

**VERIFICATION SURVEY
OF
PHASE II REMEDIAL ACTIONS
ALBANY RESEARCH CENTER
ALBANY, OREGON**

Prepared by

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INTERIM REPORT II

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This draft report has not been given full review and patent clearance, and the dissemination of its information is only for official use. No release to the public shall be made without the approval of the Office of Communication Resources, Oak Ridge Associated Universities.

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**INTERIM REPORT
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ALBANY, OREGON**

INTRODUCTION

The Albany Research Center (ARC), located in Albany, Oregon, was established in 1943 and operated by the U.S. Bureau of Mines. The initial site activities were to investigate innovative approaches for developing strategic mineral resources in the United States as well as manufacturing processes and other metallurgical research.

In addition to these activities, ARC conducted operations for the Atomic Energy Commission (AEC) and the Energy Research and Development Administration (ERDA), predecessor agencies of the Department of Energy (DOE) during the period 1948 to 1978. Operations involved the melting, machining, welding, and alloying of thorium. Research activities also included the separation, purification, and processing of limited quantities of uranium. Waste materials generated from these activities; containing low levels of thorium, uranium, and their associated decay products, were treated and placed into temporary storage and/or disposed on-site. In addition to the work performed for the DOE predecessors, ARC currently conducts work with radioactive materials under the jurisdiction of the Nuclear Regulatory Commission.

As a result of the research operations, portions of the ARC became radioactively contaminated. In 1978, Argonne National Laboratory (ANL) conducted radiological surveys and the site was subsequently designated for remedial action under the DOE's Formerly Utilized Site Remedial Action Program (FUSRAP).

In 1984, Bechtel National, Inc. (BNI), the Project Management Contractor for FUSRAP, conducted additional radiological surveys of areas identified by ANL, to define the locations and levels of above-guideline contamination. Remedial action to decontaminate identified areas was initiated by BNI in mid 1987 and completed in February 1988. Eleven structures were addressed in the 1987/1988 (Phase I) remedial action activities; they were buildings 2, 4, 5, 17, 19, 23, 27, 28, 29, 30, and 31. During characterization and post-remedial action surveys, additional building surface areas, not previously considered under FUSRAP, were identified as having residual radioactive material contamination. The areas included in the Phase II remedial actions are in buildings 1, 2, 3, 4, 5, 17, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33 and 34 and the lime pit east of Building 31. Remedial action activities were initiated in these areas in August 1990 and are currently on-going.

It is the policy of DOE to perform independent verifications of the effectiveness of remedial actions conducted within FUSRAP. The Environmental Survey and Site Assessment Program of Oak Ridge Associated Universities (ORAU) was designated by DOE as the organization responsible for this task at the Albany Research Center. Verification of the Phase I remedial actions was conducted between August 1987 and April 1989 and is the subject of a separate report¹. Verification work performed during September and October is discussed in the first unpublished interim report². During the months of November and December an ORAU representative performed verification activities in Buildings 17 and 23. These activities included reviews of pertinent documents and independent radiological measurements and sampling of remediated areas. This interim report is presented for information purposes only.

SITE DESCRIPTION

The ARC facility is located approximately 110 kilometers (70 miles) south of Portland, Oregon (Figure 1) on a 17-ha (42-acre) site of the former Albany College in

Albany, Oregon. The site is bounded on the north by Queen Avenue, on the east by Liberty Street, on the south by a tennis club facility, and on the west by Broadway Street (Figure 2). The site consists of three main areas: ARC proper, the main research facility; the former Biomass Research Facility which consists of approximately 0.8-ha (2-acre), located south of the main facility; and a 5.7-ha (14-acre) undeveloped area, known as the "Back Forty", occupying the south end of the facility. There are 34 buildings and several smaller structures located at the ARC. Most of the buildings are currently being utilized. Several of these buildings are interconnected through adjoining hallways and rooms.

PROCEDURES

Objectives

The objectives of the verification were to confirm that the surveys, sampling, analyses, and associated project documentation performed by the project management contractor, provide an accurate and complete description of the radiological condition of the property. Based on the verification findings, the determination was made as to whether additional remediation was necessary or that remedial actions were effective in meeting established release criteria.

Document Review

The characterization report developed by BNI was reviewed for general thoroughness and accuracy and to determine the current radiological status of the site.

Survey Procedures

1. Verification activities were conducted in parallel with or immediately following remedial actions and post-remedial action monitoring, to minimize

delays or interruptions in remedial action and restoration efforts. An ORAU representative conducted visual inspections, and independent measurements and sampling. Survey activities were conducted in accordance with current procedures in the ORAU ESSAP Survey Procedures Manual and the site specific survey plan. Verification activities during November and December were in the following locations: Building 17 - Lab 10-A; Building 23 - Basement, Lab 1, Crusher Room, Second Floor Storage, Exterior East Wall, and the Roof.

2. Independent measurements and sampling were typically performed in 25 to 50% of the total area remediated. The actual fraction of the remediated area selected for independent survey was area specific and was based on such factors as the historical use of radiological materials at the site, decontamination procedures, and post-remedial action monitoring data. Based on findings as the work progressed, the scope of the survey was altered as necessary.
3. Verification measurements and sampling locations were referenced to the existing BNI grid system where possible. When necessary, a reference grid was established by ORAU. The size of the grid blocks varied according to the size of the area remediated or the size of the room. Typically, the grid consisted of either 1 m² or 4 m² grid blocks. Grid blocks were established on floors and lower walls (up to 2 m) in areas designated for remediation. The upper walls, ceilings, and remediated areas less than 10 m² were not gridded. Measurements made on these surfaces were referenced to prominent building features.
4. Surfaces of selected remediated areas were scanned in order to identify any residual contamination. Indoor building surfaces were scanned for elevated

gamma radiation levels and for alpha and/or beta-gamma contamination, as appropriate. In some cases, dependent upon the history of radiological material usage, areas were scanned up to 100%. Areas of elevated activity, identified by the scans, were brought to the attention of BNI for further investigation and when necessary, remediation.

5. Five point and single point alpha and/or beta-gamma activity measurements were performed in two buildings. Particular attention was given to cracks, beams, piping, ledges, ducts, drains, and other surfaces where material might settle or accumulate. In gridded areas, five-point direct measurements for total alpha and beta-gamma activity were systematically performed at the center and at four points, midway between the center and the grid block corners. For remediated areas smaller than 10 m² and upper walls and ceilings, single-point measurements for total activity were performed. Smears for removable alpha and beta activity were collected at the highest direct measurement location in each grid block and at suspect single-point measurement locations. Refer to Figures 3 through 24 for measurement locations. Some locations were scanned then verified by review of contractor post-remedial action survey measurements.

As the ORAU representative completed each verification survey, a preliminary verification survey form was provided to BNI and ARC representatives. The form provided a permanent on-site record of the current radiological status of each remediated area as determined from the verification survey. Survey results were compared to the U. S. Department of Energy Guidelines for Residual Radioactive Material at Formerly Utilized Sites, Remedial Action Program and Surplus Facilities Management Program Sites (Revision 2, March 1987) for thorium-232 which are:

1000 dpm/100 cm² average over 1 m²
3000 dpm/100 cm² maximum in a 100 cm² area
200 dpm/100 cm² removable

DATA INTERPRETATION AND SAMPLE ANALYSIS

Samples and direct measurement data were returned monthly to the Oak Ridge, TN laboratory for analysis and interpretation. Data developed by the independent verification surveys was compared with the established remedial action guidelines to assure that remediation had been effective in meeting these guidelines.

FINDINGS AND RESULTS

Surface Scans

Surface scans identified areas of elevated beta-gamma activity in Lab 1 and the Crusher Room of Building 23. The location in Lab 1 was found on a pipe that protruded into Trench #7 (Figure 10). In the Crusher Room, elevated activity was found on equipment numbers 38834 and 38562 and an overhead vent duct (Figure 17). No other significant elevated activity was identified.

Measurement of Surface Activity

Surface activity measurements collected from Buildings 17 and 23 are summarized in Table 1. The highest grid block averages for total activity were <100 dpm/100 cm² for alpha and <710 dpm/100 cm² for beta-gamma. Total activity measurements ranged from <83 to 140 dpm/100 cm² for alpha and <410 to 11,000 dpm/100 cm² for beta-gamma.

Removable activity ranged from <6 to 200 dpm/100 cm² for alpha and <13 to 110 dpm/100 cm² for beta.

COMPARISON OF SURVEY RESULTS WITH GUIDELINES

Listed below are the general DOE surface contamination guidelines for residual radioactive material at a "Formerly Utilized Sites Remedial Action Program" (FUSRAP) site. The primary contaminant on building and equipment surfaces at ARC is thorium-232. The applicable guidelines are:

- 1000 dpm/100 cm², averaged over 1 m² area
- 3000 dpm/100 cm², maximum in a 100 cm² area
- 200 dpm/100 cm², removable

Several single-point direct measurements taken in trenches 6, 7, 13 and 16, which are located in Building 23, Lab 1, exceeded the 1000 dpm/100 cm² average guideline. However, when averaged across the contiguous 1 m² area, these areas were found to be within guidelines. Locations in Lab 1 and the Crusher Room identified as exceeding the maximum residual activity guideline were brought to the attention of the PMC and will be resurveyed following additional remediation.

SUMMARY

During the months of November and December, a representative from ORAU's Environmental Survey and Site Assessment Program performed verification measurements at the Albany Research Center in Albany, Oregon. Data collected during these surveys indicate that most areas remediated by BNI during this period are within the established guidelines. Several areas will require additional remediation prior to final verification measurements and sampling.

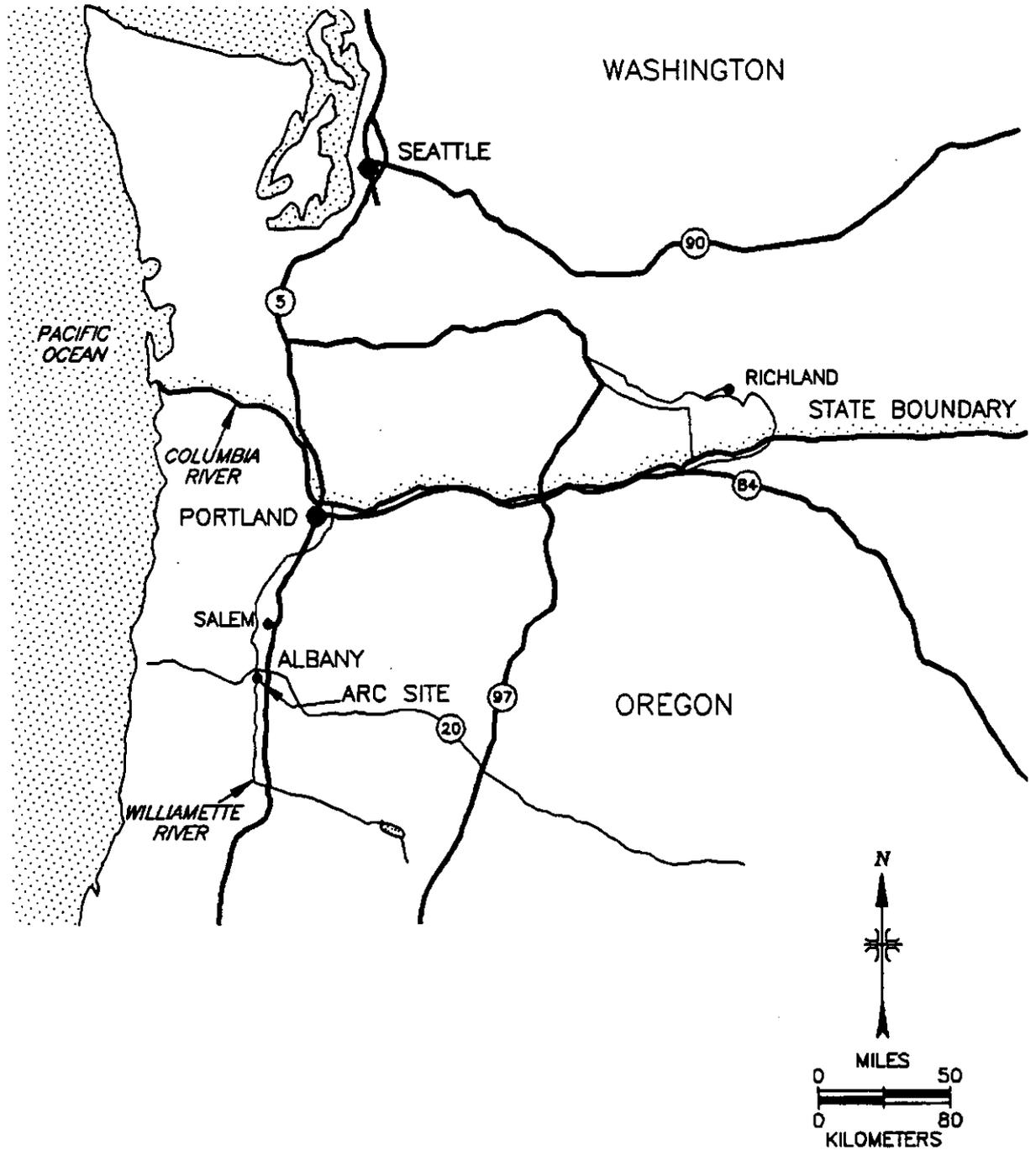


FIGURE 1: Location of the Albany Research Center

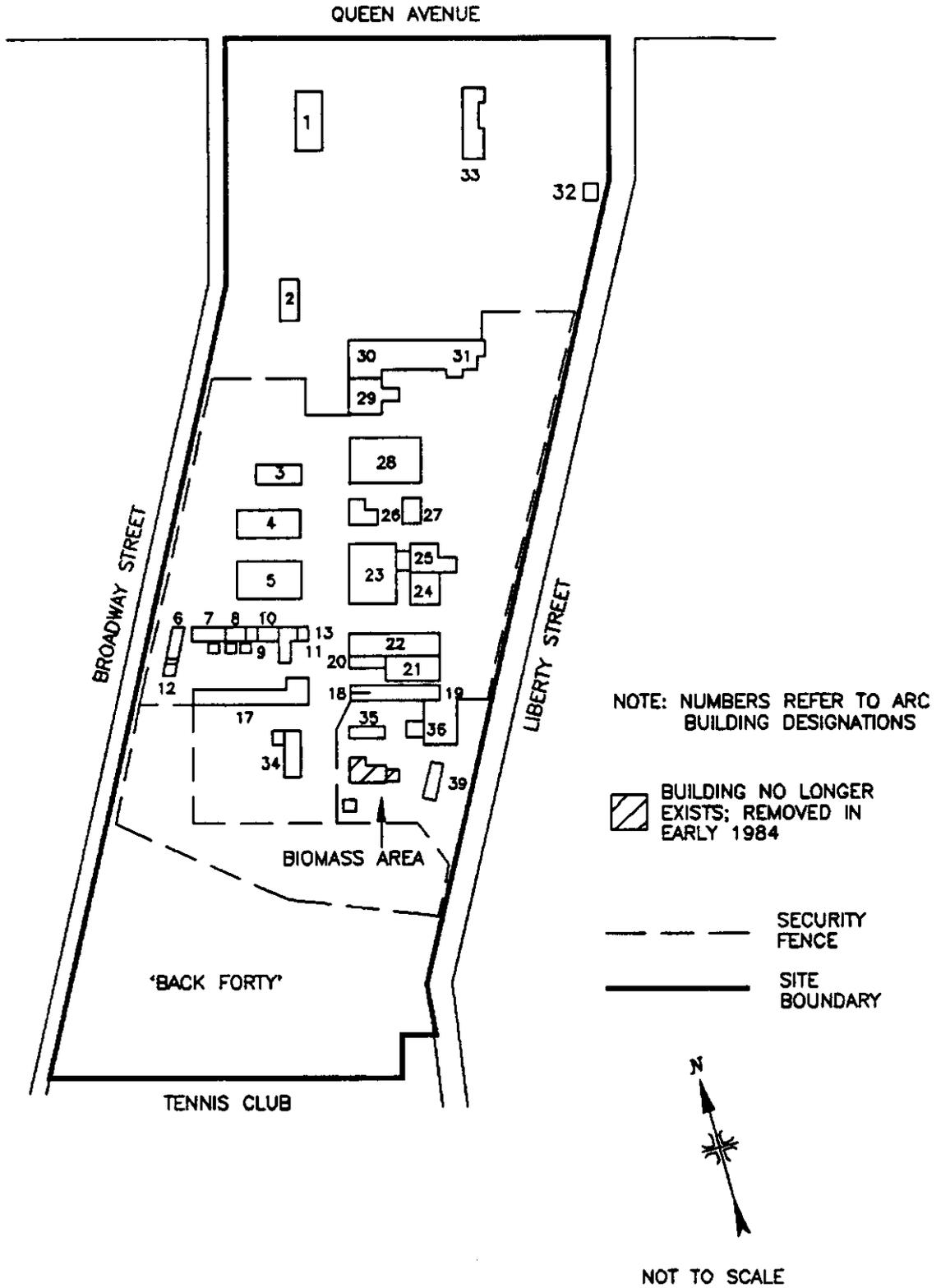


FIGURE 2: Plot Plan of the Albany Research Center

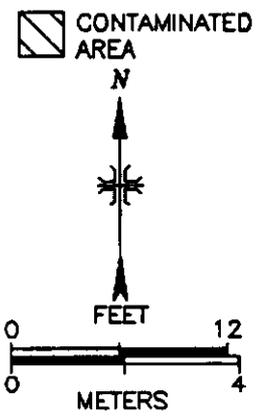
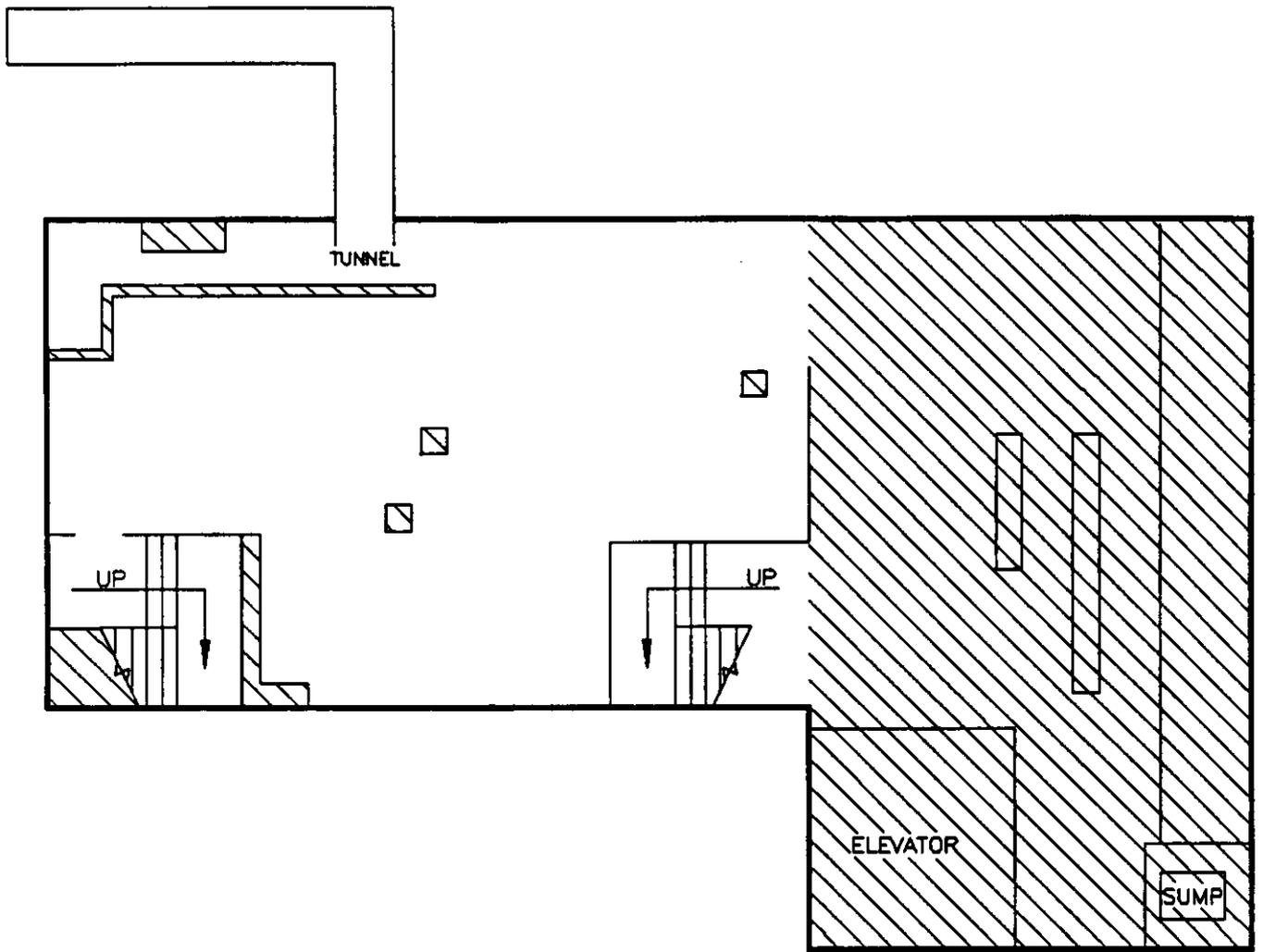


FIGURE 3: Plot Plan of Building 23, Basement

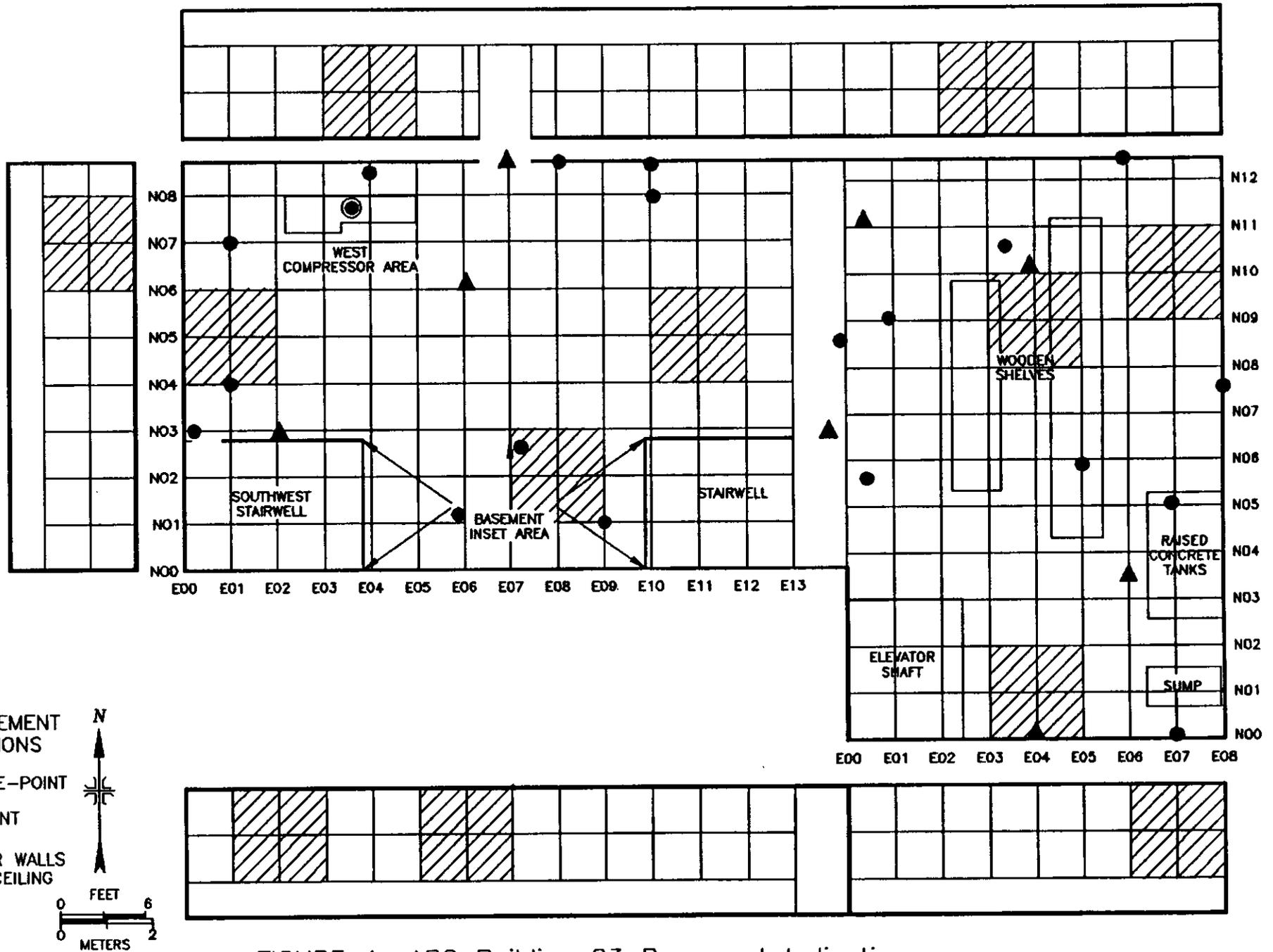


FIGURE 4: ARC Building 23 Basement Indicating Measurement Locations

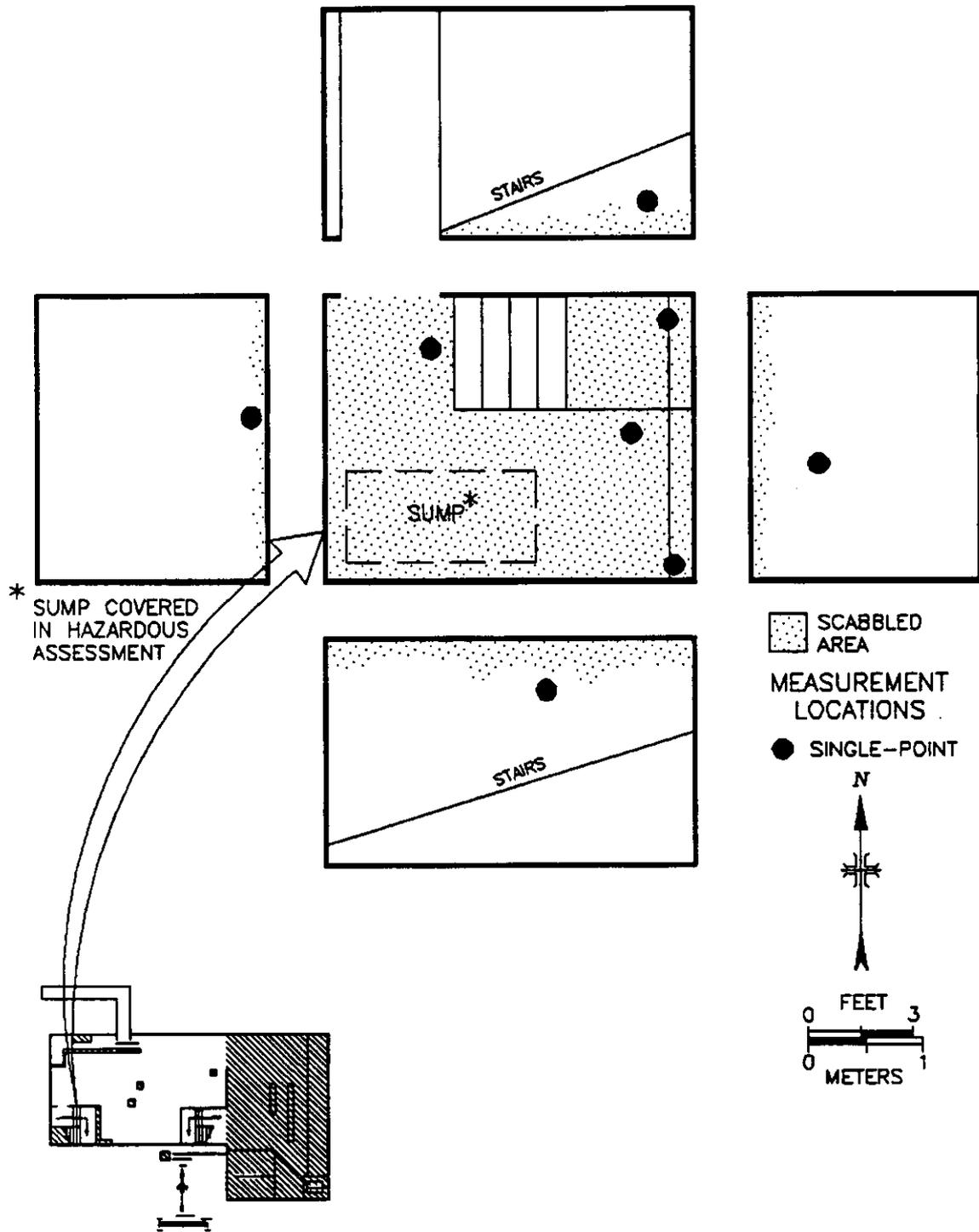


FIGURE 5: ARC Building 23, Basement, Southwest Stairwell Indicating Measurement Locations

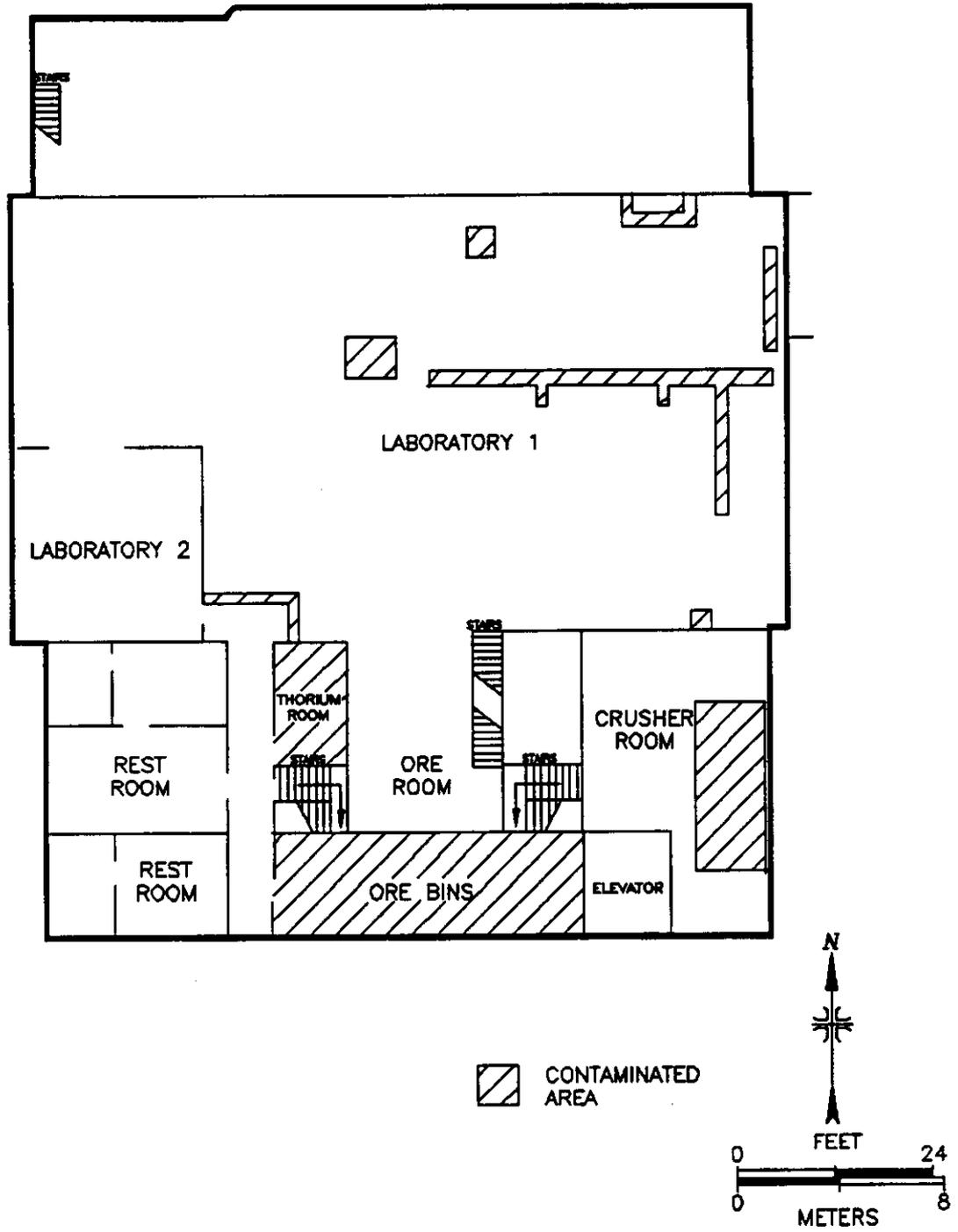


FIGURE 6: Plot Plan of Building 23, First Floor

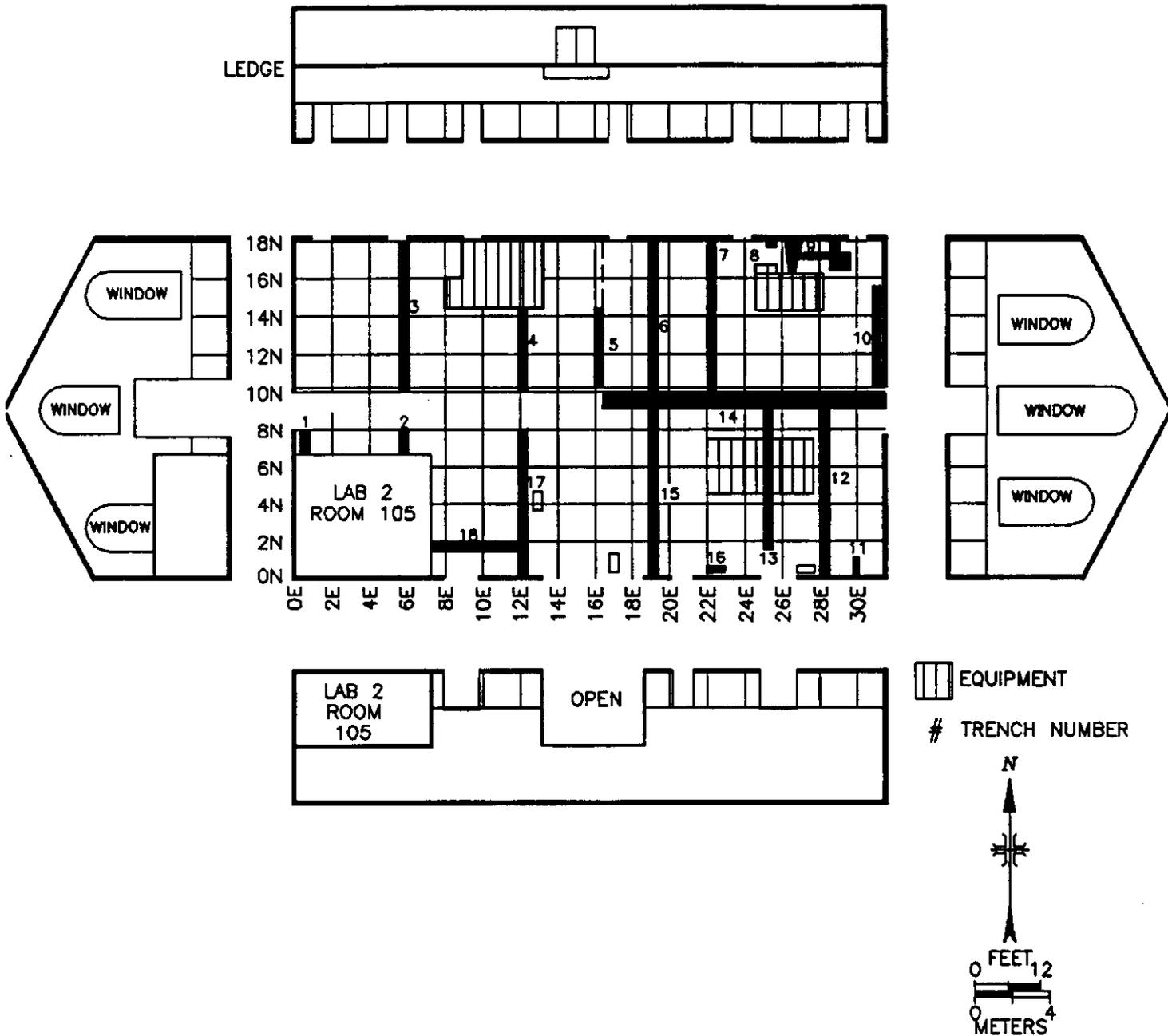


FIGURE 7: ARC Lab 1, Building 23 Showing Reference Grid and Trench Locations

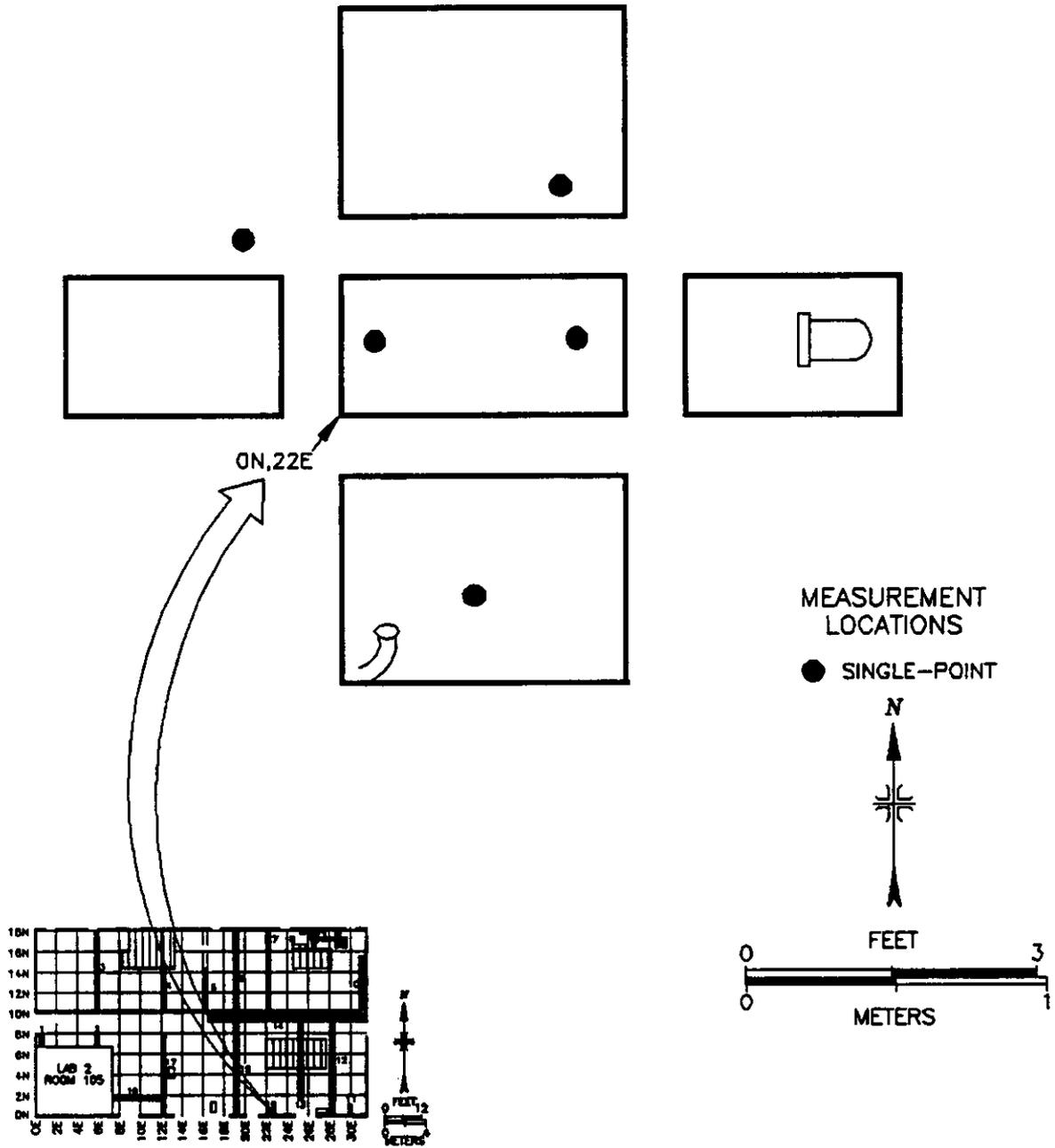


FIGURE 8: ARC-Building 23, Lab 1, Sump on South Wall Between Rooms 112 and 113 Indicating Measurement Locations

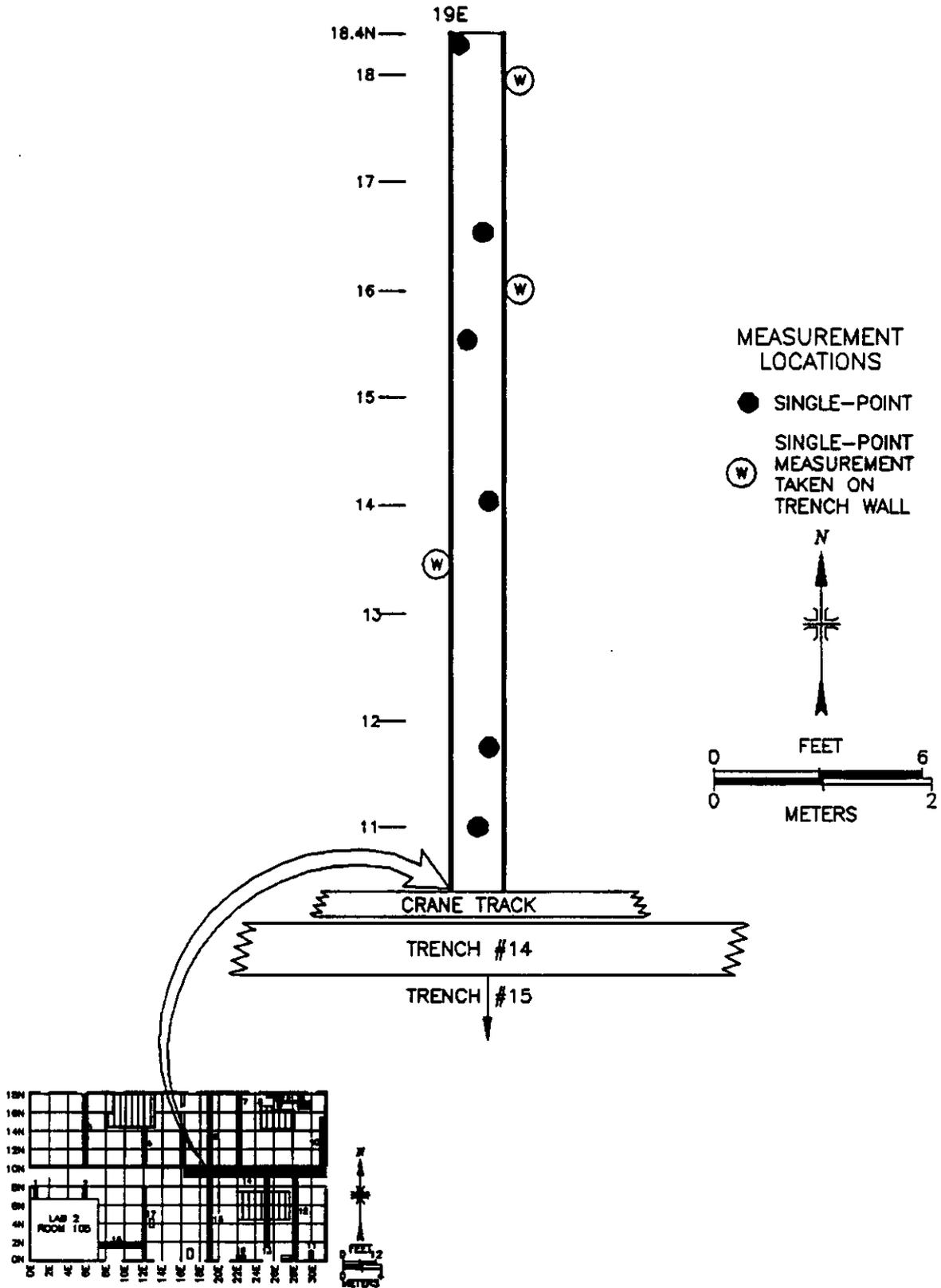


FIGURE 9: ARC-Bldg. 23, Lab 1, Trench #6
Indicating Measurement Locations

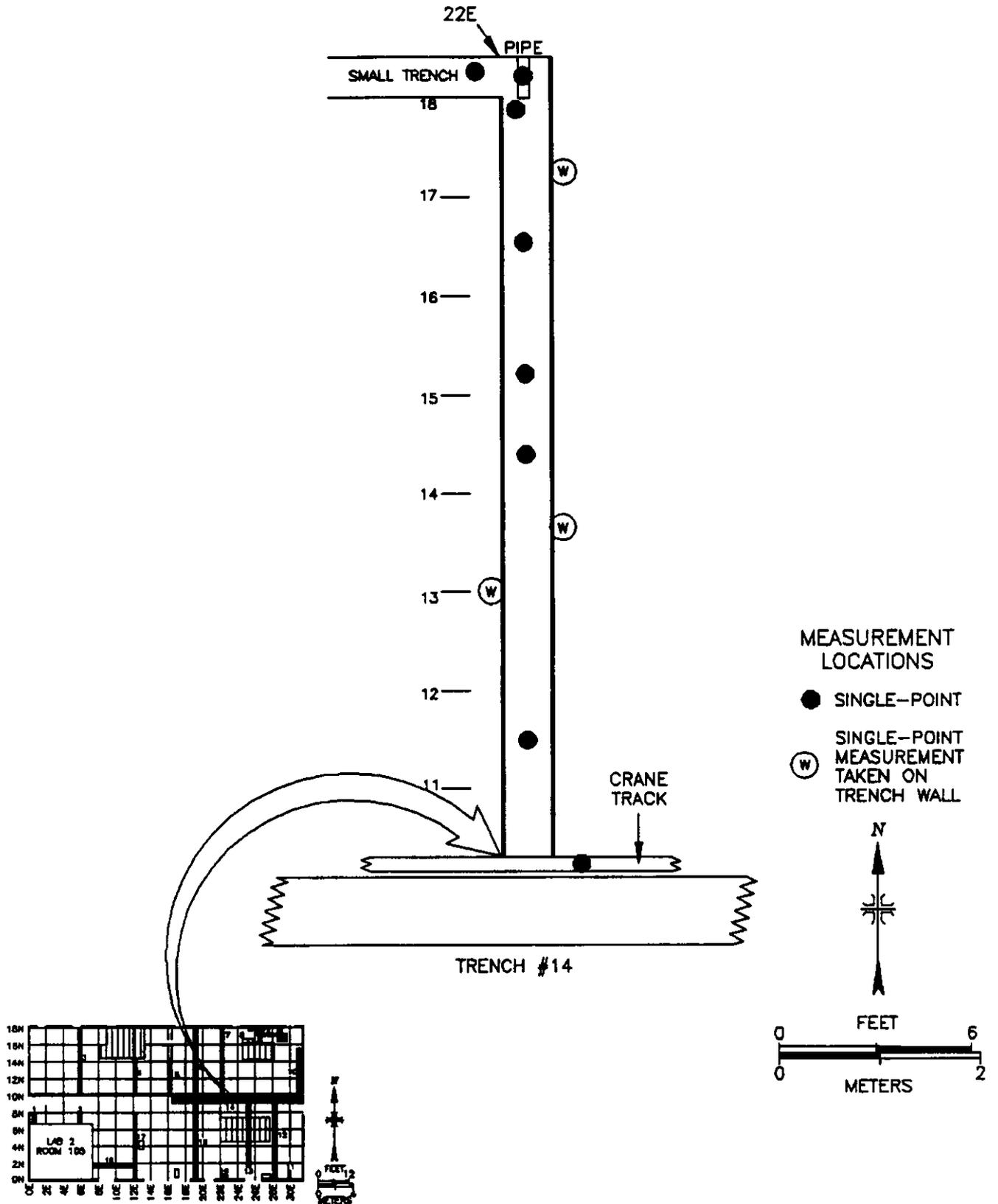


FIGURE 10: ARC Building 23, Lab 1, Trench #7
Indicating Measurement Locations

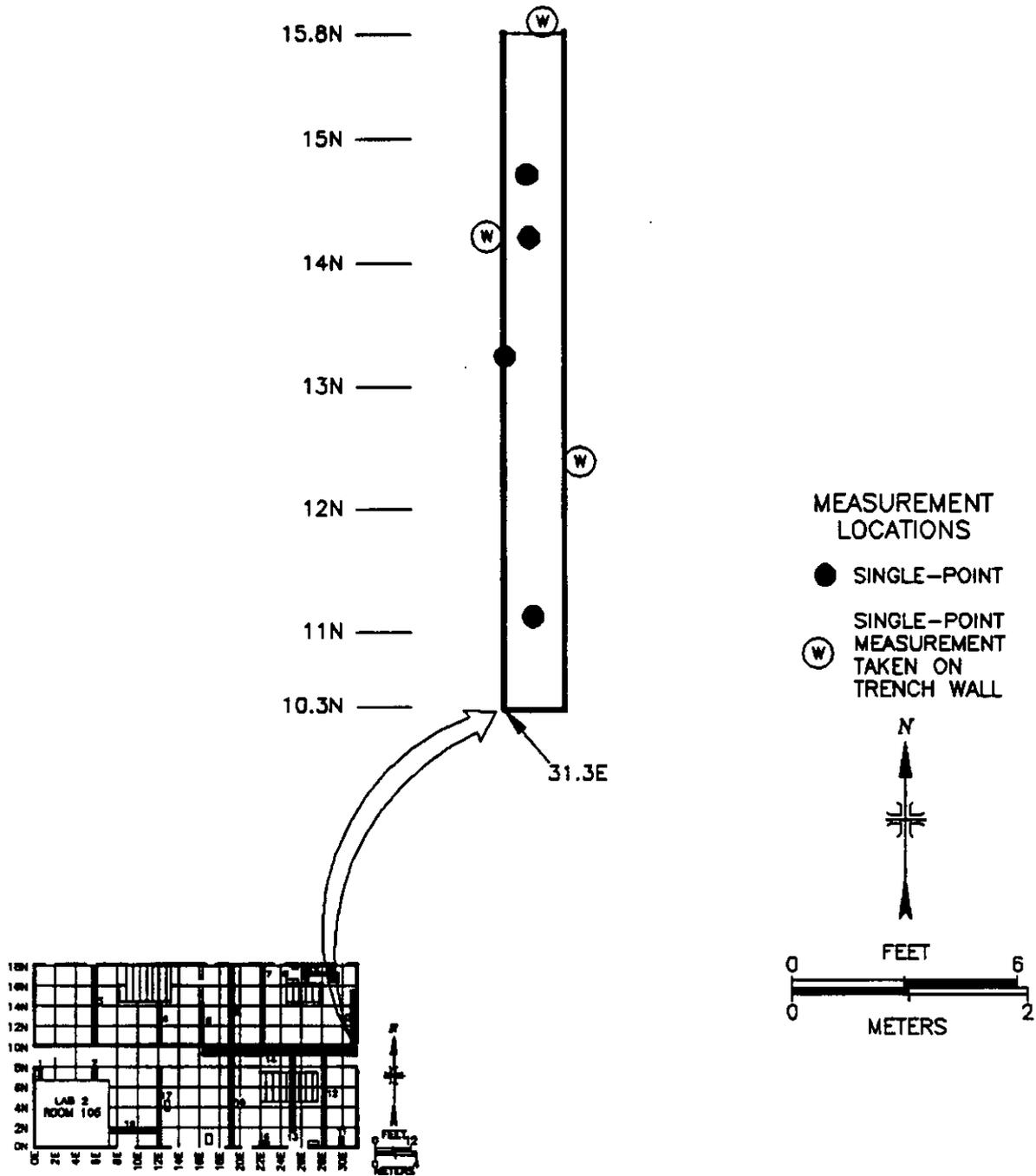


FIGURE 11: ARC-Building 23, Lab 1, Trench #10
Indicating Measurement Locations

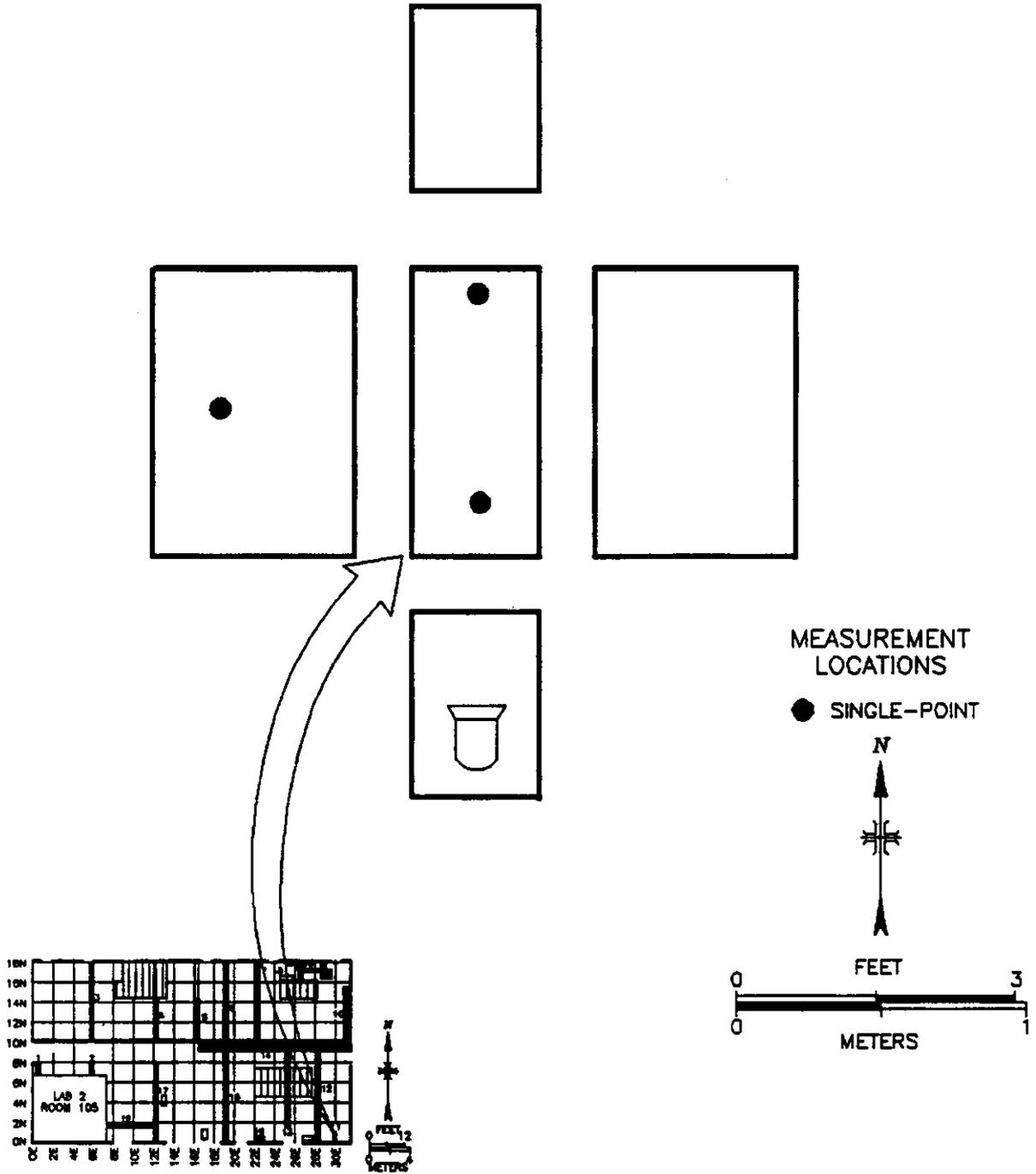


FIGURE 12: ARC Building 23, Lab 1, Trench #11 (Sump) Indicating Measurement Locations

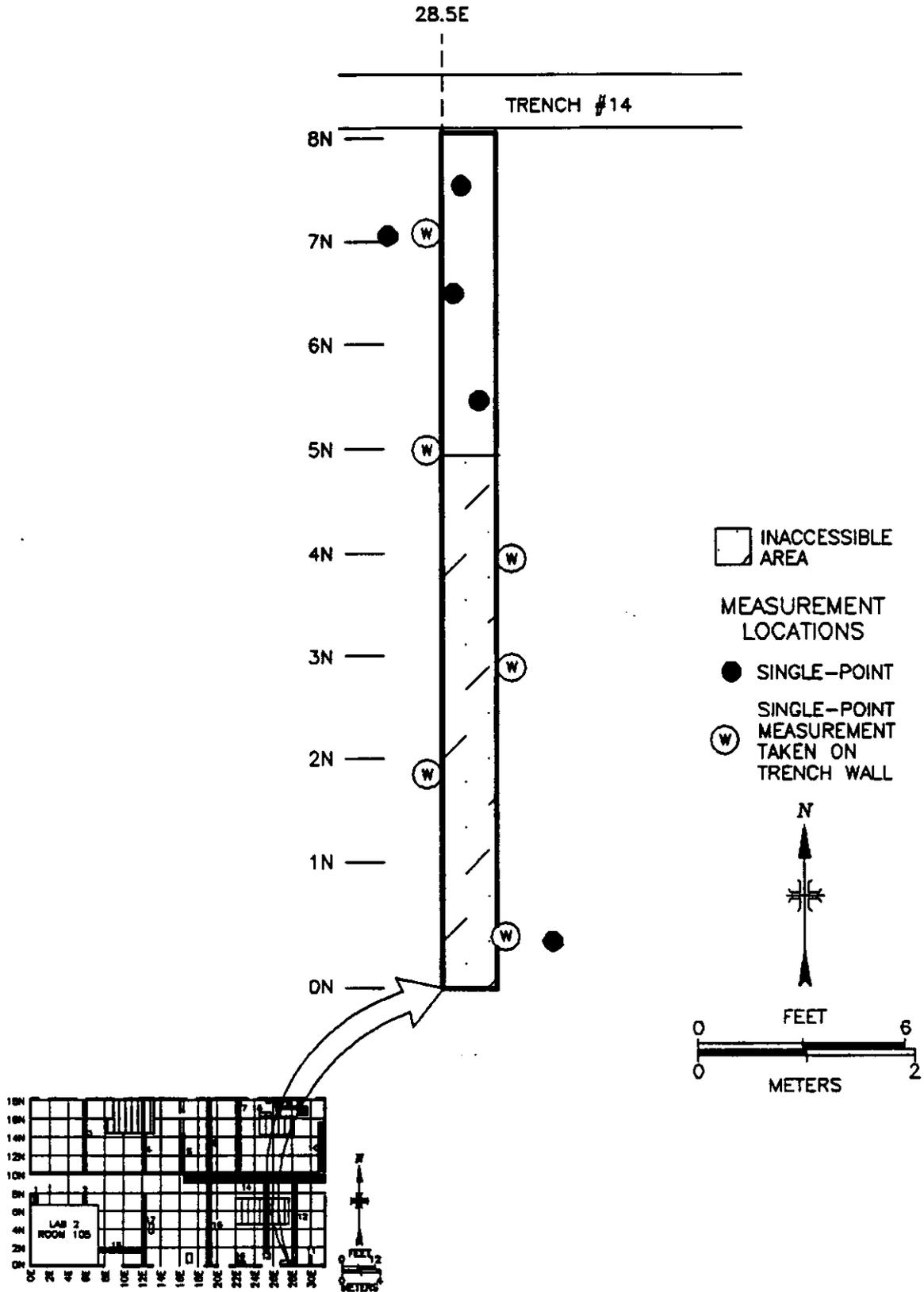


FIGURE 13: ARC Building 23, Lab 1, Trench #12
Indicating Measurement Locations

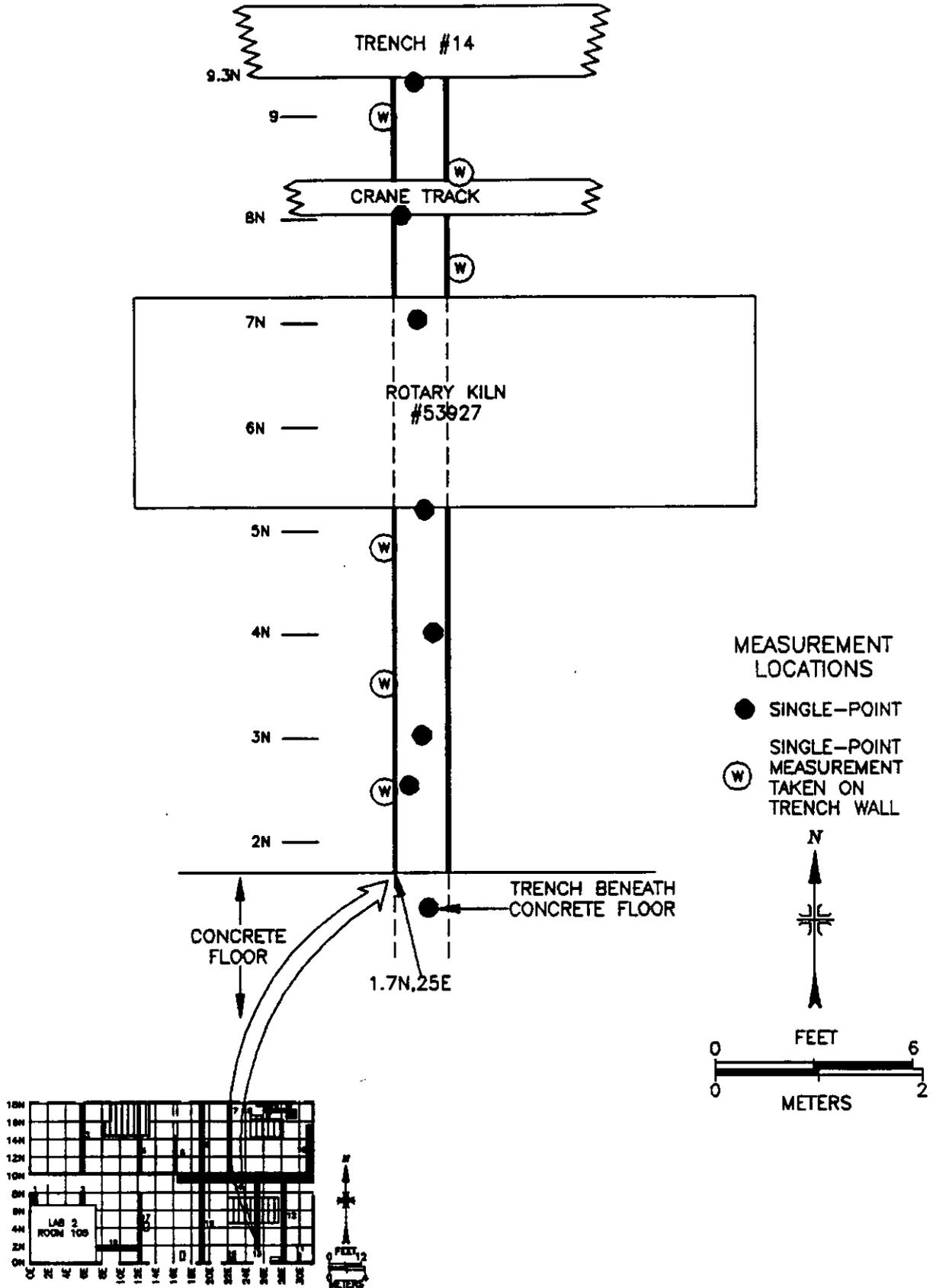


FIGURE 14: ARC-Building 23, Lab 1, Trench #13
 Indicating Measurement Locations

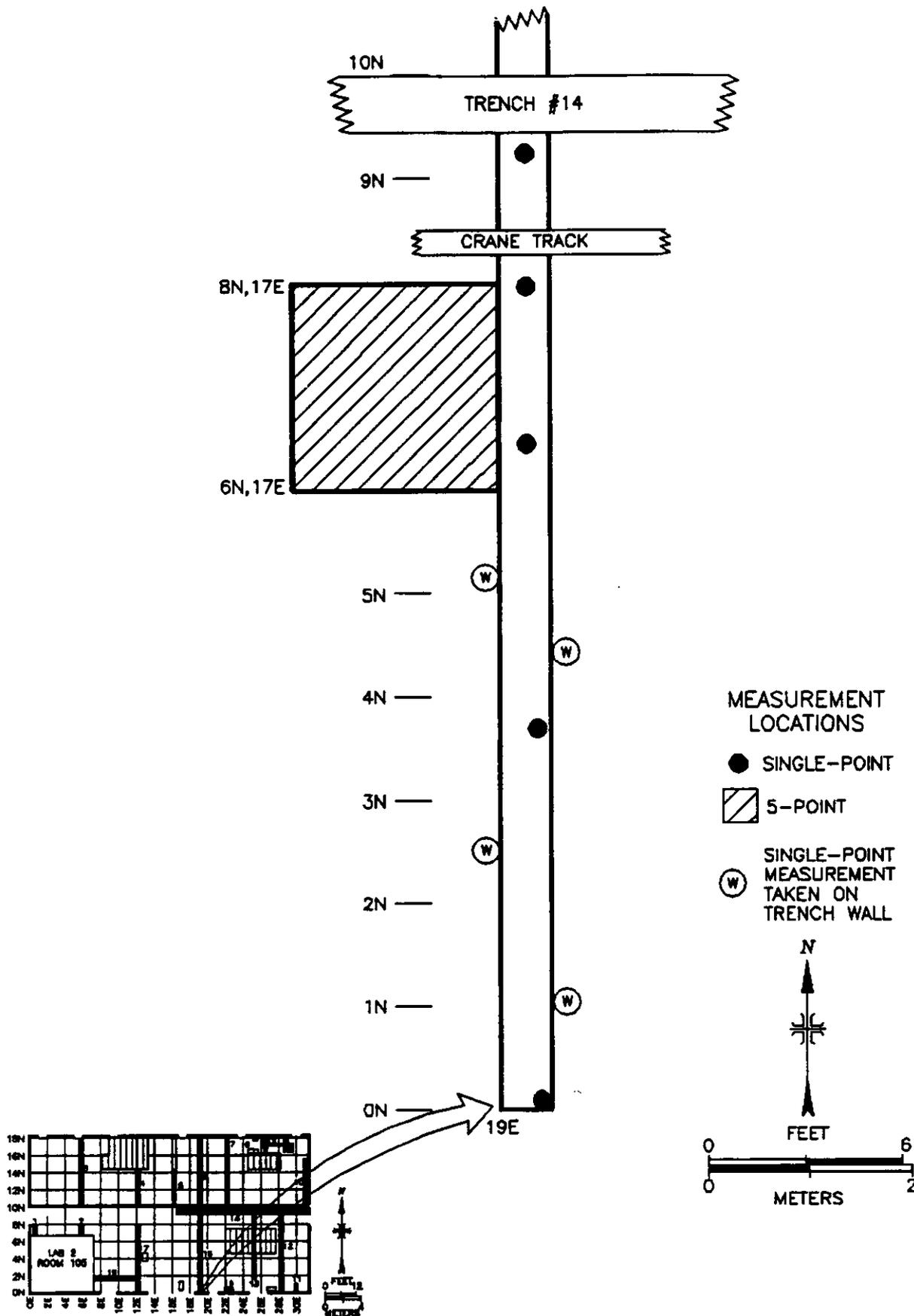


FIGURE 15: ARC Building 23, Lab 1, Trench #15
Indicating Measurement Locations

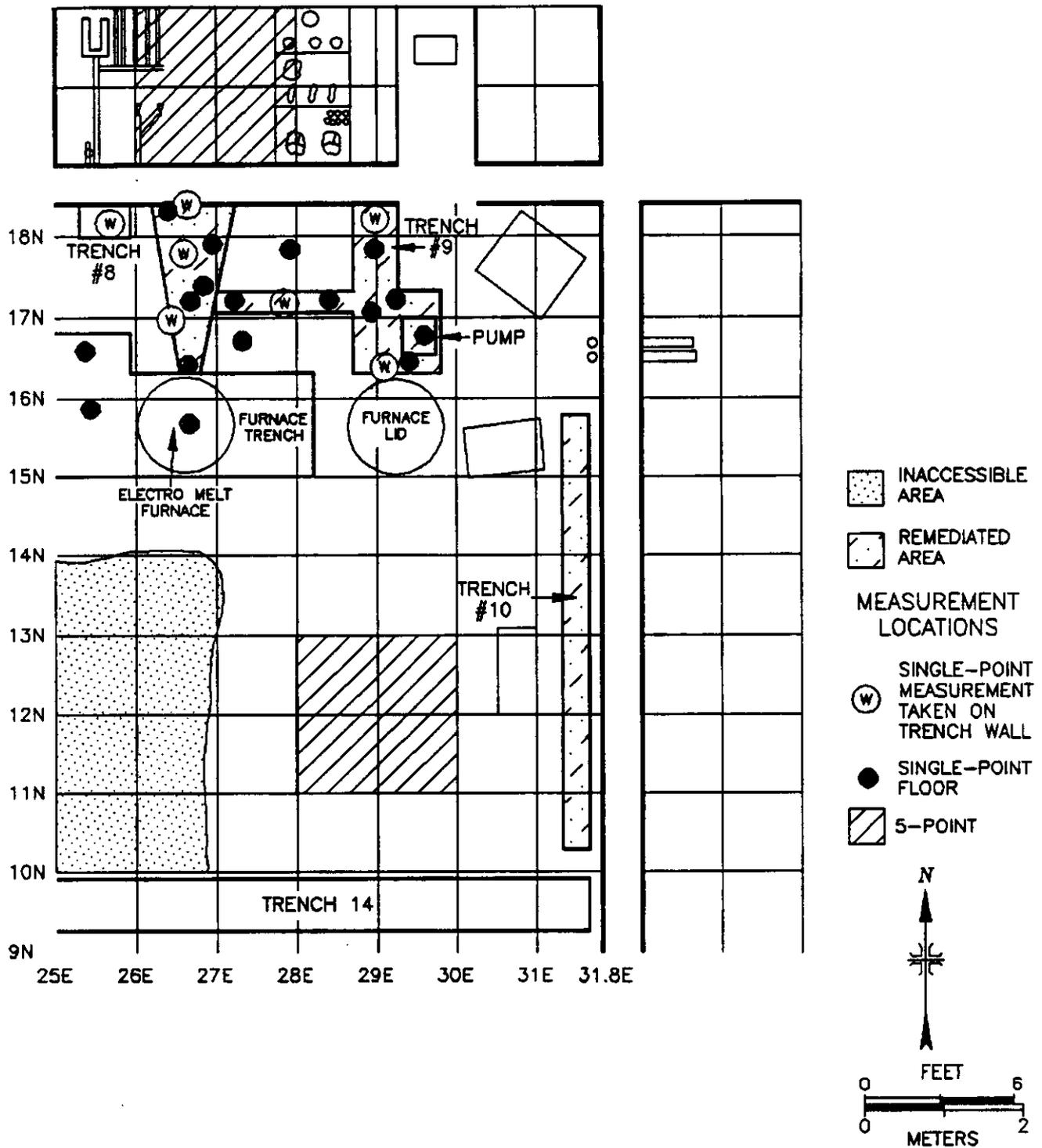


FIGURE 16: ARC Building 23, Lab 1, Northeast Corner, Floor and Lower Walls Indicating Measurement Locations

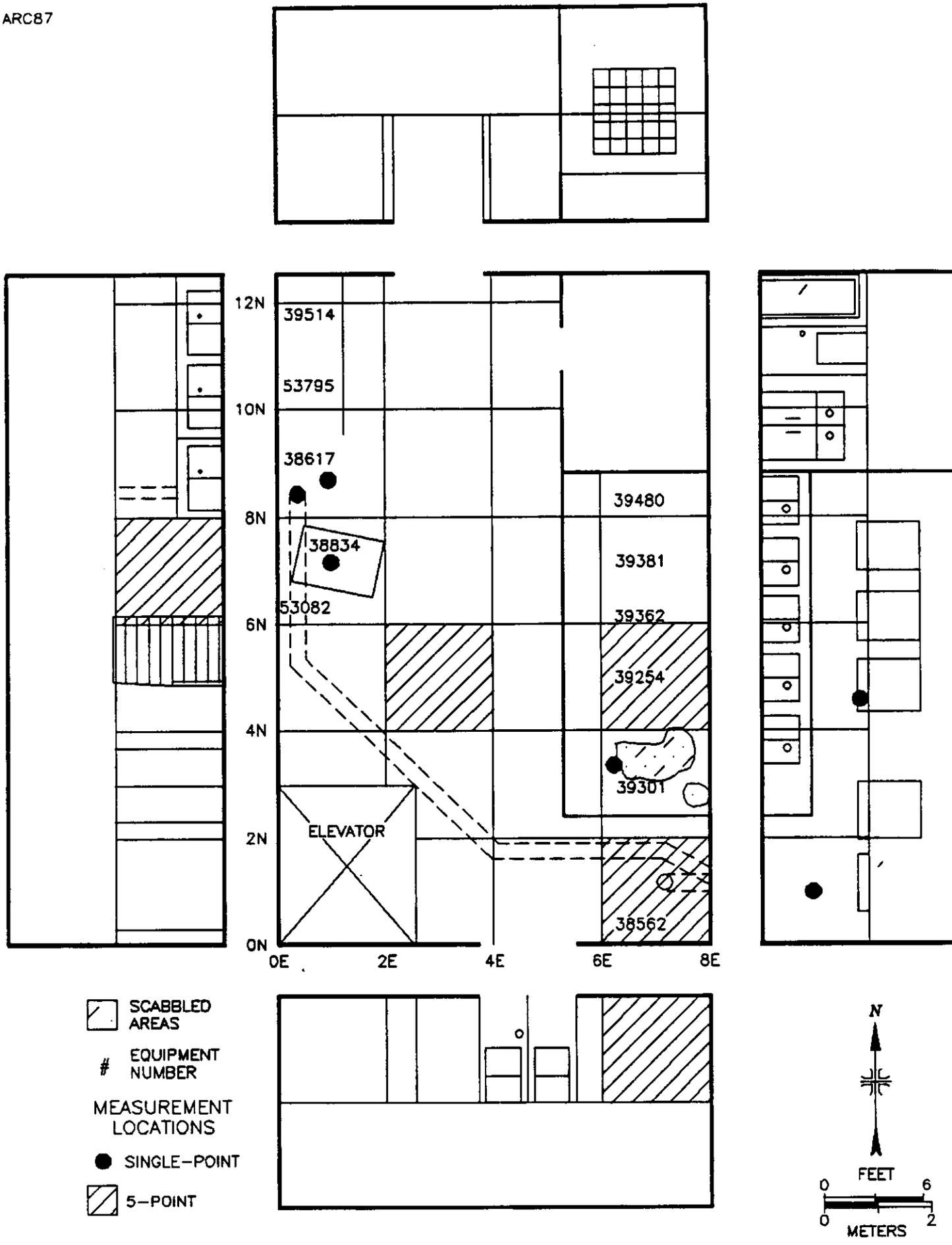


FIGURE 17: ARC Building 23, Crusher Room, First Floor
 Indicating Measurement Locations

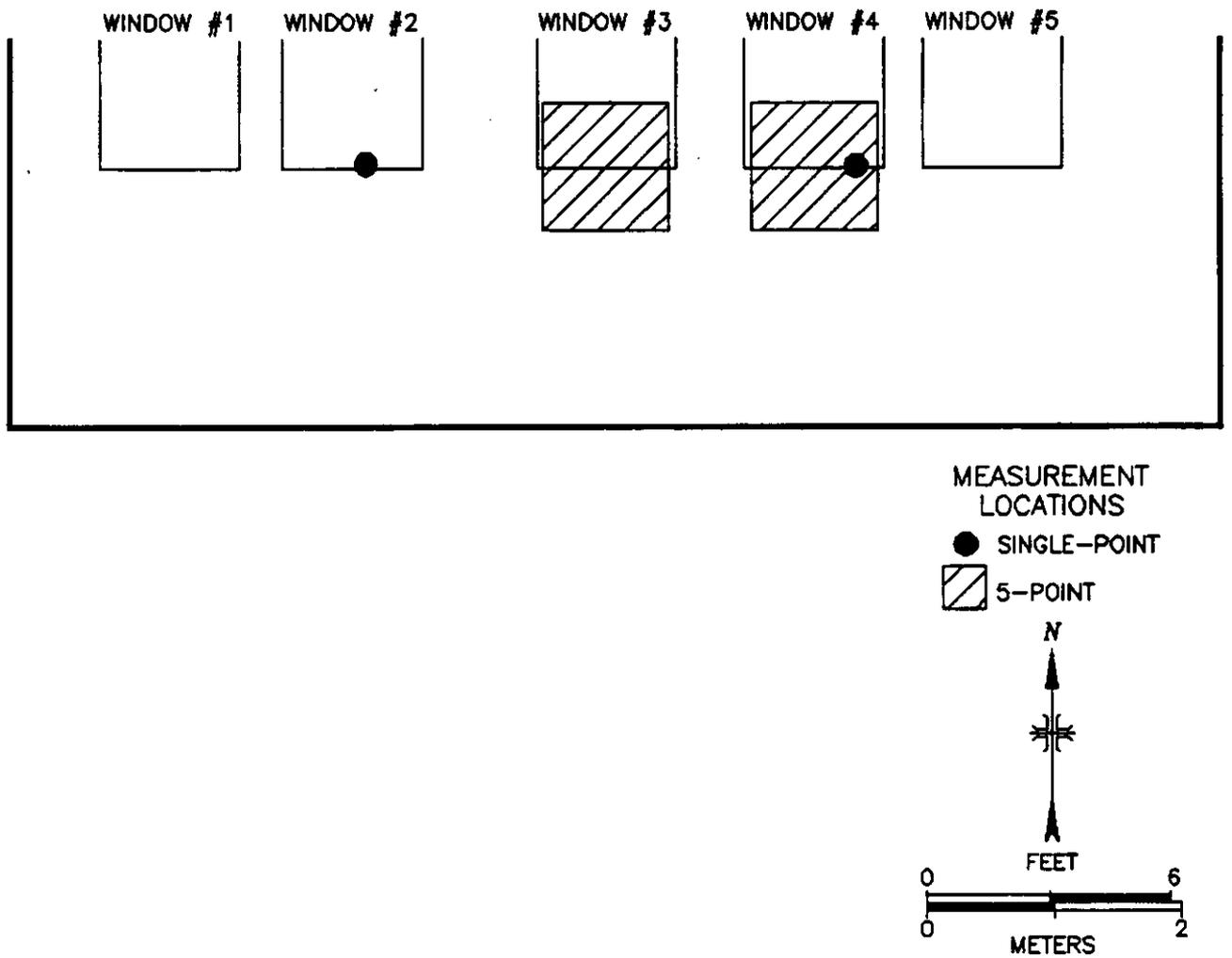


FIGURE 18:ARC Building 23, Outside Wall, Crusher Room
First Floor Facing West Indicating
Measurement Locations

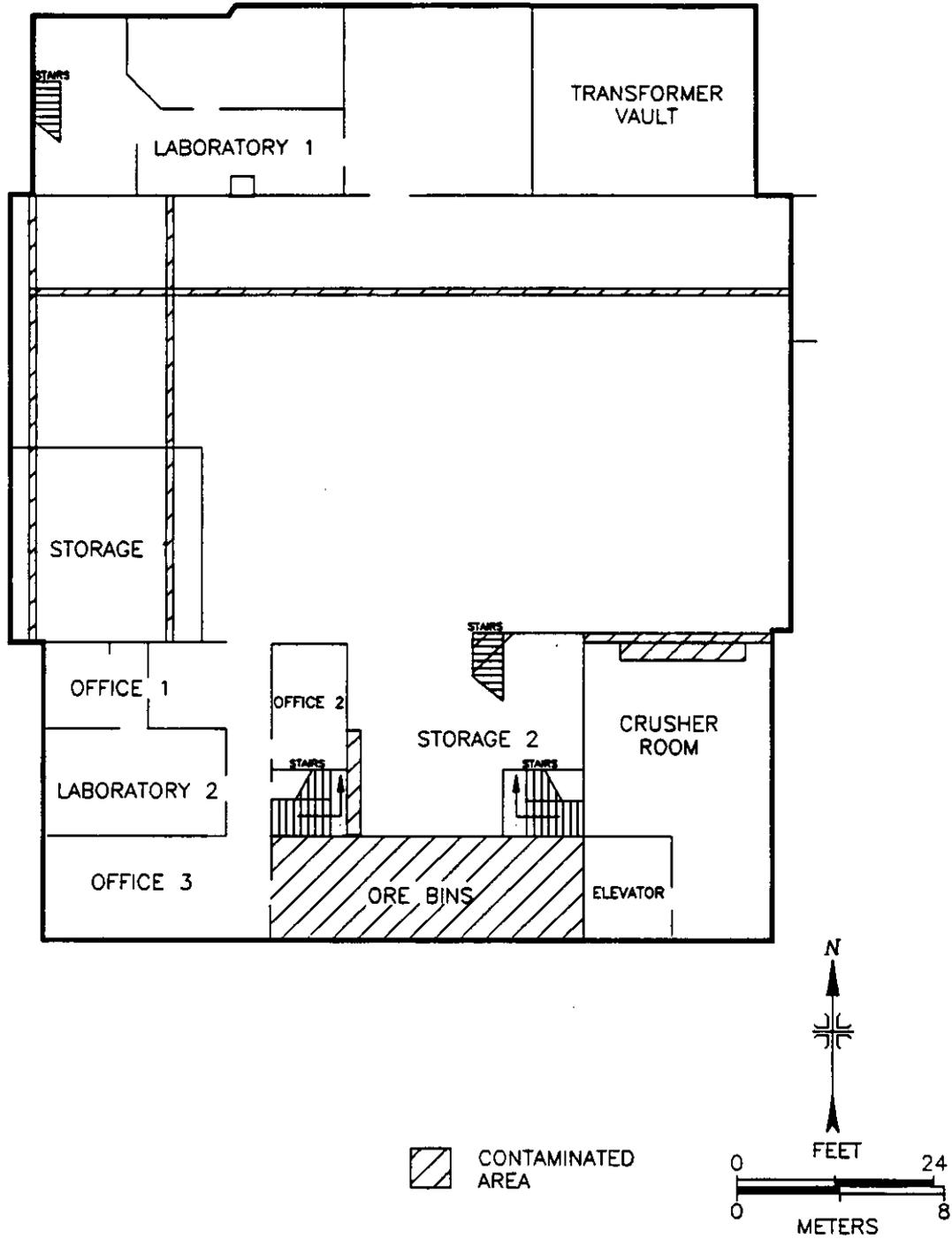


FIGURE 19: Plot Plan of Building 23, Second Floor

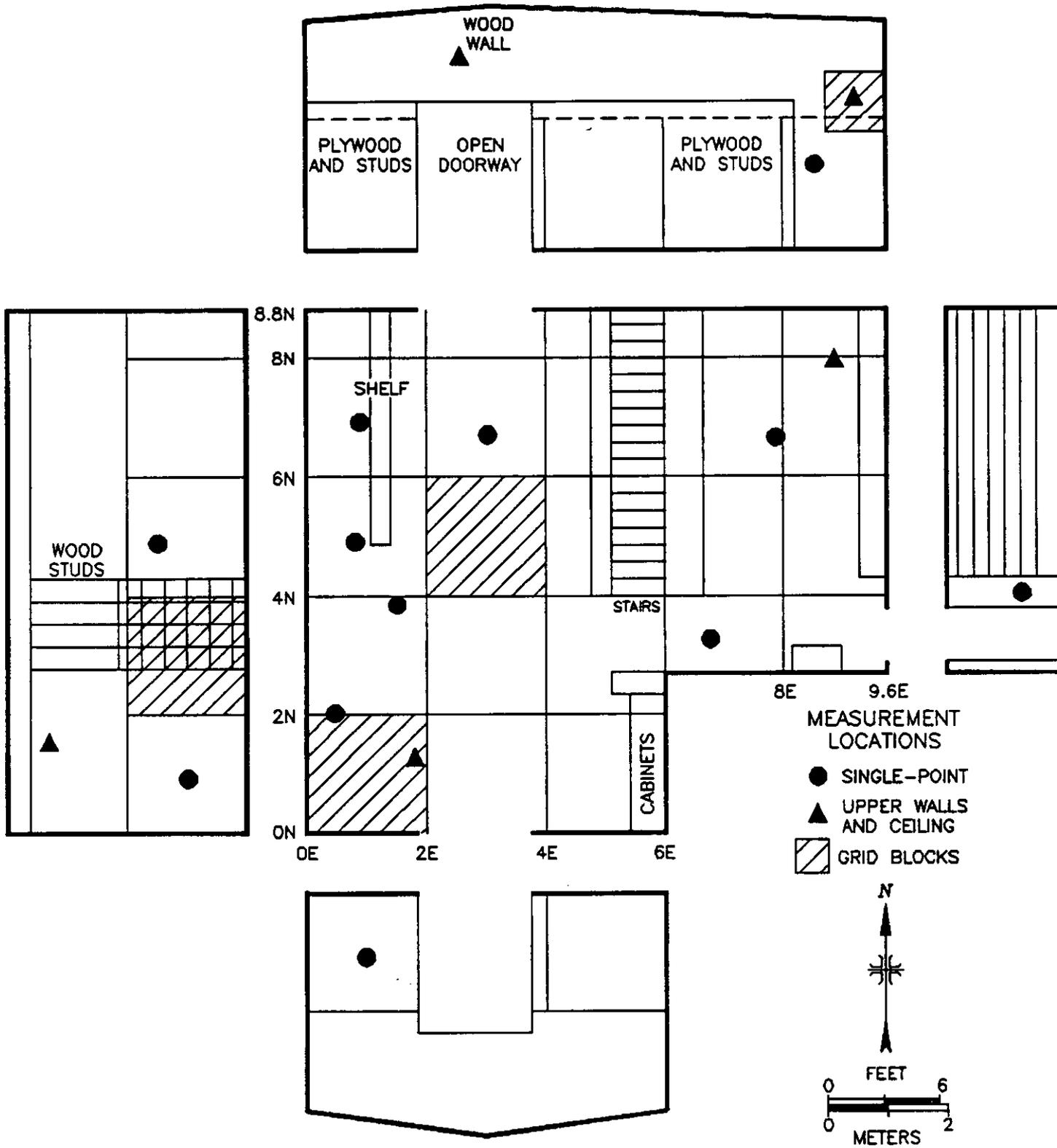


FIGURE 20: ARC Building 23, Second Floor Storage Area Indicating Measurement Locations

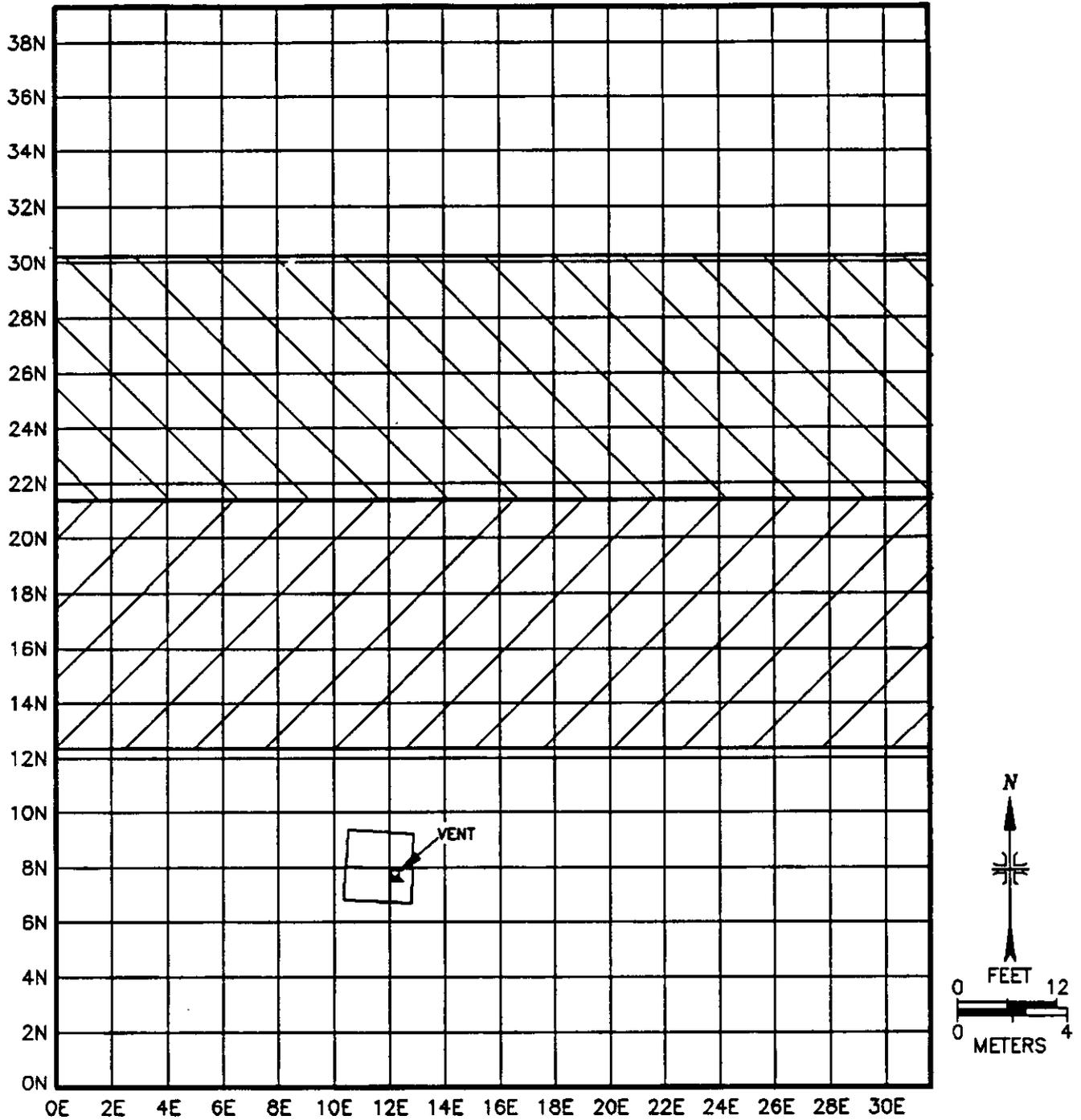


FIGURE 21: ARC Building 23 Roof Showing Location of Vent Above Upper Storage Area

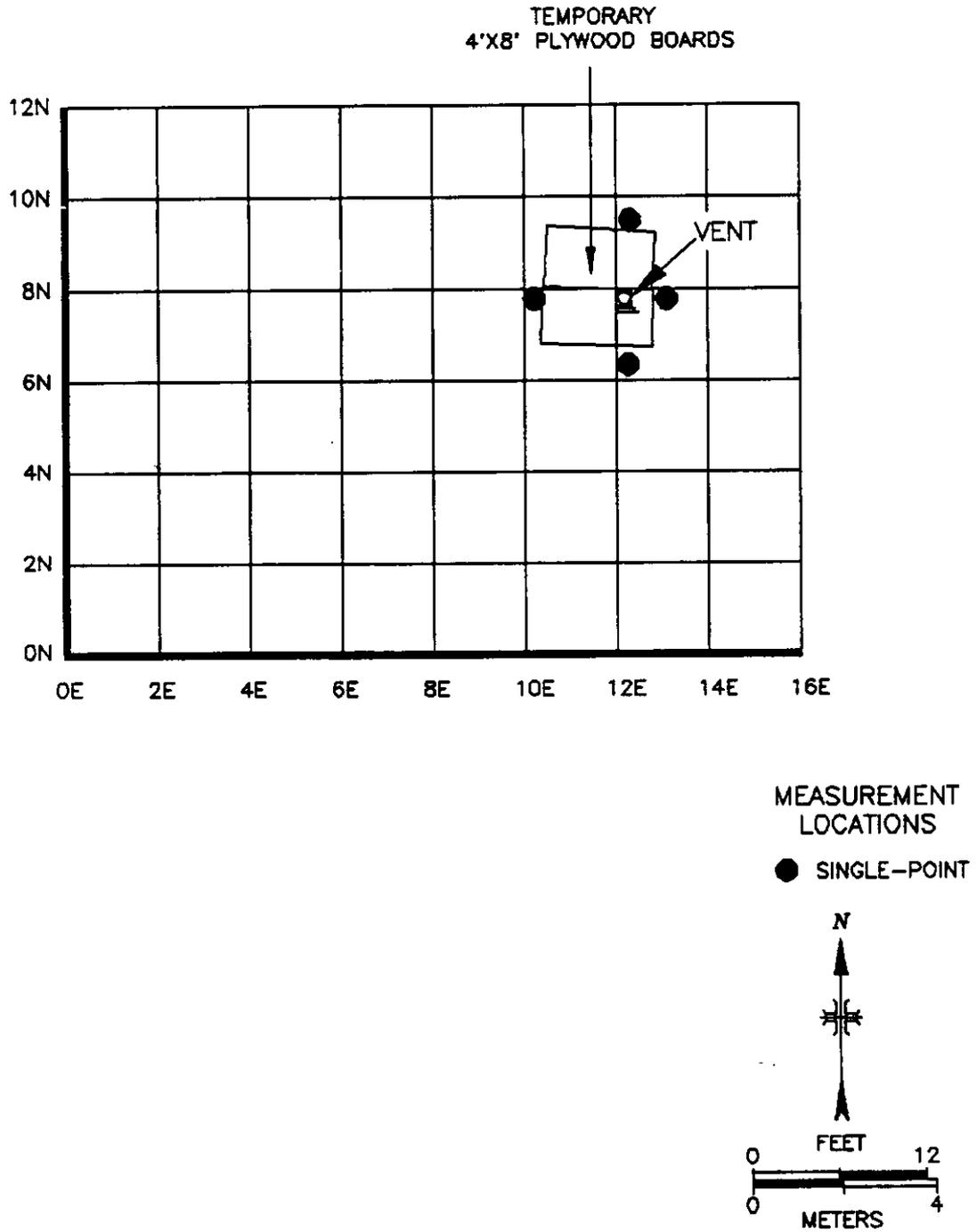


FIGURE 22: ARC Building 23, Southwest Corner of Roof
Indicating Measurement Locations

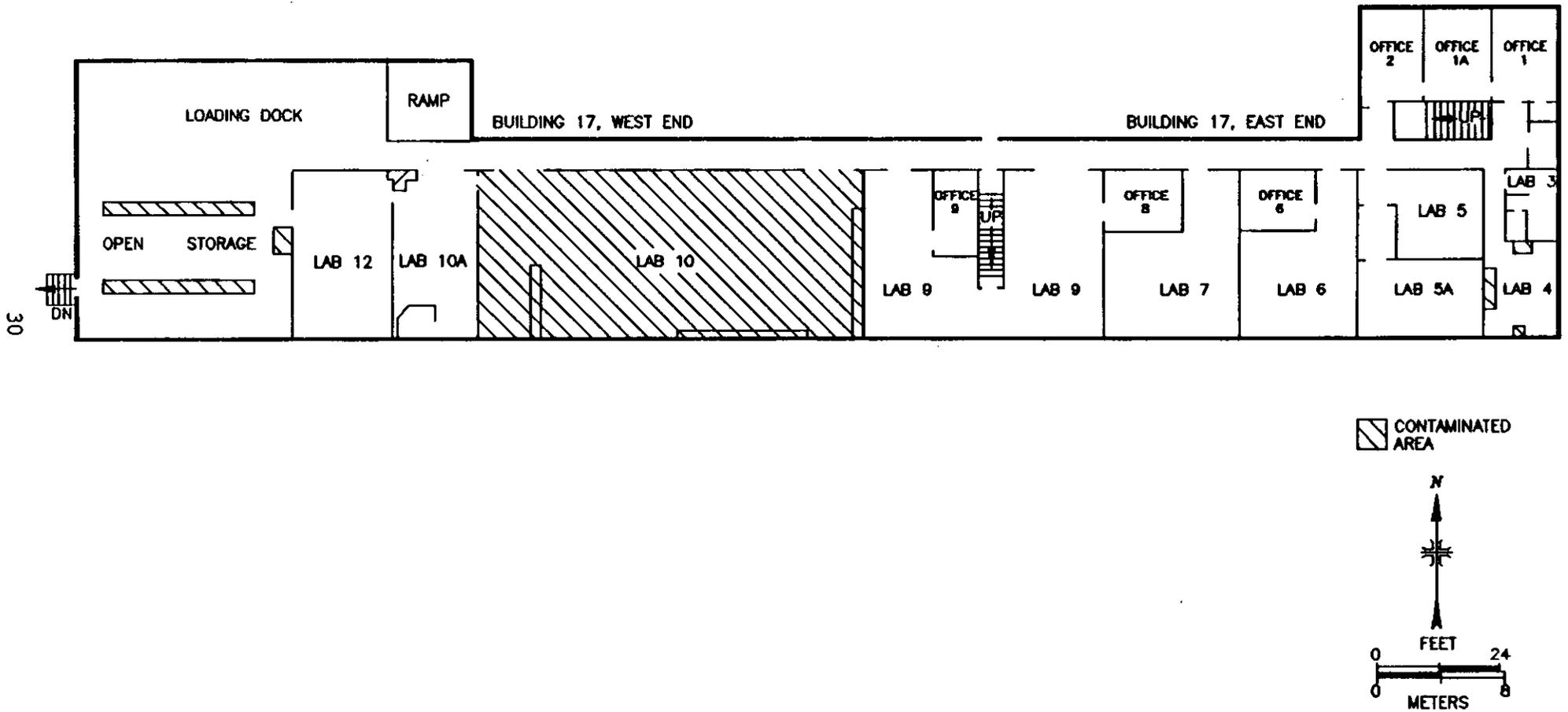


FIGURE 23: Plot Plan of Building 17

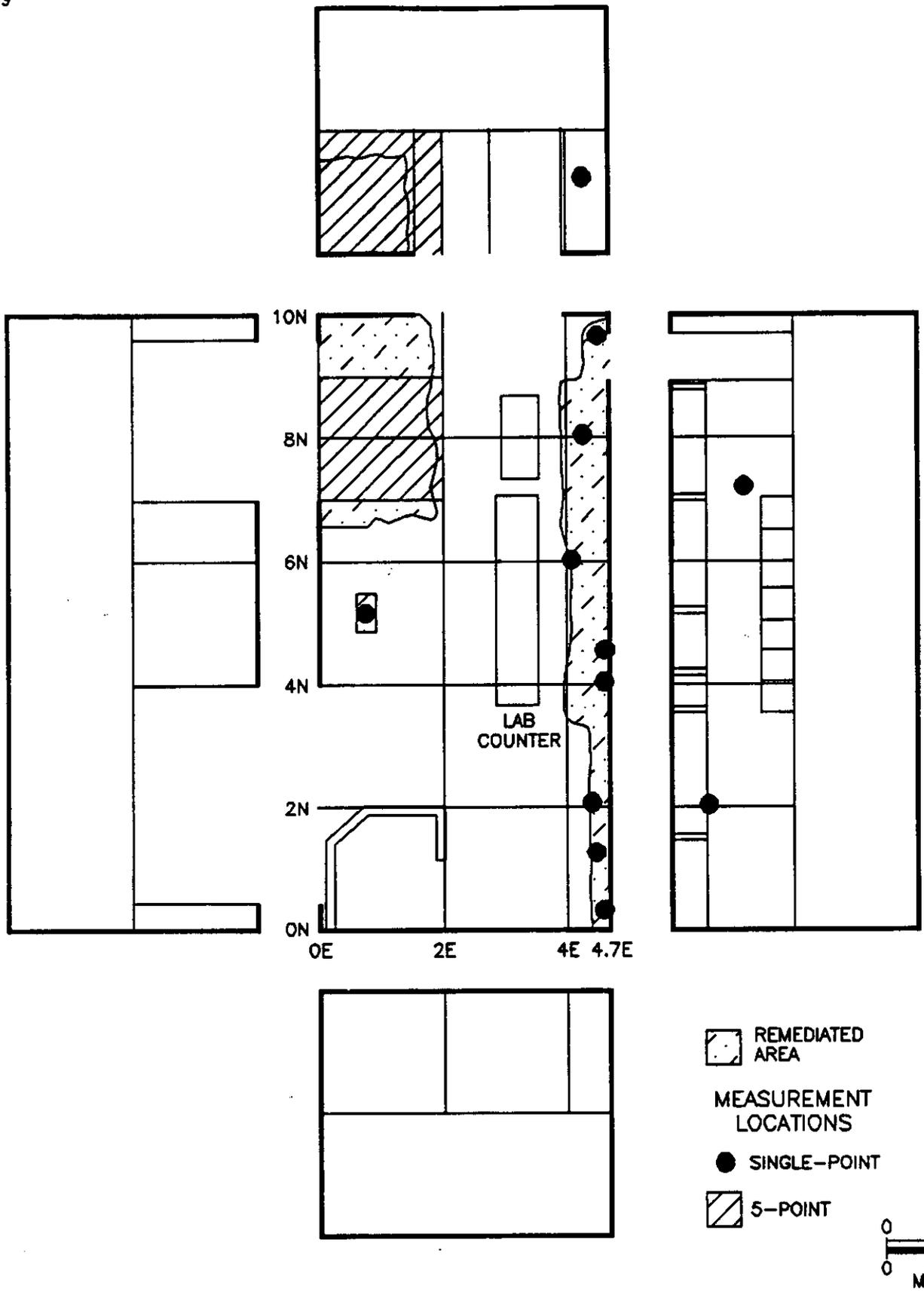


FIGURE 24: ARC Building 17, Lab 10A
Indicating Measurement Locations

TABLE I
SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
ALBANY RESEARCH CENTER
ALBANY, OREGON

BLDG.	ROOM	LOCATION*	# OF GRID BLKS OR LOCATIONS MEASURED	HIGHEST GRID BLOCK AVERAGE DPM/100 cm ²		TOTAL ACTIVITY DPM/100 cm ²		REMOVABLE ACTIVITY DPM/100 cm ²	
				α	β	α range	β - γ range	α range	β - γ range
23	Basement	FLOOR	7/17*	88	470	<83-120	<440-1100	<6	<13
		LOWER WALLS	6/5*	100	<440	<83-140	<440	<6	<13
		UPPER WALLS & CEILINGS	8*	N/A*	N/A	<83	<440	<6	<13
	S.W. Stairwell	FLOOR	4*	N/A	N/A	<83	<440	--	---
		LOWER WALL	4*	N/A	N/A	<83	<440	--	---
	Lab 1	FLOOR	2/7*	<83	630	<83	<440-1200	<6	<13
		LOWER WALL	1*	<83	<440	<83	<440	<6	<13
		TRENCH #8	1*	N/A	N/A	<83	<440	--	---
		TRENCH #9	18*	N/A	N/A	<83	<440-570	<6	<13
		FURNACE PIT	3*	N/A	N/A	<83	<440-690	<6	<13
		TRENCH #11	3*	N/A	N/A	<83	<440-730	<6	<13
		TRENCH #7	10*	N/A	N/A	<83	<440-1900	<6	<13
		PIPE INTO TRENCH #7	1*	N/A	N/A	--	11,000	--	---
		TRENCH #12	8*	N/A	N/A	<83	<440-650	<6	<13
		TRFNCH #6	9*	N/A	N/A	<83	<350-1300	<6	<13

TABLE 1 (continued)
SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
ALBANY RESEARCH CENTER
ALBANY, OREGON

BLDG.	ROOM	LOCATION*	# OF GRID BLKS OR LOCATIONS MEASURED	HIGHEST GRID BLOCK AVERAGE DPM/100 cm ²		TOTAL ACTIVITY DPM/100 cm ²		REMOVABLE ACTIVITY DPM/100 cm ²	
				α	β	α range	β - γ range	α range	β - γ range
		TRENCH #16	4*	N/A	N/A	< 83	< 440-1000	< 6	< 13
		TRENCH #10	7*	N/A	N/A	< 83	< 440-690	< 6	< 13
		TRENCH #13	14*	N/A	N/A	< 83	< 440-1600	< 6	< 13
		TRENCH #15	10*	N/A	N/A	< 83	< 440-640	< 6	< 13
23	Crusher Room	FLOOR	3 ¹ / ₂ *	< 83	490	< 83	< 440-670	< 6	< 13
		LOWER WALLS	2 ¹ / ₂ *	< 83	500	< 83	< 440-700	< 6	< 13
		EQUIPMENT	6*	N/A	N/A	< 83	< 350-10,000	6-200	< 13-110
	Second Floor Storage	FLOOR	2 ¹ / ₈ *	< 83	< 440	< 83-110	< 440-740	< 6	< 13
		LOWER WALLS	1 ¹ / ₅ *	< 83	< 440	< 83	< 440-820	< 6	< 13
		UPPER WALLS & CEILINGS	1 ¹ / ₈ *	115	825	< 83-130	< 440-1900	< 6	< 13
	Roof	ROOF VENT EXIT	4*	N/A	N/A	< 83-120	< 350	--	---
	East Wall	EXTERIOR WINDOWS	2*	< 83	710	< 83	< 440-2400	< 6	< 13
17	10-A	FLOOR	1 ¹ / ₉ *	< 83	< 440	< 83-210	< 440-840	< 6	< 13
		LOWER WALLS	1 ¹ / ₃ *	98	< 440	< 83-140	< 440	< 6	< 13

*REFER TO FIGURES
*FIVE POINT MEASUREMENT
*SINGLE POINT MEASUREMENT
*N/A: NOT APPLICABLE
--INDICATES SMEAR SAMPLE NOT COLLECTED

REFERENCE

1. P.R. Cotten, Verification of Remediation. Albany Research Center, Albany, Oregon, October 1989.
2. T.J. Vitkus and P.R. Cotten, Verification Survey of Phase II Remedial Actions, Albany Research Center, Albany, Oregon, Interim Report, January 1991.