VERIFICATION SURVEY OF THE BAKER AND WILLIAMS WAREHOUSES BUILDING 513-519 NEW YORK, NEW YORK

W. C. ADAMS

Prepared for the
Office of Environmental Restoration
U.S. Department of Energy

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION
Environmental Survey and Site Assessment Program
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ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
ASME	American Society of Mechanical Engineers
BNI	Bechtel National, Inc.
BWW	Baker and Williams Warehouses
cm	centimeter
cm^2	square centimeter
cpm	counts per minute
DOE	U.S. Department of Energy
DOE-ORO	DOE Oak Ridge Operations Office
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
EML	Environmental Measurements Laboratory
ESSAP	Environmental Survey and Site Assessment Program
FSRD	Former Sites Restoration Division
ft^2	square foot
FUSRAP	Formerly Utilized Sites Remedial Action Program
GM	Geiger-Mueller
kg	kilograms
km	kilometer
lbs	pounds
m	meter
m^2	square meter
μR/h	microroentgens per hour
MDA	minimum detectable activity
MED	Manhattan Engineer District
mi	mile
NaI	sodium iodide
NIST	National Institute of Standards and Technology
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
PIC	pressurized ionization chamber
PMC	Project Management Contractor
PRAR	post remedial action report
QA	Quality Assurance
TMA	Thermo-Analytical/Eberline

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INTRODUCTION AND SITE HISTORY

During the early 1940s, the Baker and Williams Warehouses (BWW) on West 20th Street, in New York, New York, were used by the Manhattan Engineer District (MED), predecessor to the Atomic Energy Commission (AEC) and the Department of Energy (DOE), for short term storage of uranium concentrates. According to historical information, approximately 99,000 kg (220,000 lbs) of orange and yellow sodium urinate were delivered to the Baker and Williams Warehouses in 1942 for storage and later distribution to U.S. Government Reservations. Additional documentation indicated that the warehouses also received approximately 39,000 kg of orange and yellow sodium urinate, 10,000 kg of sodium uranyl carbonate and 9,100 kg of black uranium oxide in 1943.

The Baker and Williams Company owned three adjacent warehouse buildings at 513-519, 521-527, and 529-535 West 20th Street. The warehouses have been owned and leased by several businesses since the 1940s. Historical shipping documents indicate that MED/AEC shipments of uranium concentrates were delivered to the shipping and receiving office located in Building 529-535. However, shipments may have been received, unloaded, and stored at either of the adjacent warehouse buildings. The three buildings are currently operated as functional warehouse facilities.

The DOE reviewed available historical documentation that described the previous MED/AEC activities conducted at this facility and based on this information, the DOE determined that the potential for radioactive material to be present as a result of the past activities was low. However, the information was insufficient to verify the radiological condition of the site after MED/AEC activities were terminated. DOE decided that a radiological survey should be

performed to determine if additional investigations were warranted under the Formerly Utilized Sites Remedial Action Program (FUSRAP), or if the site could be eliminated from the program.[1]

In August 1989, the Environmental Survey and Site Assessment Program (ESSAP) of Oak Ridge Associated Universities (now known as Oak Ridge Institute for Science and Education [ORISE]) conducted a designation survey of the interior surfaces of Buildings 521-527 and 529-535. Radioactive contamination in excess of the DOE guidelines for residual uranium activity on surfaces was detected on the floor of the West Bay of Building 521-527, in several small areas on the floor and lower west wall located in the East Bay, and in the basement of Building 521-527.[2] As a result of these findings by ESSAP, the BWW site was designated for inclusion into FUSRAP and was determined to qualify as a candidate for the DOE expedited protocol for remedial actions at small FUSRAP sites. In March/April 1991, characterization of the contaminated areas in Buildings 521-527 and 529-535 was performed by ESSAP; this was followed by remediation and post-remedial action surveys by Bechtel National, Inc. (BNI) and independent verification by ESSAP.[3,4] Remedial actions were successful in removing contamination to levels which would allow future use of these buildings without radiological control restrictions.

During the March/April 1991 operations, ESSAP also conducted surveys of accessible surfaces in Building 513-519. Results of these surveys identified small areas of fixed residual uranium contamination in excess of the DOE guidelines on the floors of the basement, 1st, and 5th floors; the entire 3rd floor area on the east side of the building also appeared to be contaminated. No areas of contamination were identified at that time on the 2nd, 4th, 6th, and 7th floors. No removable contamination was identified. Because materials were stored in the Warehouse at the time of this survey, access to floor surfaces was limited to less than 50% of the floor area. These findings were described in a December 1991 ORAU report, "Radiological Survey of the Baker and Williams Warehouse, Building 513-519, New York, New York."[5] Based on these findings, Building 513-519 was designated for remediation under the FUSRAP expedited protocol.

ESSAP personnel conducted a characterization survey of the Basement, First Floor-East Bay, Third Floor, and the East Bay Elevator Pit of Building 513-519 between May 3 and July 8, 1993. The results of these survey activities are presented in the characterization report.[6]

During the period May through July 1993, BNI performed remediation of those contaminated areas identified by characterization survey activities. ESSAP performed independent verification survey activities and the results of those activities are presented in this report.

PROJECT ORGANIZATION AND RESPONSIBILITY

DOE Headquarters provides overview and coordination for all FUSRAP activities. The DOE Oak Ridge Operations Office (DOE-ORO) is responsible for implementation of FUSRAP and the Former Sites Restoration Division (FSRD) of DOE-ORO, manages the daily activities.

Under the standard FUSRAP protocol, an initial investigation survey of a potential site is performed by ORISE or Oak Ridge National Laboratory (ORNL), under contract to DOE Headquarters. If appropriate, DOE Headquarters designates the site into FUSRAP based upon the results provided by the initial investigation. DOE's Project Management Contractor (PMC) for FUSRAP is Bechtel National, Inc. (BNI). BNI is responsible for the planning and the implementation of FUSRAP activities and managing the site characterization and remedial actions. The final phase for a FUSRAP site is independent verification which is provided by ORISE or ORNL after remedial action is complete. This verification process provides independent (third party) data to assist DOE in evaluating the accuracy of the post-remedial action status of the site, as presented by the PMC, and in assuring that the documentation accurately and adequately describes the condition of the site. DOE Headquarters uses the information developed by the remediation and verification activities to certify that a site can be released for use, without restrictions.

The Baker and Williams Warehouses were selected for remediation under an expedited protocol being used within FUSRAP. In contrast to the standard protocol, under the expedited protocol, the designation contractor functions as the organization responsible for the characterization and

verification activities, while BNI is responsible for conducting the remedial action and post-remedial action survey. Because the Baker and Williams Warehouses were designated previously, ESSAP was the organization responsible for characterization and verification.

SITE DESCRIPTION

The BWW site is located on the west side of New York City in the borough of Manhattan (Figure 1). Building 513-519, consisting of eight levels, has 778 m^2 (8375 ft^2) of floor space per level (Figure 2). The main office space and loading docks are on the First Floor level. The building is constructed of steel, concrete, terra-cotta, and brick. The basement floor is concrete; other floors have been coated with a 5 cm (2 in) thick bituminous (asphalt) material. Beneath the bituminous material is a concrete layer which is approximately 1.3 cm (0.5 in) thick. In preparation for survey activities, all stored materials had been removed from the building to enable access to all floor and wall surfaces.

Because results of a previous ESSAP survey indicated that residual contamination, in excess of the DOE guidelines, existed on the entire Third Floor-East Bay area, the PMC was asked to remediate this floor prior to further characterization by ESSAP. The PMC performed preliminary remedial actions on the floor by removing 0.2 cm (0.06 in) layers of the bituminous material using an inertial, steel-shot, scabbling machine (Blastrac™). The process was successful at removing the surface contamination from the majority of the bituminous material surface. Cursory floor and lower wall scans by ESSAP indicated that surface contamination remained on the lower (1 m) portions of the west and south walls, at the wall and floor interfaces, and at numerous locations on the floor. Remedial actions identified contamination on the concrete floor beneath the asphalt at the wall and floor interfaces. Therefore, small patches of asphalt from selected locations on the floor were removed to expose the underlying concrete floor and enable survey of the concrete underneath. The results indicated that widespread residual contamination was present under the bituminous material. The PMC decided to remove the entire bituminous material floor covering to facilitate thorough identification and remediation of contaminated areas. Subsequently, ESSAP reviewed the PMC's data for this area and performed further characterization survey activities of the floor area.

OBJECTIVES

The objectives of the verification process were to provide independent document reviews and radiological data to the DOE. These independent evaluations may then be used to determine whether procedures and methods, utilized by the remedial action contractor, were adequate. In addition, independent verification provides assurance that the post-remediation data is sufficient, accurate, and demonstrates that remedial actions were accomplished in accordance with appropriate standards and guidelines, and that authorized limits were met.

DOCUMENT REVIEW

Bechtel National, Inc.'s field data and the predecisional draft of the post-remedial action report were reviewed for general thoroughness, accuracy, and consistency.[7] Remedial action data were evaluated to assure that areas previously identified as exceeding guidelines by ESSAP had undergone remediation.[6] Post-remedial action survey results were compared with guidelines to ensure that the remedial objectives had been met.

PROCEDURES

ESSAP personnel conducted a verification survey of the Basement, First Floor-East Bay, Third Floor and the East Bay Elevator Pit of Building 513-519 during the period of May 3 through July 8, 1993. Additional radiological surveys of the remaining areas, including the stairwells, elevators, roof, and the loading dock were also performed. Survey activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the DOE.[8]

Before the bituminous material could be released from the site, the PMC performed radiological surveys on the material to determine its radiological status. The bituminous material was broken up in 2 m $\times$ 2 m batches, and surveyed as a unit. If the PMC surveys indicated that the material was contaminated, the material was disposed of as radioactive waste. ESSAP then performed verification survey activities on the remaining bituminous material batches which were deemed releasable for disposal as ordinary waste by the PMC.

Additional survey procedures used for the verification of released bituminous material from the building are provided in this report and documented in the site logbook. The instruments and procedures used in this survey are described in the ESSAP Survey Procedures Manual and are summarized in Appendices A and B.

REFERENCE GRID

A 1 m × 1 m alphanumeric reference grid was established by ESSAP on floors and lower walls (up to 2 m) of each floor that had been remediated. Measurement and sampling locations in the remediated areas were referenced to this grid. Measurement and sampling locations in non-gridded areas were referenced to prominent building features, and/or recorded on appropriate drawings.

SURFACE SCANS

Floor and lower wall (up to 2 m) surfaces of each bay, stairwells, elevators, elevator shaft pits, the roof, and the loading dock, were scanned for beta and gamma activity using gas proportional, GM, and NaI scintillation detectors, coupled to instruments with audible indicators. Particular attention was given to cracks and joints in the floors and walls, ledges, overhead and horizontal surfaces, and other locations where material may have accumulated. Surface scans were also performed on other (non-floor) horizontal surfaces of the stairwells, the elevators, the elevator shaft and pit, the rooftop parapets, the rooftop elevator power room, and the loading dock. Locations of elevated direct radiation, identified by surface scans, were marked for further investigation.

Surfaces, selected at random, representing approximately 15% of each batch of bituminous material that was removed from 2 m × 2 m areas of the west side and southern portion of the east side of the Third Floor-East Bay, were scanned for beta activity using GM detectors coupled to instruments with audible indicators. For the remaining eastern portion of the floor, approximately 20% of the 2 m × 2 m portions of bituminous material were scanned in the same

manner as the western and southern portions. Increases in the audible output suggested the presence of elevated direct radiation; these areas of increased activity were further investigated.

SURFACE ACTIVITY MEASUREMENTS

The contaminant of concern is processed natural uranium, i.e. uranium separated from its long lived daughter products, but in its naturally occurring isotopic abundances. Processed natural uranium emits both alpha and beta radiation in approximately equal proportions; either beta activity levels or alpha activity levels may, therefore, be measured for determining uranium surface activity levels. Measurements of beta activity levels, rather than alpha activity levels, provide a more accurate representation of uranium surface activity, due to conditions of the building surfaces (e.g. dusty, porous, or rough), which may selectively attenuate the alpha activity. Therefore, beta activity levels were used for comparison with the guideline values.

In non-remediated bays, direct measurements and smears for beta activity were performed at a minimum of 30 locations on the floor and at a minimum of 30 locations on the walls and ceiling; at a minimum of 30 locations in each stairwell and elevator shaft; at 14 locations on the loading dock; and at 15 locations on the roof of each bay.

In remediated bays, direct measurements for total and removable beta activity were performed on a minimum of 30% of randomly selected floor and lower wall grid blocks on all gridded surfaces. Measurements were performed at the center and at four points equidistant from the center and grid block corners. One set of five direct measurements was obtained from each selected grid block, and one smear for removable contamination, corresponding to the location of highest total (direct) activity, was taken for each set of five measurements. Direct measurements and smears were also obtained on non-remediated surfaces in the remediated bays at a minimum of 30 additional floor locations, 30 wall locations, and 10 ceiling locations.

Direct measurements were performed using GM detectors, coupled with ratemeter-scalers. Measurements and sampling locations for total and removable activity are illustrated on Figures 3 through 27.

Direct measurements were performed at a minimum of 3 locations for each batch of bituminous material that was surface scanned. One smear for removable contamination was taken for each direct measurement that exceeded 1000 dpm/100 cm^2 and at all elevated direct radiation locations. Measurements were performed using GM detectors, coupled with ratemeter-scalers.

Exposure Rate Measurements

Background exposure rate measurements were performed during a previous survey at four locations in a building of similar construction but without a history of radioactive material use.[4]

Exposure rate measurements were performed at 1 m above the surface at 4 locations in each bay on every floor, at 2 locations on the loading dock, and at one location in each elevator. Measurements were performed using a pressurized ionization chamber (PIC); locations are shown on Figures 3 through 27.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ESSAP laboratory in Oak Ridge, TN for analyses and interpretation in accordance with the ESSAP Laboratory Procedures Manual. Smears were analyzed for gross alpha and gross beta activity using a low background proportional counter. Direct measurement data and smear data were converted to units of disintegrations per minute/100 cm^2 and exposure rate measurements were reported in units of μR/h. Additional information concerning major instrumentation, sampling equipment, and analytical procedures is provided in Appendices A and B. Results were compared to DOE guidelines which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEWS

ESSAP reviewed the PMC's predecisional draft of the post-remedial action report (PRAR) for Building 513-519 of the Baker and Williams Warehouses, describing the remediation activities and post-remediation survey results.[7] Information was evaluated to assure that remedial actions were effective in reducing contamination to levels below the DOE guidelines and authorized limits. ESSAP comments on the PRAR were prepared and forwarded to DOE.[9]

SURFACE SCANS

Surface scans for alpha, beta, and gamma activity, performed on the floors, lower walls, portions of the upper walls and ceiling, the support columns, and in various other locations, did not identify any areas of contamination exceeding guidelines. With one exception, surface scans of the released bituminous material did not identify any areas of contamination exceeding guidelines. One pile of radiologically "clean" bituminous material had contamination that exceeded guidelines, and was returned to the PMC for re-survey and further investigation. This pile was further segregated and re-surveys by ESSAP did not identify any areas of contamination exceeding guidelines.

SURFACE ACTIVITY LEVELS

Direct measurements for total and removable activity are summarized in Tables 1 and 2. Table 1 presents results of individual (single-point) measurements. Single-point measurements ranged from $<1,300$ to 11,000 dpm/100 cm^2. Of the approximately 1,200 individual measurements performed, there were 20 measurements which were greater than the average but less than the maximum contamination guideline; these locations were small, isolated spots. Further radiological investigations (i.e., surface scans) indicated that the immediately adjacent 1 m^2 areas had radiation levels that were comparable to background levels and thus were below

the average contamination guideline. Removable activity for these measurement locations ranged from < 12 to 140 dpm/100 cm² for alpha activity and < 20 to 240 dpm/100 cm² for beta activity.

Results of grid block measurements are presented in Table 2. Grid block averages ranged from < 2,100 to 3,400 dpm/100 cm², for beta activity, while the individual measurements in the grid blocks ranged from < 2,100 to 13,000 dpm/100 cm². Removable activity ranged from < 12 to 45 dpm/100 cm², for alpha and ranged from < 20 to 54 dpm/100 cm², for beta.

Results of direct measurements on released bituminous material are presented in Table 1. All single-point measurements were < 2100 dpm/100 cm². Removable activity for these measurements were < 12 dpm/100 cm² for alpha activity and < 20 dpm/100 cm² for beta activity.

Exposure Rate Measurements

Background exposure rates ranged from 11 to 13 μR/h. Exposure rate measurements in Building 513-519 ranged from 10 to 14 μR/h. A summary of the results is presented in Table 3.

COMPARISON OF RESULTS WITH GUIDELINES

The DOE surface contamination guidelines for residual radioactive material at a FUSRAP site are summarized in Appendix C. The DOE surface contamination guidelines for processed natural uranium are as follows:[10]

Total Activity

5,000 α dpm/100 cm², averaged over 1 m²

15,000 α dpm/100 cm², maximum in a 100 cm² area

Removable Activity

1,000 α dpm/100 cm²

As rough, porous, or dirty surfaces attenuate alpha radiation, the beta activity was considered to be most representative of surface activity and was used for comparison to guideline levels since processed natural uranium emits both alpha and beta radiations in a 1:1 ratio.

The applicable exposure rate guideline is 20 μR/h above background.

All final independent data measurements performed by ESSAP indicated that the guidelines had been met.

SUMMARY

At the request of the U.S. Department of Energy, the Oak Ridge Institute for Science and Education's Environmental Survey and Site Assessment Program conducted a verification survey of Building 513-519 at the Baker and Williams Warehouses on West 20th Street in New York City, New York. Verification activities included document reviews, surface scans, surface activity measurements, and exposure rate measurements.

Direct measurements and smears of the remediated floors, walls and ceiling, and the released bituminous material were compared to the DOE surface contamination guidelines for uranium (Appendix C). The ESSAP survey results indicate that surface activity levels were within the DOE surface contamination guidelines. All exposure rate measurements were within the guideline value of 20 μR/h above background. These findings support the results of the remediation survey activities performed by the PMC.

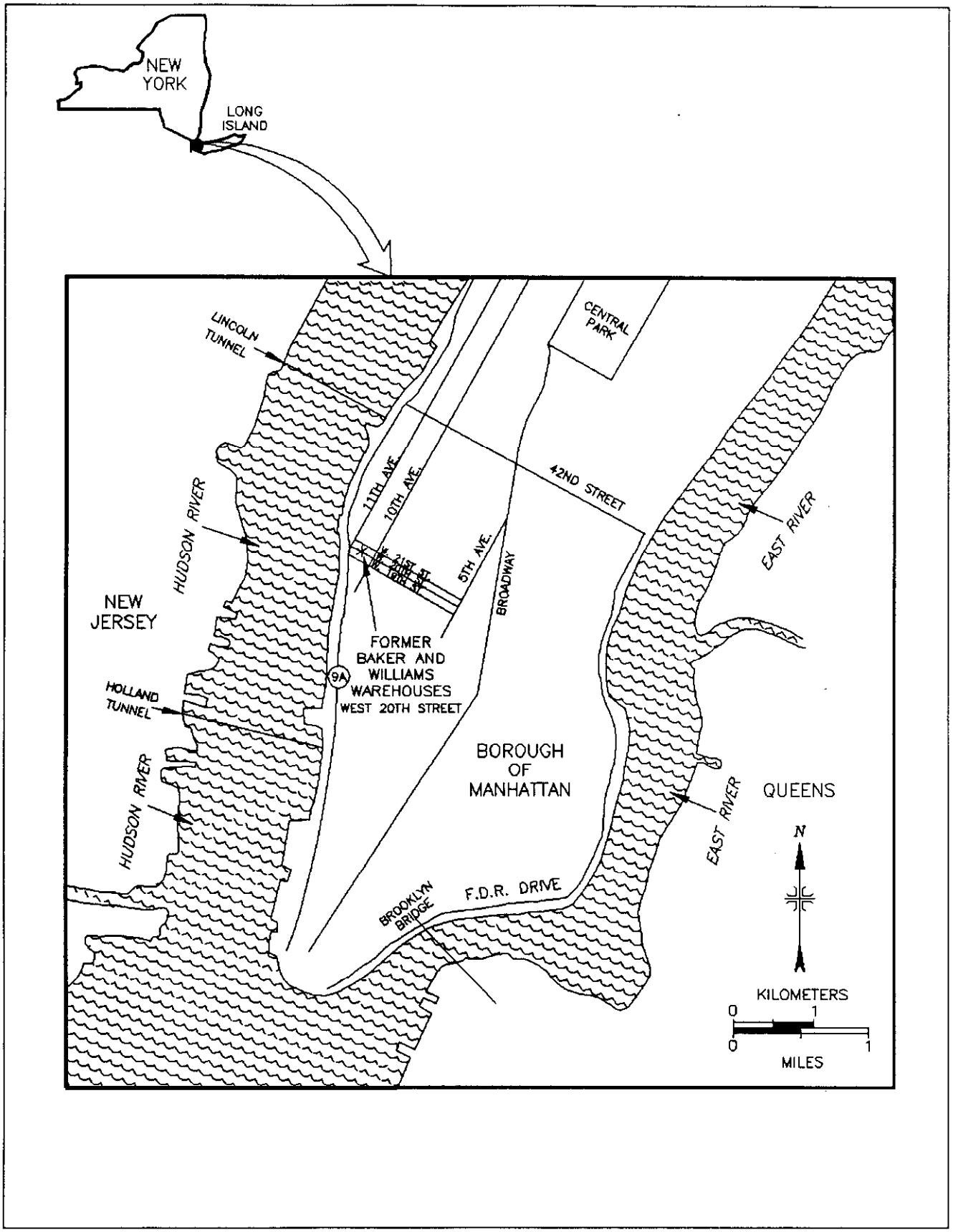

FIGURE 1: Location of the Baker and Williams Warehouses, New York, New York

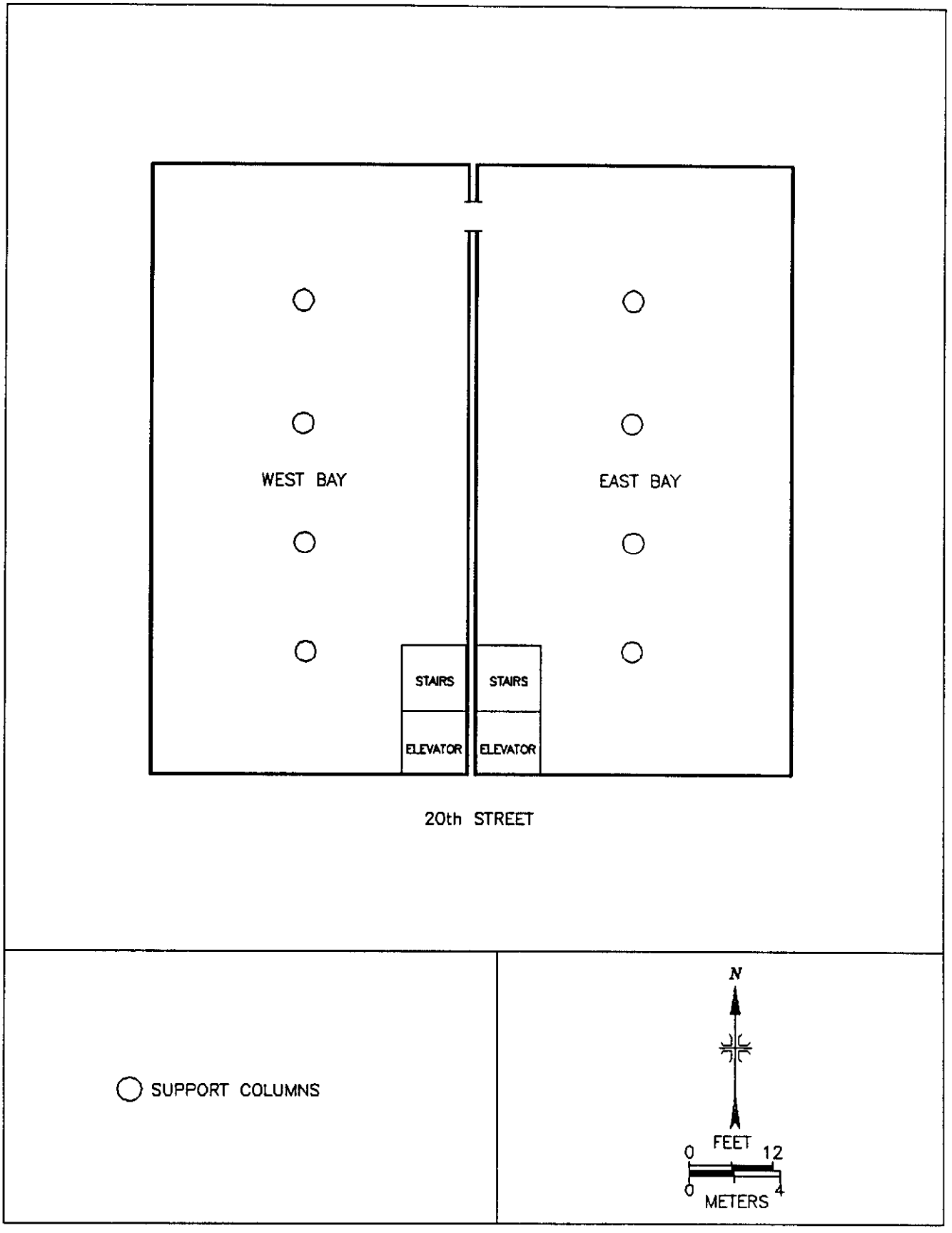

FIGURE 2: Baker and Williams Warehouses, Building 513-519 – General Floor Plan

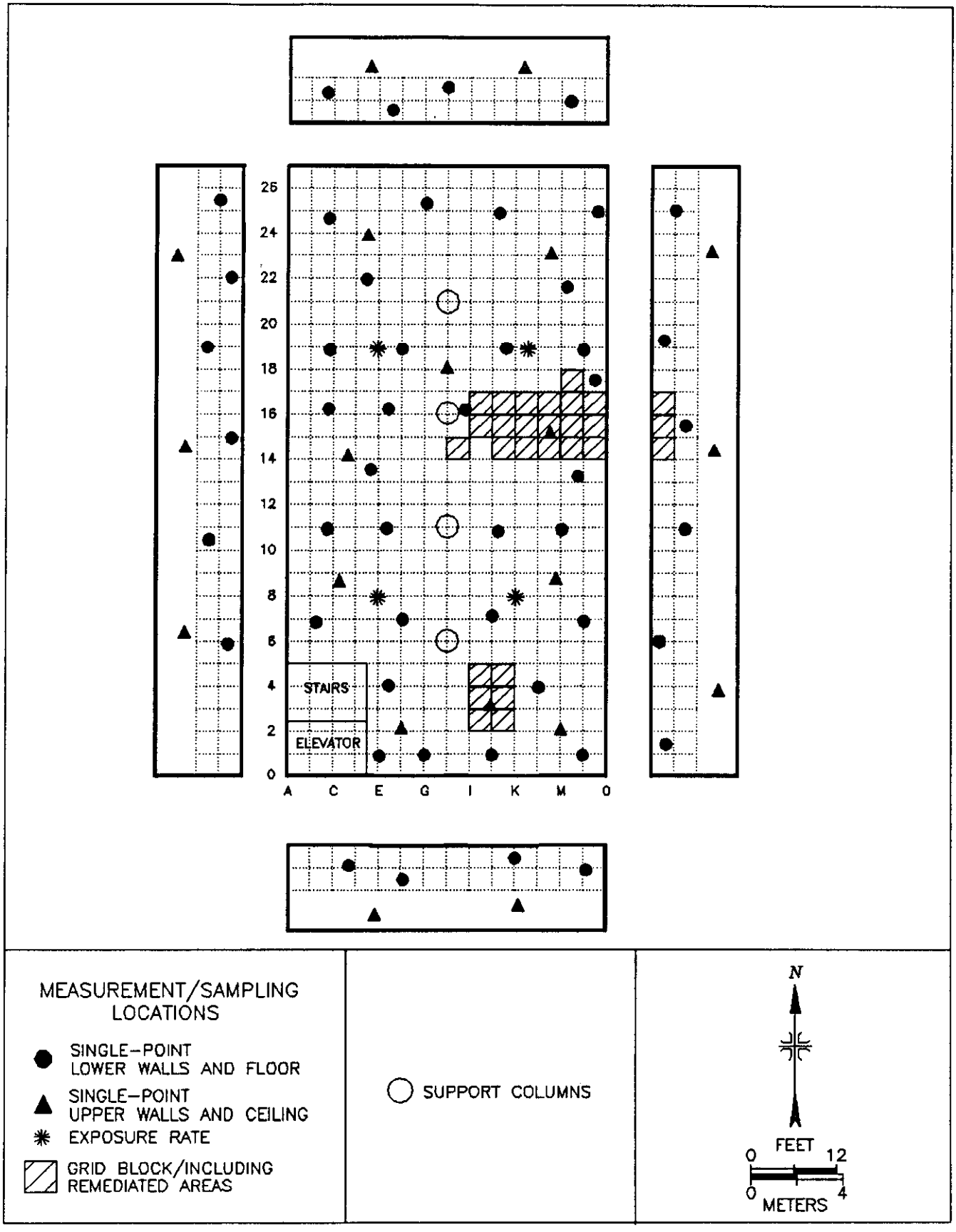

FIGURE 3: Basement, East Bay – Measurement and Sampling Locations

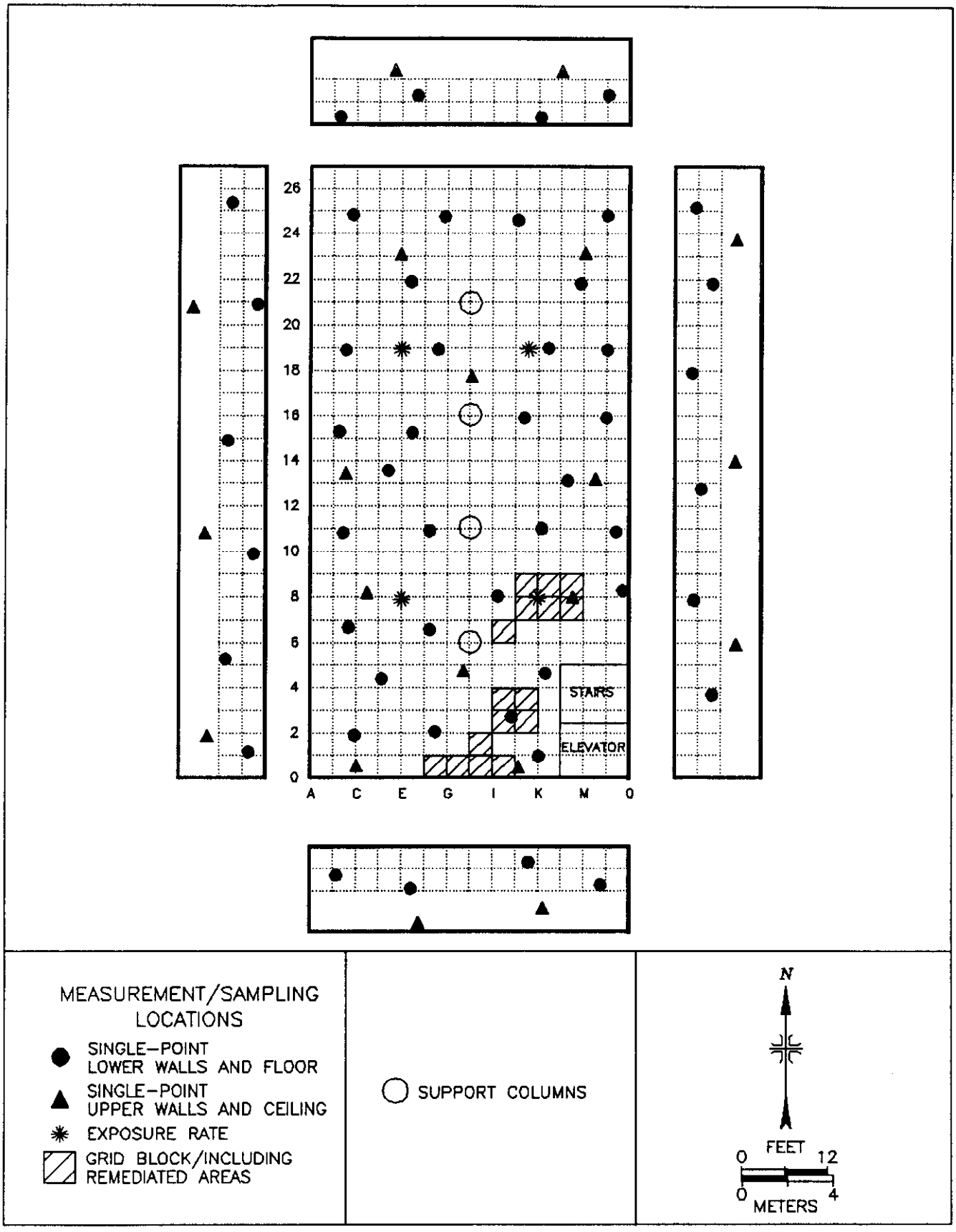

FIGURE 4: Basement, West Bay – Measurement and Sampling Locations

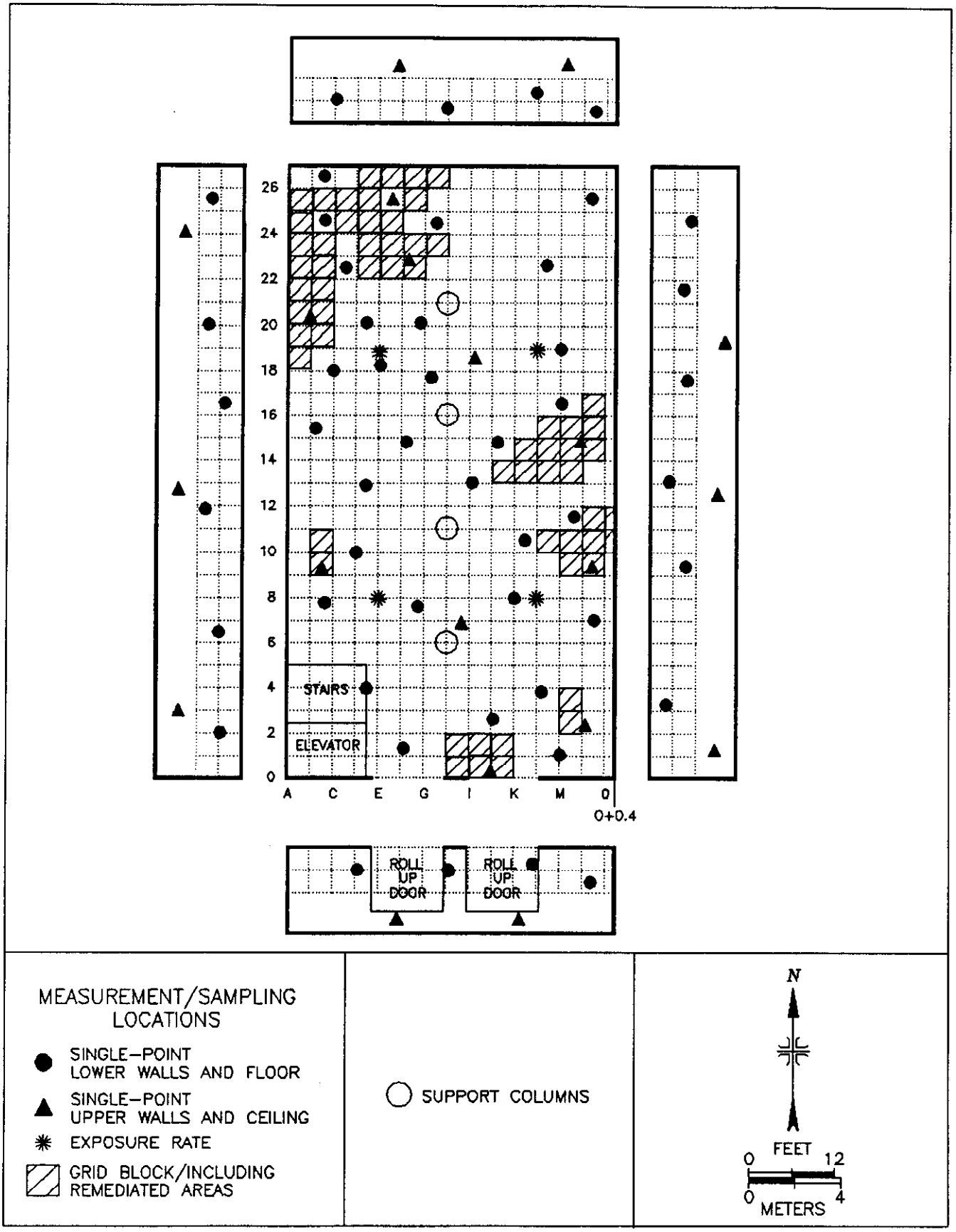

FIGURE 5: First Floor, East Bay – Measurement and Sampling Locations

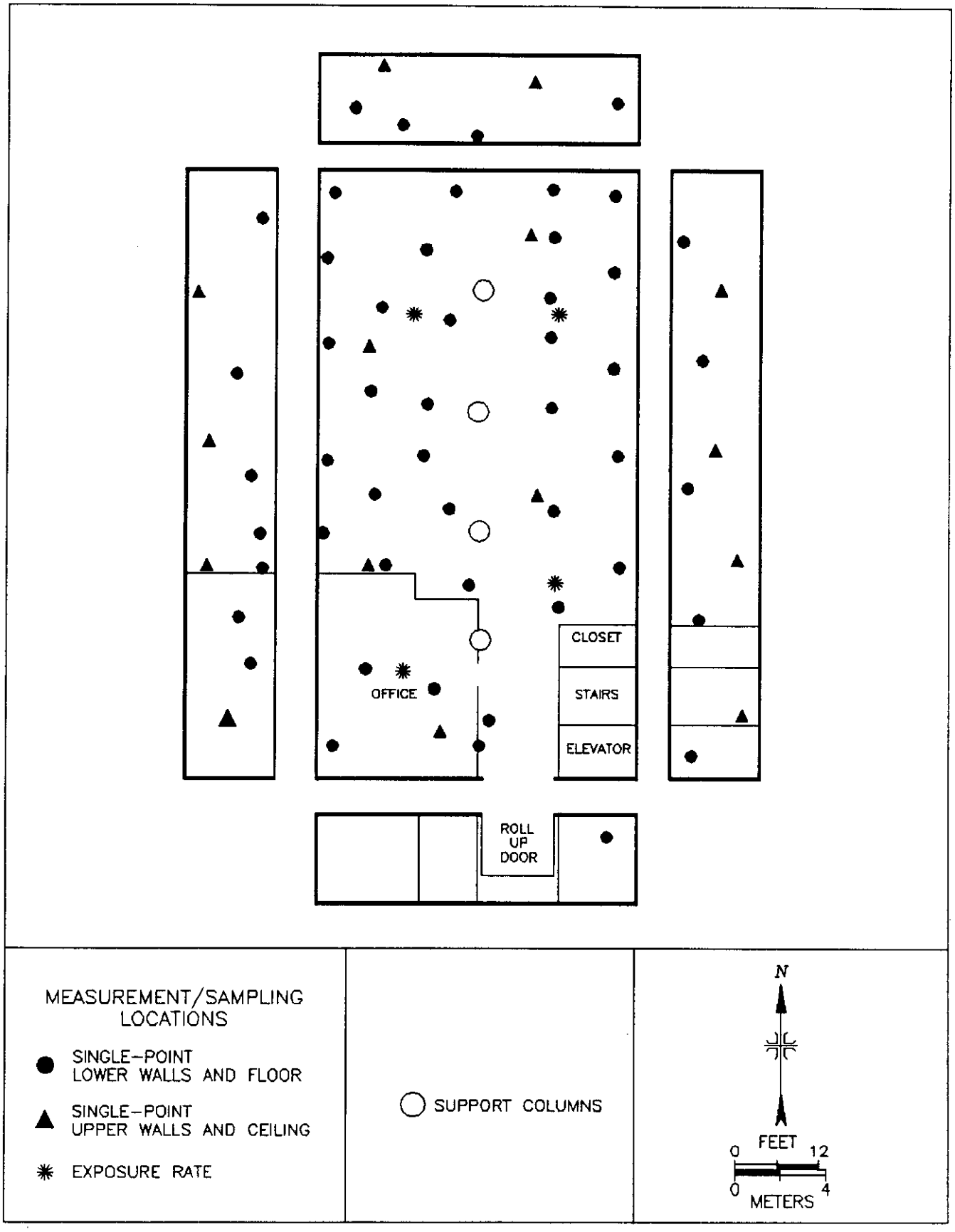

FIGURE 6: First Floor, West Bay – Measurement and Sampling Locations

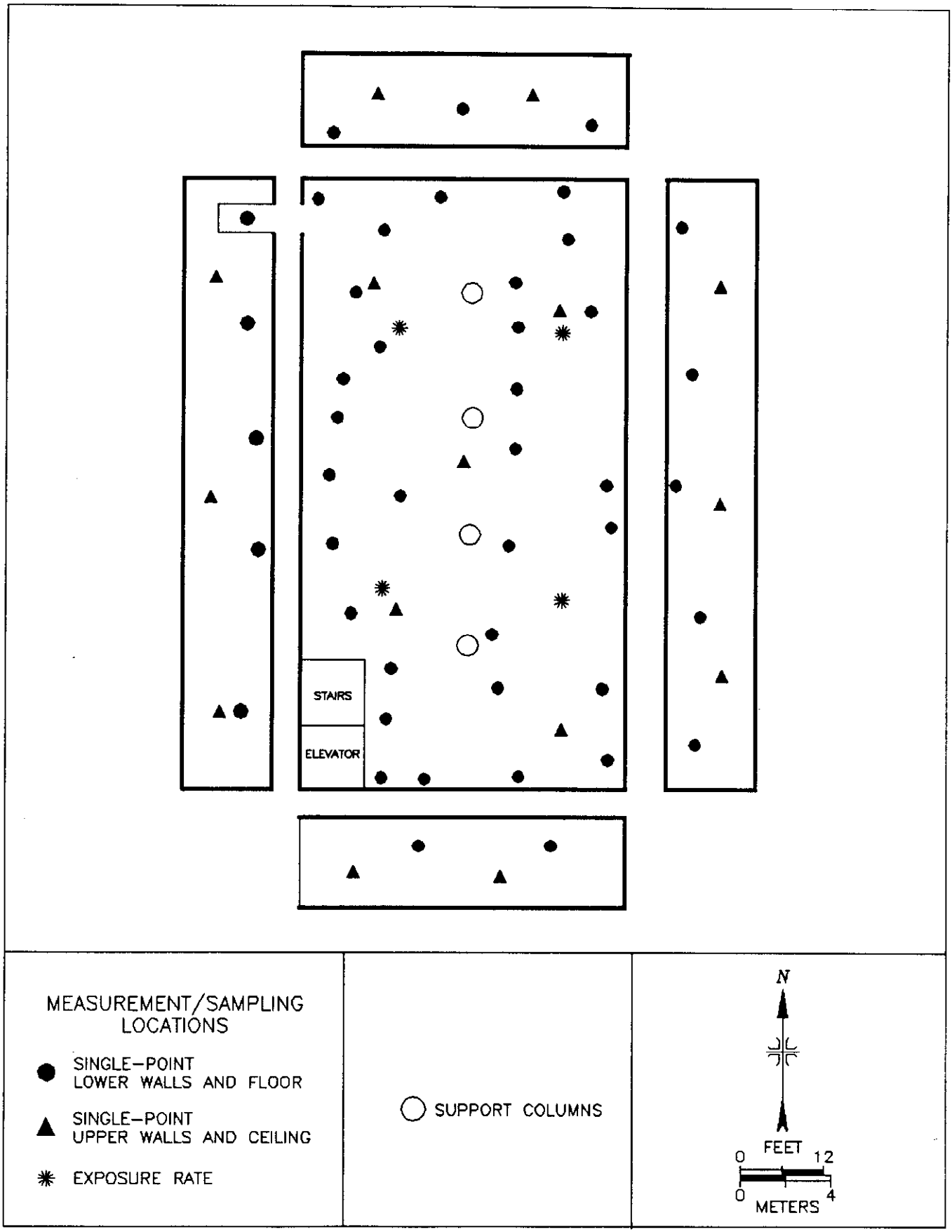

FIGURE 7: Second Floor, East Bay – Measurement and Sampling Locations

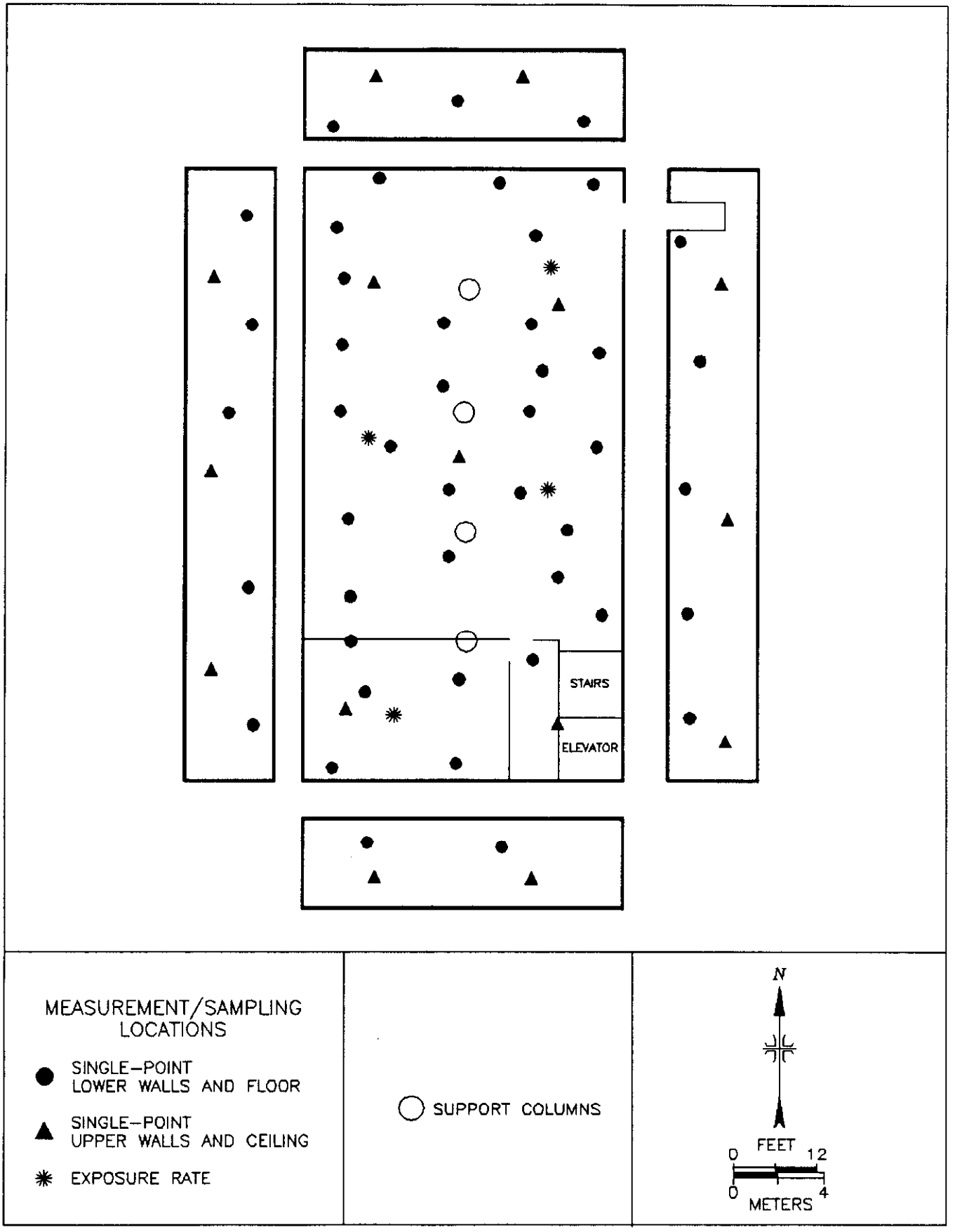

FIGURE 8: Second Floor, West Bay – Measurement and Sampling Locations

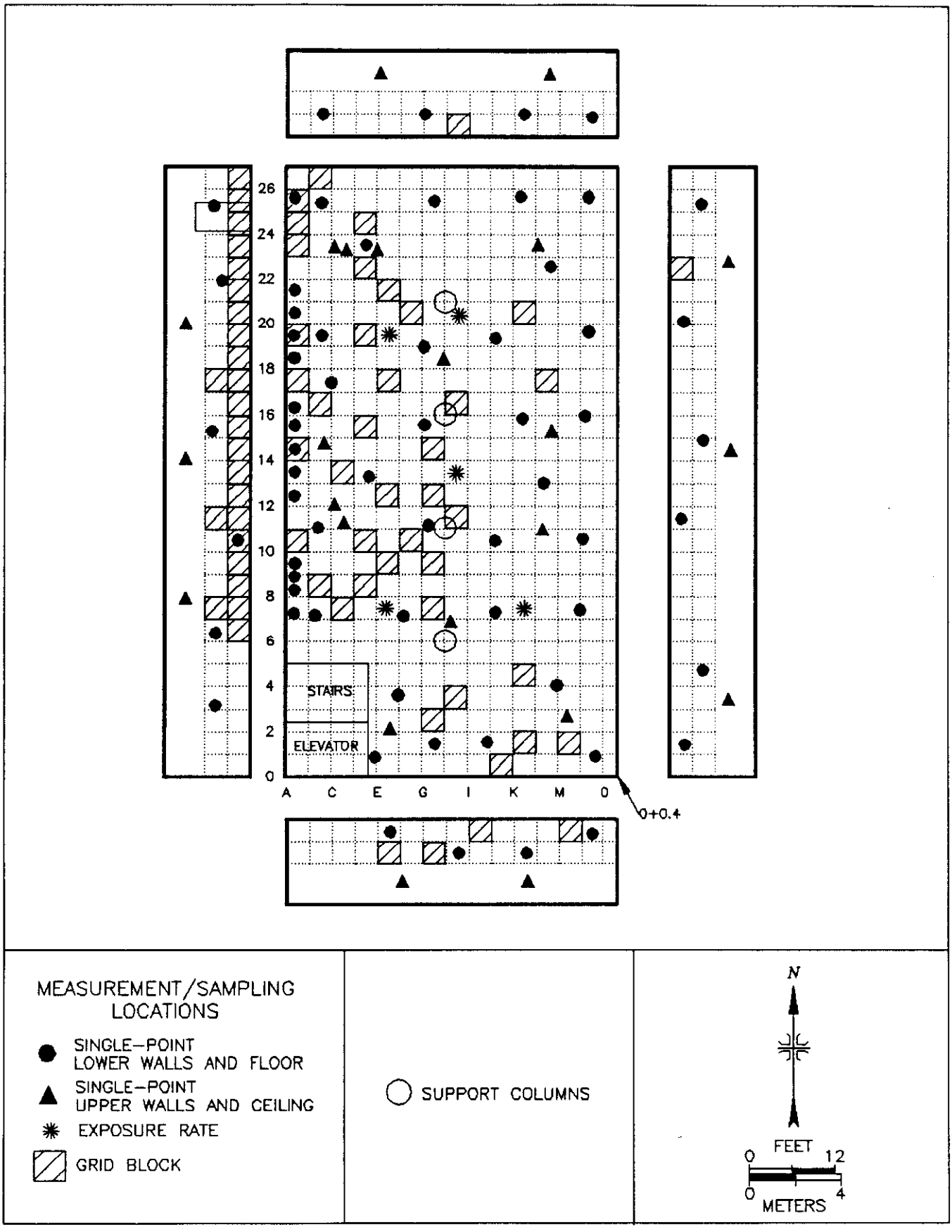

FIGURE 9: Third Floor, East Bay – Measurement and Sampling Locations

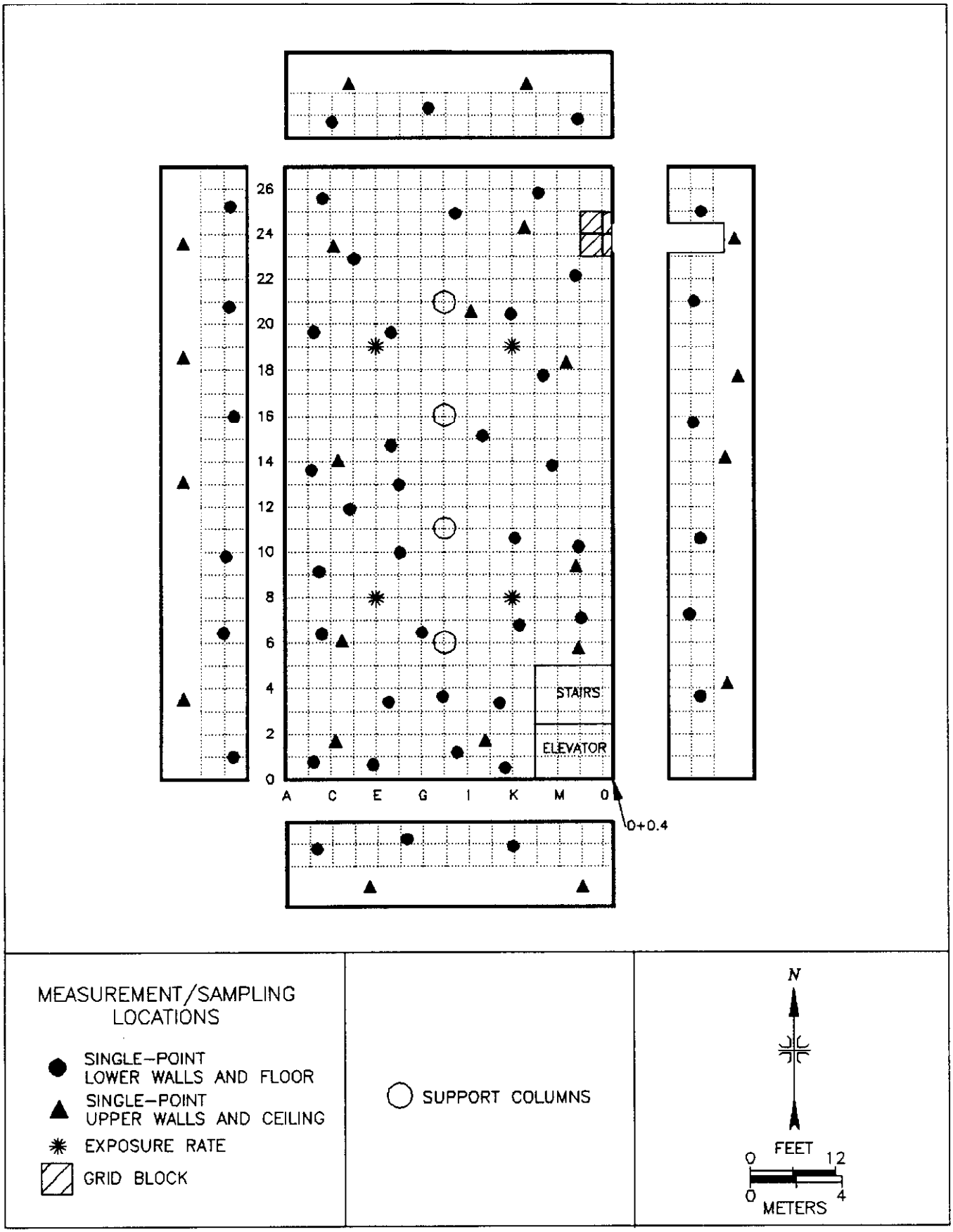

FIGURE 10: Third Floor, West Bay – Measurement and Sampling Locations

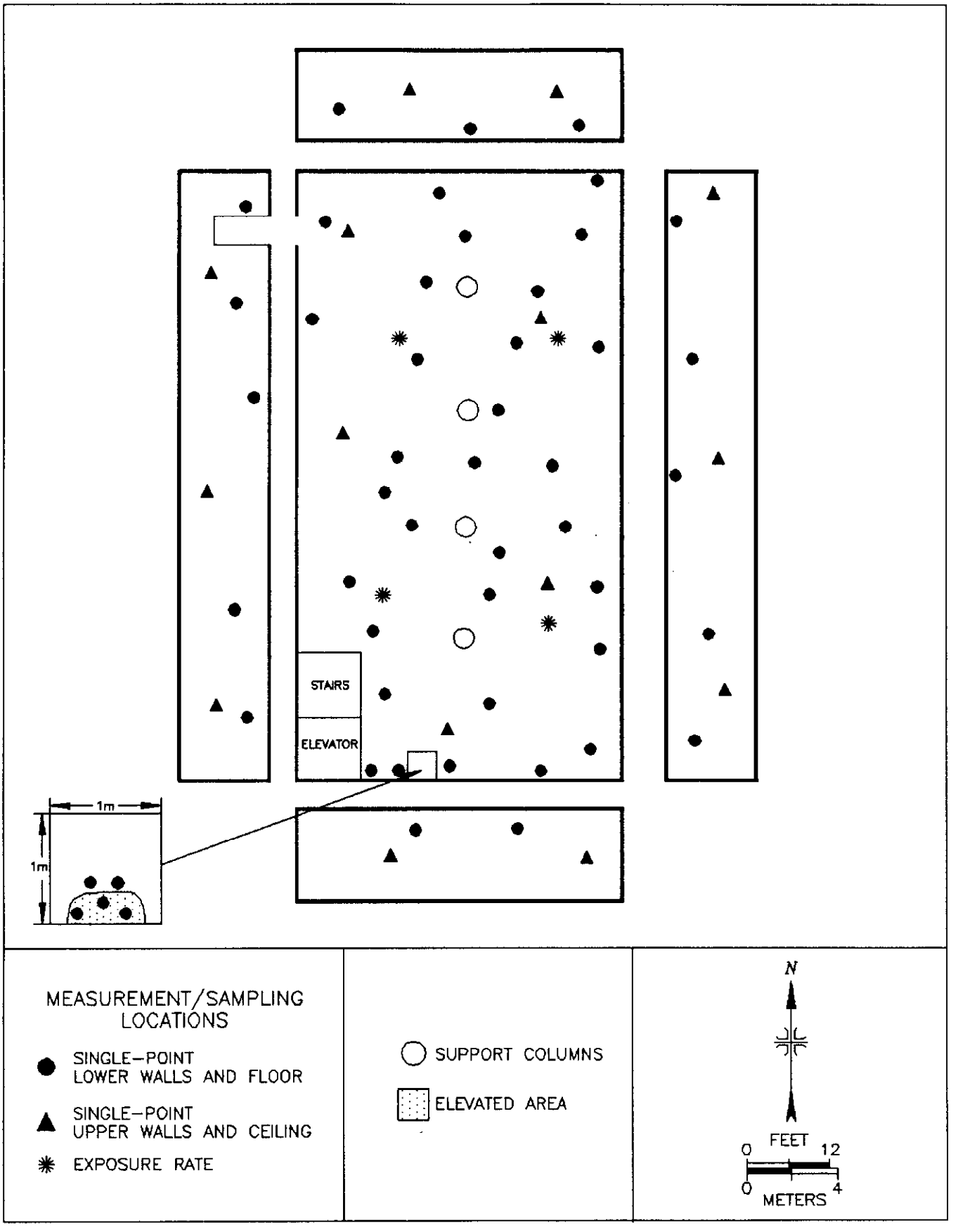

FIGURE 11: Fourth Floor, East Bay – Measurement and Sampling Locations

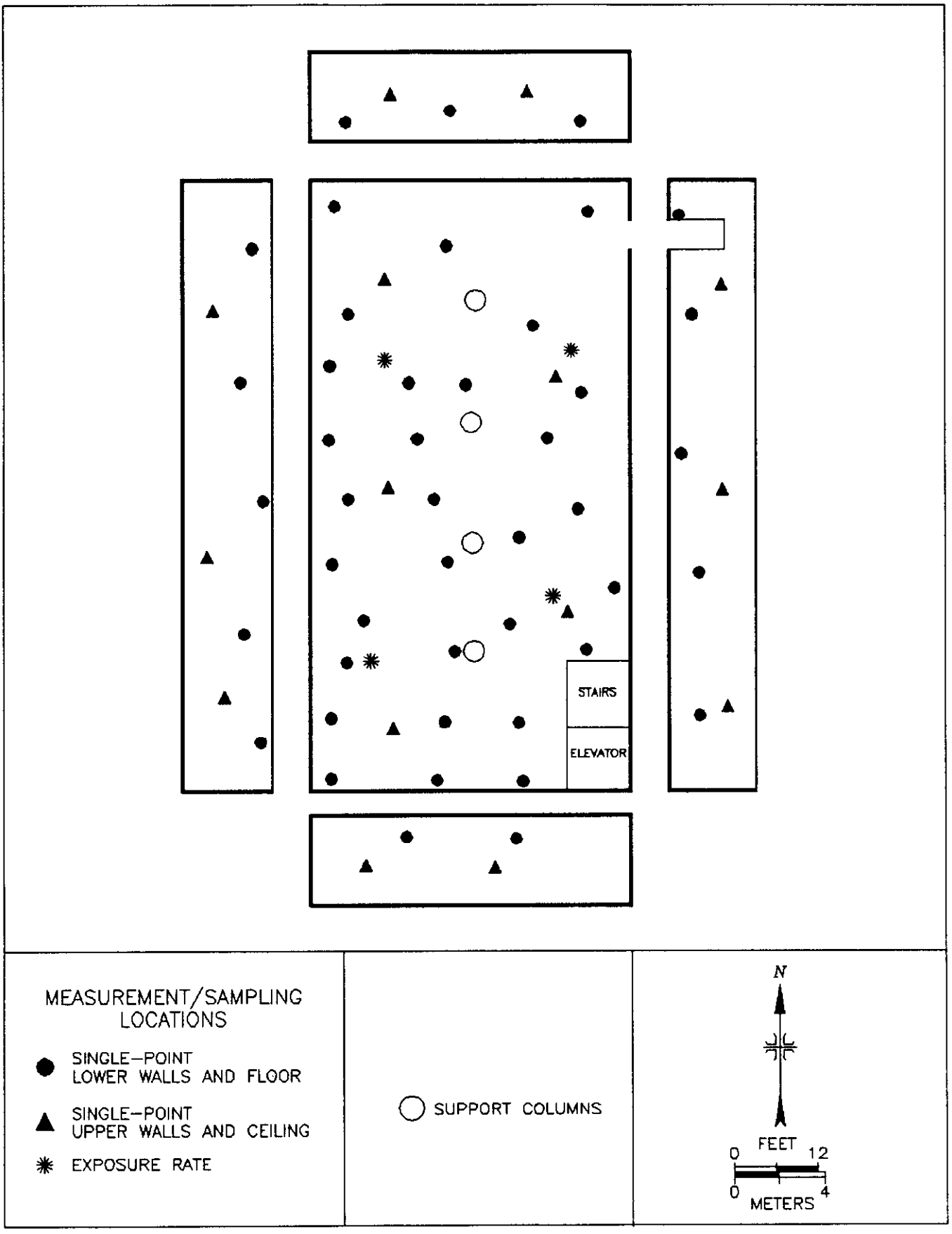

FIGURE 12: Fourth Floor, West Bay – Measurement and Sampling Locations

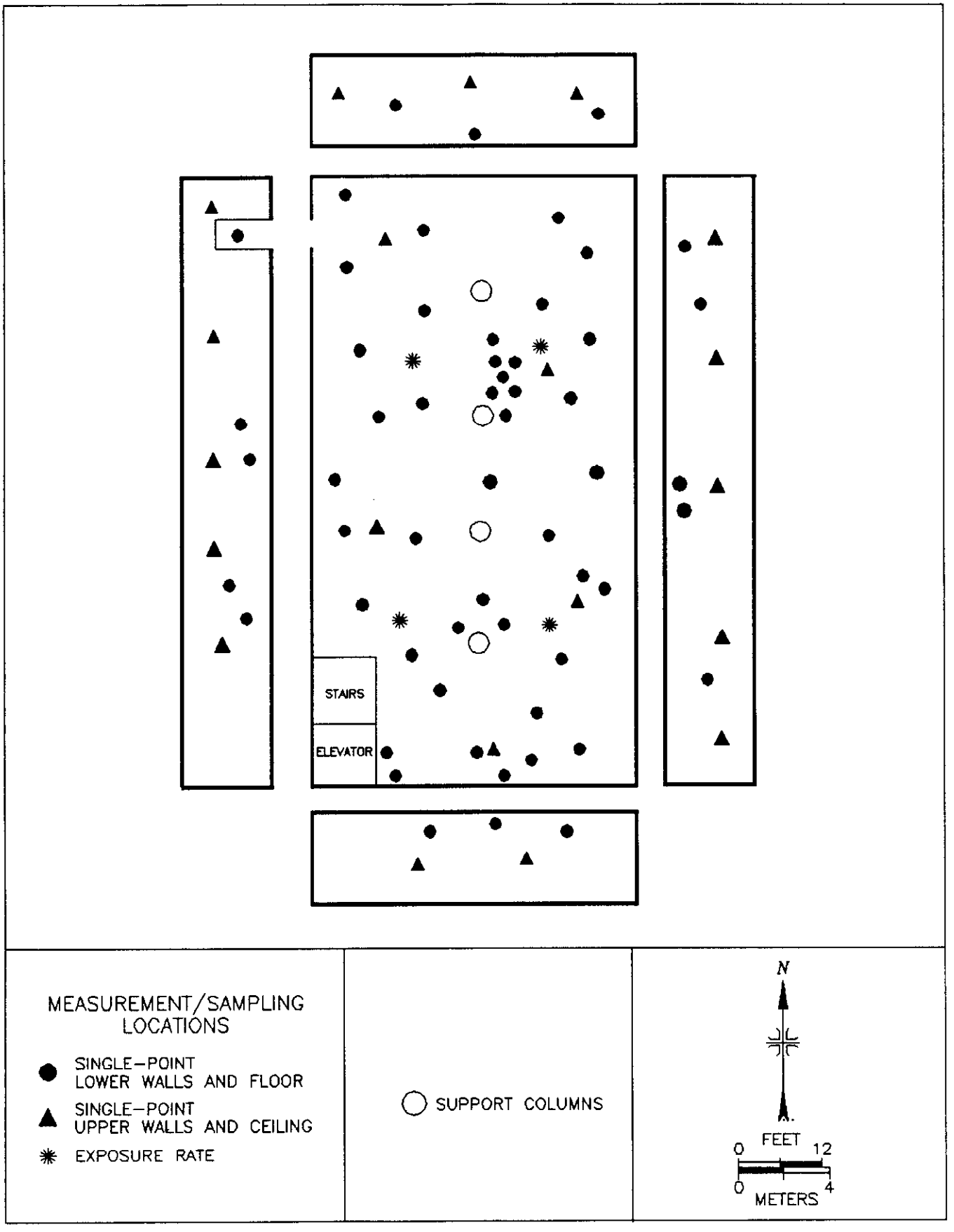

FIGURE 13: Fifth Floor, East Bay – Measurement and Sampling Locations

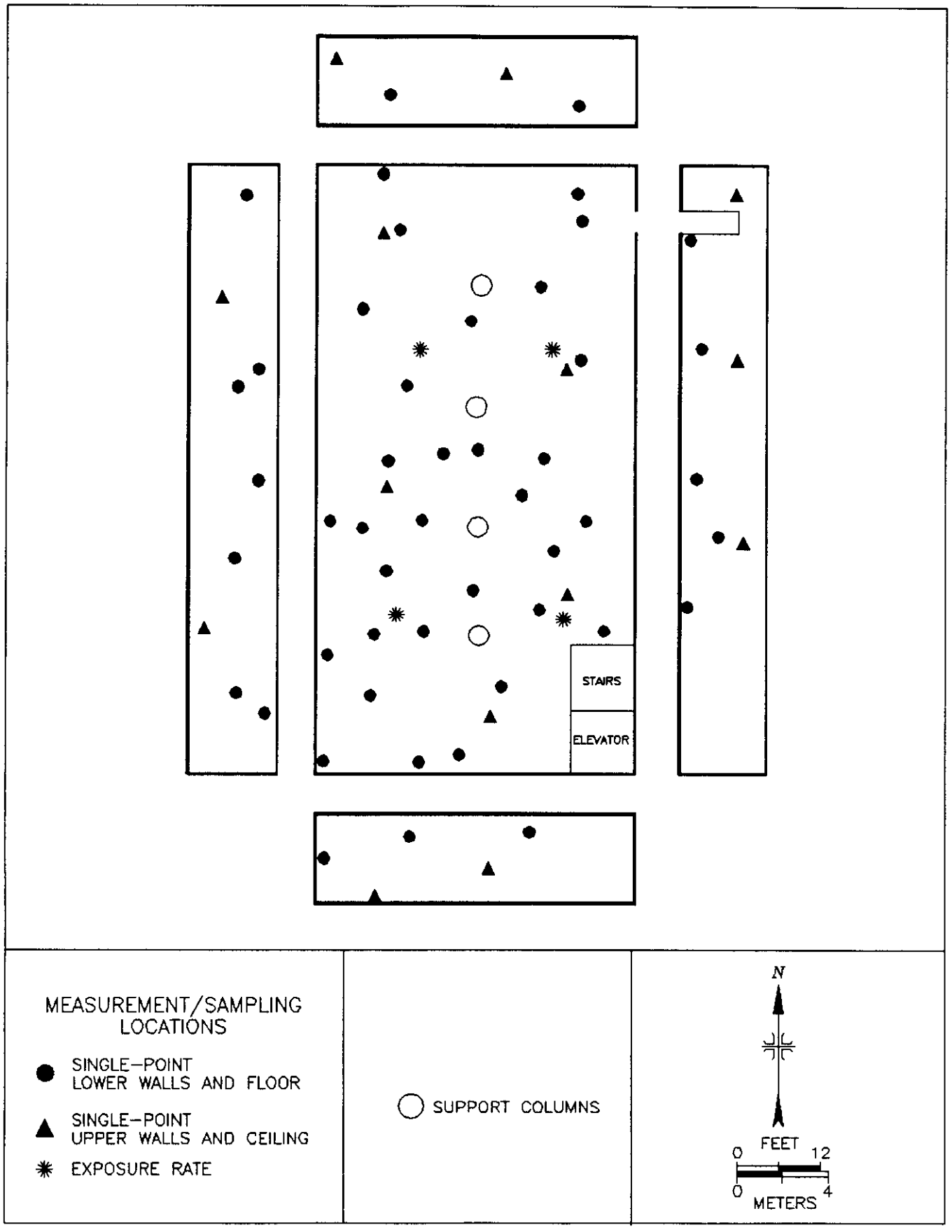

FIGURE 14: Fifth Floor, West Bay – Measurement and Sampling Locations

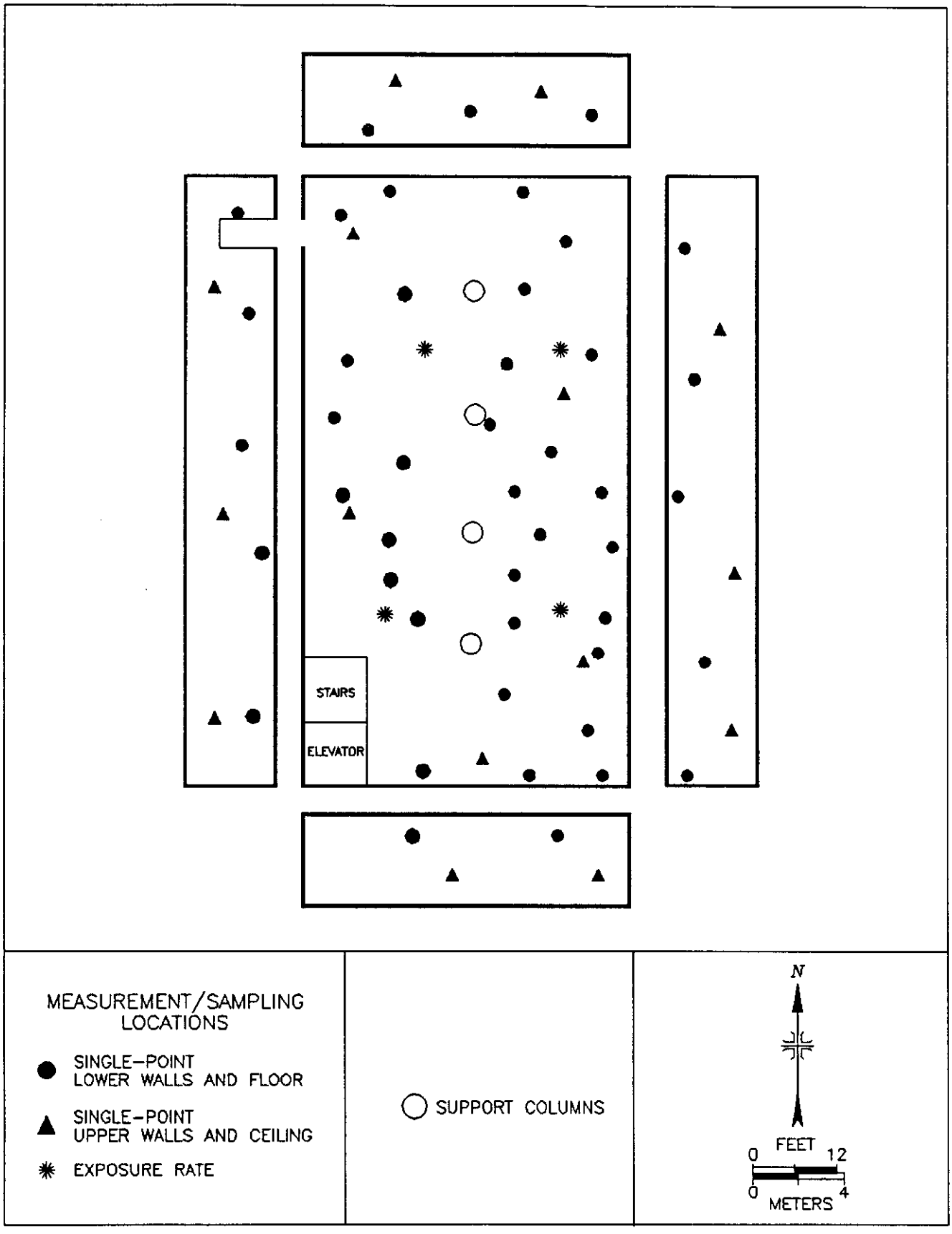

FIGURE 15: Sixth Floor, East Bay – Measurement and Sampling Locations

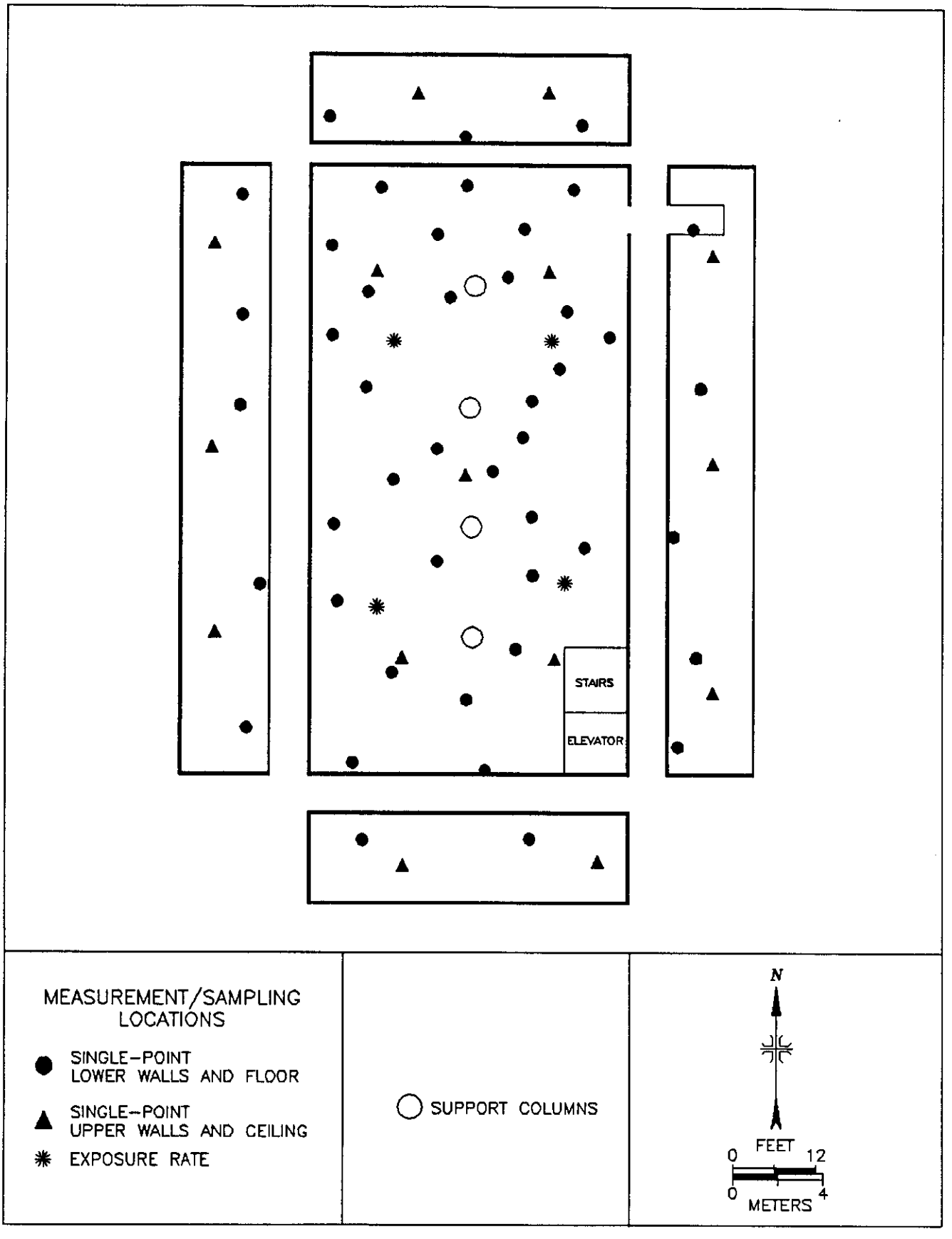

FIGURE 16: Sixth Floor, West Bay – Measurement and Sampling Locations

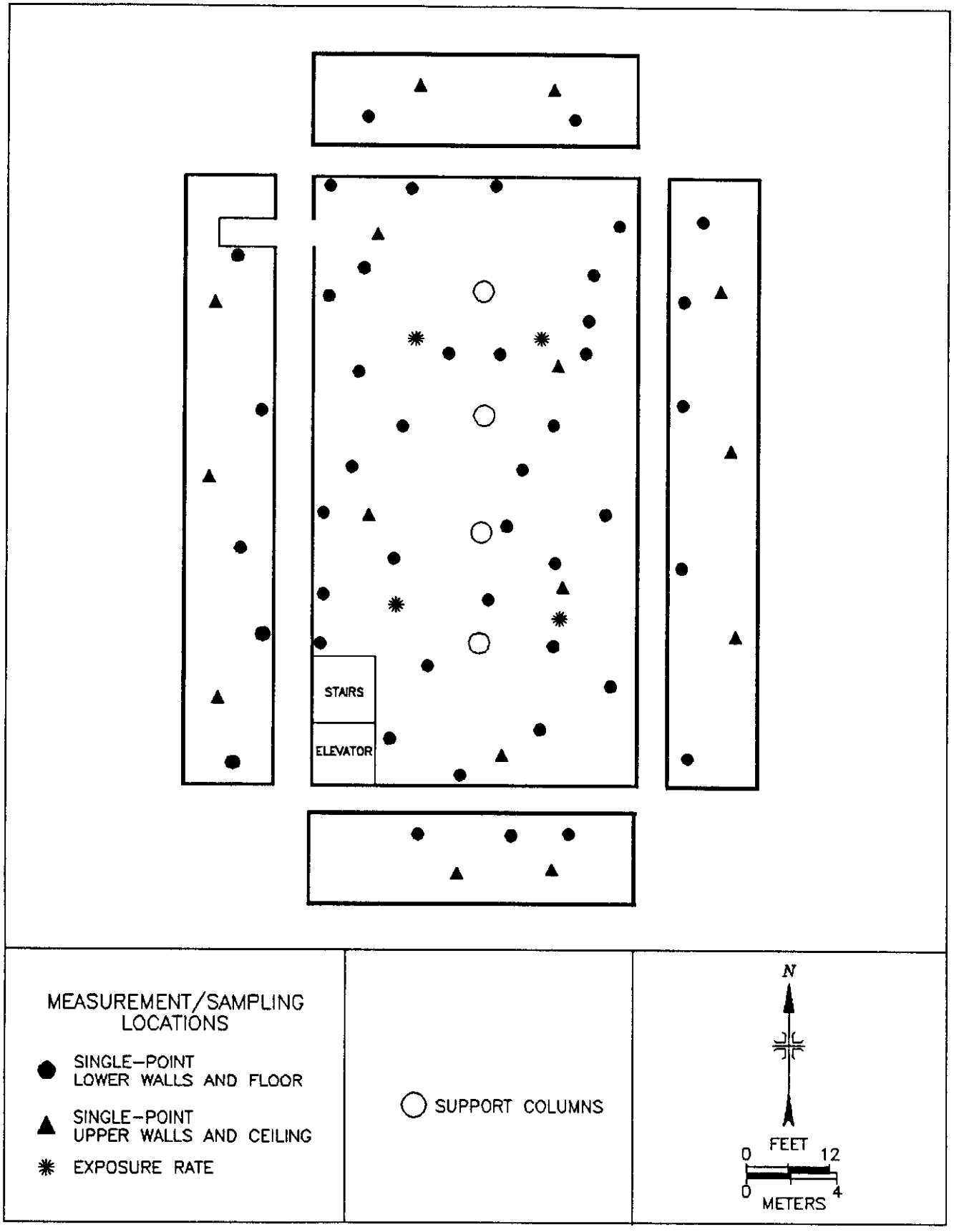

FIGURE 17: Seventh Floor, East Bay – Measurement and Sampling Locations

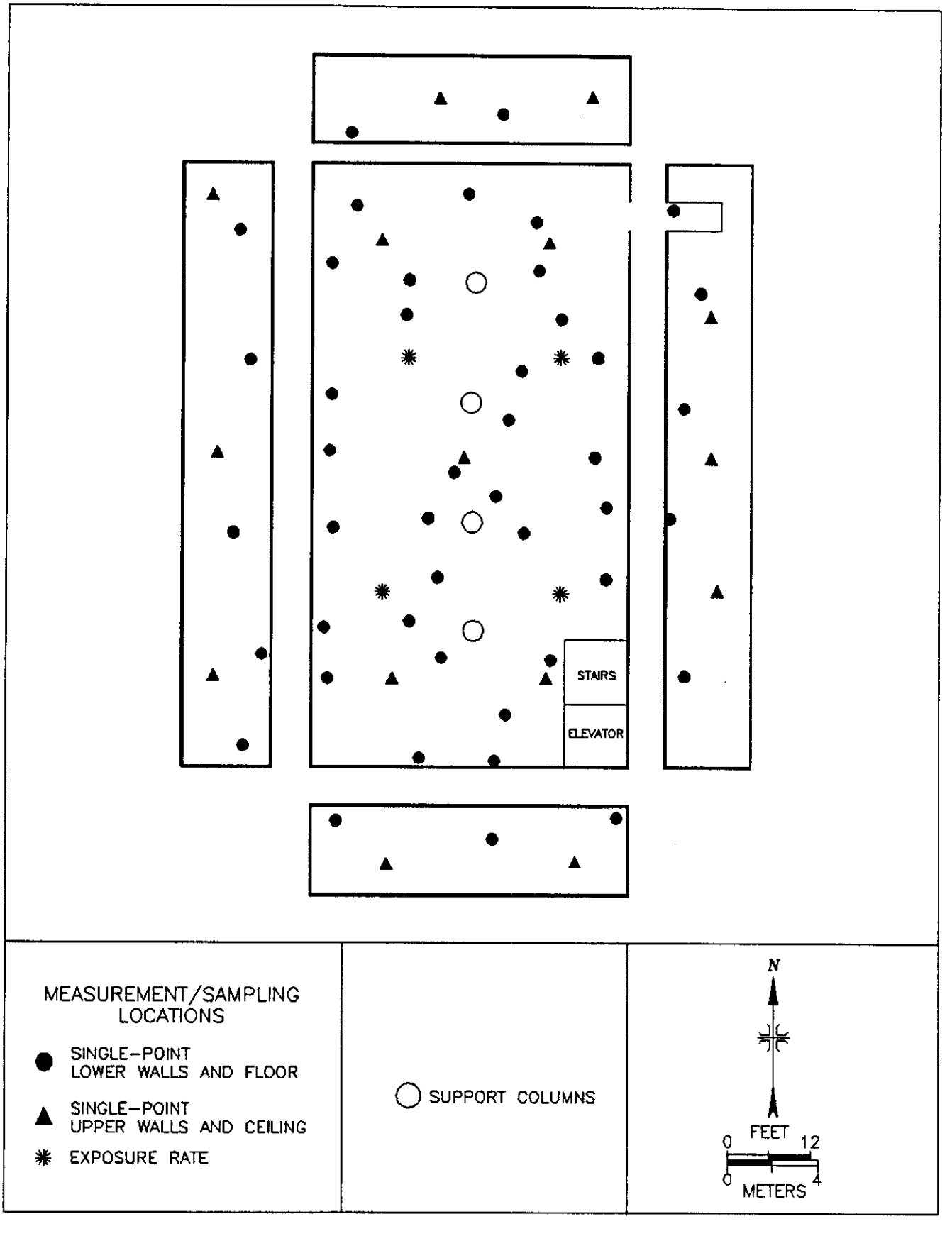

FIGURE 18: Seventh Floor, West Bay – Measurement and Sampling Locations

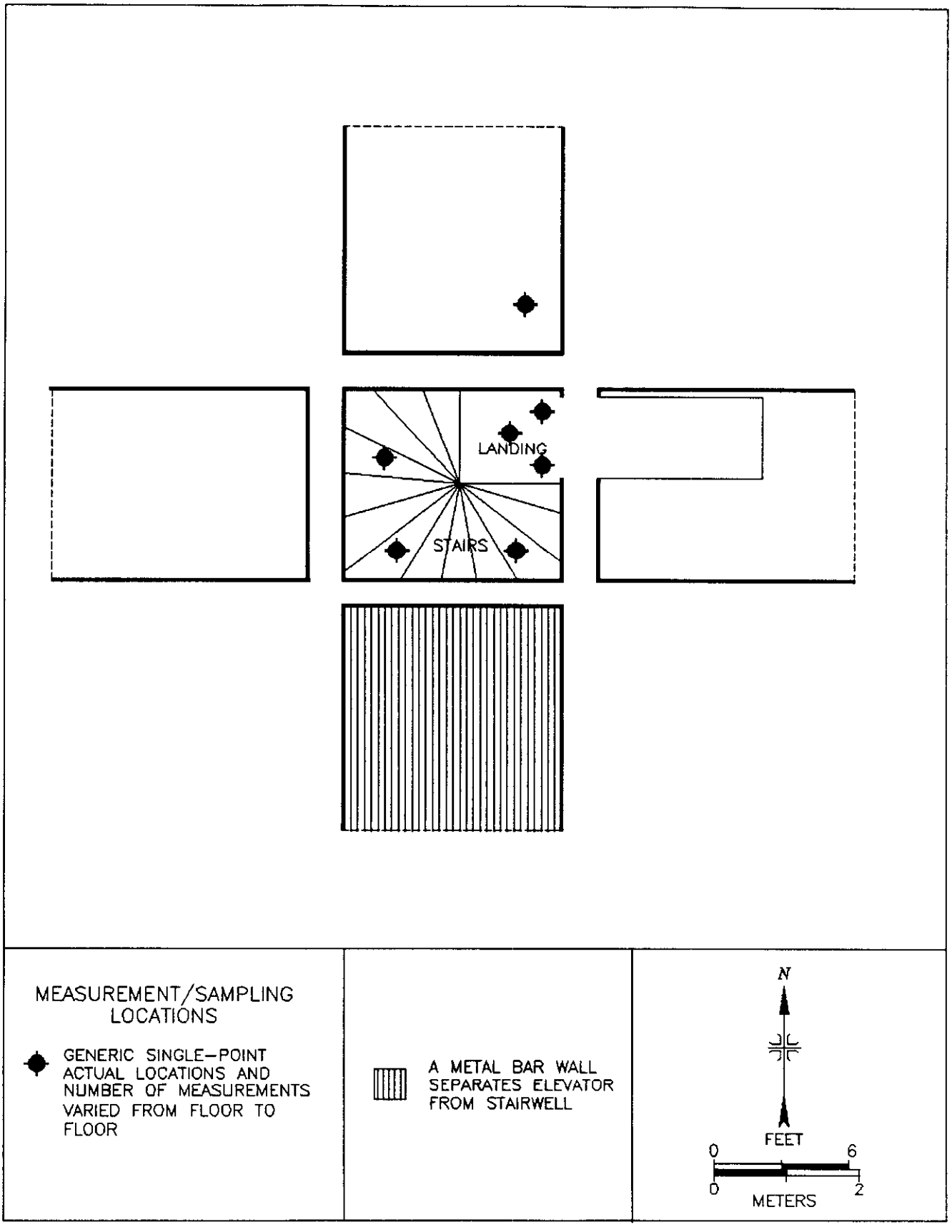

FIGURE 19: Stairwell, East Bay – Measurement and Sampling Locations

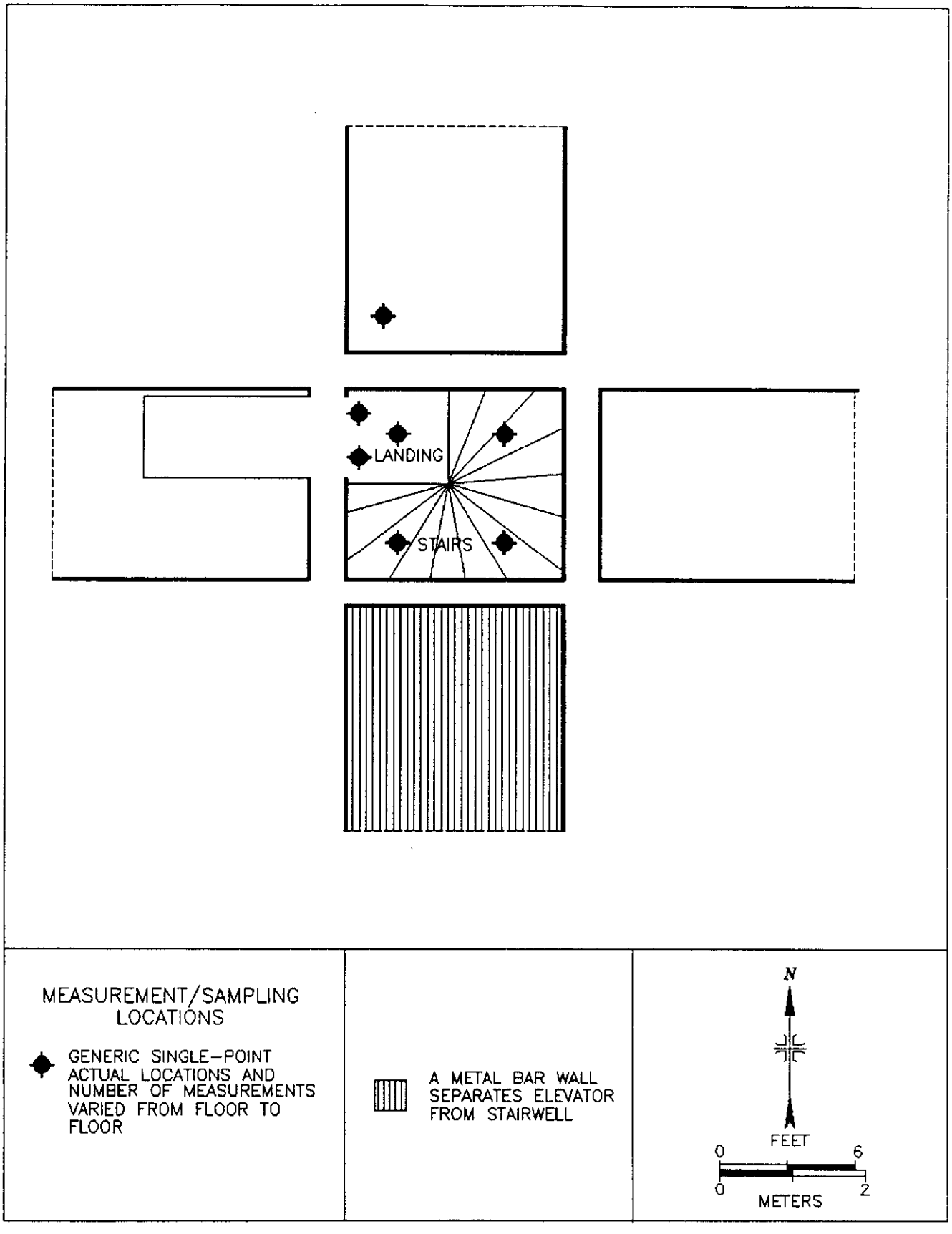

FIGURE 20: Stairwell, West Bay – Measurement and Sampling Locations

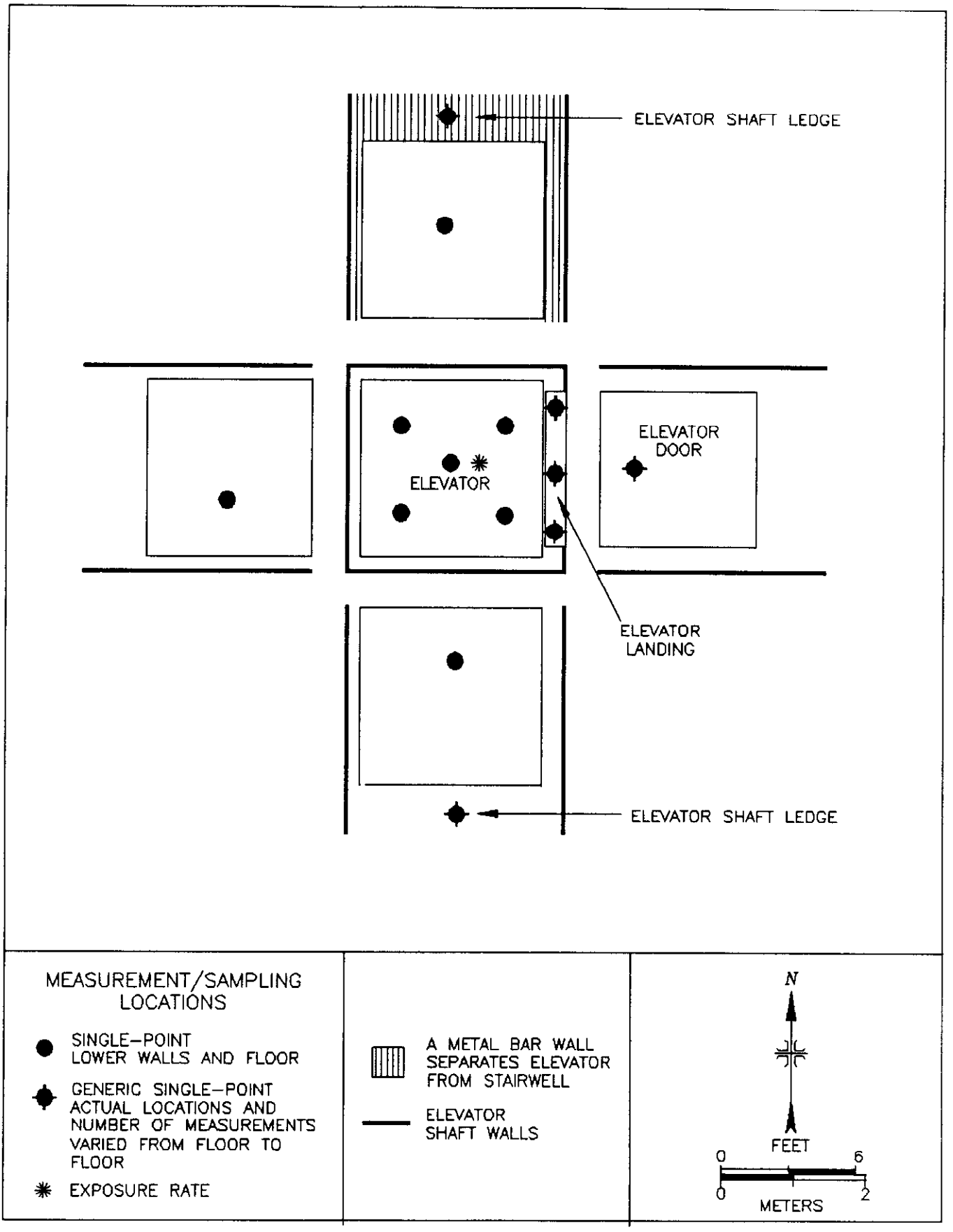

FIGURE 21: Elevator, East Bay – Measurement and Sampling Locations

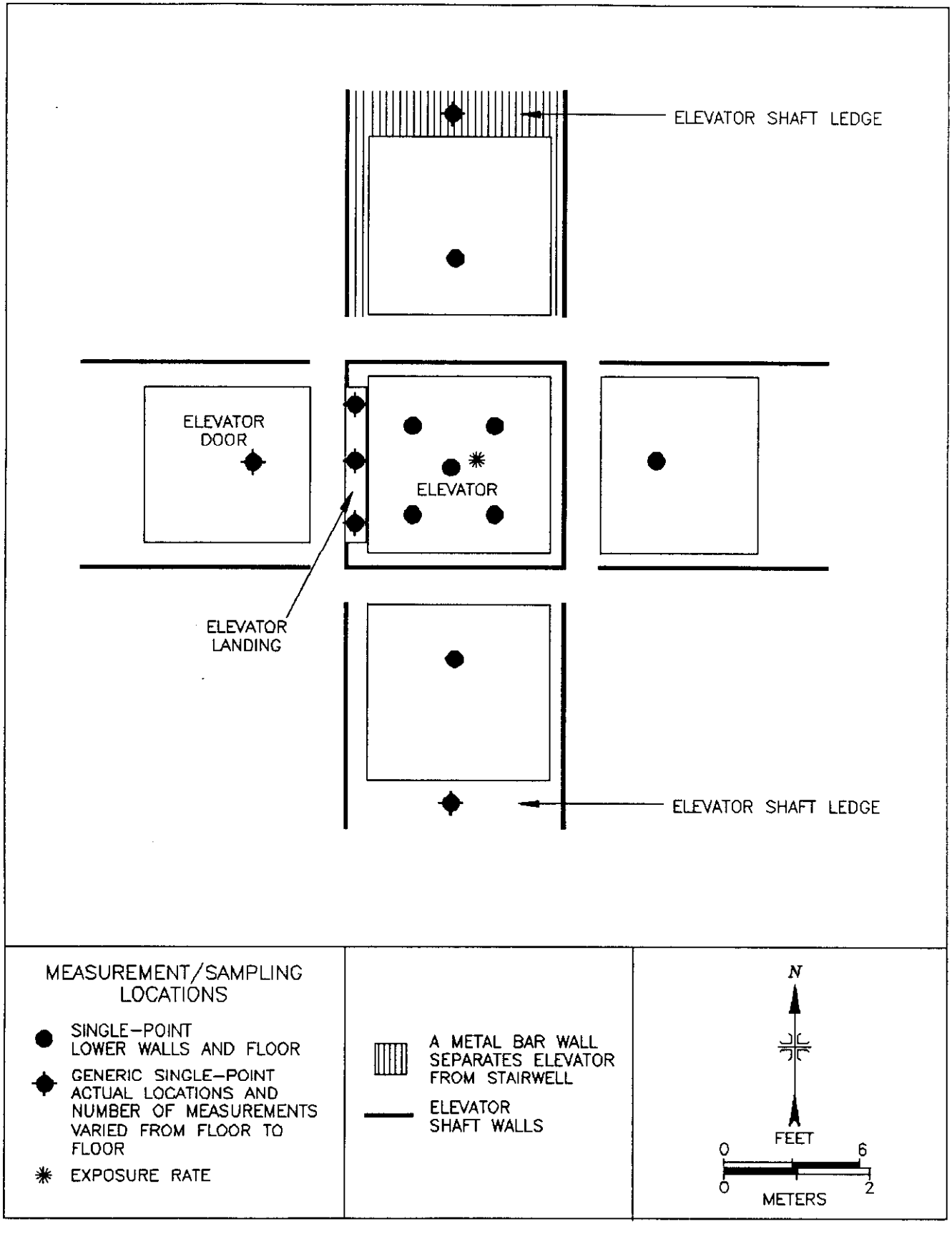

FIGURE 22: Elevator, West Bay - Measurement and Sampling Locations

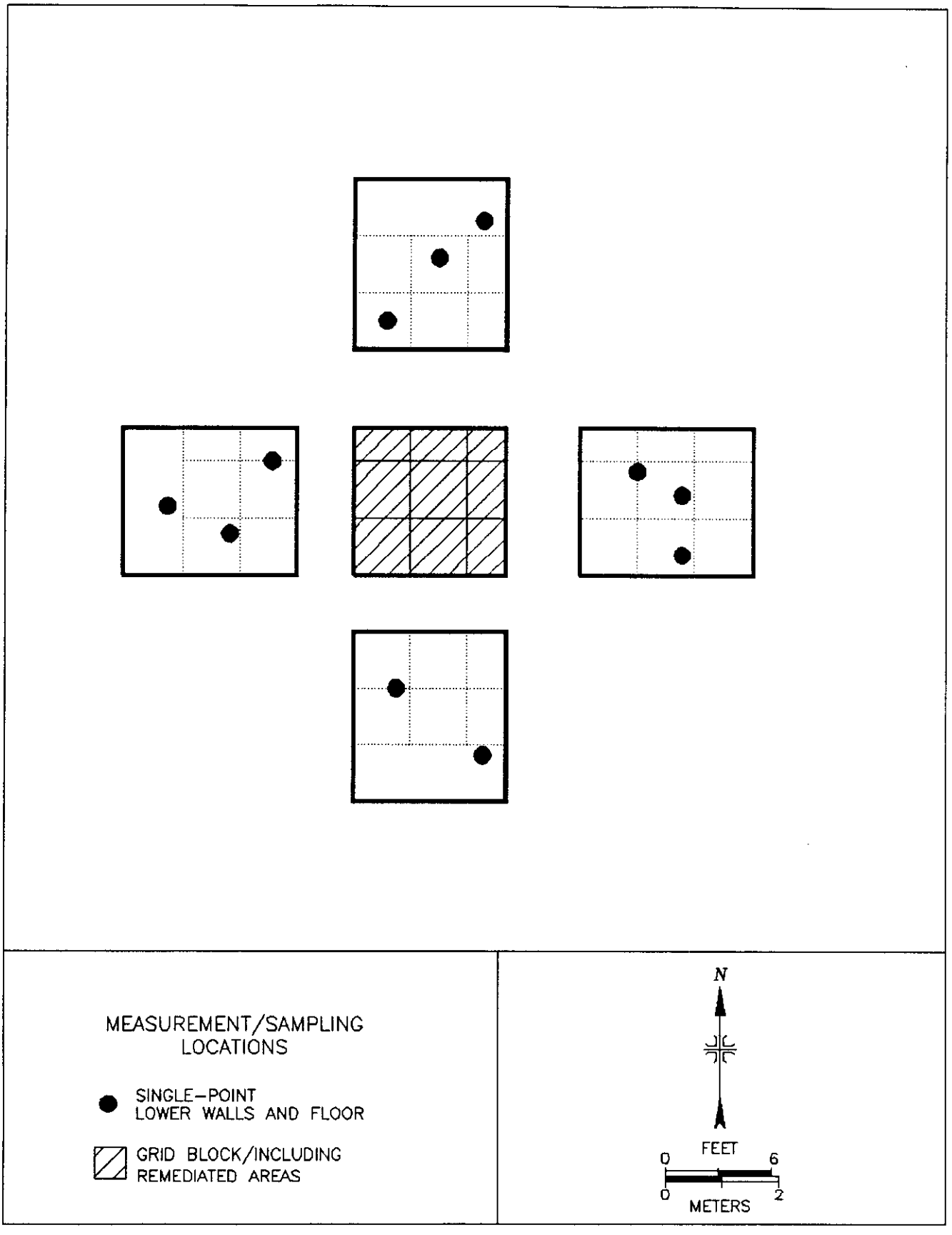

FIGURE 23: Elevator Pit, East Bay – Measurement and Sampling Locations

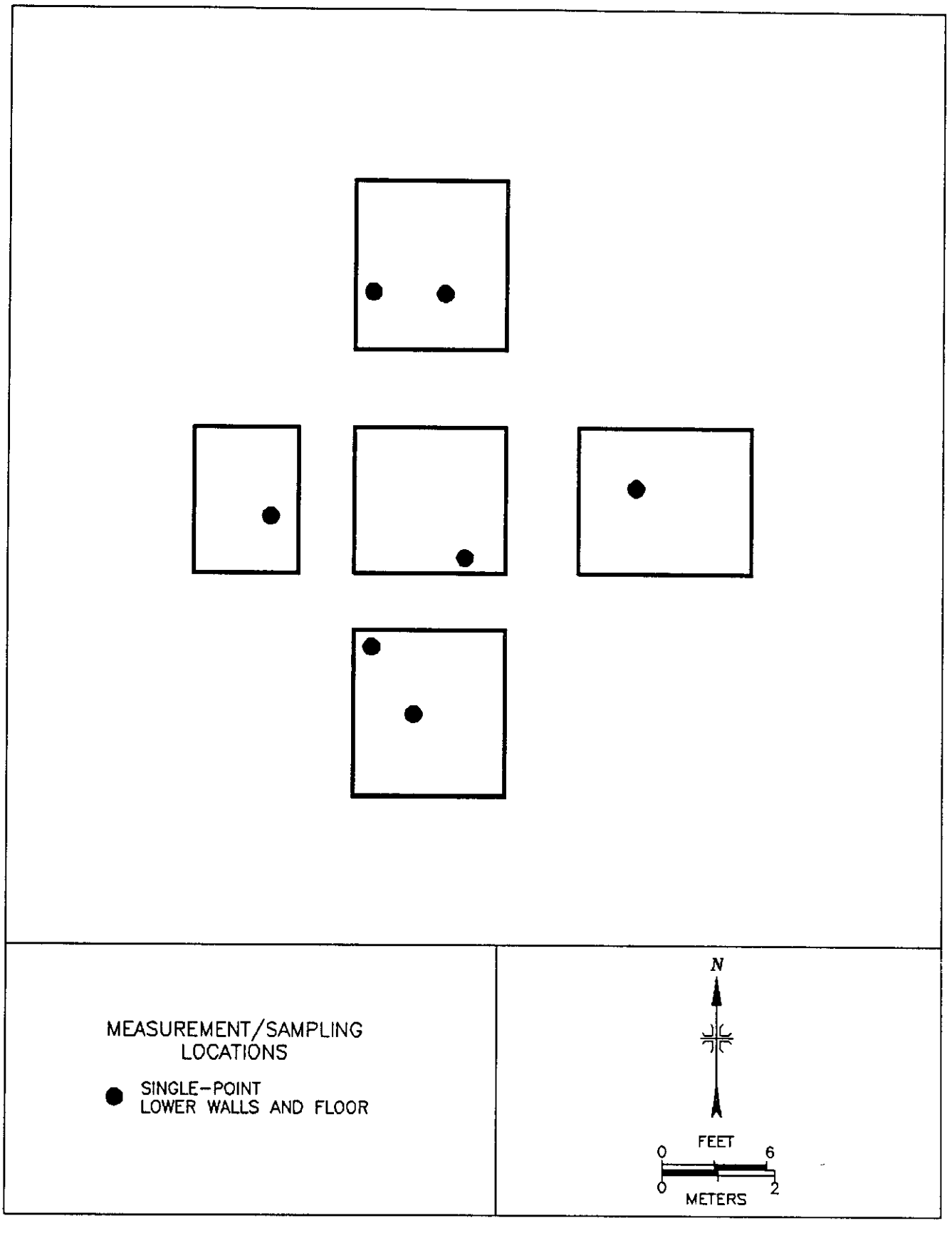

FIGURE 24: Elevator Pit, West Bay – Measurement and Sampling Locations

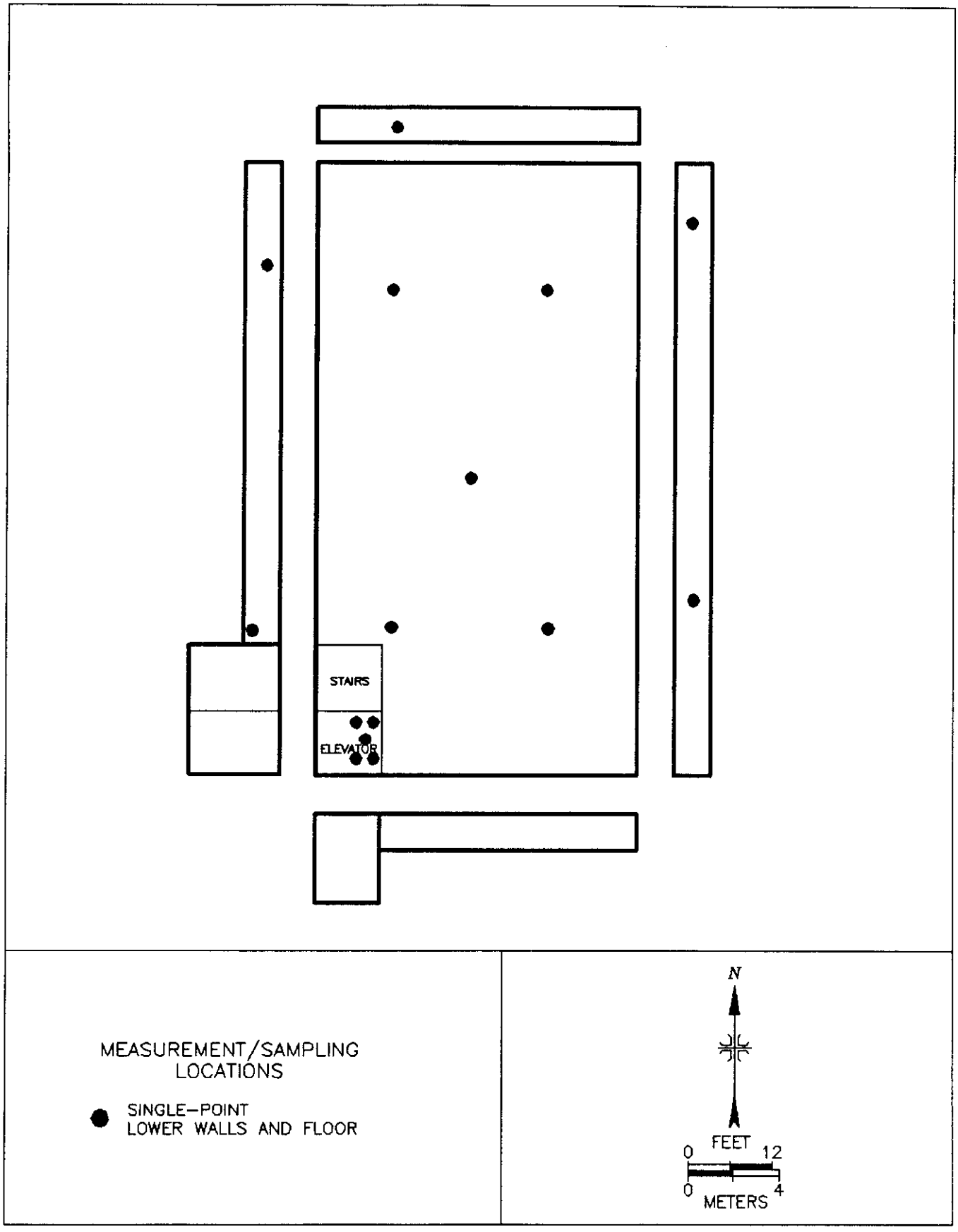

FIGURE 25: Roof, East Bay – Measurement and Sampling Locations

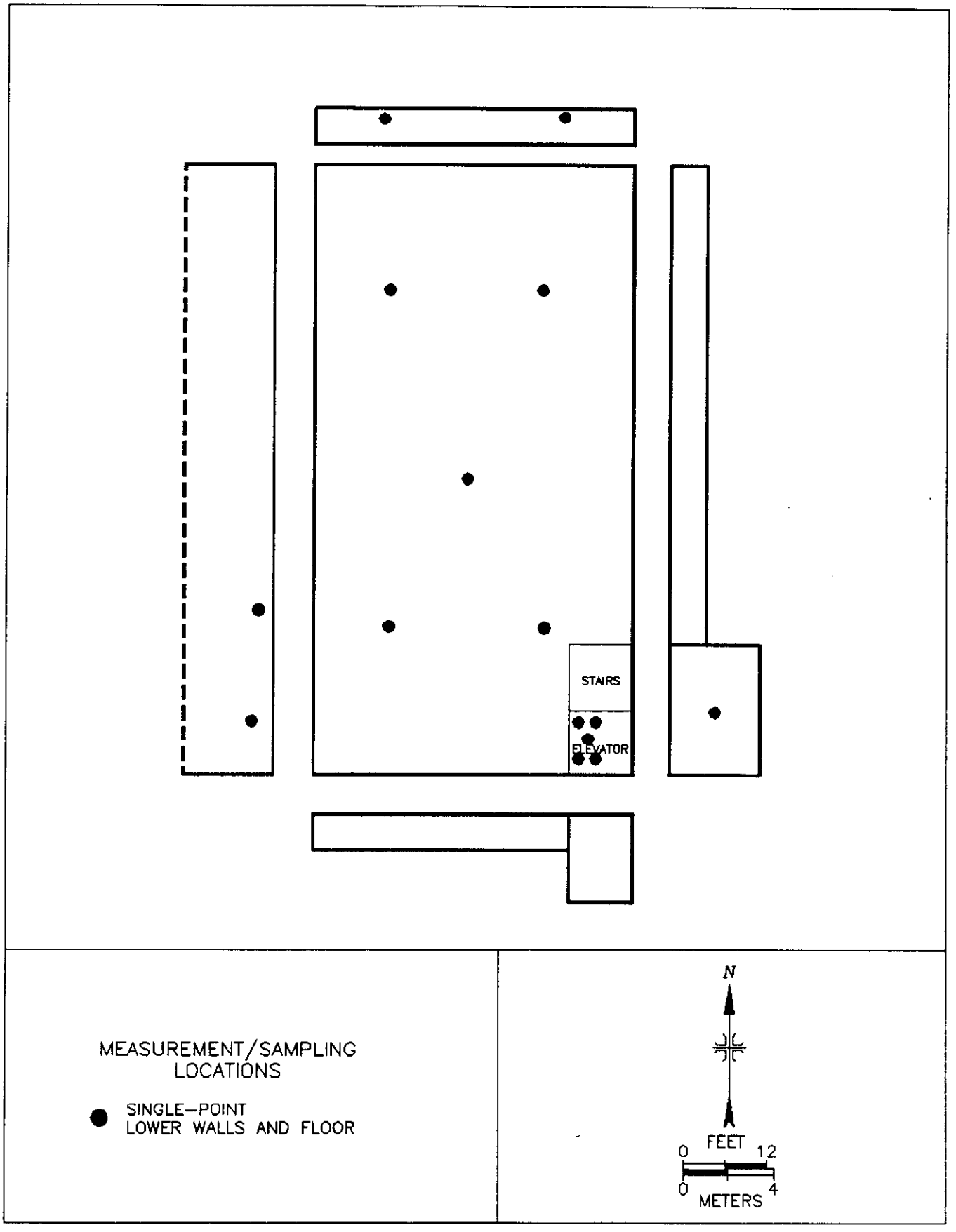

FIGURE 26: Roof, West Bay – Measurement and Sampling Locations

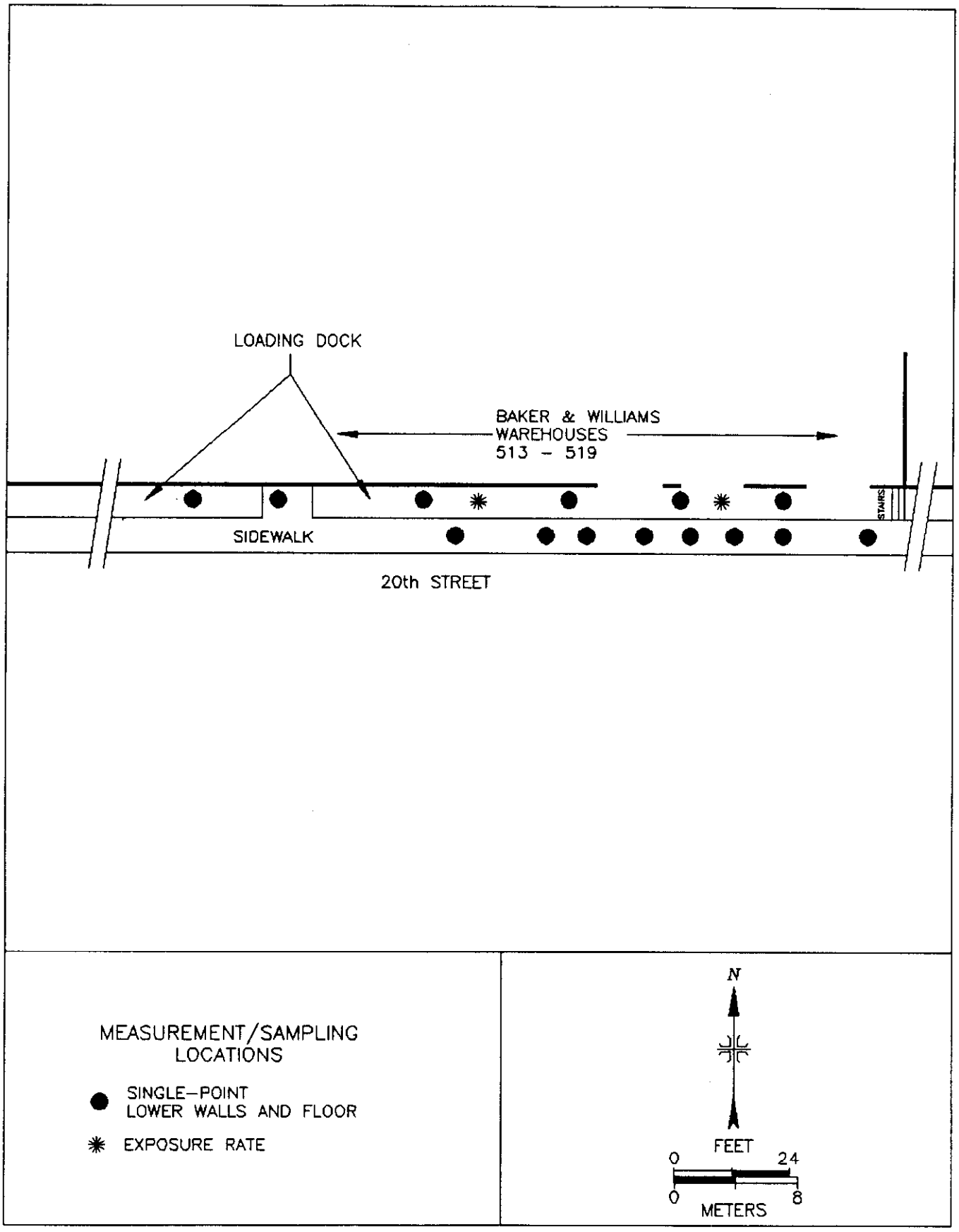

FIGURE 27: Loading Dock – Measurement and Sampling Locations

TABLE 1

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
Basement - East Bay					
Floor	3	24 (6)[a]	<2100-4600 (7500-11,000)[b]	<12	<20
Lower Walls	3	20	<2100	<12	<20
Upper Walls	3	10	<2100	<12	<20
Ceiling	3	10	<2100	<12	<20
Stairwell	19	4	<1500-1900	<12	<20
Elevator Shaft/Landing	21	3	<1900	<12	<20
Basement - West Bay					
Floor	4	30	<2200-4700	<12	<20
Lower Walls	4	20	<2200	<12	<20
Upper Walls	4	10	<2200	<12	<20
Ceiling	4	10	<2200	<12	<20
Stairwell	20	ND[c]	ND	ND	ND
Elevator Shaft/Landing	22	3	<1900	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
1st Floor - East Bay					
Floor	5	26 (4)	<2100-4600 (5900-9100)	<12	<20
Lower Walls	5	20	<2100	<12	<20
Upper Walls	5	10	<2100	<12	<20
Ceiling	5	10	<2100	<12	<20
Stairwell	19	4	<1300-3000	<12	<20
Elevator Shaft/Landing	21	3	<1900	<12	<20
1st Floor - West Bay					
Floor	6	33	<2500	<12	<20
Lower Walls	6	17	<2100-3200	<12	<20
Upper Walls	6	10	<2100	<12	<20
Ceiling	6	5	<2100	<12	<20
Stairwell	20	4	<2200	<12	<20
Elevator Shaft/Landing	22	5	<2100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
2nd Floor - East Bay					
Floor	7	30	<2200-3700	<12	<20
Lower Walls	7	15	<2100	<12	<20
Upper Walls	7	10	<2100	<12	<20
Ceiling	7	5	<2100	<12	<20
Stairwell	19	3 (1)	<1900-2900 (5800)	<12	<20
Elevator Shaft/Landing	21	4 (1)	<1900-4500 (6700)	<12	<20
2nd Floor - West Bay					
Floor	8	30	<2200	<12	<20
Lower Walls	8	15	<2100-2200	<12	<20
Upper Walls	8	10	<2100	<12	<20-20
Ceiling	8	5	<2100	<12	<20
Stairwell	20	4	<2200	<12	<20
Elevator Shaft/Landing	22	4	<2100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
3rd Floor - East Bay					
Floor	9	44	<2200-2800	<12	<20
Lower Walls	9	20	<2200	<12	<20
Upper Walls	9	10	<2200	<12	<20
Ceiling	9	11 (2)	<2200-2300 (7300-8200)	<12-140	<20-240
Stairwell	19	6	<1900-4400	<12	<20
Elevator Shaft/Landing	21	6	<1900-3900	<12	<20
3rd Floor - West Bay					
Floor	10	30	<2200	<12	<20
Lower Walls	10	18	<2100	<12	<20
Upper Walls	10	12	<2100	<12	<20
Ceiling	10	10	<2100	<12	<20
Stairwell	20	6	<1800	<12	<20
Elevator Shaft/Landing	22	4	<1900	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
4th Floor- East Bay					
Floor	11	33 (3)	<2200-3500 (5200-11,000)	<12	<20
Lower Walls	11	15	<2100	<12	<20
Upper Walls	11	10	<2100	<12	<20
Ceiling	11	5	<2100	<12	<20
Stairwell	19	4	<1900-3500	<12	<20
Elevator Shaft/Landing	21	3 (1)	<1900-4100 (8200)	<12	<20
4th Floor - West Bay					
Floor	12	30	<2200	<12	<20
Lower Walls	12	15	<2100	<12	<20
Upper Walls	12	10	<2100	<12	<20
Ceiling	12	5	<2100	<12	<20
Stairwell	20	4	<2200	<12	<20
Elevator Shaft/Landing	22	4	<2100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
5th Floor - East Bay					
Floor	13	40 (1)	<1700-3700 (9900)	<12	<20
Lower Walls	13	16	<1500-<2100	<12	<20-22
Upper Walls	13	15	<2100	<12	<20
Ceiling	13	5	<2100	<12	<20
Stairwell	19	4	<2200-2400	<12	<20
Elevator Shaft/Landing	21	3 (1)	<1900-3000 (8200)	<12	<20
5th Floor - West Bay					
Floor	14	31	<2100	<12	<20
Lower Walls	14	16	<2100	<12	<20
Upper Walls	14	9	<2100	<12	<20
Ceiling	14	5	<2500	<12	<20
Stairwell	20	4	<2200	<12	<20
Elevator Shaft/Landing	22	4	<2100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
6th Floor - East Bay					
Floor	15	30	<2200	<12	<20
Lower Walls	15	15	<2100	<12	<20
Upper Walls	15	10	<2100	<12	<20
Ceiling	15	5	<2100	<12	<20
Stairwell	19	4	<2200	<12	<20
Elevator Shaft/Landing	21	4	<1900	<12	<20
6th Floor - West Bay					
Floor	16	30	<2200	<12	<20
Lower Walls	16	15	<2500	<12	<20
Upper Walls	16	10	<2500	<12	<20
Ceiling	16	5	<2500	<12	<20
Stairwell	20	4	<2200	<12	<20
Elevator Shaft/Landing	22	4	<1900	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
7th Floor - East Bay					
Floor	17	30	<2200	<12	<20-20
Lower Walls	17	15	<2100-2800	<12	<20
Upper Walls	17	10	<2100	<12	<20
Ceiling	17	5	<2100	<12	<20
Stairwell	19	4	<2200	<12	<20
Elevator Shaft/Landing	21	5	<1900-1900	<12	<20
7th Floor - West Bay					
Floor	18	30	<2100	<12	<20
Lower Walls	18	15	<2500	<12	<20
Upper Walls	18	10	<2500	<12	<20
Ceiling	18	5	<2500	<12	<20
Stairwell	20	3	<2200	<12	<20
Elevator Shaft/Landing	22	5	<2100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
Elevator - East Bay					
Floor	21	5	<1900	<12	<20
Lower Walls	21	3	<2200	<12	<20
Elevator - West Bay					
Floor	22	5	<1900	<12	<20
Lower Walls	22	3	<2200	<12	<20
Elevator Pit - East Bay					
Lower Wall	23	11	<2500	<12	<20
Elevator Pit - West Bay					
Floor	24	3	<1700	<12	<20
Lower Walls	24	4	<1700	<12	<20
Roof - East Bay					
Roof	25	15	<2100	<12	<20
Roof - West Bay					
Roof	26	15	<2100	<12	<20
Loading Dock and Sidewalk					
Dock and Sidewalk	27	14	<1900-4100	<12	<20

TABLE 1 (Continued)

SUMMARY OF SINGLE-POINT SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	Number of Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)	Range of Removable Activity (dpm/100 cm²)	
				Alpha	Beta
Released Bituminous Material					
Floor	NA[d]	240	<2100	<12	<20

[a]Number in parenthesis represents the number of measurements above 5000 dpm/100 cm² but below 15,000 dpm/100 cm². These measurement locations contained elevated activity but were within DOE guidelines.
[b]Parenthesis indicate the ranges of the measurements indicated by footnote a.
[c]Not determined.
[d]Not applicable.

TABLE 2

SUMMARY OF GRID BLOCK SURFACE ACTIVITY MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure No.	Number of Grid Block Measurement Locations	Range of Total Beta Activity (dpm/100 cm²)		Range of Removable Activity (dpm/100 cm²)	
			Individual Measurements	Grid Block Average	Alpha	Beta
Basement - East Bay						
Floor	3	25	<2500-4200	<2500	<12	<20
Lower Wall	3	3	<2500-4500	<2500-3400	<12	<20
Basement - West Bay						
Floor	4	16	<2500-7400	<2500-2900	<12-17	<20
1st Floor - East Bay						
Floor	5	61	<2200-13,000	<2200-2700	<12	<20
3rd Floor - East Bay						
Floor	9	38	<2500	<2500	<12	<20
Lower Wall	9	30	<2100-4200	<2100-2800	<12-45	<20-54
3rd Floor - West Bay						
Floor	10	4	<2500	<2500	<12	<20
Elevator Pit - East Bay						
Floor	23	9	<2500-5100	<2500	<12	<20

TABLE 3

SUMMARY OF EXPOSURE RATE MEASUREMENTS
BAKER AND WILLIAMS WAREHOUSE
BUILDING 513-519
NEW YORK, NEW YORK

Location	Figure Number	# of Measurement Locations	Range of Exposure Rates (μR/h)
Background[a]	NA[b]	4	11 - 13
Basement - East Bay	3	4	10 - 11
Basement - West Bay	4	4	10
1st Floor - East Bay	5	4	11 - 12
1st Floor - West Bay	6	4	12 - 13
2nd Floor - East Bay	7	4	12 - 13
2nd Floor - West Bay	8	4	13
3rd Floor - East Bay	9	4	13 - 14
3rd Floor - West Bay	10	4	13 - 14
4th Floor - East Bay	11	4	13 - 14
4th Floor - West Bay	12	4	13 - 14
5th Floor - East Bay	13	4	13 - 14
5th Floor - West Bay	14	4	13 - 14
6th Floor - East Bay	15	4	13 - 14
6th Floor - West Bay	16	4	13 - 14
7th Floor - East Bay	17	4	13 - 14
7th Floor - West Bay	18	4	14
Elevator - East Bay	21	1	12
Elevator - West Bay	22	1	11
Outside - Dock	27	2	10

[a]Background exposure rates were determined during a previous survey at the Baker and Williams Warehouses.[4]
[b]Not applicable.

REFERENCES

1. "Implementation Plan for Radiological Survey Protocols," Bechtel National, Inc.; Formerly Utilized Sites Remedial Action Program, July 1988.

2. "Radiological Survey of the Baker and Williams Warehouses, New York, New York," Oak Ridge Associated Universities, June 1990.

3. "Characterization Survey of the Baker and Williams Warehouses, Building 521-527, New York, New York," Oak Ridge Associated Universities, November 1991.

4. "Verification Survey of the Baker and Williams Warehouses, Building 521-527, New York, New York," Oak Ridge Institute for Science and Education, May 1992.

5. "Radiological Survey of the Baker and Williams Warehouses, Building 513-519, New York, New York," Oak Ridge Associated Universities, December 1991.

6. "Characterization Survey of the Baker and Williams Warehouses, Building 513-519, New York, New York," Oak Ridge Institute for Science and Education, December 1993.

7. "Post-Remedial Action Report for Building 513-519, Baker and Williams Warehouses Site, New York, New York," Bechtel National, Inc., Predecisional Draft, March 1994.

8. "Radiological Survey Plan for Building 513-519 of the Baker and Williams Warehouse New York, New York," Oak Ridge Institute for Science and Education, April 27, 1993.

9. Oak Ridge Institute for Science and Education, letter from W. C. Adams to W. A. Williams, Designation and Certification Manager, U.S. DOE, "Document Review—Post Remedial Action Report for Building 513-519, Baker and Williams Warehouses Site, New York, New York—Predecisional Draft," April 11, 1994.

10. "Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites," U.S. Department of Energy, Revision 2, March 1987.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A
MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc., Sweetwater, TX)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc., Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Ludlum Gas Proportional Detector
Model 43-37
Effective Area, 550 cm^2
(Ludlum Measurements, Inc., Sweetwater, TX)

Ludlum Gas Proportional Detector
Model 43-68
Effective Area, 100 cm^2
(Ludlum Measurements, Inc., Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm Crystal
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

Low Background Gas Proportional Counter
Model LB-5110
(Tennelec, Oak Ridge, TN)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum—nominally about 1 cm.

A large surface area, gas proportional floor monitor was used to scan the floors and walls of the surveyed areas. Other surfaces were scanned using small area (15.5 cm^2 or 100 cm^2) hand-held detectors. Combinations of detectors and instruments used for the scans were:

Beta	—	gas proportional detector with ratemeter-scaler
Beta	—	pancake GM detector with ratemeter-scaler
Gamma	—	NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total beta activity levels were performed using GM detectors with portable ratemeter-scalers.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by dividing the net count rate by the 4 π efficiency and correcting for the active area of the detector. The beta activity background count rates for GM detectors averaged 58 cpm. Beta efficiency factors ranged from 0.15 to 0.17 for the GM detectors. The effective window for the GM detectors was 15.5 cm^2.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear with two or three fingers, and approximately 100 cm^2 of the surface was wiped. Smears were placed in labeled envelopes with the location and other pertinent information recorded.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed at 1 m above the surface, using a pressurized ionization chamber (PIC).

UNCERTAINTIES AND DETECTION LIMITS

Detection limits, referred to as minimum detectable activity (MDA), were based on 2.71 + 4.66 times the statistical deviation of the background count. When the activity was determined to be less than the MDA of the measurement procedure, the result was reported as less than the MDA. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument.

CALIBRATION AND QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following documents of the Environmental Survey and Site Assessment Program:

- Survey Procedures Manual, Revision 7 (May 1992)
- Laboratory Procedures Manual, Revision 7 (April 1992)
- Quality Assurance Manual, Revision 5 (May 1992)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance and contain measures to assess processes during their performance.

Calibration of all field and analytical instrumentation was based on standards/sources, traceable to NIST, when such standard/sources were available. In cases where they were not available, standards of an industry recognized organization were used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.
- Participation in EPA and EML laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.

APPENDIX C

SUMMARY OF DEPARTMENT OF ENERGY RESIDUAL RADIOACTIVE MATERIAL GUIDELINES[1]

APPENDIX C

SUMMARY OF DEPARTMENT OF ENERGY RESIDUAL RADIOACTIVE MATERIAL GUIDELINES[1]

BASIC DOSE LIMITS

The basic dose limit for the annual radiation dose (excluding radon) received by an individual member of the general public is 100 mrem/yr.[2] In implementing this limit, DOE applies as low as reasonably achievable principles to set site-specific guidelines.

EXTERNAL GAMMA RADIATION

The average level of gamma radiation inside a building or habitable structure on a site that has no radiological restriction on its use shall not exceed the background level by more than 20 μR/h and will comply with the basic dose limits when an appropriate-use scenario is considered.

SURFACE CONTAMINATION GUIDELINES

	Allowable Total Residual Surface Contamination (dpm/100 cm^2)[a]		
Radionuclides[b]	Average[c,d]	Maximum[d,e]	Removable[d,f]
Transuranics, Ra-226, Ra-228, Th-230 Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000α	15,000α	1,000α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000β-γ	15,000β-γ	1,000β-γ

[a] 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 measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[b] Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[c] Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d] The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at a depth of 1 cm.

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

[f] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. The numbers in this column are maximum amounts.

REFERENCES

1. "Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites," U.S. Department of Energy, Revision 2, March 1987.

2. "Radiation Protection of the Public and the Environment," DOE Order 5400.5, U.S. Department of Energy, February 8, 1990.