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Transmittal remedial action radiological OR report survey

Department of Energy
Oak Ridge Operations
P.O. Box E
Oak Ridge, Tennessee 37830

JUN 15 1983

E. G. DeLaney, DRAP, NE-24

COMPLETION OF DECONTAMINATION OF GILMAN HALL, UNIVERSITY OF CALIFORNIA AT BERKELEY

Attached is a copy of the final report covering the remedial actions and associated radiological survey work on Gilman Hall. Your attention is called to the last paragraph of the attached letter from Mr. Davis (SAN) which states: "Completion of this work has fulfilled OR's obligation under the Formerly Utilized Sites Remedial Action Program (FUSRAP). No further involvement by OR/FUSRAP in this matter is required."

for Lowell F. Campbell
E. L. Keller, Director
Technical Services Division

CE-53:EHH

Attachment:
As Stated

Keller

U.S. DEPARTMENT OF ENERGY

memorandum

DATE June 1, 1983

REPLY TO ATTN OF San Francisco Operations Office (ESQA)

SUBJECT Completion of Decontamination of Gilman Hall, University of California at Berkeley

TO E. L. Keller, Director, Technical Services Division, OR

Remedial actions to remove or shield all known radioactive contamination in Gilman Hall, located on the campus of the University of California, Berkeley, have been completed. A copy of the final report, prepared by the University's Office of Environmental Health, is attached.

The work was accomplished in accordance with the agreement between SAN, the Lawrence Berkeley Laboratory, and the University of California at Berkeley. The total cost was $68K which was the amount allocated for this work by OR/FUSRAP.

The current radiological status of the building is acceptable to both the University and to SAN. The University and SAN agree that when and if final decontamination of Gilman Hall is required it will be accomplished through the normal contract close-out process.

Completion of this work has fulfilled OR's obligation under the Formerly Utilized Sites Remedial Action Program (FUSRAP). No further involvement by OR/FUSRAP in this matter is required.

James T. Davis, Director
Environment, Safety and
Quality Assurance Division

Attachment

18363

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY · DAVIS · IRVINE · LOS ANGELES · RIVERSIDE · SAN DIEGO · SAN FRANCISCO

SANTA BARBARA · SANTA CRUZ

OFFICE OF ENVIRONMENTAL HEALTH

BERKELEY, CALIFORNIA 94720

May 6, 1983

Mr. J. T. Davis
Director, Safety and Health Division
San Francisco Operations Office
U. S. Department of Energy
1333 Broadway
Oakland, CA 94612

Dear Mr. Davis,

Remedial actions to correct contamination in Gilman Hall have been completed. All the work was done according to our agreements with the U. S. Department of Energy. The current status of the building is acceptable to the University.

Much of the contamination remains in place, although it has been covered and/or shielded to background levels. It is likely that additional contamination exists in inaccessable areas or other locations where the emissions are shielded by building materials or equipment. The Office of Environmental Health and Safety will continue to survey Gilman Hall and will monitor whenever remodeling or renovation takes place.

We extend our appreciation to personnel from the Department of Energy and Lawrence Berkeley Laboratory who worked with us. All those involved were extremely cooperative with the University and diligent in bringing the project to a successful completion.

Sincerley,

Joseph M. Gates
Director
Environmental Health & Safety

JMG/MS:lcc

RADIOLOGICAL SURVEY AND REMEDIAL ACTIONS

GILMAN HALL, UNIVERSITY OF CALIFORNIA, BERKELEY

REPORT DISTRIBUTION

Department of Energy

Mr. T. Carroll, Attorney, Office of Chief Counsel
Mr. E. Raheley, Chief, Environmental and Nuclear Safety Branch
Mr. W. Warner, Health Physicist, Environmental and Nuclear Safety Branch

Lawrence Berkeley Branch

Mr. W. D. Bartsough, Associate Director, Engineering and Technical Services Division
Mr. T. Kirksey, Public Information Officer
Dr. R. H. Thomas, Deputy for Health and Safety, Engineering and Technical Services Division
Mr. J. Young, Head, Environmental Health and Safety

University of California, Berkeley

Prof. A. T. Bell, Chairman, Chemical Engineering
Mr. R. A. Colvig, Public Information Manager
Mr. J. M. Gates, Director, Environmental Health and Safety
Prof. C. J. King, Dean, College of Chemistry
Mr. T. G. Nycum, Assistant Vice Chancellor, Facilities Management
Prof. R. B. Park, The Vice Chancellor
Mr. R. J. Rossi, Manager, Maintenance and Alterations
Mr. R. S. Sanchez, Manager, Custodial Services
Prof. C. L. Tien, Faculty Assistant to the Vice Chancellor
Dr. R. W. Wallace, Chairman, Radiation Safety Committee
Dr. R. W. Wright, Vice Chancellor, Business and Administrative Services

RADIOLOGICAL SURVEY AND REMEDIAL ACTIONS

GILMAN HALL, UNIVERSITY OF CALIFORNIA, BERKELEY

ABSTRACT

Research with radioactive materials during World War II was conducted in Gilman Hall at the University of California at Berkeley. U. S. Department of Energy and campus Environmental Health and Safety surveys of the site in 1976 and 1981 detected low-level contamination in several rooms and hallways. Nearly all the contamination consisted of uranium compounds spilled onto floors and walls. A few locations contained higher-energy gamma emitters. Some very low-level removable surface contamination was discovered. There was no spread of contamination. Dose rates did not exceed limits for non-occupational radiation exposure.

Remedial actions taken from 1981 through 1983 included removal of much contaminated material, and the remainder was shielded or sealed. There remains no detectable radiation levels above background and no removable contamination. Since some radioactive material was left in place, the building will remain under control and surveillance of campus Environmental Health and Safety. All renovation or demolition will be monitored.

It was concluded that the contamination posed no health hazard to occupants of the building prior to or during the remedial actions.

INTRODUCTION

Gilman Hall at the University of California at Berkeley was used in support of the Manhattan Engineering District activities in the early 1940's. Research was performed with small amounts of uranium which were bombarded with cyclotron-produced neutrons to produce minute quantities of plutonium. Plutonium was first isolated and the fissionability of Uranium-233 was first demonstrated by researchers here during this period. It is now known that small amounts of these elements, as well as other radioisotopes, such as ^{137}Cs, were present in various laboratories throughout the building.

In 1976, some rooms in Gilman Hall were identified and surveyed by the Department of Energy (DOE) as part of the FUSRAP program to evaluate such formerly-utilized sites. At that time, low-level alpha contamination was detected under the flooring in two locations on the third floor. Low-level ^{137}Cs contamination was detected in an unused sewer line under the

floor of the ground floor. It was decided at that time to take no immediate action, since the levels were low and there was no removable contamination. The campus' radioisotope licenses cover the materials involved, and controls were instituted so that any renovations of the areas which might affect the material would be monitored.

In June, 1981, additional contamination was discovered by EH&S in a room not originally surveyed by DOE. Since it was now evident that areas other than those originally identified by DOE were used, EH&S decided to survey the entire building.

This report covers surveys done by EH&S from June, 1981, through March, 1983. Surveys include preliminary identification of contaminated areas and follow-up inspections after remedial work by Lawrence Berkeley Laboratory (LBL) and contractors.

SURVEY AND ANALYTICAL TECHNIQUES

General

Portable survey instruments were used to conduct a radiological survey of accessible floor, wall and work surfaces of all rooms in the building. The instrument survey was backed up by surface contamination smears.

Instrumentation

The main instrumentation used consisted of Ludlum Model 2 survey meters equipped with 1.5" diameter "pancake" style alpha-beta-gamma Geiger probes (2 mg/cm^2 window thickness). Background on these meters averaged about .05 millirem per hour. A reading of 5x background at contact with a surface was considered to be positive. When contamination was detected, follow-up was made with other instrumentation. Dose rate levels were measured with a Victoreen Model 470 ion-chamber survey instrument (background less than .1 millirem per hour). Alpha contamination was detected with Ludlum Model 2 survey meters equipped with alpha scintillation probes. Smears were counted with a windowless gas flow Geiger planchet counter, Nuclear Chicago Model 470 (background less than 30 dpm).

SURVEY RESULTS

General

Contamination was found in a total of twelve rooms throughout all floors of the building and in the hallways. In all cases, the contamination was

low-level, with a dose rate of 5 millirem per hour or less at contact. When contamination was at or very near the surface, alpha emissions could be detected at levels up to 10,000 dpm. In every location except two, the contamination exhibited emissions similar to those of natural uranium. Two samples analyzed by LBL were identified as probable uranium. Covering this type of contamination with 1/8" vinyl-asbestos floor tile reduced the dose rate to below detection limits. In two cases, the contamination was a higher-energy gamma emitter, possibly ^{137}Cs.

Most of the contamination detected was embedded in bare concrete floors. Some was found to be on painted-over walls or cabinet faces, or embedded in bench tops. Contamination was also found on exterior alcoves on the stucco walls or in the tarred flooring. No contamination was detected on floors in rooms which had tiled floors. (Such covered contamination would typically not have been detected through the tile.)

Removable contamination was found in very few instances (e.g., on an exterior unpainted stucco wall, in mortar between concrete floor panels, under a removed bench). Typically, the contamination had been painted or tarred over, or had been absorbed into the concrete over the years. Removable contamination never exceeded 500 dpm/100 cm^2.

Survey A - June 9, 1981

On June 8, 1981, EH&S received a request to survey an area after removal of a bench. (After the 1976 DOE survey, departmental and maintenance personnel had been requested to notify EH&S prior to any renovation or demolition in the building.) This room was not on the list surveyed in 1976.

Results:

Contamination was detected on the wall and bare concrete floor exposed after the bench was removed--about 20 square feet total. Dose rates up to three millirem per hour at contact were detected. Due to a small flood, the area became wet. After drying, some removable contamination was detected on the floor (about 500 dpm/100 cm^2). Alpha contamination could be detected on the surface, 4,000 dpm. See attached diagram in Appendix A.

Action Taken:

LBL personnel removed as much of the contamination as possible from the wall and floor. The floor and wall were rebuilt by a contractor, monitored by EH&S.

Follow-up Survey:

Contamination was completely removed from the wall. After the floor had been excavated to about 8 inches, residual contamination (about 1 millirem/hour) remained in the bottom of the hole. A sample, analyzed by LBL, was determined to be natural uranium. After the hole had been refilled with concrete, no radiation levels above background or removable contamination could be detected.

Survey B - July 15-19, 1981

Since contamination had been found in an area not on the list of rooms that DOE had surveyed in 1976, it was decided to survey all accessible surfaces in the building.

Results:

Contamination was detected in several areas in 12 rooms, 3 hallways, and 6 exterior alcoves. Dose rate levels ranged up to 5 millirem/hour at contact. See attached diagrams in Appendix A. Types of surfaces contaminated included concrete laboratory and hallway floors, plaster walls, bench tops, wooden sills leading to exterior alcoves, tarred alcove floors and exterior stucco walls.

Removable contamination was initially detected in only one location: on a stucco wall on an alcove outside Room 301 (200 dpm/100 cm^2). A later follow-up survey revealed a similar level from the mortar between concrete floor panels in Room 221.

Direct alpha readings of up to 10,000 dpm were detected at the two areas with removable contamination. Similar levels of alpha contamination were detected on the floor of Room 121, the sill leading to the alcove off Room 301, and on the ground floor hallway.

In nearly all cases, the contamination appeared to be similar in nature to that found in Room 310, exhibiting alpha and beta emissions. A sample from the exterior alcove of Room 301 was analyzed by LBL and determined to be natural uranium. The dose rate dropped to undetectable levels at 3 feet and the contamination could be completely shielded by covering it with 1/8" vinyl asbestos tile.

In a later survey, one area of contamination exhibited higher energy gamma emissions, similar to those found by DOE in the ground floor.

Action Taken:

Agreement was made between DOE and the campus for decontamination or shielding of all contamination detected, including material found in the 1976 DOE survey. LBL personnel performed the decontamination, and contractors performed all work not involving direct contact with contaminated material. See the letter in Appendix B. This work took place from December, 1981, through February, 1983.

Follow-up Surveys:

During and after each phase of LBL decontamination work, EH&S surveyed the areas involved. In some cases, additional fixed contamination was discovered during and after decontamination. In all cases, this was followed up with more decontamination or shielding until no further radiation levels or removable contamination could be detected. At no time was removable surface contamination produced by the clean-up work. The following gives a summary of these efforts:

A. Hallways of ground, second and third floors: The contamination was completely removed.

B. Concrete and piping in floors of Rooms 19 and 21: Some residual low-level contamination remained in the floor after the excavations went as deep as possible. Radiation levels at the bottom of the excavations were less than one millirem/hour. Some contaminated piping remains in the floor. After refilling with concrete, no radiation levels above background or removable contamination could be detected.

C. Walls in Rooms 19 and 21: The contamination was completely removed.

D. Floors in Rooms 22, 121, 121B, 121C, 221, 313A and 322: These areas were covered with flooring. No radiation levels above background and no removable contamination remains.

E. Laboratory bench, Room 121: The contaminated bench top has been removed. Contamination later found on the baseboard, drawer fronts, and doors has been removed. No contamination remains on the bench. Some low-level contamination remains on the floor beneath the bench. It is covered by floor tiles or the bench itself. No detectable radiation levels above background or removable contamination remains.

F. Wooden sills leading to exterior alcoves, Rooms 301, 307, 311 and 322: The contamination was completely removed.

G. Door leading to west alcove, Room 301 (found to be contaminated in a follow-up survey): The contamination was completely removed.

H. Exterior alcove floors, Rooms 301, 307, 311, 319: Tar and paper have been added to shield the contamination. No detectable radiation levels above background or removable contamination remains.

I. Walls of west alcove, Room 301: Contamination has been completely removed.

J. Baseboard, west wall, Room 301; and also the wall above (found to be contaminated on a follow-up survey): All contamination removed.

K. Alcove, Room 307: walls, table, electrical piping (found to be contaminated on a follow-up survey): All contamination was removed.

L. Closet, Room 307: The contaminated floor was covered with tile, and a follow-up survey showed radiation levels remaining up to 1 millirem/hour. (The contamination is a higher-energy gamma emitter such as ^{137}Cs.) One-inch lead plates were bolted down over the contaminated area. No radiation levels above background or removable contamination remains.

Summary of follow-up survey results: There are no radiation levels above background or removable contamination detectable with the instrumentation used.

CONCLUSION

An undetermined amount of radioactive contamination remains in Gilman Hall. The building will remain under control and EH&S will monitor any renovation or demolition work performed there. There remains no detectable radiation levels or removable contamination in accessable areas.

The contamination that has remained in the building since the early 1940's exhibits low-level and mostly non-penetrating radiation emitted from uranium or similar compounds. The few discoveries of low-level, penetrating radiation were in low-occupation areas. In no case were the regulatory radiation dose limits for non-occupational exposure exceeded. Removable contamination was detected in a few isolated areas. There was no indication of contamination spread or of the existence of any airborne contaminants. It is concluded that there have been no deleterious effects to the health of those occupying the building prior to or during the clean-up.

The remedial actions agreed upon have been performed satisfactorily without causing contamination spread or any other hazard to the building occupants. We wish to thank LBL Environmental Health and Safety and our campus' Department of Facilities Management for their cooperation in this project.

Michael R. Schoonover

Michael R Schoonover

Health Physicist
Office of Environmental Health&Safety
University of California at Berkeley

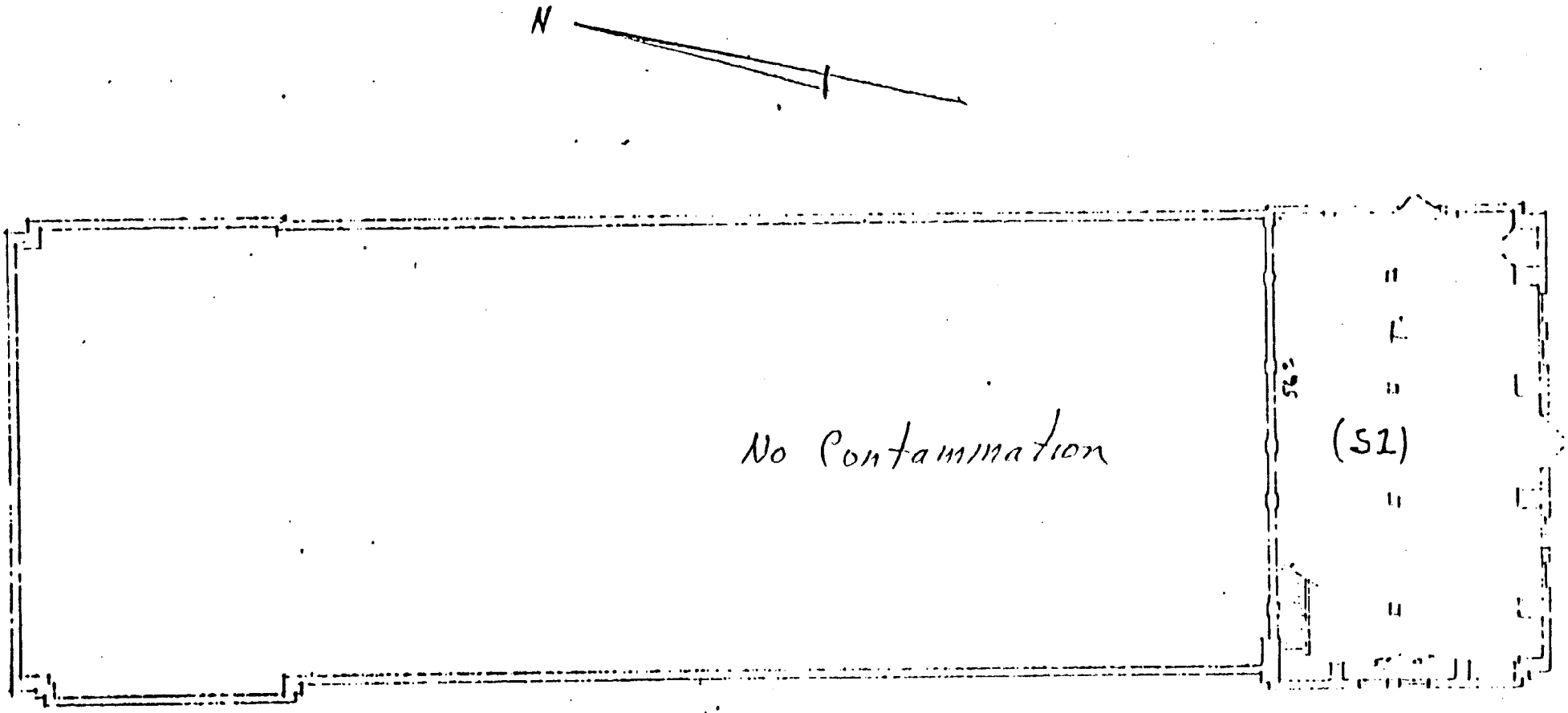
GILMAN HALL CONTAMINATION

Location	Contact Dose Rate (millirem/hour)	Alpha Rate (dpm)	Removable dpm/100 cm^2	Comments
Sub-basement	(no contamination)			
Basement (ground floor)				
A, floor, rm 22	.2	-	-	covered
B, floor, rm 22	.2	-	-	covered
C, floor, rm 22	.2	-	-	covered
D, floor, rm 21	.2	-	-	removed
E, floor, rm 21	.4	-	-	removed
F, floor, hall	.4	10,000	-	removed
G, wall, rm 19	.2	-	-	removed
H, wall, rm 19	.2	-	-	removed
I, floor, wall, rm 21	2.6	-	-	from DOE survey (1976), partially removed, refilled
J, floor, rm 19	.2	-	-	from DOE survey (1976), partially removed, refilled
K, floor, rm 19	.4	-	-	from DOE survey (1976), partially removed, refilled
First Floor				
A, floor, rm 121	.2	-	-	covered
B, floor, rm 121	.2	-	-	covered
C, floor, rm 121	.3	4,000		covered by bench or flooring
D, floor, rm 121	.2	-	-	covered
E, floor, rm 121	.2	-	-	covered
F, floor, rm 120	.2	-	-	covered
G, floor, rm 120	.2 to 3	-	-	several spots, all covered
H, bench, rm 121	.2	-	-	bench top, doors, facing removed
Second Floor				
A-C, G-J, floor, rm 221	.2 to .4	-	-	covered
D-F, floor, rm 22	1.5 to 5	5,000 to 10,000	200	removable from joints between slabs; all covered
K-M, floor, hall	.2	-	-	removed

Appendix A

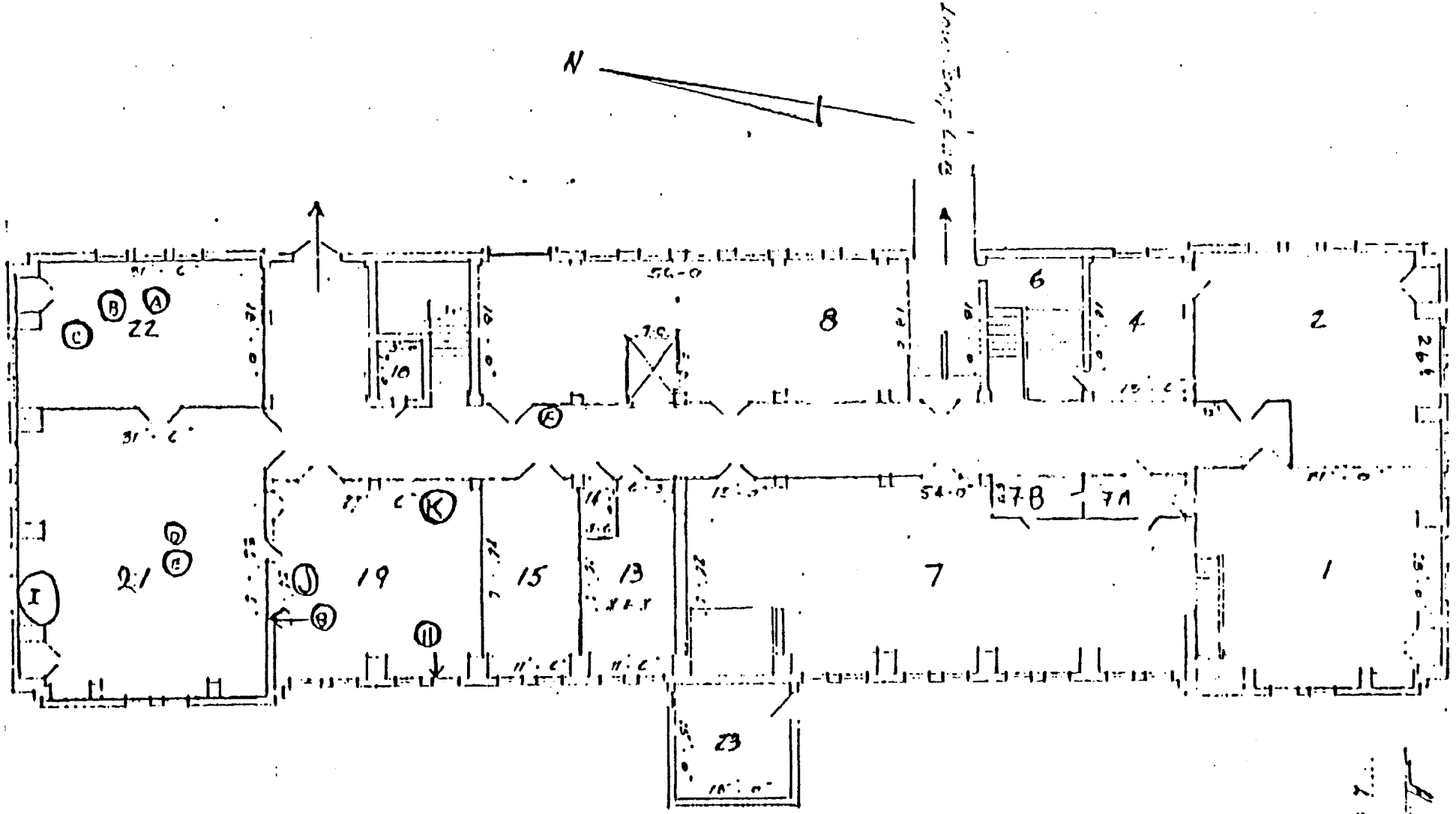
Location	Contact Dose Rate (millirem/hour)	Alpha Rate (dpm)	Removable dpm/100 cm^2	Comments
Third Floor				
A, sill & alcove door, rm 301	.3	2,000	-	removed
B, walls, alcove, rm 301	3.5	10,000	200	removed
C, floor, alcove, rm 301	.4	-	-	covered
D, baseboard, wall, rm 301	.2	-	-	removed
E, sill to alcove, rm 301	.2	-	-	removed
F, floor, table, walls, piping, of alcove, rm 307	.2 to .4	-	-	floor covered; table, walls, piping removed
G, sill, alcove, rm 307	.2	-	-	removed
H, floor, closet, rm 307	.3	-	-	some gamma, covered with lead
I, sill, alcove, rm 311	.2	-	-	removed
J, floor, alcove, rm 311	.3	-	-	covered
K, floor, alcove, rm 319	.2	-	-	covered
L, sill, alcove, rm 322	.2	-	-	removed
M, floor, alcove, rm 322	.2	-	-	covered
N, floor, rm 313A	.3	-	-	covered
O, floor, hall	.2	-	-	removed
P, floor, rm 307	-	-	-	DOE survey (1976), no action needed
Q, floor, rm 301	-	-	-	DOE survey (1976), no action needed
R, wall, floor under removed bench, rm 310	3.0	4,000	500	Survey A, wall removed, floor contamination partially removed, covered

Appendix A, cont.



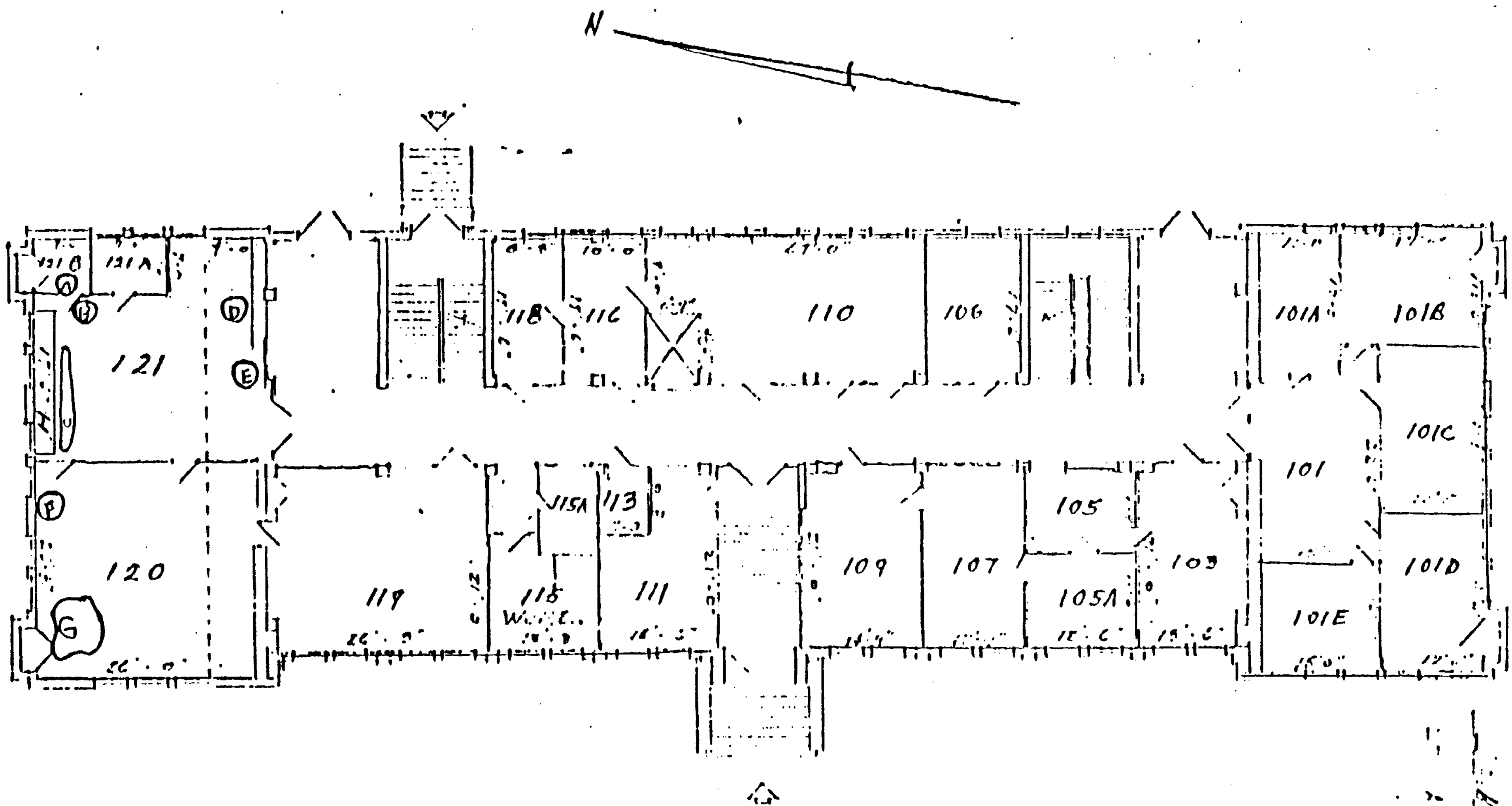
SUB-BASEMENT FLOOR

SCALE 1" = 20'-0"



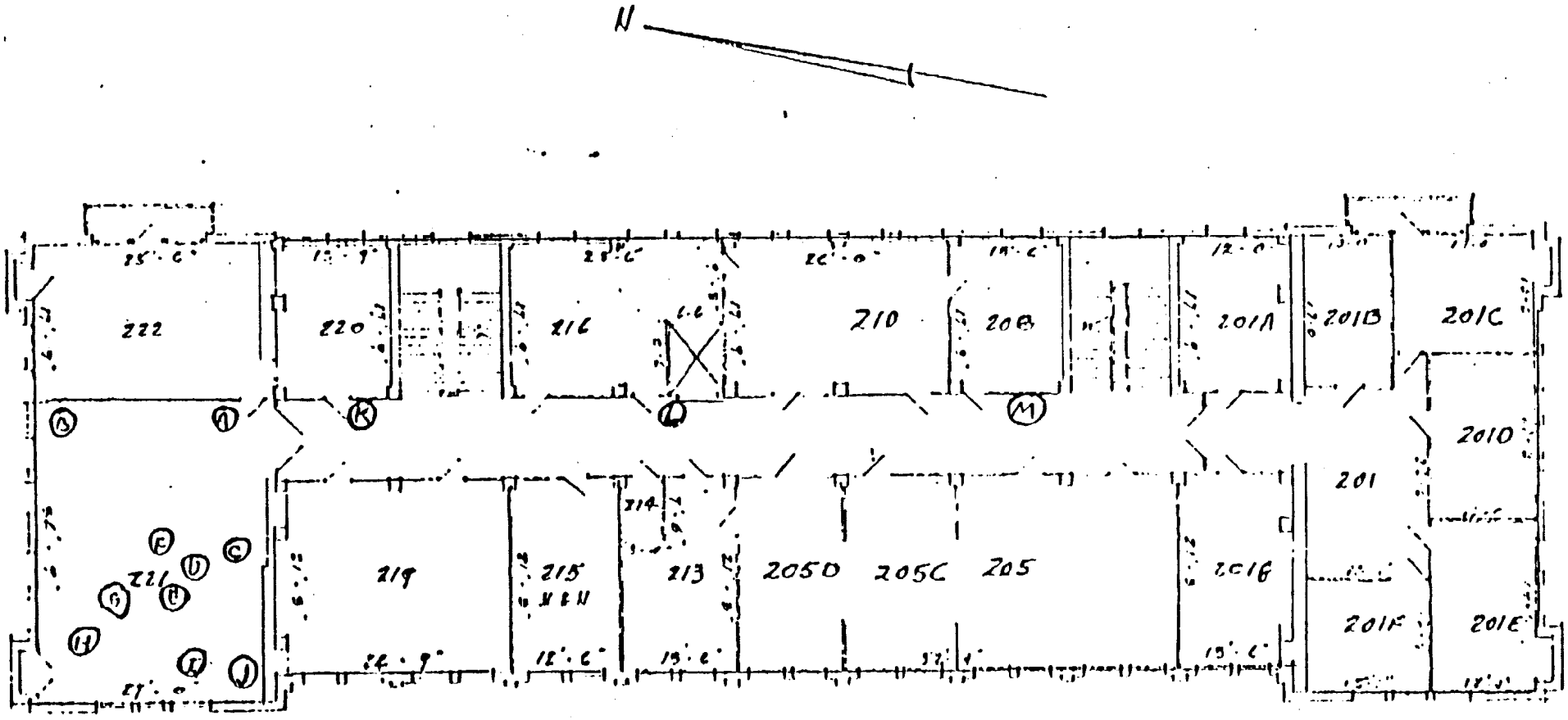
BASEMENT FLOOR

SCALE 1" = 20'-0"



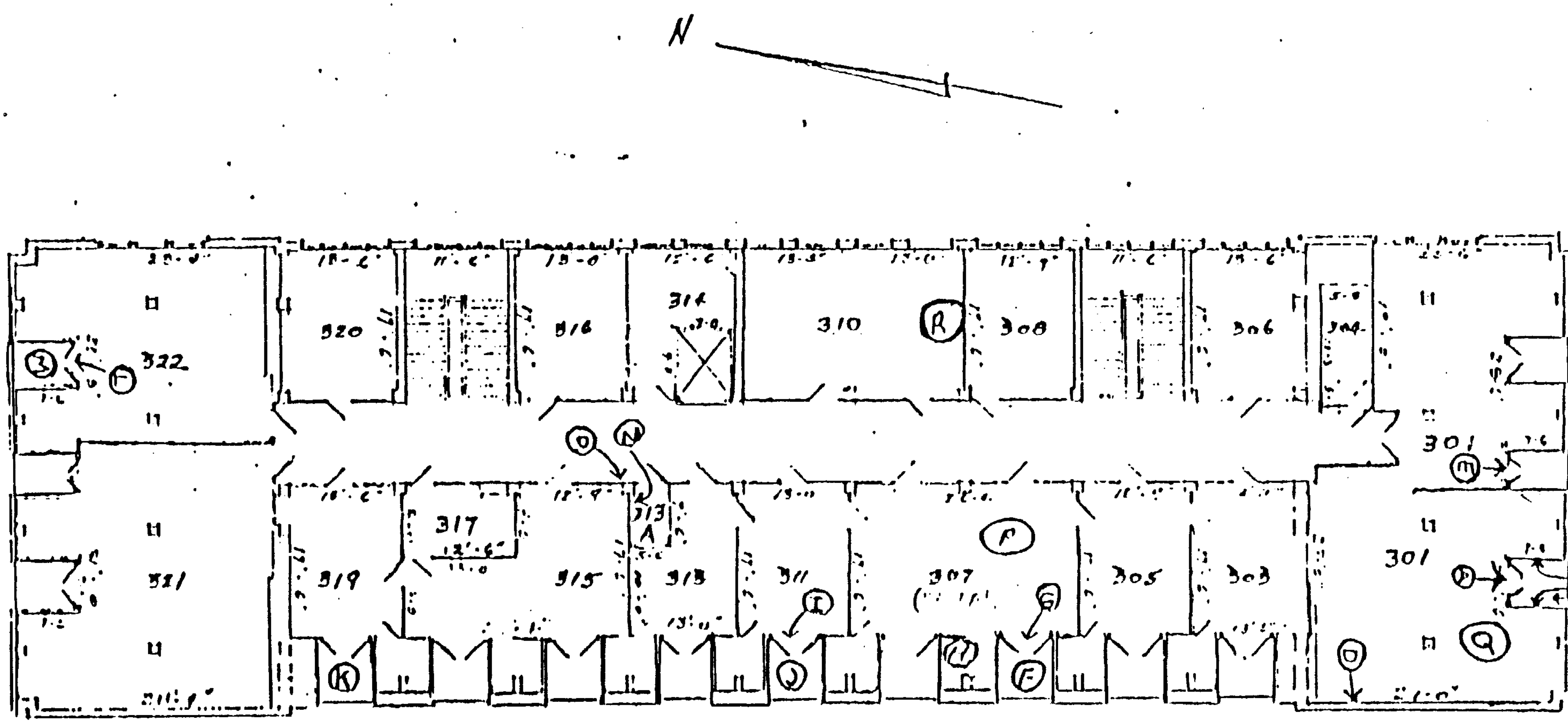
FIRST FLOOR

SCALE 1" = 20'-0"



SECOND FLOOR

SCALE 1" = 20'-0"



THIRD FLOOR

SCALE 1"=20'-0"

GILMAN HALL

ASSET # 1350

UNIVERSITY OF CALIFORNIA, BERKELEY

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OFFICE OF ENVIRONMENTAL HEALTH BERKELEY, CALIFORNIA 94720

November 3, 1981

Mr. Calvin D. Jackson, Director
Environment, Safety and Program
Support Division
1333 Broadway
Oakland, CA 94612

Dear Mr. Jackson:

In my letter to you dated October 28, 1981 I stated that there would be a meeting of various campus representatives to discuss a plan of action for the residual radioactivity in Gilman Hall.

The meeting took place as planned and agreement was reached on remedial action necessary to correct the problems noted in Gilman Hall. I will now propose specific steps which we feel are necessary in each of the areas known to have residual radioactivity. The same notations will be used as in the floor diagrams of the August 4, 1981 report. These diagrams are enclosed for ease of reference.

Room 301

1. Remove and replace outside walls of west alcove (Items B and C on diagram).
2. Remove and replace wood sills leading to both alcoves (A and E).
3. Remove and replace baseboard on west wall (D).

Room 307

1. Cover floor of south alcove (F).
2. Remove and replace wood sill leading to south alcove (G).
3. Cover floor of small closet between the two alcoves (H).

Room 311

1. Remove and replace wood sill leading to alcove (I).
2. Cover floor of alcove (J).

Room 313A

1. Cover floor (N).

Corridor near Room 313A

1. Remove spot on floor and replace floor (O).

Room 322

1. Remove and replace wood sill (L).
2. Cover floor (M).

Room 221

1. Cover floor (A-J).

Second floor corridor

1. Remove spots on floor and replace floor (K-M).

Room 121B

1. Cover floor (A).

Room 121

1. Remove and replace lab bench on north wall (E).
2. Cover floor (B-E).

Room 121C

1. Cover floor (F and G).

Basement corridor

1. Remove spot near Room 8 and replace floor (F).

Room 22

1. Cover floor (A-C).

Room 21

1. Remove contamination and replace floor at D and E.
2. Evaluate cross-hatched area near north wall (^{137}Cs) and decide whether to remove or shield.

Room 19

1. Remove spots on north and west wall and replace wall (G and E).
2. Evaluate cross-hatched area near north and east walls (^{137}Cs) and decide whether to remove or shield.

The College of Chemistry has plans to convert Room 19 into an office area by the Start of the Winter Quarter which will start in January. Room 22 is also in transition and would be easy to work in. These two areas should be placed at the top of the priority list for remedial action.

We also feel that there should be long range plans made for the removal of any residual radioactivity in the event of major remodeling of any of the areas in question.

I look forward to working with you in this area of mutual concern and hope that steps may be taken in the very near future as far as Rooms 19 and 22 are concerned.

Sincerely,

Joseph M. Gates
Acting Environmental Health
and Safety Officer

cc A.T. Bell
J. King
R.H. Thomas
R.W. Wallace
R.W. Wright
J. Young

jm