GENERAL ATOMICS

November 30, 2005
CAL- 3940

Dr. Ron Rogus (In Duplicate)
State of California
Department of Health Services
Radiologic Health Branch Mail Stop 7610
1500 Capitol
Sacramento, CA 95814-0208

Subject: Radioactive Materials License No. 0145-37; **Submittal of: 1) GA's Responses to Comments Regarding the Final Radiological Survey Report for the Phase IV area of GA's Building 30/31 Complex, and 2) *Revised* Final Survey Report for Building 30/31- Phase IV.**

References: 1. Letter dated September 6, 2001 from Dr. Keith E. Asmussen to Dr. Ronald Rogus and Ms. Mary Adams, (CAL/696-3404) "Request to Release Certain Portions of General Atomics' Facility to Unrestricted Use and Delete Them From License: Namely, Building 30/31 - Phase IV"

2. Letter dated August 4, 2004 from Ms. Sudana Kwok to Dr. Keith E. Asmussen, regarding GA's amendment request to release Building 30/31 - Phase IV to unrestricted use

Dear Dr. Rogus:

General Atomics (GA) previously submitted its final radiological survey report for Phase IV of GA's Building 30/31 complex (Ref. 1). During a review of that report by Ms. Sudana Kwok and her co-workers at the Department of Health Services' Radiologic Health Branch (DHS/RHB), a number of questions were raised, comments made and additional information requested. GA's Ms. Laura Gonzales reviewed those questions and concerns during a meeting with DHS/RHB staff members in August 2004. Subsequently, GA received a written request for additional information and responses to comments and questions resulting from the review meeting between GA and DHS/RHB staff (Ref.2).

The purpose of this letter is to respond to the DHS/RHB's request for additional information and its comments and questions (Ref. 2). Accordingly, enclosed are GA's item-by-item responses to the comments and questions (Enclosure 1) and a revised Building 30/31 - Phase IV final radiological survey report incorporating additional information (Enclosure 2).

Specifically, the report was revised to: 1) describe the removal and disposal of ceramic tile from two showers in Room 102A which had elevated radiation levels due to naturally occurring radioactivity in the material from which the tiles were made, 2) describe the removal of internal walls and ceilings around Rooms 102 and 102A (which

were all radiologically clean), and 3) include additional survey information obtained during the excavation and removal of a portion of the underground drain line associated with the shower in Room 102A. This survey included gamma spectroscopy analysis of soil samples collected from inside the resultant trench (no radioactive contamination found).

GA trusts that the enclosed responses and revised report (enclosures 1 and 2, respectively) will be adequate to allow DHS/RHB to complete its review and respond favorably to GA's request for the release of the Phase IV area of the Building 30/31 complex to unrestricted use and delete it from GA's California radioactive materials license number 0145-37.

It should be noted that DHS/RHB completed a confirmatory radiological survey of both the Phase IV and the Phase V Rooms of the Building 30/31 complex during the period February 25-27, 2002. The survey was lead by Dr. Mina Goeders with the assistance of Messrs. Roger Lupo, John Rexroth and Steven Pay.

If you should have any questions regarding this request, or the enclosures, please don't hesitate to contact Ms. Laura Q. Gonzales at (858) 455-2758, or me at (858) 455-2823.

Very truly yours,

Keith E. Asmussen

Keith E. Asmussen, Ph.D., Director
Licensing, Safety and Nuclear Compliance

Enclosure 1: Responses to Comments regarding Building 30/31 Phase IV Report
Enclosure 2: General Atomics' ***Revised*** Final Radiological Survey Report of Building 30/31 - Phase IV Rooms - For Release to Unrestricted Use, dated November 2005.

cc: Mr. Jeff Wong, State of CA, Berkeley, CA
Ms. Barbara Hamrick, State of CA, Brea, CA

Responses to State DHS/RHB Comments Regarding Final Survey Report for Building 30/31- Phase IV

The following information is provided in response to Ms. Sudana Kwok's (California DHS/RHB) letter to Dr. Keith E. Asmussen (GA) dated August 4, 2004:

General Comments:

1. There are several areas classified as "Non-Suspect Affected Areas," but the table on page 9 does not provide a comparison of the survey requirements for "Non-Suspect Affected Areas" used in Building 30/31 - Phase IV, with those requirements contained in the Site Decommissioning Plan (SDP). That classification and the comparison to the SDP should be added to the table on page 9 or make an addendum to this request.

   GA Response: A table comparing the surveys performed with the survey requirements specified in GA's approved SDP for "Non-Suspect Affected Areas" has been added to the revised report (under "Final Surveys" section).

2. Provide Gamma Spectroscopy minimum detectable activities for the activities reported in the report (i.e., along with table of results). See NUREG/CR-5849, Section 8.4.

   GA Response: GA has added average or typical MDA's specific to various radionuclides and types of samples (i.e., soil, concrete, etc.) to the tables of gamma spectroscopy results. It should be noted that typical background concentrations for each isotope were not subtracted from any of the results. Furthermore, the results (with background not subtracted) are far below the allowable release criteria, and in most cases, at or near normal background levels.

3. The background data needs to reflect the materials sampled in the final survey (concrete and rebar). Background data for soil is provided but there are no soil samples taken for the final survey.

   GA Response: Background data for concrete and rebar was not provided because the only contaminant present was Co-60 (an activation product). **GA assumes the naturally occurring background concentrations of Co-60 in concrete and rebar to be essentially zero (i.e., < 0.1 pCi/g); therefore, the presence of any Co-60 is assumed to be the result of GA activities.** Background concentrations were not subtracted from any of the results. Therefore, background data is not needed for this specific situation. The soil background data was provided because there were a few soil samples taken during the survey of Room 118. The results for the soil samples taken in Room 118 were provided in the Phase IV report in Table 4.

4. Explain why no soil samples were taken after decontamination work?

   GA Response: The Building 30/31 Phase IV consists of only rooms within a building structure. Specifically, Rooms 100 and 118 in the Building 30 portion of the complex and Rooms 102, 102A, a hallway, and Room 103 of the Building 31 portion of the complex. The only remediation required was the removal of the outer layer of concrete and the rebar. As described on page 4 of the Phase IV report submitted in September 2001, "samples of concrete and rebar that formed that portion of the wall, and soil from behind the wall were collected and counted by gamma spectroscopy. Soil sample results showed only background levels of naturally occurring radioactive materials."

   No additional soil samples were needed after decontamination work because soil sampling and analyses conducted prior to decontamination work (which involved only the removal of activated concrete and rebar) showed that the soil was found to be clean, i.e., "non-impacted".

5. Normally, it is good practice to tabulate the smear results within the report not just placed anywhere on the figures and scattered in the text. It is a burden to the reviewer to verify that all data has been included in the report. For example, page 11, first paragraph, line 6, it stated that smear results are provided in figures 13, 20, 21, 25, 30, 35, 43, 46 and 54. The reviewer's findings were:

   Fig. 13. Smear results in the instrumentation information block, next to comments
   Fig. 20. Same as Fig. 13
   Fig. 21. Smear results in between the drawings
   Fig. 25. Same as Fig. 13
   Fig. 30. Same as Fig. 13
   Fig. 35 Wipe results (instead of smear) under Notes
   Fig. 46 Smear results next to the drawings
   Fig. 54 Results at the bottom of the page

   GA Response: A tabulation (table) of smear results is provided in the revised Phase IV report.

Specific Comments:

1. Room 103 - A copy of all relevant documents for the removal and post-removal of the High Temperature Gas Reactor (HTGR) should be submitted for review to support General Atomics' classification of Room 103 as a Non-Suspect Affected Area.

   GA Response: By definition (per SDP), a Non-Suspect Affected Area is an area where past usage of radioactive material occurred but contamination is not likely.

Actual radiological surveys verified that GA's classification of room 103 as a Non-Suspect Affected Area was indeed appropriate. Providing the documents requested will not change the classification. Furthermore, the HTGR fuel was stored inside shielded, closed and tamper-sealed casks that were never opened in room 103. Therefore, the storage of these casks in room 103 would not have and did not result in radiological contamination of the room.

2. Room 103 - As explained by General Atomics the lack of activation products relative to the Linear Accelerator beam pipe, it is not clear to the reviewer the potential for residual activation products from the neutron activation performed between 1973 and about 1978. Please elaborate.

   GA Response: The potential for residual activation products from neutron activation work performed using Cf-252 sources during the period 1973 to about 1978 is non-existent. The Cf-252 source strength was not high enough to induce activation. As for the work done in the early 1960's involving the Linear Accelerator, the electrons produced did not have sufficient energy to cause activation of materials and only a few experiments were conducted involving the beam pipe.

3. Room 103 - With respect to storage, sampling and packaging performed in this room, are those materials sealed or unsealed?

   GA Response: Materials stored in Room 103 were both sealed and unsealed. The form of the material varied but all unsealed materials were properly stored in approved containers and properly labeled. In the rare case when sampling was performed, the sampling was conducted inside a hood that was exhausted through a HEPA filtered plenum before release to the environment. Air sampling was conducted in the area. Packaging of materials was allowed inside the room but all sampling and handling of radioactive materials that could become airborne was handled in a ventilated hood or other enclosure.

4. Room 102A - On page 7, first paragraph, General Atomics indicates that the tile from the showers contained NORM. What is the percent "by weight" of uranium and thorium in these tiles?

   GA Response: The ceramic tile in the showers (room 102A) did contain NORM. However, to avoid any additional sampling and analyses necessary to answer these questions, GA decided to remove all of the ceramic tile and dispose of it as low level radioactive waste. This work was completed in July 2004.

5. Table 5 - On page 6, it stated that Background Soil Concentrations are to be found in Table 4, this should be Table 5. It also stated that the table contains descriptions of the locations where these samples were taken. No descriptions regarding the sample locations are included in Table 5.

GA Response: Table 4 on page 6 should have been Table 5 and a description of where the soil samples were taken was not provided. In the revised Phase IV report, Table 5 is stated and descriptions where the soil samples were taken are provided.

ENCLOSURE 2

FINAL RADIOLOGICAL SURVEY REPORT FOR THE BUILDING 30/31 COMPLEX - PHASE IV

REVISED NOVEMBER 2005

GENERAL ATOMICS

GENERAL ATOMICS' FINAL RADIOLOGICAL SURVEY REPORT OF BUILDING 30/31 - PHASE IV ROOMS FOR RELEASE TO UNRESTRICTED USE

Prepared By: W. LaBonte, P. Maschka, and L. Gonzales
Illustrated By: W. LaBonte

Final Survey Technicians: C. Stanley, W. Schuck, B. Lyons, S. Finchum, P. Poole, J. Sullivan, and S. Cowan

September 2001
Revised November 2005

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INTRODUCTION

This report documents certain of General Atomics' (GA's) continuing efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected laboratories and facilities on its San Diego Site.

The Building 30/31 complex, located on GA's main site (Figures 1A and 1B), is being released in five (5) phases as shown in Figure 1C. The rooms comprising Phases I, II and III have been released to unrestricted use by both the U.S. Nuclear Regulatory Commission (NRC) and the State of California Department of Health Services/Radiological Health Branch (DHS/RHB).

A Final Radiological Survey Report for the Phase V rooms was submitted to the NRC and State DHS/RHB on March 22, 2001 with a request to release the Phase V rooms to unrestricted use.

On September 6, 2001, GA submitted a request along with a Final Radiological Survey Report for the Phase IV rooms to the State DHS/RHB requesting that these rooms be released to unrestricted use.[1] The Phase IV rooms consist of rooms 100 and 118 located in the Building 30 portion of the complex and rooms 102, 102A, 103, and a hallway located in the Building 31 portion of the complex (Figure 1C and Figure 2). The Phase IV rooms occupy ~4,220 ft^2 (~392 m^2).

After the Phase IV report was submitted to the State DHS/RHB, it was reviewed by State personnel resulting in a number of questions and comments. GA addressed those questions and comments by submitting formal written responses and by modifying and re-submitting this revised Phase IV Report.

Furthermore, this revised report includes additional survey information obtained after the original report was submitted. The additional survey information was gathered following renovation efforts in a few of the Phase IV rooms. Specifically the work included: (1) The removal and disposal of ceramic tile in two showers in room 102A, (2) the removal of internal walls and ceilings around rooms 102 and 102A (see Figure 3B), and (3) the removal of a portion of an underground drain line which was long ago connected to a holding tank from a shower in room 102A (see Figure 3C). The holding tank itself was removed in 1984 and the area where the tank had been located was subsequently released to unrestricted use by both the NRC and the State DHS/RHB. The remaining portion of underground drain line located beneath the concrete floor of room 101 (as shown in Figure 3C) will be addressed when room 101 is decommissioned sometime in the future.

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[1] Letter dated September 6, 2001 from Dr. Keith E. Asmussen to Dr. Ronald Rogus and Ms. Mary Adams, (CAL/696-3404) "Request to Release Certain Portions of General Atomics' Facility to Unrestricted Use and Delete Them From License: Namely, Building 30/31 - Phase IV".

No radioactive contamination was detected in soil samples collected from the bottom of the trench resulting from the drain line removal and radiation measurements inside the trench were not distinguishable from normal background levels.

This report documents the results of extensive and comprehensive radiological measurements performed in the Phase IV rooms to demonstrate these rooms meet the NRC- and State- approved criteria for release to unrestricted use.

Accordingly, GA is requesting that the "Building 30/31 - Phase IV Rooms" rooms as described in this report be released to unrestricted use.

SITE DESCRIPTION

Figure 1A shows a plan view of GA's Main Site and Sorrento Valley Site. Figure 1B shows GA's Main Site Land Areas (including the location of the Building 30/31 Complex). Figure 1C shows the rooms associated with each of the various Building 30/31 phases (Phases I, II, III, IV and V).

The list of rooms in the Phase IV portion of the Building 30/31 complex and approximate area of each room (see Figures 2 and 3A) are provided in the following table.

Building 30/31 Phase IV Rooms			
Building #	**Room #**	**ft²**	**m²**
30	100	~950	~88
30	118	~680	~63
31	102 and 102A change room	~313	~30
31	Hallway	~115	~11
31	103 and catwalk	~2,162	~200
Total		~4,220 ft²	~392 m²

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Facilities and Equipment

The U.S. NRC's and State of California's criteria for releasing facilities and equipment to unrestricted use are shown in Tables 1 and 2, respectively. Based on process knowledge, the potential contaminants were identified as being mixed activation products from accelerator operations and depleted and/or enriched uranium from research activities.

The characterization surveys identified Co-60 as the primary activation product in room 118. Although uranium was a potential contaminant, no uranium contamination or thorium contamination was detected in any of the surveys.

The applicable guideline residual surface activity levels for beta/gamma emitters (including Co-60), depleted uranium and enriched uranium are as follows:

5,000 dpm/100cm², averaged over a 1 m^2 area
15,000 dpm/100cm², maximum in a 100 cm^2 area if the average over 1 m² is met.
1,000 dpm/100cm², removable activity

Exposure Rate Guideline
The guideline value for exposure rates measured at 1 m above the surface, is ≤10 μR/hr above background levels.

Soil Release Criteria
The soil release criteria, which also apply to concrete rubble, asphalt and gravel, and are concentrations above background levels are provided below for radionuclides typically found at the GA Site. For the Phase IV rooms, Co-60 is the radionuclide of concern.

Co-60	8 pCi/g
Enriched Uranium (U-234 and U-235)	30 pCi/g
Depleted Uranium	35 pCi/g

The U-235 concentrations are determined by gamma spectroscopy to ensure that concentrations of enriched uranium are below the given limit. The ratio of U-234 to U-235 is conservatively assumed to be ~30:1 and applies for these rooms based on the previous use of high enriched uranium.

If more than one radionuclide is detected, the sum of the fractions of the concentrations, calculated as follows, must be less than or equal to one (1):

$$\sum_{i=1}^{n} \frac{C_i}{L_i} < 1$$

Where:
C_i = The average soil concentration of radionuclide i
L_i = The maximum soil limit for i (pCi/g).

INSTRUMENTATION

A general description of the instruments used for this survey are contained in Table 3. On each survey provided in the figures, additional data is provided for each survey meter

including: (1) instrument type, the model and serial numbers, (2) a description of the detector (if applicable) and its serial number, (3) calibration due dates and efficiencies, (4) typical background count rates, and (5) MDA'S (if applicable). All instruments used were calibrated semiannually and after repair. Exposure rate meters were calibrated quarterly. All instruments are calibrated using NIST traceable sources.

BACKGROUND MEASUREMENTS

Instrument Background Measurements

Building 13 on GA's main site was used for conducting background measurements on most instruments used for the final survey because: (1) there is no history of use or storage of radioactive materials in Building 13, (2) the various surfaces found the Building 30/31 Phase IV rooms and labs could also be found in Building 13, and (3) the age of the building approximates the age of Building 30.

Background measurements are provided in the tables on each figure. The mean and standard deviation of measurements made for each surface surveyed with the 100 cm^2 beta detector, 50 cm^2 alpha detector and/or 15 cm^2 Geiger counter were calculated using equations 8-11 and 8-12 from NUREG/CR-5849 as shown below:

Equation (8-11):

$$\bar{x}=\frac{1}{n_s}\sum_{i=1}^{n_s} x_i$$

Equation (8-12):

$$s_x=\sqrt{\frac{\sum_{i=1}^{n}(\bar{x}-x_i)^2}{n-1}}$$

Background measurements and minimum detectable activities (MDA's) for each type of surface and for various counting times are also provided in the tables. Minimum detectable activities (MDA's) for each type of surface, were calculated using equation (5-2) from NUREG/CR-5849 as shown below:

Equation (5-2):

$$MDA=\frac{2.71+4.65\sqrt{B_R\times t}}{t\times E\times\frac{A}{100}}(dpm/100cm^2)$$

Where:

B_R=background rate (cpm)

t = count time (min)

E = efficiency

A = area of the detector (cm^2)

The MDA for scan surveys was calculated using equation 5-3 from the draft NUREG/CR-5849 (modified in accordance with the discussion on page 5.8 of the draft NUREG/CR-5849).

Equation (5-3):

$$MDA = \frac{X \times B_R}{E \times \frac{A}{100}} (dpm/100cm^2)$$

Where:

X = the multiple/portion of the background rate that can be discernable as an increase in instrument response by the surveyor (dependent on the type of instrument used).

B_R = background rate in (cpm)

E = efficiency

A = area of the detector (cm^2)

Background Soil Concentrations

Typical background concentrations in soil near the GA site have been measured by gamma spectroscopy (at the 95% confidence level) and are provided in Table 5 along with a description of the locations where these samples were taken.

Exposure Rate Background

The various rooms in Phase IV all currently have concrete floors. The walls and ceilings are made of different materials, all of which affect the exposure rate background. The normal background level used as the basis for evaluating these areas is 20 to 23 μR/hr at 1 m from the surface, as measured in an all-concrete room in GA's Building 1 (GA's Administration Office Building a non-impacted area). The background in Room 118 Building 30 is higher than the other rooms because it has concrete floors, walls and ceiling. The exposure dose rates measured in this room at 1 meter above the floor were 28-30 μR/hr.

HISTORY OF USE AND SURVEY CLASSIFICATIONS

Based on the use of each of the Phase IV rooms and initial surveys as described below, the Phase IV rooms were classified as follows:

Unaffected Areas:	Rooms 102 and 102A and the hallway of Building 31
Non-suspect Affected Areas:	Room 100 of Building 30 and room 103 of Building 31
Suspect Affected Area:	Room 118 of Building 30

Unaffected Areas

Room 102 was used as an office and an electronics repair area. This room, along with the nearby hallway was classified as an Unaffected Area (Figure 3).

Room 102A was a locker room and change room that contained lockers, two showers and rest room facilities. One of the showers was connected by drain line to a low level radioactive waste underground holding tank (the tank was removed in 1984). Only a portion

of the drain line was removed in 1984. The site where the underground storage tank had been located has been released to unrestricted use by the NRC and the State of California. The remaining shower and the rest room facilities (sinks and toilet) were connected to the GA Site sewer system which was the subject of a Final Survey Report submitted to the State of California DHS/RHB in April 2004. Room 102A was classified as an Unaffected Area (Figure 3).

The hallway of Building 31 was also classified as an Unaffected Area since there was no history of use involving radioactive materials in the hallway and no known radioactive contamination.

Non-Suspect Affected Areas

Room 100 was classified as a Non-Suspect Affected Area (see Figure 3) because although radioactive material had been used in the room, radioactive contamination was not likely based upon initial surveys performed in this room.

In the early 1960's, provisions had been made to bring the Linear Accelerator Beam pipe into room 103. A 3' diameter hole was bored through the wall between room 123 of Building 30 and room 103 of Building 31. The beam pipe was positioned in the center of this hole. The electron beam was confined to the center of the 2 inch diameter beam pipe by the use of magnets surrounding the beam pipe. If electrons penetrated through the beam pipe, they would do so at an acute angle, losing a large amount of energy which greatly reduced the possibility of creating gamma rays when they interacted with the surrounding materials. In order to create high energy gamma rays (actually Bremsstrahlung X-Rays) the electrons must interact with high density material. Soil, concrete, and even stainless steel are relatively low density materials and do not readily produce high energy gamma rays. The high energy gamma rays cause activation due to the γ-n reaction caused when they penetrate into the nucleus of the atom. Therefore, it is very unlikely that there was any activation of the materials in this hole. Additionally, only a few experiments were run in room 103. The beam pipe was removed in the mid-1960's (after a couple of years) and the hole was filled with soil and concrete.

Room 103 was also used as the location for the HTGR (High Temperature Gas Reactor) Critical Experimental Facility. The HTGR test reactor was operated at low power levels (several hundred watts thermal) and was last operated in 1971-1972. After the HTGR testing was completed the test bed was disassembled and removed in 1973.

Room 103 was also used for repair and set up of electronic equipment. It also was equipped with a chemistry hood having self-contained HEPA exhaust system. Some radiochemistry operations with various low level radioactive materials and repair of activated equipment were done in the hood. In 1977 or 1978, the chemistry hood and its associated HEPA unit were removed.

Neutron Radiography, using Cf-252 sources, was performed in this area until ~1977 or ~1978. The room housed a Van de Graff generator and various radiation machines in the 1970's and 1980's.

Most recently, this room was used by the Nuclear Material Accountability (NMA) Department for storage, limited sampling and packaging of radioactive materials including thorium, byproduct material, and Special Nuclear Material. The materials sampled and packaged were both sealed and unsealed materials. All work with unsealed materials was performed in a hood having a HEPA filter system. The hood, HEPA filter system, and all radioactive materials were removed from the area before GA's final survey was completed.

Suspect Affected Area

Room 118 was initially part of the LINAC operations. The "LINAC" was a 100 MeV Linear Electron Accelerator which was operated in Rooms 118, 114A, 114, 113, 113A, and 123 of Building 30 from 1961 until 1978. All of the rooms, with the exception of room 118 were surveyed as part of "Phase V" rooms.

Room 118 was the Single Section Accelerator Radiation Processing Cell. During accelerator operations, this cell was used for sterilization of medical products, irradiation of gemstones and electronics components. Accelerator operations were discontinued in this cell in 1978. Later on, room 118 was also used to store fuel casks containing irradiated fuel. Characterization surveys indicated elevated readings in the north wall due to activation of the material by the electrons and the resultant Bremsstrahlung radiation. Therefore, the room was classified as a Suspect Affected Area.

DECONTAMINATION EFFORTS

Rooms 102 and 102A and Hallway of Building 31

GA's Final Radiological Surveys documented in the original Phase IV report, noted elevated alpha and beta radiation levels in the ceramic tile in the showers in room 102A of Building 31. Tile samples were removed and analyzed by gamma spectroscopy. Low levels of natural uranium (inherent in the ceramic glaze of the tile) were detected.

Upon review of the original Phase IV report, the State of California noted the elevated radiation levels reported for the ceramic tile. Due to the difficulty in obtaining similar tile to use as "background" for comparison with the tile in the showers in room 102A, GA decided to remove the tile and dispose of it as low level radioactive waste.

The drain from one of the showers in room 102A was connected to the GA sewer system (which was addressed in the "Sewer Project" report). The drain from the other shower had been connected, years ago, to an underground low level radioactive waste holding tank. The holding tank and a portion of the drain line was removed in 1984 and the area where

the tank had been located was released to unrestricted use by both the NRC and the State DHS/RHB. The remaining underground drain line was capped in 1984 (Figure 3C).

During removal of the ceramic tile, GA decided to also remove the portion of the remaining drain line located between of the shower and the outer west wall of room 100. The

remaining portion of this pipe, which runs under the floor of room 101, was capped and will be removed when room 101 is decommissioned sometime in the future (Figure 3C).

Additionally, to facilitate anticipated future renovations in Building 31, the walls and ceiling between room 102 and 102A, room 102 and the hallway, room 102A and the hallway, and the partitions within room 102A were removed (Figure 3B). All materials removed were surveyed for release to unrestricted use and found to be clean; i.e., radiation levels were not distinguishable from normal background radiation levels. As a result, the material was disposed of as clean and sent to a local landfill.

Room 100 of Building 30

No radioactive contamination was found in this room, therefore, no decontamination was required.

Room 103 of Building 31

No radioactive contamination was found in this room, therefore, no decontamination was required.

Room 118 of Building 30

Elevated radiation exposure rate readings using a microR meter were measured on a small portion of the north wall of Room 118 of Building 30 due to neutron activation from past (1961-1978) linear accelerator operations. Readings ranged from 32-36 μR/hr (surface measurements).

Core samples of concrete and rebar were taken from the portion of the wall having the highest radiation readings. Additionally, cores were drilled through the wall and into the soil behind the wall (which was used as shielding during accelerator operations) to allow for collection of soil samples.

All of the samples were analyzed by gamma spectroscopy to determine the extent of activation. One concrete sample showed a trace amount of Co-60 (~0.02 pCi/g). All other gamma spectroscopy results of concrete samples showed only normal background levels. The steel rebar contained Co-60 in concentrations ranging from 0.11 pCi/g to 1.35 pCi/g (see Table 4 for gamma spectroscopy results). Soil sample results showed only normal background levels of naturally occurring radioactive materials. No other activation products (or other contaminants) were detected in any of the samples.

Decontamination involved the removal of the outer layer of concrete and rebar. It was decided to remove only the outer surface of the concrete wall and the first layer of rebar in this area for three reasons: 1) Because it was feared that if the entire section of wall were removed, the soil could collapse into the room, 2) removal of the wall could affect the structural integrity of the entire wall and 3) removal of only the outer surface of the concrete wall and first layer of rebar should reduce the radiation levels to levels below acceptable levels.

The concrete was removed and transferred to the Sorrento Valley Soil Storage Area (Bin S9) for temporary storage. After release of the material by the State of California, the concrete was disposed of at a local landfill as "clean" waste. All of the rebar removed from the wall was disposed of as radioactive waste.

After remediation, two samples of concrete from the remaining wall were collected and counted by gamma ray spectroscopy. The results revealed no Co-60 or other activation products; only natural background levels were detected. Rebar samples were also collected after remediation from each of the four edges of the remaining wall. The four samples were placed collectively in a marinelli container and analyzed by gamma spectroscopy for two hours. Trace quantities of Co-60 (~0.50 pCi/g) were detected (see Table 4 for results).

In order to retain the integrity of the wall, a steel frame and braces were set up around the affected area.

SURVEY PLANS

Survey plans were developed based upon the physical characteristics of the various rooms, the radioactive material used, the potential for contamination, and the results of the characterization surveys. The physical characteristics of the rooms include the consideration of vents, ducts, floor drains, whether surfaces are painted or unpainted, overhead structures, floor coverings, etc., were considered in determining the types of surveys to be performed. Surveys included scanning, exposure rate measurements and survey measurements (wipes and fixed measurements). In areas where elevated readings were detected, additional surveys were required. Copies of the Final Survey Plans are provided in Appendix A.

FINAL SURVEYS

Objectives and Responsibilities

The objectives of the final survey plans were: (1) to demonstrate that the average surface contamination levels for each survey unit were below the approved release criteria, (2) to show that the maximum residual activity did not exceed three times the approved release

criteria for average surface contamination value in an area up to 100 cm^2, and (3) to show that the exposure rate measurements taken in these rooms measured at 1 meter above the surface are less than 10 μR/hr above background. Only Room 118 in Building 30 required gridding. Gridding was done on a 1m x 1m pattern.

Documentation

Surveys were taken in accordance with approved survey plans by qualified Health Physics Technicians having a minimum of three years health physics experience. Soil samples and wipes (100 cm^2) were counted in GA's Health Physics Laboratory which maintains an effective QA program.

Every survey taken was documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The figures provided in this report include the measurement locations (and, in some cases, the results of these measurements (including units), the technician's name, date(s) of the surveys, instrument(s) used (including the model and serial number of both the ratemeter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Comparisons with Site Decommissioning Plan

Comparisons of the site Decommissioning Plan requirements with the Final Surveys performed in relation to the percentage of surface area scanned, number of fixed and removable measurements performed, exposure rate measurements (μR/hr) and soil samples taken are provided in the table below:

Comparisons of Site Decommissioning Plan (Site D-Plan) Requirements with the Final Surveys Performed in the Building 30/31 Phase IV Rooms				
Required Activity	**β Scanning on concrete**	**# of Measurements (fixed & wipes)**	**Exposure Rate Measurements (μR/hr) @ 1m above the surface**	**Soil Samples**
Unaffected Areas (Rooms 102 and 102A of Building 30 and Hallway of Building 31)				
Site D-Plan ⇨	10% floor & lower walls (below 2m)	30 minimum 1 every ~7m	Total = 4 fixed measurements (1/10 m^2)	None
Final surveys Performed ⇨	100% floor & lower (below 2m) 10% walls above 2m.	Total = 59 16 Fixed α 14 fixed β and 29 wipes.	Total = 17 fixed measurements Plus 100% floor surface scan	4 in trench

Comparisons of Site Decommissioning Plan (Site D-Plan) Requirements with the Final Surveys Performed in the Building 30/31 Phase IV Rooms				
Required Activity	**β Scanning on concrete**	**# of Measurements (fixed & wipes)**	**Exposure Rate Measurements (μR/hr) @ 1m above the surface**	**Soil Samples**
Non-Suspect Affected Area (Room 100 of Building 30 and Room 103 of Building 31)				
Site D-Plan ⇨	10% floors and lower walls (below 2m)	30 minimum 1 every ~ 4.5m	Total = 30 fixed measurements (1/10 m^2)	None
Final surveys performed ⇨	100% floor and lower walls below 2m for β 10% of walls above 2m for β 25% floor and lower walls below 2m for α 25% of walls above 2m for α	Total = 193 54 fixed α 56 fixed β and 83 wipes	Total = 45 fixed measurements Plus 100% surface scan of floors in room 102A, hallway to room 103 and 103 catwalk Plus 10% surface scan of room 103 and 60% surface scan of room 100	None
Suspect Affected Area (Room 118 of Building 30)				
Site D-Plan ⇨	100% floor and lower walls (below 2m)	30 minimum 1 every ~2m	Total = 16 fixed measurements (1/ 4 m^2)	None
Final surveys performed ⇨	100% floor and lower walls below 2m for β 10% walls above 2m for β 10%floor and walls below 2m for α Measurements using hand held geiger counter (15cm^2 pancake GM) in all elevated areas -β & γ	Total = 63 43 fixed β and 20 wipes	Total = 30 fixed measurements (~1/2 m^2) 100% scan of floor and wall in elevated north wall areas	None

RESULTS OF THE FINAL SURVEY

The radiological data obtained from the final surveys performed in these rooms are provided in the tables and figures as described below:

Unaffected Areas (Rooms 102, 102A and Hallway)

All interior walls, room partitions, ceiling, bathroom/shower fixtures and ceramic tile was removed from this area (Figure 3B).

Alpha and Beta Scans

Approximately 100% of the floor in this area was scanned for both α and β activity using a large area (434 cm^2) gas flow proportional counters. All of the scan results were not distinguishable from normal background levels (see Figure 5).

Approximately 100% of the lower walls (below 2 meters) in the entire area was scanned for β activity using a large area (434 cm^2) gas flow proportional counter. All of the scan results were not distinguishable from normal background levels (see Figure 6 for locations and results).

Approximately 10-25% of the upper walls (above 2 meters) were scanned for α activity using a large area (434 cm^2) gas flow proportional counter. The results are at or near normal background levels for this type of surface (see Figure 6 for locations and results)

Fixed Alpha and Beta Measurements

Eight (8) fixed β measurements using a 100 cm^2 gas flow proportional counter were taken on the floor of the area. The highest measurement was 361 dpm/100 cm^2; well below the release criteria of 5,000 dpm/100 cm^2 (see Figure 7 for approximate locations and results).

Seven (7) fixed α measurements were taken using a 50 cm^2 alpha counter on the floor of the area. All of the measurements were below the MDA (Minimum Detectable Activity) of 309 dpm/100 cm^2 (see Figure 7 for approximate locations and results).

Removable Contamination Survey

Twenty-nine (29) 100 cm^2 wipe samples (i.e., smears) were taken and analyzed for α and β activity using a low level α/β counting system. The results were not distinguishable from natural background activity levels. See Figure 8 for approximate locations and Table 6 for the α/β results.

Exposure Rate Surveys

Approximately 100% of the concrete floor surfaces was scanned with a 2"x2" NaI(Tl) detector held within 1" of the surface. Results ranged from 19-22 μR/hr. Seventeen (17) fixed measurements were taken at contact and at 1 meter from the surface.
The results ranged from 19-25 μR/hr at contact and 19-26 μR/hr at 1 meter. Typical background readings in room such as these (surrounded by concrete) range from 20-28 μR/hr; therefore, these readings were not distinguishable from normal background readings. See Figure 9 for locations and results.

Soil Samples

Four (4) surface (0-6") soil samples were taken from the bottom of the trench resulting from the removal of a portion of the underground drain line from the shower to the west wall of room 103. The approximate locations are shown in Figure 8. The soil samples were analyzed by gamma spectroscopy. The results are provided in Table 4.

Non-Suspect Affected Areas (Room 100 of Building 30 and Room 103 of Building 31)

Alpha and Beta Scans

In room 100 of Building 30, approximately 100% of the floor and 100% of the lower walls (below 2 meters) and approximately 10% of the walls above 2 meters were scanned for β activity using the large area (434 cm^2) gas flow proportional counters. The readings ranged from 1050-2400 cpm depending on the type of surface being scanned (see Figure 10). These results are at or near normal background levels.

In room 103, approximately 100% of the floor was scanned for β activity using the large area (434 cm^2) floor monitor gas flow proportional counters. The scan readings ranged from 2300-3150 cpm which was slightly higher than typical concrete background readings of 1858-2036 cpm. This was thought to be due to the naturally occurring radionuclides in the high density concrete used to build the room. Floor areas having the highest radiation levels with the 434 cm^2 floor monitor were checked using a 15 cm^2 pancake GM counter. Radiation levels (which ranged from 80-160 cpm) were typical of non-contaminated concrete surfaces. The locations surveyed and the results are provided in Figure 12.

Approximately 100% of the lower walls (below 2 meters) and 10% of the upper walls (above 2 meters) in room 103 were scanned for β activity using the large area (434 cm^2) floor monitor gas flow proportional counters. Readings ranged from 1950-2700 cpm which was not significantly higher than typical concrete background readings of 1858-2036 cpm (see Figure 13).

Approximately 25% of the floors and 25% of the walls in room 103 were scanned for α activity using the large area (434 cm^2) floor monitor gas flow proportional counters. The results were not discernable from normal background readings (see Figure 14 for floor scan results and Figure 15 for wall scan results).

Approximately 100% of the floor and 100% of the lower walls (below 2 meters) and 10% of the upper walls (above 2 meters) were scanned for β activity using the large area (434 cm^2) floor monitor gas flow proportional counter on the "Catwalk" of Room 103 (see Figure 16). Elevated areas were then scanned using a 15 cm^2 pancake GM counter. All results were not significantly above normal background levels (see Figure 17).

Approximately 25% for the floor surface and 25% of the lower walls (below 2 meters) were scanned for α activity using a large area (434 cm^2) floor monitor gas flow proportional

counter on the "catwalk" of Room 103. All results < 20 cpm (typical of normal background levels) as shown in Figure 18 (floor survey) and Figure 19 (wall survey).

Approximately 100% of the Room 103 "Catwalk" stairs were scanned β activity using a hand-held 15 cm^2 pancake GM counter. The results were 40-80 cpm (typical background levels). See Figure 20. In addition, the stairs were scanned for α activity using a 50 cm^2 alpha detector. All readings were < 20 cpm (typical background level). In addition, fixed measurements were taken on the stairs using the same instrument. All of the readings were below the MDA of 322 dpm/100 cm^2 (see Figure 21).

Approximately 100% of the floors and 100% of the lower walls (below 2 meters), and 10% of the upper walls (above 2 meters), were scanned for α and β activity using a large area (434 cm^2) floor monitor gas flow proportional counter in the front hallway walls at the entry to room 103. The beta scan results are provided in Figure 23. All readings were at or near normal background levels. The alpha scan results are provided in Figure 24.

Fixed Alpha and Beta Measurements

In room 100, thirteen (13) fixed β measurements were taken using a 100 cm^2 gas flow proportional counter. All of the results were < the MDA for each surface measured. The approximate locations of the measurements and the results are provided in Figure 25.

In room 103, the "Catwalk", Stairways and Entry Hallway, a total fifty-four (54) fixed α measurements were taken using a hand-held 50 cm^2 alpha detector. All of the results were < MDA (< 322 dpm/100 cm). The locations and the results are shown in Figures 26, 27 and 28.

A total of 39 fixed β measurements were taken in these same areas using a 100 cm^2 gas flow proportional counter. The highest result was 999 dpm/100 cm^2. The locations and the results are provided in Figures 29 and 30.

Removable Contamination (Wipe) Surveys

A total of eighty-nine (89) wipe samples were taken in Rooms 100 and 103 (the entire complex) and analyzed for α and β activity using a low-level alpha/beta counting system. All of the results were < 20 dpm/100 cm^2. See Figures 31, 32, 33, 34, 35, and 36 for approximate locations and Table 6 for analysis results.

Removable contamination surveys (100 cm^2 wipes) were collected on the stairs in the approximate locations shown in Figure 22. The results (all < 20 dpm/100 cm^2) are provided in Table 6.

Exposure Rate Surveys

In Room 100, over 50% of the concrete floor surface was scanned using a 2"x2" NaI(Tl)

detector held within 1" of the surface and fixed measurements (1 meter from the surface) were taken at fourteen (14) locations as shown in Figure 37. The scan results ranged from 16-24 μR/hr.

Fixed exposure rate measurements were also taken in room 100; the highest fixed measurement result was 22 μR/hr measured 1 meter from the surface (see Figure 37).

In room 103, approximately 10% of the floor surfaces in Room 103 and ~100% of the "Catwalk" stairs, and ~100% of the front hallway stairs were scanned with with a 2"x2" NaI(Tl) detector held within 1" of the surface as shown in Figures 38, 39 and 40. The range in room 103 was 25-31 μR/hr (see Figure 38), the range on the "Catwalk stairs was 16-22 μR/hr (see Figure 39), and the range on the front hallway stairs was 16-32 μR/hr (see Figure 40).

A total of seventeen (17) fixed exposure rate measurements were taken in Room 103 at 1 meter from the surface. The highest measurement was 31 μR/hr, higher than typical background due to the high density concrete walls and floors which make up room 103. The approximate locations and results are shown in Figure 38.

A total of five (5) fixed measurements were taken on the front hallway stairs; the highest result was 33 μR/hr. The approximate locations and the results are shown in Figure 41.

Paint Samples

Four (4) paint samples were taken in room 100 (see Figure 30) and four (4) paint samples were taken in room 103 (see Figure 42). The paint samples were analyzed for α and β activity using a low level alpha beta counting system. All of the results were not distinguishable from natural background activity.

The fixed beta readings taken before and after paint removal were essentially the same in room 100 (all < MDA as shown in Figure 42). However, the fixed readings taken on the wall of room 103 after paint removal were slightly higher than the fixed readings taken before paint removal, as shown in Figure 30. However, all of the readings were below the approved release criteria. The highest result was 754 dpm/100 cm^2.

Suspect Affected Area (Room 118 of Building 30)

Alpha and Beta Scans

Approximately 100% of the floor and walls below 2 meters and approximately 10% of the walls above 2 meters were scanned for β activity using the large area (434 cm^2) gas flow proportional counters. The scan results, shown in Figure 43, show slightly elevated radiation levels consistent with the high density concrete which makes up the floor and the walls.

Approximately 25% of the floor surface was scanned for α activity. All α results were < 40 cpm (normal background levels). See Figure 44 for approximate scan locations and results.

Fixed Beta Measurements

Forty-four (44) fixed β measurements were taken using a 100 cm^2 gas flow proportional counter. The highest result was 491 dpm/100 cm^2 on a small location on the north concrete block wall, in the area that had been decontaminated. See Figure 45 for approximate locations of the measurements and the results.

Removable Contamination (Wipe) Surveys

Twenty (20) wipe samples were taken and analyzed for α and β activity. The results were not distinguishable from natural background activity levels. See Figure 46 for locations and Table 6 for the gross alpha/beta results.

Exposure Rate Surveys

Approximately 100% of the concrete floor surfaces and ~100% of the decontaminated area of the north wall were scanned using a 2"x2" NaI(Tl) gamma detector held within 1" of the surface. The readings ranged from 28-32 μR/hr on the floor surfaces and 32-37 μR/hr on the wall surfaces as shown in Figure 47.

Thirty (30) fixed measurements were taken with the detector held 1 meter from the surface. The highest measurement was 30 μR/hr as shown in Figure 48.

Activation Product Concentrations - Evaluation

After remediation, two samples of concrete from the remaining wall were collected and counted by gamma ray spectroscopy. The results revealed no Co-60 or other activation products; only natural background levels were detected. Rebar samples were also collected after remediation from each of the four edges of the remaining wall. The four samples were placed collectively in a marinelli container and analyzed by gamma spectroscopy for two hours. Trace quantities of Co-60 (0.50 pCi/g) were detected (see Table 4 for results).

INTERNAL CONFIRMATORY SURVEY

After completing the final surveys, GA conducted an internal confirmatory survey of the Building 30/31 Phase IV rooms. All survey results were at or near background levels. See Appendix B for the Survey Plan and a summary of results of GA's Internal Confirmatory Survey.

CONCLUSION

The results of the final and confirmatory surveys provided in this report, demonstrate that the rooms designated as "Building 30/31 Phase IV", as defined in this report, meet the NRC- and State- approved guidelines for release to unrestricted use.

Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]			
Nuclides	Average[b,c,f] (dpm/100 cm²)	Maximum[b,d,f] (dpm/100 cm²)	Removable[b,e,f] (dpm/100 cm²)
U-nat, ^{235}U, ^{238}U, & associated decay products	5,000 α	15,000 α	1,000 α
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Th-nat, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{133}I, ^{131}I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and other noted above.	5,000	15,000	1,000

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mRad/hr at 1 cm^2 and 1.0 mRad/hr at 1 cm^2, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]			
Nuclides[a]	Average[b,c,f] (dpm/100 cm²)	Maximum[b,d,f] (dpm/100 cm²)	Removable[b,e,f] (dpm/100 cm²)
U-nat, ^{235}U, ^{238}U, & associated decay products	5,000	15,000	1,000
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Th-nat, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{133}I, ^{131}I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and other noted above	5,000	15,000	1,000

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm^2 and 1.0 mrad/hr at 1 cm^2, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

1. Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

Table 3: List Of Instruments for the Building 30/31 Phase IV Final Survey						
Instrument	Detector	Range	Calibration Due Date	Efficiency	Background	Description
Ludlum Model 2221 S/N **84510**	Ludlum Model 43-37 434 cm^2 gas flow proportional **Alpha detector** S/N **093601**	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000cpm	10/25/2001 11/12/2001	21.29%	concrete 3-21 cpm Scan MDA= 52 dpm/100 cm^2 Plaster 0-20 cpm Scan MDA= 43 dpm/100 cm^2 Tile 0-20 cpm Scan MDA= 43 dpm/100 cm^2	Active Probe Area = 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick disconnects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N **84459**	Ludlum Model 43-37 434 cm^2 gas flow proportional **Alpha detector** S/N 08621	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000cpm	08/06/2004	22.14%	concrete 20-40 cpm Scan MDA= 125 dpm/100 cm^2 Plaster 0-20 cpm Scan MDA= 42 dpm/100 cm^2	Active Probe Area = 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick disconnects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N **84459**	Ludlum Model 43-37 434 cm^2 gas flow proportional **Beta detector** S/N **086215**	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000 cpm	09/03/2001	22.15%	concrete 1858-2036 cpm Scan MDA= 608 dpm/100 cm^2 plaster 1083-1250 cpm Scan MDA=364 dpm/100 cm^2 Tile 2067-2207 cpm Scan MDA=667 dpm/100 cm^2 Wood 1061- 1262 cpm Scan MDA= 264 dpm/100 cm^2	Active Probe Area = 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick disconnects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.

Table 3: List Of Instruments for the Building 30/31 Phase IV Final Survey						
Instrument	Detector	Range	Calibration Due Date	Efficiency	Background	Description
Ludlum Model 2221 S/N **154202**	Ludlum Model 43-37 434 cm^2 gas flow proportional **Beta detector** S/N **149017**	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000 cpm	08/06/2004	30.39%	concrete 1655-1830 cpm Scan MDA= 396 dpm/100 cm^2 Plaster 1136-1303 cpm Scan MDA= 277 dpm/100 cm^2	Active Probe Area = 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick disconnects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 2221 S/N **84423**	Ludlum Model 43-68 100 cm^2 gas flow proportional **Beta detector** S/N **119444**	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000 cpm	09/26/2001	24.13%	concrete 1042 ± 90 cp2m MDA = 317 dpm/100cm^2 Plywood 747 ± 46 cp2m MDA = 269 dpm/100 cm^2. Plaster 587 cp2m MDA=239 dpm/100 cm^2 Tile 1306 cp2m MDA=354 dpm/100 cm^2	Active Probe Area = 100 cm^2. The detector and rate meter are combined on a roll around cart. The instrument features a static-flow system, quick disconnects and a portable gas bottle.
Ludlum Model 2221 S/N **86302**	Ludlum Model 43-68 100 cm^2 gas flow proportional **Beta detector** S/N **142547**	Four Linear Ranges 0-500,000 cpm & one Log 50-500,000 cpm	08/18/2004	34.36%	concrete 991cp2m MDA = 217 dpm/100cm^2 Plaster 677 cp2m MDA=180 dpm/100 cm^2	Active Probe Area = 100 cm^2. The detector and rate meter are combined on a roll around cart. The instrument features a static-flow system, quick disconnects and a portable gas bottle.
Ludlum Model 3 S/N**153590**	Ludlum Model 44-10 NaI (Tl) Scintillator **Gamma detector** S/N **155190**	Five Ranges 0-500 μR/hr	06/07/2001	N/A	concrete 16-19 μR/hr @ contact 15-18 μR/hr @ 1meter	2 inch x 2 inch NaI (Tl) scintillator. Used for measuring external dose rates at the surface and at 1 meter.

Table 3: List Of Instruments for the Building 30/31 Phase IV Final Survey						
Instrument	Detector	Range	Calibration Due Date	Efficiency	Background	Description
Ludlum Model 3 S/N**139180**	Ludlum Model 44-9 15 cm^2 GM **Beta/Gamma** S/N **145973**	Four Ranges 0-100,000 cpm	09/10/2001	21.05%	concrete 80-120 cpm Metal 40-60 cpm Grating(stairways) 40-80 cpm	This instrument is used for beta/gamma surveying. The detector has an active area of 15 cm^2
Ludlum Model 3 S/N**151348**	Ludlum Model 44-10 NaI (Tl) Scintillator **Gamma detector** S/N **163169**	Five Ranges 0-500 μR/hr	10/06/2004	N/A	concrete 15-20 μR/hr@ contact 15-20 μR/hr @ 1m	2 inch x 2 inch NaI (Tl) scintillator. Used for measuring external dose rates at the surface and at 1 meter.
Ludlum Model 12 S/N **138739**	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag) **Alpha detector** S/N 145699	Four Ranges 0-500,000 cpm	08/31/2001	21.58%	0-20 cpm (all) MDA =322 dpm/100 cm^2	Active Probe Area = 50 cm^2. Used for Alpha surveying and fixed measurements.
Ludlum Model 12 S/N **138801**	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag) **Alpha detector** S/N 145696	Four Ranges 0-500,000 cpm	09/07/2004	22.51%	0-20 cpm (all) MDA =309 dpm/100 cm^2	Active Probe Area = 50 cm^2. Used for Alpha surveying and fixed measurements.
Canberra Low Level α/β Counter Model 2404	Gas Flow Proportional Detector	N/A	As needed	~26-30%	Varies with Sample	Canberra Model 2404 Low Level α/β gas proportional counting system used to count wipes for removable contamination. Results are usually reported as dpm/100 cm^2.
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	As needed	Varies with Sample	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector

TABLE 4: Building 30/31 Phase IV Gamma Spectroscopy Results of Soil, Concrete, and Rebar Samples								
Sample ID	Sample Type	Radionuclide Concentration (pCi/g) - Results ± 2σ Background Not Subtracted- 30 minute count						Evaluation and Comments
		^{60}Co 1173 keV	^{228}Th 238 keV (^{212}Pb)	^{232}Th 911 keV (^{228}Ac)	^{total}Th ^{228}Th + ^{232}Th	^{238}U 63(92.77)keV	^{235}U 186(144) keV	
Characterization Sample Results								
B30-118-1A	Concrete Core	ND	0.70 ± 0.09	1.15 ± 0.34	1.85	2.23 ± 0.63	0.38 ± 0.29	Below Release Criteria
30-118-1	Soil	ND	1.02 ± 0.10	1.68 ± 0.37	2.70	2.04 ± 0.72	0.20 ± 0.25	Below Release Criteria
B30-118-1AS	Soil	ND	1.19 ± 0.11	1.71 ± 0.38	2.90	2.59 ± 0.67	0.21 ± 0.07	Below Release Criteria
B30-118-2A	Concrete Core	0.02 ± 0.01	0.64 ± 0.09	1.17 ± 0.27	1.81	1.90 ± 0.53	0.18 ± 0.06	Below Release Criteria
30-118-2	Soil	ND	1.15 ± 0.12	1.98 ± 0.33	3.14	2.31 ± 0.60	0.16 ± 0.07	Below Release Criteria
B30-118-2AS	Soil	ND	1.19 ± 0.11	1.71 ± 0.38	2.90	2.59 ± 0.68	0.21 ± 0.07	Below Release Criteria
B30-118-2B	Rebar	0.11 ± 0.02	0.05 ± 0.03	0.08 ± 0.03	0.14	0.43 ± 0.23	0.04 ± 0.02	Below Release Criteria
B30-118-3A	Concrete Core	ND	0.67 ± 0.15	1.21 ± 0.27	1.88	2.21 ± 0.06	0.23 ± 0.06	Below Release Criteria
30-118-3	Soil	ND	1.22 ± 0.11	1.77 ± 0.35	2.99	3.15 ± 0.70	0.16 ± 0.07	Below Release Criteria
30-118-3AS	Soil	ND	1.31 ± 0.14	1.98 ± 0.46	3.26	2.44 ± 1.04	0.12 ± 0.08	Below Release Criteria
B30-118-3B	Rebar	0.23 ± 0.08	0.54 ± 0.31	0.82 ± 0.33	1.37	2.67 ± 2.99	ND	Below Release Criteria
30C-118#1	Concrete	ND	1.45 ± 0.57	2.78 ± 2.01	4.23	3.17 ± 2.5	ND	Below Release Criteria
30C-118#2	Concrete	ND	1.52 ± 0.64	4.76 ± 2.07	6.28	6.82 ± 3.9	ND	Below Release Criteria
30C-118#3	Concrete	ND	1.36 ± 0.59	4.66 ± 2.21	6.03	ND	0.72 ± 0.56	Below Release Criteria

TABLE 4: Building 30/31 Phase IV Gamma Spectroscopy Results of Soil, Concrete, and Rebar Samples								
Sample ID	Sample Type	Radionuclide Concentration (pCi/g) - Results ± 2σ Background Not Subtracted- 30 minute count						Evaluation and Comments
		^{60}Co 1173 keV	^{228}Th 238 keV (^{212}Pb)	^{232}Th 911 keV (^{228}Ac)	^{total}Th ^{228}Th + ^{232}Th	^{238}U 63(92.77)keV	^{235}U 186(144) keV	
30C-118#4	Concrete	ND	1.83 ± 0.57	4.58 ± 2.65	6.41	ND	0.43 ± 0.36	Below Release Criteria
30-118	Rebar	1.35 ± 0.63	1.34 ± 0.66	4.01 ± 2.66	5.35	ND	ND	Below Release Criteria
Post Decontamination Sample Results								
B30-118 #1 Concrete	Rubble from decontaminated area	ND	1.01 ± 0.11	1.33 ± 0.32	2.34	1.54 ± 1.06	0.17 ± 0.09	Below Release Criteria
B30-118 #2 Concrete	Rubble from decontaminated area	ND	1.09 ± 0.12	1.84 ± 0.30	2.92	1.67 ± 1.50	0.13 ± 0.10	Below Release Criteria
B30-118 Rebar Composite	all 4 rebar pieces counted together for 2 hours	0.50 ± 0.31	0.43 ± 0.14	2.05 ± 0.46	2.49	ND	ND	Below Release Criteria
Room 102A Shower Drain Line Trench Soil Sample Results								
B31-102A-Trench 1	0.09 ± 0.05	ND	1.03 ± 0.28	1.03 ± 0.27	2.06	1.62 ± 1.26	0.13 ± 0.06	Below Release Criteria
B31-102A-Trench 2	ND	ND	1.13 ± 0.23	1.24 ± 0.29	2.37	0.88 ± 0.76	0.09 ± 0.07	Below Release Criteria
B31-102A-Trench 3	ND	ND	1.06 ± 0.24	1.04 ± 0.25	2.10	1.53 ± 1.12	0.19 ± 0.07	Below Release Criteria
B31-102A-Trench 4	ND	ND	0.86 ± 0.13	0.97 ± 0.25	1.83	1.09 ± 1.08	0.07 ± 0.08	Below Release Criteria

Notes: 1. ND means not detected.

2. Average Minimum Detectable Activities (MDA's) for soil samples counted for 30 minutes:

Cs-137= 0.13 pCi/g (662 keV peak)	Th-232 = 0.43 pCi/g (911 keV peak)
Co-60 = 0.16 pCi/g (1173 keV peak)	U-238 = 1.58 pCi/g (63 keV peak)
Th-228 = 0.21 pCi/g (238 keV peak)	U-235 = 0.14 pCi/g (186 keV peak)

3. Typical MDA's for new/unused rebar samples counted for 30 minutes:

Cs-137 = 0.04 pCi/g (662 keV peak)	Th 232 = 0.19 pCi/g (911 keV peak)
Co-60 = 0.04 pCi/g (1173 keV peak)	U-238 = 0.46 pCi/g (63 keV peak)
Th 228 = 0.07 pCi/g (238 keV peak)	U-235 = 0.05 pCi/g (186 keV peak)

4. Typical MDA's for concrete counted for 30 minutes:August 4, 2005

Cs-137 = 0.24 pCi/g (662 keV peak)	Th 232 = 1.49 pCi/g (911 keV peak)
Co-60 = 0.27 pCi/g (1173 keV peak)	U-238 = 1.98 pCi/g (63 keV peak)
Th 228 = 0.34 pCi/g (238 keV peak)	U-235 = 0.26 pCi/g (186 keV peak)August 4, 2005

Table 5: General Atomics' Gamma Spectroscopy Results of Background Surface Soil Samples

September 24, 2002

Energy Peaks →	^{137}Cs 661.6 keV	^{60}Co 1173 keV	^{228}Th 238 keV (^{212}Pb)	^{228}Ra (^{232}Th) 911 keV (^{228}Ac)	(Total) Th $^{228}Th + ^{232}Th$	^{238}U 63.3 (92.7) keV (^{234}Th)	^{235}U 144 (186) keV
Sample ID ↓	*Radionuclide Concentrations (pCi/g) - Results ± 2σ - 30 Minute Counts*						
Samples collected June, 2000 Re- analyzed November, 2001							
X-1	ND[1]	ND	0.49 ± 0.15	1.25 ± 0.34	1.74 ± 0.48	ND	ND
X-2	ND	ND	0.91 ± 0.23	0.91 ± 0.23	1.81 ± 0.46	1.17 ± 1.13	(0.09 ± 0.05)
X-3	ND	ND	1.40 ± 0.27	1.79 ± 0.37	3.19 ± 0.63	1.51 ± 1.20	(0.09 ± 0.09)
X-4	0.08 ± 0.07	ND	1.71 ± 0.31	2.08 ± 0.47	3.78 ± 0.78	ND	(0.18 ± 0.13)
X-5	ND	ND	1.52 ± 0.29	2.83 ± 0.70	4.35 ± 0.99	ND	(0.20 ± 0.15)
X-6	ND	ND	1.14 ± 0.32	1.12 ± 0.26	2.25 ± 0.58	ND	(0.09 ± 0.05)
X-7	0.11 ± 0.07	ND	1.68 ± 0.24	2.18 ± 0.47	3.86 ± 0.71	ND	(0.22 ± 0.10)
X-8	ND	ND	2.32 ± 0.38	2.14 ± 0.54	4.45 ± 0.92	ND	(0.26 ± 0.14)
X-9	ND	ND	0.61 ± 0.15	1.59 ± 0.42	2.20 ± 0.57	ND	ND
X-10	0.09 ± 0.06	ND	1.59 ± 0.26	1.39 ± 0.36	2.98 ± 0.61	0.75 ± 1.22	(0.13 ± 0.07)
Samples collected and analyzed September, 2002							
X-11	0.23 ± 0.07	ND	1.37 ± 0.29	1.71 ± 0.37	3.07 ± 0.66	1.13 ± 1.30	(0.25 ± 0.11)
X-12	0.31 ± 0.08	ND	0.50 ± 0.08	0.65 ± 0.18	1.14 ± 0.26	ND	(0.11 ± 0.07)
X-13	ND	ND	0.95 ± 0.20	1.13 ± 0.23	2.08 ± 0.43	1.29 ± 0.99	(0.14 ± 0.05)

[1] ND = Energy peak not identified

Table 5: General Atomics' Gamma Spectroscopy Results of Background Surface Soil Samples September 24, 2002							
Energy Peaks →	^{137}Cs 661.6 keV	^{60}Co 1173 keV	^{228}Th 238 keV (^{212}Pb)	^{228}Ra (^{232}Th) 911 keV (^{228}Ac)	(Total) Th $^{228}Th + ^{232}Th$	^{238}U 63.3 (92.7) keV (^{234}Th)	^{235}U 144 (186) keV
Sample ID ↓	*Radionuclide Concentrations (ρCi/g) - Results ± 2σ - 30 Minute Counts*						
X-14	ND	ND	1.42 ± 0.19	1.59 ± 0.29	3.01 ± 0.48	0.67 ± 0.71	(0.11 ± 0.05)
X-15	ND	ND	0.37 ± 0.09	0.56 ± 0.16	0.92 ± 0.25	0.50 ± 0.66	(0.04 ± 0.04)
X-16	0.06 ± 0.03	ND	0.97 ± 0.22	1.15 ± 0.23	2.12 ± 0.45	ND	(0.10 ± 0.05)
X-17	ND	ND	0.80 ± 0.12	0.96 ± 0.40	1.76 ± 0.52	ND	ND
X-18	0.25 ± 0.07	ND	0.77 ± 0.21	0.94 ± 0.24	1.71 ± 0.45	0.92 ± 0.94	(0.13 ± 0.08)
X-19	ND	ND	0.72 ± 0.12	0.68 ± 0.23	1.40 ± 0.35	ND	(0.11 ± 0.07)
X-20	ND	ND	1.42 ± 0.17	1.40 ± 0.27	2.82 ± 0.45	ND	(0.20 ± 0.09)
X-21	ND	ND	1.51 ± 0.32	1.48 ± 0.30	2.99 ± 0.62	2.47 ± 1.71	0.26 ± 0.23
X-22	0.07 ± 0.05	ND	0.85 ± 0.12	0.98 ± 0.29	1.83 ± 0.41	ND	(0.10 ± 0.08)
X-23	ND	ND	1.17 ± 0.15	1.33 ± 0.28	2.50 ± 0.42	ND	(0.10 ± 0.05)
X-24	ND	ND	2.03 ± 0.26	1.70 ± 0.33	3.73 ± 0.59	1.75 ± 1.37	(0.17 ± 0.06)
X-25	ND	ND	1.44 ± 0.29	1.36 ± 0.28	2.80 ± 0.57	1.52 ± 1.26	(0.19 ± 0.08)
X-26	ND	ND	1.81 ± 0.24	1.41 ± 0.31	3.22 ± 0.54	0.68 ± 0.96	(0.13 ± 0.06)
X-27	ND	ND	1.65 ± 0.20	2.00 ± 0.34	3.65 ± 0.54	ND	(0.15 ± 0.07)
X-28	ND	ND	1.40 ± 0.20	1.47 ± 0.33	2.87 ± 0.54	1.35 ± 1.03	(0.28 ± 0.07)
X-29	0.01 ± 0.07	ND	0.81 ± 0.17	1.61 ± 0.34	2.42 ± 0.51	ND	(0.09 ± 0.06)
X-30	ND	ND	1.90 ± 0.22	1.88 ± 0.33	3.79 ± 0.55	2.67 ± 1.79	(0.35 ± 0.11)

Table 5 (continued): General Atomics Gamma Spectroscopy Results of Background Surface Soil Samples

September 24, 2002

Sample Locations:

X1	Sorrento Valley Road near sample location ST65 on the hillside ~1 mile from Building 37.
X2	Sorrento Valley Road near Carmel Mountain Road junction on steep cliff.
X3	Sorrento Valley Road in Los Penasquitos Preserve ~2 miles from Building 37.
X4	Sorrento Valley Court at the end of the road in the field.
X5	Roselle Street, East of sample location ST64 ~ ½ mile from Building 37 (collected on the hillside)
X6	Roselle Street, East of sample location ST64 ~1 ½ mile from Building 37 (collected on hillside).
X7	Lusk Boulevard, from the hillside ~ 1 ½ miles from Building 37 (collected on the hillside).
X8	Vista Sorrento Parkway, ~ ½ mile from Building 37 (collected on the hillside).
X9	Callahan Road, ~ ½ mile from Building 37 (collected on the hillside).
X10	Eastgate Mall road, ~3 miles from Building 37 (collected in a field).
X11	Creek Road (North County).
X12	Canyon de Oro (North County).
X13	Palomar (North E County).
X14	Deer Springs Rd. (North County).
X15	Rice Canyon Rd. (North County).
X16	Las Pulgas Rd. (North County).
X17	Boderfield Park (South W County).
X18	Otay Mesa (South E County).
X19	Sunset Cliff (South W County).
X20	Marion Bear Park (South County).
X21	Mission Valley (South County).
X22	Santee (South E County)
X23	Ramona (East County).
X24	Via Abitura (San Diego).
X25	Black Mtn. Park (San Diego).
X26	Park Village (San Diego).
X27	Harris Plant Rd. (San Diego).
X28	Daley Center Dr. (San Diego).
X29	Harbison Canyon (East County).
X30	Apple St. (East San Diego).

Table 6: Wipe Results for Building 30/31 Phase IV					
Room 100			Room 103 Front Hallway		
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
1	<20	<20	1	<20	<20
2	<20	<20	2	<20	<20
3	<20	<20	3	<20	<20
4	<20	<20	4	<20	<20
5	<20	<20	5	<20	<20
6	<20	<20	6	<20	<20
7	<20	<20	7	<20	<20
8	<20	<20	8	<20	<20
9	<20	<20	9	<20	<20
10	<20	<20	10	<20	<20
11	<20	<20	11	<20	<20
12	<20	<20	12	<20	<20
13	<20	<20	13	<20	<20
14	<20	<20	14	<20	<20
15	<20	<20	15	<20	<20
16	<20	<20	16	<20	<20
17	<20	<20	17	<20	<20
18	<20	<20	18	<20	<20
19	<20	<20	19	<20	<20
20	<20	<20	20	<20	<20
Room 102, 102a and Former Hallway			21	<20	<20
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	22	<20	<20
1	<20	<20	23	<20	<20
1a	<20	<20	24	<20	<20

Table 6: Wipe Results for Building 30/31 Phase IV (Cont.)					
Room 102, 102a and Former Hallway (cont)			Room 103 Front Hallway (Cont.)		
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
2	<20	<20	25	<20	<20
2a	<20	<20	26	<20	<20
3	<20	<20	Room 103 Catwalk		
4	<20	<20	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
5	<20	<20	1	<20	<20
6	<20	<20	2	<20	<20
6a	<20	<20	3	<20	<20
7	<20	<20	4	<20	<20
7a	<20	<20	5	<20	<20
8	<20	<20	6	<20	<20
9	<20	<20	7	<20	<20
10	<20	<20	8	<20	<20
10a	<20	<20	9	<20	<20
11	<20	<20	10	<20	<20
12	<20	<20	11	<20	<20
13	Wall Removed		12	<20	<20
14	Wall Removed		13	<20	<20
15	<20	<20	14	<20	<20
16	<20	<20	15	<20	<20
17	<20	<20	16	<20	<20
18	<20	<20	Room 103 Crane		
19	<20	<20	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
20	<20	<20	1	<20	<20
21	<20	<20	2	<20	<20
22	<20	<20	3	<20	<20

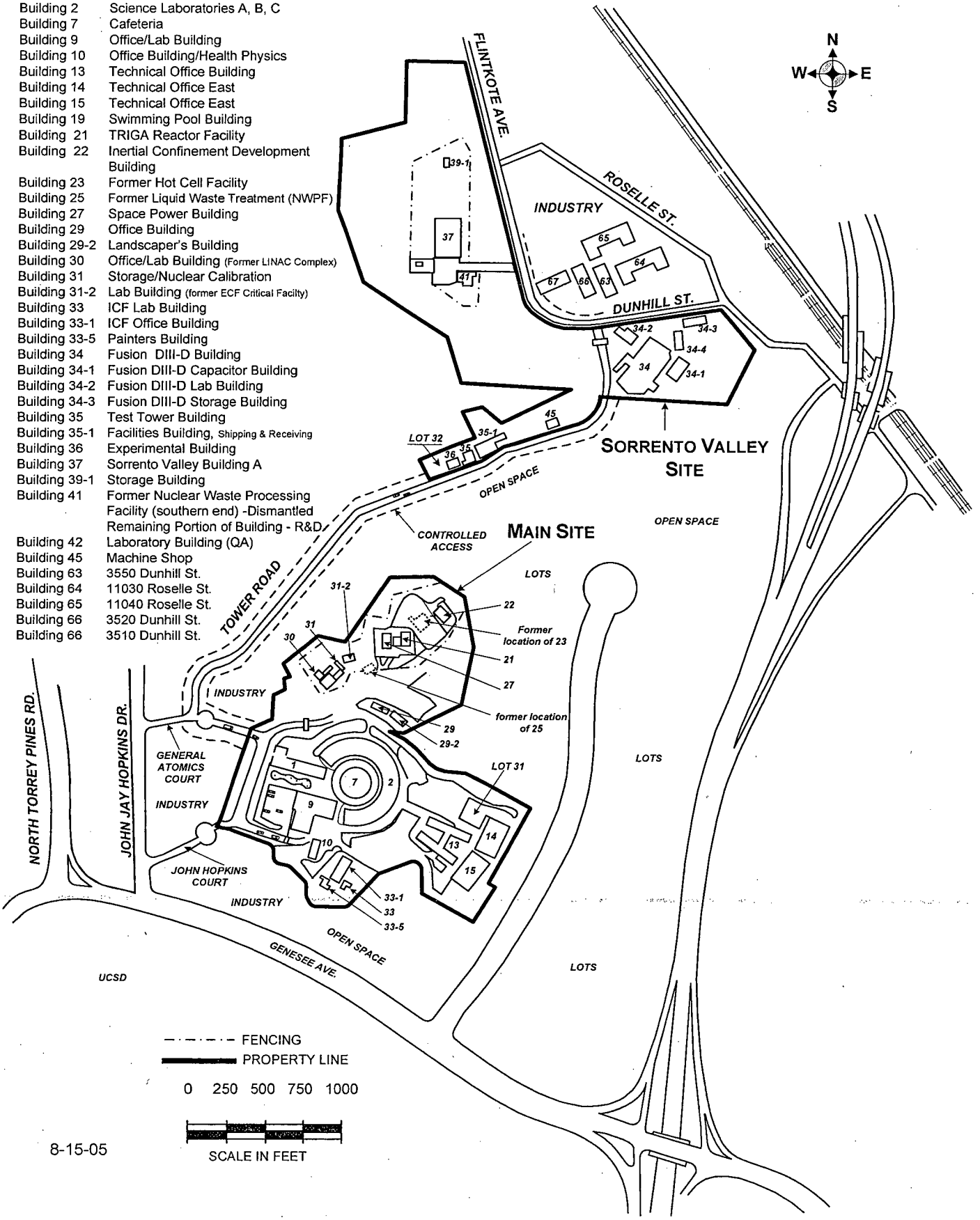
Table 6: Wipe Results for Building 30/31 Phase IV (Cont.)					
Room 102, 102a and Former Hallway (cont)			**Room 103 Crane (cont)**		
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
23	<20	<20	4	<20	<20
24	<20	<20	5	<20	<20
25	<20	<20	6	<20	<20
Room 103			7	<20	<20
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	8	<20	<20
1	<20	<20	9	<20	<20
2	<20	<20	7	<20	<20
3	<20	<20	8	<20	<20
4	<20	<20	9	<20	<20
5	<20	<20	10	<20	<20
6	<20	<20	11	<20	<20
7	<20	<20	12	<20	<20
8	<20	<20	13	<20	<20
9	<20	<20	14	<20	<20
10	<20	<20	15	<20	<20
11	<20	<20	**Room 118**		
12	<20	<20	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
Room 103 Stairway			1	<20	<20
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	2	<20	<20
1	<20	<20	3	<20	<20
2	<20	<20	4	<20	<20
3	<20	<20	5	<20	<20
4	<20	<20	6	<20	<20
5	<20	<20	7	<20	<20
6	<20	<20	8	<20	<20

Table 6: Wipe Results for Building 30/31 Phase IV (Cont.)					
Room 103 Stairway (Cont.)			Room 118 (Cont.)		
Wipe No.	α dpm/100 cm²	β dpm/100 cm²	Wipe No.	α dpm/100 cm²	β dpm/100 cm²
7	<20	<20	9	<20	<20
8	<20	<20	10	<20	<20
9	<20	<20	11	<20	<20
10	<20	<20	12	<20	<20
11	<20	<20	13	<20	<20
12	<20	<20	14	<20	<20
13	<20	<20	15	<20	<20
14	<20	<20	16	<20	<20
15	<20	<20	17	<20	<20
16	<20	<20	18	<20	<20
17	<20	<20	19	<20	<20
18	<20	<20	20	<20	<20
19	<20	<20			

Building Numbers Names

Building 1	Administration
Building 2	Science Laboratories A, B, C
Building 7	Cafeteria
Building 9	Office/Lab Building
Building 10	Office Building/Health Physics
Building 13	Technical Office Building
Building 14	Technical Office East
Building 15	Technical Office East
Building 19	Swimming Pool Building
Building 21	TRIGA Reactor Facility
Building 22	Inertial Confinement Development Building
Building 23	Former Hot Cell Facility
Building 25	Former Liquid Waste Treatment (NWPF)
Building 27	Space Power Building
Building 29	Office Building
Building 29-2	Landscaper's Building
Building 30	Office/Lab Building (Former LINAC Complex)
Building 31	Storage/Nuclear Calibration
Building 31-2	Lab Building (former ECF Critical Facilty)
Building 33	ICF Lab Building
Building 33-1	ICF Office Building
Building 33-5	Painters Building
Building 34	Fusion DIII-D Building
Building 34-1	Fusion DIII-D Capacitor Building
Building 34-2	Fusion DIII-D Lab Building
Building 34-3	Fusion DIII-D Storage Building
Building 35	Test Tower Building
Building 35-1	Facilities Building, Shipping & Receiving
Building 36	Experimental Building
Building 37	Sorrento Valley Building A
Building 39-1	Storage Building
Building 41	Former Nuclear Waste Processing Facility (southern end) -Dismantled Remaining Portion of Building - R&D
Building 42	Laboratory Building (QA)
Building 45	Machine Shop
Building 63	3550 Dunhill St.
Building 64	11030 Roselle St.
Building 65	11040 Roselle St.
Building 66	3520 Dunhill St.
Building 66	3510 Dunhill St.

Figure 1A: GA's Main Site and Sorrento Valley Site



8-15-05

Figure 1B: Torrey Pines (Main) Site Land Areas

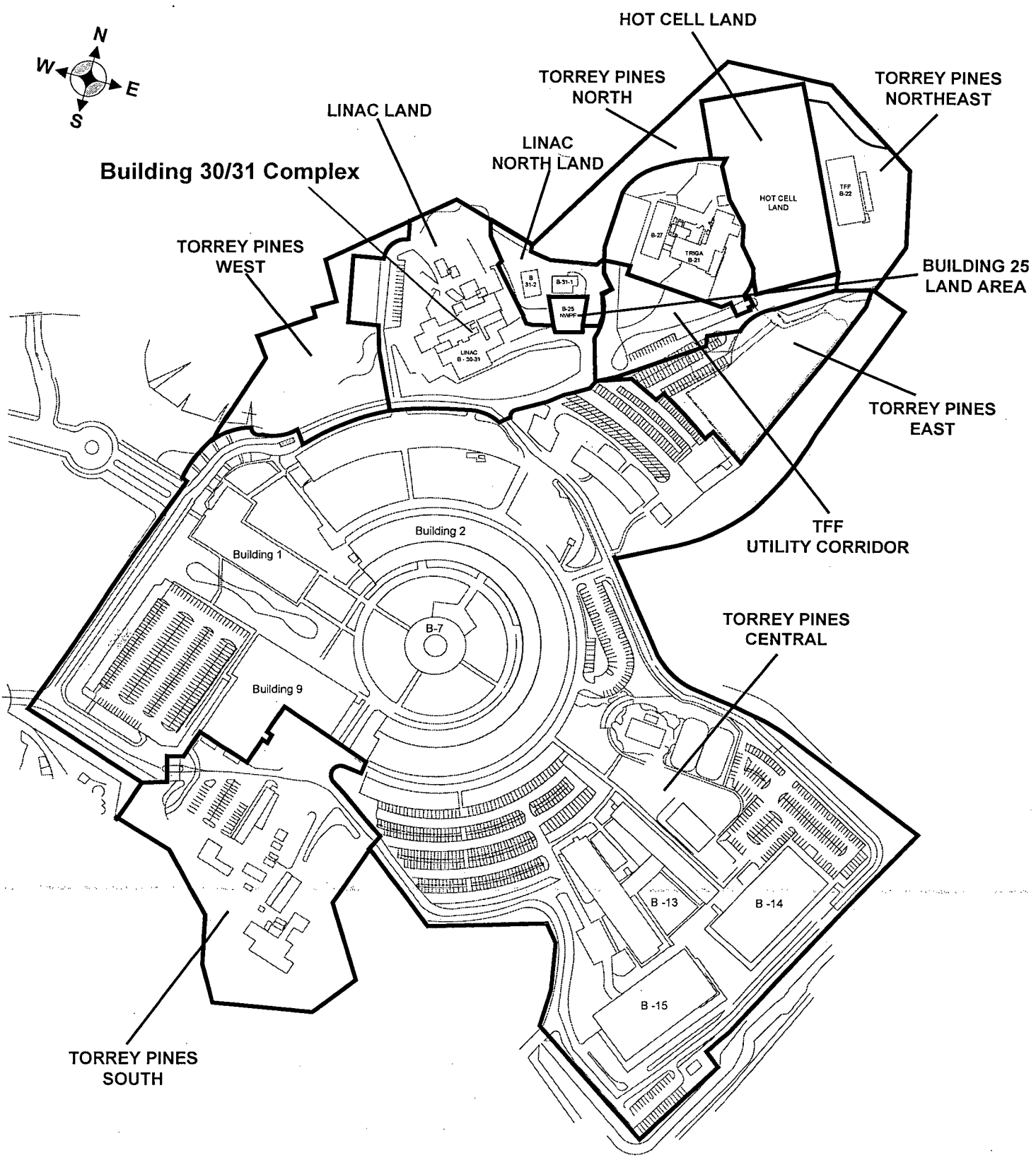
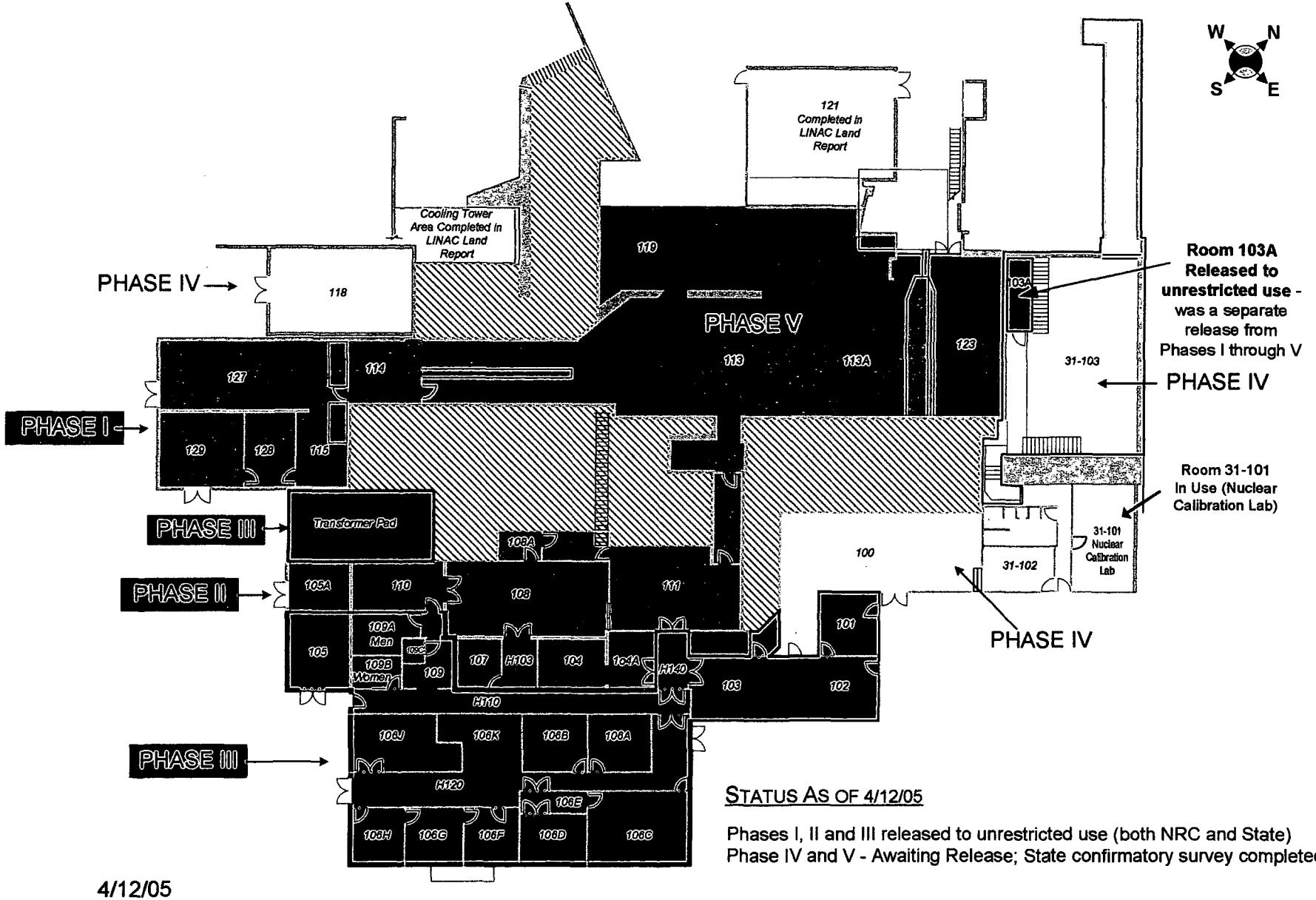


Figure 1C: Building 30/31 LINAC Complex PHASES I, II, III, IV, V



STATUS AS OF 4/12/05

Phases I, II and III released to unrestricted use (both NRC and State)
Phase IV and V - Awaiting Release; State confirmatory survey completed.

4/12/05

Figure 2: Building 30/31 Phase IV. Rooms

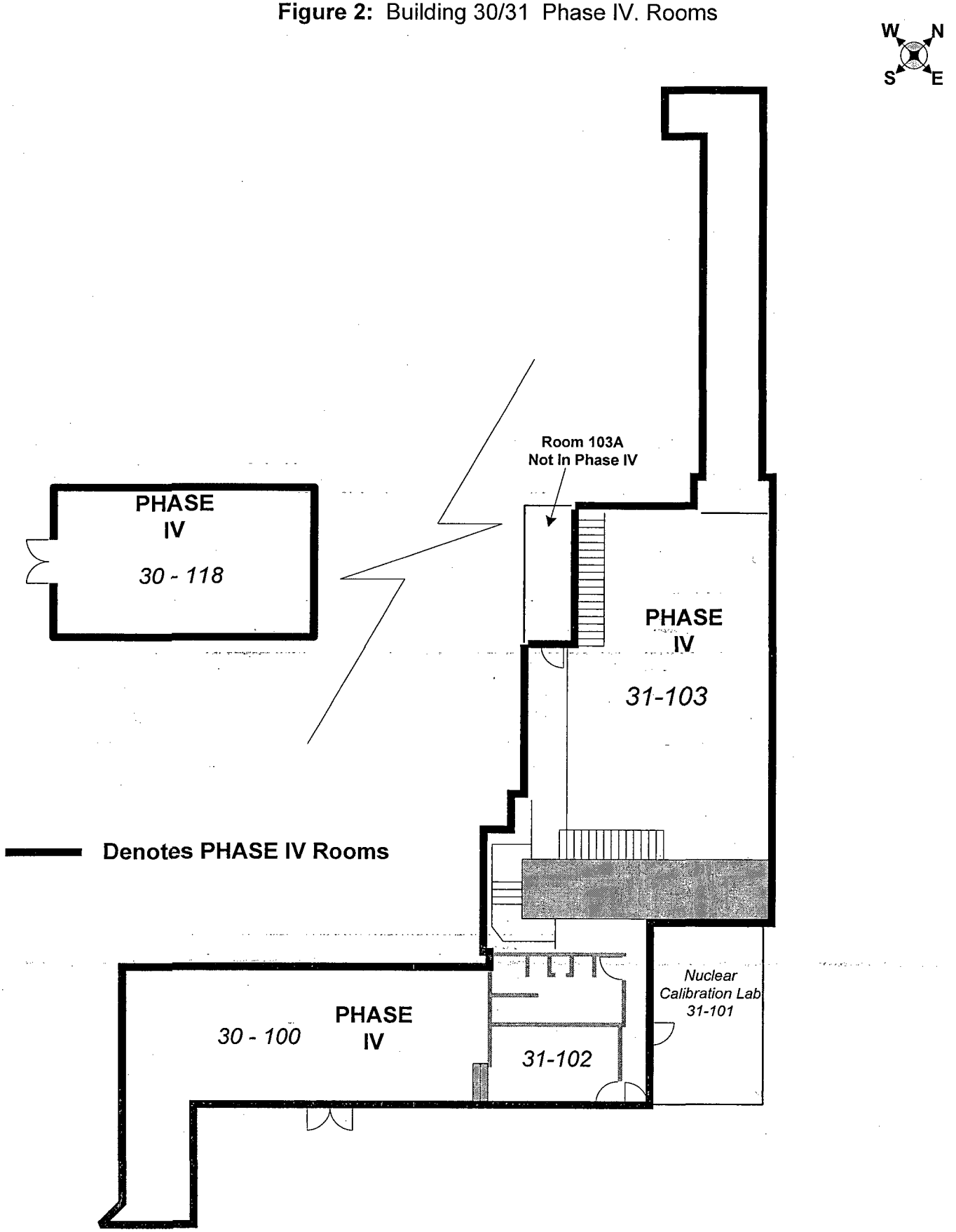


Figure 3A: Dimensions of Building 30/31 - Phase IV Rooms

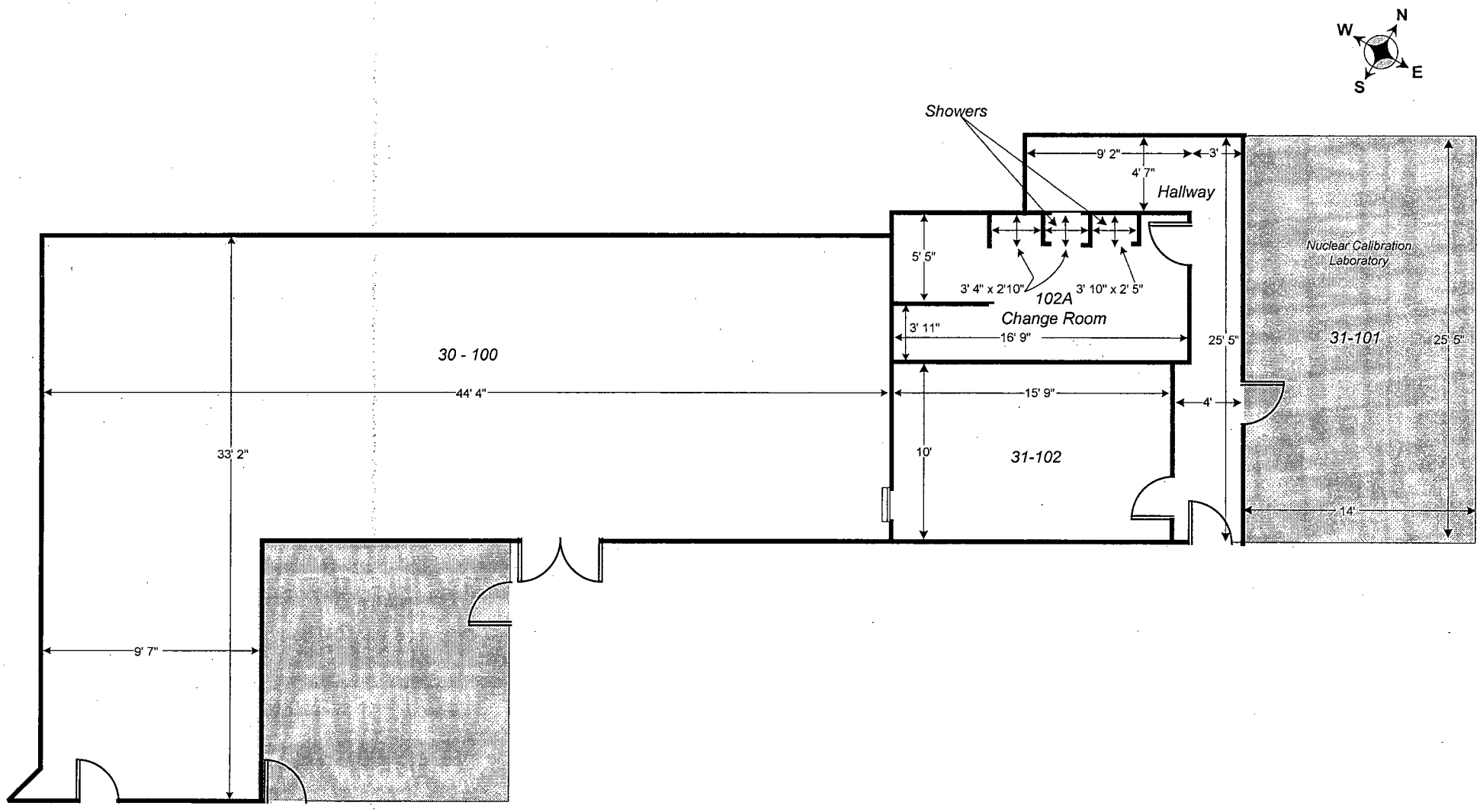
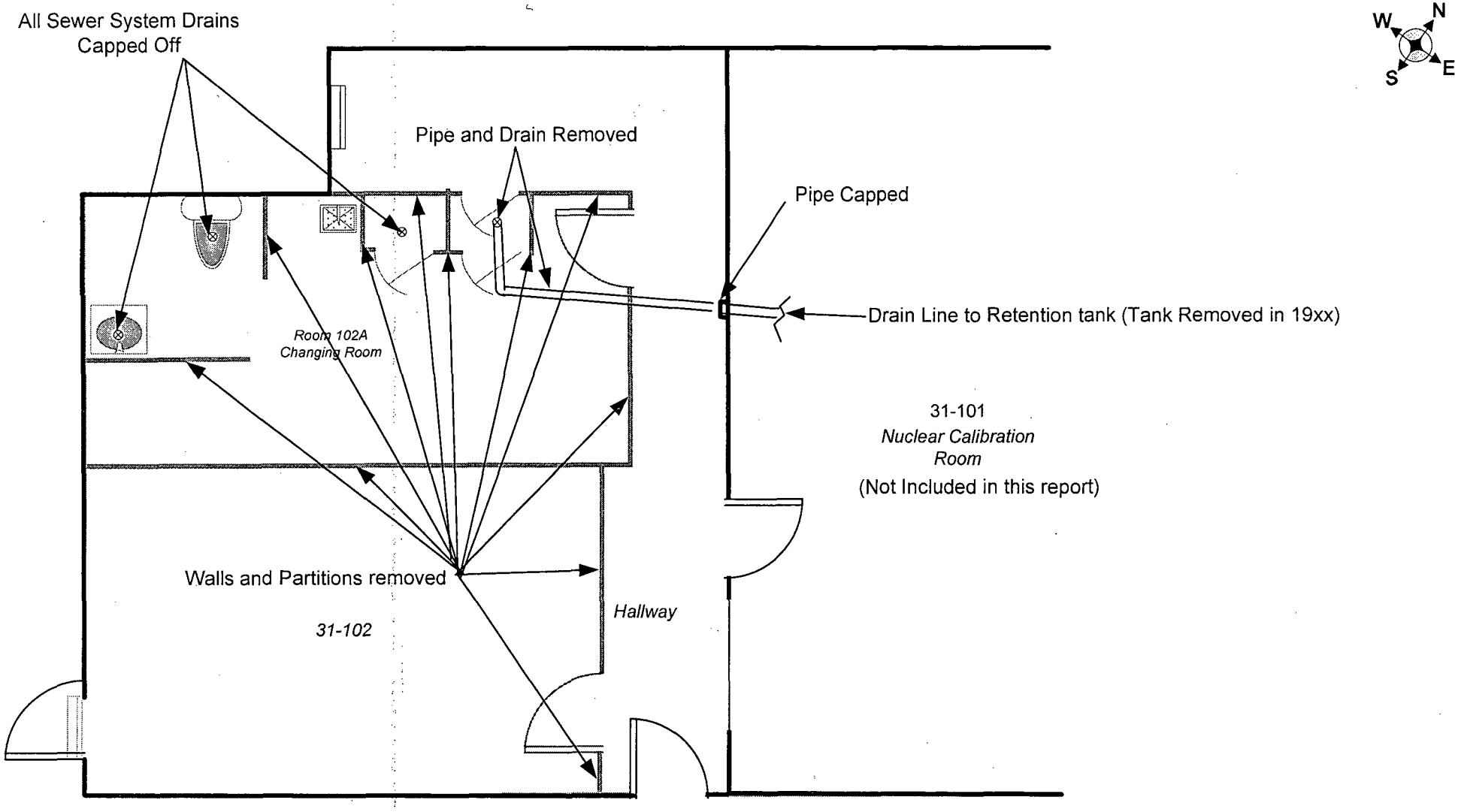


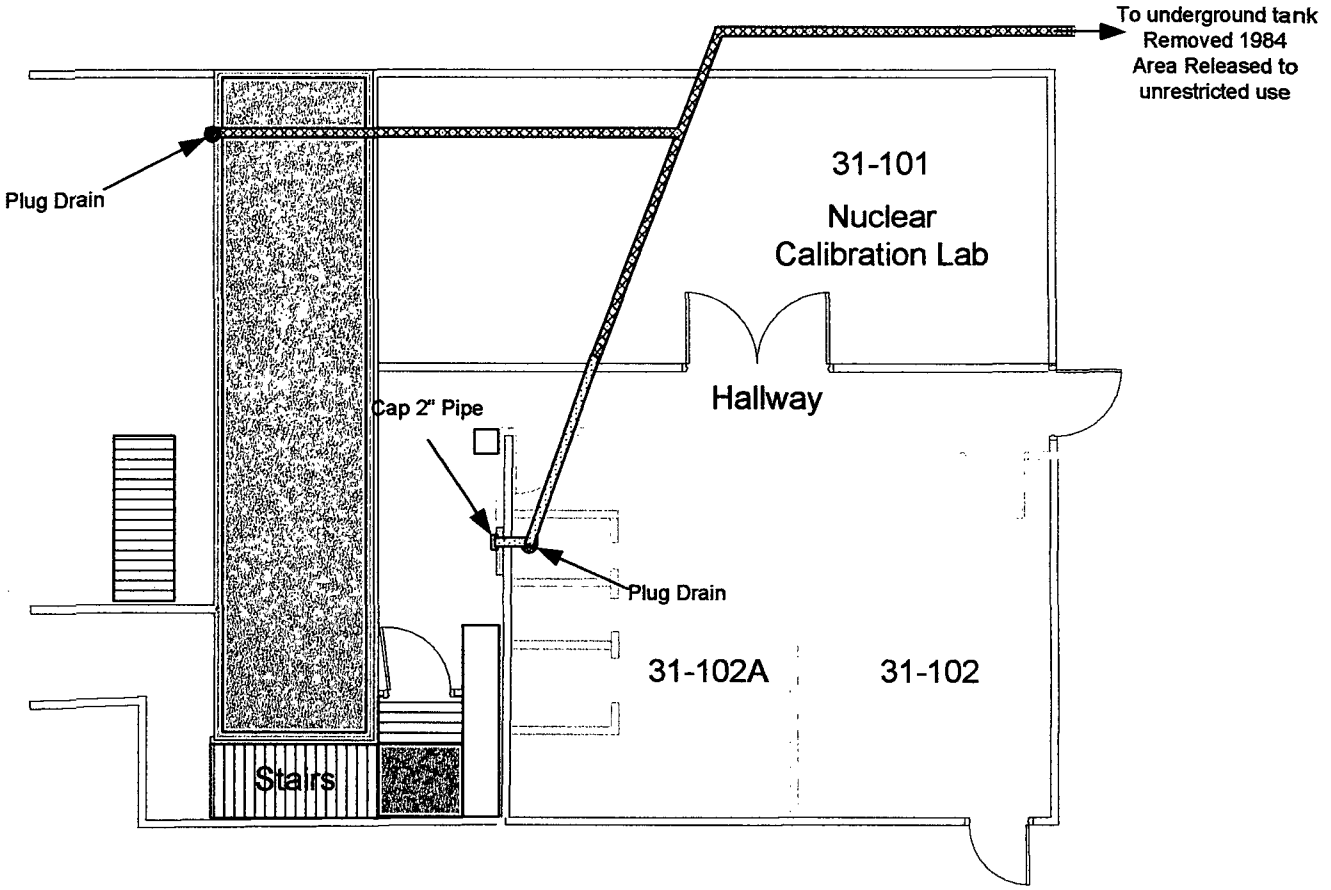
Figure 3B: Internal Walls and Ceilings removed and Drain Line Excavation -Building 30, Phase IV,



Notes: All "ghosted" interior walls and bathroom fixtures removed.

All Tile Removed From Room 102A and Disposed of as Low Level Radioactive Waste.

Figure 3C: Building 31 Drain Line Modification



Portion of drain line removed August 2004

Remaining drain line as of October 2005

Bldg 31 - Drain Modification 8/9/84
(Facilities Drawing Z-22-1)
HP Revised 10/21/05

Figure 4: Building 31, Room 103 Former S-1 NMA Storage

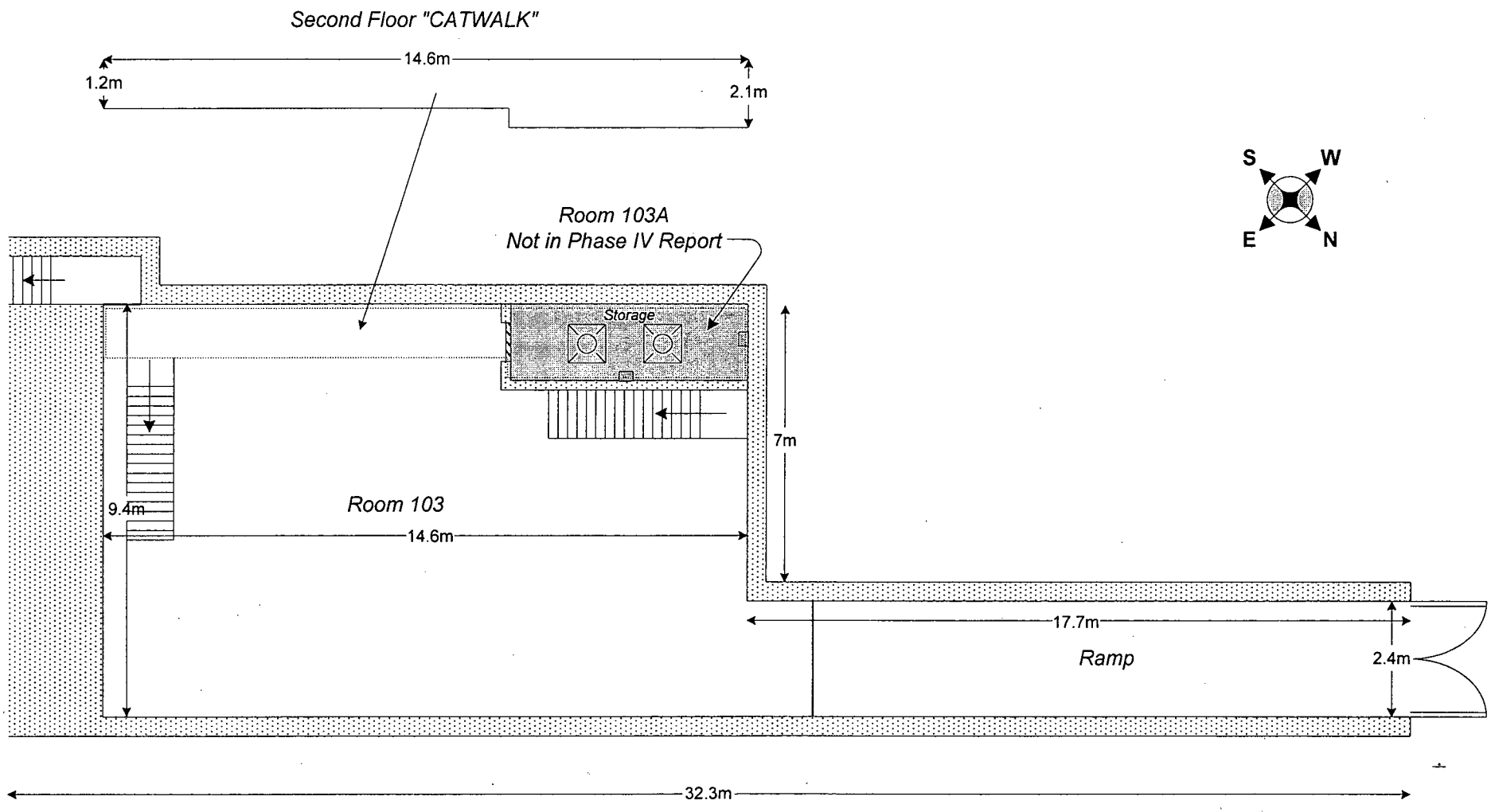
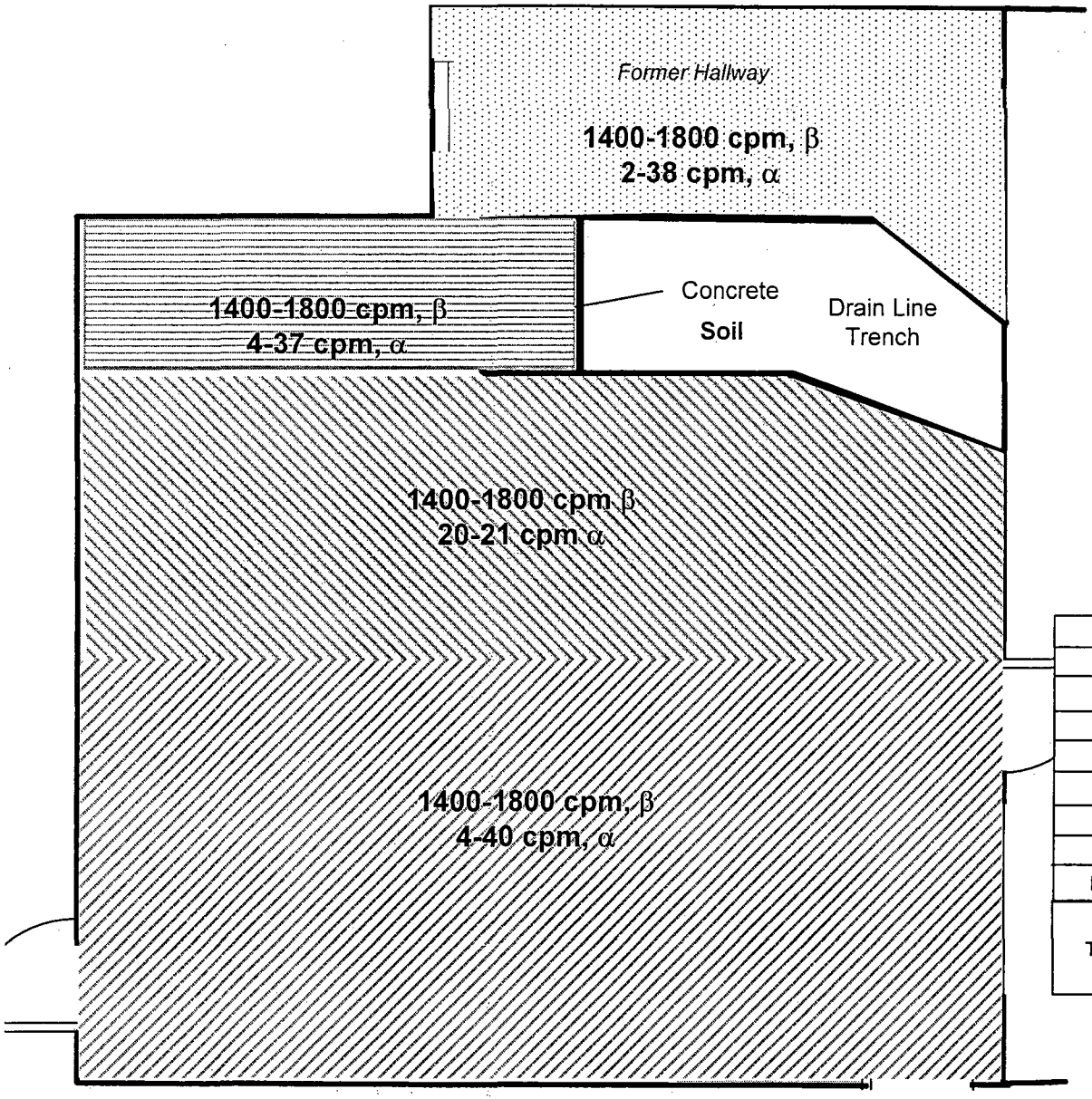
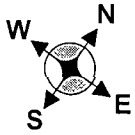


Figure 5: Building 30/31, Phase IV, Rooms 102, 102a and Former Hallway, Alpha and Beta Floor Scan Survey Locations and Results



Drawing NOT to scale.



100% of shaded areas scanned with detectors positioned within 1" of the surface.

Building 30/31 Phase IV		
Instument	Ludlum Model-2221	Ludlum Model 2221
Serial Number	154202	84459
Calibration Due Date	08/18/04	08/06/04
Efficiency	34.36%	22.14%
α β γ	β	α
Probe Number	149017	08621
Probe Size	434 cm^2	434 cm^2
Background, Concrete	1655-1830 cpm	20-40 cpm
Technician(s): S. Cowan/ J. Sullivan		Date: 07/11/04

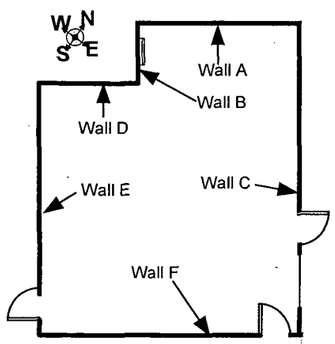
Scan MDA Data		
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$	
X	0.3 (β)	4.0 (α)
Scan MDA (dpm/100 cm^2)	351(β)	125 (α)

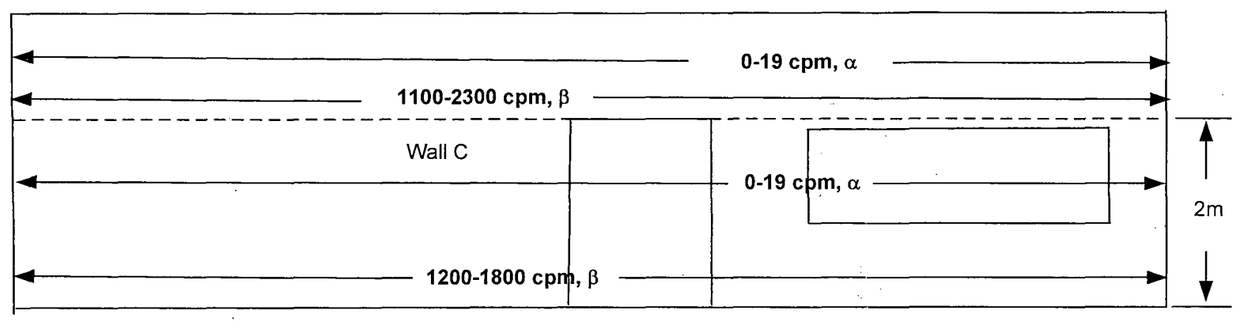
Figure 6: Building 30/31, Phase IV, Rooms 102, 102A and Hallway, Alpha and Beta Scan Survey Locations and Results

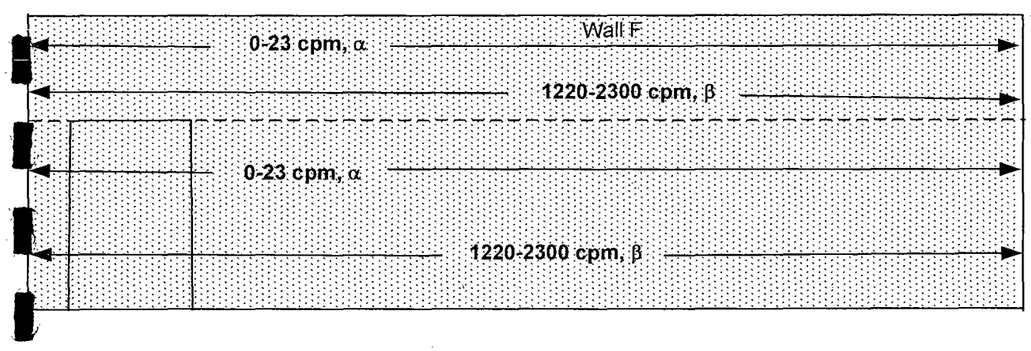
=100% of surface scanned for α & β activity below 2m, 10% of surface above 2m.

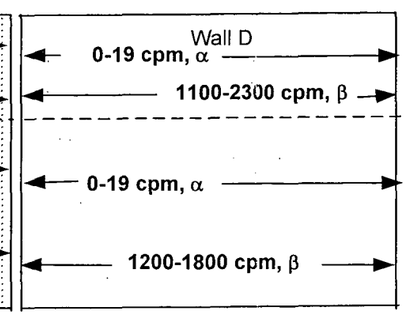
= 100% of surface below 2m scanned for β activity, 25% for α activity below 2m, 10% scanned for α & β above 2m.

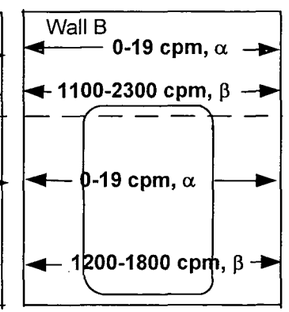
Wall C is Plaster, the remaining walls are concrete.

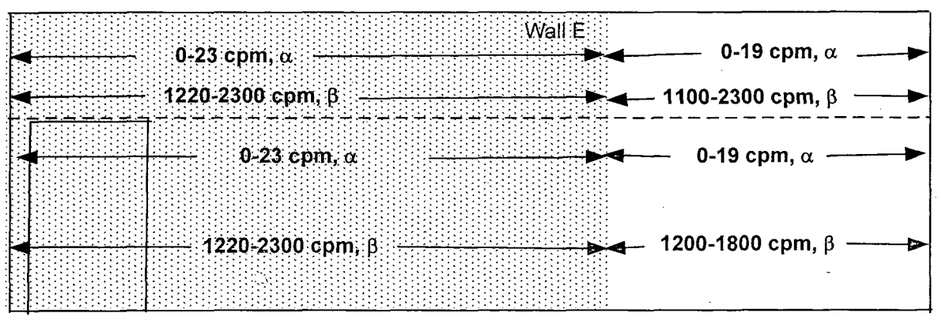


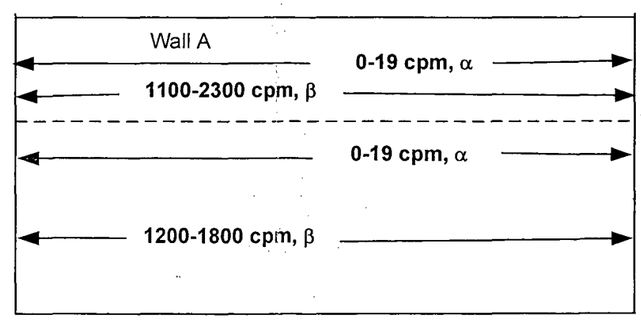








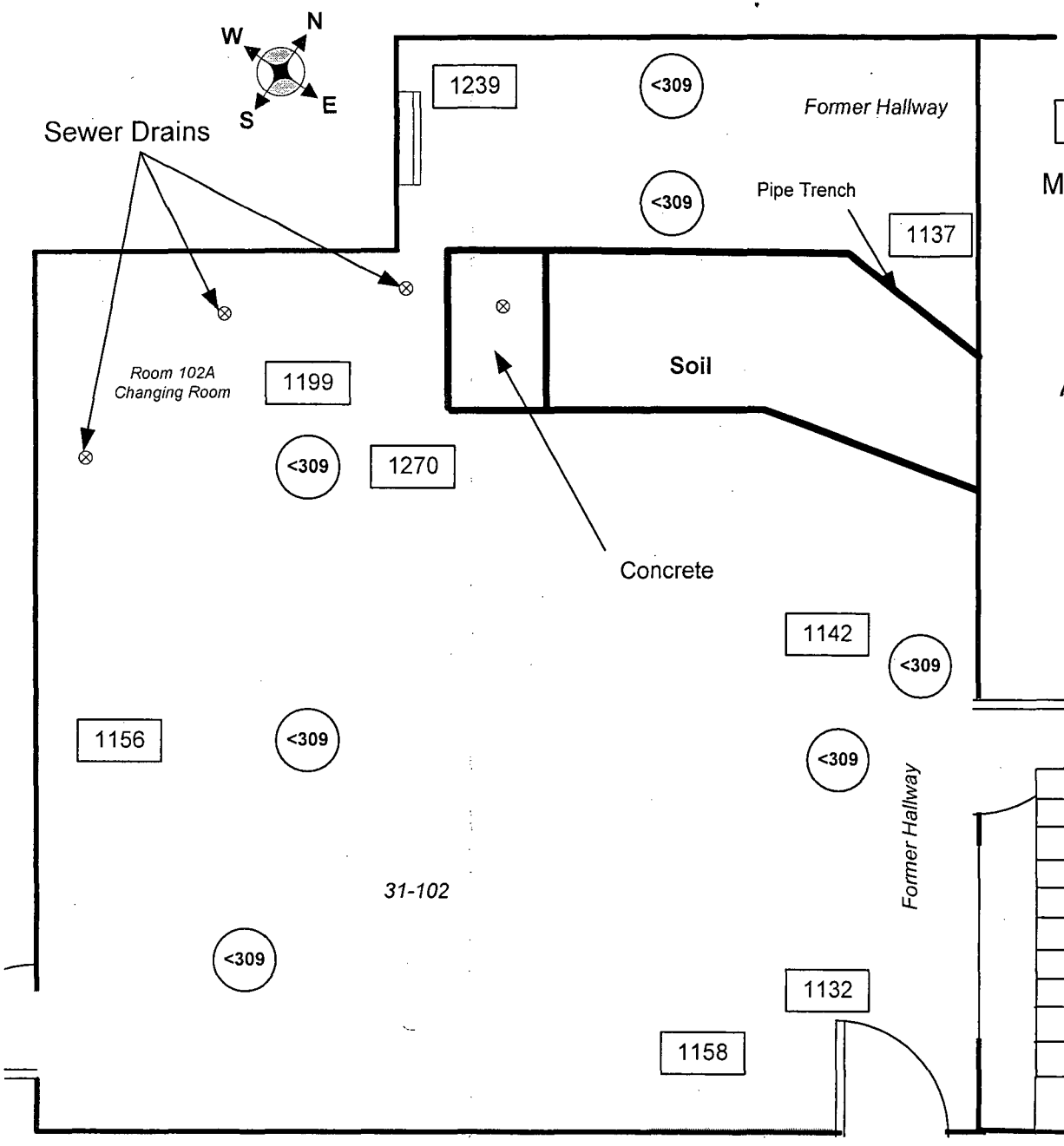




Building 30/31 Phase IV			
Instument	Ludlum Model-2221	Ludlum Model 2221	Ludlum Model 2221
Serial Number	84459	148425	84510
Calibration Due Date	09/03/01, 11/15/01	11/03/01	10/25/01
Efficiency	22.15%, 22.11%	21.29%	21.29%
α β γ	β	α	α
Probe Number	086215	086236	093601
Probe Size	434 cm^2	434 cm^2	434 cm^2
Background, Concrete	1858-2036 cpm	10-40 cpm	3-21 cpm
Background, Plaster	1083-1250 cpm	0-20 cpm	0-20 cpm
Technician(s): C. Stanley		Date: 06/22/01 & 08/09/01	

Scan MDA Data		
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm^2)	
X	0.3 (β)	4.0 (α)
MDA in dpm/100 cm^2 Concrete	608(β)	80 (α)
MDA in dpm/100 cm^2 Plaster	364(β)	43 (α)

Figure 7: Building 30/31, Phase IV, Room 102, 102A, and Former Hallway Fixed Alpha and Beta Measurement Locations and Results



= Fixed Beta Measurement in cp2m

Maximum Beta Result, 1239 cp2m, = 361 dpm/100 cm^2.

= Fixed Alpha Measurement dpm/100 cm^2.

All Alpha Results were < MDA of 309 dpm/100 cm^2

Building 30/31 Phase IV		
Instument	Ludlum Model-2221	Ludlum Model 12
Serial Number	86302	138801
Calibration Due Date	08/18/04	09/07/04
Efficiency	34.36%	22.51%
α β γ	β	α
Probe Number	142547	145696
Probe Size	100 cm^2	50 cm^2
Background, Concrete	991 cp2m	0-20 cpm
MDA, dpm/100 cm^2	217	309
Technician(s): S. Cowan/ J. Sullivan		Date: 07/02-10/04

Figure 8: Building 30/31, Phase IV, Room 102, 102A, and Former Hallway Removable Contamination (Wipe) Survey Locations and Soil Sample Locations

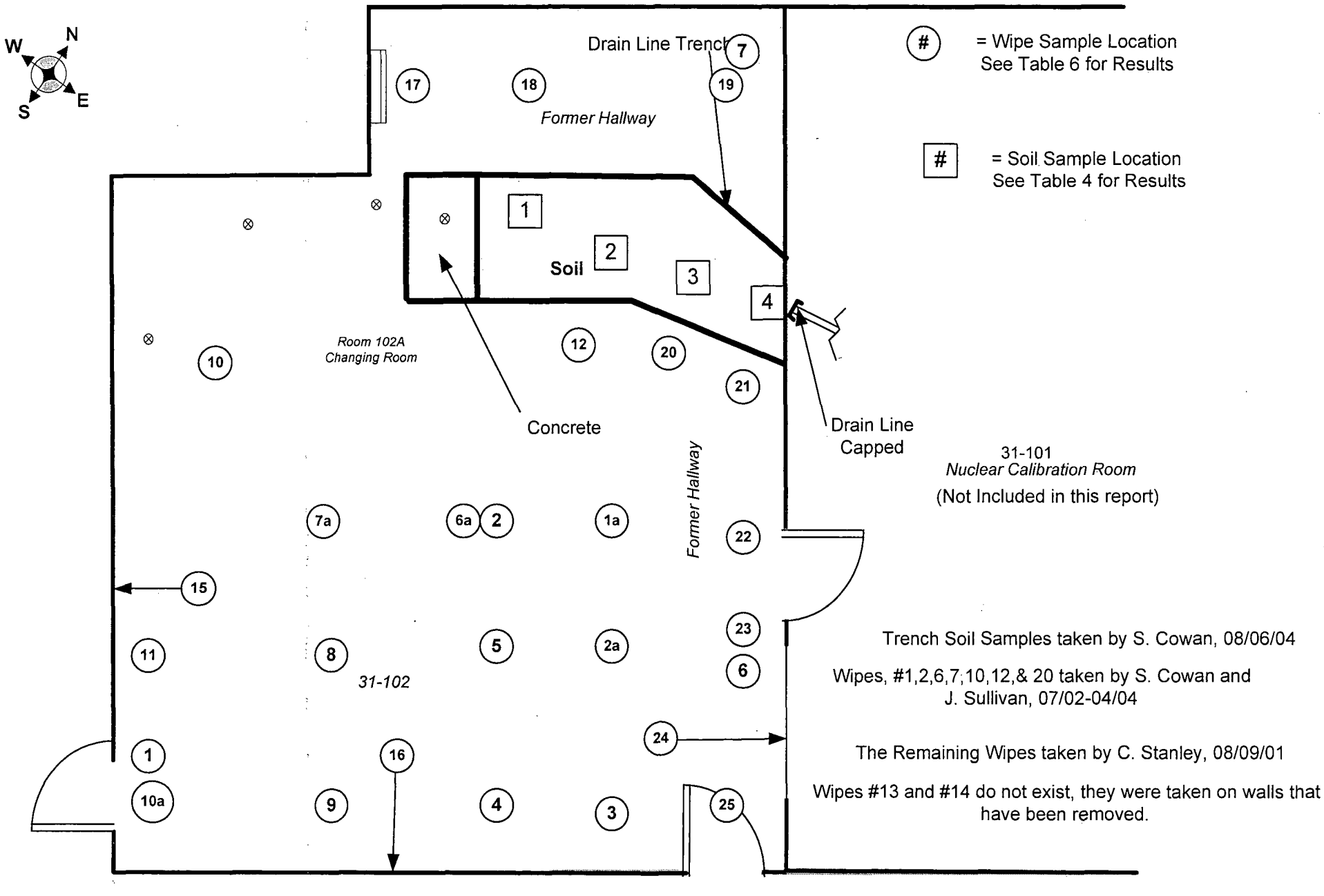
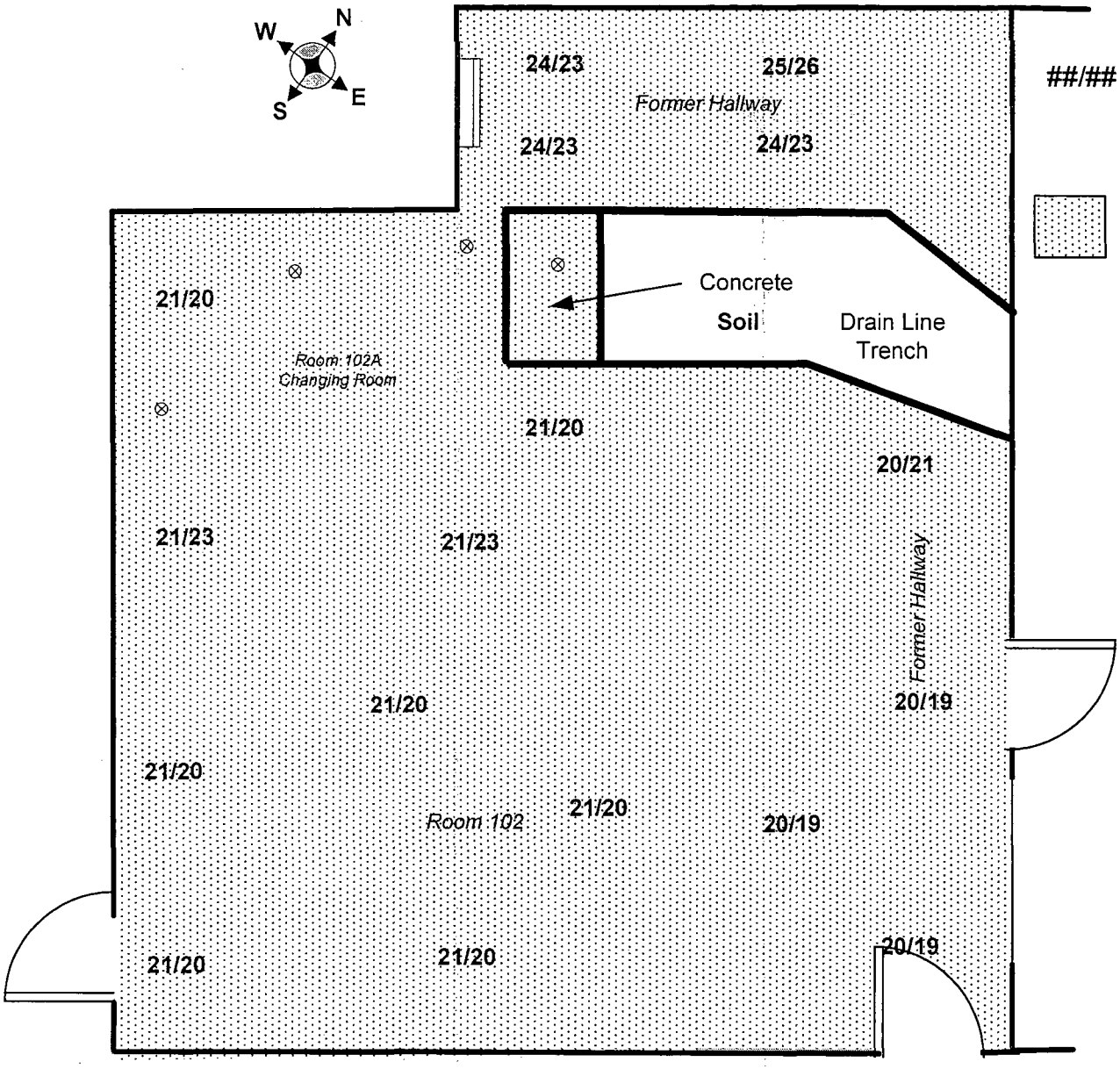


Figure 9: Building 30/31, Phase IV, Rooms 102, 102A and Former Hallway, Exposure Rate Measurement Locations and Results

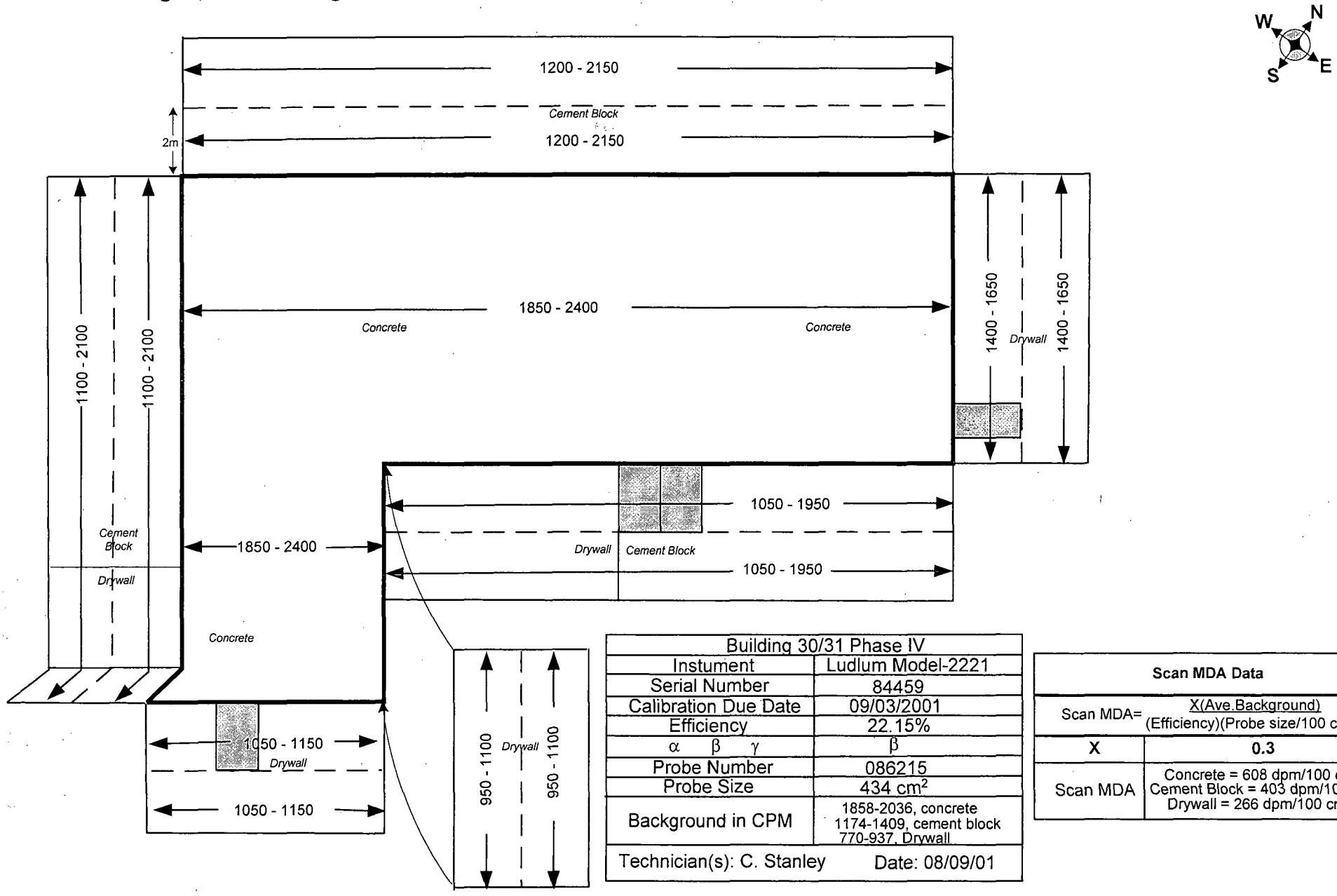


##/## = Exposure Rate at contact in μR/hr / Exposure Rate @ 1 meter in μR/hr

= Entire shaded area scanned with detector held within 1" of surface, measurement range: 19 - 22 μR/hr.

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	151348
Calibration Due Date	10/06/04
Efficiency	NA
α β γ	γ
Probe Number	163169
Probe Size	2" x 2"
Background in Concrete Rooms	23-28 μR/hr, Contact 20 - 25 μR/hr @ 1m
Technician(s): S. Cowan/ J. Sullivan	Date: 07/02-07/04

Figure 10: Building 30/31, Phase IV. Room 100, Beta Scan Survey Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	09/03/2001
Efficiency	22.15%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete 1174-1409, cement block 770-937, Drywall
Technician(s): C. Stanley	Date: 08/09/01

Scan MDA Data	
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm^2)
X	0.3
Scan MDA	Concrete = 608 dpm/100 cm^2 Cement Block = 403 dpm/100 cm^2 Drywall = 266 dpm/100 cm^2

Figure 11: Building 30/31, Phase IV, Room 103, 100% Beta Scan of Floor, Locations and Results

Range of Readings = ####-####) in cpm

Floor Surface = Concrete

100% of floor surface scanned

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	09/03/2001
Efficiency	22.15%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete 1174-1409, cement block
Technician(s): C. Stanley, W. Schuck	Date: 05/14/01

Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$
X	0.3
Scan MDA	Concrete = 608 dpm/100 cm^2 Cement Block = 403 dpm/100 cm^2

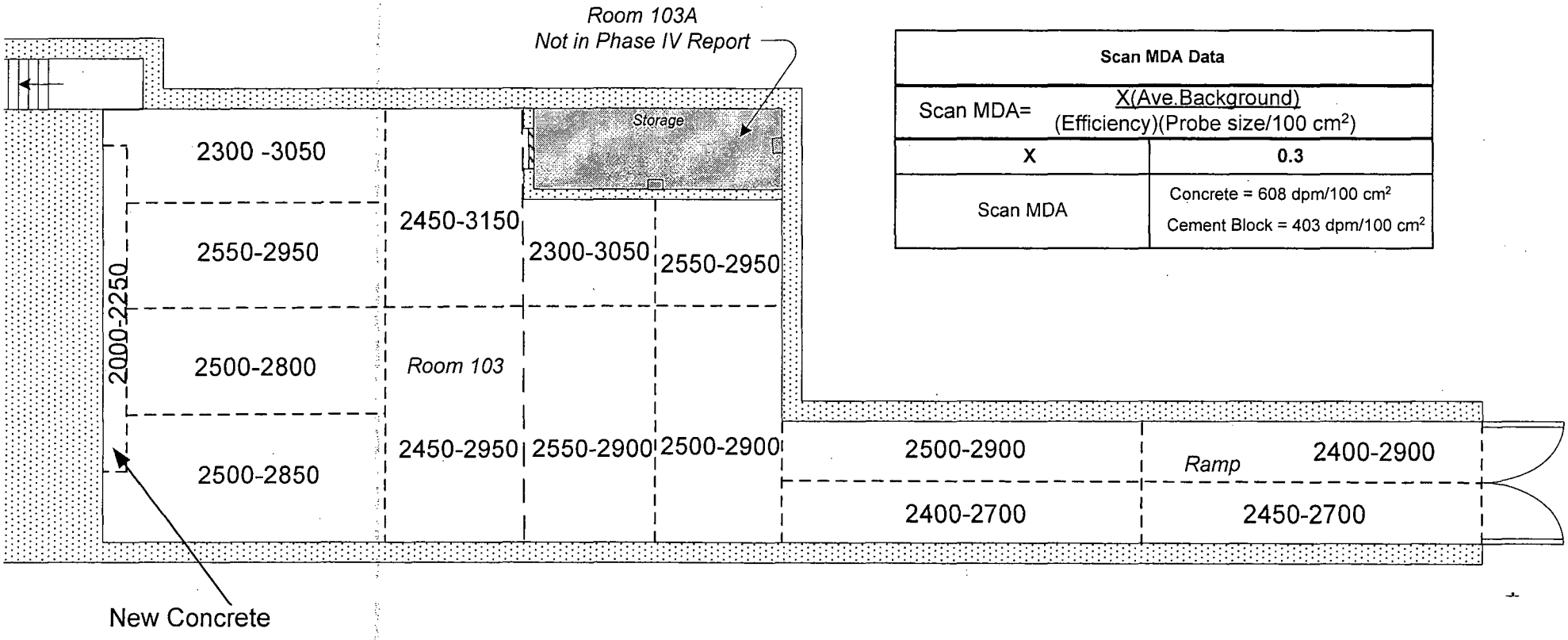
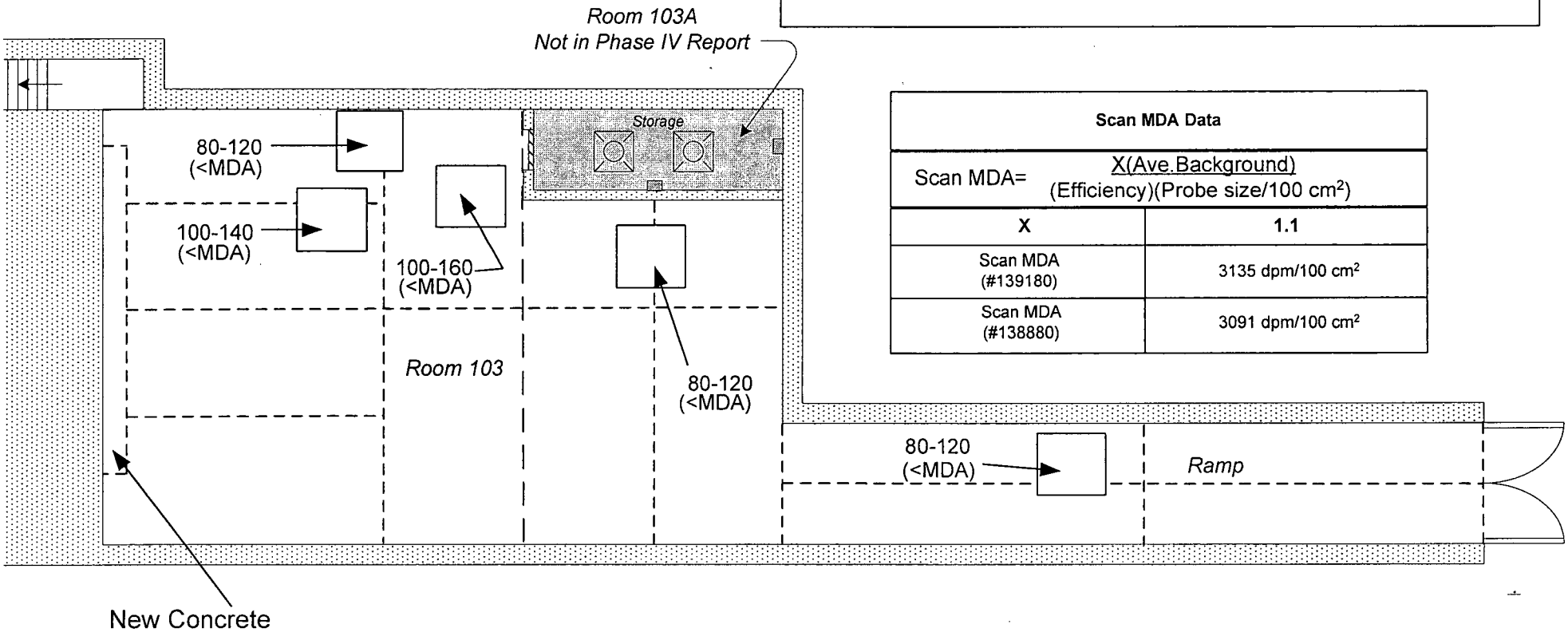


Figure 12: Building 31, Phase IV, Room 103, 15 cm² Scan of Floor, Selected 1 m² Locations and Results

= 1 m² area surveyed
(Highest 434 cm² Beta Scan measurement locations)

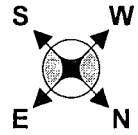
All Results in cpm

Building 30/31 Phase IV		
Instrument(s)	Ludlum Model-3	Ludlum Model-3
Serial Number	139180	138880
Calibration Due	09/10/2001	08/09/2001
Efficiency	21.05%	21.35%
α β γ	β	β
Probe Number	145973	145963
Probe Size	15 cm²	15 cm²
Background	80-100 cpm	80-100 cpm
Technician(s): C. Stanley/ W. Schuck Date: 05/14/01 - 05/23/01		



Scan MDA Data	
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm²)
X	1.1
Scan MDA (#139180)	3135 dpm/100 cm²
Scan MDA (#138880)	3091 dpm/100 cm²

Figure 13: Building 30/31, Phase IV, Room 103, Beta Scan of Walls, Locations and Results



NOTES

100% scan below 2 m, 10% scan above 2 m

All Results (#### - ####) in CPM

Wall Surface = Concrete except where noted

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	09/03/2001
Efficiency	22.15%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete 1174-1409, cement block
Technician(s): C. Stanley, W. Schuck	Date: 05/14/01

Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$
X	0.3
Scan MDA	Concrete = 608 dpm/100 cm^2 Cement Block = 403 dpm/100 cm^2

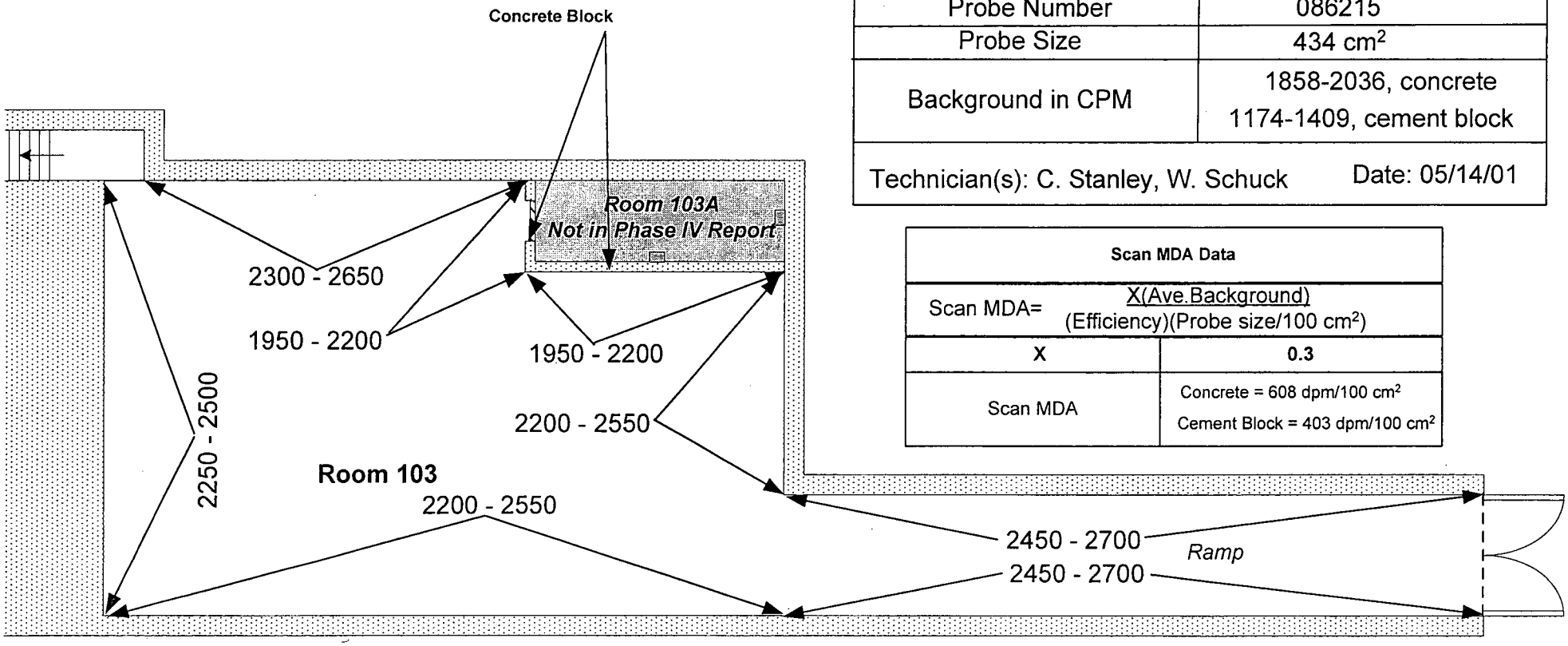
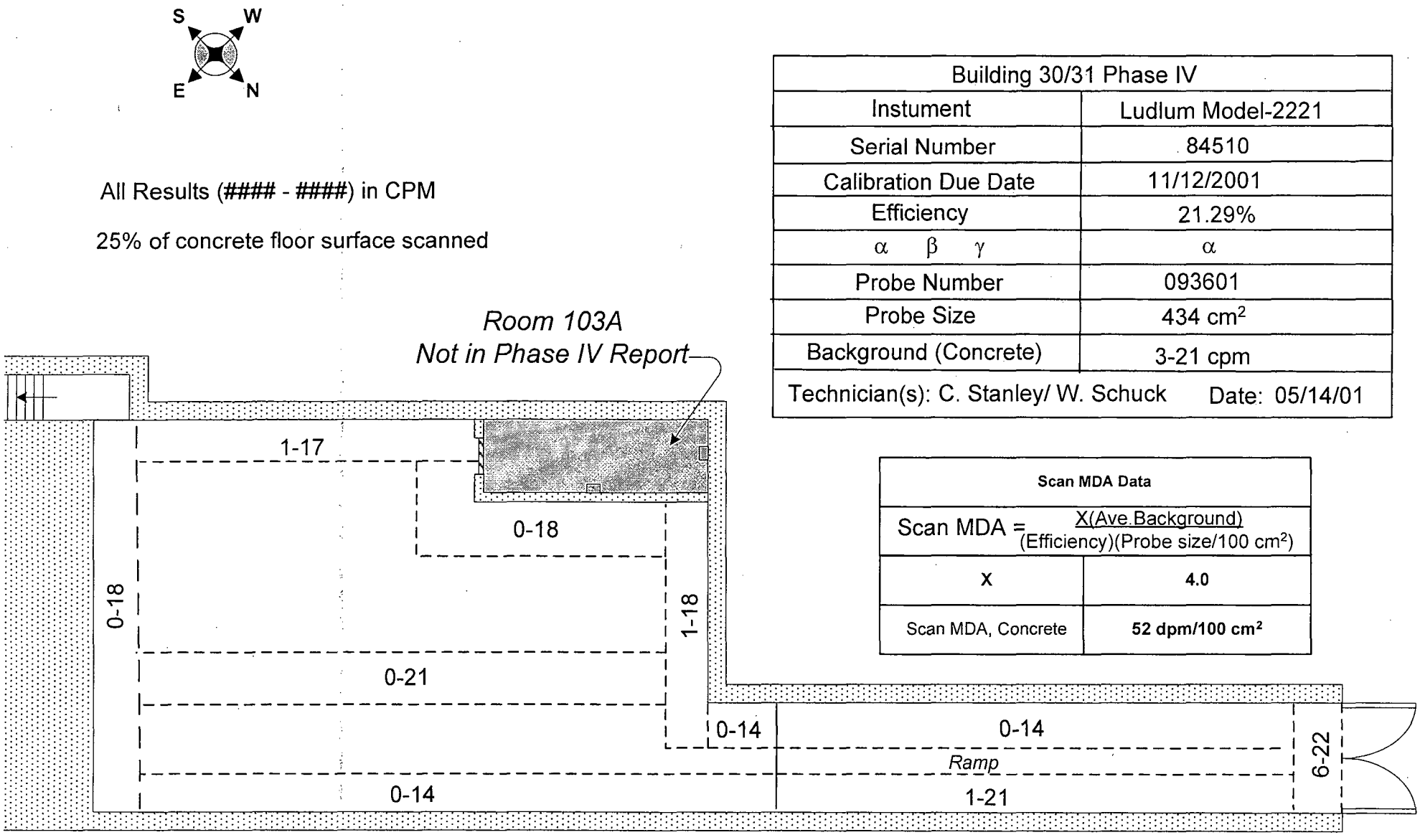


Figure 14: Building 30/31, Phase IV, Room 103, Alpha Scan of Floor, Locations and Results



All Results (#### - ####) in CPM

25% of concrete floor surface scanned

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84510
Calibration Due Date	11/12/2001
Efficiency	21.29%
α β γ	α
Probe Number	093601
Probe Size	434 cm^2
Background (Concrete)	3-21 cpm
Technician(s): C. Stanley/ W. Schuck	Date: 05/14/01

Scan MDA Data	
Scan MDA = $\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$	
X	4.0
Scan MDA, Concrete	**52 dpm/100 cm^2**

Figure 15: Building 30/31, Phase IV, Room 103, Alpha Scan of Walls, Locations and Results

All Results (#### - ####) in CPM

25% of walls scanned

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84510
Calibration Due Date	11/12/2001
Efficiency	21.29%
α β γ	α
Probe Number	093601
Probe Size	434 cm^2
Background (Concrete)	3-21 cpm
Technician(s): C. Stanley/ W. Schuck	Date: 05/14/01

Scan MDA Data	
Scan MDA = $\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$	
X	4.0
Scan MDA, Concrete	**52 dpm/100 cm^2**

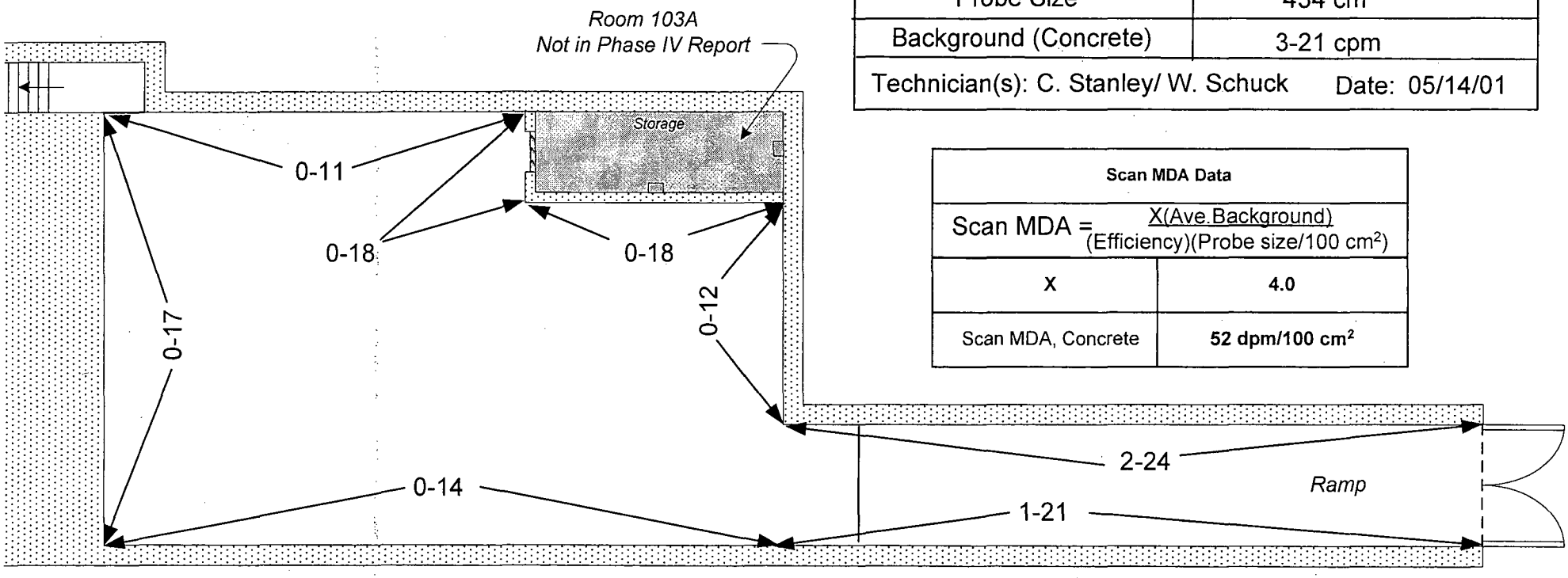
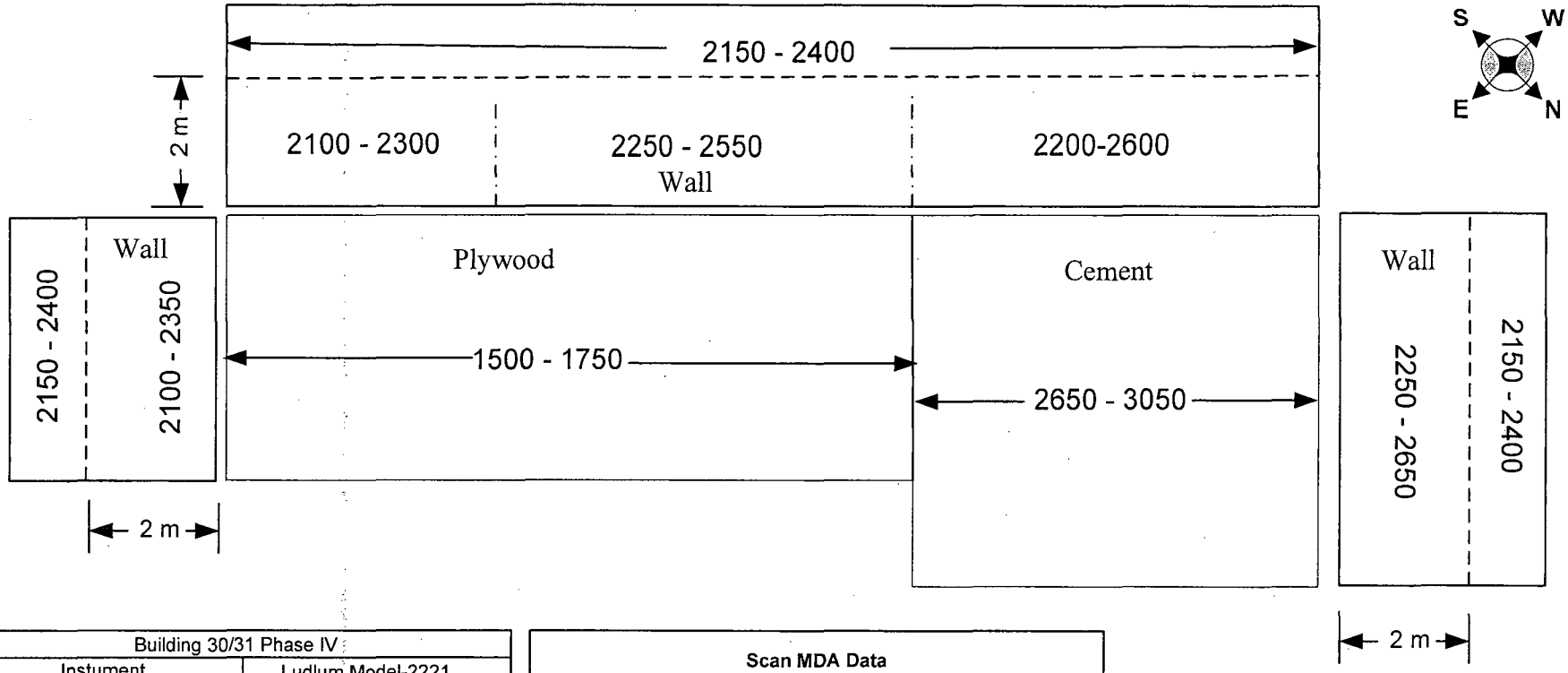


Figure 16: Building 30/31, Phase IV, Room 103 "Catwalk", Beta Scan Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	11/15/2001
Efficiency	22.11%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete 1061-1262, wood
Technician(s): C. Stanley, W. Schuck	Date: 05/18/01

Scan MDA Data	
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm^2)
X	0.3
Scan MDA	Concrete = 608 dpm/100 cm^2 Wood = 264 dpm/100 cm^2

100% Scan of floor

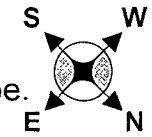
100% Scan of walls below 2 meters

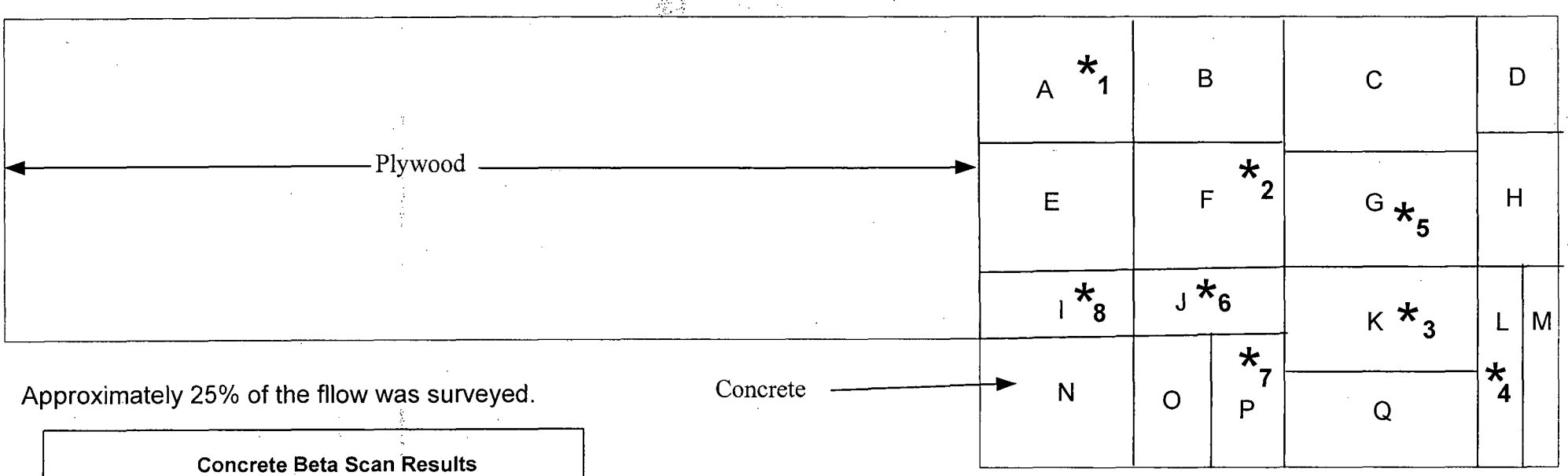
10% Scan of walls above 2 meters

All Beta Results in cpm

Figure 17: Building 30/31, Phase IV, Room 103 "Catwalk" Concrete, Beta Scan Locations and Results

Letter (i.e., A) = area scanned with 434 cm² probe (~25% of area) *Number (i.e., *1) = area also scanned with 15 cm² probe.





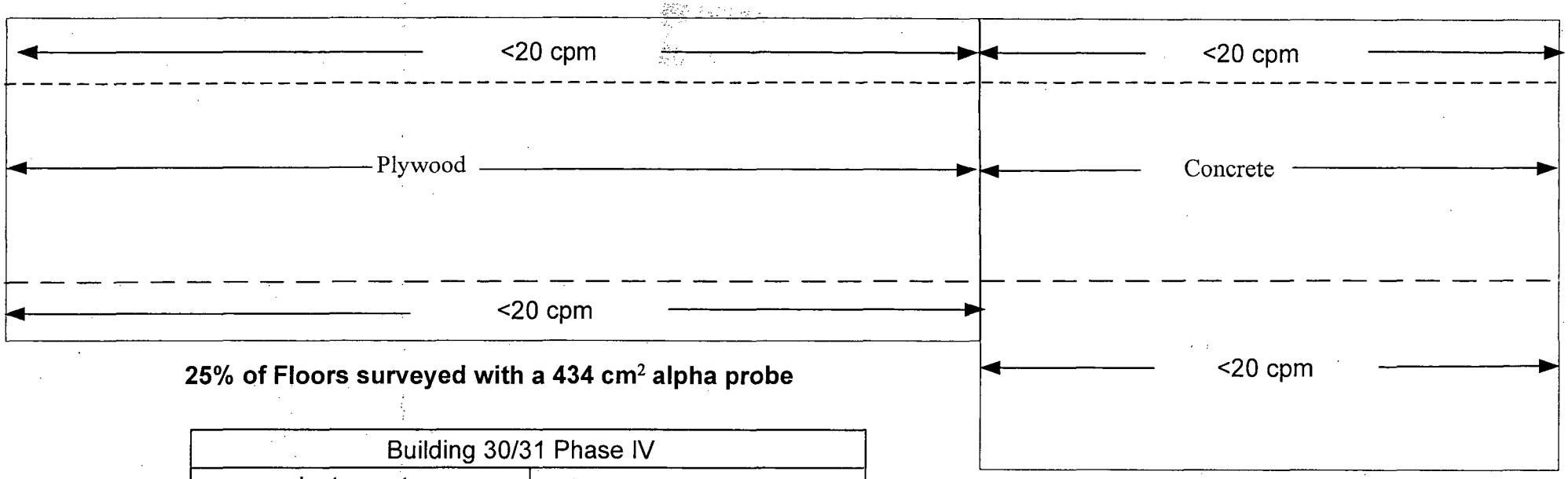
Approximately 25% of the fllow was surveyed.

Concrete Beta Scan Results			
15 cm² probe Scans		434 cm² probe Scans	
Area	Results in cpm	Area	Results in cpm
*1	80-120	A	2800 - 3000
*2	100-120	B	2800 - 3000
*3	100-140	C	2700 - 2900
*4	80-120	D	2650 - 2800
*5	120-160	E	2600 - 2800
*6	120-140	F	2750 - 3000
7	100-140	G	2800 - 3000
8	80-120	H	2700 - 2850
Note: All Above Results are < MDA		I	2800 - 2950
		J	2800 - 3000
		K	2600 - 2900
		L	2600 - 2900
		M	2750 - 2900
		N	2750 - 2900
		O	2600 - 2800
		P	2800 - 2950
		Q	2650 - 2900

Building 30/31 Phase IV		
Instument	Ludlum Model-2221	Ludlum Model 3
Serial Number	84459	139180
Calibration Due Date	11/15/2001	09/10/2001
Efficiency	22.11%	21.05%
α β γ	β	β
Probe Number	086215	145973
Probe Size	434 cm²	15 cm²
Background in CPM	1858-2036, concrete	80-100, concrete
Technician(s): C. Stanley, W. Schuck		Date: 05/22/01

Scan MDA Data			
Scan MDA= $\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ \text{cm}^2)}$			
434 cm²	X = 0.3	15 cm²	X = 1.1
	Scan MDA (concrete) = 608 dpm/100 cm²		Scan MDA (concrete) = 3135 dpm/100 cm²

Figure 18: Building 30/31, Phase IV, Room 103 "Catwalk", Alpha Scan Locations and Results

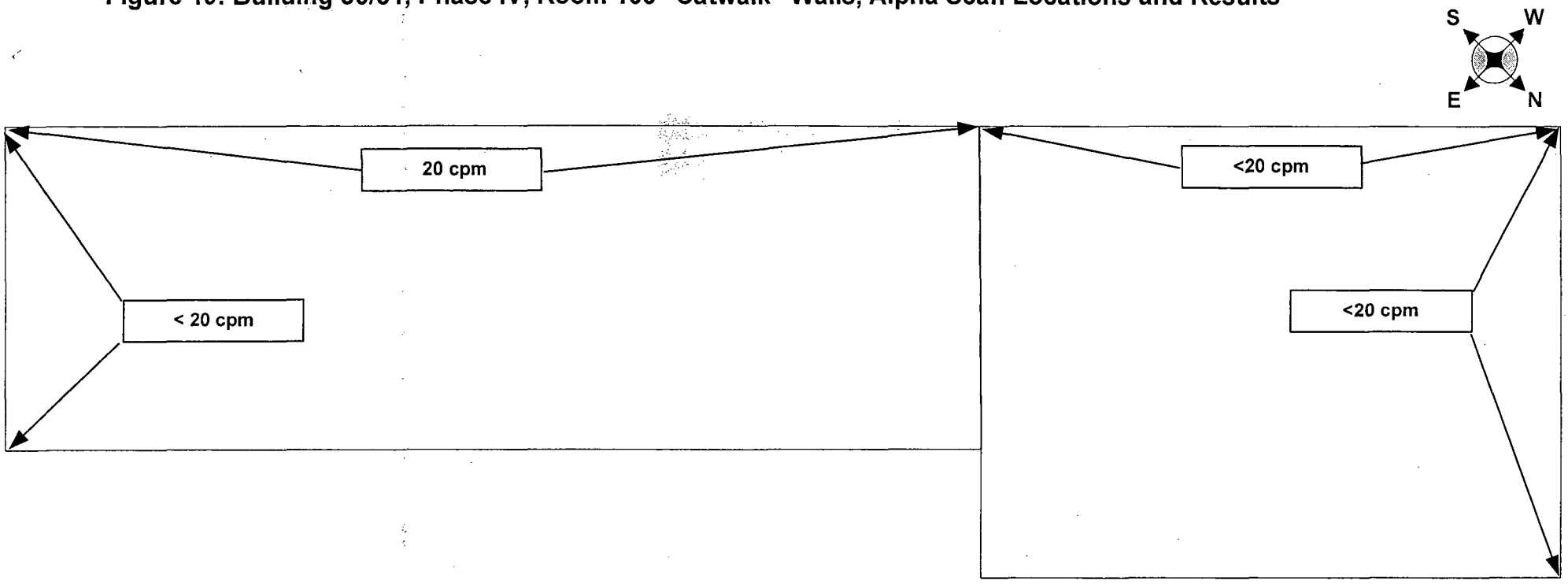


25% of Floors surveyed with a 434 cm² alpha probe

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84510
Calibration Due Date	11/12/2001
Efficiency	21.29%
α β γ	α
Probe Number	093601
Probe Size	434 cm²
Background (Concrete)	3-21 cpm
Technician(s): C. Stanley/ W. Schuck	Date: 05/14/01

Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ \text{cm}^2)}$
X	4.0
Scan MDA	52 dpm/100 cm²

Figure 19: Building 30/31, Phase IV, Room 103 "Catwalk" Walls, Alpha Scan Locations and Results

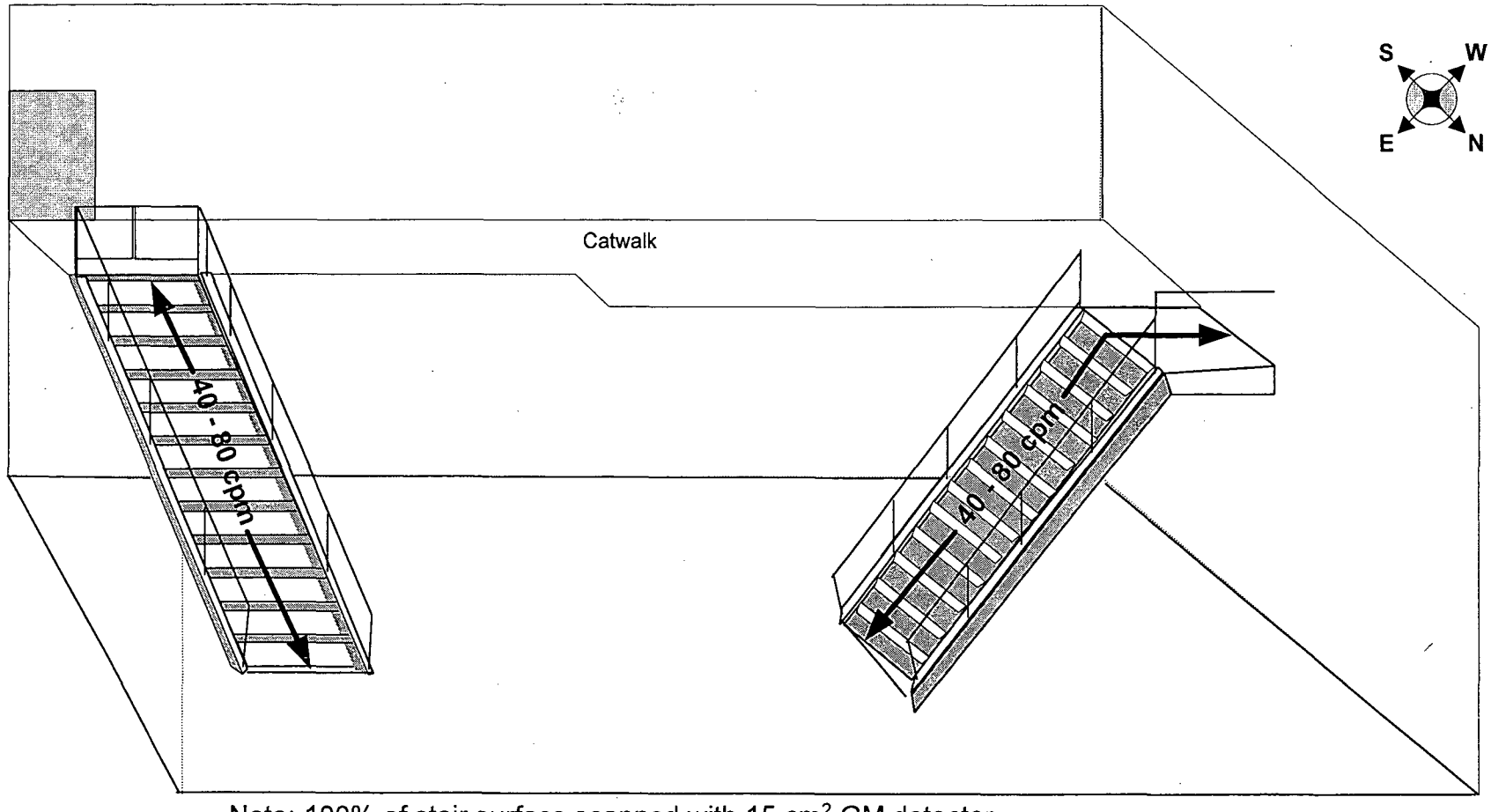


25% of Walls (Concrete) below 2m surveyed with a 434 cm² alpha probe

Scan MDA Data	
Scan MDA = $\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ \text{cm}^2)}$	
X	4.0
Scan MDA, Concrete	52 dpm/100 cm²
Scan MDA, Wood	43 dpm/100 cm²

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84510
Calibration Due Date	11/12/2001
Efficiency	21.29%
α β γ	α
Probe Number	093601
Probe Size	434 cm²
Background (Concrete)	3-21 cpm
Background (Wood-typical)	0-20 cpm
Technician(s): C. Stanley/ W. Schuck	Date: 05/17/01

Figure 20: Building 30/31, Phase IV, Room 103 Stairways, Beta Scan Survey Locations and Results

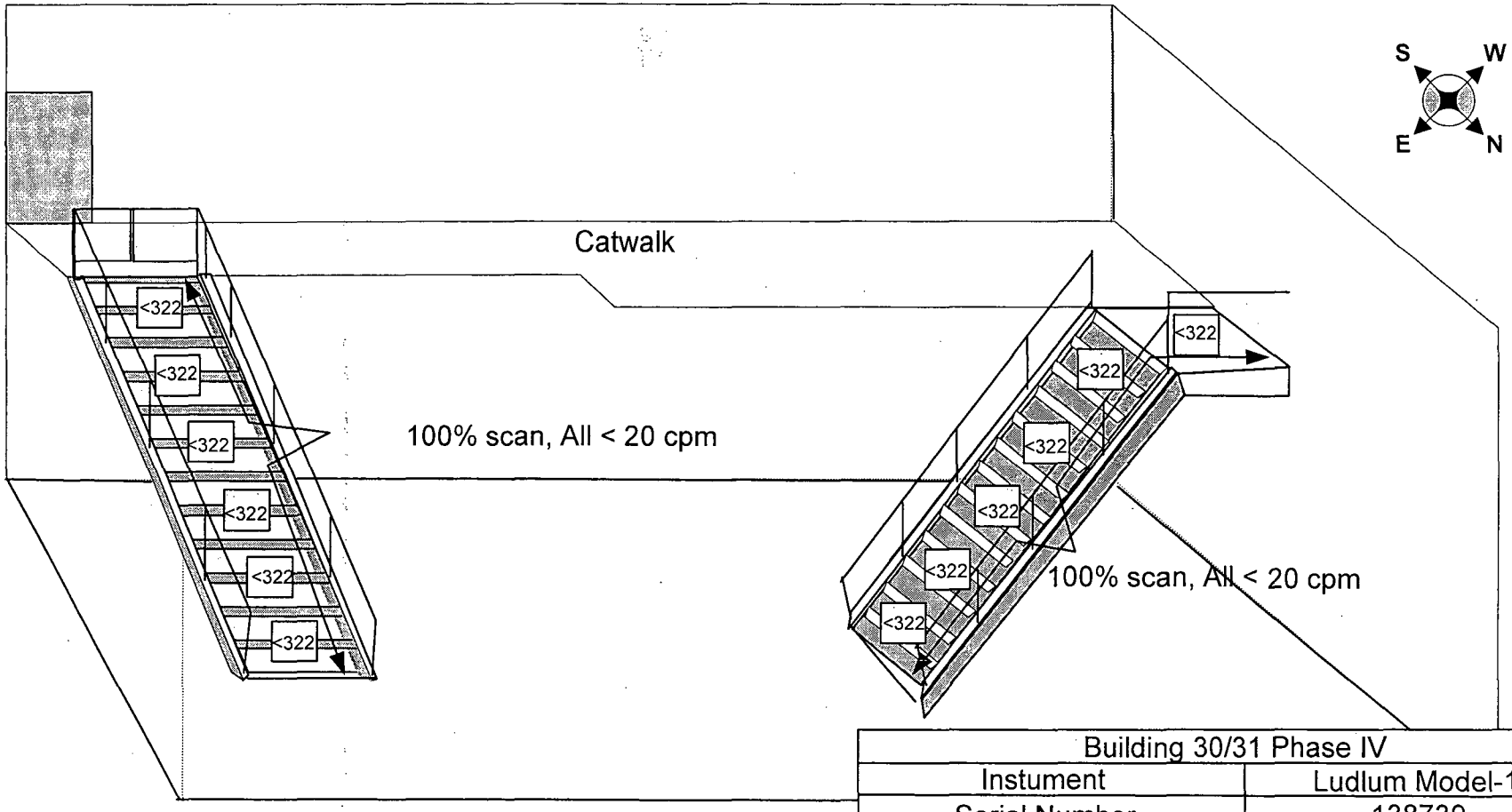


Note: 100% of stair surface scanned with 15 cm^2 GM detector

Building 30/31 Phase IV	
Instument	Ludlum Model 3
Serial Number	139180
Calibration Due Date	09/10/2001
Efficiency	21.05%
α β γ	β
Probe Number	145973
Probe Size	15 cm^2
Background in CPM	40-80
Technician(s): C. Stanley	Date: 06/04/01

Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$
X	1.1
Scan MDA (#139180)	3135 dpm/100 cm^2

Figure 21: Building 30/31, Phase IV, Room 103 Stairways, Alpha Scan and Fixed Survey Locations and Results

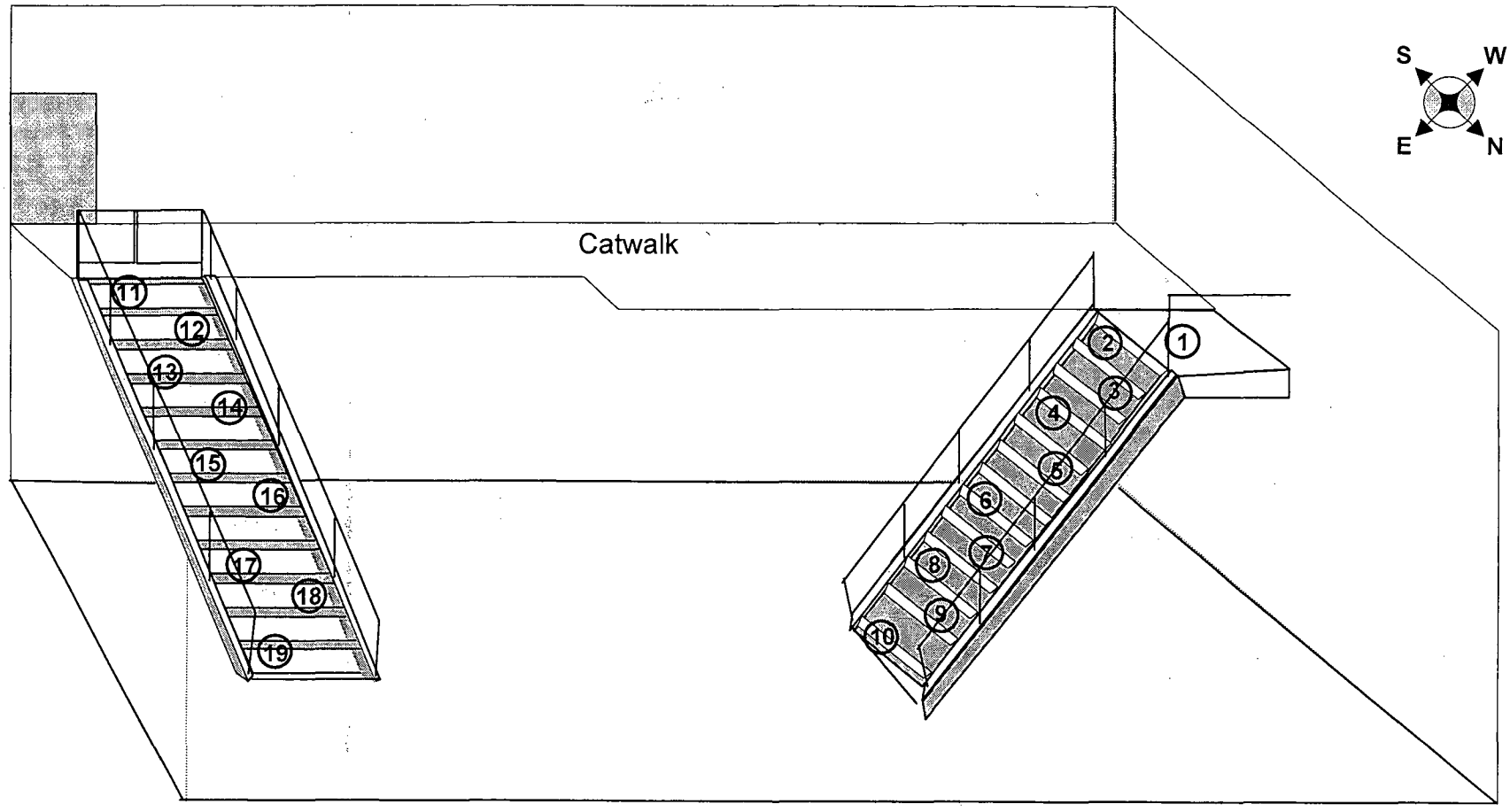


Building 30/31 Phase IV	
Instument	Ludlum Model-12
Serial Number	138739
Calibration Due Date	08/31/2001
Efficiency	21.58%
α β γ	α
Probe Number	145699
Probe Size	50 cm^2
Background in CPM	0-20
MDA	322 dpm/100 cm^2
Technician(s): C. Stanley	Date: 06/04/01

= Fixed measurement, Results in dpm/100 cm^2

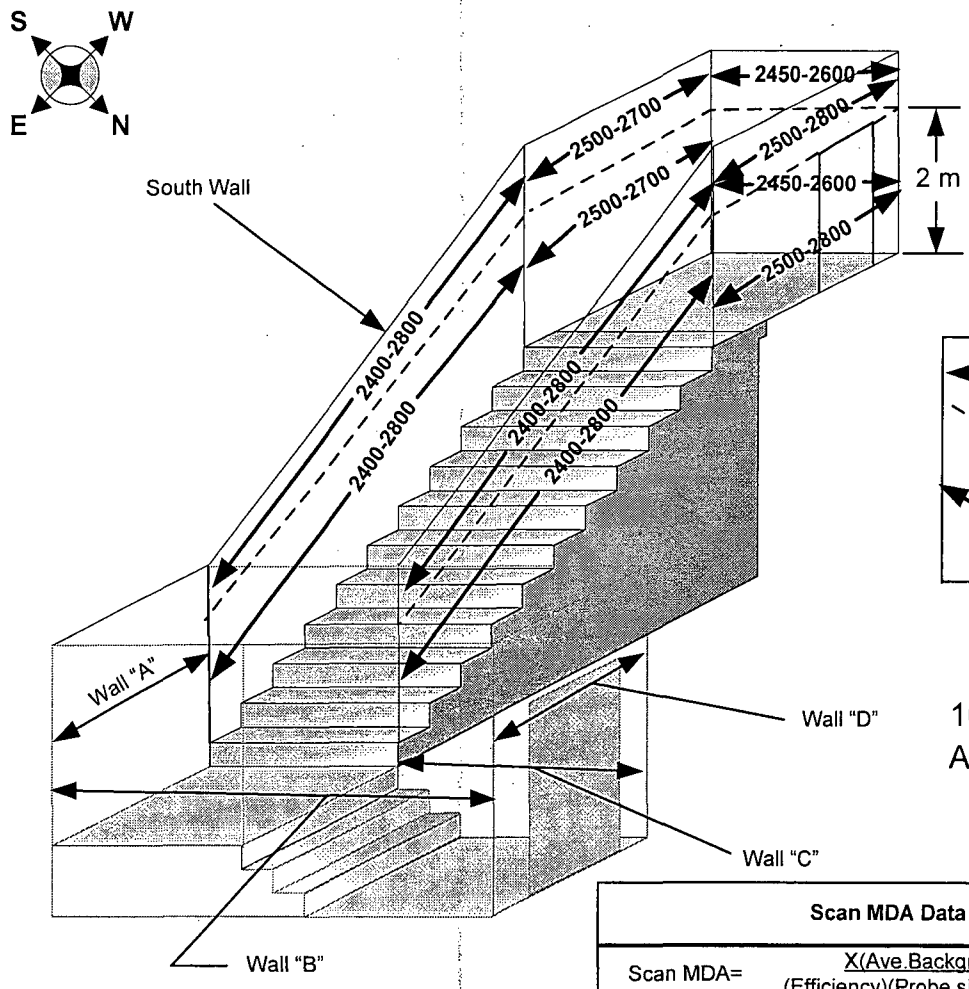
Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ \text{cm}^2)}$
X	4.0
Scan MDA	371 dpm/100 cm^2

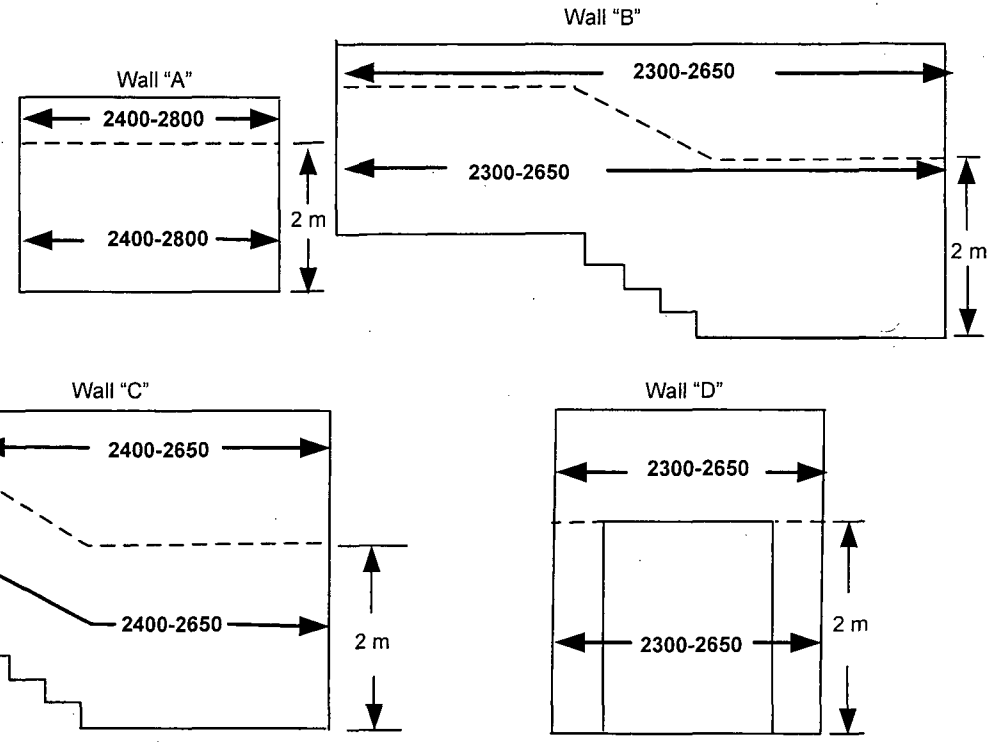
Figure 22: Building 30/31, Phase IV, Room 103 Stairways, Removable Contamination (Wipe) Survey Locations



(#) = Wipe survey location, See Table 6 for alpha and beta results

Figure 23: Building 30/31, Phase IV, Stairway from Front Hallway to Room 103 Walls , Beta Scan Survey Locations and Results





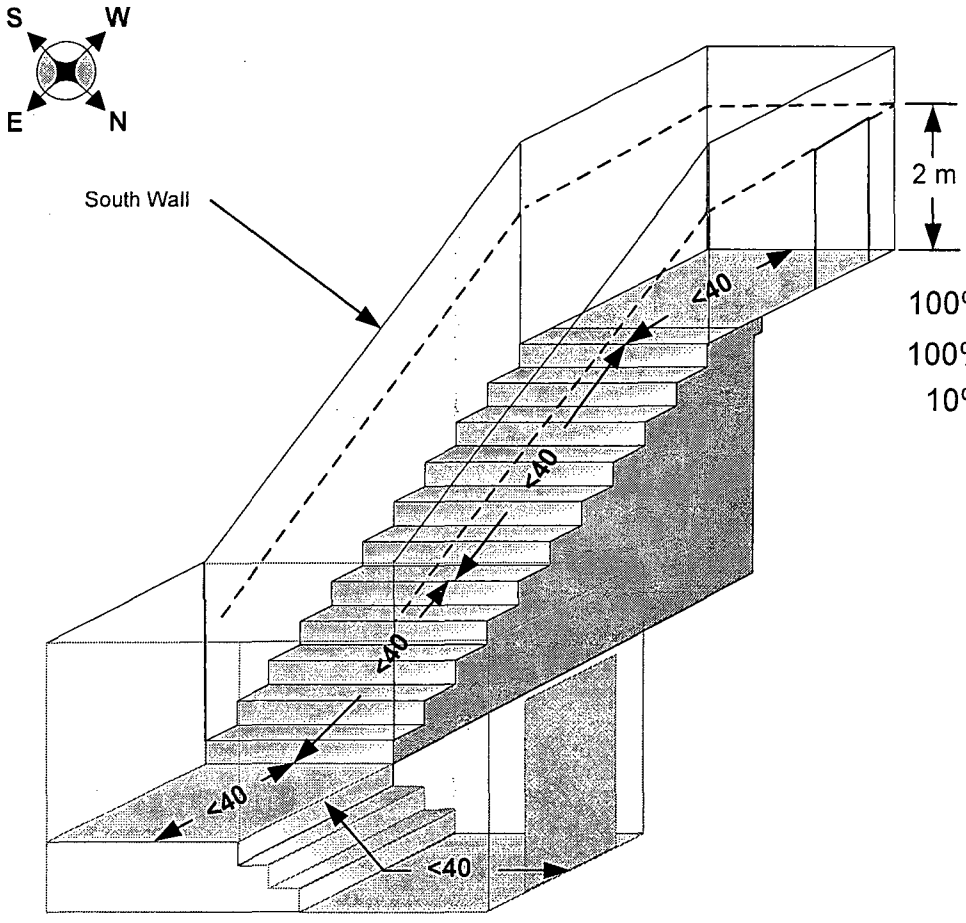
100% of wall surfaces below 2m and 10% above 2m scanned
All readings are provided in cpm

Note: Drawing Not to Scale

Scan MDA Data	
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm^2)
X	0.3
Scan MDA	Concrete = 608 dpm/100 cm^2

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	11/15/2001
Efficiency	22.11%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete
Technician(s): C. Stanley	Date: 06/08/01

Figure 24: Building 30/31, Phase IV, Stairway from Front Hallway to Room 103 Walls, Alpha Scan Survey Locations and Results



Note: Drawing Not to Scale

100% scan of floor and stair surfaces, All results < 40 cpm

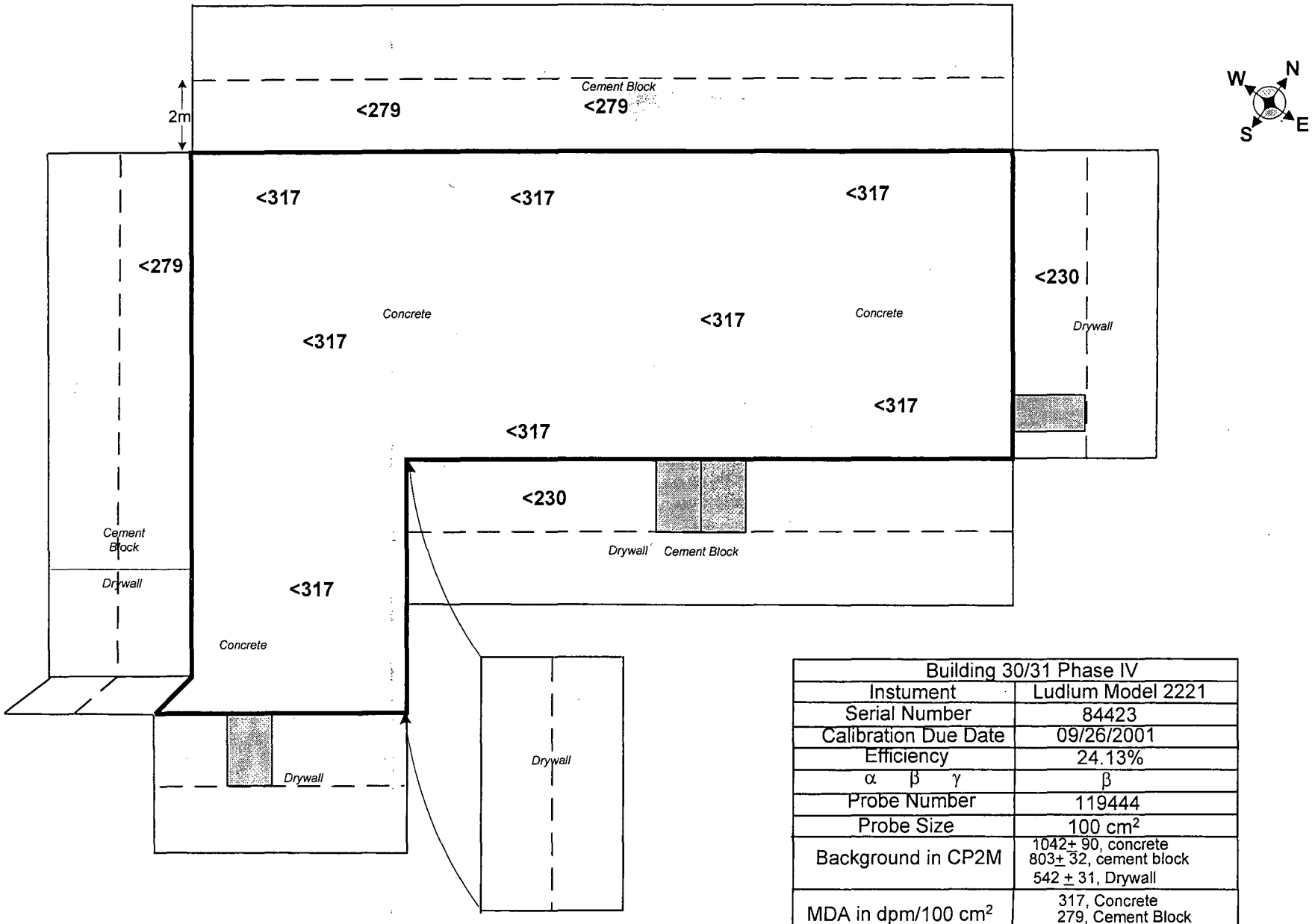
100% of walls below 2 meters scanned, All results < 40 cpm

10% of walls above 2 meters scanned, All results < 40 cpm

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	12/27/05
Efficiency	22.14%
α β γ	α
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	20-40, Concrete
Technician(s): S. Cowan	Date: 07/05/05

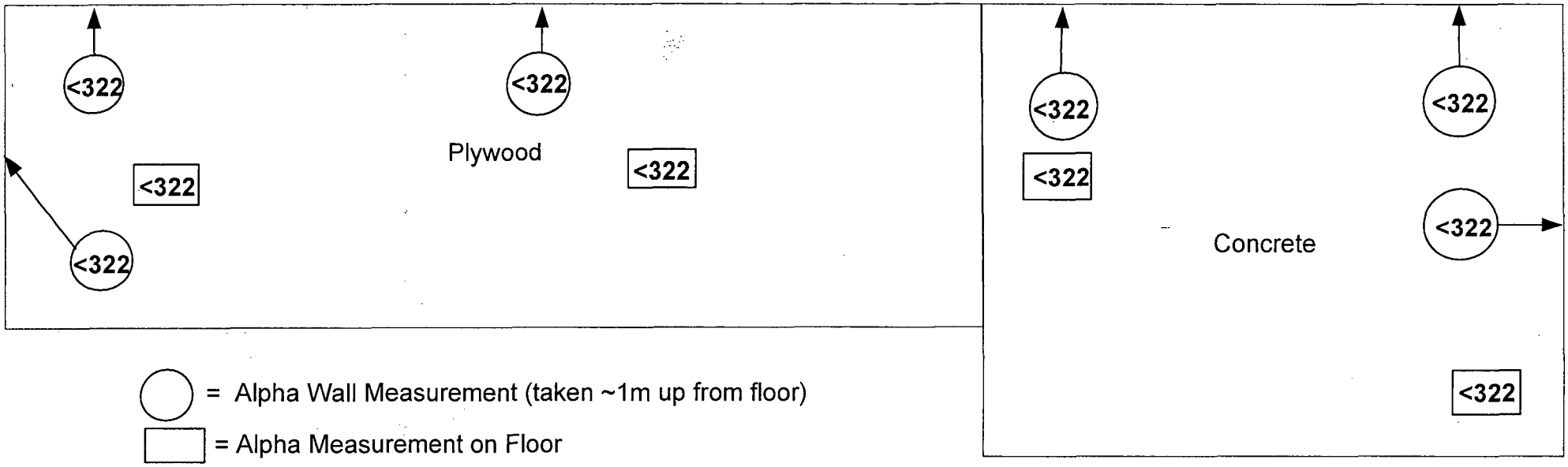
Scan MDA Data	
Scan MDA=	$\frac{X(\text{Ave.Background})}{(\text{Efficiency})(\text{Probe size}/100\ cm^2)}$
X	4
Scan MDA	125 dpm/100 cm^2

Figure 25: Building 30/31, Phase IV. Room 100, Fixed Beta Measurement Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model 2221
Serial Number	84423
Calibration Due Date	09/26/2001
Efficiency	24.13%
α β γ	β
Probe Number	119444
Probe Size	100 cm²
Background in CP2M	1042± 90, concrete 803± 32, cement block 542 ± 31, Drywall
MDA in dpm/100 cm²	317, Concrete 279, Cement Block 230, Drywall
Technician(s): C. Stanley	Date: 08/09/01

Figure 26: Building 30/31, Phase IV, Room 103 "Catwalk", Fixed Alpha Measurement Locations and Results



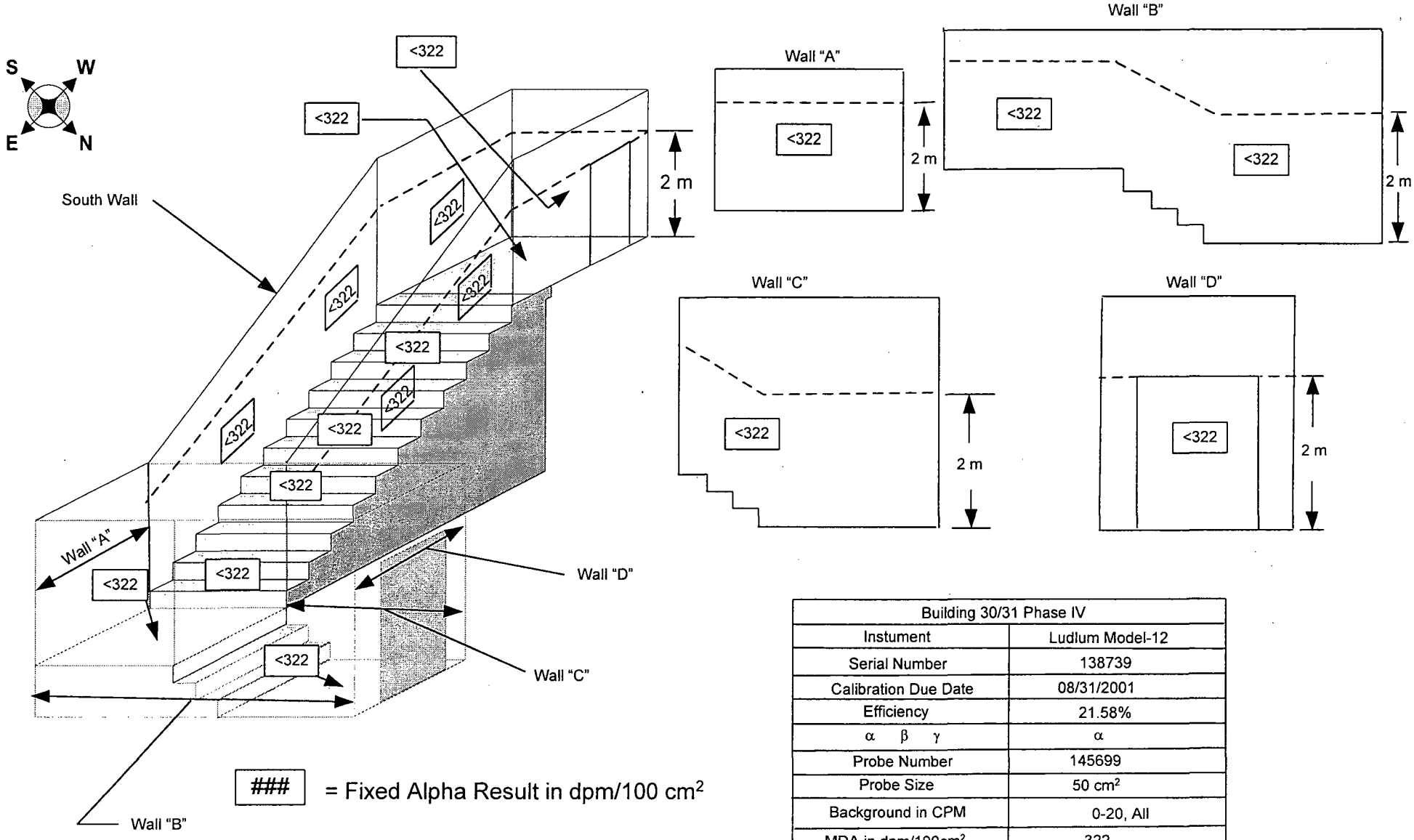
◯ = Alpha Wall Measurement (taken ~1m up from floor)

▭ = Alpha Measurement on Floor

All Results in dpm/100 cm^2

Building 30/31 Phase IV	
Instument	Ludlum Model-12
Serial Number	138739
Calibration Due Date	08/31/2001
Efficiency	21.58%
α β γ	α
Probe Number	145699
Probe Size	50 cm^2
Background in CPM	0-20
MDA	322 dpm/100 cm^2
Technician(s): C. Stanley, W. Schuck	Date: 05/15/01

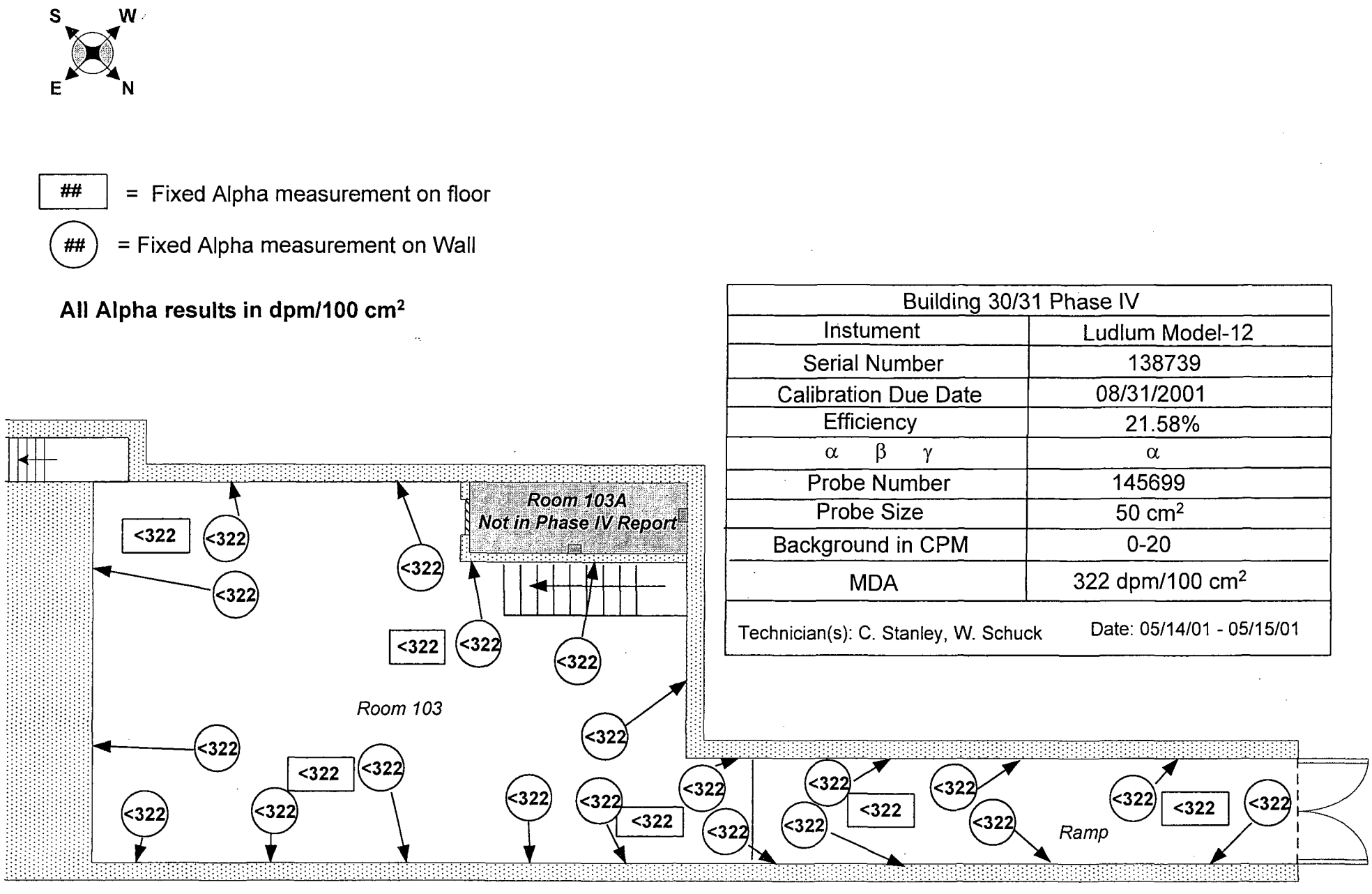
Figure 27: Building 30/31, Phase IV, Stairway from Front Hallway to Room 103 Walls , Fixed Alpha Survey Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-12
Serial Number	138739
Calibration Due Date	08/31/2001
Efficiency	21.58%
α β γ	α
Probe Number	145699
Probe Size	50 cm²
Background in CPM	0-20, All
MDA in dpm/100cm²	322
Technician(s): C. Stanley	Date: 06/04/01

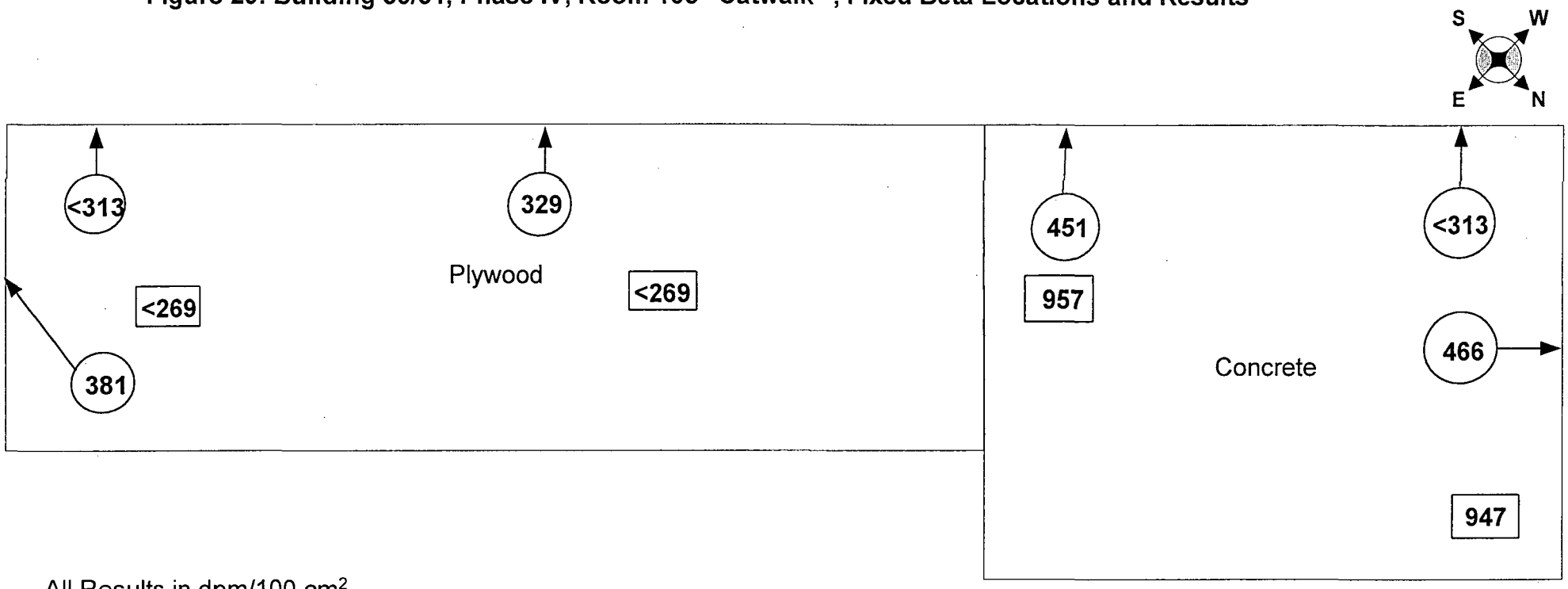
Note: Drawing Not to Scale

Figure 28: Building 30/31, Phase IV, Room 103, Fixed Alpha Measurement Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-12
Serial Number	138739
Calibration Due Date	08/31/2001
Efficiency	21.58%
α β γ	α
Probe Number	145699
Probe Size	50 cm²
Background in CPM	0-20
MDA	322 dpm/100 cm²
Technician(s): C. Stanley, W. Schuck	Date: 05/14/01 - 05/15/01

Figure 29: Building 30/31, Phase IV, Room 103 "Catwalk" , Fixed Beta Locations and Results



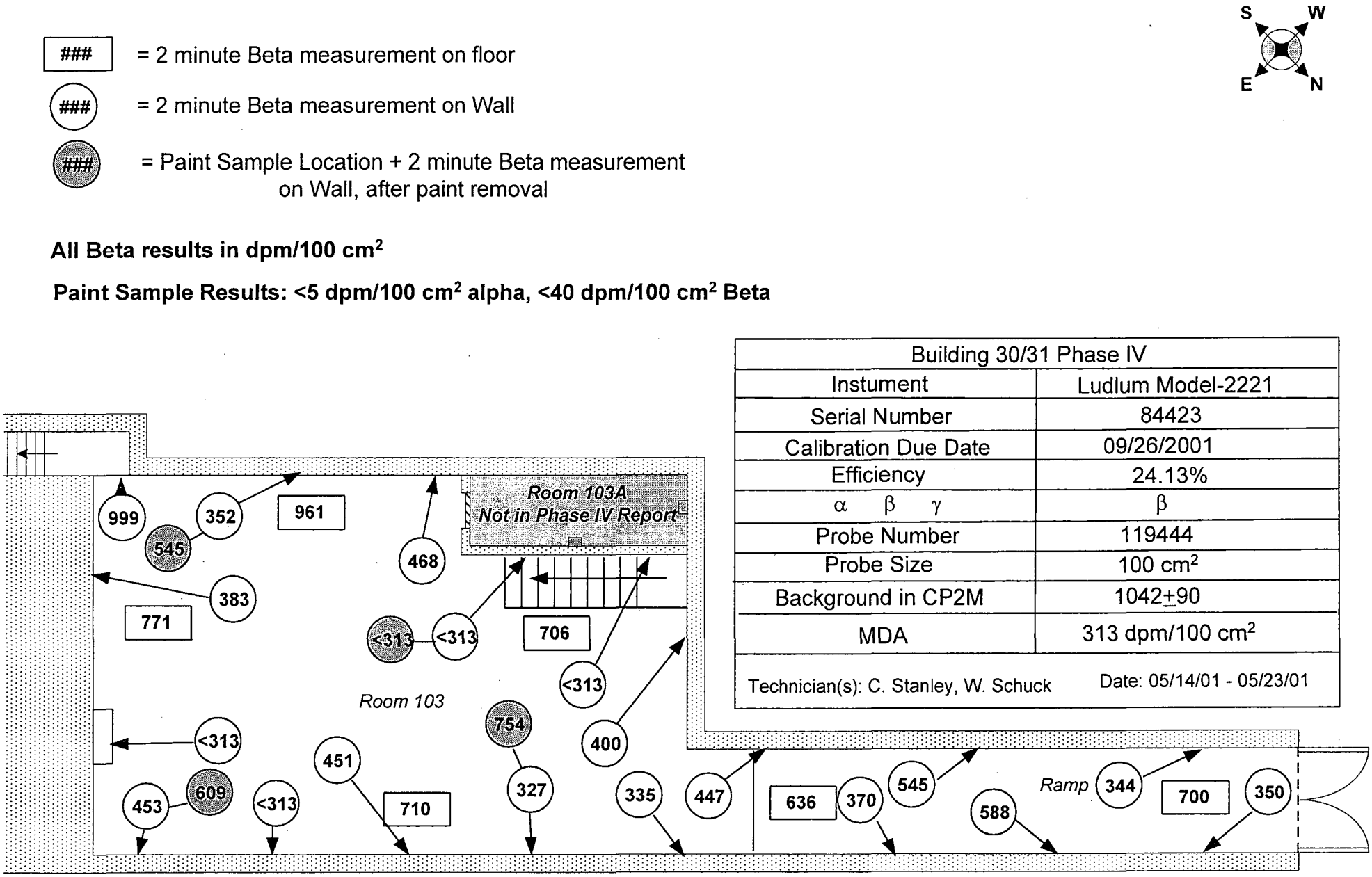
All Results in dpm/100 cm^2

○ = 2 minute Beta Measurement on walls, approx. 1m from floor.

▭ = 2 minute Beta Measurement on Floor.

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84423
Calibration Due Date	09/26/2001
Efficiency	24.13%
α β γ	β
Probe Number	119444
Probe Size	100 cm^2
Background in CP2M	1042±90 Concrete 747±46 Plywood
MDA in dpm/100 cm^2	317 (Concrete) 269 (Wood)
Technician(s): C. Stanley, W. Schuck	Date: 05/15/01

Figure 30: Building 30/31, Phase IV, Room 103, Fixed Beta Measurements and Paint Samples, Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84423
Calibration Due Date	09/26/2001
Efficiency	24.13%
α β γ	β
Probe Number	119444
Probe Size	100 cm²
Background in CP2M	1042±90
MDA	313 dpm/100 cm²
Technician(s): C. Stanley, W. Schuck	Date: 05/14/01 - 05/23/01

Figure 31: Building 30/31, Phase IV. Room 100, Removable Contamination (Wipe) Survey Locations

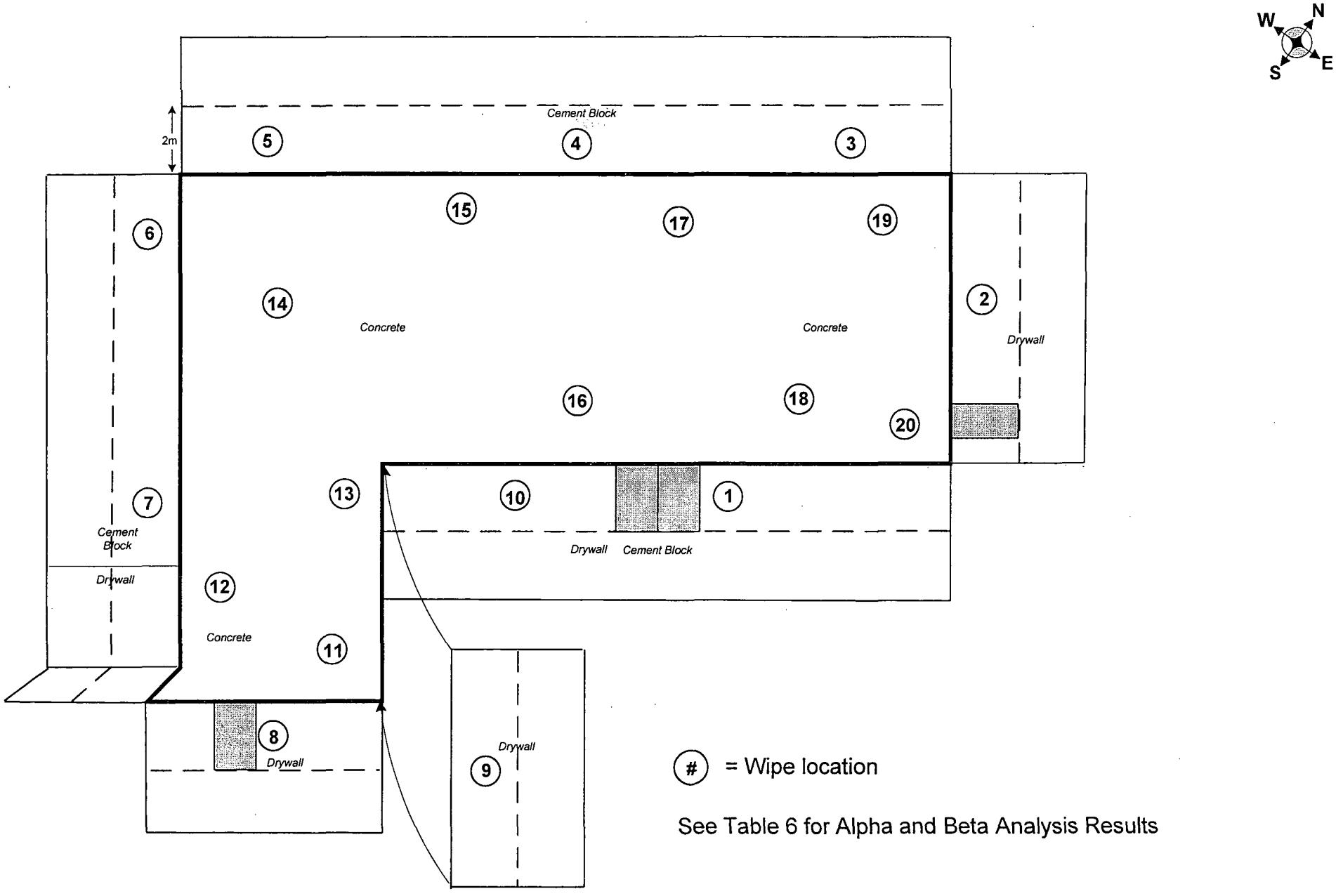
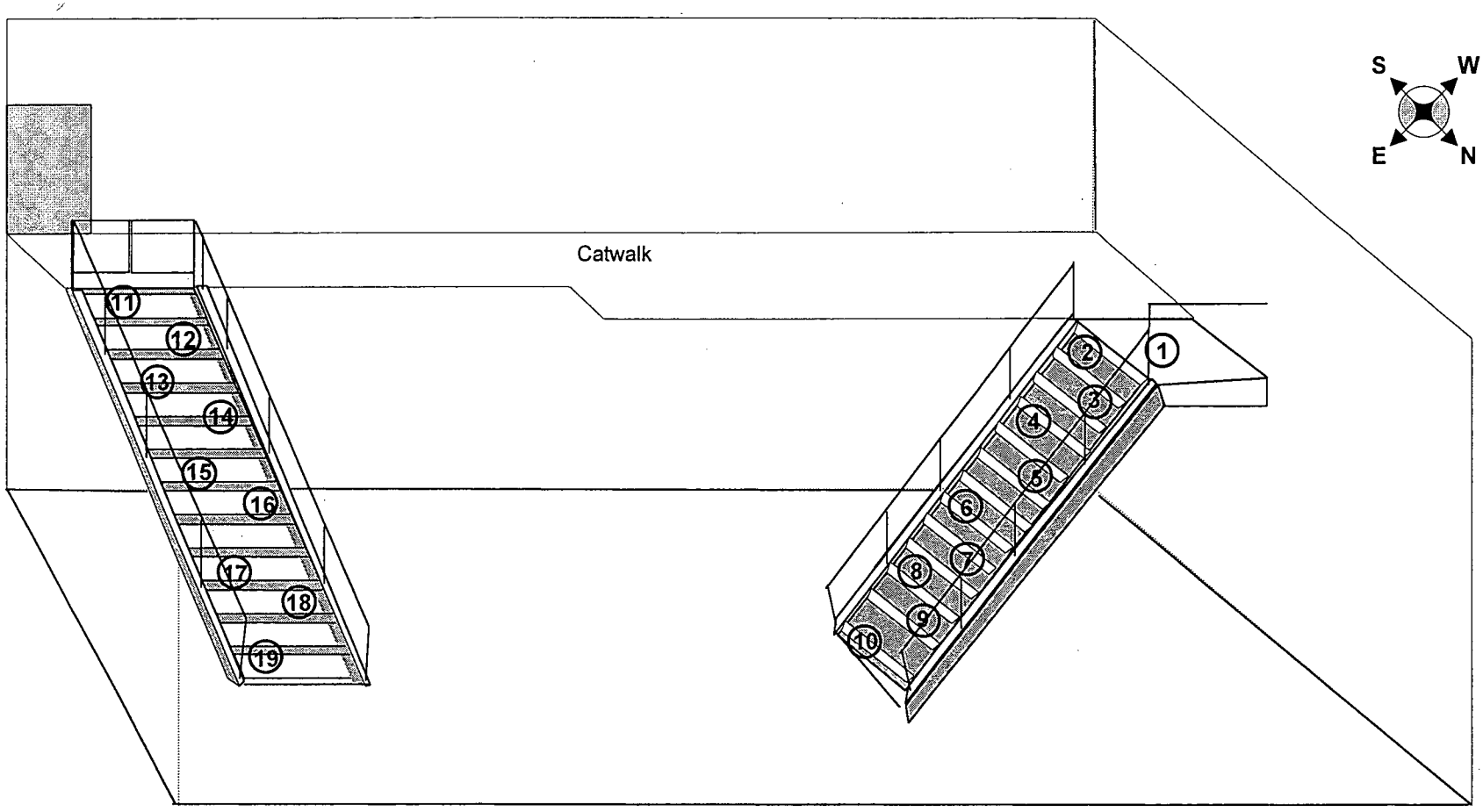
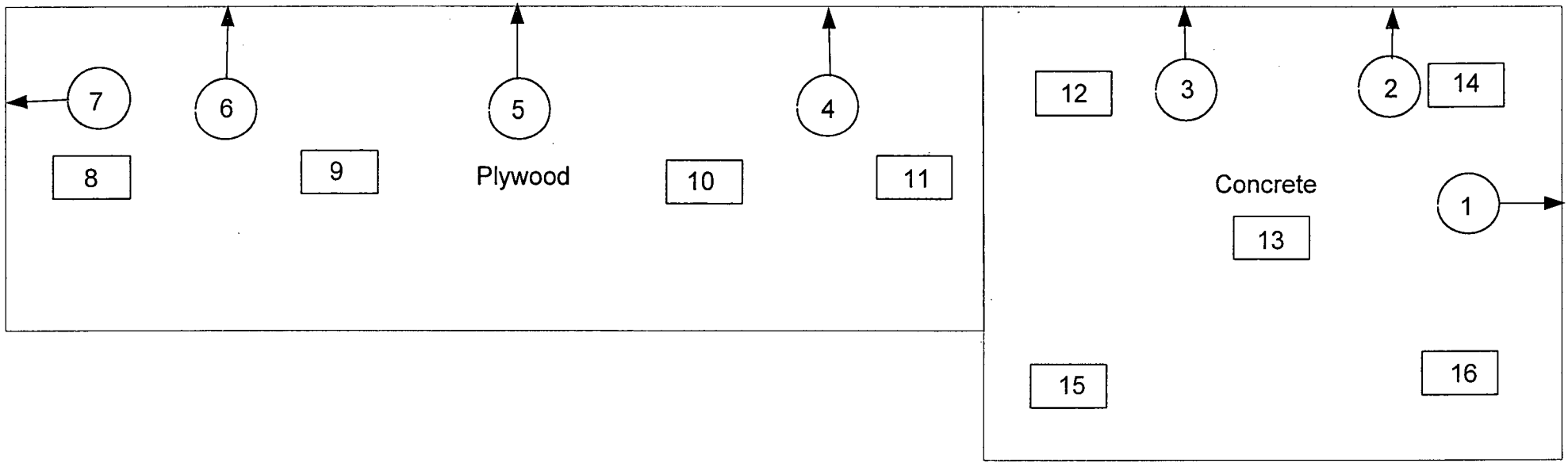


Figure 32: Building 30/31, Phase IV, Room 103 Stairways, Removable Contamination (Wipe) Survey Locations



(#) = Wipe survey location, See Table 6 for alpha and beta analysis results

Figure 33: Building 30/31, Phase IV, Room 103 "Catwalk" , Removable Contamination (Wipe) Survey Locations



= Wipe Survey Locations on Floor.

= Wipe Survey Locations on Walls, Approximately 1 m from the Floor.

All Wipe Samples Taken were Analyzed for Alpha and Beta Activity, See Table 6 for Results

Figure 34: Building 30/31, Phase IV, Room 103, Removable Contamination (Wipe) Survey Locations

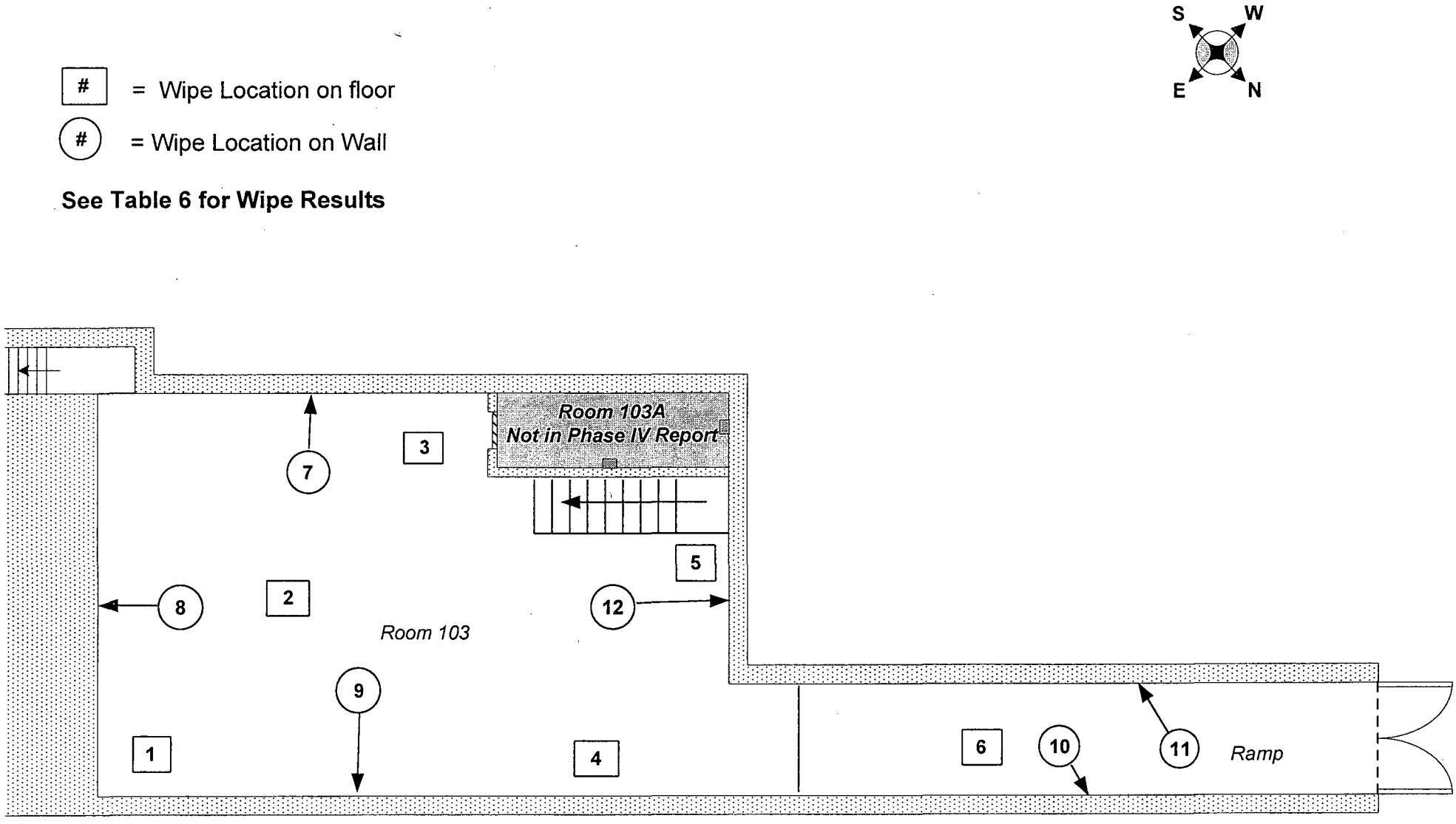
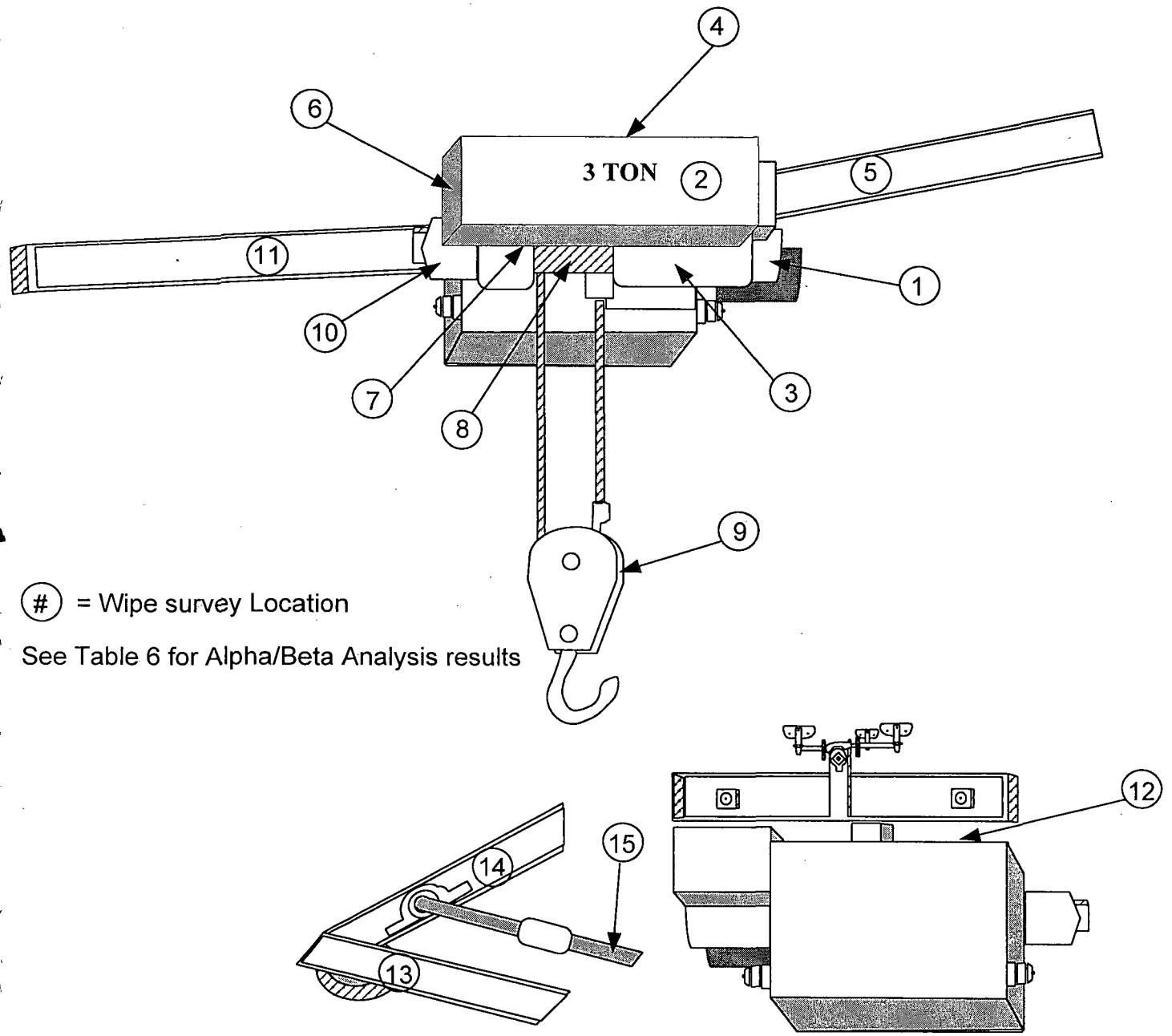


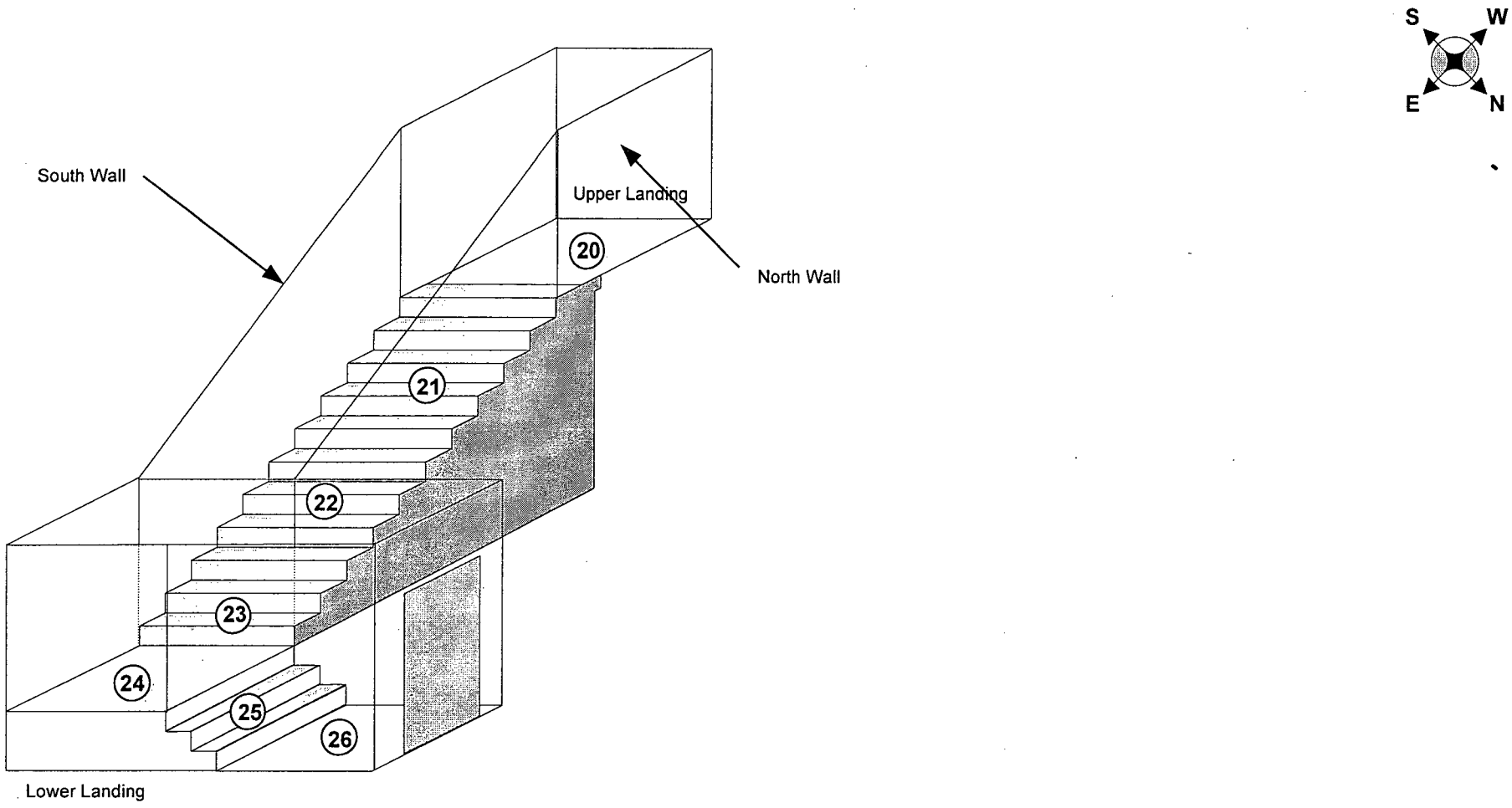
Figure 35: Building 30/31, Phase IV, Room 103 Overhead Crane, Alpha and Beta Scan Survey Locations and Results, and, Removable Contamination (Wipe) Survey Locations



Note: 100% of accessible surfaces were scanned for Alpha and Beta activity. All Alpha scans were < 10 cpm and all Beta scans were <60 cpm.

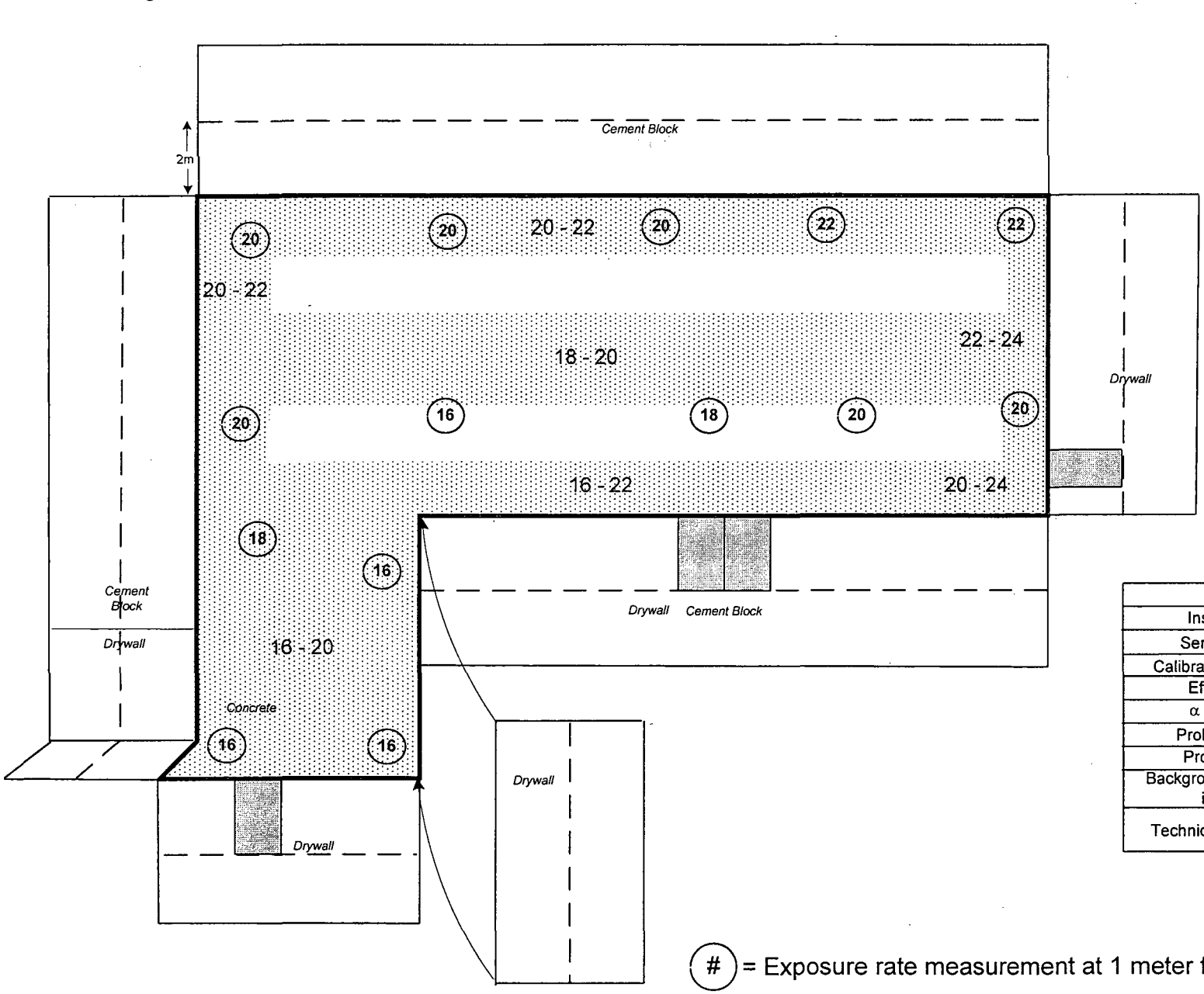
Building 30/31 Phase IV		
Instument	Ludlum Model-12	Ludlum Model 3
Serial Number	138739	139180
Calibration Due Date	08/31/2001	09/10/2001
Efficiency	21.58%	21.05%
α β γ	α	β
Probe Number	145699	145973
Probe Size	50 cm^2	15 cm^2
Background in CPM	<10	40-60
Technician(s): C. Stanley, W. Schuck		Date: 05/16/01

Figure 36: Building 30/31, Phase IV, Stairs from Front Hallway to Room 103, Removable Contamination (Wipe) Survey Locations



(#) = Wipe Survey Locations, See Table 6 for Alpha and Beta Analysis Results

Figure 37: Building 30/31, Phase IV. Room 100, Exposure Rate measurement Locations and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	153590
Calibration Due Date	06/07/2001
Efficiency	N/A
α β γ	γ
Probe Number	155190
Probe Size	2" x 2"
Background (Concrete) in μR/hr	15-18 @ 1 meter, 16-19 @ contact
Technician(s): C. Stanley	Date: 06/08/01

(#) = Exposure rate measurement at 1 meter from the surface in μR/hr.

- ## = exposure Rate scan measurement range in μR/hr.

= 100% of shaded area scanned with a 2" x 2" NaI detector held within 1" of surface.

Figure 38: Building 30/31, Phase IV, Room 103, Exposure Rate scan and Fixed Measurement Locations and Results

All Results in μR/hr

- #### Exposure rate scan results in μR/hr

[#] = Exposure Rate measurement @ 1 m from the surface

Floor Surface = Concrete

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	153590
Calibration Due Date	06/07/2001
Efficiency	N/A
α β γ	γ
Probe Number	155190
Probe Size	2" x 2"
Background (Concrete) in μR/hr	15-18 @ 1 meter, 16-19 @ contact
Technician(s): C. Stanley/ W. Schuck	Date: 05/15/01

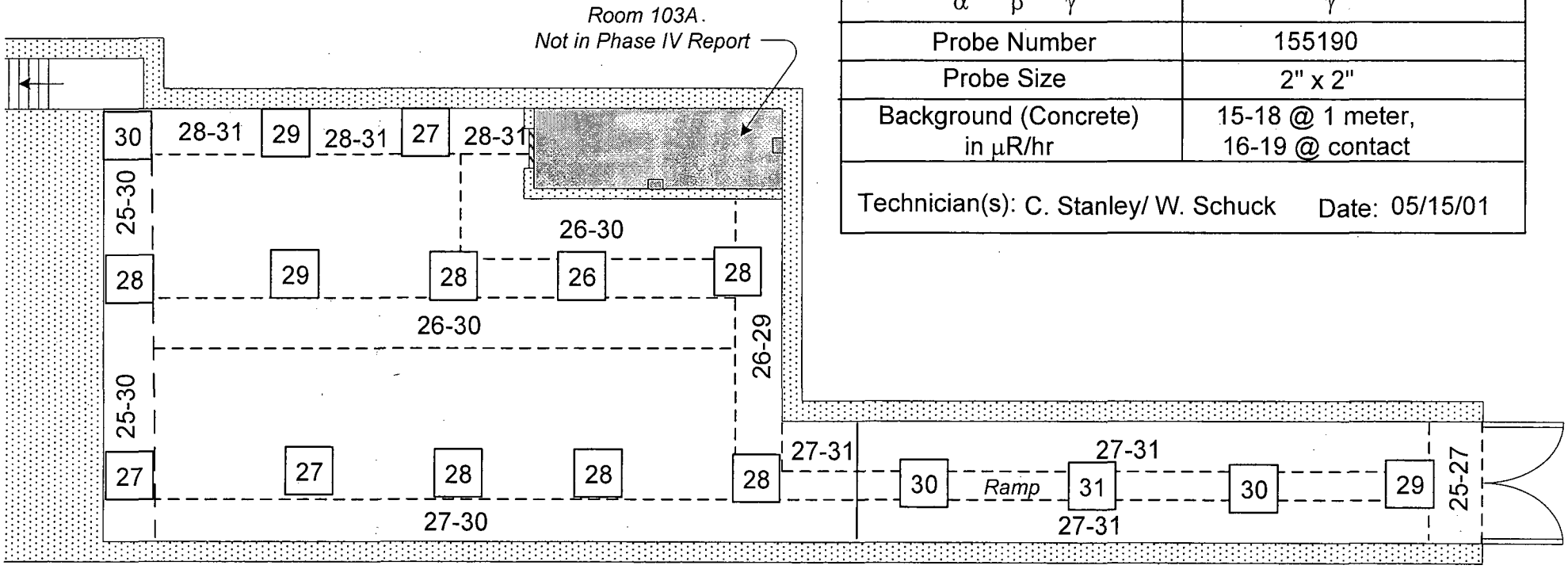
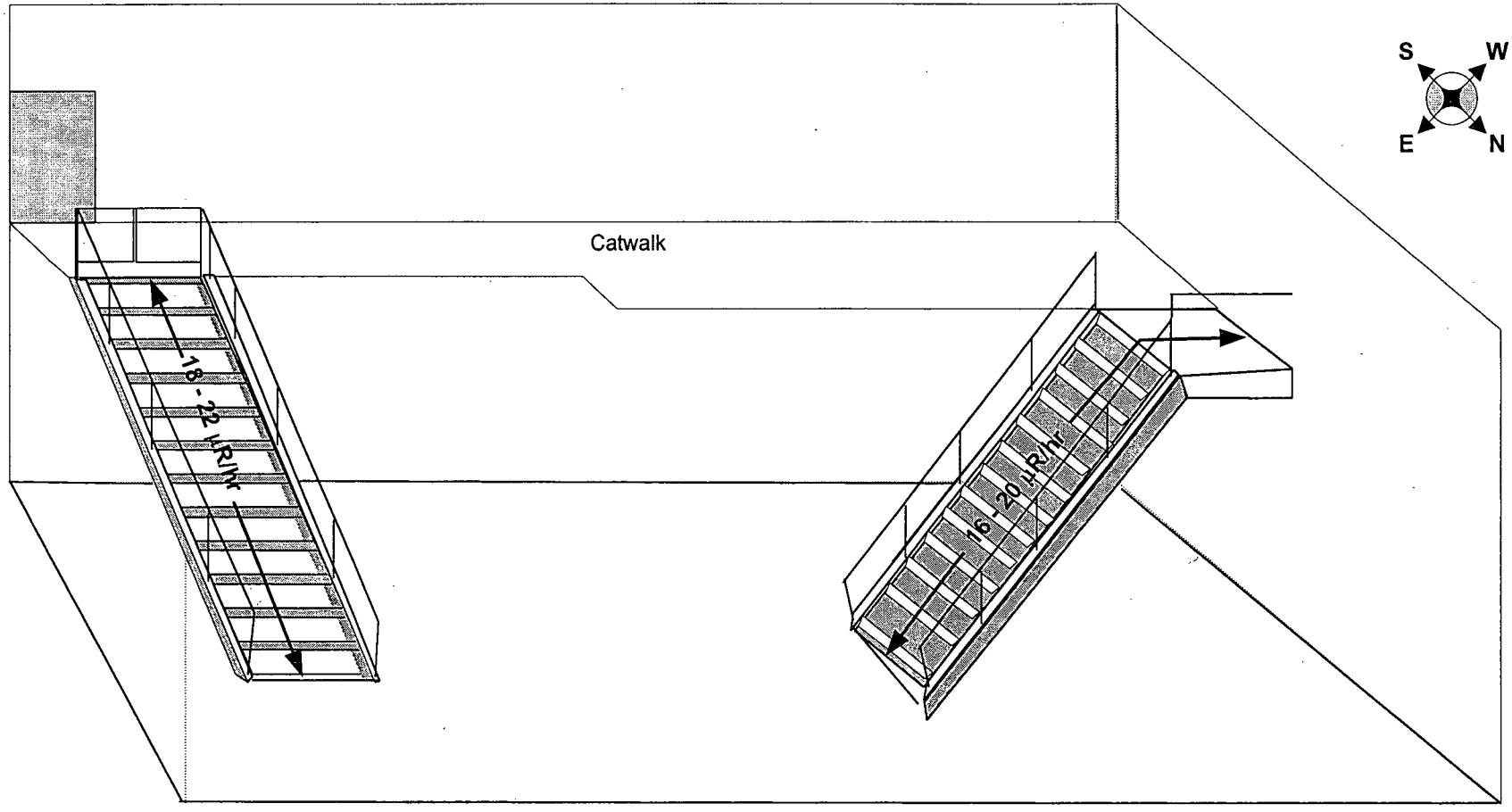


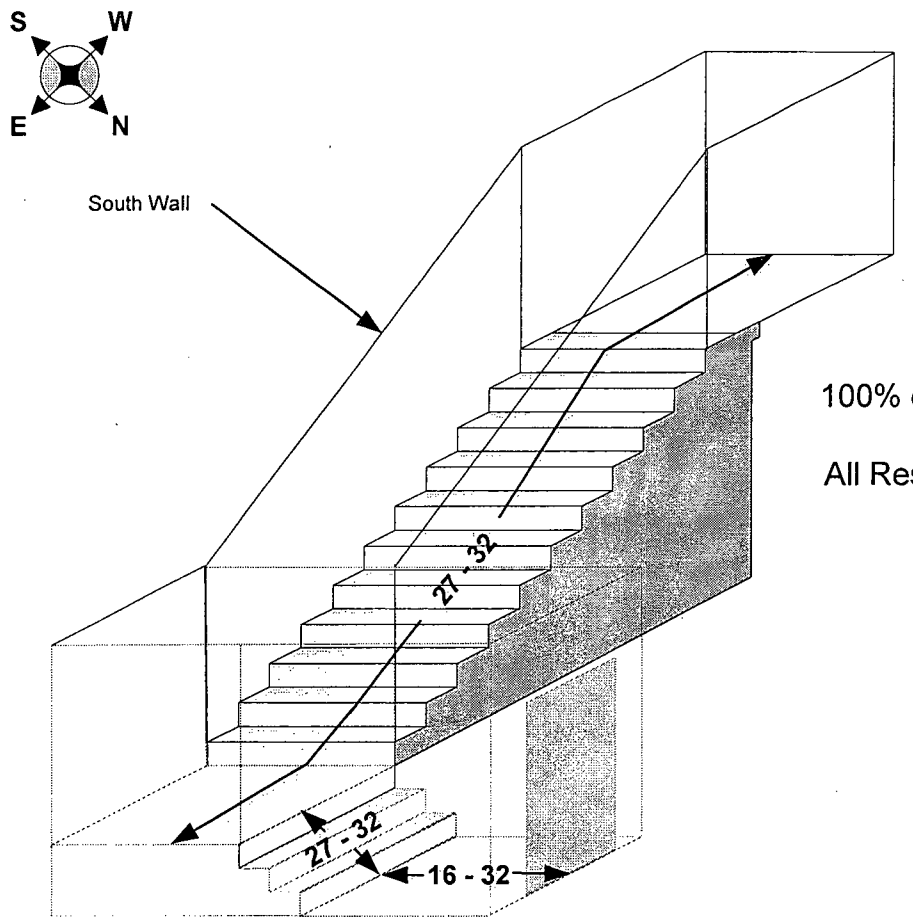
Figure 39: Building 30/31, Phase IV, Room 103 Stairways, Exposure Rate Scan Survey Locations and Results



100% of stairway surface scanned with 2"x2" NaI(Tl) detector held within 1" of the surface

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	153590
Calibration Due Date	06/07/2001
Efficiency	N/A
α β γ	γ
Probe Number	155190
Probe Size	2" x 2"
Background in µR/hr	16-19 @ contact
Technician(s): C. Stanley	Date: 06/04/01

Figure 40: Building 30/31, Phase IV, Stairway from Front Hallway to Room 103 Walls , Exposure Rate Scan Survey Locations and Results



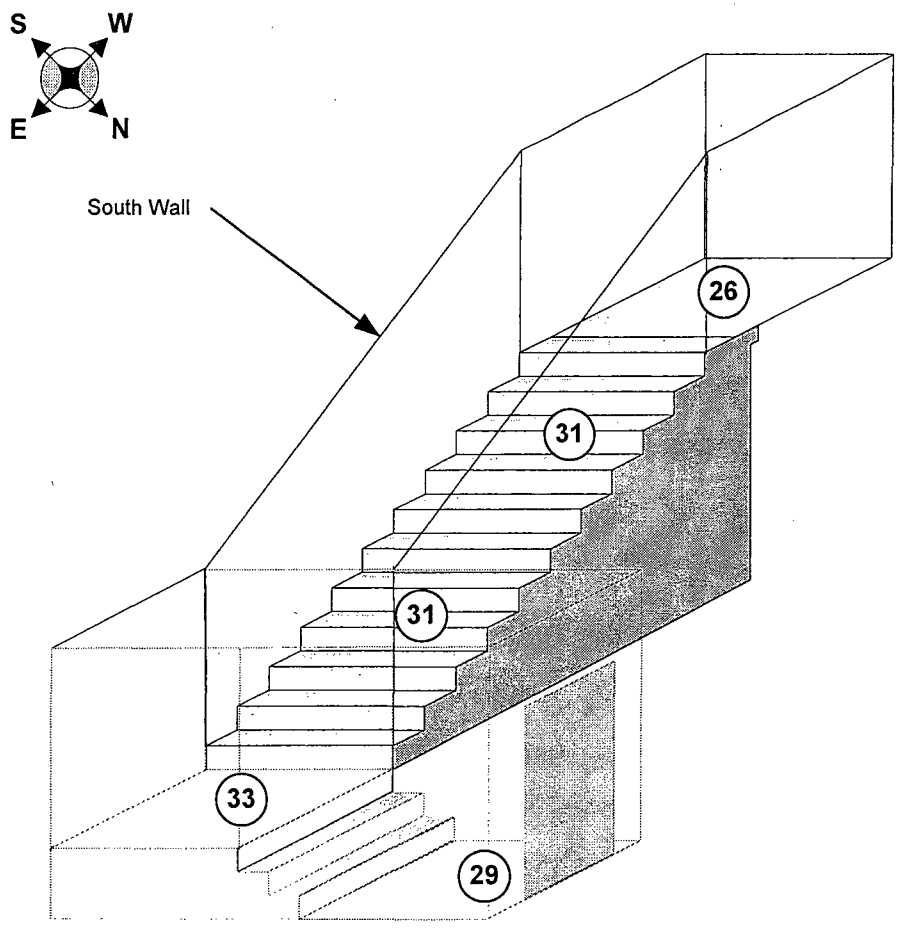
100% of floor surface scanned with detector held within 1" of the surface

All Results in μR/hr.

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	153590
Calibration Due Date	06/07/2001
Efficiency	NA
α β γ	γ
Probe Number	155190
Probe Size	2" x 2"
Background	16 - 19 μR/hr
Technician(s): C. Stanley	Date: 06/04/01

Note: Drawing Not to Scale

Figure 41: Building 30/31, Phase IV, Stairway from Front Hallway to Room 103 Walls , Fixed Exposure Rate Survey Locations and Results

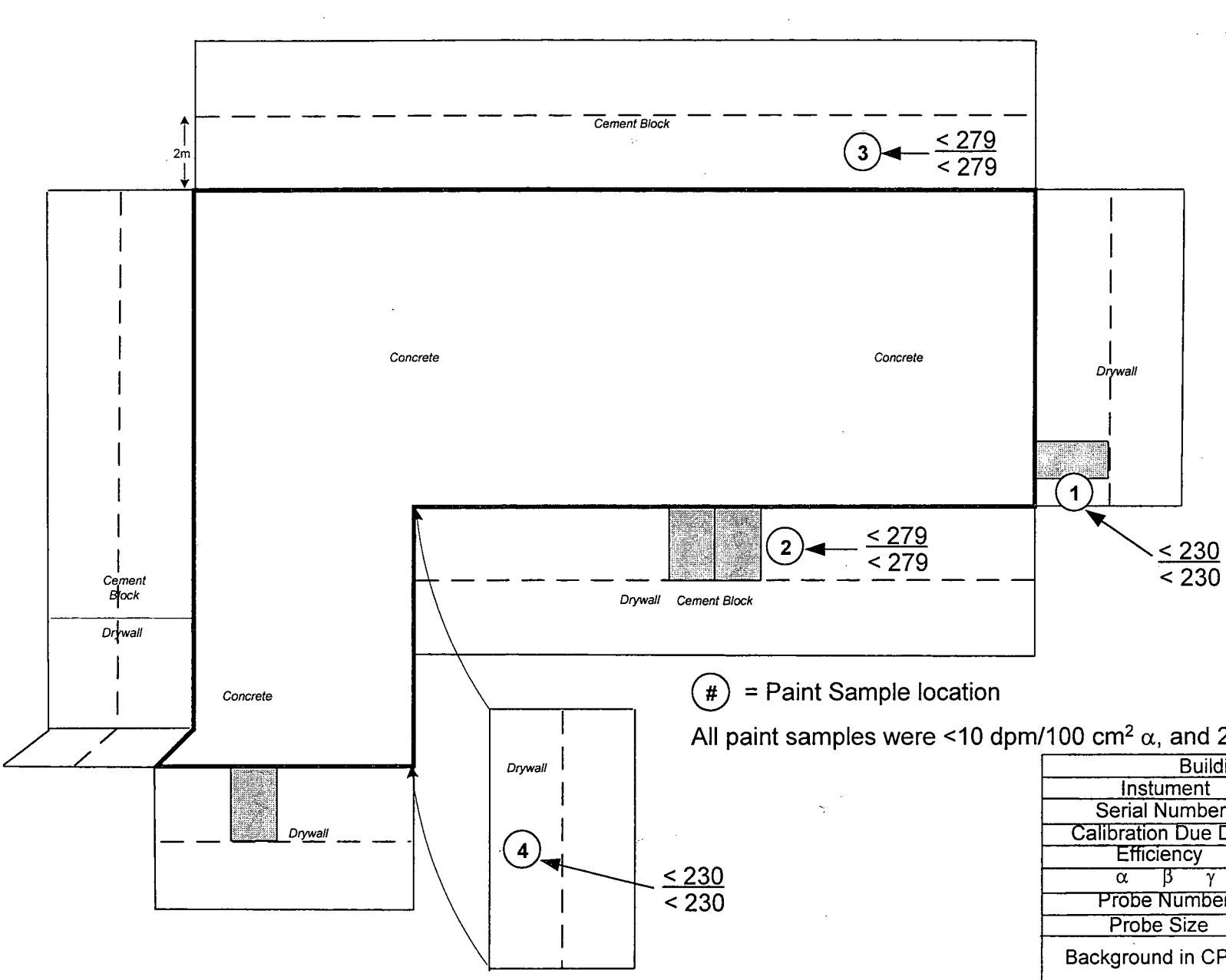


(##) = Exposure Rate at 1 meter from the surface, All Results in μR/hr.

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	151348
Calibration Due Date	08/02/05
Efficiency	NA
α β γ	γ
Probe Number	163169
Probe Size	2" x 2"
Background in Concrete Rooms	20 - 25 μR/hr
Technician(s): S. Cowan	Date: 06/30/05

Note: Drawing Not to Scale

Figure 42: Building 30/31, Phase IV. Room 100, Paint Sample Locations and Results



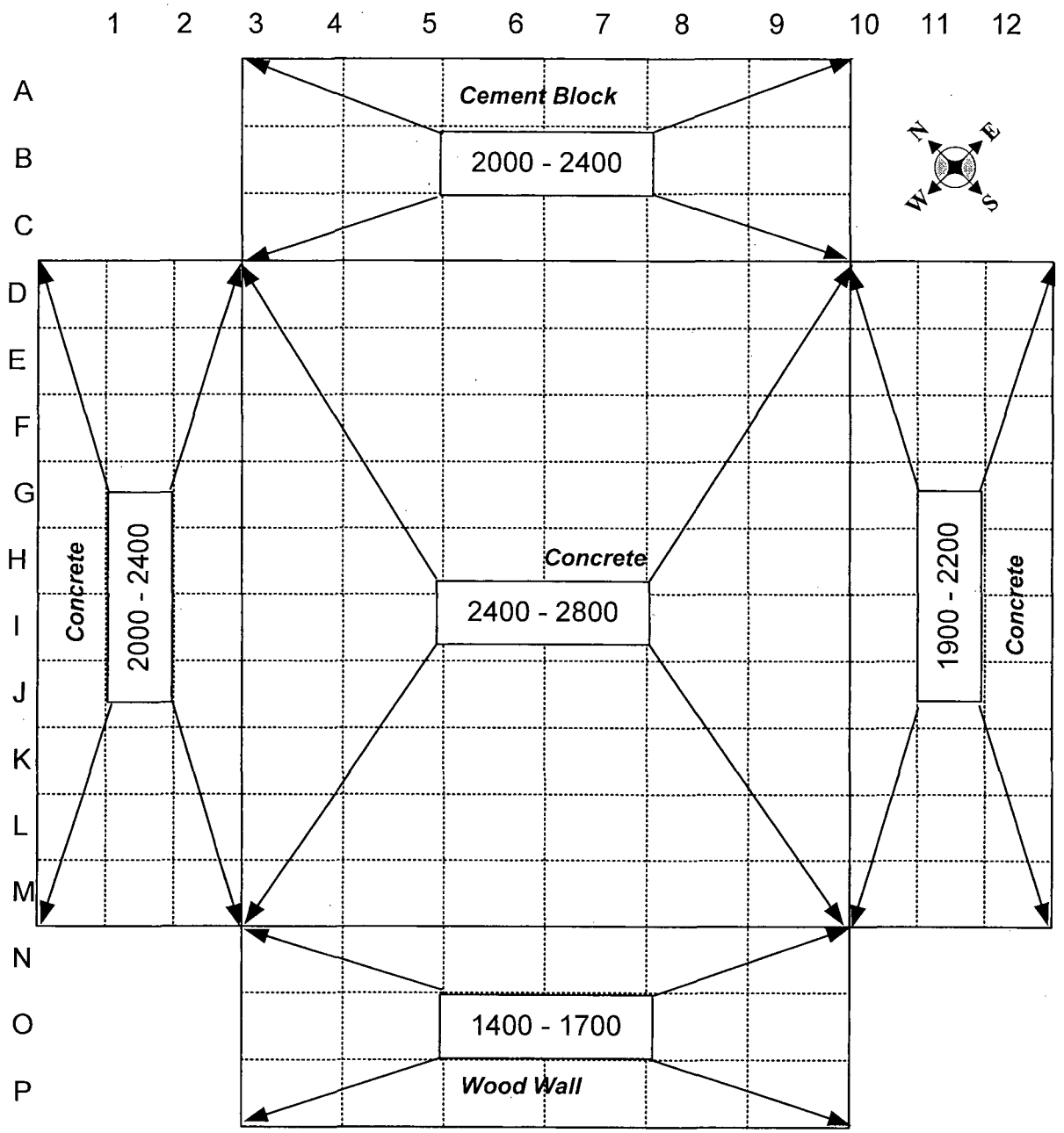
(#) = Paint Sample location

All paint samples were <10 dpm/100 cm² α, and 20 dpm/100 cm² β.

Building 30/31 Phase IV	
Instument	Ludlum Model 2221
Serial Number	84423
Calibration Due Date	09/26/2001
Efficiency	24.13%
α β γ	β
Probe Number	119444
Probe Size	100 cm²
Background in CP2M	1042± 90, concrete 803± 32, cement block 542 ± 31, Drywall
MDA in dpm/100 cm²	317, Concrete 279, Cement Block 230, Drywall
Technician(s): C. Stanley	Date: 08/09/01

$$\frac{\#\#\#}{\#\#\#} = \frac{\text{2 minute fixed Beta measurement before paint removal, in DPM/100 cm}^2}{\text{2 minute fixed Beta measurement After paint removal, in DPM/100 cm}^2}$$

Figure 43: Building 30/31 Phase IV, Room 118 Beta Scan Locations and Results



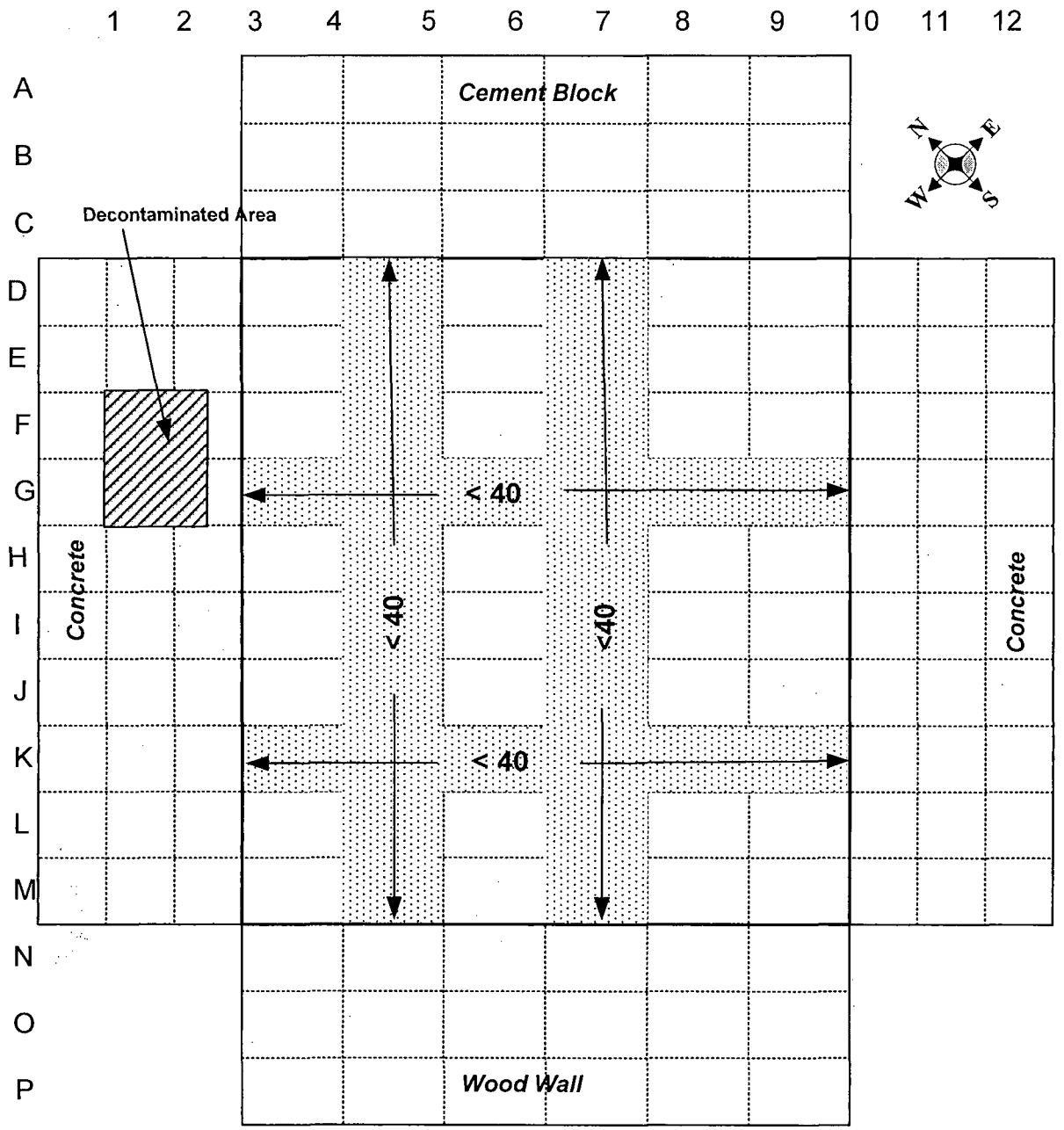
#### - ####	= Scan range results in cpm.

Floors - 100% surface scan
Walls - 100% lower walls scanned
10% upper walls scanned.

Scan MDA Data	
Scan MDA=	X(Ave.Background) / (Efficiency)(Probe size/100 cm^2)
X	0.3
Scan MDA	Concrete = 569 dpm/100 cm^2 Cement Block = 377 dpm/100 cm^2 Wood = 339 dpm/100 cm^2

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	84459
Calibration Due Date	01/10/2002
Efficiency	23.67%
α β γ	β
Probe Number	086215
Probe Size	434 cm^2
Background in CPM	1858-2036, concrete 1174-1409, cement block 1061-1262, Wood
Technician(s): B. Lyons/W. Schuck	Date: 07/13/01

Figure 44: Building 30/31 Phase IV, Room 118 Alpha Scan Locations and Results



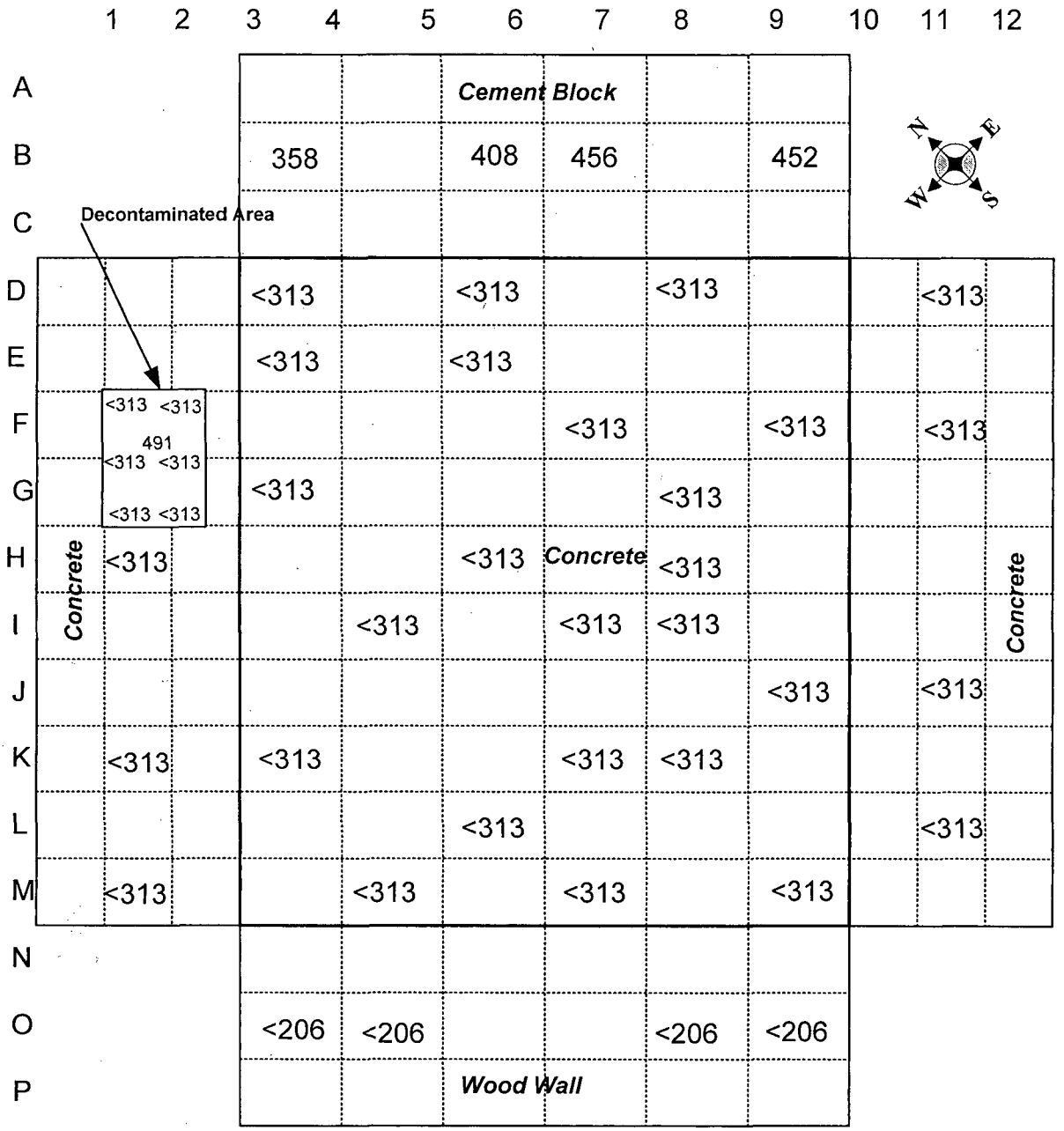
= 100% of area scanned with detector held within 1" of the surface.

All Results are in cpm

Scan MDA Data	
Scan MDA =	X(Ave.Background) / (Efficiency)(Probe size/100 cm²)
X	4.0
Scan MDA, Concrete	108 dpm/100 cm²

Building 30/31 Phase IV	
Instument	Ludlum Model-2221
Serial Number	148425
Calibration Due Date	11/03/2001
Efficiency	21.29%
α β γ	α
Probe Number	086236
Probe Size	434 cm²
Background (Concrete)	10 - 40 cpm
Technician(s): B. Lyons/ W. Schuck Date: 07/12/01	

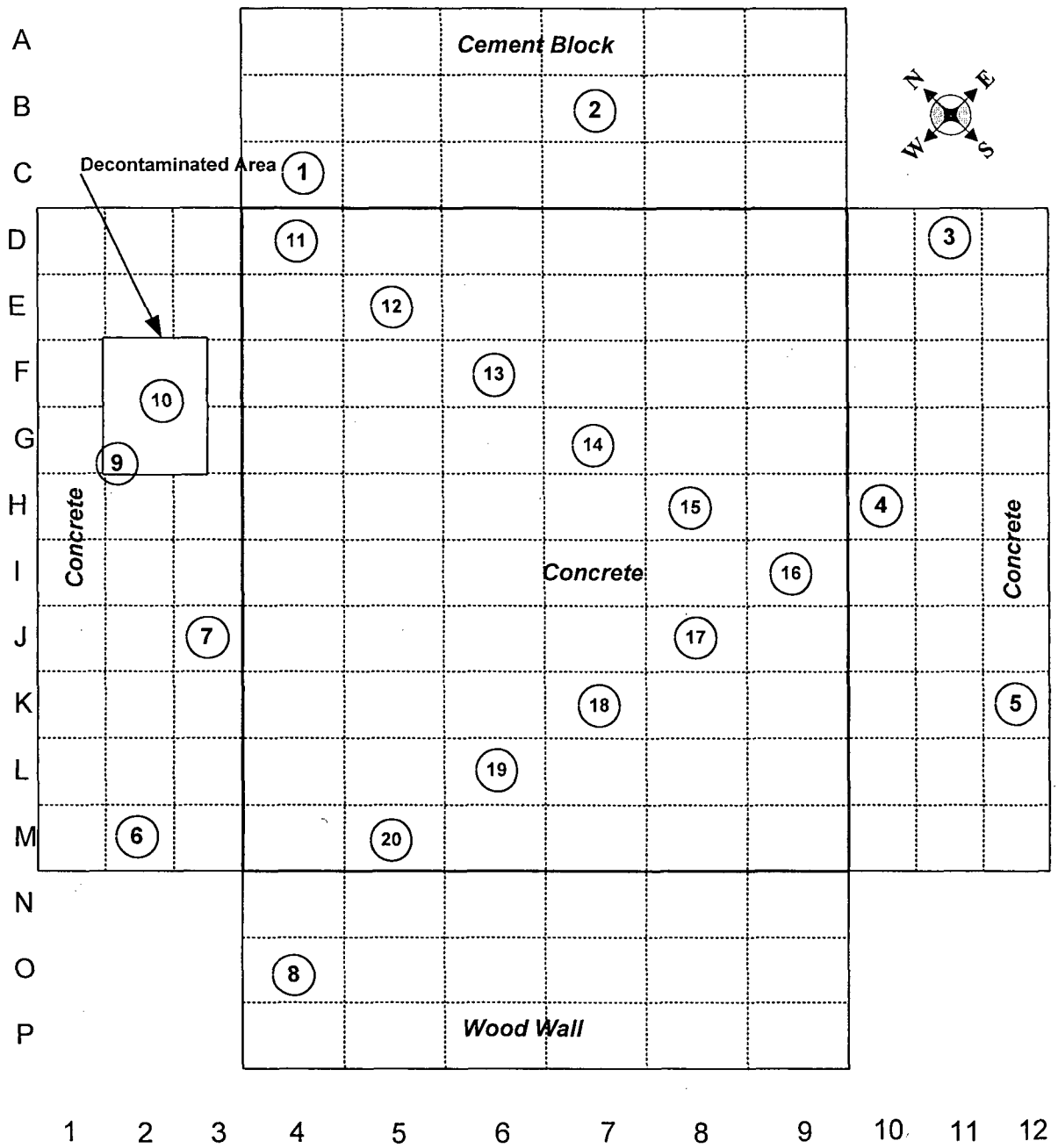
Figure 45: Building 30/31 Phase IV, Room 118 Fixed Beta Measurement Locations and Results



All measurements are 2 minute counts at contact converted to dpm/100 cm²

Building 30/31 Phase IV	
Instument	Ludlum Model 2221
Serial Number	84423
Calibration Due Date	09/26/2001
Efficiency	24.13%
α β γ	β
Probe Number	119444
Probe Size	100 cm²
Background in CP2M	1042± 90, concrete 803± 32, cement block 757 ± 46, Wood
MDA in dpm/100 cm²	313, Concrete 275, Cement Block 206, Wood
Technician(s): B. Lyons/W. Schuck	Date: 07/13/01

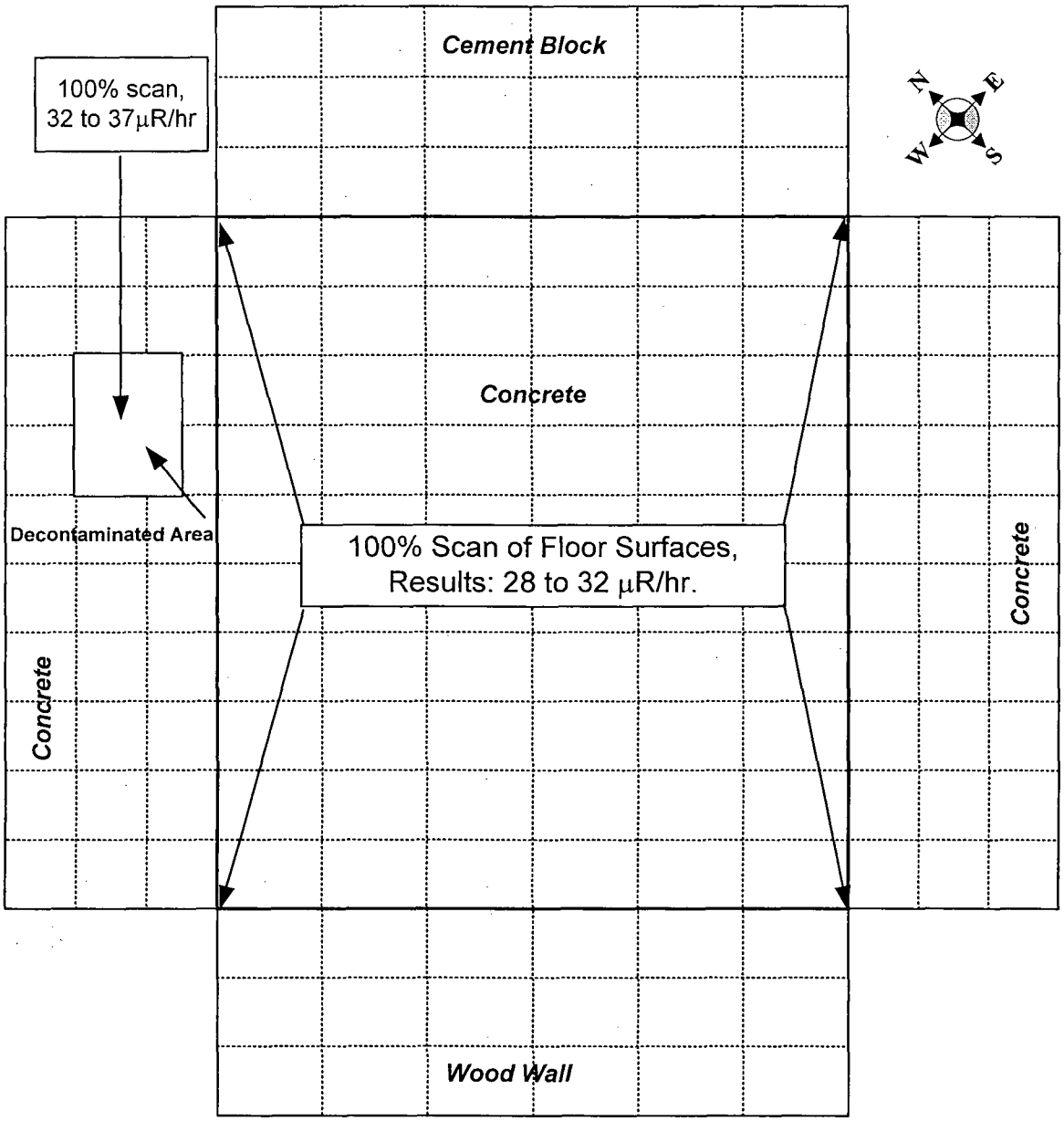
Figure 46: Building 30/31 Phase IV, Room 118 Removable Contamination (Wipe) Survey Locations



(#) = Wipe Survey Locations. See Table 6 for Alpha and Beta analysis results

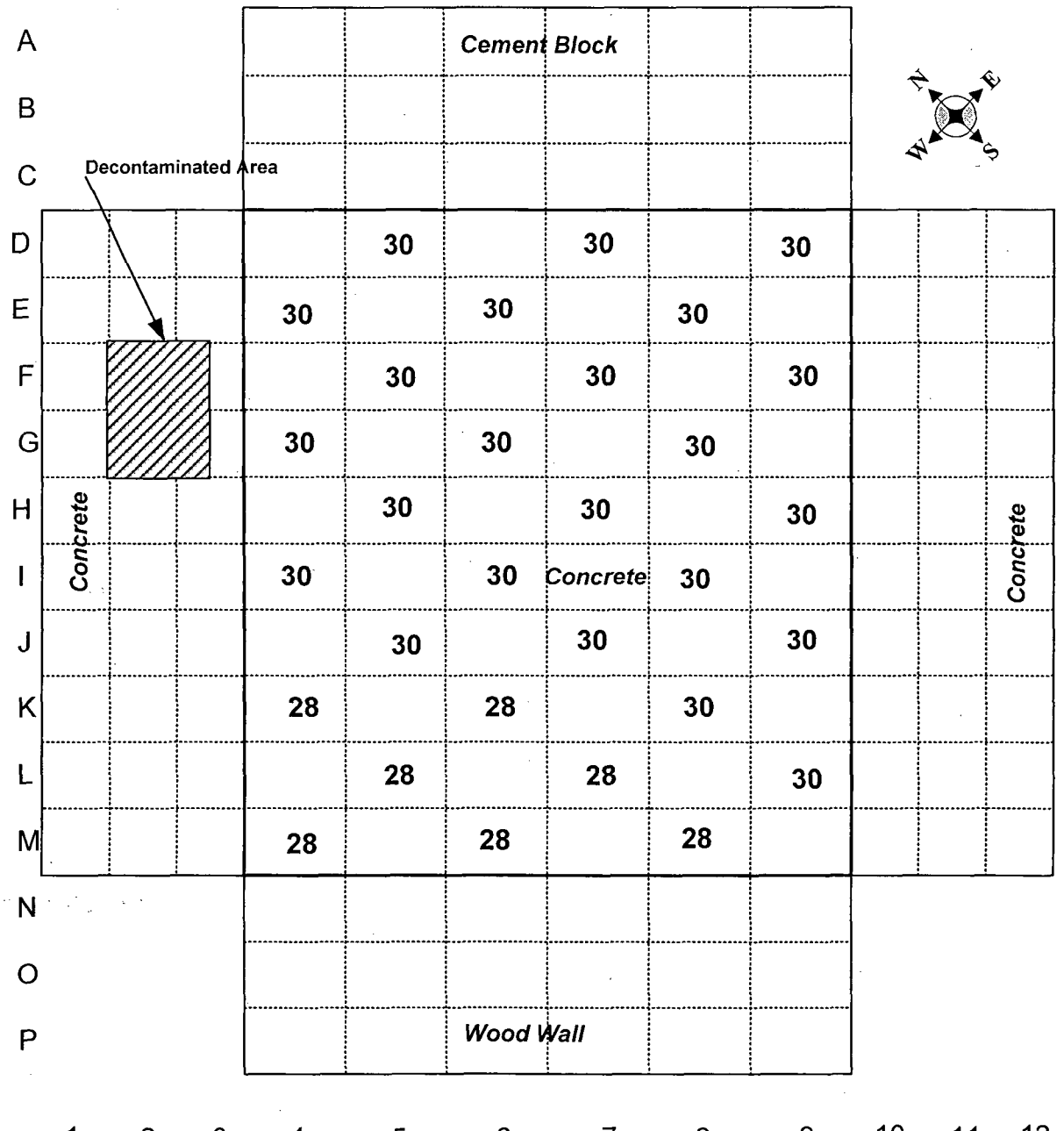
Wipe samples collected by B. Lyons and W. Schuck on 7/12/01

Figure 47: Building 30/31 Phase IV, Room 118 Exposure Rate Surface Scan Location and Results



Building 30/31 Phase IV	
Instument	Ludlum Model-19
Serial Number	12390
Calibration Due Date	11/08/2001
Efficiency	NA
α β γ	γ
Probe Number	NA (internal)
Probe Size	1" x 1"
Background (Concrete)	28-30 μR/hr
Technician(s): B. Lyons/ W. Schuck Date: 07/12/01	

Figure 48: Building 30/31 Phase IV, Room 118 Fixed Exposure Rate Locations and Results



All Results in μR/hr at 1 meter from the surface

Building 30/31 Phase IV	
Instument	Ludlum Model-19
Serial Number	12390
Calibration Due Date	11/08/2001
Efficiency	NA
α β γ	γ
Probe Number	NA (internal)
Probe Size	1" x 1"
Background (Concrete)	20-23 μR/hr
Technician(s): B. Lyons/ W. Schuck	Date: 07/12/01

Appendix A

Final Survey Plans for Building 30/31 - Phase IV Rooms

of

General Atomics' Final Radiological Survey Report of
Building 30/31 - Phase IV Rooms
For Release to Unrestricted Use

September 2001
Revised November 2005

March 29, 2001
Amended April 13, 2001
Prepared by Paul R. Maschka PRM

Approved Laura Gonzales Date 4/13/01
Laura Gonzales

FINAL SURVEY PLAN FOR BUILDING 30/31, PHASE-IV

Phase IV includes rooms 30-100, 31-102, Hallway, Dress-out/Change Room, and 31-103 (Chet Wisham's former Vault Room) as shown in Figures 1, 2, and 3.

Amended this survey because Room 31-101 is to be used as the Calibration Lab and will be surveyed for release at a later date.

BACKGROUND

Characterization surveys were completed for these rooms and the results of these surveys did not reveal any areas that required decontamination. There was one area that had elevated radiation measurements.

> The shower stalls in the change room had elevated alpha and beta measurements but a similar shower in a non-radiation location, with similar tile, also had similar elevated measurements. A sample of the tile was checked by gamma ray analysis, and this showed the presence of normal uranium.

All other measurements were at normal background levels or were well below the approved criteria for release to unconditional use.

Classification

Room 100: Radioactive materials used in room 100 were either Linear Accelerator irradiated or small sealed sources, or possibly soil samples with low levels of contamination; therefore, contamination is not expected. Based on the history of use, this room was categorized as **"non-suspect affected" area**.

Room 102: Room 102 was used as an office and an electronics repair area. This room is classified as an **Unaffected Area.**

Hallway: This area is classified as an **Unaffected Area.**

Change Room: The Change Room was a locker room used by people who needed to change clothing before going into Room 103, which at times was a suspected contamination area. This room is a **Non-Suspect Affected Area.**

Room 103: Room 103 is classified as a **"Non-Suspect Affected" Area** (i.e., it is not expected that the average removable or total surface activity will exceed 75% of the guideline values). The characterization surveys demonstrated that radiation levels did not exceed 75% of the

guideline values; therefore the classification remains non-suspect affected. The primary contaminants of concern for this area are enriched uranium and thorium

Survey Objectives and Responsibilities

The purpose of performing a final survey is to demonstrate that the radiological conditions in each room satisfy the NRC and State of CA guidelines for release to unrestricted use. The objective include (1) to show that the average surface contamination levels for each survey unit are within the authorized value, (2) to show that the maximum residual activity ('hot spot" area do not exceed three times the average value in an area up to 100 cm^2 and (3) that a reasonable effort has been made to clean removable contamination and fixed contamination and (4) that the exposure rates in occupiable locations are less than 10 μR/hr above background measured at 1 meter above the surface. Samples will be counted in GA's Health Physics laboratory. Surveys will be taken only by qualified Health Physics Technicians having a minimum of 3 years Health Physics Technician experience following approved Health Physics procedures and this Plan. The survey and final report documenting eh survey will be performed by GA's Health Physics group.

Release Levels (per GA's Site Decommissioning Plan)

Facilities and Equipment

The primary contaminants of concern for these rooms is enriched uranium and thorium.

The applicable guidelines for residual uranium contamination on building surfaces are:

5,000 dpm/100 cm^2 (averaged over 1 m^2 area)
15,000 dpm/100 cm^2 (maximum in a 100 cm^2 area if the average over 1 m^2 is met).
1,000 dpm/100 cm^2 (removable activity)

The applicable NRC guidelines for residual natural thorium surface activity levels are:

1,000 dpm/100cm^2 (averaged over a 1 m^2 area)
3,000 dpm/100cm^2 (maximum in a 100 cm^2 area if the average over 1m^2 is met)
200 dpm/100cm^2 (removable activity)

As interpreted by the NRC, the average 1000 dpm/100cm^2 and the maximum 3000 dpm/100cm^2 should apply to both alpha and beta measurements, independently, for surface contamination involving natural thorium. ("Interpretation of Thorium Surface Decontamination Limits," U.S. Nuclear Regulatory Commission, February 9, 1992). Thorium emits alpha radiation to beta radiation in a 1:0.67 ratio; therefore, the corresponding average and maximum beta activity guidelines were adjusted to be 670 dpm/100cm^2 and 2000 dpm/100cm^2, respectively.
Since the instruments cannot distinguish between uranium and thorium contamination, the most restrictive activity guideline for natural thorium (670 dpm/100cm^2) is used to compare all direct measurement for beta activity.

Alert Levels

Notify Health Physics Management if any of the following alert levels are exceeded:

Alpha Monitoring
>100 cpm using the 434 cm^2 probe (check area with a hand-held alpha meter).
> 60 cpm using a 50 cm^2 hand-held probe.

Beta Monitoring
>300 cpm above the appropriate background using the 434 cm^2 probe.
>100 cpm above the appropriate background using the 100 cm^2 probe.
>150 cpm above background (using a 15 cm^2 pancake GM probe)

Exposure Rate Measurements
Background is typically ~15μR/hr at I meter above the surface (but may vary with type of facility and location). Normal background for this type of area in Building 31 with concrete walls, floor, and ceiling, ranges from ~20-23 μR/hr. This background value was measured in a similar concrete room in GA's Building 1.

The exposure rate alert level is:
>25 μR/hr at 1 meter from the surface
>30 μR/hr at contact with the surface.

Documentation
The radiological survey conducted must be documented on a daily basis to a worksheet or logbook and on a drawing showing the appropriate locations surveyed. The documentation must include the results of the measurements (including units), the technicians printed name and signature, date, instrument(s) used (including the model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

FINAL SURVEY FOR BUILDING-30 -31 PHASE IV
FOLLOWING THE REQUIREMENTS OF THE SITE DECOMMISSIONING PLAN

Room	SCANS			MEASUREMENTS	PAINT SAMPLES	EXPOSURE RATE MEASUREMENTS
	Floor and Walls Below 2 m	Walls above 2 m	Overhead Fixtures			
	Survey	Survey	Survey	Direct and Smears	No. of Samples (Take 100 cm² beta 2 min. count before and after)	µR Survey
Non-Suspect Affected Area						
Room 100	100% beta only	10% beta only	None	20 direct beta, 2 min. count with 100 cm² probe. 20 smears 100cm²	4	Scan 20% of the floor ~2" above. Take one measurement every 3 m at 1m above the surface
Change Room	100% beta 100% alpha	10% beta only	None	10 direct beta, 2 min. count with 100 cm² probe. 10 direct alpha with 50 cm² probe. 30 sec. count 16 smears 100cm²	4	Scan 20% of the floor ~2" above. Take one measurement every 3 m at 1m above the surface or a minimum of 6 readings.
Room 103 and the Tunnel	100% beta 25% alpha	10% beta only	NA	Take one direct measurement every 3 m. Alternate: Beta, Alpha, Smear	4	Scan 10% of the floor ~2" above. Take one measurement every 3 m at 1m above the surface
Room 103 Catwalk	100 % Beta 25% alpha	10% beta only	NA	10 direct beta, 2 min. count with 100 cm² probe. 10 direct alpha with 50 cm² probe. 30 sec. count 16 smears 100cm²	None	None
Room 103 Overhead Crane	Scan 100% of the crane that can be reached from the catwalk with 15 cm² GM pancake counter and with a 50 cm² alpha counter			15 smears 100cm²	None	N/A
Unaffected Areas						
Room 102	25% beta 25% alpha	10% beta only	None	10 direct beta, 2 min. count with 100 cm² probe. 10 direct alpha with 50 cm² probe. 30 sec. count 16 smears 100cm²	4	Scan 20% of the floor ~2" above. Take one measurement 1m above the surface every 3 m or a minimum of 6 readings.

FINAL SURVEY FOR BUILDING-30 -31 PHASE IV
FOLLOWING THE REQUIREMENTS OF THE SITE DECOMMISSIONING PLAN

Room	SCANS			MEASUREMENTS	PAINT SAMPLES	EXPOSURE RATE MEASUREMENTS
	Floor and Walls Below 2 m	Walls above 2 m	Overhead Fixtures			
	Survey	Survey	Survey	Direct and Smears	No. of Samples (Take 100 cm² beta 2 min. count before and after)	µR Survey
Hallway	100% beta	105 beta only Typo (%)	None	10 direct beta, 2 min. count with 100 cm² probe. 10 direct alpha with 50 cm² probe. 30 sec. count 10 smears 100cm²	4	Scan 20% of the floor ~2" above. Take one measurement 1m above the surface every 3 m or a minimum of 6 readings.

Figure 1: Building 30/31 PHASE IV

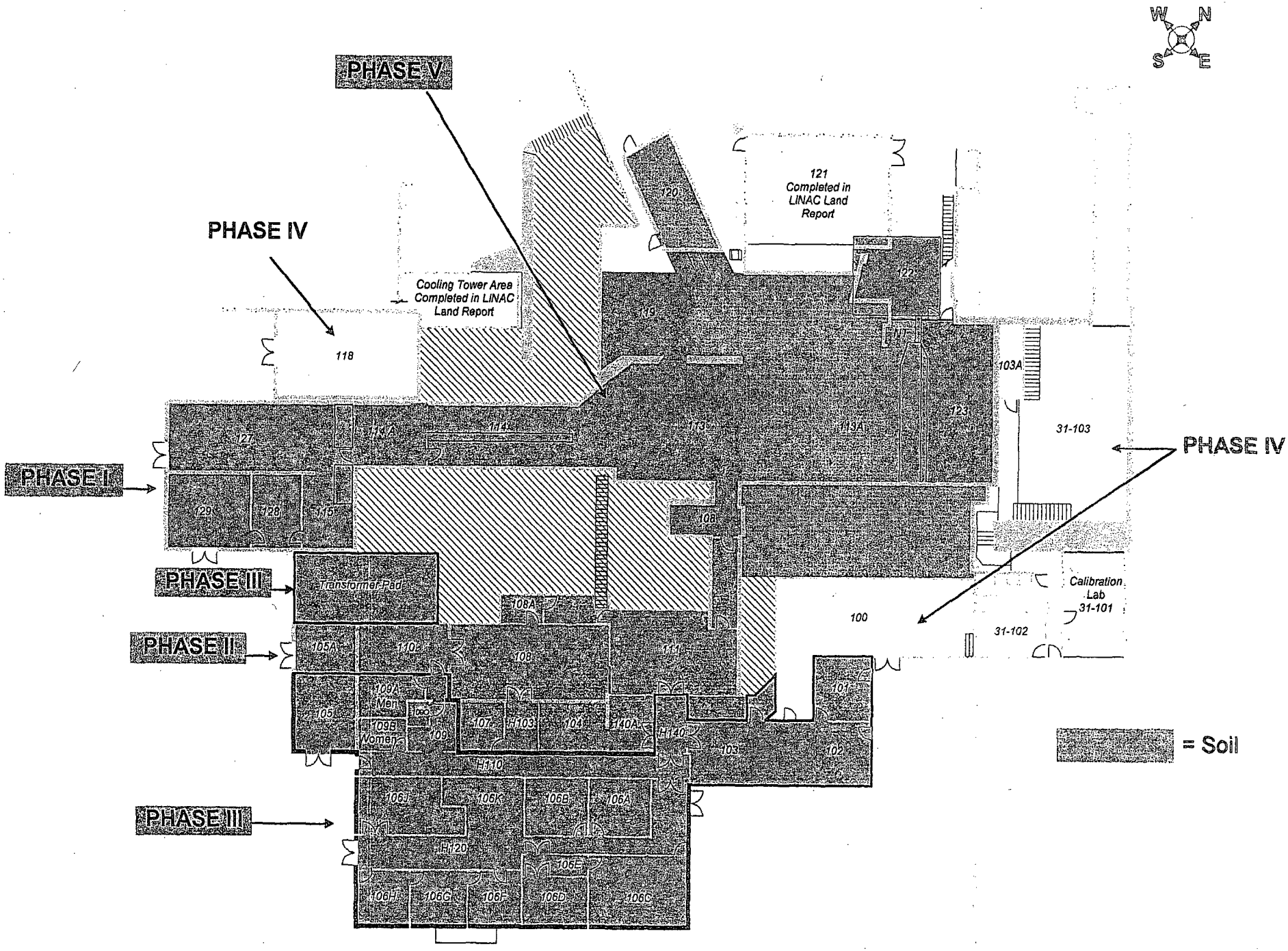


Figure 2: Building 30/31 PHASE IV

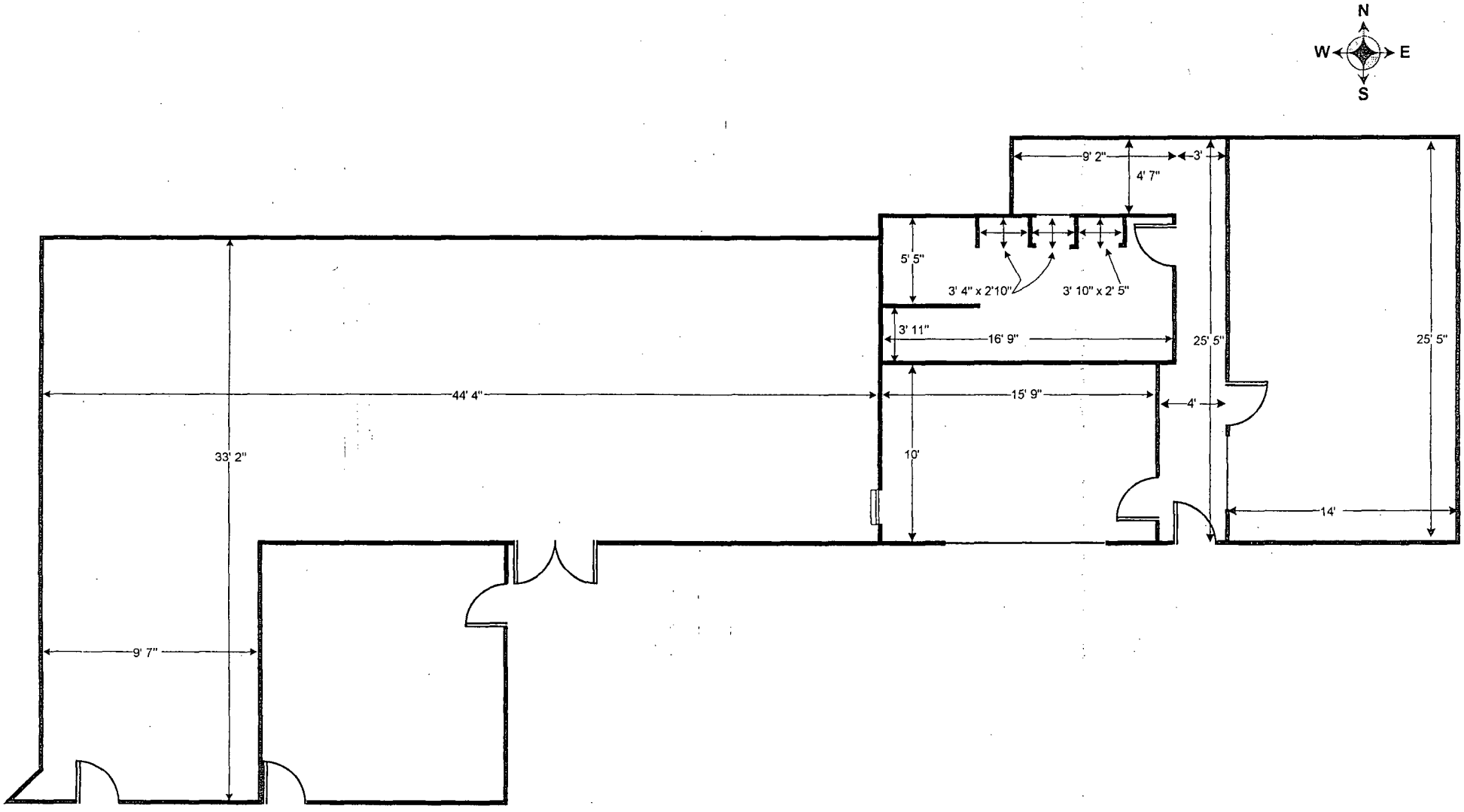


Figure 3: Building 30/31 PHASE IV

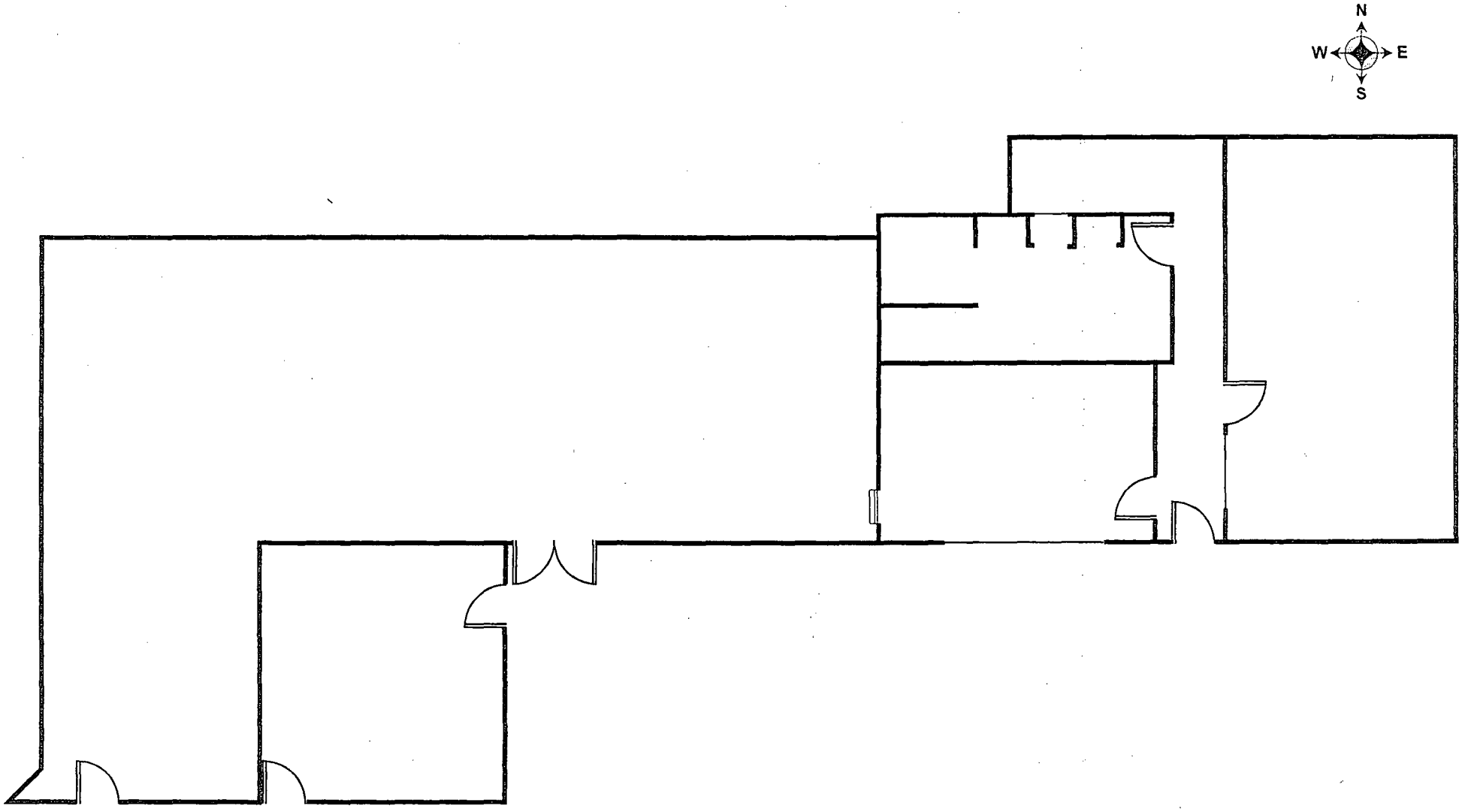
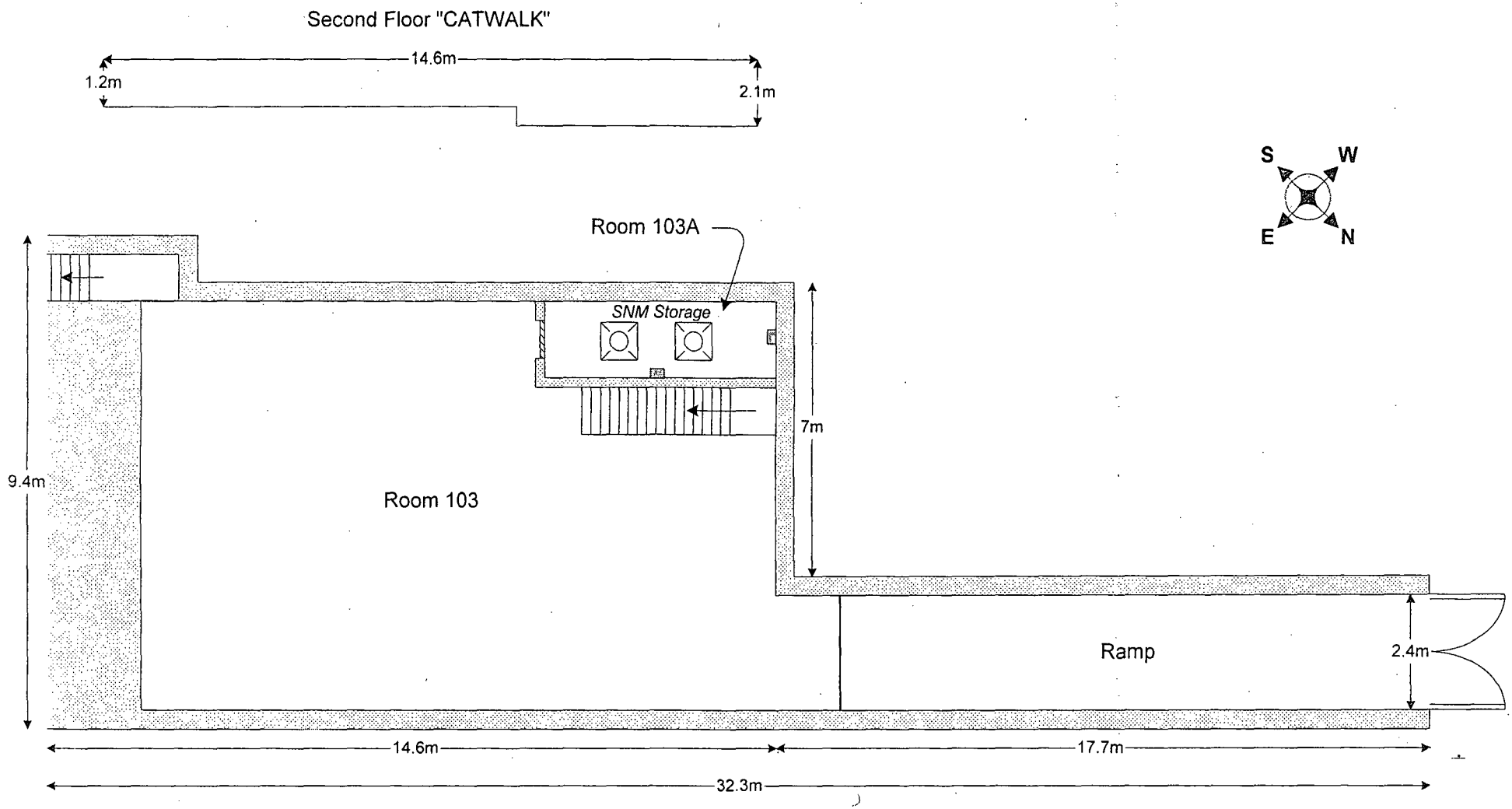


Figure 4: Building 31-103. PHASE IV, Former S-1 NMA Storage



FINAL SURVEY PLAN FOR BUILDING 30, ROOM 118

Prepared by: Paul R. Maschka Date: 6/26/01
Paul R. Maschka

Approved by: Laura Gonzales Date: 6/26/01
Laura Gonzales

Background

Building 30 previously housed a 100 MeV linear electron accelerator (LINAC). The LINAC consisted of two in-line accelerators which were operated independently at 25 and 75 MeV, respectively. The two accelerators could be connected in tandem and could operate up to 100 MeV. The single section accelerator located in the west end of room 114 could direct the electron beam into Room 118.

Survey Objectives and Responsibilities

The purpose of performing a final survey is to demonstrate that the radiological conditions in each room satisfy the NRC and State of CA guidelines for release to unrestricted use. The objective include (1) to show that the average surface contamination levels for each survey unit are within the authorized value, (2) to show that the maximum residual activity ('hot spot" area do not exceed three times the average value in an area up to 100 cm^2 and (3) that a reasonable effort has been made to clean removable contamination and fixed contamination and (4) that the exposure rates in occupiable locations are less than 10 μR/hr above background measured at 1 meter above the surface. Samples will be counted in GA's Health Physics laboratory. Surveys will be taken only by qualified Health Physics Technicians having a minimum of 3 years Health Physics Technician experience following approved Health Physics procedures and this Plan. The survey and final report documenting eh survey will be performed by GA's Health Physics group.

History of Use of Radioactive Materials

Room 118 was used for sterilization of medical products and radiation processing of gem stones and semiconductors. A small section of the north wall contained activated radioactive materials due to past accelerator operations, and characterization surveys showed the extent and quantity of activation. Three core samples were removed from the north wall and divided into a concrete sample and a rebar sample (one core did not have any rebar). From each location two samples were collected from the soil that is behind the wall. The gamma scan of the rebar showed Co-60 activity levels of 0.11 pCi/g and 0.23 pCi/g. Only one concrete sample showed any Co-60 and that was 0.02 pCi/g. All of the soil samples were at or near background levels and no Co-60 was detected. Micro scans of the wall measured from 32-36 μR/hr, which is above the release criterial. The activated section of wall and rebar have been removed and post decon surveys show the wall now meets the release criteria.

Classification
This room is classified as a Suspect Affected Area.

Release Limits
The primary contaminant is Co-60 (beta/gamma emitter).

Beta/Gamma Emitters
5000 dpm/100 cm^2, averaged over a 1m^2 area
15,000 dpm/100 cm^2, maximum in a 100 cm^2 area if the average over 1 m^2 is met.
1000 dpm/100 cm^2, Removable activity

Alert Levels
Notify Health Physics management if any of the following alert levels are exceeded.

Smears
If any smear is >75% of the release level (750 dpm/100 cm^2), increase the number of smears to define the area of contamination and mark the area.

Alpha Alert Levels
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements.
>100 cpm alpha using the large area (434 cm^2)probe.
>60 cpm using a hand-held alpha probe (50 cm^2) - (~1500 dpm/100 cm^2)

Beta Alert Levels
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements.
>~300 cpm beta above background using the large area (434 cm^2) probe
>~200 cpm above background using the 100 cm^2 probe
>~100 cpm above background using a portable GM detector.

Exposure Dose Rate Measurements
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements: measurements >32 μR/hr on the surface, or >30 μR/hr at 1 meter from the surface.

Documentation
Every survey conducted must be documented *on a daily basis* on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's name and signature, date, instrument(s) used (including model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other applicable information.

Final Surveys For Building 30, Rooms 118 and 123

Type of Survey	30 - 118 Suspect Affected Area
Gridding	Yes 1m x 1m floor and wall up 2m
Floor α Scan with 434 cm ^{2} probe	10% (no uncontained U or Th was used or stored in this room)
Floor β Scan with 434 cm ^{2} probe	100%
Walls β Scan with 434 cm ^{2} probe	100% up 2m and 10% above 2m
North Wall β Scan with 15 cm^2 GM probe	**100% of the Marked "spot' on north wall**
Overhead Fixtures β Scan hand held GM detectors	10%
Number of Fixed Measurements with 100 cm^2 beta probe	Use 100 cm^2 beta probe with a 2 minute count. Take 16 measurements on the floor, 4 on each wall at 5' above the floor,
Number of Fixed Measurements with 100 cm^2 beta probe in the north wall "hot spot'	7 measurements; one in each corner ~8" from the sides and three near the center equally spaced.
Number of smears	18 8 - floor 8 - wall 2 - Hot Spot
Number of MicroR measurements	Scan 100%of the surface of the floor and Hot Spot on the north wall at ~2" from the surface. Take a measurement Every 2m - 1m above floor.

Appendix B

Internal Confirmatory Survey Plan and Summary of Results for

Building 30/31 - Phase IV Rooms

of

General Atomics' Final Radiological Survey Report of
Building 30/31 - Phase IV Rooms
For Release to Unrestricted Use

September 2001
Revised November 2005

Internal Confirmatory Survey Plan

Building 30/01 - Phase IV

July 19, 2001 Paul R. Maschka
Prepared by Paul R. Maschka

Approved by Laura Q. Gonzales Laura Gonzales

GA INTERNAL CONFIRMATORY SURVEY PLAN FOR B-30/31 PHASE IV

This survey plan is for a confirmatory survey of the B-30/31 Phase IV area. The surveys will be conducted by an HP Technician(s) who was not responsible for conducting any of the final surveys. These surveys will include scans and spot checks on the floors and walls using floor monitors, pancake GM detectors, and a μR survey meters. Smears will be collected in random locations.

Background and Objectives

The location of Phase IV is shown in Figure 1and the rooms to be surveyed are shown in Figure 2. Classification of the rooms are as follows:

B-30-100 - Non-Suspect Affected
B-30-118 - Suspect Affected
B-31-102 - Unaffected Area
B-31- Hall - Unaffected Area
B-31-102A - Non-Suspect Affected
B-31-103 - Non-Suspect Affected

During the characterization survey in Room 118, B-30, a section of the north wall was found to be contaminated above the release criteria for direct dose rate measurements. Samples of the concrete and metal rebar were taken and it was determined that the rebar contained Co-60. Co-60 is a normal activation product that is produced in steels by the interaction of high energy electrons. This area was decontaminated and it now meets the release criteria.

The showers in Room 102A contain small quantities of naturally occurring radioactive materials (NORM) (U and Th).

No other radioactive materials were found in any location during the Final Survey.

Survey Objectives

The purpose of performing a confirmatory survey is to demonstrate that the Final Survey performed by GA Health Physics Technicians was effective in identifying the radiological conditions of the area.

Release Limits
The primary contaminant is Co-60 (beta/gamma emitter) and NORM.

U and Th and Beta/Gamma Emitters
5000 dpm/100 cm^2, averaged over a 1m^2 area
15,000 dpm/100 cm^2, maximum in a 100 cm^2 area if the average over 1 m^2 is met.
1000 dpm/100 cm^2, Removable activity

Alert Levels
Notify Health Physics management if any of the following alert levels are exceeded.

Smears
If any smear is >75% of the release level (750 dpm/100 cm^2), increase the number of smears to define the area of contamination and mark the area.

Alpha Alert Levels
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements.
>100 cpm alpha using the large area (434 cm^2)probe.
>60 cpm using a hand-held alpha probe (50 cm^2) - (~1500 dpm/100 cm^2)

Beta Alert Levels
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements.
>~300 cpm beta above background using the large area (434 cm^2) probe
>~200 cpm above background using the 100 cm^2 probe
>~100 cpm above background using a portable GM detector.

Exposure Dose Rate Measurements
If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate decontamination requirements: measurements >38 μR/hr on the surface, or >32μR/hr at 1 meter from the surface.

Documentation
Every survey conducted must be documented *on a daily basis* on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's name and signature, date, instrument(s) used (including model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other applicable information.

Conduct surveys as shown on the following table.

BUILDING 30/31, PHASE IV CONFIRMATORY SURVEY

Type of Survey	Unaffected Area (B-31, Rm 102 and Hallway)	Non-Suspect Affected (B-30-100, B-31-103 & 102A)	Suspect Affected (B-30-118)
β Scans 434 cm²	None	None	25% floor
γ Scans and Direct Measurements 1m above the floor using Mod.19 μ R	10% scan - floor	25% scan - floor	25% scan - floor
Direct β measurements 2 min. 100 cm²			6 measurements floor 4 measurements wall 3 measurements deconed area

Figure 1: Building 30/31 PHASE IV

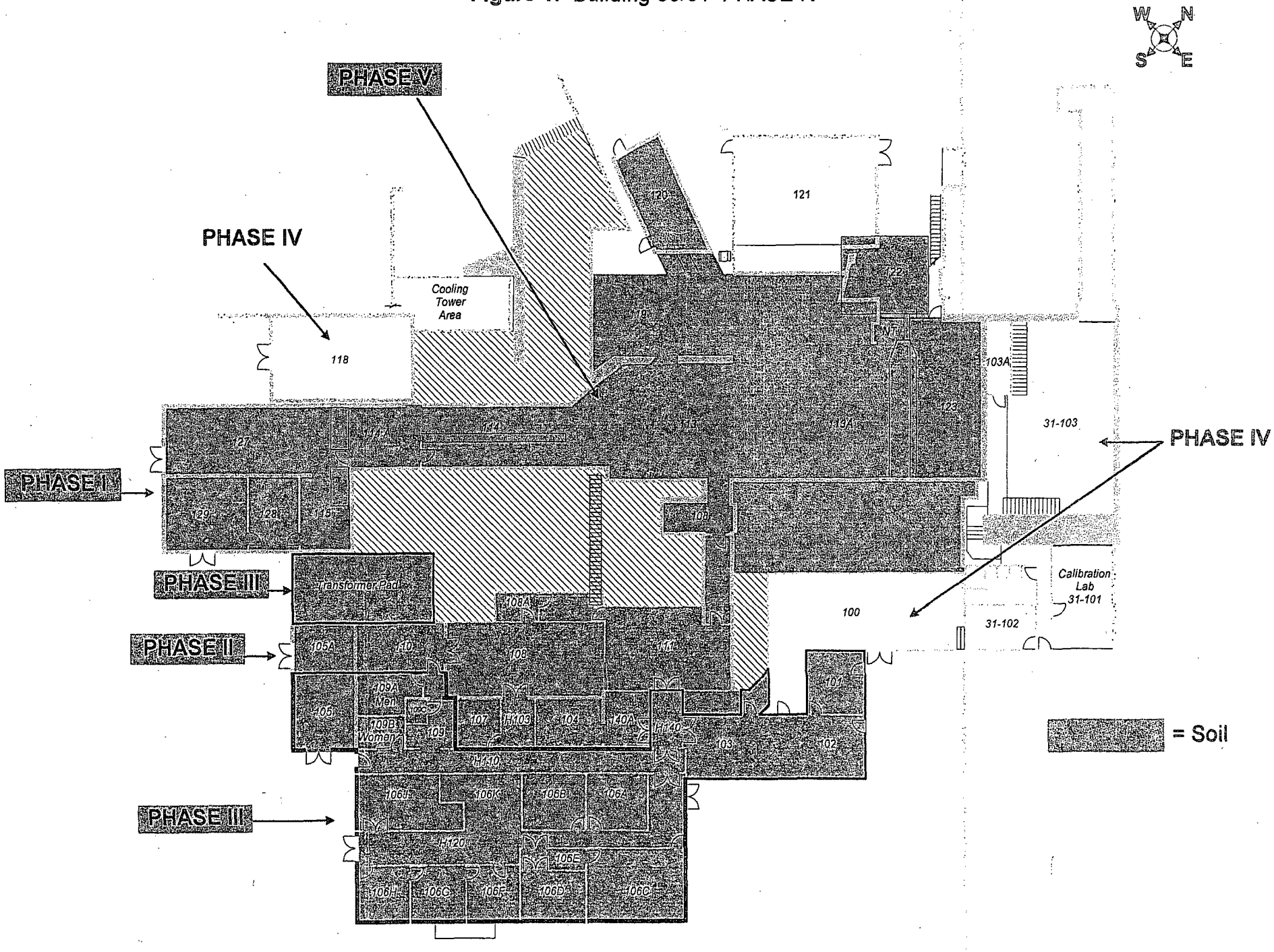
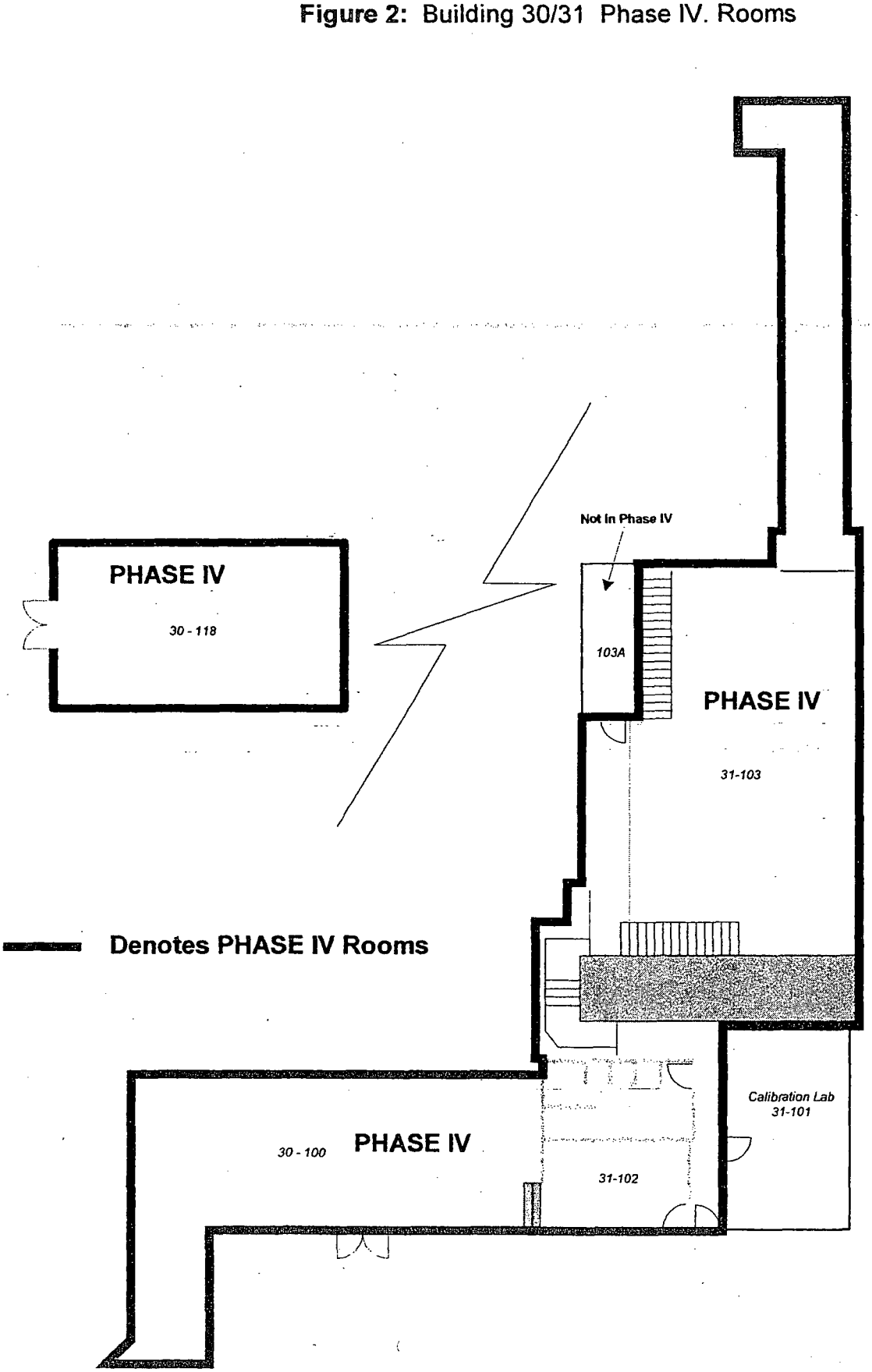


Figure 2: Building 30/31 Phase IV. Rooms



Internal Confirmatory Survey Summary of Results

Building 30/31 - Phase IV

GA Confirmatory Survey Summary - Building 30/31 Phase IV

Description

Following the completion of the Final Survey of Building 30/31 - Phase IV, a confirmatory survey was performed in accordance with an approved survey plan. The purpose of this survey was to confirm that the area meets the approved release criteria for release to unrestricted use.

This survey consisted of the following measurements:

Location	Fixed Beta Survey	Beta Surface Scans	Exposure Rate Surface Scans	Fixed Exposure Rate Survey
Room 100	No	No	~25% of floor	5 @contact and 5 @ 1m
Room 102, 102a, and Former Hallway	No	No	~25% of floor	12 @contact and 12 @ 1m
Room 103	No	No	~25% of floor	No
Room 118	15 measurements	~20% of floor	~25% of floor	6 @ 1m

Survey Results

Room 100: The exposure rate scan range was 16 to 24 μR/hr. The highest exposure rate measurement at contact was 21 μR/hr and the highest exposure rate at 1 meter from the floor was 20 μR/hr. All results are at natural background levels, see Figure 1 for locations, results, and survey instrument information.

Room 102, 102a, and the former Hallway: The exposure rate scan range was 20 to 25 μR/hr. The highest exposure rate measurement at contact was 25 μR/hr and the highest exposure rate at 1 meter from the floor was 24 μR/hr. All results are at natural background levels, see Figure 2 for locations, results, and survey instrument information.

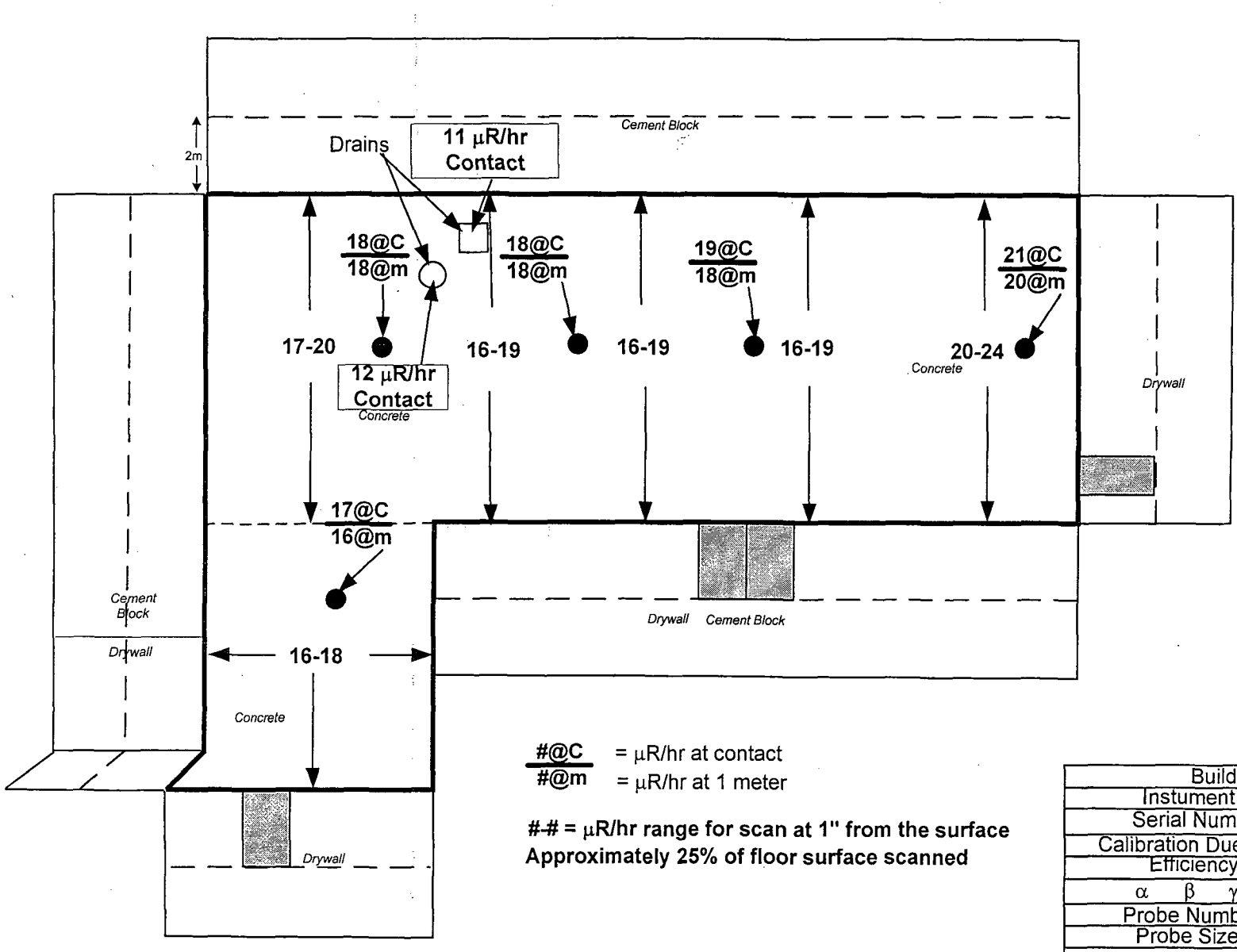
Room 103: The exposure rate scan range was 20 to 28 μR/hr. The background for the instrument used was 24-27 μR/hr. These results are far below the NRC- and State approved release criteria of less than 10 μR/hr above background. See Figure 3 for locations, results, and survey instrument information.

Room 118: All fixed beta measurements were less than the Minimum Detectable Activity level for the instrument used. The highest beta scan measurement was 2860 cpm which is 892 dpm/100 cm^2. This result is far below the NRC- and State- approved release criteria of 5000 dpm/100 cm^2. All fixed exposure rate measurement results were at the natural background level. The exposure rate surface scan results ranged from 24 to 30 μR/hr, which is sightly above natural background levels and far below the NRC- and State- approved release criteria. See Figure 4 for locations, results, and survey instrument information.

Conclusion

All survey results obtained during the performance this survey are far below the NRC- and State-approved release criteria and consistent with the results of the final survey.

Figure 1: Building 30/31, Phase IV, Room 100, Confirmatory Survey Locations and Results

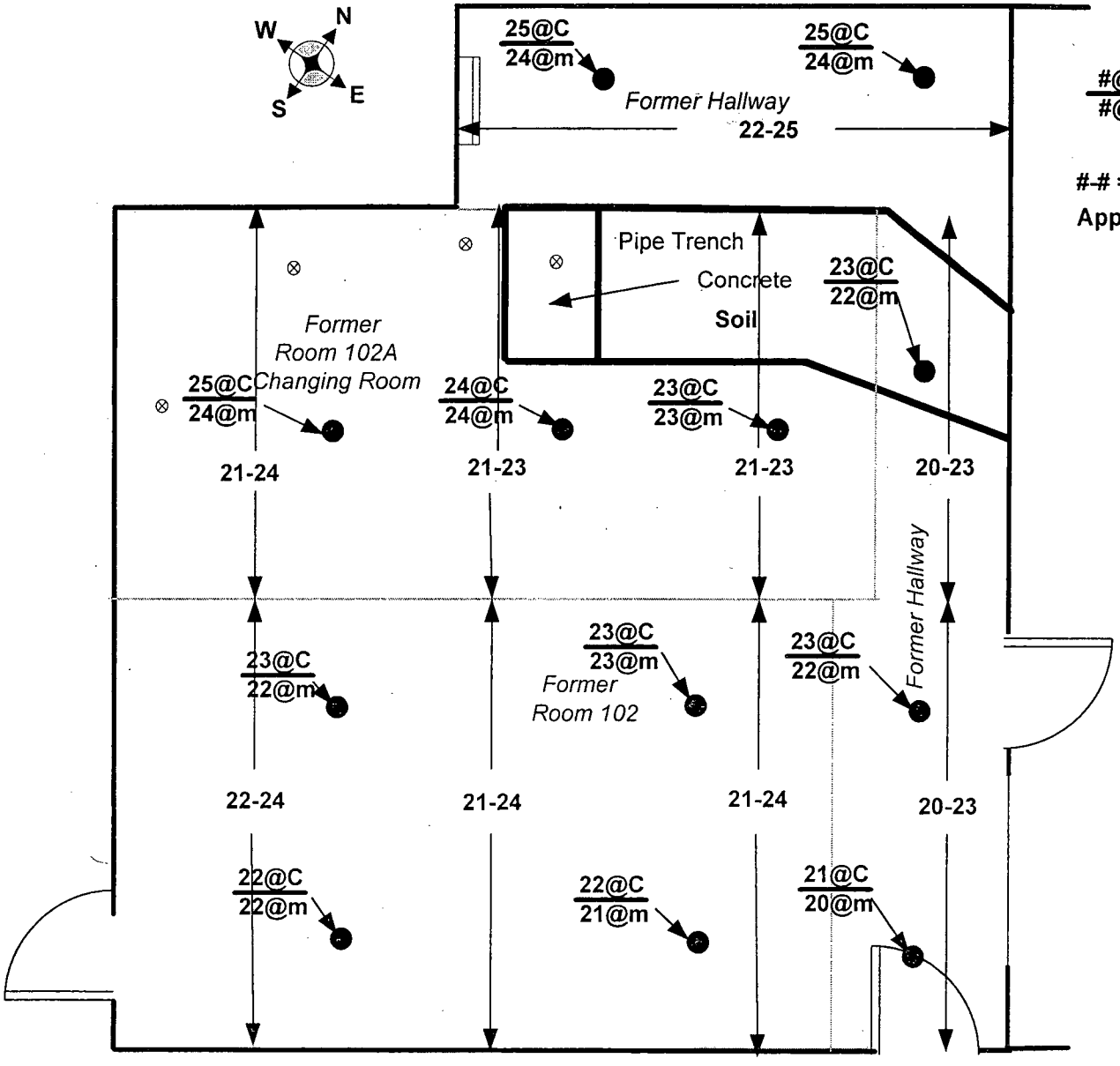


#@C / #@m = µR/hr at contact / = µR/hr at 1 meter

#-# = µR/hr range for scan at 1" from the surface
Approximately 25% of floor surface scanned

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	151348
Calibration Due Date	10/19/05
Efficiency	NA
α β γ	γ
Probe Number	163196
Probe Size	2" x 2"
Background in µRhr	23-28 µR/hr, Contact 20 - 25 µR/hr @ 1m
Technician(s): S. Cowan	Date: 08/16/05

Figure 2: Building 30/31, Phase IV, Rooms 102, 102a and Former Hallway, Confirmatory Survey Locations and Results



#@C / #@m = μR/hr at contact / = μR/hr at 1 meter

#-# = μR/hr range for scan at 1" from the surface

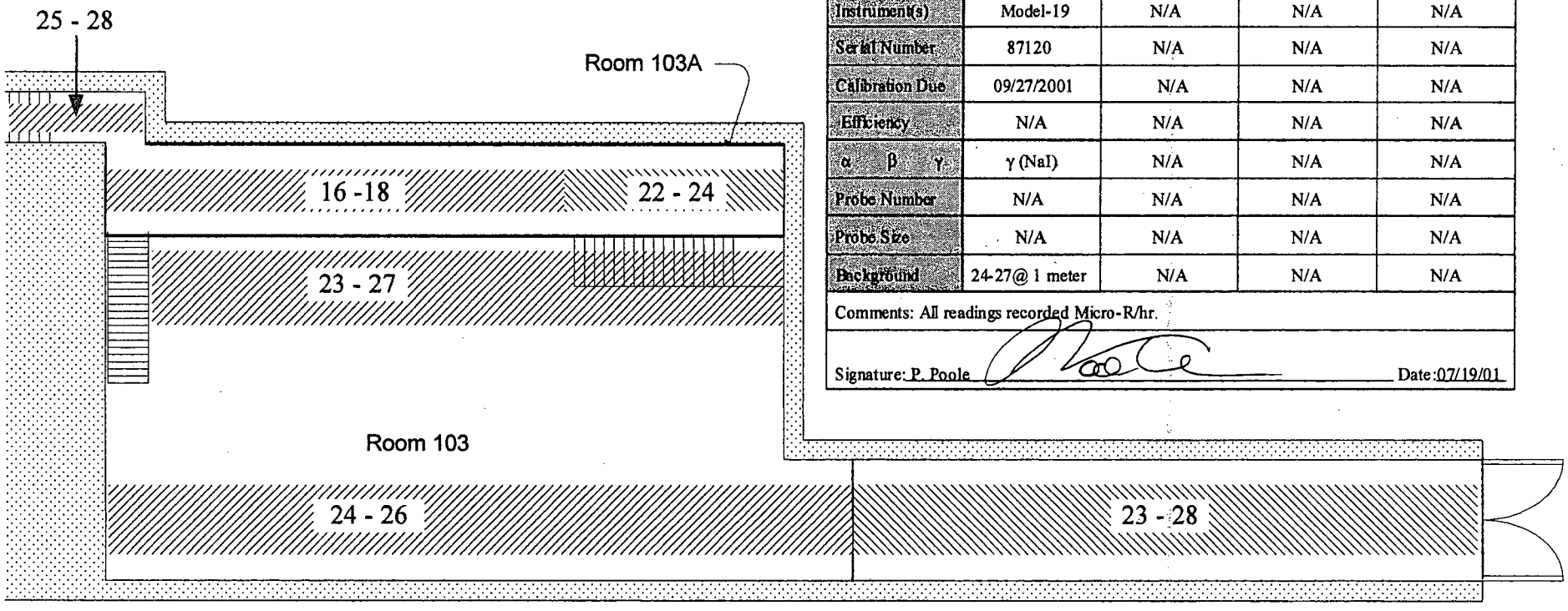
Approximately 25% of floor surface scanned

Building 30/31 Phase IV	
Instument	Ludlum Model-3
Serial Number	151348
Calibration Due Date	10/19/05
Efficiency	NA
α β γ	γ
Probe Number	163196
Probe Size	2" x 2"
Background in Concrete Rooms	23-28 μR/hr, Contact 20 - 25 μR/hr @ 1m
Technician(s): S. Cowan	Date: 08/16/05

Figure 3: Building 31 Room 103 Confirmatory

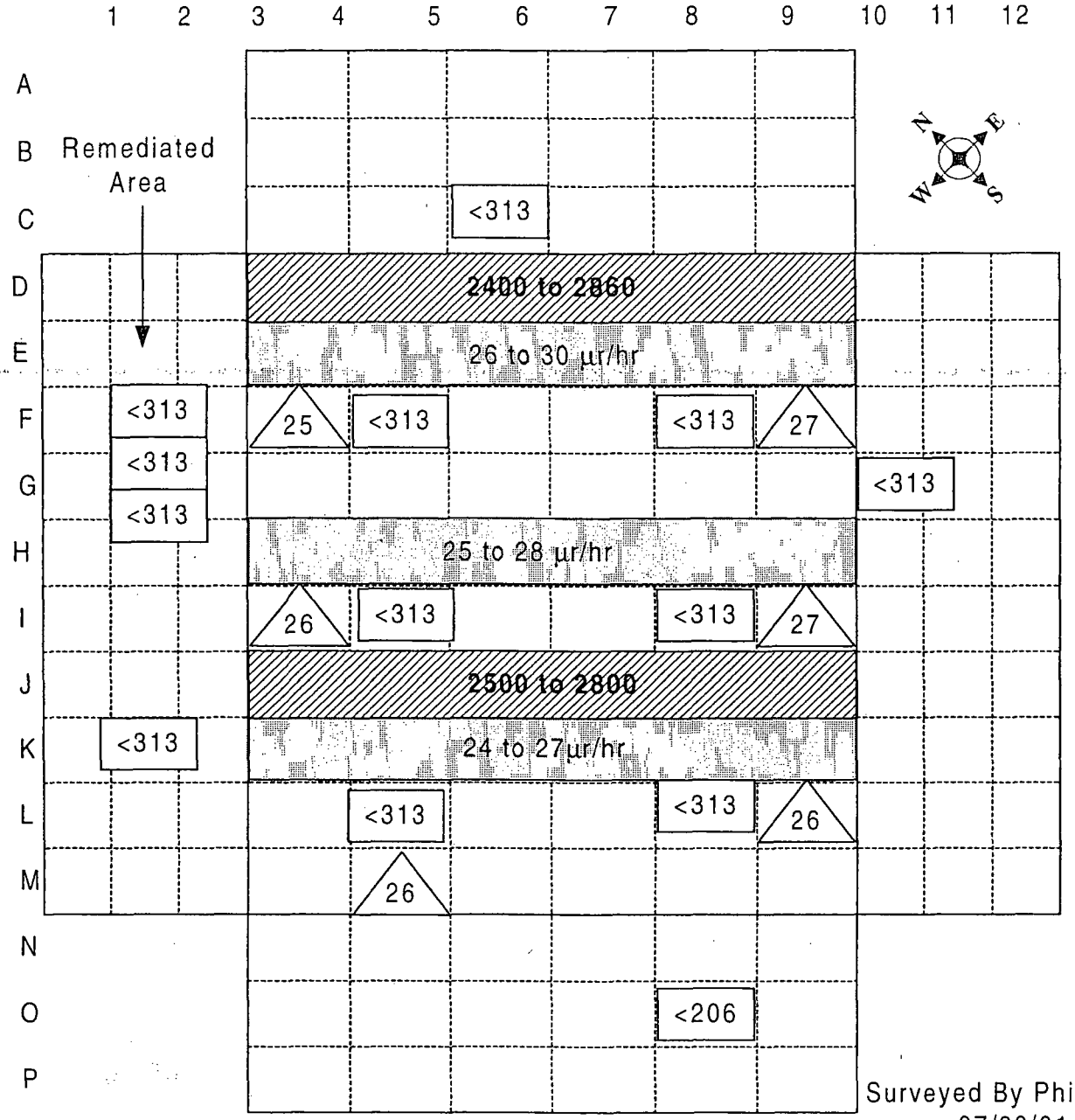
NaI 25% Scan of Floor at ~2 inches from surface

nn - nn = Denotes Scanned Area



	Building 31 Room 103 Confirmatory			
Instrument(s)	Model-19	N/A	N/A	N/A
Serial Number	87120	N/A	N/A	N/A
Calibration Due	09/27/2001	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	γ (NaI)	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Background	24-27@ 1 meter	N/A	N/A	N/A
Comments: All readings recorded Micro-R/hr.				
Signature: P. Poole				Date: 07/19/01

Figure 4: Building 30. Phase IV. Room 118 Confirmatory Survey



Surveyed By Phil Poole
07/20/01

nn = Denotes 2 minute Fixed Beta (dpm/100cm²)

nn = Denotes Fixed µR/hr @1 meter

= Denotes µR Surface Scan

= Denotes Beta Scan

Instrument			
Model	Model 19	Model 2221	Model 2221
Serial #	87120	84423	84459
Probe	1'x1" NaI	100 cm² Beta	434cm² Beta
Probe #	N/A	119444	086215
Efficiency	N/A	24.43%	23.62%
Cal Due Date	09/27/01	01/08/02	01/10/02
Concrete Bkgd	23-28µR/hr	1042±90 MDA= 313	1856±2036
Wood Bkgd	N/A	757±46 MDA= 206	N/A

TO WTRobinson 8/16/05