, Underfloor Trenches and Floor Trenches at the North End of TA-21-3," Sheet TA-21-ER4, August 9, 1994. (See Appendix C.)

SWMU 21-023(b), sanitary waste septic system, TA-21-142, was located under Room 361. The location is shown on the same drawing.

SWMU 21-023(d), septic system, TA-21-187, was located on the east side of Building 3 north of the corridor. The clean-out for this tank is still present on the building footprint, although the tank itself was removed in 1966.

Building 3 has been demolished almost entirely. Just the main corridor and some related support rooms remain. Much of the footprint of Building 3 is crushed rubble that was monitored, then replaced in the site to return the site to approximately the natural ground level. This rubble is in small pieces from 1" to several inches in diameter. A number of

photographs of the current condition of this building are included as part of this report. See Appendix A.

2.1.2 Seepage Pit Descriptions

The seepage pit, SWMU 21-006(a) is described as an unmarked, underground seepage pit, approximately 0.1 acre, located being between Building TA-21-2 and Building TA-21-3, but the location is otherwise unknown. (*TA-21 Operable Unit RFI Work Plan for ER, May 1991, Chapter 18*) This pit was used to dispose of liquids from the Hanford container washing operation. It is not known if the seepage pit is on the north or south side of the corridor between the buildings. According to the work plan, it may the same site as 21-006(c) and (d).

The seepage pit, SWMU 21-006(c) is reported to be 15 ft outside the door to the bomb cleaning room 322, at Building TA-21-3. This seepage pit reportedly received "bomb electrolytic decontamination solution" from a drain in Room 322. The solution may have been contaminated with plutonium. At one time the location of Room 322 was very near the northeast corner of the southern bay between Buildings 2 and 3, and its location may be under Room 3131 or 3133 of the new addition.

Seepage pit SWMU 21-006(d) may be associated with a concrete pad and French drain system called the TA-21-272 dock. Waste from a 2nd story chemical make-up room was dumped or pumped into a stone-filled seepage pit somewhere in the area. This pit may be the same a SWMU 21-006(c) or (a).

Building 2 is in the process of final cleanup so that demolition may begin. The area between Building 2 and the Building 3 footprint is generally paved up to the Building 3 footprint. In some cases there are concrete pads covering over old contamination adjacent to Building 2 on the north side of the corridor. The dock Structure 272 is still in place.

The word "bombs" used in the early description of this operation is used for the containers for transport of the plutonium to Los Alamos from the Hanford site where Pu was separated from the irradiated fuel. (The "bombs" were not warheads.) The containers may have contained long lived fission products as well as the Pu materials.

No physical description of the seepage pit is currently available. However, a drawing of an "Ether Pit" is available, and the design of both may be similar. The Ether Pit was installed on the south side of the road across from Building 3.

2.1.3 Building 150 Description

Building 150 is immediately west of Building 5 and was constructed after the other buildings in the main complex. This building contained seven laboratories on the main floor. The building has a full basement as documented in this report. The basement is divided into a number of rooms, some of which contain large equipment. The building was in use until recently and is currently used, in part, for the storage of radiation protection supplies and a small radiological counting room and laboratory. All other occupants have been transferred elsewhere. Some contamination remains in the building.

Three satellite container storage areas were located under hoods in Rooms 603, 605, and 607. These storage areas were used before the writing of the 1991 Operable Unit Workplan for TA-21. No environmental releases have been reported from these locations.

2.2 Technical Approach to Surveys

2.2.1 Septic Tank Soil Sampling

The septic tanks were to be located based on a drawing made during the remediation of Building 3 when the septic tanks were removed in the late 1960s. After locating the old tank positions, the soil in the ground below the tank bottom was to be sampled. If the tank locations could not be identified, then an array of samples would be collected to cover the possible tank positions. The samples were to be provided to LANL Environmental Restoration Project (ER) personnel as they were collected. ER would have the samples analyzed. Sampling was to be by motorized hand auger and sampling according to established ER procedures. All samples were to be turned over to ER custody immediately as they were collected.

2.2.2 Building 150 Chemical Storage Locations

Building 150 chemical storage locations were to be inspected for evidence of spills and to ascertain if the floors under the locations were over soil. If so, the floors were to be cored or removed so soil could be sampled. Samples collected were to be turned over to ER for analysis as they were collected. Sampling was to be done manually according to established ER procedures. Evidence of spills was to be documented by photographing the locations. General areas were to be surveyed for radiological

contamination.

2.2.3 Seepage Pit Between Buildings 2 and 3

The seepage pit was to be identified by the radiation from the pit that would be discernable on the surface of the ground in the areas between the two buildings. A survey technique to enhance sensitivity was established by using a NaI(Tl) detector suitable for low energy gamma rays and setting a gamma window to view the ^{241}Am gamma ray at 59.5 keV. This is a weak gamma ray and may not penetrate a thick layer of soil over a pit. However, if the Pu and the associated Am has migrated toward the surface, some may be detectable with this detector.

The general process is to scan the area in grids and identify any locations with elevated activity. These area were to be excavated carefully to ascertain if the seepage pit was located at that point. Once the pit was located, no further excavation would be done. The location would be marked for remediation later.

The decision of higher than normal readings was to be those readings that differed significantly from the median value of all the readings. The median value is that value where half the readings are above and half the readings are below. In the case of spotty contamination, the median is a good measure of the expected local background. The measurements are single counts using a scaler, so the estimate of the standard deviation associated with the median value is the square root of the median number. The 95% confidence for detection above this is similar the minimum detectable activity equation and is taken to be

$$C_{\text{pos}} = \bar{X} + (1.645 + 1.645) \sqrt{2\bar{X}} \quad (1)$$

Where

- C_{pos} = the count that can be positively identified above the median,
- \bar{X} = median for the data set,
- 1.645 = the 95th percentile coefficient for detection if present, or the 5th percentile coefficient or false detection if absent.

The same process was to be used for identifying ^{137}Cs or other higher energy nuclides by making similar readings at the same locations using the same detector with no window set. In this case, the background will

increase, but the readings will be sensitive to the expected ^{137}Cs . The gamma-ray from ^{137}Cs has greater penetrating power (662 keV) than that of ^{241}Am (59.5 keV). This higher energy gamma-ray may be detected on the surface of the soil over the seepage pit from material at a greater depth. Again, the median value of all values was to be used as the background value and any significantly different higher value would indicate the likely presence of the seepage pit. Careful excavation would determine the presence of the pit by locating Pu or alpha contamination in higher concentrations. Once the pit was located, no further excavation would take place. The location would be marked for later remediation.

3.0 SURVEYS

3.1 Radiation Surveys For Seepage Pit

3.1.1 Radiation Survey Guideline Values

Sensitivity of the gamma measurements for the seepage pit and for the french drain is based on the local gamma background in the gamma energy window and on the counting time available for each measurement.

The time available for each measurement was based on the total time available to do the work and the number of points to be measured. The total time to do the work is based on an agreed time or duration with the project managers. This includes the number of days to do the work and the number of points to use to detect changes in the field that would constitute an anomaly. For a two to three day survey, this leads to the total number of points that can be taken. In addition, each reading should be relatively independent of the adjacent ones, so the spacing of the readings should not be so close together that adjacent readings are reading the same field. Based on the time and the resolution, the spacing of readings was set at 2.5 meters, giving 16 readings in each 100 square meter area. The readings themselves are taken at a 15 cm distance above the ground. This provides a field of view of about one square meter for each reading. (A circle with a diameter of 1.13 meters, approximately). This geometry is shown in Figure 4.

3.1.2 Gamma-Ray Survey Instrumentation

The surveys for gamma radiation were done using a Ludlum Model 2350-1 survey meter and a Ludlum Model 44-16 $\frac{1}{2}$ " x 2" NaI(Tl) detector. The threshold for the gamma energy was set at 40 keV and the window was set for 40 keV, giving a window about the 59.5 keV gamma ray for ^{241}Am . The same threshold was used without a window for measuring ^{137}Cs . The

overall gain of the system was set to place the ^{137}Cs peak at 662 on the overall threshold scale of 0-1000.

3.1.3 Survey Organization

The surveys were performed by the GTS Duratek office in Los Alamos as subcontractor to Commodore Advanced Sciences. The GTS Duratek Task leader was Troy Eshleman. The survey crew included John Andrews, GTS Health Physicist, and two technicians. GPS information was collected by Jeff Linn of the GTS Duratek Los Alamos Office.

3.1.4 Gamma-Ray Survey Design

Survey Grids - The design of the gamma survey was to survey the area between Building 2 and 3 both north and south of the corridor in the areas suspected of containing the seepage pit. This area is shown in Figure 1 from *TA-21 Operable Unit RFI Work Plan for ER, May 1991*. It was decided to survey the areas between Building 2 and 3 and to establish a 10-meter grid system as the basis for the survey area. Two grid systems were established, one south of the corridor, and one north of the corridor. Each 10 x 10 meter grid area was further subdivided into sixteen 2.5 x 2.5 meter grids. The grids north and south of the corridor are shown on the following pages in Figures 2 and 3. Shaded areas were not surveyed.

In Figure 2, on the south side, the shaded areas in Grid A1 are Room 2, an existing extension to Building 2. Location B1-14 was obstructed by a trailer. Location B4-13 was inadvertently not surveyed. Location C2-06 was obstructed by chemical waste barrels. These barrels were not radioactive and did not contribute an increased background level. Shaded areas in Grids C3 and C4 are the loading dock, Structure 272, that may be the location of the French drain and the existing building extension for Building 3.

In Figure 3, on the north side, the shaded area in Grid F1 is a barricaded contaminated area. The large area in Grids E2, E3, F2, and F3 is a large pile of rubble. The shaded area in Grid D1 is within the existing Room 224 addition to Building 2. The shaded area in D3 is the existing structures that have not been demolished in Building 3. The shaded area in Grid D1 is within the existing Room 224 addition to Building 2.

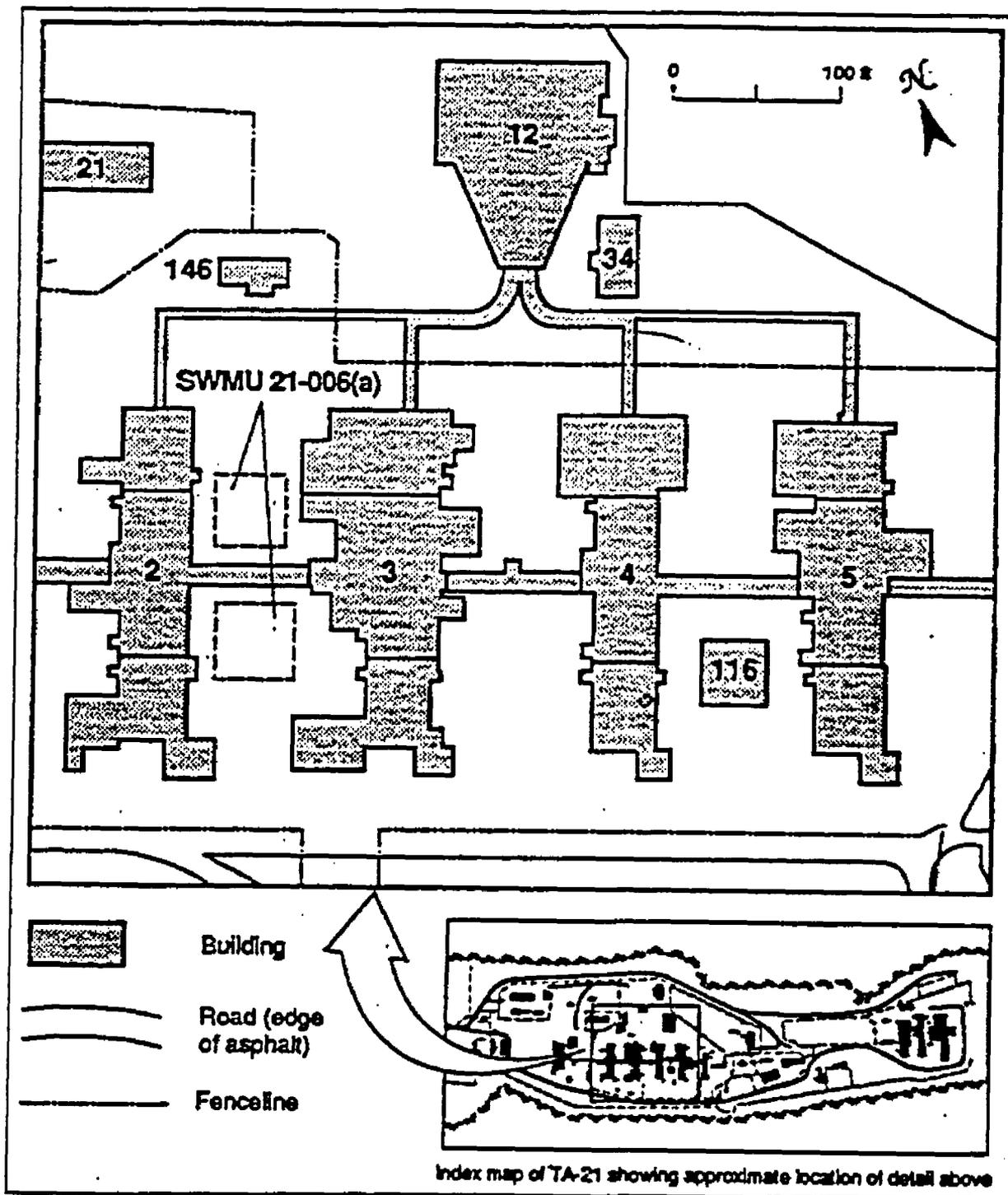


Figure 1. General location of SWMU 21-006(a) and the 1964 configuration of Buildings 2 and 3 at TA-21. (TA-21 Operable Unit RFI Work Plan for ER, May 1991)

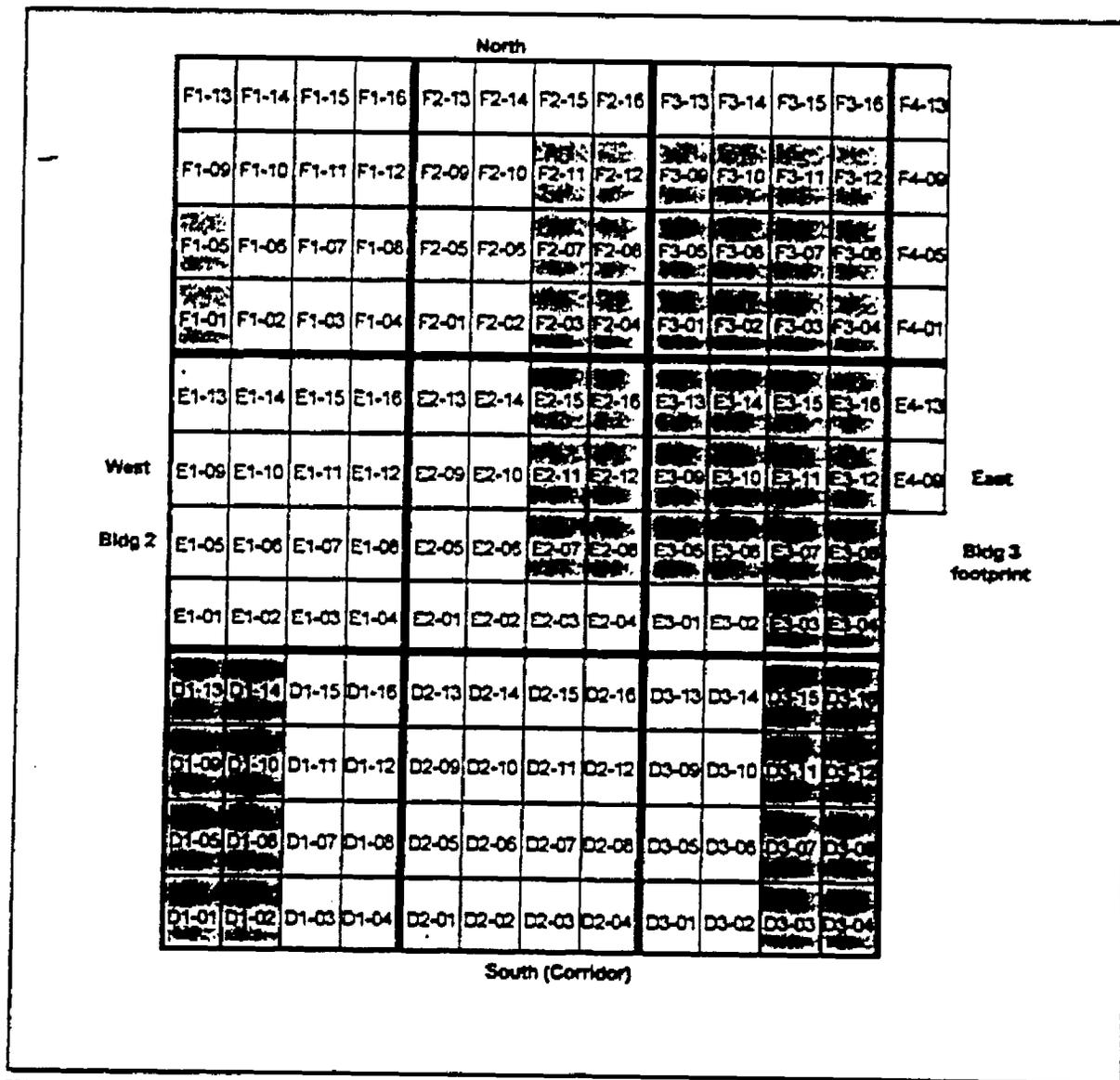


Figure 3. General Layout of Grids for Surveys of Area Between Bldg 2 and 3, North of Corridor

Measurement Geometry All measurements were collected at the center of each sub-grid. Each measurement was collected at 15 cm from the ground (6 inches). The measurement geometry and the approximate area of sensitivity is shown in Figure 4.

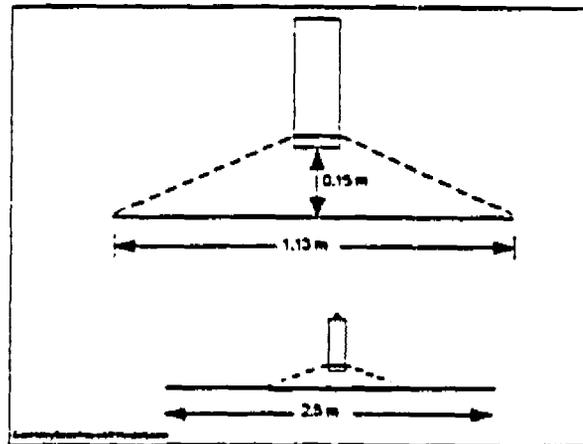


Figure 4. Gamma measurement geometry at 15 cm above the ground in the center of a 2.5 x 2.5 meter area

Gamma-ray Windows

Two windows in the gamma ray spectrum were used to make the measurements. The low-energy gamma ray from ^{241}Am was selected as the primary method for measuring Plutonium. The gamma ray from ^{241}Am is associated with plutonium because it is the decay product of ^{241}Pu by beta decay. ^{241}Pu is produced by activation of the ^{239}Pu to ^{240}Pu , and then to ^{241}Pu during the irradiation of ^{238}U to produce Pu. As the 13-year ^{241}Pu decays, 453-year ^{241}Am is produced. It is reasonable to assume, under the circumstances of the seepage pit, that significant amounts of ^{241}Am would remain in the pit. The gamma ray has an energy of 59.6 keV. This is a relatively low-energy gamma ray, but by using a window, the background in this region of interest can be reduced and the sensitivity to Am (and therefore, Pu) can be enhanced. If the Am is not near the surface, it will not be observed.

The second window selected was an open window with the same threshold setting as the ^{241}Am window. This setting is sensitive to the gamma-ray from ^{241}Am and to the gamma-ray from ^{137}Cs and to all the influences of the natural background. It is also sensitive to other long-lived gamma emitters that may be in the washings introduced into the seepage pit.

3.1.5 Quality Assurance and Quality Control of Gamma-Ray Surveys

Gamma measurements were made according to a written plan included in the database for the surveys. Quality control included pre- and post-source checks on the instrument daily before and after the days counting. All pre- and post-source checks must agree within given tolerance (10%) with the original settings for the window, source, detector and meter.

3.1.6 Documentation of Gamma-Ray Surveys

Data from the surveys was downloaded into a Paradox® database. The report of the survey was printed and reviewed. Any changes were documented on the report and changes were made to correct mistakes in location coding, but not in readings. All changes are documented in the table of changes to the database.

3.1.7 Data Reduction and Statistical Evaluation of Gamma-Ray Surveys

Data from the corrected files was extracted into a spreadsheet, then transferred to a statistical and plotting package, Psi-Plot®. This package is used to generate the graphics and the statistics for the data sets. For each data set, a histogram of the data is provided. The median value is calculated and limiting values exceeding the highest value expected value for the set of readings. Results of these surveys are given in Section 4.

3.2 GPS Surveys of Locations for Gamma Surveys for Seepage Pit

3.2.1 GPS Instrumentation

Instrumentation used for the GPS survey was the Trimble Model 4700/4800 Rover Kit with Radio and Pro XRS Mapping Unit.

3.2.2 GPS Survey Design

The GPS survey is a simple stake survey of the location of the markings made while doing the gamma survey. The system provides precise measurements within several centimeters of the location. The readout is in the New Mexico State Plane. All gamma location measurements could not be surveyed because of the shadow effect of the buildings on those locations immediately adjacent to the buildings. The shadow effect hides GPS satellites from the receiver making readings impossible. Only the perimeter of the surveys was measured, thus providing sufficient data to identify the locations on those points within the perimeter. Locations for the shadowed points near the buildings were also extrapolated from the measured locations in the open.

3.2.3 GPS Quality Control

A number of duplicate and triplicate measurements of the GPS position of locations were made. These all plotted within two centimeters of each other.

3.2.4 Documentation of GPS Surveys

Output of the surveys from the Trimble system are in comma delimited ASCII (CSV) files. These files were imported into Quattro Pro® for analysis.

3.2.5 Data Reduction of GPS data

Data from the CSV files were reviewed and location codes read from the paint markings on the ground were corrected based on the known layout of the grids. Some location codes were mis-identified because rain had partially obliterated the markings on the ground. Missing points were extrapolated from the perimeter measurements. Grid Identification numbers were associated with each point. Duplicate points were reviewed, accepted and were then removed from the final data set. Final survey results are presented in Section 4.

3.3 Visual Surveys of Active Container Storage Areas In Building 150

3.3.1 Visual Surveillance in Basement of Building 150

A diagram of Building 150 main floor plan as taken from the *TA-21 Operable Unit RFI Work Plan for ER* is shown in Figure 4. The work plan document does not show the basement of this building leaving open the question of migration of materials from the storage locations into adjacent soil. The basement area of Building 150 was observed to determine if any of the storage areas in the rooms on the main level were directly over soil where there was a possibility of release of spilled material to the ground. The walkdown of the basement areas showed that none of the rooms were constructed directly over earthen fill.

3.3.2 Radiological Surveys of the Storage Areas

The storage areas are shown in Figure 4. Current surveys of the storage areas performed by the LANL ESH-1 technicians as part of the routine survey program were reviewed. No significant radioactivity was found in the storage locations or in the rooms containing the storage locations.

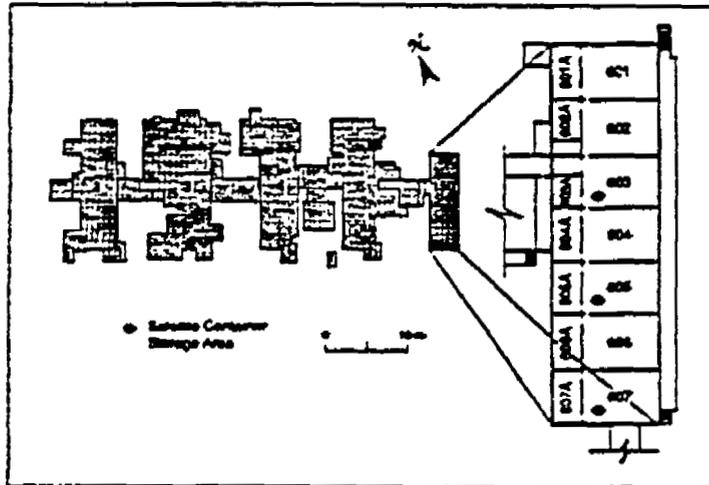


Figure 5. Locations of the active container storage areas in TA-231-150 (LANL no date)

Currently available data for the individual rooms are shown in Table 1. The survey data for these surveys are included in Appendix B.

Table 1. Survey Results for Building 150 Storage Locations

SWMU 21-028(b) Building 150 Room No/ Survey Date	Removable Alpha Contamination dpm/100 cm ²	Removable Beta Contamination, dpm/100 cm ²	Direct Alpha Reading, dpm/100 cm ²	Direct Beta Reading, dpm/100 cm ²
Room 603 8/6/99	<10	<12	Not available	Not available
Room 605 5/13/99	<10	<12	<68 cpm with Ludlum M239 floor monitor	<1700 cpm with Ludlum M239 floor monitor
Room 607 5/12/99	<9	<12	<68 cpm with Ludlum M239 floor monitor	<1700 cpm with Ludlum M239 floor monitor

Note: All open floor surfaces were scanned with the Ludlum Model 239 floor monitor. The areas were indistinguishable from background as noted.

3.3.3 Documentation

Photographs for the Building 150 basement rooms were taken to document that the rooms above were not over soil. Contact sheets of the photographs of the basement rooms are shown in Figure 6. The locations from which the photographs in the basement were taken are shown in Figure 7.

Each room on the main floor was photographed to show the stains on the floor. Contact sheets of the photographs of each storage location on the main floor are shown in Figure 8. Some stains were photographed from several different directions. The set of color photographs shown in these Figures are included in the attached electronic files in the folder for Building 150. The photographs are all JPEG format. Photographs were taken with a 35mm camera and scanned into electronic format and saved as .jpg files. The specific room and the orientation of the photograph are shown in Table 2.

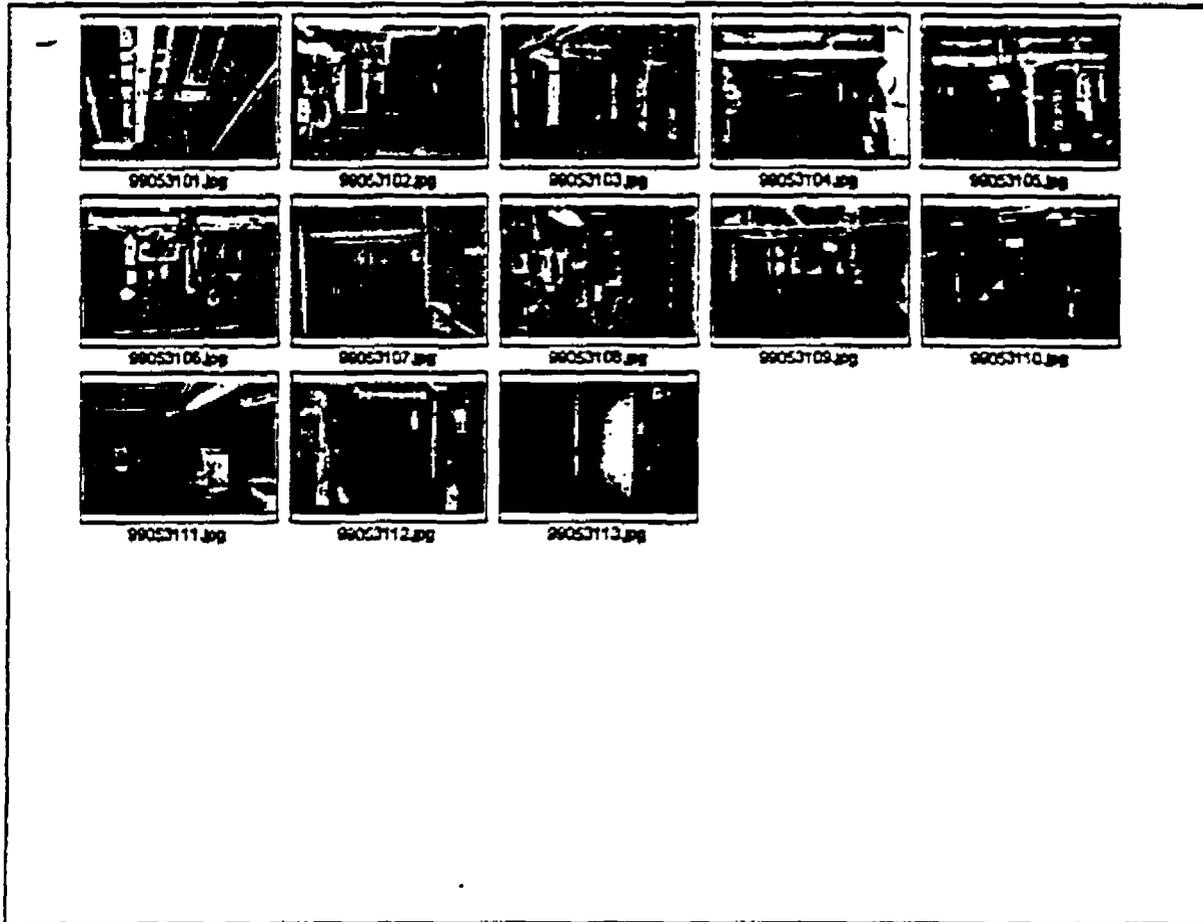


Figure 6. Photographs of basement area in Building 150 showing that the basement extends fully under the storage areas on the main floor.

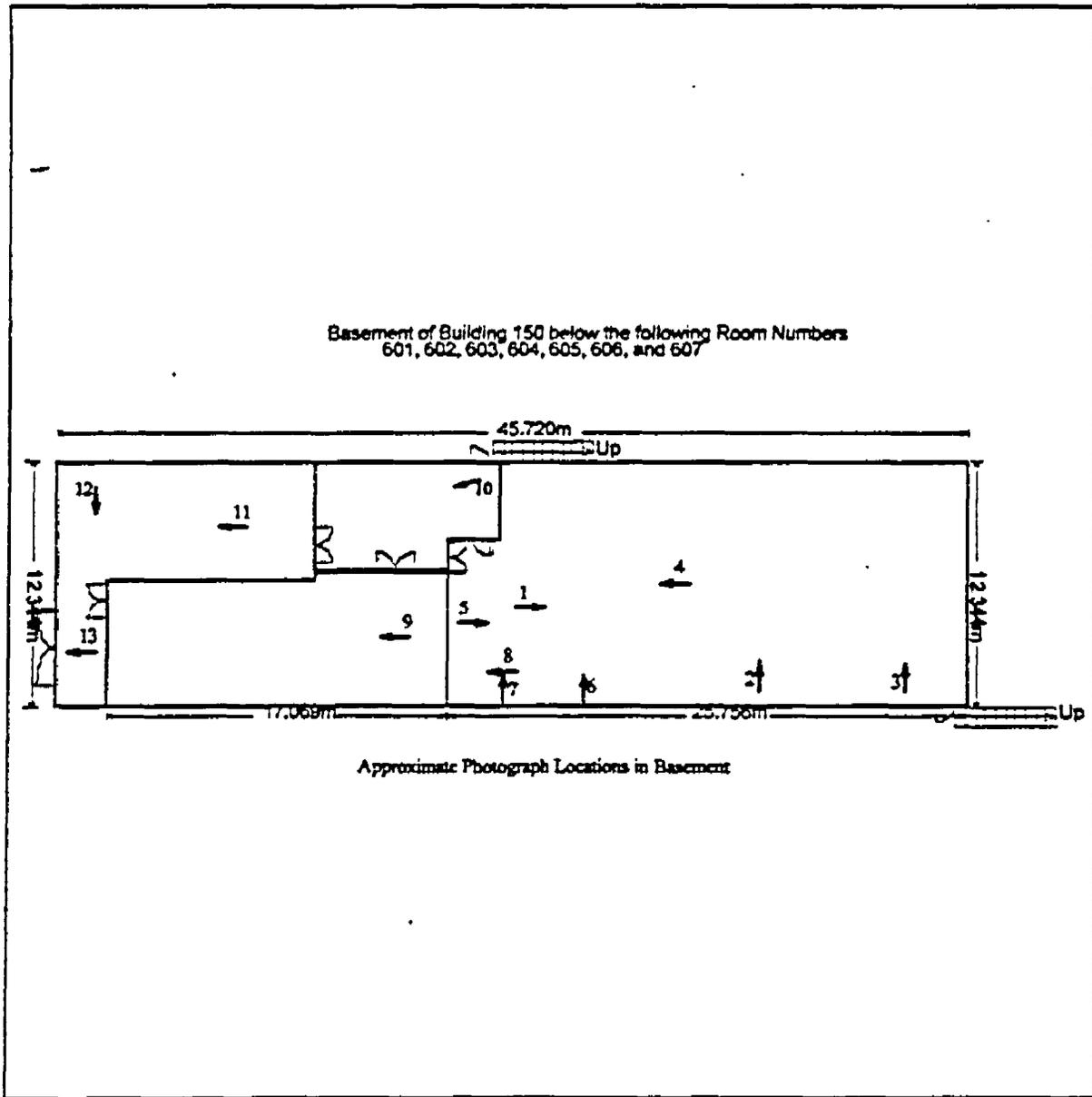


Figure 7. Photograph locations in basement of Building 150. Photo numbers are 990511.xx.jpg where xx is the photo number in this sketch.

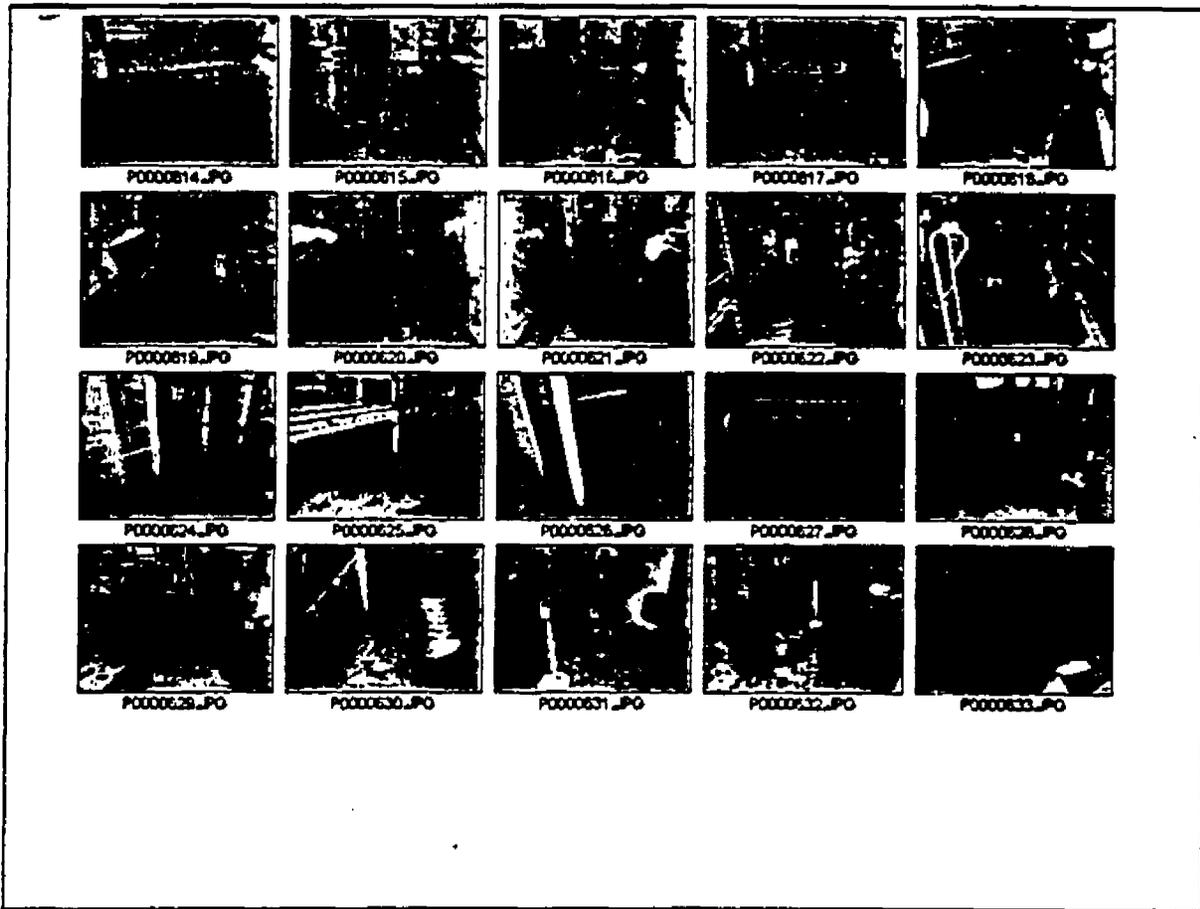


Figure 8. Building 150 storage locations showing stains and marks in storage areas

Table 2. Location and Orientation of Pictures of Building 150 Main Floor Rooms

Photo Number	Room and Orientation	Photo Number	Room and Orientation
p0000614.jpg	Room 603 showing stain on floor in front of wall to 603a	p0000615.jpg	Room 603 looking east
p0000616.jpg	Room 603a looking north	p0000617.jpg	Room 603a looking south
p0000618.jpg	Room 607a looking north	p0000619.jpg	Room 607a looking south
p0000620.jpg	Room 607 looking south	p0000621.jpg	Room 607 looking north
p0000622.jpg	Room 607 looking west on the north side	p0000623.jpg	Room 607 looking west on the south side
p0000624.jpg	Room 607 floor stain looking south	p0000625.jpg	Room 607 floor stain
p0000626.jpg	Room 605 south east wall corner under hood	p0000627.jpg	Room 605a south east corner
p0000628.jpg	Room 605 looking east on north side	p0000629.jpg	Room 605 looking east on south side
p0000630.jpg	Room 605 south east corner	p0000631.jpg	Room 605 looking south
p0000632.jpg	Room 605 looking north	p0000633.jpg	Room 605a waste area

3.4 Surveys of the Septic Tank Locations

3.4.1 Septic Tank Survey Design

The sampling program for the septic tank locations known as SWMU 21-023(a), (b), and (d) was to:

- locate the tanks based on existing drawings;
- auger to below the tank bottom level;
- sample soil from below the tank location; and
- immediately transfer the tank location samples to ER for analysis.
- If alpha activity was found, further excavation would stop.

Tank locations were to be physically identified. The approximate location of the tanks is shown in Figure 9.

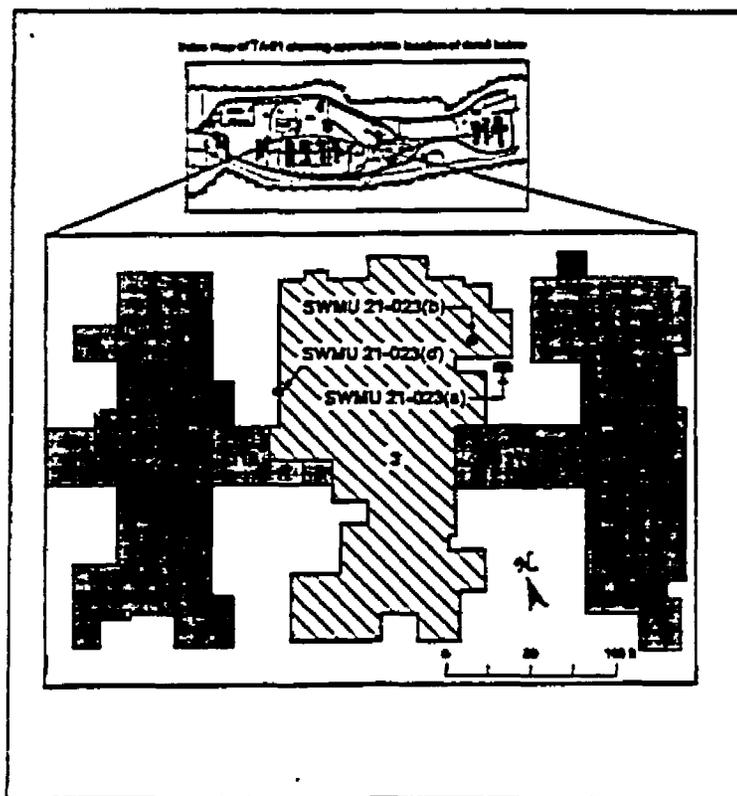


Figure 9. Location of SWMUs 21-023(a), (b), and (d) in relation to current configuration of Building 3. (LASL 1964, 1968a)

3.4.2 Staking Tank Location Based on Triangulation

The tank location for SWMU 21-023(d) was evident from the location of the clean-out for the tank. Although the tank had been removed, the clean-out remained. Tank locations for SWMU 21-023(a) and (b) were identified by triangulation from existing steel beams in Building 3. The beams were identified from the drawing *Existing Underground Utilities, Underfloor Tunnel and Floor Trenches at the North End of TA-21-3*, 8/9/94. The scale of the drawing was verified by reference to measurements of the width of the building in meters (12.04 m or 39.5 ft inside wall to inside wall), then measuring the distances on the drawing and scaling to meters for the triangulation measurements. The triangulation information is shown in Table 3. The marked up drawing is included as Appendix 3.

Table 3. Triangulation Measurements from Existing Vertical Steel Beams in Building 3 Structure

Septic Tank ID	Distance from East Beam, meters	Distance from West Beam, meters
SWMU 21-023(a)	20.53	11.27
SWMU 21-023(b)	21.30	14.20

The locations of the tanks as measured by triangulation were marked with wooden stakes with the SMWU number on them. These were left in place. Based on the distance and the triangulation angles, the locations are within about one to two feet from the center of the tanks as shown on the drawings.

3.4.3 GPS Locations for Septic Tanks

Each of the staked locations for the septic tanks was identified using the Trimble GPS unit to provide New Mexico Plane coordinates for the tank. The GPS locations are shown graphically in Figure 10.

To interpret this figure, add the value of Offset to the X- or Y-axis value to obtain the full GPS value in feet on the New Mexico Plane. The X- and Y-axes were shortened to make the graphic legible.

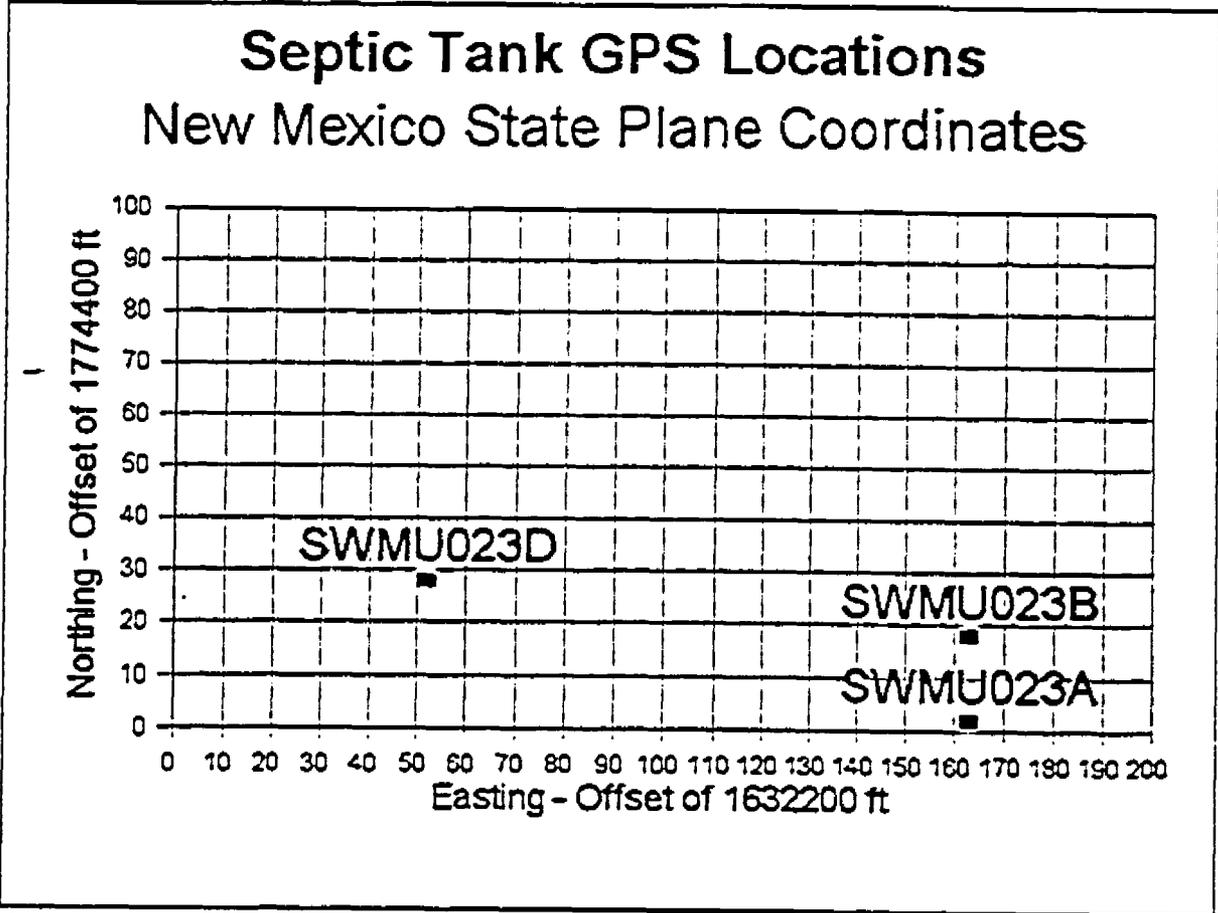


Figure 10. GPS locations of Building 3 septic tanks

3.4.4 Sampling Soil Under the Tank Locations

Sampling soil under the tank locations was unsuccessful. The rubble over the old tank locations is large enough to make drilling with a motorized hand auger impossible. The tip will not push larger blocks aside and the bit then makes no progress, or the bit will catch on a piece of rubble and screw itself into the rubble without drilling the material. Hand auguring was abandoned after attempting to drill to the bottom of the tank locations at each of the septic tank locations. No samples were collected. Direct surveys of the disturbed soil were made at each location during the auguring attempts. No beta or alpha activity was observed using a pancake GM detector and a 75 cm² alpha scintillation detector. Essentially no penetration into the rubble was made at (a) and (b). At SWMU -023(d) the augur penetrated to its full depth and was dug free manually. Direct surveys here were also negative.

4.0 SURVEY RESULTS

4.1 Survey Results Summary

The results of the surveys are summarized here as follows:

- No gamma radiation was detected on either the south or north side of the corridor that may be attributable to radiation from the seepage pits. This is true for both the low-energy gamma-ray survey for ^{241}Am and the high-energy gamma-ray survey for ^{137}Cs .
- The survey did not cover the previously identified contaminated area immediately to the south of the survey zone on the south side of the corridor. This recently discovered "hot-spot", investigated by LANL ESH, contains alpha activity and ^{137}Cs . It is probably the missing seepage pit. Surveys done of this area to define the boundaries of the contaminated area seem to indicate both low and high energy gamma radiation. This survey did not undertake an in-depth investigation of this area.
- Septic tanks locations were identified by triangulation from existing structural members remaining in Building 3. Sampling through the backfilled rubble was unsuccessful. No contamination was observed during attempted auguring.
- Building 150 active storage locations were reviewed and photographed. All these areas are over the full basement for this building. No soil sampling was done for that reason. LANL ESH radiation and contamination surveys show these areas are not contaminated.

4.2 Gamma Surveys for ^{241}Am and ^{137}Cs from Seepage Pits

4.2.1 Survey for ^{241}Am on the South Side of the Corridor

One-hundred thirty-five gamma measurements were collected over the area on the south side of the corridor with the window set for the ^{241}Am gamma-ray energy. The histogram for these readings in Figure 11 does not show any readings above the nominal upper statistical bound for the background in this area.

4.2.1.1 Critical Value for Readings Different than Background

The data set of readings on the south side of the corridor had a median value of 825 counts in one minute. The estimated standard

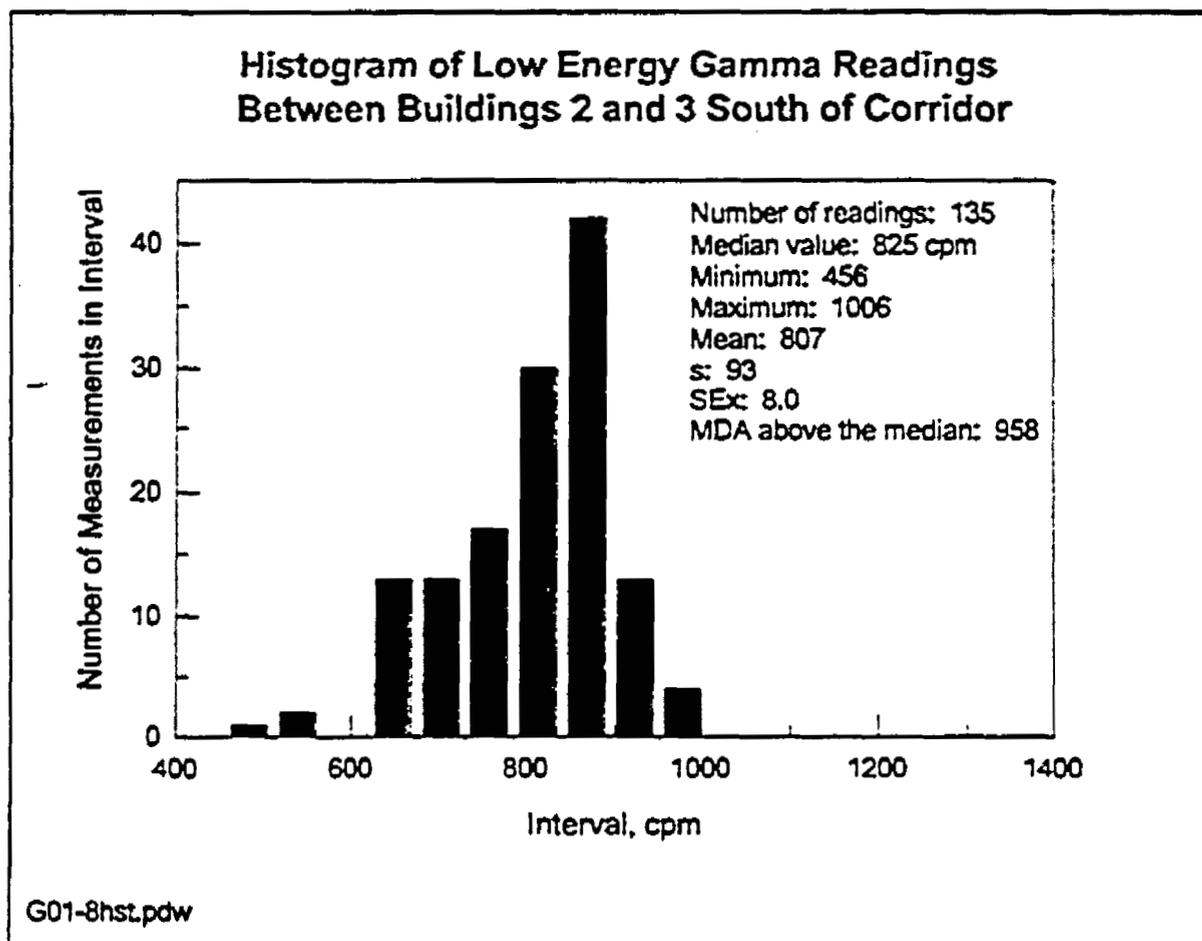


Figure 11. Histogram of ^{241}Am readings on south side of corridor

deviation for a single count of this magnitude is $\sqrt{825}$, or 29 counts. The value, in counts, that can be detected that is different from the median is 4.65 times the estimated standard deviation (Eq. (1)), or 133 counts above the median. Therefore, the value used to define a reading higher than that due only to background, C_{post} (MDA over background) is $825 + 133$, or 958 cpm.

4.2.1.2 Contours for ^{241}Am Readings and Evaluation

The graph in Figure 12 of readings showing the contours do not identify any areas of elevated activity within the gridded area. However, the posted contaminated area is immediately adjacent to the area to be surveyed. This area is in a location that could meet the position criteria for the seepage pit. It is not between the buildings, but is at the very end of Building 3.

The highest reading in this data set is near a posted contaminated area on the loading dock where the suspected French drain may be located. We believe that the reading is from the contaminated area

on the dock and not from buried activity below the soil at this location. No core boring was done at this location.

North and west directions are given from the SE corner of the original Building 2 not including the add-on buildings (Room 2). However, the origin of the grid measurement process was at the intersection of the west wall of Building 2 and the south wall of the corridor structure. Contours in these graphs are as selected by the graphing software. However, there are no *significant* contours.

4.2.1.3 Measurement Locations for South Side of Corridor

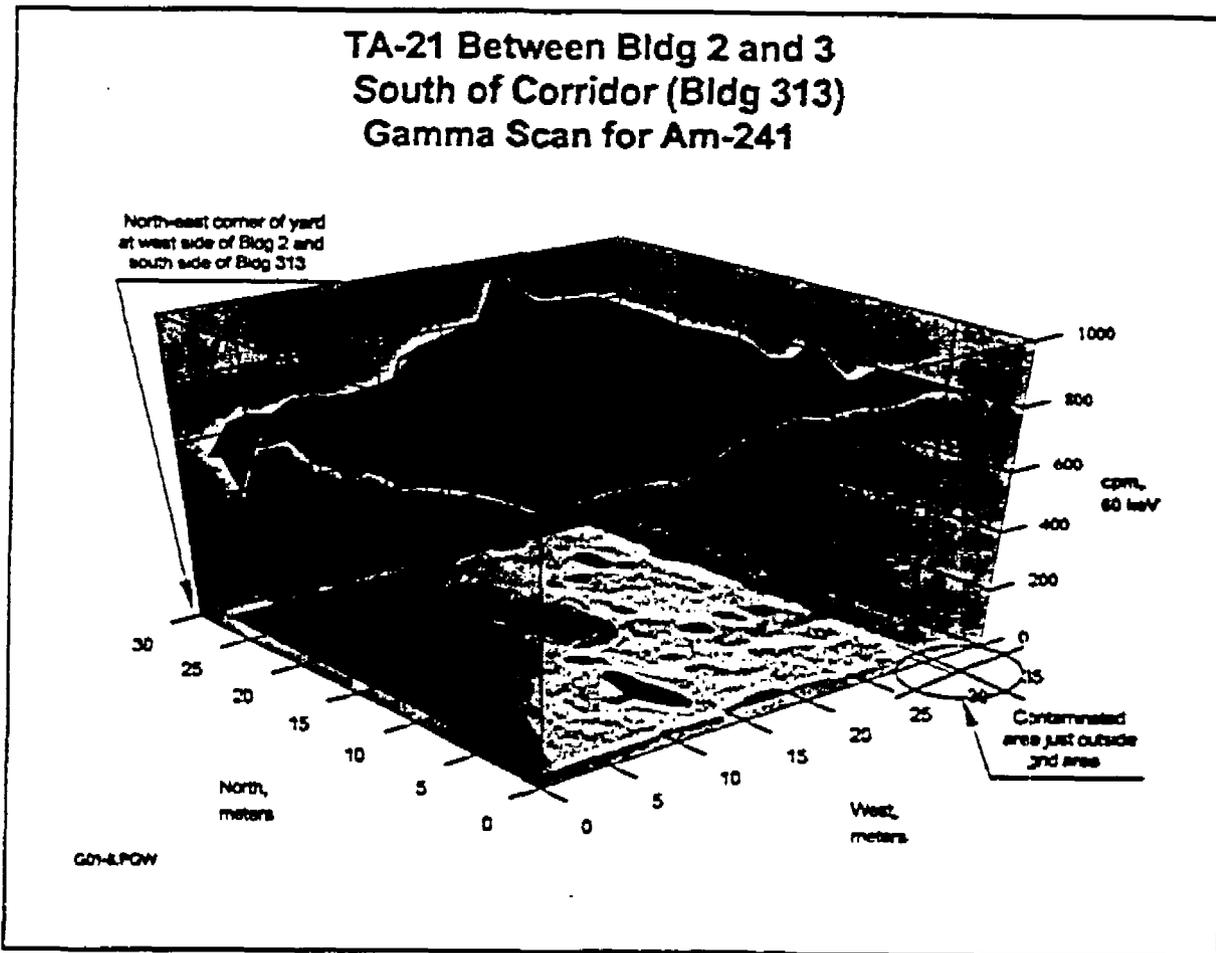


Figure 12. Contours for ^{241}Am on the south side of the corridor. Note the location of the posted area relative to the assigned area for the survey between the two buildings.

The locations for the measurements for this grid as measured using sub-meter GPS are shown in Figure 13. Position values were reproducible to within about 2 cm or less during the survey.

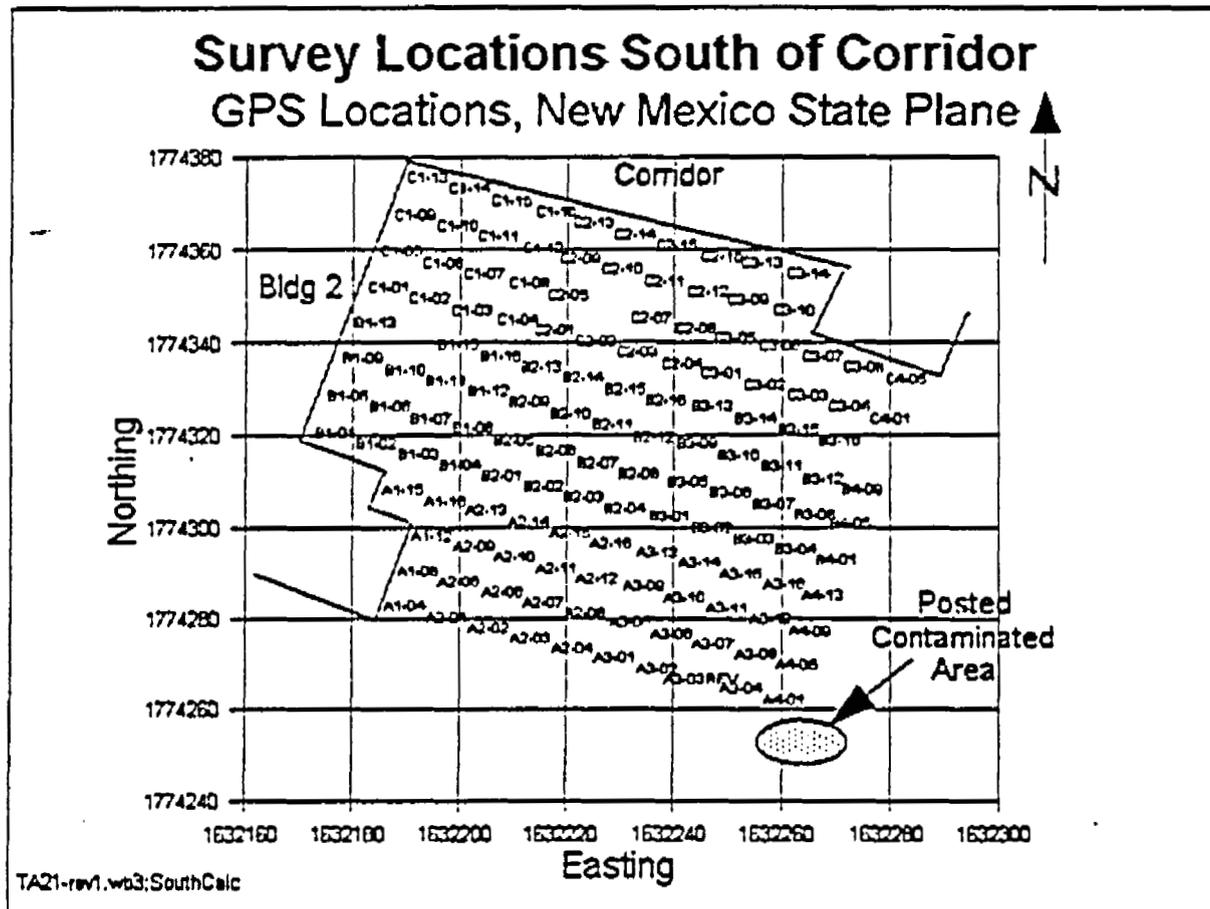


Figure 13. Measurement locations for gamma survey readings on the south side of the corridor between Buildings 2 and 3. Locations are in the New Mexico State Plane coordinates.

4.2.1.4 Photographs of South Side of Corridor Survey Area

Photographs of the survey area south of the corridor are included on the attached electronic files. A contact sheet of the images is included as Appendix A.

Additional photographs of the trenching done in this area are also included. The trenching was done near Room 2 at the south end of Building 2 and does not show any evidence of a seepage pit. The trenching was designed to intercept lines going to Building 3 from Building 2. These lines were identified. The trenches generally lie east of the contaminated area at the south end of the Building 3

footprint. The contact sheet for these images is included here as Figure 14.

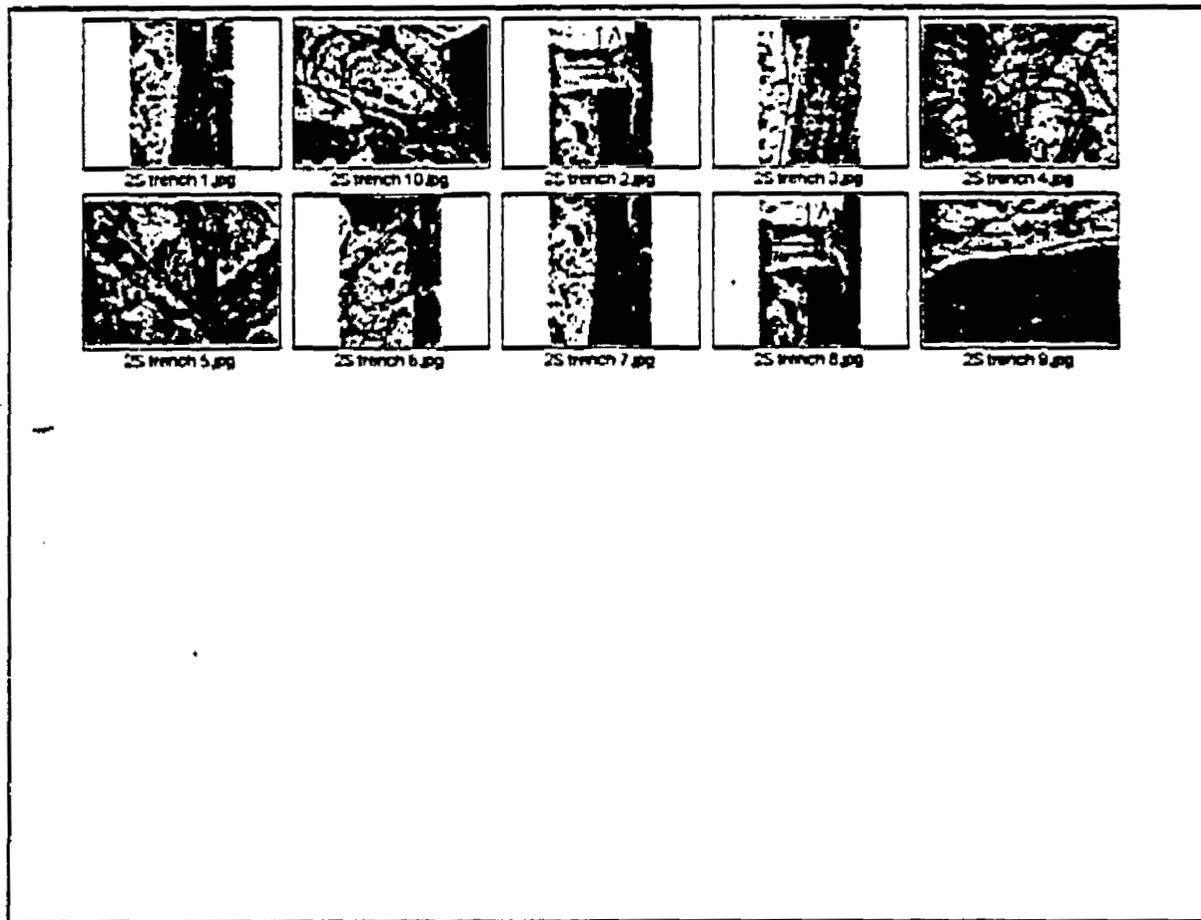


Figure 14. Photographs of excavations done between Building 2 and Building 3 near Room 2 on the south side of the corridor. Excavations were to locate and acid line between Bldg 2 and 3.

4.2.2 Survey for ^{137}Cs on the South Side of the Corridor

One hundred thirty-three readings for high energy gamma radiation were taken on the south side of the corridor with the window set for the ^{137}Cs and other high energy gamma-ray energies. The histogram for these readings in Figure 15 shows some readings above the nominal upper statistical bound for the background in this area.

4.2.2.1 Critical Value for Readings Different than Background

The upper bound expected for normally distributed activity with the median of 4760 counts is 5080 counts calculated as described earlier. Readings exceeding this value may indicate activity buried under the surface or may be surface contamination.

4.2.2.2 Contours for ^{137}Cs Readings and Evaluation

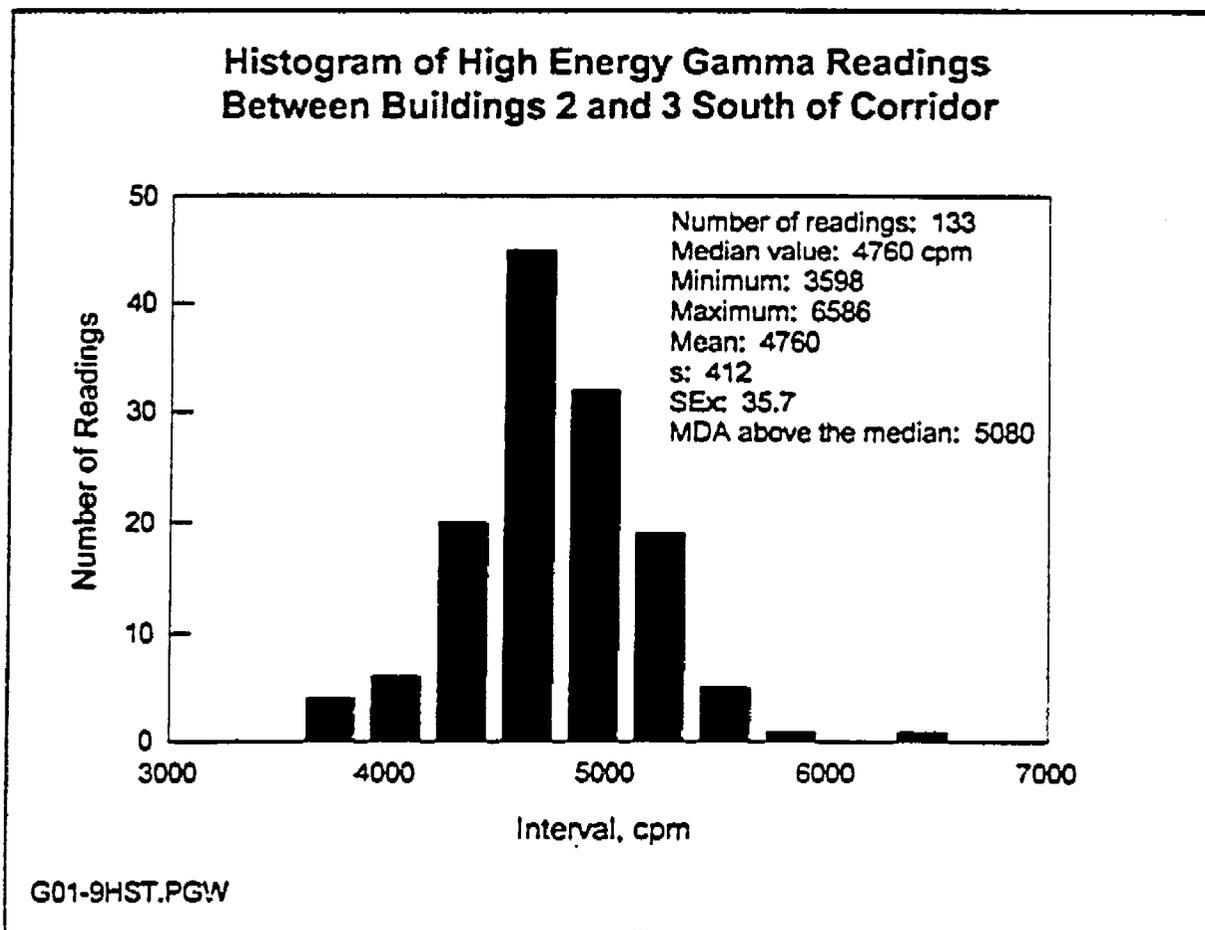


Figure 15. Histogram of the high energy gamma ray survey on the south side of the corridor.

The contours generated by the readings are shown in Figure 16. Slightly elevated readings are found near the dock Structure 272. This is in the north-west section of the area. In the graph these areas are shaded as contours. The dock, however, is marked as a contaminated area and magenta marks on the dock indicate contamination near the locations where the readings were made.

The possible seepage pit is indicated in the graphic in the south-west corner of the area. This location was just out of the boundary set for the survey since it is south of the end of Building 3. The gridded survey got close enough to just see the radiation from this area. Additional survey and photographic information on this area is provided in Section 4.2.5.

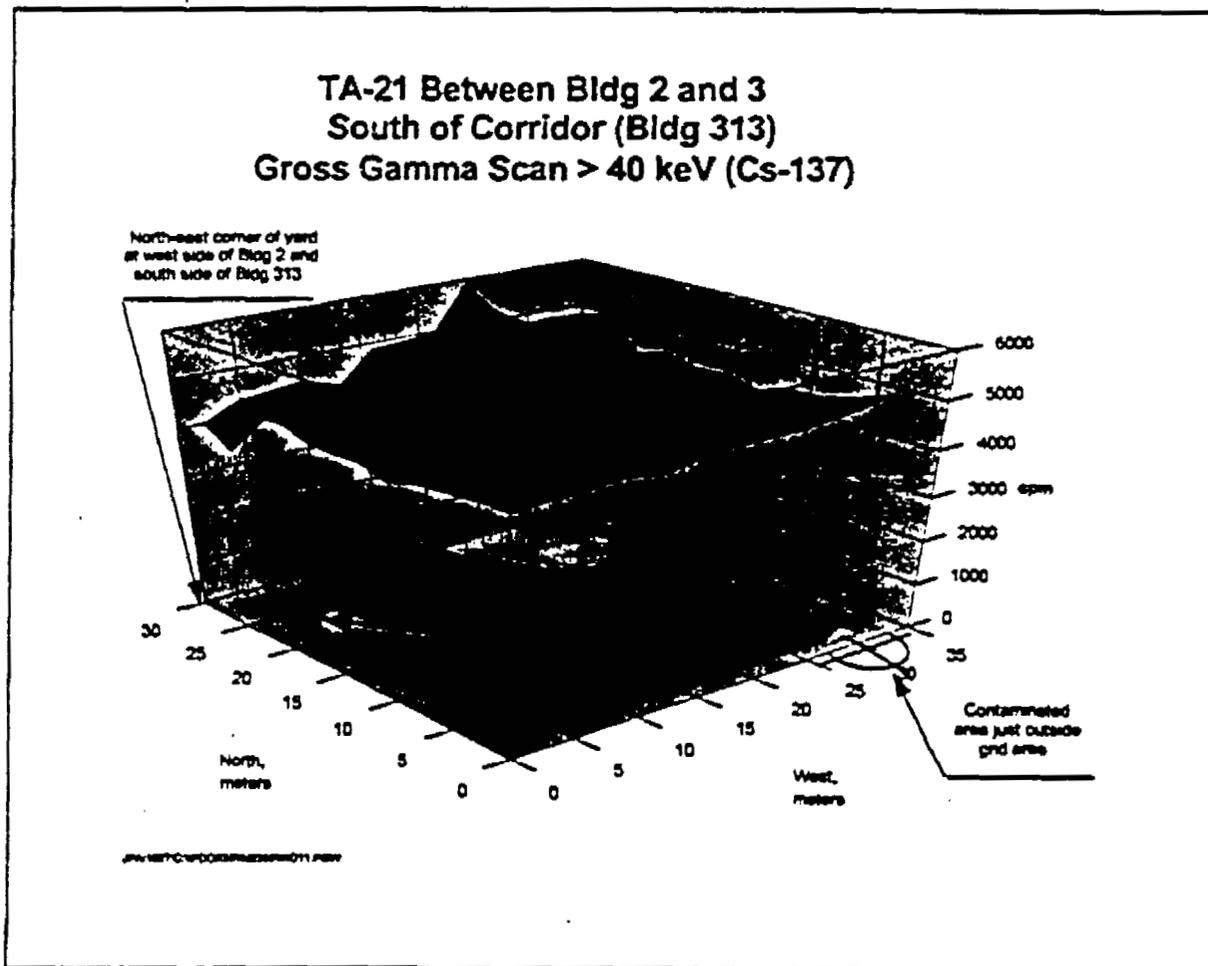


Figure 16. Contours of the high energy gamma measurements on the south side of the corridor between Building 2 and the Building 3 footprint.

4.2.3 Survey for ^{241}Am on the North Side of the Corridor

Similar surveys for ^{241}Am and ^{137}Cs were conducted on the north side of the corridor. Local contamination was identified in areas adjacent to Building 2. A large pile of the rubble from demolition of Building 3 remains in this area, effectively blocking surveys for both ^{241}Am and ^{137}Cs . Some areas of Building 3 remain in this area. Where the building was removed except for the floor, the surveys were conducted anyway. No readings were collected inside the few remaining rooms of Building 3 that were not part of the large original building. The areas near Building 2 were largely paved with asphalt and with concrete slabs. Some of the slabs were purportedly placed to shield the radiation from contamination in the soil. Readings over these areas were lower than the general readings elsewhere.

Ninety-seven readings were collected for ^{241}Am on the north side of the corridor. The histogram for this data and the summary statistics are shown in Figure 17. Based on the analysis of the data, readings greater than about 1008 are higher than expected due to background only.

4.2.3.1 Critical Value for Readings Different than Background

Based on the median and the analysis of the data, values greater than 1008 indicate activity that is probably greater than background. The contours are, therefore, set to plot values greater than 871 cpm at intervals of 140 cpm.

4.2.3.2 Contours for ^{241}Am Readings and Evaluation

The contours for ^{241}Am readings taken on the north side of the corridor are shown in Figure 17. The contours show one small

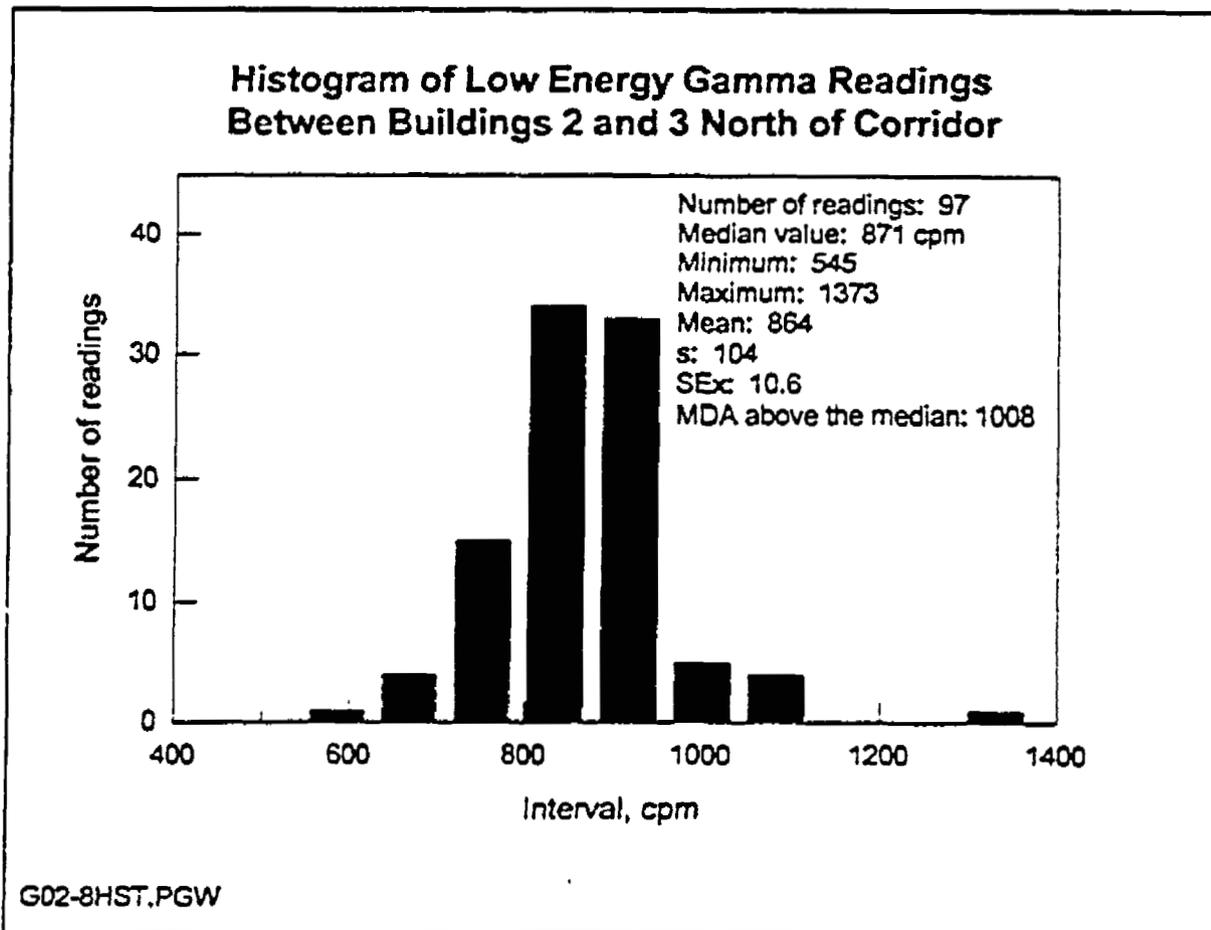


Figure 17. Histogram for ^{241}Am readings taken on the north side of the corridor. Highest readings were located at previously marked contaminated areas near the Bldg 2 west wall.

area identified during the survey because it was collected in a previously marked contaminated area on the west wall of Building 2. No other significant readings were identified.

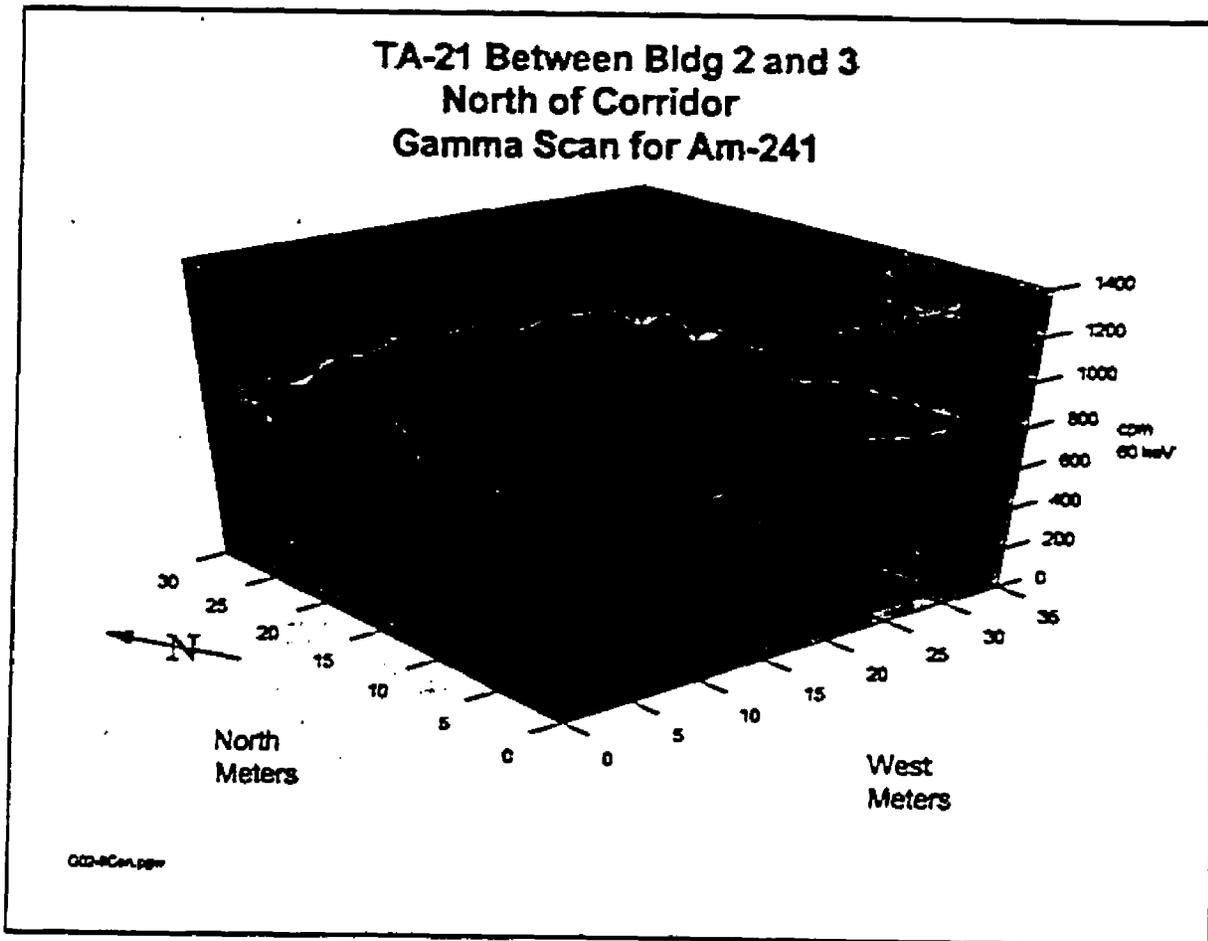


Figure 18. Contours for ^{241}Am readings taken on the north side of the corridor. The only significant reading is about 15 meters north of the corridor beside Building 2 in a previously marked contaminated area.

4.2.3.3 Measurement Locations for North Side of Corridor

The measurement locations on the north side of the corridor were marked and labeled similar to those on the south side. These markings begin with Row D on the southern edge of the area and end with Row F on the northern edge. Room 224 on the west side of Building 2 interferes with the survey in the south-east corner. Readings taken on the porch for the entrance to this room were clearly shielded from the natural activity from the ground. A fence separates the Building 2 grounds from the Building 3 footprint. The survey disregarded the fence and surveyed as if it was not there. A large mound of rubble remaining from the demolition of Building 3 remains in the north-west corner of the survey area. No readings were collected from this area. In Figure 19, the actual locations where readings were taken are shown in

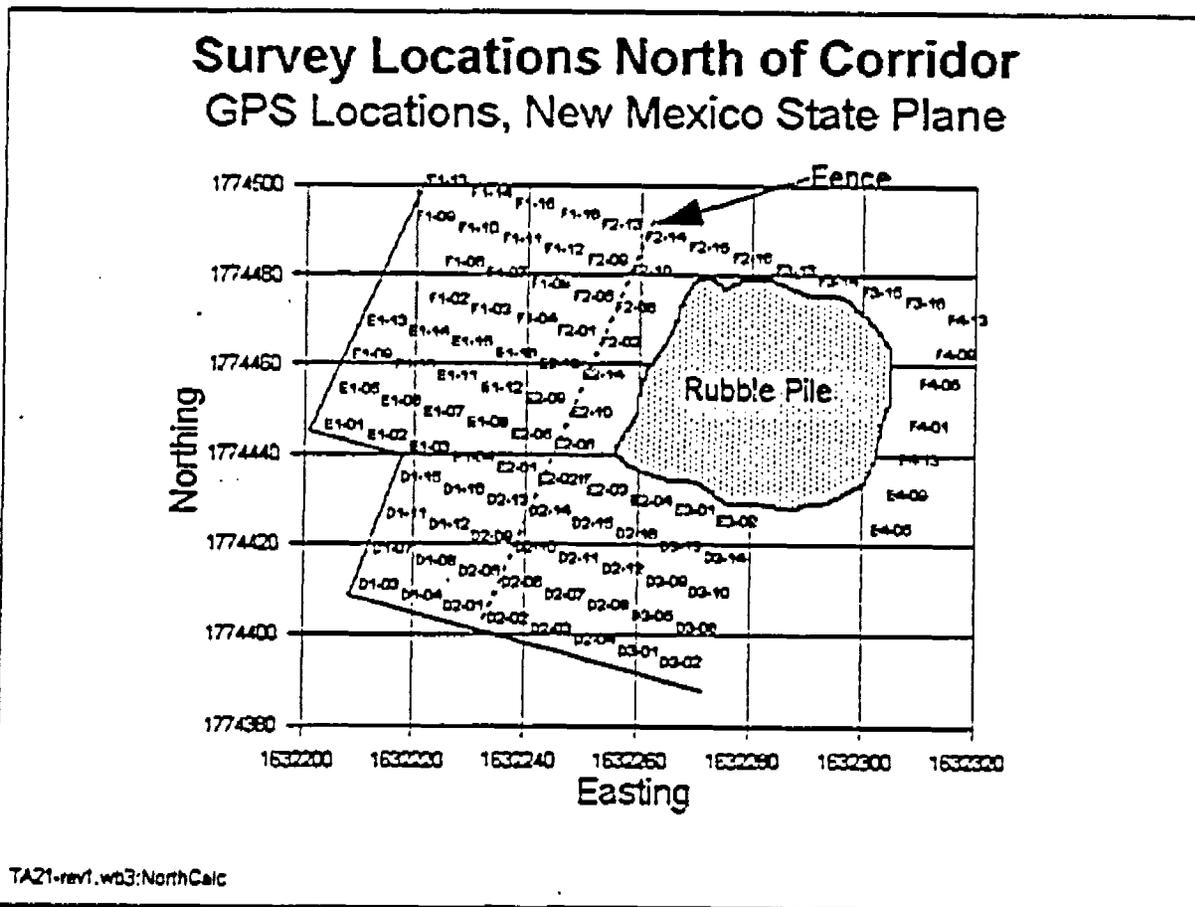


Figure 19. GPS measurements of survey locations on the north side of the corridor. Actual gamma measurement locations are shown as well as locations extrapolated from nearby GPS measurements.

the New Mexico State Plane grid. Missing locations along Building 2 are in a roped-off controlled area and were not surveyed.

4.2.3.4 Photographs of North Side of Corridor Survey Area

Photographs of the north side of the facility showing many of the features are included in the report on the enclosed set of .jpg files. These images are shown here on a "contact sheet" of the various images. Figure 20 is of the images of the Building 3 footprint and the mound of debris or rubble remaining on the site. Additional images are shown in Appendix A.

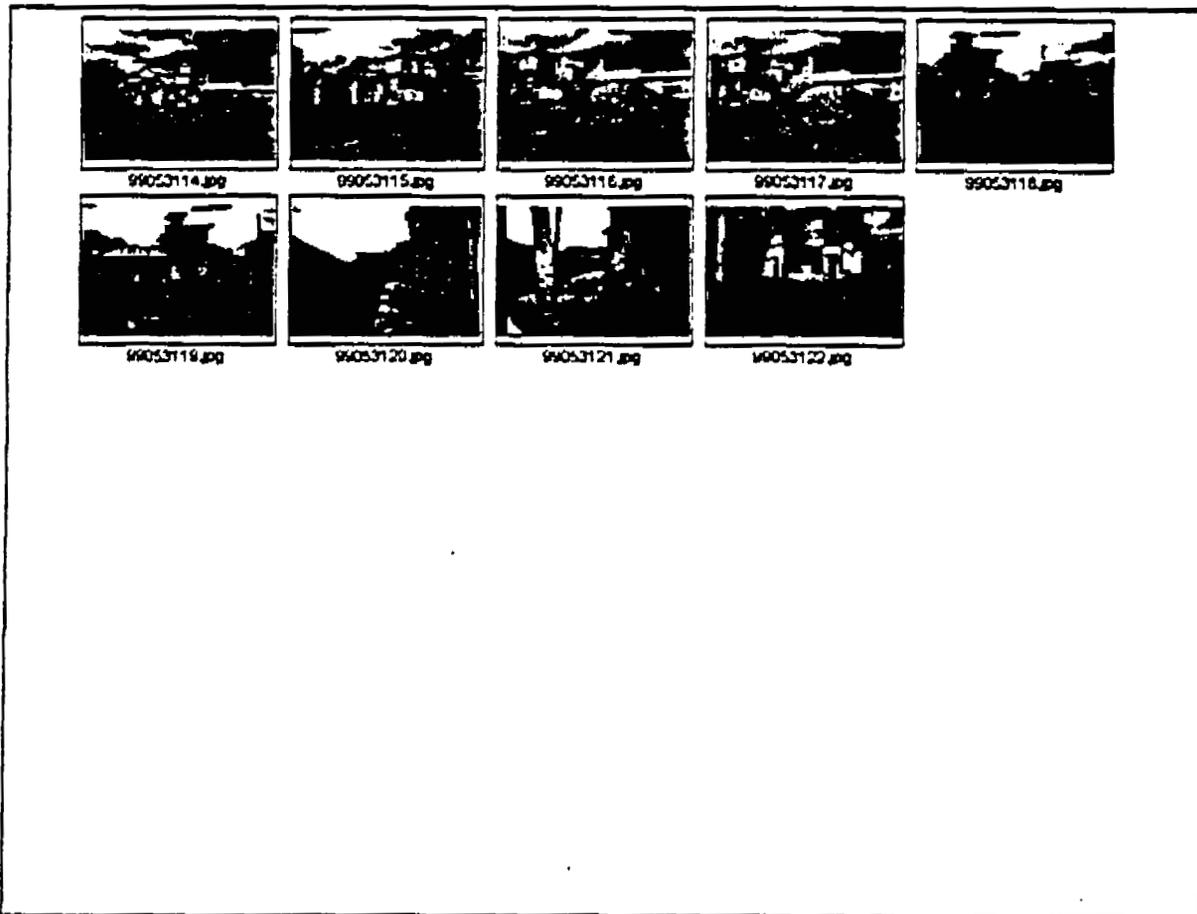


Figure 20. Images of the Building 3 footprint and the pile of rubble on the north side of the corridor, May, 1999

4.2.4 Survey for ^{137}Cs on the North Side of the Corridor

Surveys for ^{137}Cs were conducted on the north side of the corridor. Local contamination was identified in areas adjacent to Building 2 in the same locations that were identified for ^{241}Am . The large pile of the rubble from demolition of Building 3 remains in this area, effectively blocking these surveys also. As described above, some areas of Building 3 remain in this area. Where the building was removed except for the floor, the surveys were conducted anyway. No readings were collected inside the few remaining rooms of Building 3 that were not part of the large original building. The areas near Building 2 were largely paved with asphalt and with concrete slabs. The porch to Room 224 is an effective shield for gamma radiation from the ground yielding the lowest readings for this set.

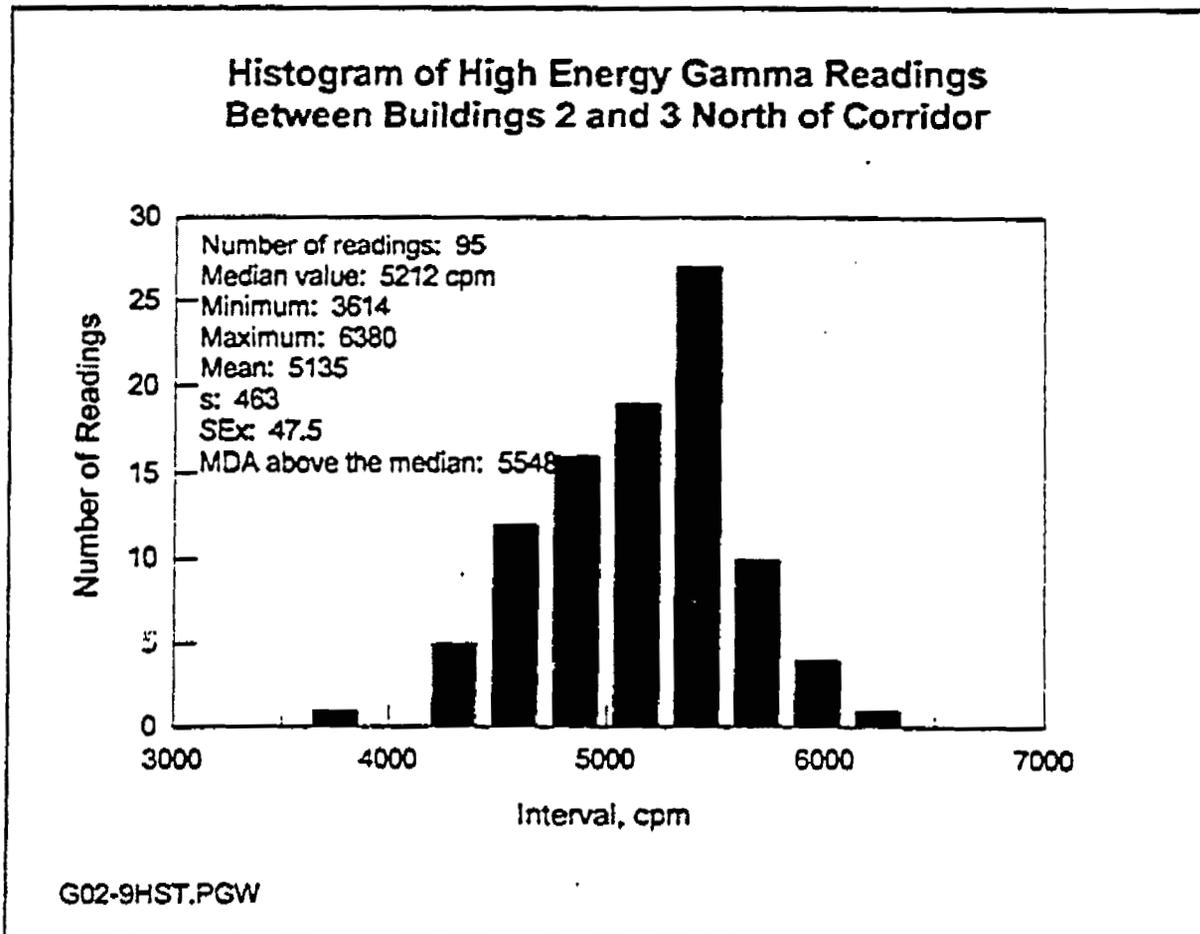


Figure 21. Histogram of high-energy gamma readings taken on the north side of the corridor. Readings greater than about 5550 cpm are probably greater than the local background radiation.

2. No other significant readings were identified.

4.2.5 Survey Data for Seepage Pit Surveys

The data from the readings and the GPS information for each measured location is given in two tables in Appendix B. Table B1 is for the south side of the corridor and Table B2 is for the north side of the corridor.

4.2.6 Probable Location of Seepage Pit

The seepage pit may be the contaminated zone just south of the Building 3 footprint as discussed earlier. This area was recently discovered accidentally when one of the EHS staff passed the area with an operating gamma meter. The meter gave an indication and the area was investigated. According to John Elliot, the contamination in this area included ^{137}Cs and alpha activity. Apparently the contamination extended to the depth attainable with the backhoe used for the exploratory excavation. The fact that ^{137}Cs and alpha activity and the proximity to the survey area on the south side of the corridor lead us to believe that this contamination is due to the seepage pit referenced in the ER sampling plan.

During the course of the surveys on the south side of the corridor, the extent of the contamination in this area was surveyed and the location of two perimeters were painted on the ground. The "positively above background" line is approximately at the posted boundary. Another line was marked at a reading of "maybe above background." This reading is not clearly distinguishable from the variations in background. However this lower level indication appears to extend east and west of the posted area at about the same width and for a distance of about 30 ft in either direction.

4.2.6.1 Photographs of Posted Area on South End of Building 3 Footprint

Several photographs were taken of the surveyed area of the possible seepage pit. Examples of these are shown in the contact sheet shown in Figure 23. Files with these images are included with the report as JPEG files. All photographs were taken with an automatic 35 mm camera, then scanned at 300 dpi and saved as .jpg files.



Figure 23. Images of the suspected seepage pit just south and west of the area surveyed on the south side of the corridor..

4.3 Surveys of Storage Areas in Building 150

4.3.1 Contamination Surveys for Storage Areas in Building 150

Surveys of the rooms containing the storage areas in Building 150 were surveyed routinely for alpha and for beta contamination. Both direct and removable surveys were performed. No contamination was observed in the rooms. Routine survey results for Rooms 605, 605A, 607, and 607A are attached in Appendix B. These surveys were performed by ESH-1 in May 1999.

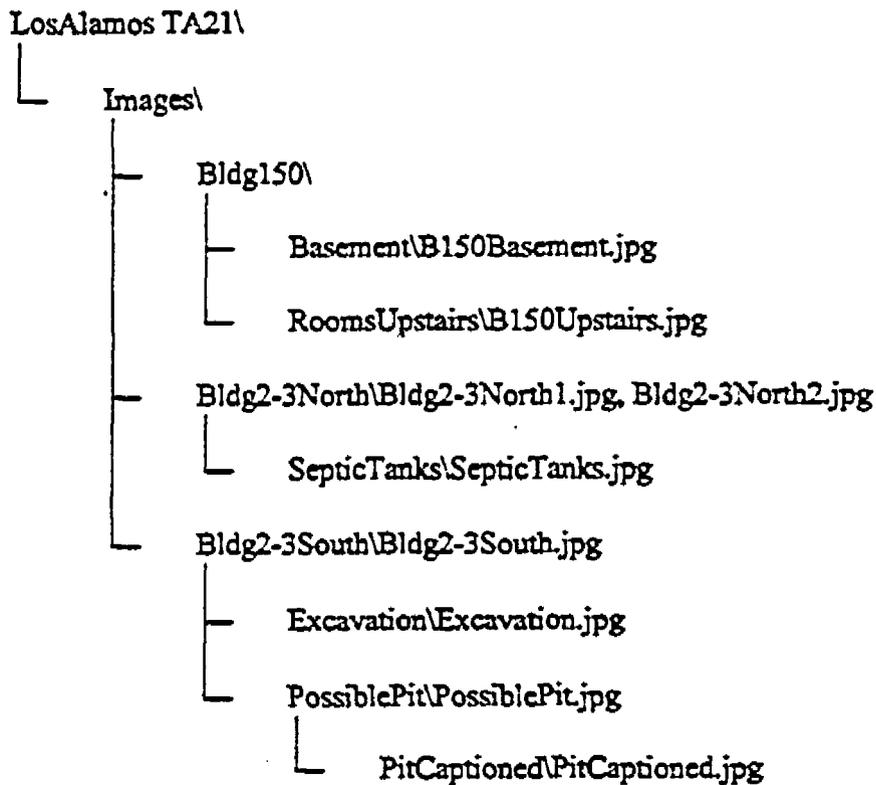
REFERENCES

1. Memorandum from Troy Eshleman, GTS Duratek Task Leader, to Gary McMath, LANL EM/ER, through Johnny Harper, EM/DND, dated 21 May, 1998, Letter # 7002-300-0010, entitled *Field Implementation Plan for: TA-21 D&D Characterization -ER Project Coordination*
2. Drawing "Existing Underground Utilities, Underfloor Trenches and Floor Trenches at the North End of TA-21-3," Sheet TA-21-ER4, August 9, 1994.
3. *TA-21 Operable Unit RFJ Work Plan for ER, May 1991, Chapter 18*

Appendix A Photographs

Appendix A Photographs

The image files for this report are found in the included disk in the following directory structure. Each subdirectory contains images and thumbnail images used by Graphic Workshop Professional. There is one or more contact sheet images in each subdirectory. The contact sheet contains identified thumbnails of the other images. Contact sheets are in .jpg format and are listed in this outline. These are the same contact sheets used as figures in the report.



Appendix B Survey Data

Appendix B Table B1

South Side of Corridor						
Feature code	Easting	Northing	Meters North	Meters West	AM-241 Counts	Cs-137 Counts
A1-01	1632166.7	1774287.5				
A1-02	1632174.4	1774285.1				
A1-03	1632182.2	1774282.7				
A1-04	1632190.0	1774280.6	1.25	8.75	811	4958
A1-05	1632169.1	1774295.3				
A1-06	1632176.9	1774292.9				
A1-07	1632184.6	1774290.4				
A1-08	1632192.4	1774288.3	3.75	8.75	811	4647
A1-09	1632171.7	1774303.4				
A1-10	1632179.5	1774301.0				
A1-11	1632187.3	1774298.5				
A1-12	1632195.0	1774296.1	6.25	8.75	890	5166
A1-13	1632174.1	1774311.2				
A1-14	1632181.9	1774308.7				
A1-15	1632189.7	1774306.3	8.75	6.25	812	4844
A1-16	1632197.5	1774303.9	8.75	8.75	871	5027
A2-01	1632197.8	1774278.2	1.25	11.25	791	4635
A2-02	1632205.8	1774275.9	1.25	13.75	876	4860
A2-03	1632213.5	1774273.6	1.25	16.25	916	5042
A2-04	1632221.4	1774271.3	1.25	18.75	952	5105
A2-05	1632200.2	1774286.0				
A2-06	1632208.2	1774283.6	3.75	13.75	929	4924
A2-07	1632216.0	1774281.4	3.75	16.25	860	5101
A2-08	1632223.9	1774279.0	3.75	18.75	832	4762
A2-09	1632202.8	1774293.8	6.25	11.25	933	5119
A2-10	1632210.6	1774291.4	6.25	13.75	956	5165
A2-11	1632218.4	1774289.0	6.25	16.25	844	5021
A2-12	1632226.2	1774286.6	6.25	18.75	894	4841
A2-13	1632205.3	1774301.6	8.75	11.25	907	5051
A2-14	1632213.0	1774299.2	8.75	13.75	918	5180
A2-15	1632220.8	1774296.8	8.75	16.25	830	4732
A2-16	1632228.6	1774294.3	8.75	18.75	800	4591
A3-01	1632229.3	1774269.1	1.25	21.25	900	5055
A3-02	1632237.2	1774266.7	1.25	23.75	894	4983
A3-03	1632245.1	1774264.2	1.25	26.25	879	5034
A3-04	1632252.8	1774262.2	1.25	28.75	908	5097
A3-05	1632232.2	1774277.0	3.75	21.25	887	4760
A3-06	1632240.0	1774274.6	3.75	23.75	864	4926
A3-07	1632247.8	1774272.1	3.75	26.25	844	4911
A3-08	1632255.6	1774269.7	3.75	28.75	911	5006
A3-09	1632234.7	1774284.9	6.25	21.25	926	4565
A3-10	1632242.5	1774282.5	6.25	23.75	891	4706
A3-11	1632250.3	1774280.0	6.25	26.25	864	4792
A3-12	1632258.0	1774277.6	6.25	28.75	809	4763
A3-13	1632237.3	1774292.5	8.75	21.25	852	4772
A3-14	1632245.1	1774290.1	8.75	23.75	815	4679
A3-15	1632252.8	1774287.7	8.75	26.25	825	4842
A3-16	1632260.6	1774285.2	8.75	28.75	808	4671
B1-01	1632176.8	1774318.6	11.25	1.25	720	4422
B1-02	1632184.6	1774316.2	11.25	3.75	658	4353
B1-03	1632192.4	1774313.8	11.25	6.25	741	4324
B1-04	1632200.1	1774311.7	11.25	8.75	824	4928
B1-05	1632179.3	1774326.4	13.75	1.25	724	4611

South Side of Corridor						
Feature code	Easting	Northing	Meters North	Meters West	AM-241 Counts	Cs-137 Counts
B1-06	1632187.1	1774324.0	13.75	3.75	720	4479
B1-07	1632194.8	1774321.5	13.75	6.25	750	4350
B1-08	1632202.6	1774319.4	13.75	8.75	777	4392
B1-09	1632182.0	1774334.5	16.25	1.25	662	4563
B1-10	1632189.8	1774332.1	16.25	3.75	707	4316
B1-11	1632197.6	1774329.6	16.25	6.25	724	4435
B1-12	1632205.3	1774327.2	16.25	8.75	740	4416
B1-13	1632184.3	1774342.3	18.75	1.25	685	4616
B1-14	1632192.0	1774339.8				
B1-15	1632199.8	1774337.4	18.75	6.25	631	3875
B1-16	1632207.6	1774335.0	18.75	8.75	727	4352
B2-01	1632207.9	1774309.4	11.25	11.25	818	4771
B2-02	1632215.7	1774307.0	11.25	13.75	921	5117
B2-03	1632223.5	1774304.5	11.25	16.25	844	4830
B2-04	1632231.2	1774302.1	11.25	18.75	860	4802
B2-05	1632210.4	1774316.9	13.75	11.25	844	4708
B2-06	1632218.2	1774314.5	13.75	13.75	845	5035
B2-07	1632225.9	1774312.0	13.75	16.25	775	4629
B2-08	1632233.7	1774309.6	13.75	18.75	815	4685
B2-09	1632213.1	1774324.9	16.25	11.25	765	4631
B2-10	1632220.9	1774322.5	16.25	13.75	821	4842
B2-11	1632228.7	1774320.1	16.25	16.25	785	4597
B2-12	1632236.5	1774317.6	16.25	18.75	758	4688
B2-13	1632215.4	1774332.6	18.75	11.25	751	4463
B2-14	1632223.1	1774330.2	18.75	13.75	816	4839
B2-15	1632230.9	1774327.7	18.75	16.25	784	4940
B2-16	1632238.7	1774325.3	18.75	18.75	798	5023
B3-01	1632239.5	1774300.4	11.25	21.25	826	4629
B3-02	1632247.2	1774297.9	11.25	23.75	786	4715
B3-03	1632255.0	1774295.5	11.25	26.25	908	4766
B3-04	1632262.8	1774293.1	11.25	28.75	782	4682
B3-05	1632243.1	1774308.0	13.75	21.25	836	4621
B3-06	1632250.8	1774305.6	13.75	23.75	859	4576
B3-07	1632258.6	1774303.2	13.75	26.25	865	4518
B3-08	1632266.4	1774300.7	13.75	28.75	842	4731
B3-09	1632244.5	1774316.0	16.25	21.25	918	4762
B3-10	1632252.3	1774313.6	16.25	23.75	837	4710
B3-11	1632260.1	1774311.2	16.25	26.25	846	
B3-12	1632267.8	1774308.7	16.25	28.75	894	
B3-13	1632247.6	1774324.0	18.75	21.25	853	4606
B3-14	1632255.4	1774321.6	18.75	23.75	860	4514
B3-15	1632263.1	1774319.2	18.75	26.25	892	
B3-16	1632270.9	1774316.8	18.75	28.75	867	
C1-01	1632186.7	1774349.7	21.25	1.25	743	4829
C1-02	1632194.5	1774347.3	21.25	3.75	649	4186
C1-03	1632202.3	1774344.9	21.25	6.25	655	4121
C1-04	1632210.7	1774342.8	21.25	8.75	796	4308
C1-05	1632189.2	1774357.5	23.75	1.25	656	5075
C1-06	1632196.9	1774355.1	23.75	3.75	665	4310
C1-07	1632204.7	1774352.6	23.75	6.25	682	4134
C1-08	1632213.1	1774350.5	23.75	8.75	710	4228
C1-09	1632191.6	1774365.6	26.25	1.25	456	3770
C1-10	1632199.4	1774363.2	26.25	3.75	671	4262

South Side of Corridor						
Feature code	Easting	Northing	Meters North	Meters West	AM-241 Counts	Cs-137 Counts
C1-11	1632207.1	1774360.7	26.25	6.25	675	4369
C1-12	1632215.6	1774358.3	26.25	8.75	682	4382
C1-13	1632194.0	1774373.4	28.75	1.25	560	4147
C1-14	1632201.8	1774370.9	28.75	3.75	659	4444
C1-15	1632209.6	1774368.5	28.75	6.25	649	4529
C1-16	1632218.0	1774366.1	28.75	8.75	677	4681
C2-01	1632217.8	1774340.4	21.25	11.25	739	4441
C2-02	1632225.6	1774338.3	21.25	13.75	830	4535
C2-03	1632233.4	1774335.9	21.25	16.25	848	4840
C2-04	1632241.8	1774333.4	21.25	18.75	855	5129
C2-05	1632220.3	1774348.0	23.75	11.25	767	4150
C2-06	1632228.0	1774345.6	23.75	13.75		4828
C2-07	1632235.8	1774343.1	23.75	16.25	816	5151
C2-08	1632244.2	1774340.7	23.75	18.75	870	4194
C2-09	1632222.7	1774356.0	26.25	11.25	673	4629
C2-10	1632230.5	1774353.6	26.25	13.75	719	5200
C2-11	1632238.2	1774351.2	26.25	16.25	884	5890
C2-12	1632246.7	1774348.7	26.25	18.75	890	4254
C2-13	1632225.1	1774363.7	28.75	11.25	639	3656
C2-14	1632232.9	1774361.3	28.75	13.75	537	5157
C2-15	1632240.7	1774358.8	28.75	16.25	765	5201
C2-16	1632249.1	1774356.4	28.75	18.75	793	5072
C3-01	1632249.2	1774331.2	21.25	21.25	880	5014
C3-02	1632257.0	1774328.8	21.25	23.75	936	5166
C3-03	1632264.8	1774326.3	21.25	26.25	883	5618
C3-04	1632272.5	1774323.9	21.25	28.75	935	5181
C3-05	1632251.5	1774339.0	23.75	21.25	852	4736
C3-06	1632259.9	1774337.4	23.75	23.75	863	5391
C3-07	1632267.6	1774335.0	23.75	26.25	954	5624
C3-08	1632275.4	1774332.5	23.75	28.75	872	5481
C3-09	1632254.0	1774347.1	26.25	21.25	848	5528
C3-10	1632262.3	1774344.7	26.25	23.75	792	5185
C3-11	1632270.1	1774342.3				
C3-12	1632277.8	1774339.8				
C3-13	1632256.4	1774355.1	28.75	21.25	793	5188
C3-14	1632264.7	1774352.7	28.75	23.75	1006	6586
C3-15	1632272.5	1774350.3				
C3-16	1632280.3	1774347.9				
C4-01	1632280.3	1774321.5	21.25	31.25	699	4650
C4-05	1632283.2	1774330.1	23.75	31.25	830	5292
C4-09	1632285.6	1774337.4	26.25	31.25		3598
C4-13	1632288.1	1774345.4	28.75	31.25		
A4-01	1632260.6	1774259.7	1.25	31.25	856	5201
A4-05	1632263.0	1774267.5	3.75	31.25	867	4963
A4-09	1632265.4	1774275.3	6.25	31.25	879	4798
A4-13	1632267.9	1774283.1	8.75	31.25	785	4763
B4-01	1632270.3	1774290.8	11.25	31.25	893	4561
B4-05	1632272.7	1774298.6	13.75	31.25	778	4708
B4-09	1632275.2	1774306.4	16.25	31.25	825	4663

Appendix B Table B2

North Side of Corridor						
Feature code	Northing	Easting	Meters North	Meters West	Am-241 Counts	Cs-137 Counts
D1-01			1.25	1.25		
D1-02			1.25	3.75		
D1-03	1774408.8	1632214.0	1.25	6.25	786	4792
D1-04	1774406.4	1632221.8	1.25	8.75	709	4610
D2-01	1774404.0	1632229.6	1.25	11.25	786	4754
D2-02	1774401.5	1632237.3	1.25	13.75	766	4965
D2-03	1774399.1	1632245.1	1.25	16.25	856	5834
D2-04	1774396.7	1632252.9	1.25	18.75	852	5641
D3-01	1774394.2	1632260.7	1.25	21.25	894	5808
D3-02	1774391.8	1632268.4	1.25	23.75	904	6380
D3-03	1774389.4	1632276.2	1.25	26.25		
D3-04	1774387.0	1632284.0	1.25	28.75		
D1-05			3.75	1.25		
D1-06			3.75	3.75		
D1-07	1774416.6	1632216.4	3.75	6.25	964	5306
D1-08	1774414.2	1632224.2	3.75	8.75	926	5317
D2-05	1774411.7	1632232.0	3.75	11.25	824	5263
D2-06	1774409.3	1632239.8	3.75	13.75	824	5407
D2-07	1774406.9	1632247.5	3.75	16.25	800	5735
D2-08	1774404.5	1632255.3	3.75	18.75	813	5383
D3-05	1774402.0	1632263.1	3.75	21.25	831	5582
D3-06	1774399.6	1632270.9	3.75	23.75	850	5903
D3-07	1774397.2	1632278.6	3.75	26.25		
D3-08	1774394.7	1632286.4	3.75	28.75		
D1-09			6.25	1.25		
D1-10			6.25	3.75		
D1-11	1774424.4	1632218.9	6.25	6.25	545	3614
D1-12	1774421.9	1632226.6	6.25	8.75	912	4997
D2-09	1774419.5	1632234.4	6.25	11.25	875	5274
D2-10	1774417.1	1632242.2	6.25	13.75	875	5707
D2-11	1774414.7	1632250.0	6.25	16.25	803	5340
D2-12	1774412.2	1632257.7	6.25	18.75	753	5052
D3-09	1774409.8	1632265.5	6.25	21.25	772	5099
D3-10	1774407.4	1632273.3	6.25	23.75	808	5382
D3-11	1774404.9	1632281.1	6.25	26.25		
D3-12	1774402.5	1632288.9	6.25	28.75		
D1-13			8.75	1.25		
D1-14			8.75	3.75		
D1-15	1774432.2	1632221.3	8.75	6.25	1020	5579
D1-16	1774429.7	1632229.1	8.75	8.75	924	5090
D2-13	1774427.3	1632236.9	8.75	11.25	873	5474
D2-14	1774424.9	1632244.6	8.75	13.75	820	5414
D2-15	1774422.4	1632252.4	8.75	16.25	643	4174
D2-16	1774420.0	1632260.2	8.75	18.75	783	4992
D3-13	1774417.6	1632268.0	8.75	21.25	788	4901
D3-14	1774415.1	1632275.7	8.75	23.75	812	5017
D3-15	1774412.7	1632283.5	8.75	26.25		
D3-16	1774410.3	1632291.3	8.75	28.75		
E1-01	1774444.4	1632207.4	11.25	1.25	812	4555
E1-02	1774441.9	1632215.2	11.25	3.75	1080	5446
E1-03	1774439.5	1632223.0	11.25	6.25	970	5211
E1-04	1774437.1	1632230.8	11.25	8.75	893	5106
E2-01	1774434.6	1632238.5	11.25	11.25	827	5278

North Side of Corridor						
Feature code	Northing	Easting	Meters North	Meters West	Am-241 Counts	Cs-137 Counts
E2-02IF	1774431.8	1632247.0	11.25	13.75	918	5654
E2-03	1774429.6	1632254.8	11.25	16.25	865	5277
E2-04	1774427.2	1632262.6	11.25	18.75	942	5561
E3-01	1774425.3	1632270.4	11.25	21.25	843	5144
E3-02	1774422.9	1632278.2	11.25	23.75	796	4892
E3-03	1774420.5	1632285.9	11.25	26.25		
E3-04	1774418.1	1632293.7	11.25	28.75		
E1-05	1774452.1	1632209.9	13.75	1.25	1023	6102
E1-06	1774449.7	1632217.6	13.75	3.75	1065	5499
E1-07	1774447.3	1632225.4	13.75	6.25	910	5301
E1-08	1774444.8	1632233.2	13.75	8.75	903	4968
E2-05	1774442.4	1632241.0	13.75	11.25	888	5381
E2-06	1774440.0	1632248.7	13.75	13.75	904	5459
E2-07	1774437.6	1632256.5	13.75	16.25		
E2-08	1774435.1	1632264.3	13.75	18.75		
E3-05	1774432.7	1632272.1	13.75	21.25		
E3-06	1774430.3	1632279.8	13.75	23.75		
E3-07	1774427.8	1632287.6	13.75	26.25		
E3-08	1774425.4	1632295.4	13.75	28.75		
E4-05	1774421.3	1632305.7	13.75	31.25	757	4463
E1-09	1774459.9	1632212.3	16.25	1.25	1373	5843
E1-10	1774457.5	1632220.1	16.25	3.75	1045	5542
E1-11	1774455.1	1632227.8	16.25	6.25	983	5313
E1-12	1774452.6	1632235.6	16.25	8.75	922	5338
E2-09	1774450.2	1632243.4	16.25	11.25	919	5639
E2-10	1774447.2	1632251.8	16.25	13.75	832	5533
E2-11	1774444.8	1632259.6	16.25	16.25		
E2-12	1774442.4	1632267.4	16.25	18.75		
E3-09	1774439.9	1632275.1	16.25	21.25		
E3-10	1774437.5	1632282.9	16.25	23.75		
E3-11	1774435.1	1632290.7	16.25	26.25		
E3-12	1774432.7	1632298.5	16.25	28.75		
E4-09	1774429.1	1632308.1	16.25	31.25	857	5115
E1-13	1774467.7	1632214.7	18.75	1.25	1083	5661
E1-14	1774465.3	1632222.5	18.75	3.75	948	5491
E1-15	1774462.8	1632230.3	18.75	6.25	907	5204
E1-16	1774460.4	1632238.0	18.75	8.75	909	5212
E2-13	1774458.0	1632245.8	18.75	11.25	881	5330
E2-14	1774455.5	1632253.6	18.75	13.75	800	4842
E2-15	1774453.1	1632261.4	18.75	16.25		
E2-16	1774450.7	1632269.1	18.75	18.75		
E3-13	1774448.2	1632276.9	18.75	21.25		
E3-14	1774445.8	1632284.7	18.75	23.75		
E3-15	1774443.4	1632292.5	18.75	26.25		
E3-16	1774440.9	1632300.2	18.75	28.75		
E4-13	1774436.8	1632310.6	18.75	31.25	951	5068
F1-01	1774475.1	1632218.2	21.25	1.25	775	
F1-02	1774472.7	1632226.0	21.25	3.75	725	4459
F1-03	1774470.2	1632233.7	21.25	6.25	751	4320
F1-04	1774468.0	1632241.7	21.25	8.75	942	5331
F2-01	1774465.4	1632249.1	21.25	11.25	901	5232
F2-02	1774463.0	1632256.8	21.25	13.75	872	
F2-03	1774460.6	1632264.6	21.25	16.25		5173

North Side of Corridor						
Feature code	Northing	Easting	Meters North	Meters West	Am-241 Counts	Cs-137 Counts
F2-04	1774458.1	1632272.4	21.25	18.75		
F3-01	1774455.7	1632280.2	21.25	21.25		
F3-02	1774453.3	1632287.9	21.25	23.75		
F3-03	1774450.8	1632295.7	21.25	26.25		
F3-04	1774448.4	1632303.5	21.25	28.75		
F4-01	1774444.7	1632312.3	21.25	31.25	796	4837
F1-05	1774483.0	1632220.9	23.75	1.25	677	
F1-06	1774480.6	1632228.6	23.75	3.75	669	4184
F1-07	1774478.2	1632236.4	23.75	6.25	752	4205
F1-08	1774475.7	1632244.2	23.75	8.75	914	5473
F2-05	1774473.3	1632252.0	23.75	11.25	919	5439
F2-06	1774470.9	1632259.7	23.75	13.75	873	5261
F2-07	1774468.5	1632267.5	23.75	16.25		
F2-08	1774466.0	1632275.3	23.75	18.75		
F3-05	1774463.6	1632283.1	23.75	21.25		
F3-06	1774461.2	1632290.8	23.75	23.75		
F3-07	1774458.7	1632298.6	23.75	26.25		
F3-08	1774456.3	1632306.4	23.75	28.75		
F4-05	1774453.9	1632314.2	23.75	31.25	925	4771
F1-09	1774490.7	1632223.3	26.25	1.25	839	4618
F1-10	1774488.2	1632231.1	26.25	3.75	871	4484
F1-11	1774485.8	1632238.9	26.25	6.25	787	4340
F1-12	1774483.6	1632246.7	26.25	8.75	921	5267
F2-09	1774481.1	1632254.5	26.25	11.25	893	5325
F2-10	1774478.7	1632262.2	26.25	13.75	878	5330
F2-11	1774476.3	1632270.0	26.25	16.25		
F2-12	1774473.8	1632277.8	26.25	18.75		
F3-09	1774471.4	1632285.6	26.25	21.25		
F3-10	1774469.0	1632293.3	26.25	23.75		
F3-11	1774466.6	1632301.1	26.25	26.25		
F3-12	1774464.1	1632308.9	26.25	28.75		
F4-09	1774460.6	1632316.8	26.25	31.25	792	4625
F1-13	1774498.7	1632225.6	28.75	1.25	802	4702
F1-14	1774496.3	1632233.3	28.75	3.75	829	4459
F1-15	1774493.7	1632241.2	28.75	6.25	745	4668
F1-16	1774491.5	1632249.2	28.75	8.75	883	4949
F2-13	1774489.0	1632256.9	28.75	11.25	843	4895
F2-14	1774486.6	1632264.7	28.75	13.75	932	5265
F2-15	1774484.2	1632272.5	28.75	16.25	892	4821
F2-16	1774481.7	1632280.3	28.75	18.75	892	5119
F3-13	1774479.3	1632288.0	28.75	21.25	918	5113
F3-14	1774476.9	1632295.8	28.75	23.75	818	4787
F3-15	1774474.4	1632303.6	28.75	26.25	881	4953
F3-16	1774472.0	1632311.4	28.75	28.75	858	4625
F4-13	1774468.7	1632319.8	28.75	31.25	839	4592

TA21-rev1.wb3:NorthAppendix

Appendix B Building 150 Storage Area Surveys

ESH-1 SMEAR SURVEY FORM

SAMPLE DESCRIPTION		SAMPLE TRACKING NUMBER																
Sample Date/Time: <u>8/6/99</u>	No. Of Samples: <u>50</u>	99014021																
TA: <u>21</u>	Bldg: <u>150</u>																	
RCT: <u>N. BAILEY</u>	Z Number: <u>116873</u>																	
RCT Signature: <u><i>N. Bailey</i></u>	MS: <u>C330</u>																	
Phone: <u>7-3858</u>	Fax: <u>7-9710</u>																	
PURPOSE OF SURVEY																		
<input checked="" type="checkbox"/> Routine <input type="checkbox"/> Pre-Job <input type="checkbox"/> Post-Job <input type="checkbox"/> Hot-Job <input type="checkbox"/> Item Release <input type="checkbox"/> Offsite Shipment <input type="checkbox"/> Onsite Shipment <input checked="" type="checkbox"/> Non-Routine / Other: <u>WEEKLY RMI</u> <u>Rooms 603E 603A</u>																		
ADDITIONAL INFORMATION		INSTRUMENTATION																
Occurrence No.: _____		<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>TYPE</th> <th>HSE No.</th> <th>CAL Due</th> <th>% EFF</th> <th>BKG</th> </tr> </thead> <tbody> <tr> <td>Survey Unit</td> <td>844243</td> <td>11/05/1999</td> <td>See attached B. Hold printout</td> <td></td> </tr> <tr> <td>Survey Unit</td> <td>844243</td> <td>11/05/1999</td> <td>See attached B. Hold printout</td> <td></td> </tr> </tbody> </table>		TYPE	HSE No.	CAL Due	% EFF	BKG	Survey Unit	844243	11/05/1999	See attached B. Hold printout		Survey Unit	844243	11/05/1999	See attached B. Hold printout	
TYPE	HSE No.	CAL Due	% EFF	BKG														
Survey Unit	844243	11/05/1999	See attached B. Hold printout															
Survey Unit	844243	11/05/1999	See attached B. Hold printout															
Incident No.: _____		ESH-1 REVIEW BY																
RWP No.: _____		<u><i>[Signature]</i></u>																

Smear No.	Location	ALPHA	BETA	Smear No.	Location	ALPHA	BETA
1	FLOOR	NDA	NDA	16	FLOOR	NDA	NDA
2	FLOOR	NDA	NDA	17	FLOOR	NDA	NDA
3	FLOOR	NDA	NDA	18	FLOOR	NDA	NDA
4	FLOOR	NDA	NDA	19	FLOOR	NDA	NDA
5	FLOOR	NDA	NDA	20	FLOOR	NDA	NDA
6	FLOOR	NDA	NDA	21	HOOD	NDA	NDA
7	FLOOR	NDA	NDA	22	BENCH TOP	NDA	NDA
8	FLOOR	NDA	NDA	23	BENCH TOP	NDA	NDA
9	FLOOR	NDA	NDA	24	BENCH TOP	NDA	NDA
10	FLOOR	NDA	NDA	25	HOOD	NDA	NDA
11	FLOOR	NDA	NDA	26	HOOD	NDA	NDA
12	FLOOR	NDA	NDA	27	BENCH TOP	NDA	NDA
13	FLOOR	NDA	NDA	28	BENCH TOP	NDA	NDA
14	FLOOR	NDA	NDA	29	BENCH TOP	NDA	NDA
15	FLOOR	NDA	NDA	30	BENCH TOP	NDA	NDA

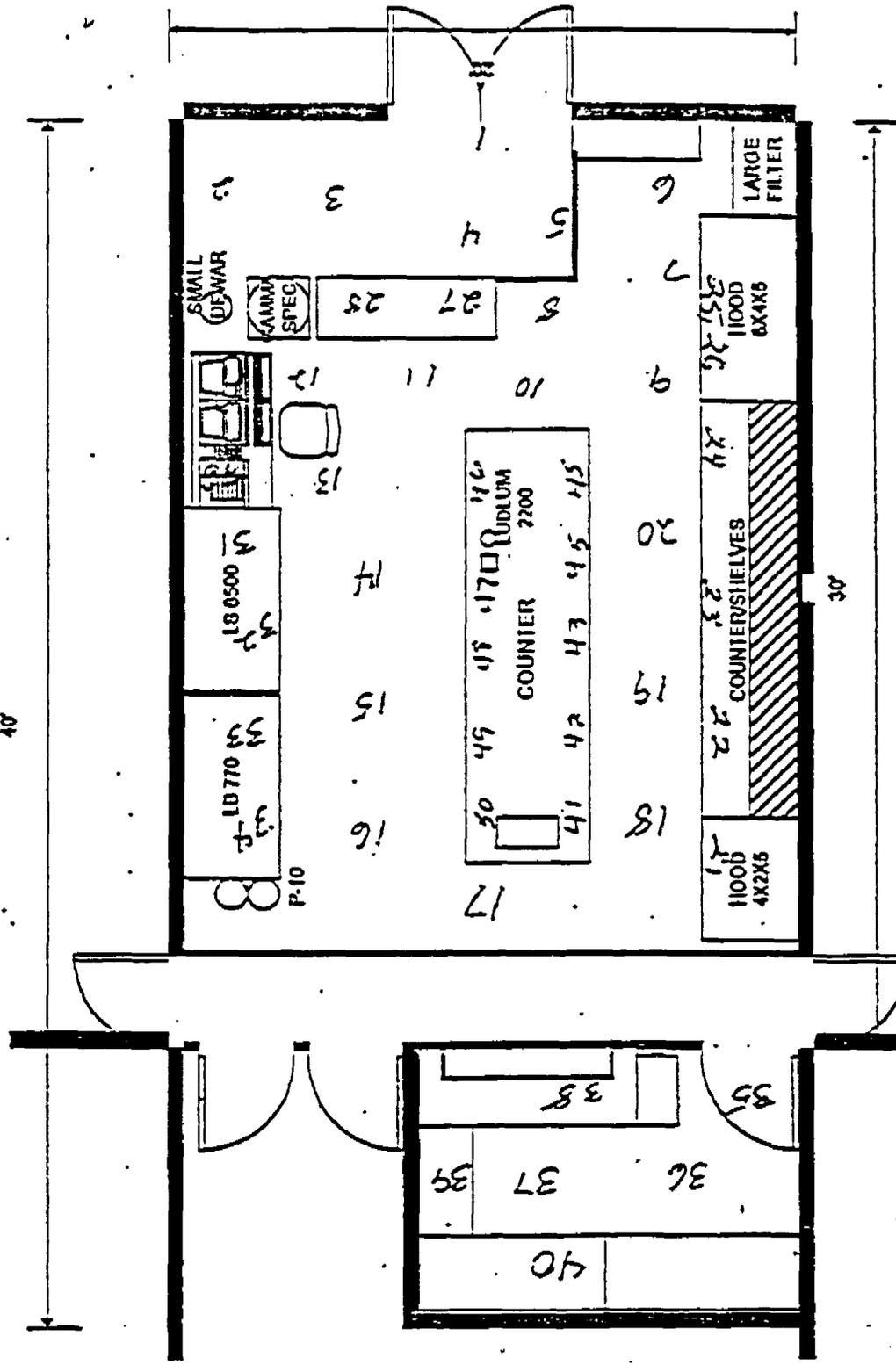
ESH-1 SMEAR SURVEY FORM

Smear No.	Location	ALPHA*	BETA*	Smear No.	Location	ALPHA*	BETA*
31	BENCH TOP	NDA	NDA	56	0	n/a	n/a
32	BENCH TOP	NDA	NDA	57	0	n/a	n/a
33	BENCH TOP	NDA	NDA	58	0	n/a	n/a
34	BENCH TOP	NDA	NDA	59	0	n/a	n/a
35	FLOOR	NDA	NDA	60	0	n/a	n/a
36	FLOOR	NDA	NDA	61	0	n/a	n/a
37	FLOOR	NDA	NDA	62	0	n/a	n/a
38	BENCH TOP	NDA	NDA	63	0	n/a	n/a
39	BENCH TOP	NDA	NDA	64	0	n/a	n/a
40	BENCH TOP	NDA	NDA	65	0	n/a	n/a
41	BENCH TOP	NDA	NDA	66	0	n/a	n/a
42	BENCH TOP	NDA	NDA	67	0	n/a	n/a
43	BENCH TOP	NDA	NDA	68	0	n/a	n/a
44	BENCH TOP	NDA	NDA	69	0	n/a	n/a
45	BENCH TOP	NDA	NDA	70	0	n/a	n/a
46	BENCH TOP	NDA	NDA	71	0	n/a	n/a
47	BENCH TOP	NDA	NDA	72	0	n/a	n/a
48	BENCH TOP	NDA	NDA	73	0	n/a	n/a
49	BENCH TOP	NDA	NDA	74	0	n/a	n/a
50	BENCH TOP	NDA	NDA	75	0	n/a	n/a
51	0	n/a	n/a	76	0	n/a	n/a
52	0	n/a	n/a	77	0	n/a	n/a
53	0	n/a	n/a	78	0	n/a	n/a
54	0	n/a	n/a	79	0	n/a	n/a
55	0	n/a	n/a	80	0	n/a	n/a

*cpm/100 cm²

TA-21 Radiological Screening Facility

Weekly Routine Survey



RCI: BAILEY
 Date: 6 Aug 99

HPAL SUBMITTAL FORM

SAMPLE DESCRIPTION

Sample Date/Time: 6 Aug 99 No. Of Samples: 50
 TA: 21 Bldg: 13 rm 603 and 603A
 RCT: N. BAILEY Z Number: 116873
 RCT Signature: Nathan Bailey MS: C334
 Phone/Fax: 7-2659 / 7-9710

SAMPLE TRACKING NUMBER

ESH-1 SAMPLE TRACKING



SAMPLE PRIORITY STATUS

TYPE OF SAMPLE SUBMITTED

- Smear LAS Oils Liquid Soil Solid
 CAM Air Sample Nasal Swipe Wound
 Stack
 Special/Type: _____

REMARKS

Weekly RMT

ANALYSIS REQUESTED

- Gross (check the appropriate box) Alpha Beta Gamma
 Gamma Spec Alpha Spec Liquid Scint
 Nuclide: _____

Relinquished by:	Date	Time	Received by	Date	Time
Printed Name					
Signature					
Number					
Printed Name					
Signature					
Number					
Printed Name					
Signature					
Number					
Printed Name					
Signature					
Number					
Printed Name					
Signature					
Number					

08-09-99
10:06

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: *MG*
LB770 Number 1 User File: ALPHA/BETA Sample Data File: MG09E10
Sample Set: TA-21/150 99014021 Mode: Alpha/Beta
V-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha					Beta				
	Low	High	Low	High	Low	High				
1	0.000	10.2	0.000	10.8	0.000	10.8				
2	10.2	20.0	10.8	200.0	10.8	200.0				
3	20.0		200.0		200.0					

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 08-09-99 Time 10:06:22
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1172

Det#	Spl#	Spl. Name	DPM	ALPHA			MDA	BETA			MDA
				%Error	Cat			DPM	%Error	Cat	
1	1	Smear	0.000	0.000	1	9.45	1.41	> 100	1	9.67	
2	2	Smear	0.000	0.000	1	5.04	0.000	0.000	1	9.92	
3	3	Smear	0.781	> 100	1	6.48	0.000	0.000	1	10.5	
4	4	Smear	0.000	0.000	1	4.46	0.000	0.000	1	11.7	
5	5	Smear	1.08	> 100	1	5.87	0.632	> 100	1	9.91	
6	6	Smear	0.613	> 100	1	6.43	4.31	> 100	1	10.2	
7	7	Smear	0.000	0.000	1	5.41	0.900	> 100	1	9.00	
8	8	Smear	0.000	0.000	1	8.69	2.10	> 100	1	10.2	
9	9	Smear	1.26	> 100	1	4.76	0.000	0.000	1	10.4	
10	10	Smear	1.06	> 100	1	5.76	2.64	> 100	1	9.98	

MDA = Minimum Detectable Activity [DPM]

08-09-99
10:09

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 2

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MLH
LB770 Number 1 User File: ALPHA/BETA Sample Data File: MG09H11
Sample Set: TA-21/150 99014021 Mode: Alpha/Beta
HV-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha		Beta	
	Low	High	Low	High
1	0.000	10.2	0.000	10.8
2	10.2	20.0	10.8	200.0
3	20.0		200.0	

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 08-09-99 Time 10:09:58
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1219

Det#	Spl#	Spl. Name	DPM	ALPHA			DPM	BETA		
				%Error	Cat	MDA		%Error	Cat	MDA
1	11	Smear	0.000	0.000	1	9.45	2.24	> 100	1	9.67
2	12	Smear	0.000	0.000	1	5.04	0.000	0.000	1	9.92
3	13	Smear	0.000	0.000	1	6.48	1.48	> 100	1	10.5
4	14	Smear	0.000	0.000	1	4.46	0.000	0.000	1	11.7
5	15	Smear	0.000	0.000	1	5.87	0.000	0.000	1	9.90
6	16	Smear	0.613	> 100	1	6.43	0.000	0.000	1	10.2
7	17	Smear	3.48	> 100	1	5.41	0.000	0.000	1	9.02
8	18	Smear	0.000	0.000	1	8.69	0.246	> 100	1	10.2
9	19	Smear	0.000	0.000	1	4.76	0.007	> 100	1	10.4
10	20	Smear	0.000	0.000	1	5.76	0.000	0.000	1	9.97

MDA = Minimum Detectable Activity [DPM]

08-09-99
10:13

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MG
LB770 Number 1 User File: ALPHA/BETA Sample Data File: MG09H12
Sample Set: TA-21/150 99014021 Mode: Alpha/Beta
V-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha		Beta	
	Low	High	Low	High
1	0.000	10.2	0.000	10.8
2	10.2	20.0	10.8	200.0
3	20.0		200.0	

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 08-09-99 Time 10:13:38
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1197

Det#	Spl#	Spl. Name	ALPHA				BETA			
			DPM	%Error	Cat	MDA	DPM	%Error	Cat	MDA
1	21	Smear	1.24	> 100	1	9.45	0.000	0.000	1	9.68
2	22	Smear	0.000	0.000	1	5.04	0.000	0.000	1	9.92
3	23	Smear	0.000	0.000	1	6.48	0.000	0.000	1	10.5
4	24	Smear	0.000	0.000	1	4.46	0.000	0.000	1	11.7
5	25	Smear	0.000	0.000	1	5.87	5.50	> 100	1	9.90
6	26	Smear	0.000	0.000	1	6.43	0.000	0.000	1	10.2
7	27	Smear	2.24	> 100	1	5.41	3.18	> 100	1	9.01
8	28	Smear	0.000	0.000	1	8.69	0.000	0.000	1	10.2
9	29	Smear	0.000	0.000	1	4.76	0.000	0.000	1	10.4
10	30	Smear	0.000	0.000	1	5.76	0.000	0.000	1	9.97

MDA = Minimum Detectable Activity [DPM]

08-09-99
10:17

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MK
LB770 Number 1 User File: ALPHA/BETA Sample Data File: MG09H13
Sample Set: TA-21/150 99014021 Mode: Alpha/Beta
HV-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha		Beta	
	Low	High	Low	High
1	0.000	10.2	0.000	10.8
2	10.2	20.0	10.8	200.0
3	20.0		200.0	

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 08-09-99 Time 10:17:16
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1170

Det#	Spl#	Spl. Name	DPM	ALPHA			MDA	DPM	BETA			MDA
				%Error	Cat				%Error	Cat		
1	31	Smear	0.000	0.000	1	9.45	1.31	> 100	1	9.67		
2	32	Smear	3.74	> 100	1	5.04	0.000	0.000	1	9.94		
3	33	Smear	0.000	0.000	1	6.48	1.48	> 100	1	10.5		
4	34	Smear	0.000	0.000	1	4.46	0.000	0.000	1	11.7		
5	35	Smear	0.000	0.000	1	5.87	0.737	> 100	1	9.90		
6	36	Smear	0.000	0.000	1	6.43	0.000	0.000	1	10.2		
7	37	Smear	0.993	> 100	1	5.41	0.000	0.000	1	9.00		
8	38	Smear	0.000	0.000	1	8.69	2.85	> 100	1	10.2		
9	39	Smear	1.26	> 100	1	4.76	0.000	0.000	1	10.4		
10	40	Smear	1.06	> 100	1	5.76	2.64	> 100	1	9.98		

MDA = Minimum Detectable Activity [DPM]

Comment: LB770 PN:844243 CAT DUE:11/5/99 Reviewed by: *Mc*
 LB770 Number 1 User File: ALPHA/BETA
 Sample Data File: MG09H14
 Sample Set: WA-21/150 99014021
 V-Meas. Counter [V] = 1486
 Statistical Error Definition: 2 standard deviation(s)
 HV-guard Counter [V] = 1700

Category List [DPM]:

Category	Low	High
1	0.000	10.2
2	10.2	20.0
3	20.0	200.0

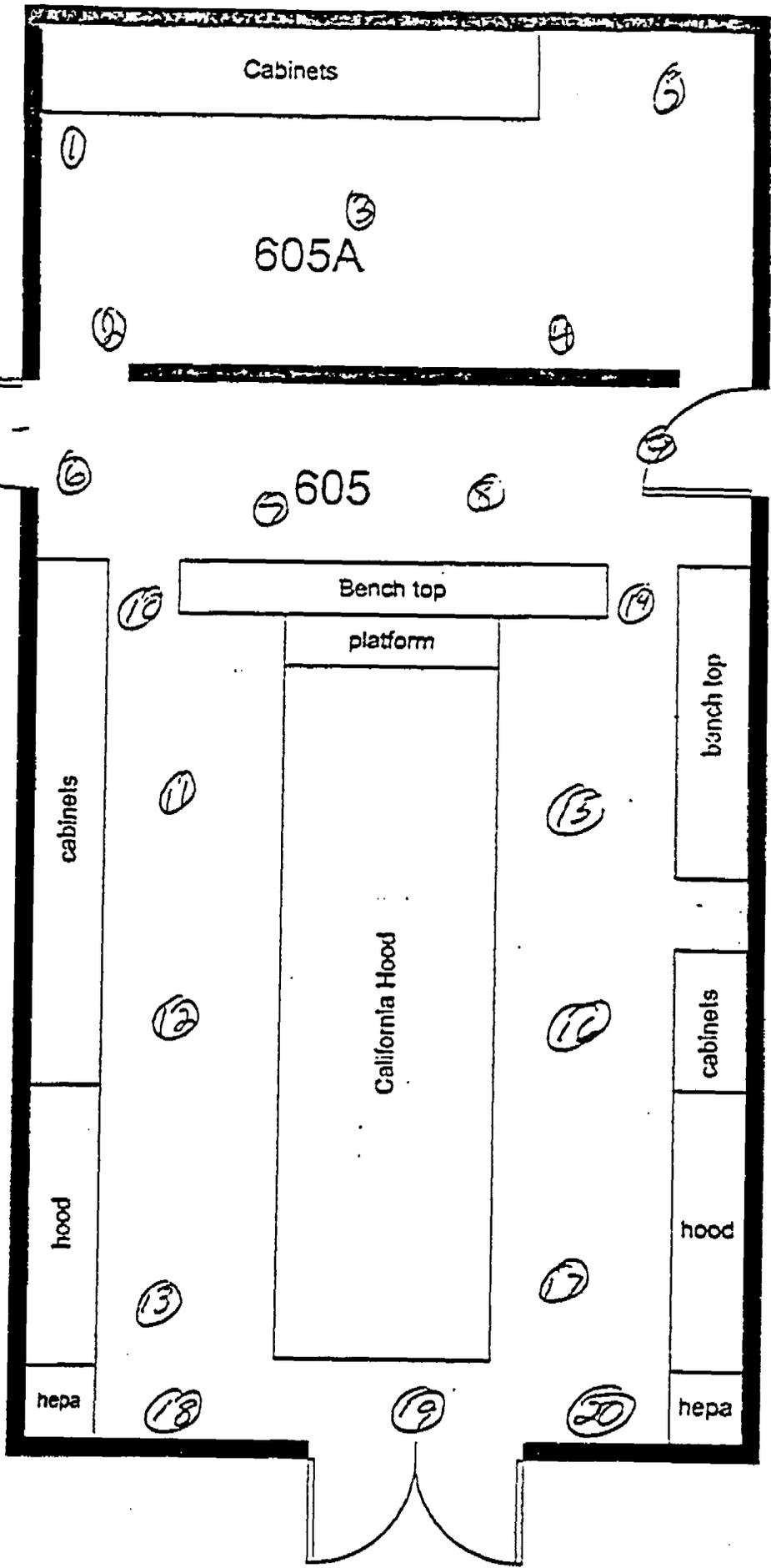
Alpha	Background [cpm]	Efficiency	T(1/2) [days]	Manufacture Date	Time	Beta	Background [cpm]	Efficiency	T(1/2) [days]	Manufacture Date	Time	Sample Results	
												Normalisation	Spillover
1	0.667	0.033	0.133	0.017	12:00	60.0	2.85	0.438	104.10	12-21-95	12:00	60.0	0.126
2	0.033	0.258	0.256	0.268	12:00	60.0	2.90	0.433	104.10	12-21-95	12:00	60.0	0.134
3	0.133	0.256	0.268	0.267	12:00	60.0	2.70	0.438	104.10	12-21-95	12:00	60.0	0.126
4	0.017	0.057	0.267	0.271	12:00	60.0	2.32	0.438	104.10	12-21-95	12:00	60.0	0.132
5	0.057	0.167	0.271	0.268	12:00	60.0	2.32	0.435	104.10	12-21-95	12:00	60.0	0.132
6	0.167	0.067	0.268	0.254	12:00	60.0	2.92	0.435	104.10	12-21-95	12:00	60.0	0.138
7	0.067	0.417	0.254	0.252	12:00	60.0	3.00	0.416	104.10	12-21-95	12:00	60.0	0.144
8	0.417	0.017	0.252	0.252	12:00	60.0	2.43	0.412	104.10	12-21-95	12:00	60.0	0.134
9	0.017	0.067	0.252	0.252	12:00	60.0	3.00	0.412	104.10	12-21-95	12:00	60.0	0.134
10	0.067	0.017	0.252	0.252	12:00	60.0	2.43	0.412	104.10	12-21-95	12:00	60.0	0.134

Sample Results

Measurement Date 08-09-99 Time 10:20:59
 Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
 Guard [cpm] 1224

Def#	Spl#	Spl. Name	DPM	Error	Cat	MDA	DPM	Error	Cat	MDA	BETA	DPM	Error	Cat	MDA
1	41	Smear	0.000	0.000	1	9.45	0.000	0.000	1	9.45	0.000	0.000	0.000	1	9.67
2	42	Smear	0.000	0.000	1	5.04	0.000	0.000	1	5.04	0.000	0.000	0.000	1	9.92
3	43	Smear	0.781	> 100	1	6.48	0.000	0.000	1	6.48	0.000	0.000	0.000	1	10.5
4	44	Smear	1.18	> 100	1	4.46	0.000	0.000	1	4.46	0.000	0.000	0.000	1	11.7
5	45	Smear	0.000	0.000	1	5.87	0.000	0.000	1	5.87	0.000	0.000	0.000	1	9.90
6	46	Smear	0.000	0.000	1	6.43	0.000	0.000	1	6.43	0.000	0.000	0.000	1	10.2
7	47	Smear	0.993	> 100	1	5.41	0.000	0.000	1	5.41	0.000	0.000	0.000	1	9.00
8	48	Smear	0.000	0.000	1	8.69	0.000	0.000	1	8.69	0.000	0.000	0.000	1	10.2
9	49	Smear	0.000	0.000	1	4.76	0.000	0.000	1	4.76	0.000	0.000	0.000	1	10.4
10	50	Smear	0.000	0.000	1	5.76	0.000	0.000	1	5.76	0.000	0.000	0.000	1	9.97

MDA = Minimum Detectable Activity [DPM]



Routine Survey Results
 TA-21, Bldg 150
 Rooms 605 and 605A
 Date: 5/13/99
 RCT: *Cathy Crady*

05-14-99
9:12

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Instrument: LB770 PN:844243 CAL DJE:11/5/99 Reviewed by: ME
770 Number 1 User File: ALPHA/BETA Sample Data File: MG14E15
Sample Set: TA-21-150 99012912 Mode: Alpha/Beta
HV-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha		Beta	
	Low	High	Low	High
1	0.000	10.2	0.000	10.8
2	10.2	20.0	10.8	200.0
3	20.0		200.0	

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 05-14-99 Time 9:12:13
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1258

Det#	Spl#	Spl. Name	DPM	ALPHA			DPM	BETA		
				%Error	Cat	MDA		%Error	Cat	MDA
1	1	Smear	6.20	> 100	1	9.45	4.81	> 100	1	9.71
2	2	Smear	3.74	> 100	1	5.04	2.46	> 100	1	9.94
3	3	Smear	0.000	0.000	1	6.48	0.000	0.000	1	10.5
4	4	Smear	1.18	> 100	1	4.46	0.000	0.000	1	11.7
5	5	Smear	1.08	> 100	1	5.87	3.02	> 100	1	9.91
6	6	Smear	0.000	0.000	1	6.43	0.000	0.000	1	10.2
7	7	Smear	0.993	> 100	1	5.41	4.11	> 100	1	9.00
8	8	Smear	0.000	0.000	1	8.69	3.70	> 100	1	10.2
9	9	Smear	1.26	> 100	1	4.76	0.000	0.000	1	10.4
10	10	Smear	2.38	> 100	1	5.76	1.63	> 100	1	9.99

MDA = Minimum Detectable Activity [DPM]

05-14-99
9:28

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Instrument: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MLC
770 Number 1 User File: ALPHA/BETA Sample Data File: MG14E16
Sample Set: TA-21-150 99012912 Mode: Alpha/Beta
HV-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha				Beta			
	Low	High	Low	High				
1	0.000	10.2	0.000	10.8				
2	10.2	20.0	10.8	200.0				
3	20.0		200.0					

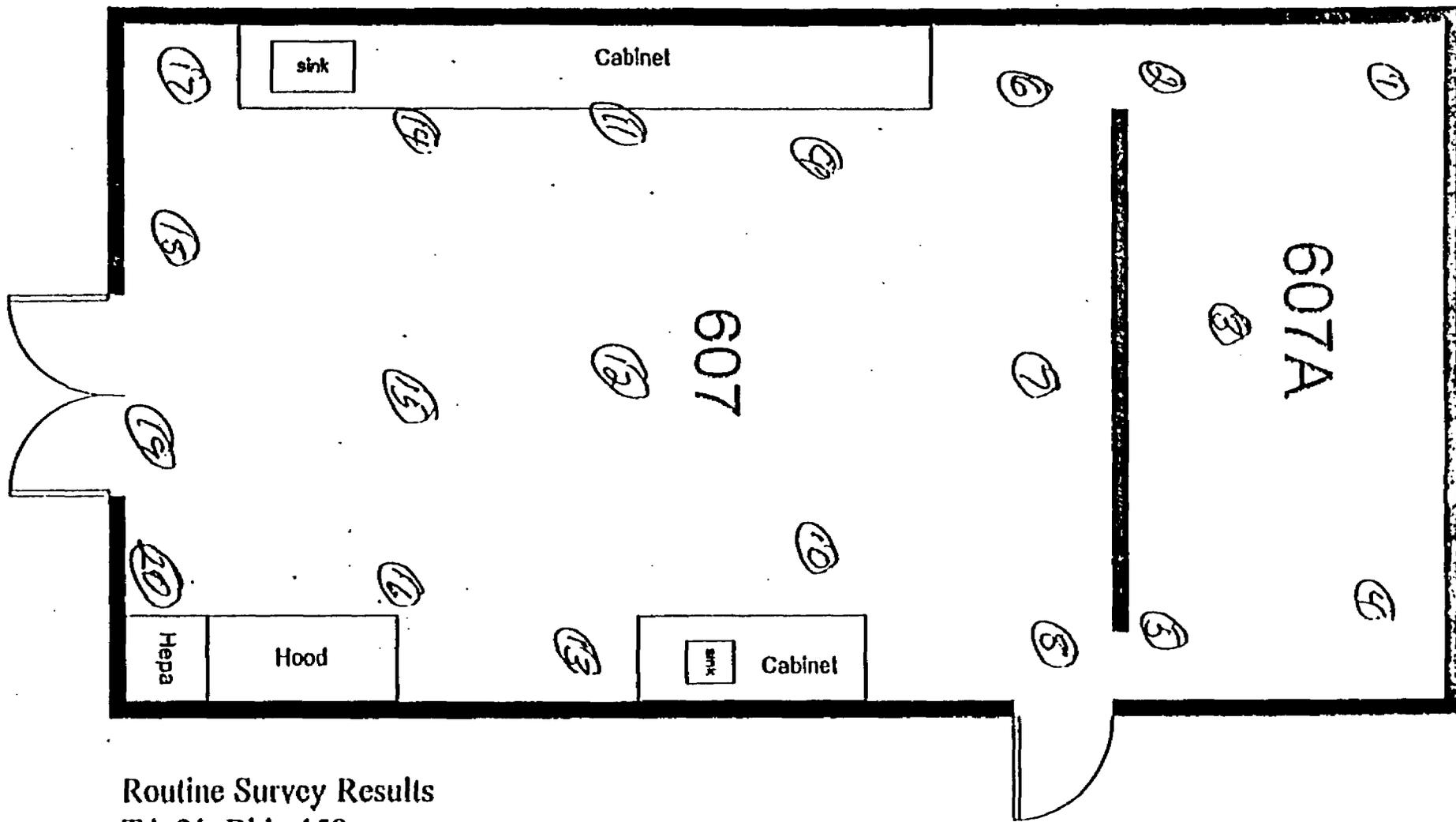
	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 05-14-99 Time 9:28:12
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1235

Det#	Spl#	Spl. Name	ALPHA				BETA			
			DPM	%Error	Cat	MDA	DPM	%Error	Cat	MDA
1	11	Smear	0.000	0.000	1	9.45	2.95	> 100	1	9.67
2	12	Smear	0.000	0.000	1	5.04	1.10	> 100	1	9.92
3	13	Smear	0.000	0.000	1	6.48	4.81	> 100	1	10.5
4	14	Smear	1.18	> 100	1	4.46	5.81	> 100	1	11.7
5	15	Smear	0.000	0.000	1	5.87	0.737	> 100	1	9.90
6	16	Smear	0.613	> 100	1	6.43	5.11	> 100	1	10.2
7	17	Smear	0.000	0.000	1	5.41	0.000	0.000	1	9.00
8	18	Smear	0.000	0.000	1	8.69	0.000	0.000	1	10.2
9	19	Smear	0.000	0.000	1	4.76	0.000	0.000	1	10.4
10	20	Smear	1.06	> 100	1	5.76	1.75	> 100	1	9.98

MDA = Minimum Detectable Activity [DPM]



Routine Survey Results
 TA-21, Bldg 150
 Rooms 607,607A
 Date: 5/13/99
 RCT: BAILEY

05-13-99
14:58

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Page: 1

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MB
770 Number 1 User File: ALPHA/BETA Sample Data File: MG13E31
Sample Set: TA-21-150 99013057 Mode: Alpha/Beta
V-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha					Beta				
	Low	High	Low	High	Low	High	Low	High	Low	High
1	0.000	10.2	0.000	10.8	0.000	10.8	200.0			
2	10.2	20.0	10.8	200.0						
3	20.0		200.0							

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpm]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.247	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8306178	8306178	8306178	8306178	8306178	8306178	8306178	8306178	8306178	8306178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpm]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 05-13-99 Time 14:58:44
Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
Guard [cpm] 1251

Det#	Spl#	Spl. Name	DPM	ALPHA			BETA			MDA
				%Error	Cat	MDA	DPM	%Error	Cat	
1	1	Smear	4.96	> 100	1	9.45	3.26	> 100	1	9.70
2	2	Smear	1.16	> 100	1	5.04	0.000	0.000	1	9.93
3	3	Smear	0.000	0.000	1	6.48	0.000	0.000	1	10.5
4	4	Smear	0.000	0.000	1	4.46	0.000	0.000	1	11.7
5	5	Smear	0.000	0.000	1	5.87	3.12	> 100	1	9.90
6	6	Smear	0.613	> 100	1	6.43	0.000	0.000	1	10.2
7	7	Smear	0.000	0.000	1	5.41	2.56	> 100	1	9.00
8	8	Smear	0.000	0.000	1	8.69	8.13	91.2	1	10.2
9	9	Smear	1.26	> 100	1	4.76	0.000	0.000	1	10.4
10	10	Smear	0.000	0.000	1	5.76	0.989	> 100	1	9.97

MDA = Minimum Detectable Activity [DPM]

05-13-99
15:02

Berthold LB770 Control System: LB770 1
S A M P L E M E A S U R E M E N T

Comment: LB770 PN:844243 CAL DUE:11/5/99 Reviewed by: MG
 770 Number 1 User File: ALPHA/BETA Sample Data File: MG13E32
 Sample Set: TA-21-150 99013057 Mode: Alpha/Beta
 HV-Meas.Counter [V] = 1486 HV-Guard Counter [V] = 1700
 Statistical Error Definition: 2 standard deviation(s)

Category List [DPM]:

Category	Alpha		Beta	
	Low	High	Low	High
1	0.000	10.2	0.000	10.8
2	10.2	20.0	10.8	200.0
3	20.0		200.0	

	1	2	3	4	5	6	7	8	9	10
Alpha										
Background [cpa]	0.667	0.033	0.133	0.017	0.067	0.167	0.067	0.417	0.017	0.067
Efficiency	0.269	0.258	0.256	0.268	0.267	0.271	0.268	0.254	0.252	0.252
T(1/2) [days]	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178	8806178
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Beta										
Background [cpa]	2.85	2.90	3.43	4.62	2.70	3.25	2.32	2.92	3.00	2.63
Efficiency	0.438	0.430	0.433	0.438	0.420	0.438	0.435	0.419	0.416	0.412
T(1/2) [days]	10410	10410	10410	10410	--	10410	10410	10410	10410	10410
Manufacture Date	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95	12-21-95
Time	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
Spillover	0.126	0.128	0.134	0.126	0.132	0.140	0.138	0.132	0.144	0.134
Normalization	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0

Sample Results

Measurement Date 05-13-99 Time 15:02:36
 Measuring Time [min:sec] Elapsed 0003:00 Preset 0003:00 Cycle 1/1
 Guard [cpm] 1235

Det#	Spl#	Spl. Name	DPM	ALPHA			DPM	BETA		
				%Error	Cat	MDA		%Error	Cat	MDA
1	11	Smear	0.000	0.000	1	9.45	2.13	> 100	1	9.67
2	12	Smear	0.000	0.000	1	5.04	0.000	0.000	1	9.92
3	13	Smear	0.781	> 100	1	6.48	0.000	0.000	1	10.5
4	14	Smear	3.66	> 100	1	4.46	0.642	> 100	1	11.8
5	15	Smear	0.000	0.000	1	5.87	3.91	> 100	1	9.90
6	16	Smear	0.613	> 100	1	6.43	0.000	0.000	1	10.2
7	17	Smear	0.000	0.000	1	5.41	0.000	0.000	1	9.00
8	18	Smear	2.30	> 100	1	8.69	2.61	> 100	1	10.2
9	19	Smear	0.000	0.000	1	4.76	0.000	0.000	1	10.4
10	20	Smear	0.000	0.000	1	5.76	2.74	> 100	1	9.97

MDA = Minimum Detectable Activity [DPM]

HPAL SUBMITTAL FORM

SAMPLE DESCRIPTION

Sample Date/Time: 5/11/99 No. Of Samples: 20
 IA: 21 Bldg: 150
 RCT: Monte Bailey Z Number: _____
 RCT Signature: _____ MS: C-329
 Phone/Fax: 7-3659

TYPE OF SAMPLE SUBMITTED

- Smear LAS Oils Liquid Soil Solid
 CAM Air Sample Nasal Swipe Wound
 Stack
 Special/Type: _____

ANALYSIS REQUESTED

- Gross (check the appropriate box) Alpha Beta Gamma
 Gamma Spec Alpha Spec Liquid Scint
 Nuclide: _____

SAMPLE TRACKING NUMBER

ESH-1 SAMPLE TRACKING



SAMPLE PRIORITY STATUS

05-13-99A11:07 1063

REMARKS

Room 607, 607A

Relinquished by	Date	Time	Received by	Date	Time
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					
Printed Name					
Signature					
Z Number					

Appendix C

Septic Tank Location Drawing

