ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

July 22, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
Division of Waste Management
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDINGS 2 AND 2W, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility for Buildings 2 and 2W on May 22, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Enclosure

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LETTER REPORT
CONFIRMATORY SURVEY OF BUILDINGS 2 AND 2W
MOLYCORP, INC., WASHINGTON FACILITY
WASHINGTON, PENNSYLVANIA
(DOCKET NO. 040-08778, RFTA NO. 02-007a)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the U.S. Nuclear Regulatory Commission (NRC) for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 22 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were

performed under the Decommissioning Plan for the Washington, PA facility which implemented final status survey (FSS) guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building as either radiologically affected or unaffected. There was no history of radiological materials present within Buildings 2 or 2W, therefore, MACTEC initially classified the buildings as unaffected. However, during the initial FSS activities, localized elevated contamination was detected in multiple areas on the concrete floor in the Train Bay of Building 2. Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, determined that the elevated activity was fixed into the concrete and required removal of those portions of the concrete. Therefore, the classification for the Building 2 Train Bay was changed from unaffected to affected and MACTEC personnel remediated the concrete floor and performed affected FSS activities within this portion of the building (MACTEC 2002a).

The NRC's Division of Waste Management requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington facility for which the licensee and MACTEC have prepared FSS reports.

SITE DESCRIPTION

The Molycorp, Inc., Washington site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines

that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002b).

Buildings 2 and 2W are located along the eastern portion of the site. These buildings are also co-joined and share several walls and building structural components between them (Figure 1).

Building 2, a six-story building with machine shops, control rooms, restrooms, and offices on several floors (Figures 2 through 13), is approximately 36 meters (m) long by 36 m wide with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from north to south and has large roll top doors on the west side of the first floor and personnel doors on the all sides. The Building 2 Train Bay is located along the eastern side of Building 2 (Figure 2).

The Building 2 Train Bay is 24 m long by 9 m wide with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from north to south and has large roll top (that accomodate railcars) and personnel doors on the north and south walls (Figure 14). The west side opens up into the second floor of Building 2.

Building 2W is 44 m long by 36 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has large roll top doors on the west wall and personnel doors on the east and west walls (Figure 15). A small interior room is located near the middle of the west wall (Figures 15 and 16). The north side opens up into Building 2.

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002b). The licensee's FSS results for Buildings 2 and 2W were provided for review prior to ESSAP's confirmatory survey activities (MACTEC 2002a).

SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Buildings 2 and 2W at the Molycorp, Washington facility on May 22, 2002. ESSAP's confirmatory survey coverage was determined by MACTEC's radiological classification of the buildings—Buildings 2 and 2W were classified as unaffected; the Train Bay was classified as affected. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2002b).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP performed alpha plus beta activity scans on accessible building structural component surfaces—however, based on an agreement between the licensee and NRC, it was decided that the ground floors would be considered a separate survey unit from the building shells. Therefore, ESSAP performed confirmatory survey activities on the building shell and other internal structural component/equipment surfaces. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

Building 2

Beta surface activity measurements were performed at eleven locations on the first floor; ten locations on the second floor; four locations each on the third, fourth and fifth floors; five locations

on the sixth floor; and six locations within the Train Bay. Measurement locations included floors (second floor through sixth floors), lower wall, and equipment surfaces. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figures 2 through 14.

Building 2W

Twenty beta surface activity measurements were performed in Building 2W on surfaces that included lower and upper walls, ceiling, and equipment surfaces. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figures 15 and 16.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002c). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). The survey results were interpreted and compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u>

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

Natural Uranium

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the beta activity level corresponding to 1,000 alpha dpm/100 cm^2 is 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2,000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Buildings 2 and 2W. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns included:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS AND SURFACE ACTIVITY LEVELS

Building 2

Alpha plus beta surface scans of the building structural components identified an area of elevated beta radiation on the grated floor of the sixth floor—this area was marked for further investigation. Total and removable surface activity levels for Building 2 are presented in Table 1. With the exception of the elevated area identified during surface scans, beta surface activity levels ranged from -270 to 370 dpm/100 cm^2. The elevated activity location on the sixth floor, located next to a firebrick kiln, had a beta activity level of 1,300 dpm/100 cm^2. The firebrick in the kiln had been removed by MACTEC during FSS activities. Cursory scans in the areas immediately adjacent to this location did not indicate any elevated activity within the contiguous 1 m^2 areas. Removable activity levels ranged from 0 to 7 dpm/100 cm^2 for alpha and -5 to 10 dpm/100 cm^2 for beta.

Building 2W

Alpha plus beta surface scans of the building structural component surfaces did not identify any areas of elevated radiation. Total and removable surface activity levels for Building 2W are presented in Table 2. Beta surface activity levels ranged from -160 to 370 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -4 to 8 dpm/100 cm^2 for beta.

COMPARISON OF RESULTS WITH GUIDELINES

One of the 64 measurement locations within Buildings 2 and 2W had a total beta activity level in excess of the average guideline; none exceeded the maximum guideline. For the measurement location on the sixth floor in Building 2 (location 1E) that exceeded the average but not the maximum guideline, cursory beta scans of the vicinity did not indicate any additional elevated activity within the contiguous 1 m^2 area.

SUMMARY

On May 22, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Buildings 2 and 2W at the Molycorp, Inc. Washington facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta surface scans and alpha and beta surface activity measurements.

ESSAP's confirmatory survey activities identified one unmarked area of elevated beta surface activity that was in excess of the average surface activity guidelines. However, cursory surveys of the adjacent $1m^2$ area did not indicate any additional elevated areas.

Based on the confirmatory survey results, it is ESSAP's opinion that fixed and removable activity levels within Buildings 2 and 2W, excluding the ground floor concrete slabs and attached foundations, meet the NRC guidelines for release for unrestricted use. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Buildings 2 and 2W satisfy the NRC guidelines for release to unrestricted use. This report does not address the upper concrete ground floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.

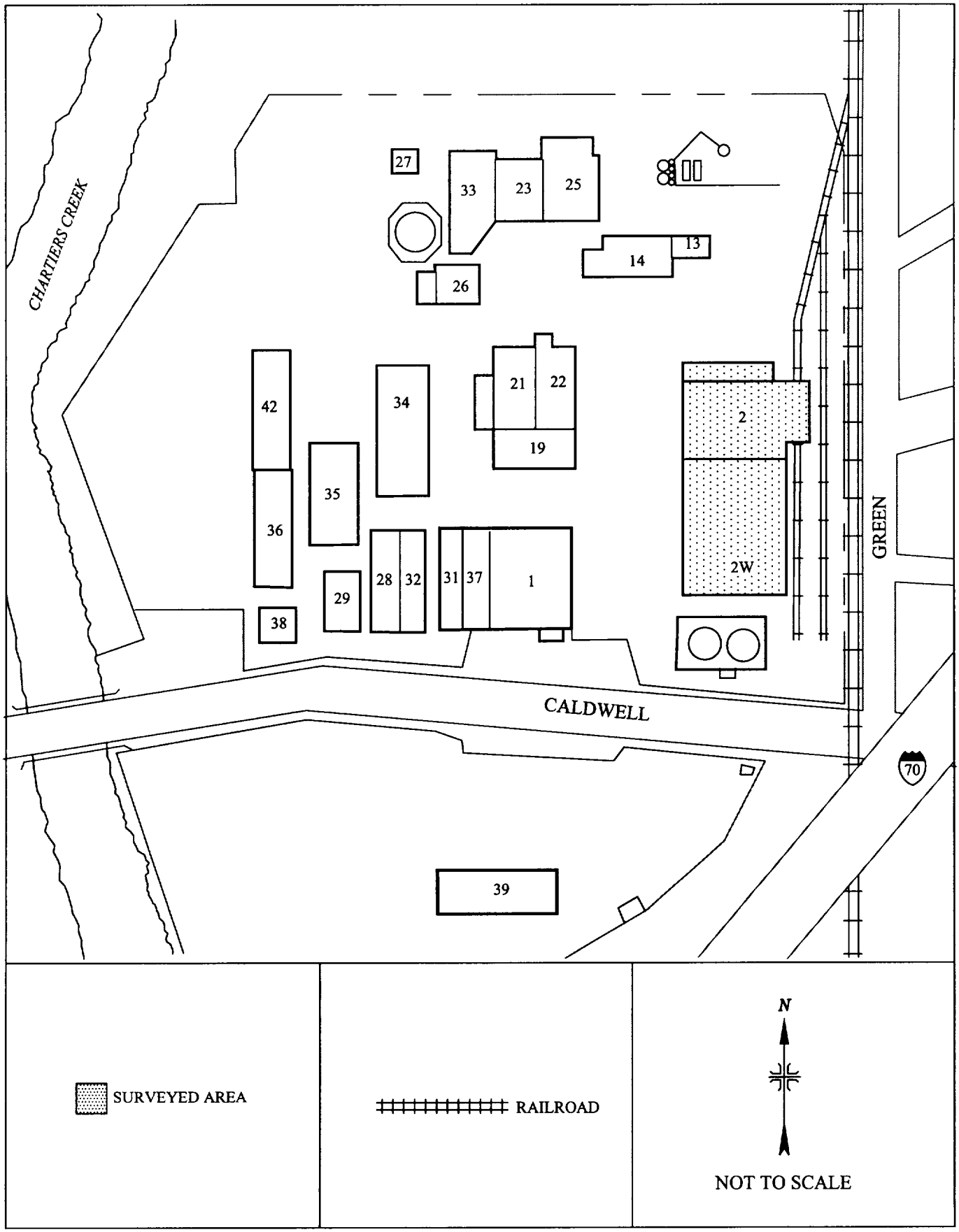


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

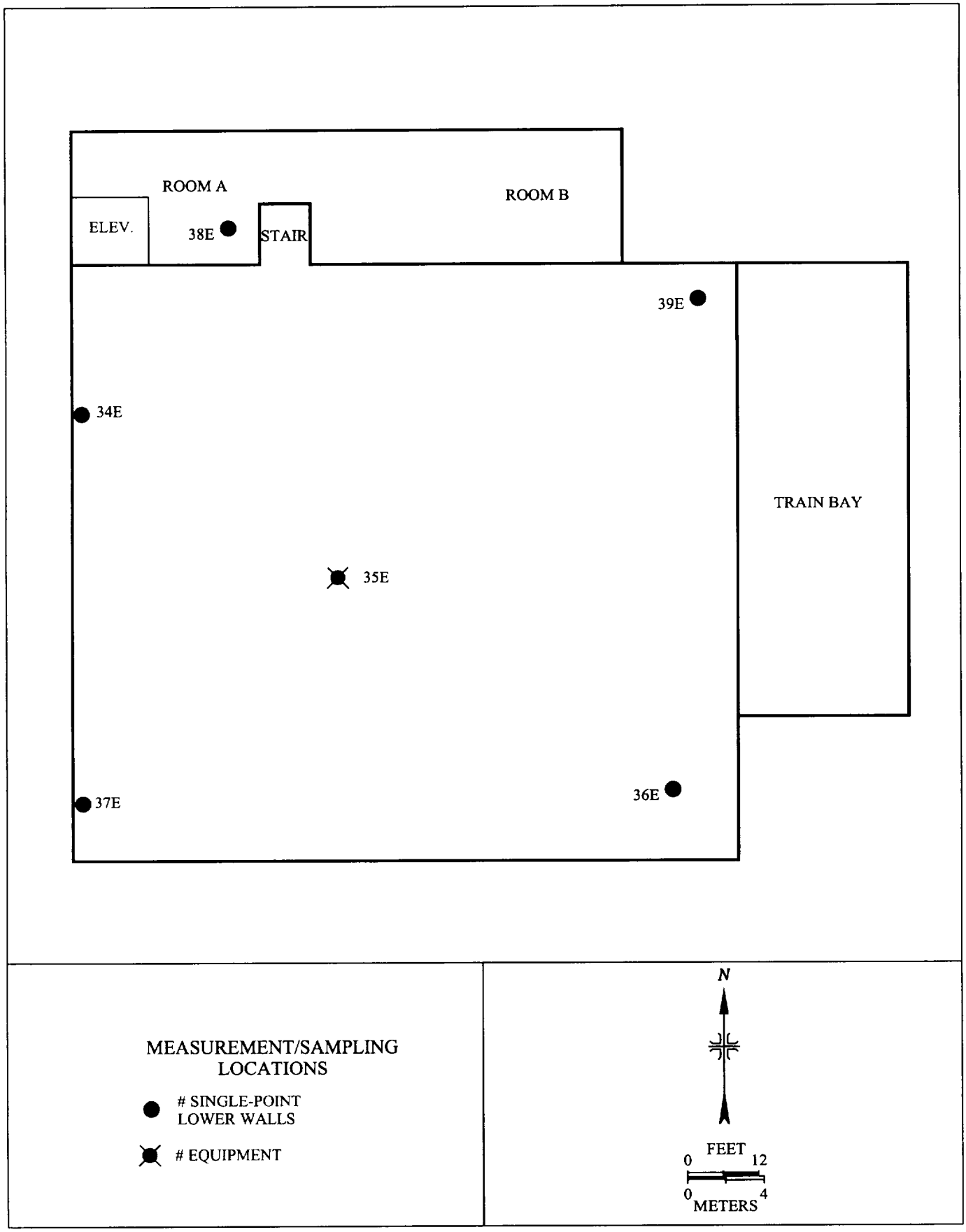


FIGURE 2: Building 2, 1st Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

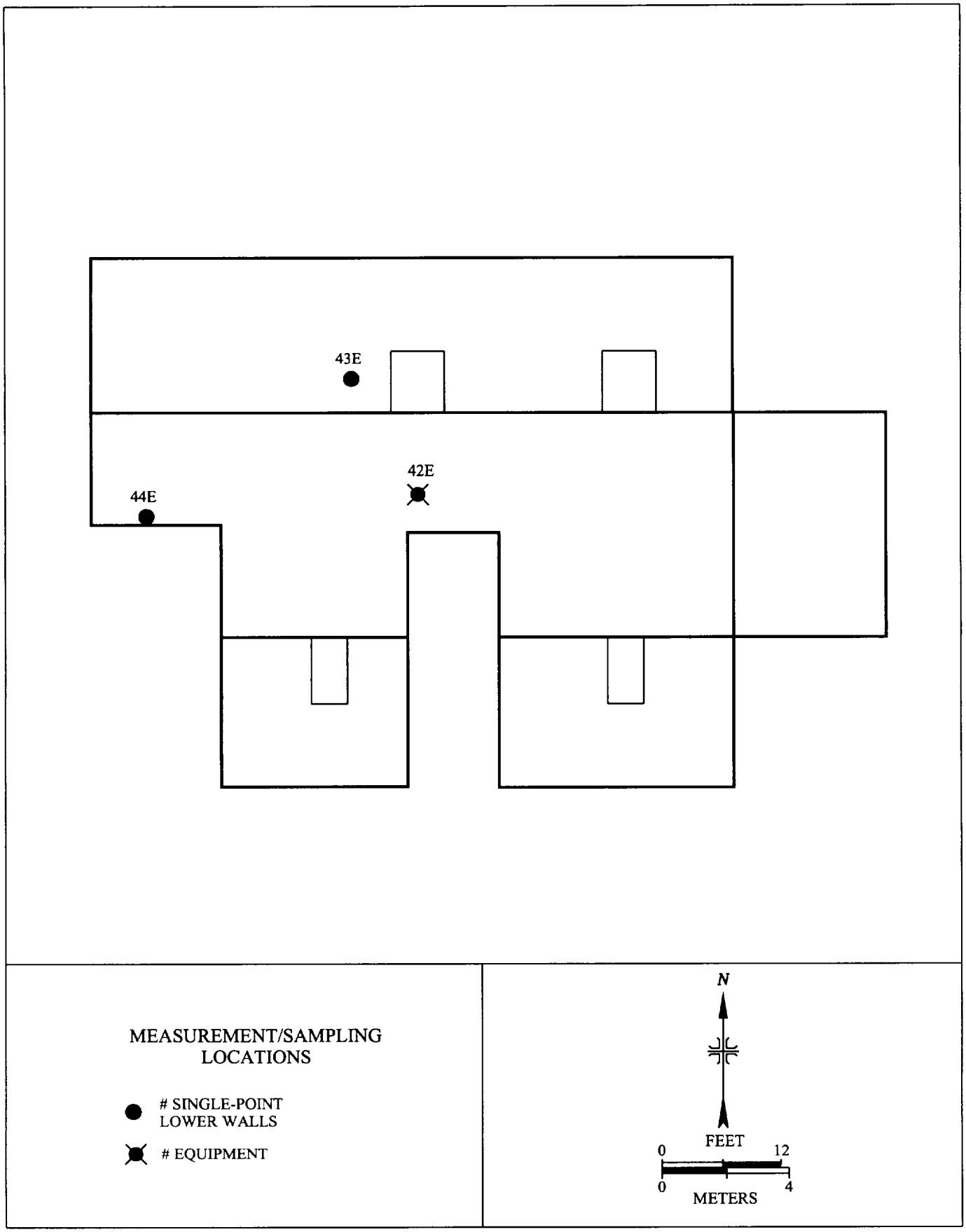
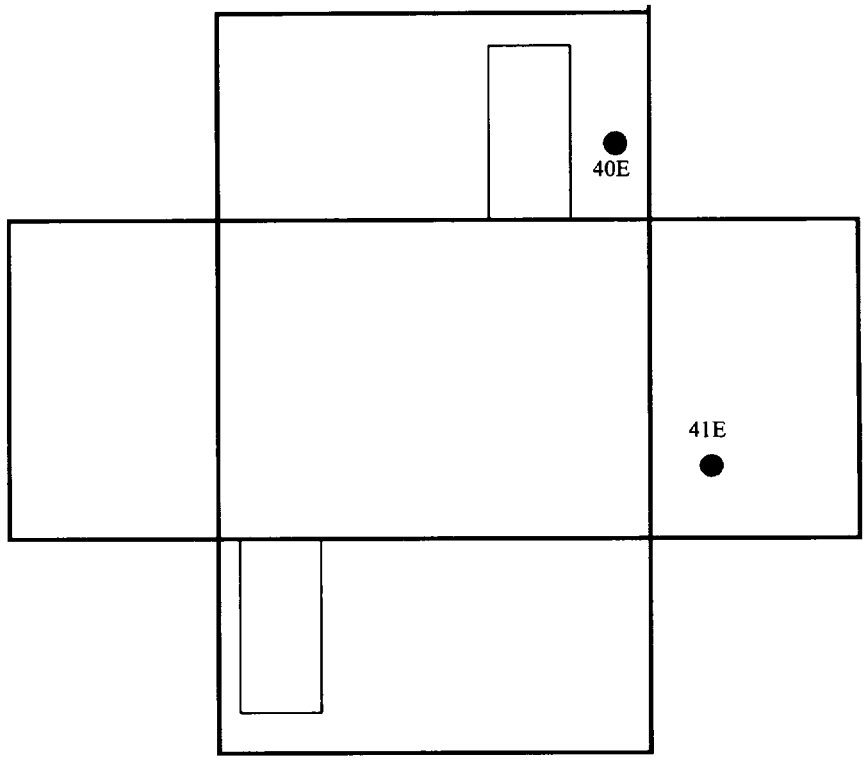


FIGURE 3: Building 2, Room A, 1st Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS

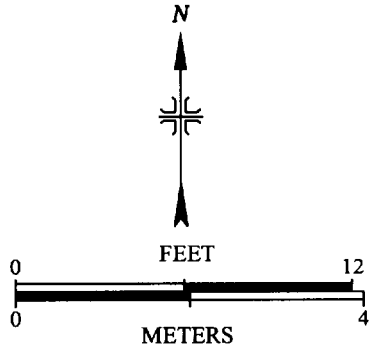


FIGURE 4: Building 2, Room B, 1st Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

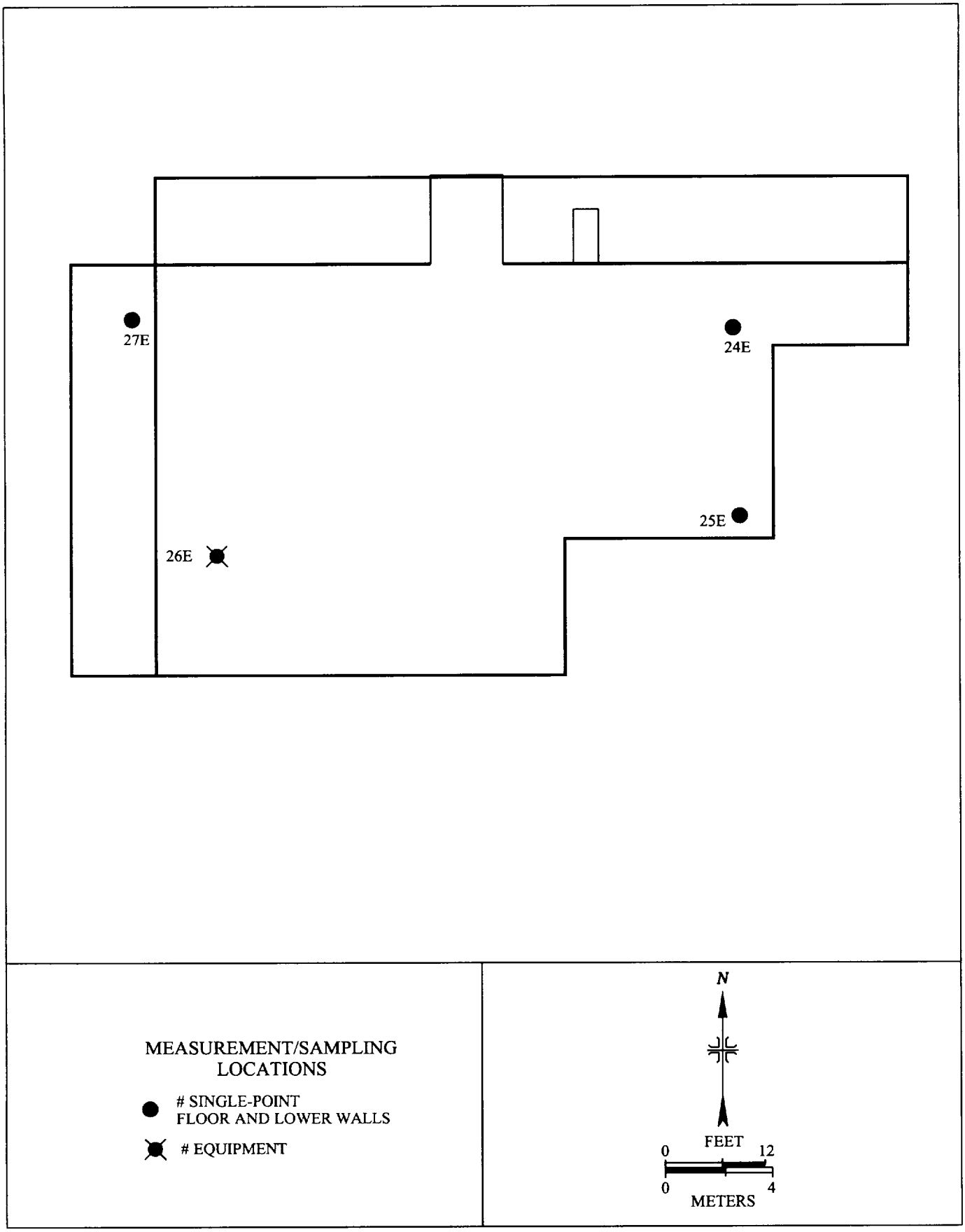
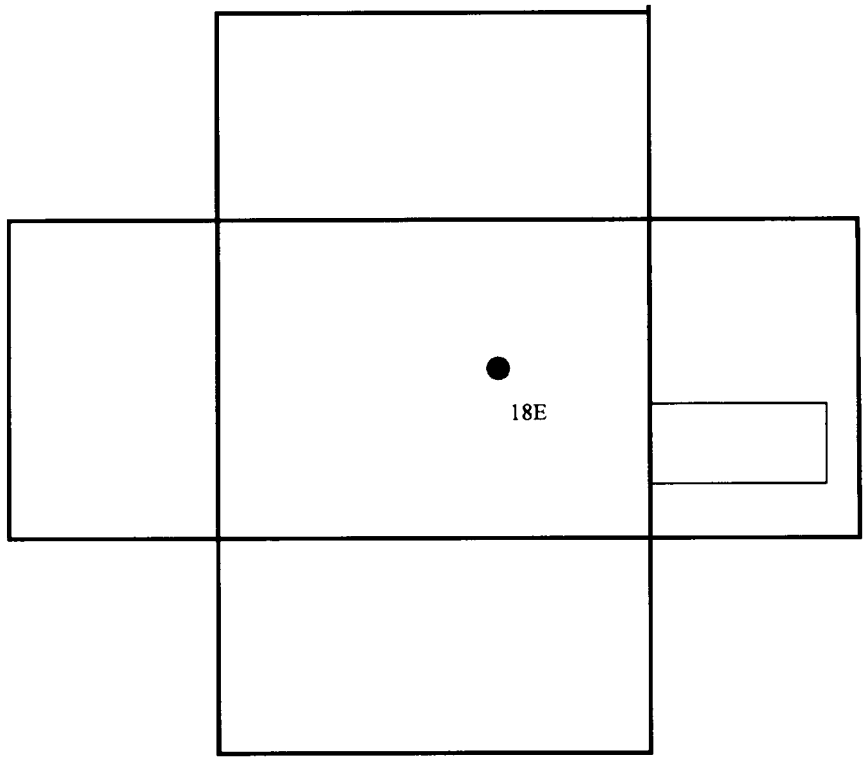


FIGURE 5: Building 2, 2nd Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS AND FLOOR

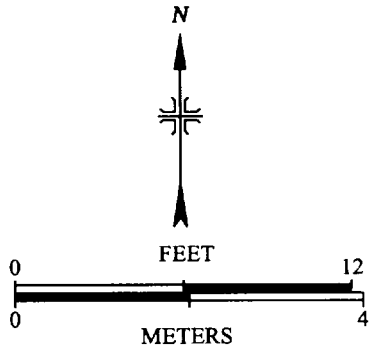
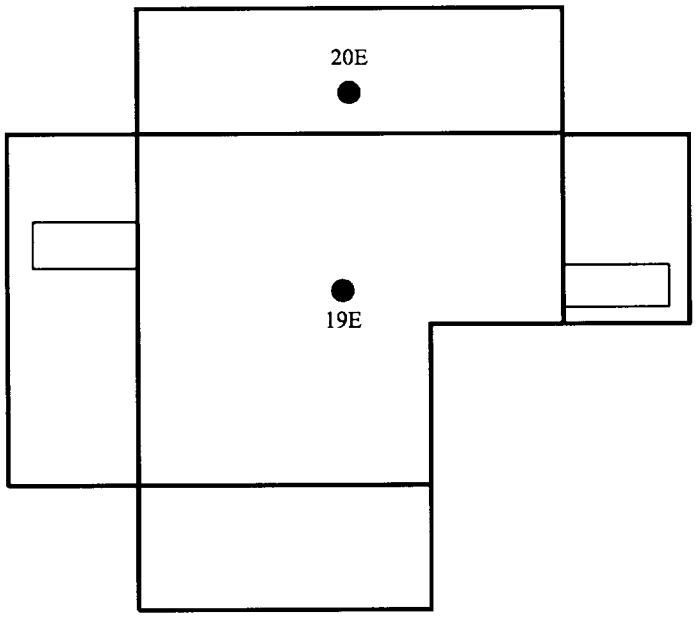


FIGURE 6: Building 2, Room C, 2nd Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS AND FLOOR

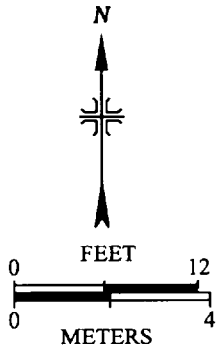


FIGURE 7: Building 2, Room D, 2nd Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

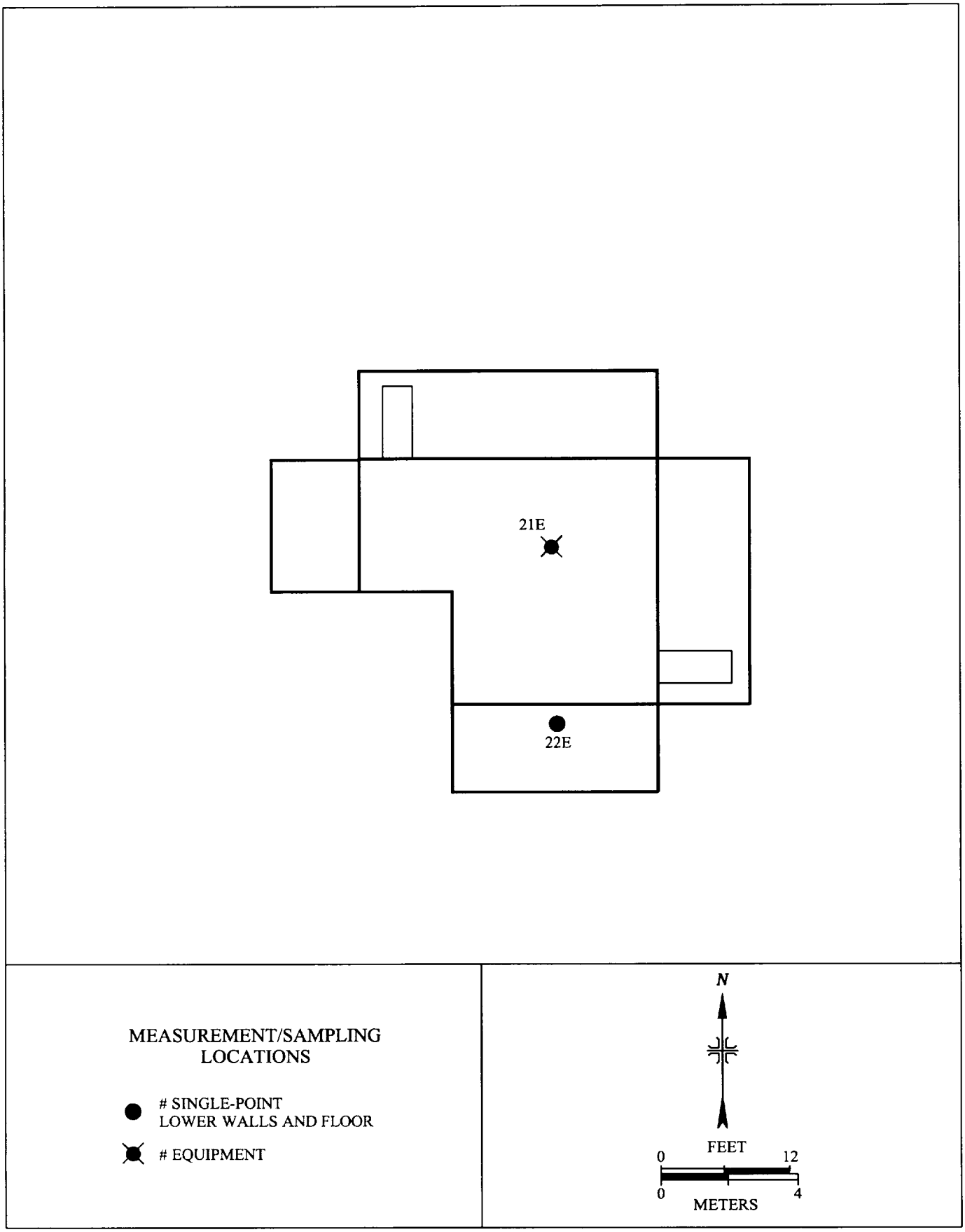


FIGURE 8: Building 2, Room F, 2nd Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

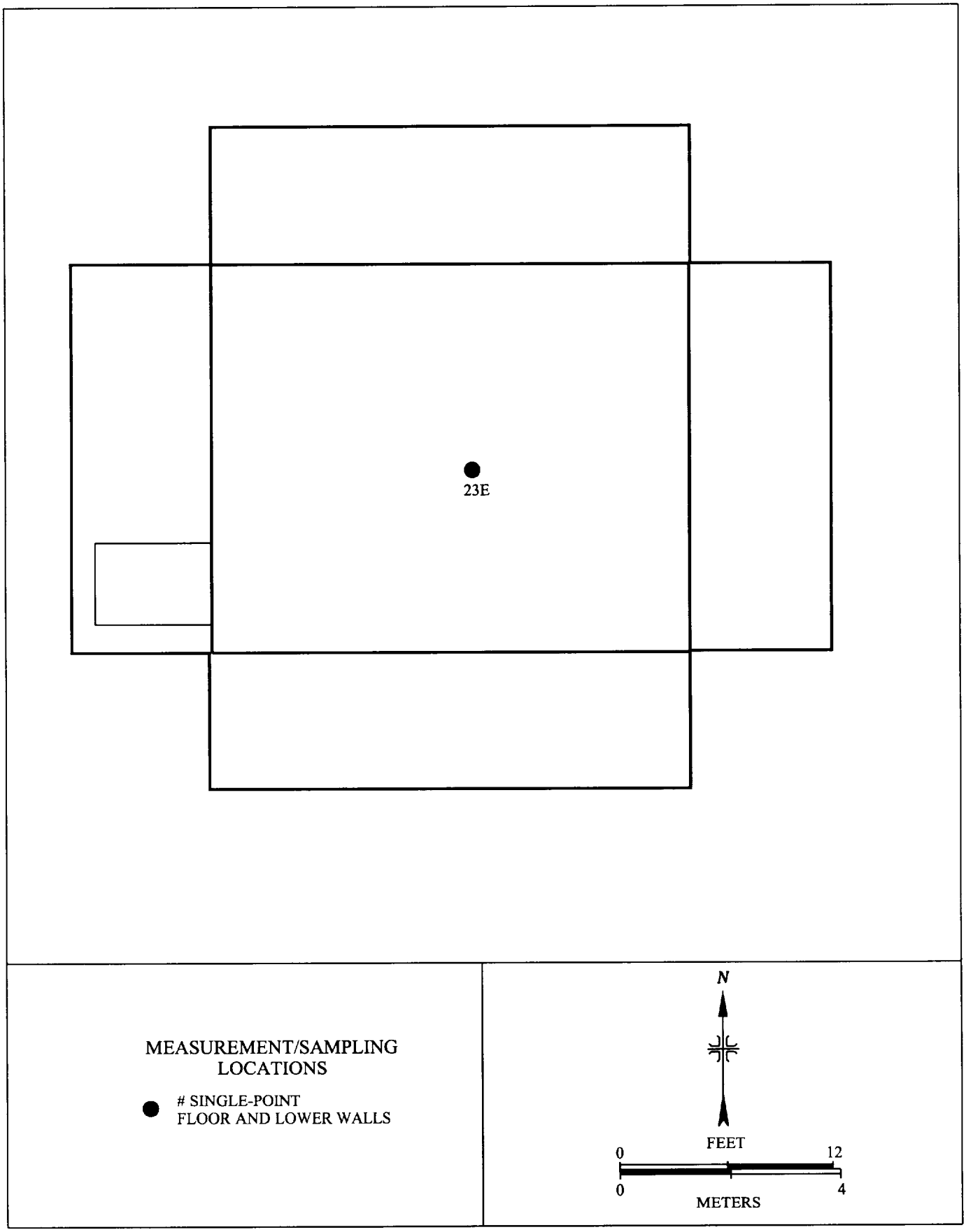


FIGURE 9: Building 2, Room G, 2nd Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

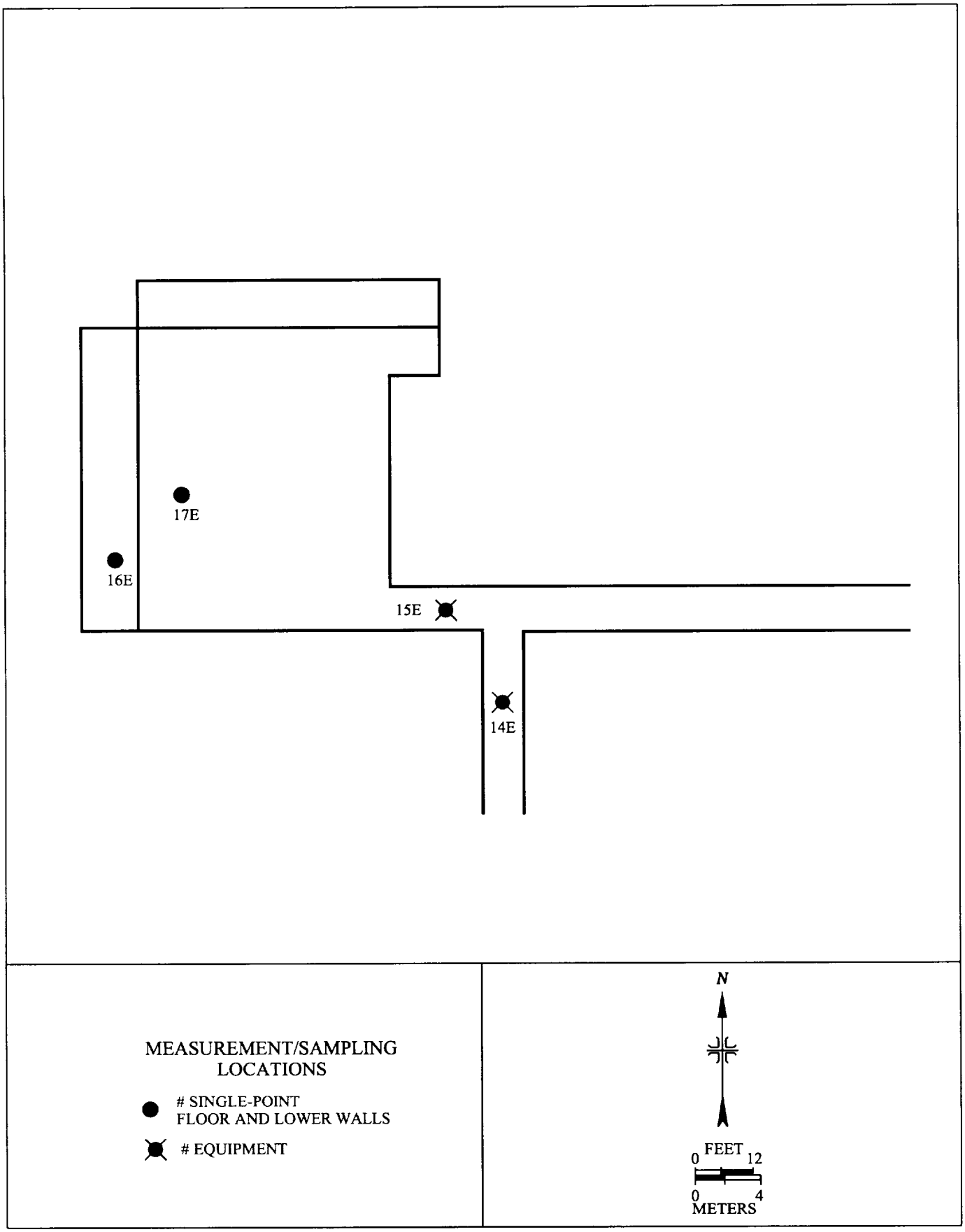


FIGURE 10: Building 2, 3rd Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

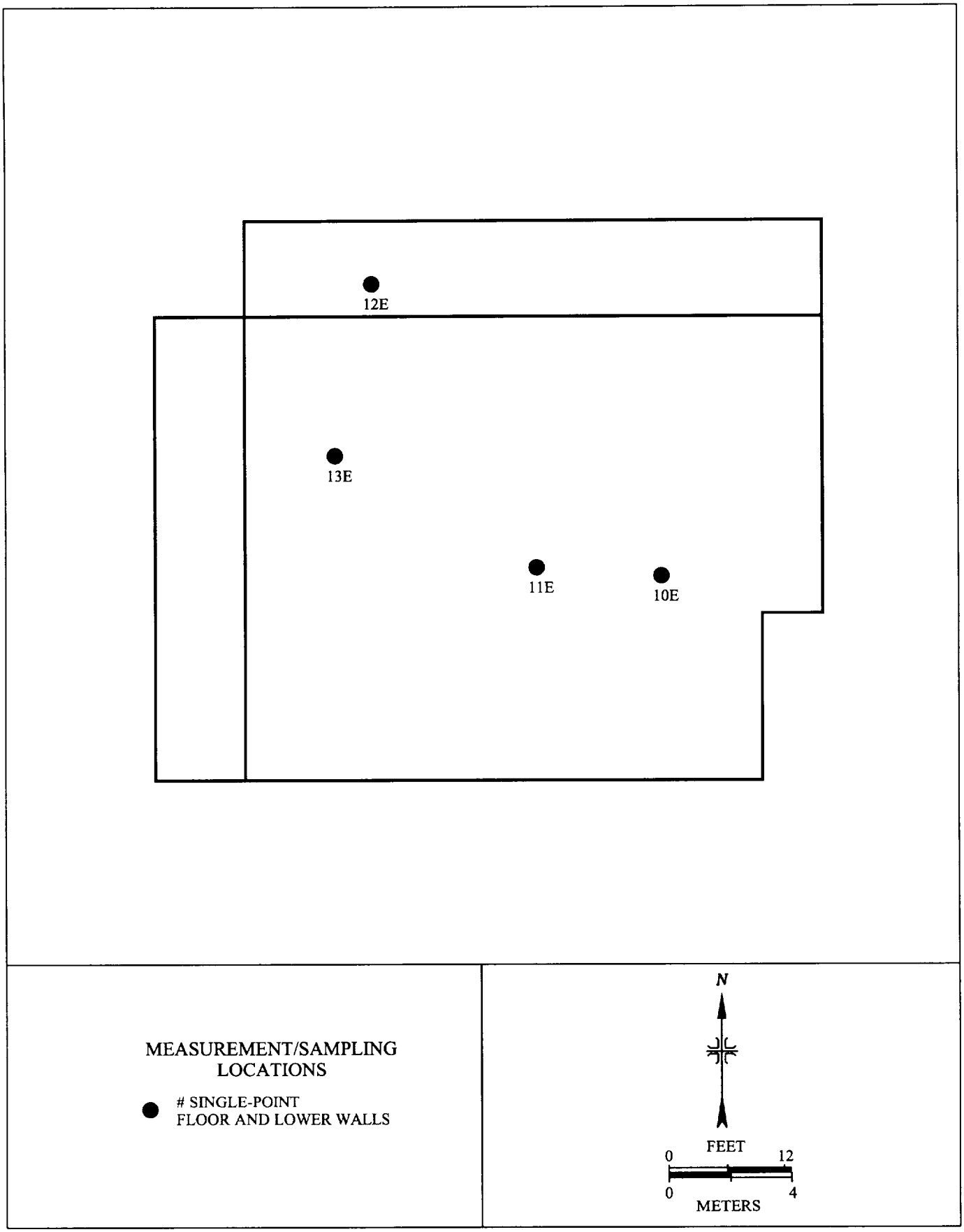


FIGURE 11: Building 2, 4th Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

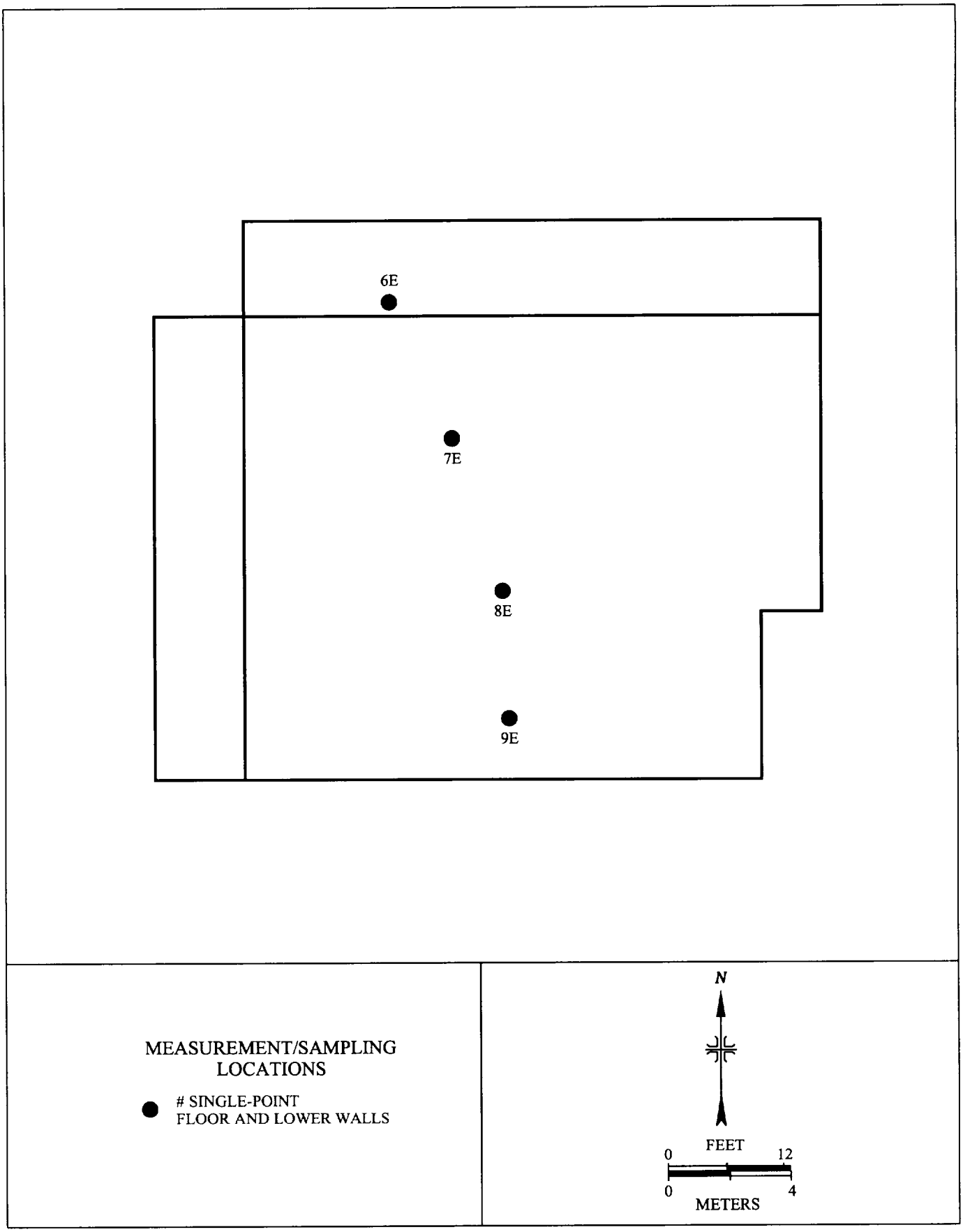


FIGURE 12: Building 2, 5th Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

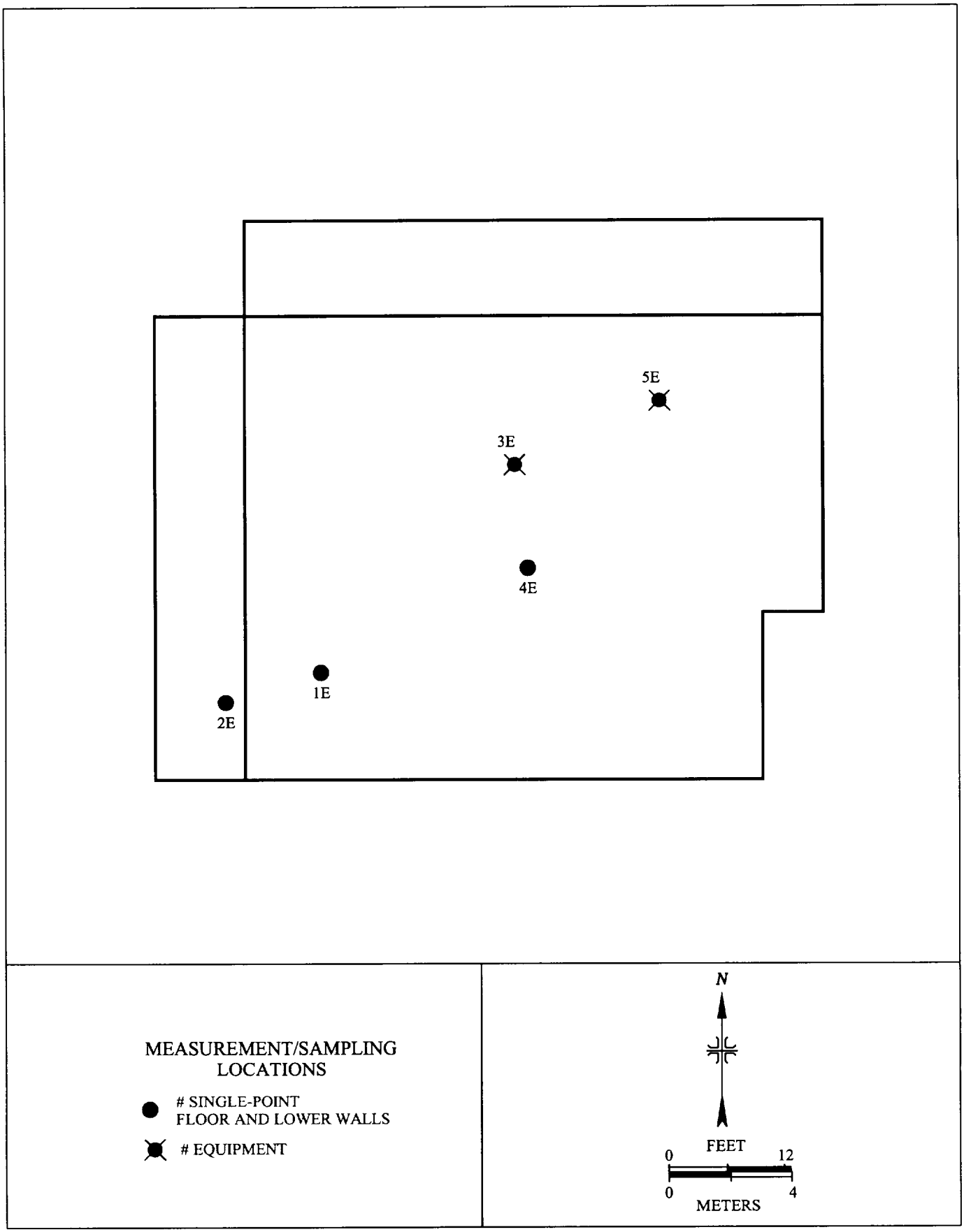


FIGURE 13: Building 2, 6th Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

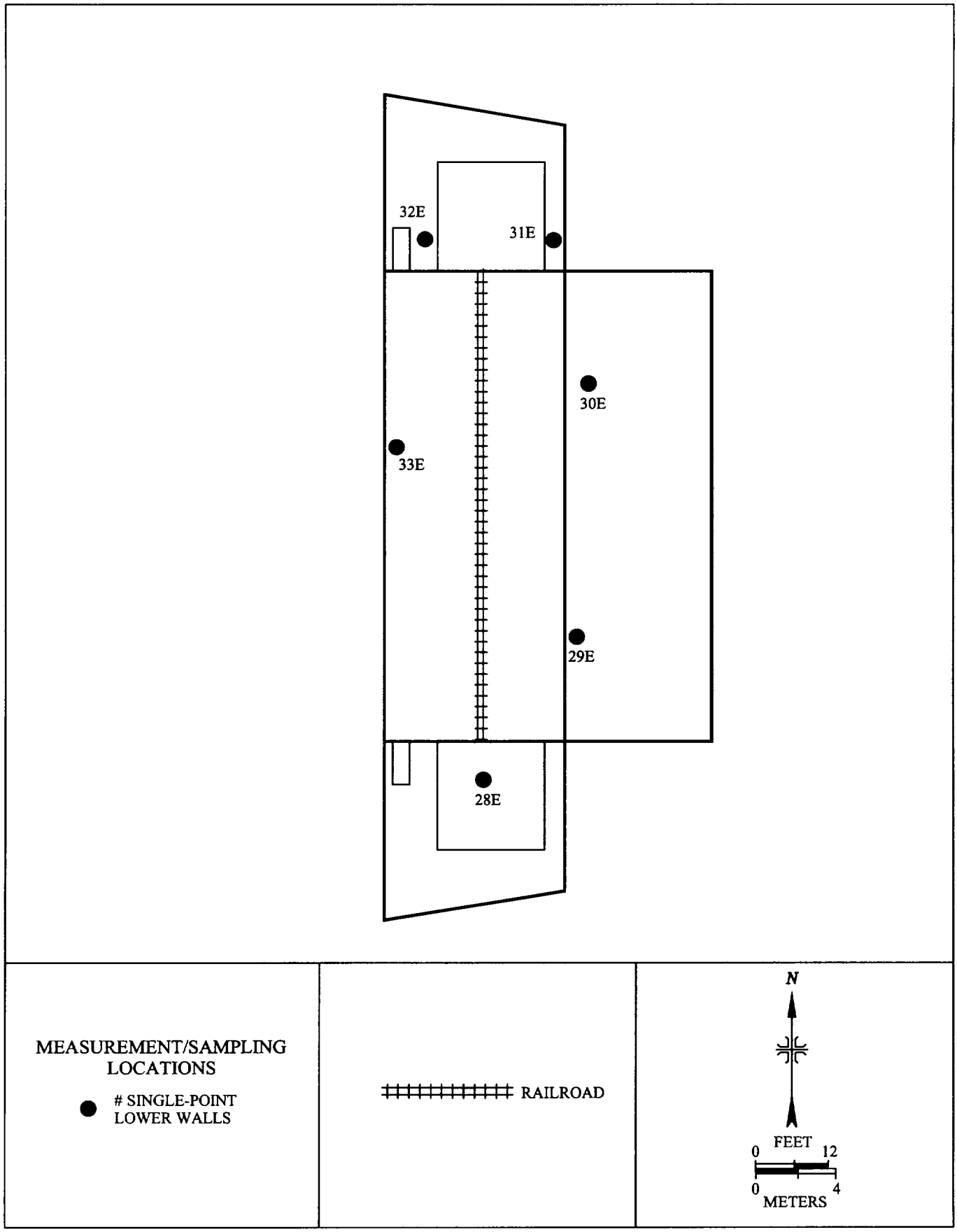


FIGURE 14: Building 2,Train Bay; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

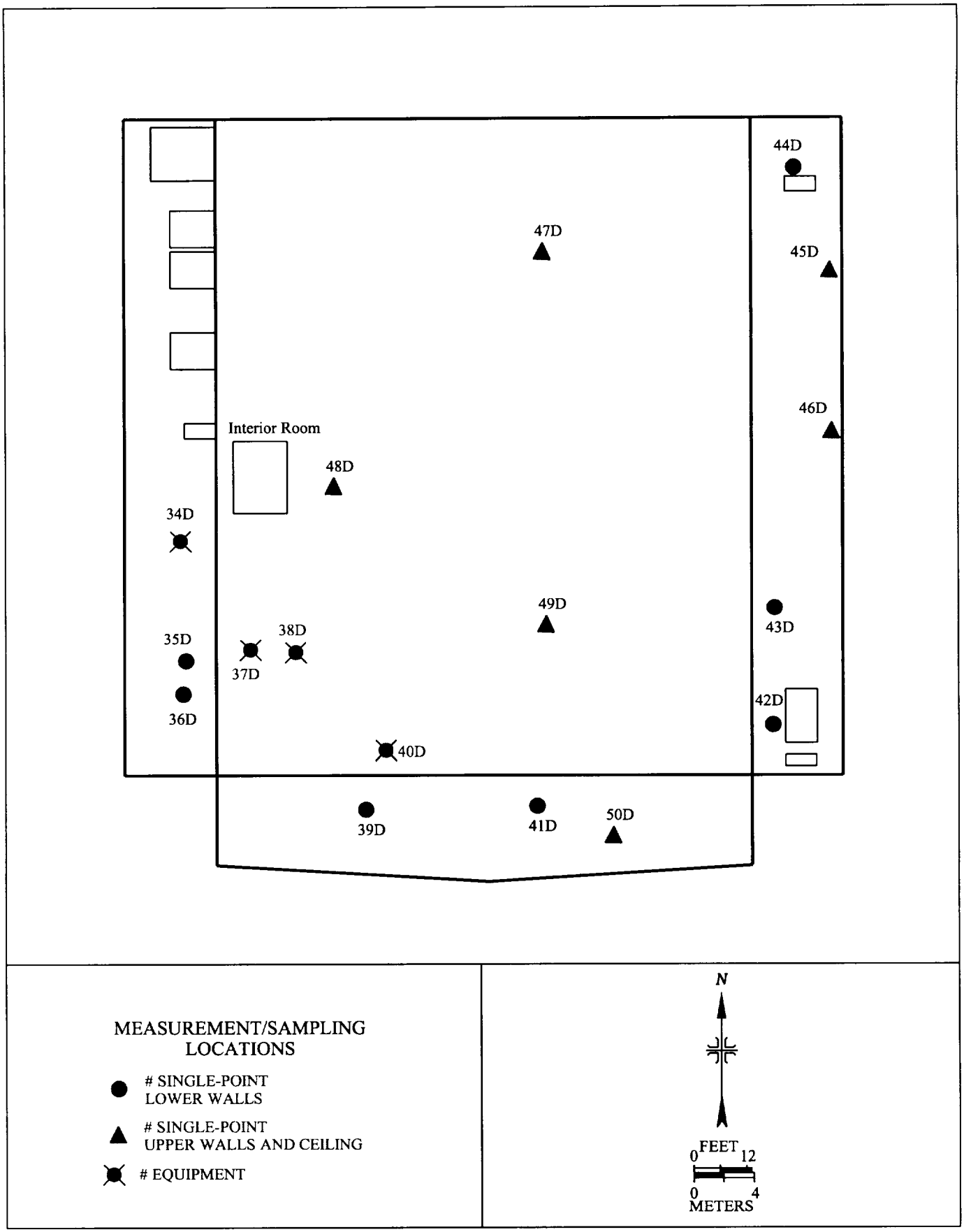
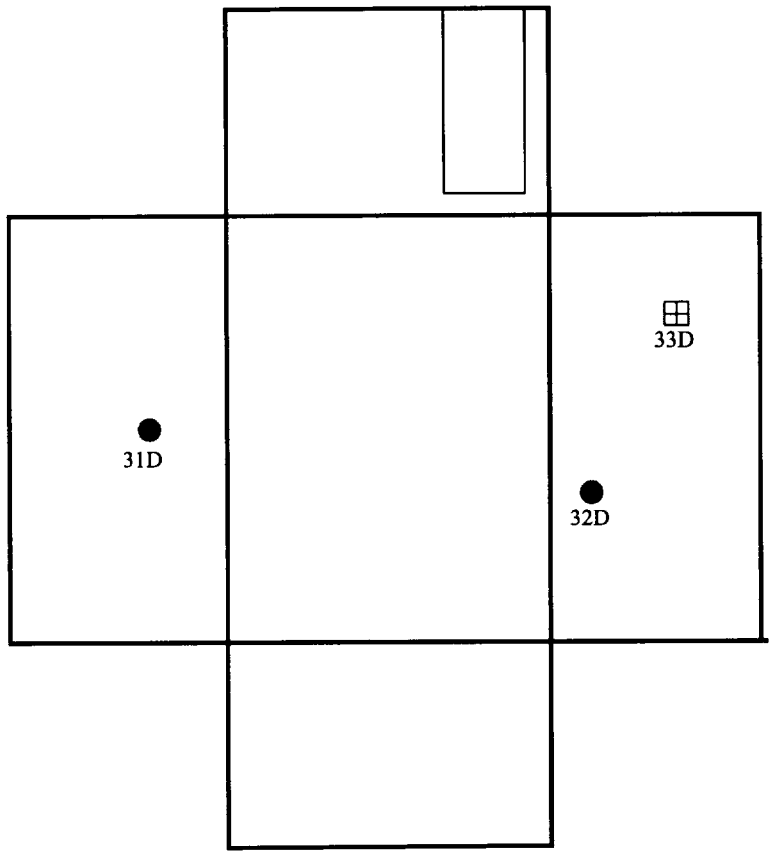


FIGURE 15: Building 2W; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS AND FLOOR

⊞ # EXTERIOR WALL

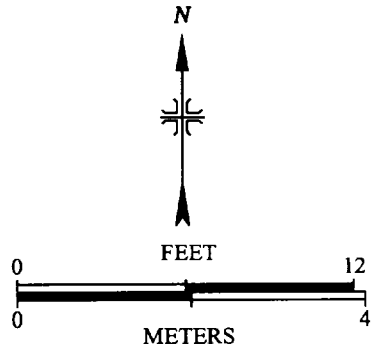


FIGURE 16: Building 2W, Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 2
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
First Floor				
34E	LW	87	0	-1
35E	E, Auger	110	1	-1
36E	LW	38	0	-3
37E	LW	57	0	3
38E	LW	-200	0	10
39E	LW	280	0	2
40E	LW	-160	0	4
41E	LW	140	1	2
42E	E, Fan Cover	94	3	-3
43E	LW	91	1	1
44E	LW	-83	0	-1

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 2
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
Second Floor				
18E	F	-200	0	-2
19E	F	30	1	3
20E	LW	370	3	1
21E	E	57	7	-2
22E	LW	-170	0	1
23E	F	-220	0	-5
24E	F	300	0	5
25E	LW	-140	3	1
26E	E, Conveyor Belt	45	0	3
27E	LW	-220	0	-1
Third Floor				
14E	E, Worm Trough	190	0	1
15E	E, Valve	-42	0	1

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 2
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
Third Floor (Continued)				
16E	LW	-60	0	4
17E	F	-30	0	1
Fourth Floor				
10E	F	140	0	4
11E	LW, I-beam	160	0	-1
12E	LW	-42	1	8
13E	F	23	0	-5
Fifth Floor				
6E	LW	-110	0	-2
7E	F	130	0	1
8E	LW	190	1	-4
9E	LW, I-beam	-23	1	4

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 2
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
Sixth Floor				
1E	F	1,300	7	-1
2E	LW	-210	0	-1
3E	E	-4	0	-1
4E	F	53	0	-1
5E	E, Cable Tray	160	0	-1
Train Bay				
28E	LW	0	0	5
29E	LW. I-beam	15	0	2
30E	LW	-180	0	-5
31E	LW, I-beam	-270	0	5
32E	LW	190	0	-1
33E	LW, Handrail	98	0	5

[a]Refer to Figures 2 through 14.
[b]F = floor; LW = lower wall; UW = upper wall; EW = exterior wall; and, E = equipment.

TABLE 2

SURFACE ACTIVITY LEVELS
BUILDING 2W
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
Interior Room				
31D	LW	-60	0	-3
32D	LW	94	0	2
33D	EW	-57	0	5
Main Room				
34D	E, Electrical Box	-160	0	-4
35D	LW	-150	0	-2
36D	LW	-60	0	2
37D	E, Baby Roaster	19	0	-3
38D	E, Hopper	160	1	8
39D	LW	-38	1	-3
40D	E, Spiral	34	1	3
41D	LW	-42	0	-4
42D	LW	-110	0	6

TABLE 2 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 2W
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)	Removable Activity (dpm/100 cm^2)	
			Alpha	Beta
Main Room (Continued)				
43D	LW	-100	0	2
44D	LW	0	0	-2
45D	UW	370	0	-3
46D	UW	160	0	1
47D	C	240	1	2
48D	C	210	0	4
49D	C	190	1	4
50D	UW	320	0	1

[a]Refer to Figures 15 and 16.
[b]LW = lower wall; UW = upper wall; EW = exterior wall; C = ceiling; and E = equipment.

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ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

July 16, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
Division of Waste Management
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDINGS 19, 21, AND 22, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility for Buildings 19, 21, and 22 during the period of May 20 through 22, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
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LETTER REPORT
CONFIRMATORY SURVEY OF BUILDINGS 19, 21, AND 22
MOLYCORP, INC., WASHINGTON FACILITY
WASHINGTON, PENNSYLVANIA
(DOCKET NO. 040-08778, RFTA NO. 02-007a)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the U.S. Nuclear Regulatory Commission (NRC) for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were

performed under the Decommissioning Plan for the Washington, PA facility which implemented final status survey (FSS) guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building as either radiologically affected or unaffected. With the exception of the Soil Sample Storage Room in Building 19 (classified as affected), there was no history of radiological materials present within these buildings, therefore, MACTEC initially classified the buildings as unaffected. However, during the initial FSS activities, localized elevated contamination was detected in multiple areas on the concrete floor and on several structural support components (purlins) within Buildings 21 and 22. Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, determined that the elevated activity was fixed into the concrete and required removal of those portions of the concrete. The radioactivity identified on the purlins was also determined to be fixed contamination. Therefore, the classification for Buildings 21 and 22 was changed from unaffected to affected and MACTEC personnel performed affected FSS activities within the building (MACTEC 2002a).

MACTEC personnel remediated the concrete floor and the FSS data indicated that the remediation efforts were successful in removing the contamination (MACTEC 2002a). The structural integrity of the building was then evaluated and it was determined that the purlins should remain in place until building demolition—areas identified as being contaminated were marked with a bright flourescent paint and recorded in a logbook.

The NRC's Division of Waste Management requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington facility for which the licensee and MACTEC have prepared FSS reports.

SITE DESCRIPTION

The Molycorp, Inc., Washington site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometer (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002b).

Buildings 19, 21 and 22 are located near the center of the site. These buildings are also co-joined—sharing several walls between them (Figure 1).

Building 19, a two-story building with machine shops and open bays on the first floor (Figure 2), and office, conference, and rest rooms on the second floor (Figure 3), is approximately 30 meters (m) long by 12 m wide with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from east to west and has large roll top doors on the south side of the first floor and personnel doors on all sides (Figure 2).

The Building 19 Soil Sample Storage Room is 4.5 m long by 4 m wide with a concrete floor, sheetrock and wood panel walls, and a styrofoam drop ceiling—there is a door on the north wall (Figure 4). When MACTEC performed their FSS activities on this room, the floor measurements were performed on floor tiles. However, during the asbestos remediation activities, which was prior to the confirmatory survey activities, the floor tiles had been removed.

Building 21 is 30 m long by 15 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has large roll top doors on the north and east walls and personnel doors

on the east and south walls (Figure 5). Two rooms---the North West and South West Rooms—are exterior to the main floor of Building 21 (Figure 6).

Building 22 is 30 m long by 15 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has large roll top doors on the north, east and west walls and personnel doors on the east, south, and west walls (Figure 7). There are several rooms located along the north wall and on the north mezzanine and a boiler room is located along the south wall under the south mezzanine (Figures 7 through 12).

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002b). The licensee's FSS results for Buildings 19, 21 and 22 were provided for review prior to ESSAP's confirmatory survey activities (MACTEC 2002a).

SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Buildings 19, 21 and 22 at the Molycorp, Washington facility during the period of May 20 through 22, 2002. ESSAP' survey coverage was determined by MACTEC's radiological classification of the buildings—Building 19, with the exception of the Soil Sample Storage Room was classified as unaffected. Buildings 21 and 22 and the Building 19 Soil Sample Storage Room were classified as affected. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2002b).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP performed alpha plus beta activity surface scans on accessible structural components within each of the three buildings. Based on an agreement with the licensee and NRC, it was decided that the ground floors would be considered a separate survey unit from the building shells and were excluded from survey activities at this time. Scan coverage was approximately 100% for the second floor area, 50% for the lower walls, and less than 5% for the upper walls and ceilings. Additionally, gamma surface scans covering approximately 100% of the floor area were performed on the second floor of Building 19. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

Building 19

Beta surface activity measurements were performed at 15 locations on the lower walls of the first floor; alpha surface activity measurements were performed at eight of these locations. For the second floor, beta surface activity measurements were performed at 22 locations that included lower and upper walls and floors—alpha surface activity measurements were performed at 19 of these locations. Alpha and beta surface activity measurements were performed at four locations on the exterior walls. Six beta and four alpha surface activity measurements were performed on the floor, upper and lower walls, and the ceiling in the Soil Sample Storage Room. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figures 2 through 4.

Because the original tile floor within the Sample Storage Room had been removed during the asbestos remediation activities, ESSAP requested that MACTEC perform additional FSS activities on the remaining concrete floor and that the data be provided for review.

Building 21

Twenty-three beta and seven alpha surface activity measurements were performed in Building 21 on surfaces that included lower, upper and exterior walls, ceiling, and equipment surfaces. Alpha and beta surface activity measurements were performed at two lower wall locations in both the North West and South West Rooms and one exterior wall location on the South West Room. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figures 5 and 6.

Building 22

Twenty-five beta and six alpha surface activity measurements were performed in Building 22 on surfaces that included lower and upper walls, mezzanine floors, ceiling, and equipment surfaces. Exterior wall measurements were not performed due to demolition activities in the vicinity of the building. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figures 7 through 12.

EXPOSURE RATE MEASUREMENTS

Exposure rate measurements were performed at six locations on the second floor of Building 19 (Figures 3 and 4). The measurements were performed at one meter above the surface using a microrem meter.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002c). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Exposure rates were reported in units of microroentgens per hour (μR/h).

The survey results were interpreted and compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u>

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

<u>Natural Uranium</u>

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous,

and/or dirty surfaces. For the thorium series in secular equilibrium, the beta activity level corresponding to 1,000 alpha dpm/100 cm^2 is 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2,000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

The NRC guideline for exposure rates at one meter above building surfaces is 5 μR/h above background (NRC 1991).

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Buildings 19, 21 and 22. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns included:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS, SURFACE ACTIVITY LEVELS AND EXPOSURE RATES

Building 19

Alpha plus beta surface scans of the building structural component surfaces identified an area of elevated beta radiation on the lower wall, and on the floor of the second floor and on the ceiling near a vent in the Soil Sample Storage Room; these areas were marked for further investigation. Total and removable surface activity levels for Building 19 are presented in Table 1. Alpha surface activity levels ranged from -16 to 62 dpm/100 cm^2 and beta surface activity levels, excluding the elevated areas identified during surface scans, ranged from -570 to 300 dpm/100 cm^2. The three elevated activity locations previously mentioned had beta activity levels of

670, 740, and 690 dpm/100 cm^2, respectively. Cursory scans in the areas immediately adjacent to the locations on the lower wall, and ceiling did not indicate any elevated activity within the contiguous 1 m^2 areas. Cursory scans on the tile floor in the rest room indicated that the elevated activity was distributed throughout the tile and attributed to the naturally occurring radioactive material (NORM) within the tile. Removable activity levels ranged from 0 to 3 dpm/100 cm^2 for alpha and -4 to 9 dpm/100 cm^2 for beta.

Site background exposure rates, performed during a previous survey trip, averaged 10 μR/h. Exposure rate measurements for the second floor, presented in Table 2, ranged from 9 to 11 μR/h.

Building 21

Alpha plus beta surface scans of the building structural component surfaces identified an area of elevated beta radiation on a crane support beam; this area was marked for further investigation. Total and removable surface activity levels for Building 21 are presented in Table 3. Alpha surface activity levels, excluding the elevated location, ranged from -9 to 35 dpm/100 cm^2 and beta surface activity levels ranged from -250 to 590 dpm/100 cm^2. The elevated activity location had a beta activity level of 710 dpm/100 cm^2. Cursory scans in the area immediately adjacent to this location did not indicate any elevated activity within the contiguous 1 m^2 area. Removable activity levels ranged from 0 to 3 dpm/100 cm^2 for alpha and -3 to 6 dpm/100 cm^2 for beta.

Building 22

Alpha plus beta surface scans of the building structural components surfaces identified an area of elevated beta radiation on the lower south wall in Room F at measurement location 79C, on a raised floor platform in Room G at measurement locations 90C and 91C, and, on the wood floor at measurement location 99C in the south mezzanine (Figures 7, 11 and 12). These areas were marked for further investigation. Total and removable surface activity levels for Building 22 are presented in Table 4. Alpha surface activity levels ranged from -16 to 87 dpm/100 cm^2; with the exception of the elevated activity locations mentioned above, beta surface activity levels ranged from -340 to 510 dpm/100 cm^2. The four elevated activity locations previously mentioned had beta

activity levels ranging from 730 to 3,900 dpm/100 cm^2. Cursory scans in the area immediately adjacent to location 99C did not indicate any elevated activity within the contiguous 1 m^2 area. Measurement location 79C was near a portion of the south wall in Room F that MACTEC personnel had previously marked as contaminated; the contaminated boundary was extended to include this measurement location. MACTEC personnel performed additional remedial activities on the raised metal floor in Room G (measurement locations 90C and 91C); however, their efforts were not able to remediate this area below guidelines and this area was subsequently marked as contaminated for disposal as low-level waste. Removable activity levels ranged from 0 to 3 dpm/100 cm^2 for alpha and -6 to 14 dpm/100 cm^2 for beta.

COMPARISON OF RESULTS WITH GUIDELINES

Three of the 47 measurement locations in Building 19 had total beta activity levels in excess of the average guideline; none exceeded the maximum guideline, and one was considered NORM related. For Building 21, one of the 28 measurement locations had a total beta activity level in excess of the average guideline but was less than the maximum guideline. Four of the 25 measurement locations within Building 22 had total beta activity levels in excess of the average guideline; of those four, two exceeded the maximum guideline. For measurement locations in Building 19 (locations 31C and 45C), Building 21 (location 73C), and Building 22 (location 99C) that exceeded the average but not the maximum guideline, cursory beta scans of the vicinity did not indicate any additional elevated activity within the contiguous 1 m^2 area (therefore meeting the averaging criteria). The remaining measurement locations in Building 22 (76C, 90C, and 91C) that exceeded the average and/or maximum guidelines were marked for segregation as low-level waste by MACTEC personnel.

SUMMARY

During the period of May 20 through 22, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Buildings 19, 21, and 22 at the Molycorp, Inc. Washington facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and exposure rate measurements.

MACTEC's final status survey activities had identified several areas that did not meet the NRC guidelines for release for unrestricted use. For these areas, MACTEC decided that those areas/items would be marked for disposal as low-level waste and each item marked was recorded in a MACTEC site logbook.

ESSAP's confirmatory survey activities identified several unmarked areas of elevated beta surface activity that were in excess of average and/or maximum surface activity guidelines. MACTEC personnel subsequently performed additional surveys and/or remediation of identified areas and marked those contaminated structural components for disposition as low-level waste. ESSAP personnel walked through the building to visually inspect that all such surfaces had been identified and marked accordingly.

Based on the confirmatory survey results, it is ESSAP's opinion that fixed and removable activity levels, other than those areas marked for disposal as low-level waste, meet the NRC guidelines for release for unrestricted use. All exposure rate measurements were within the guideline. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Buildings 19, 21 and 22 satisfy the NRC guidelines for release to unrestricted use. This report does not address the upper concrete ground floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.

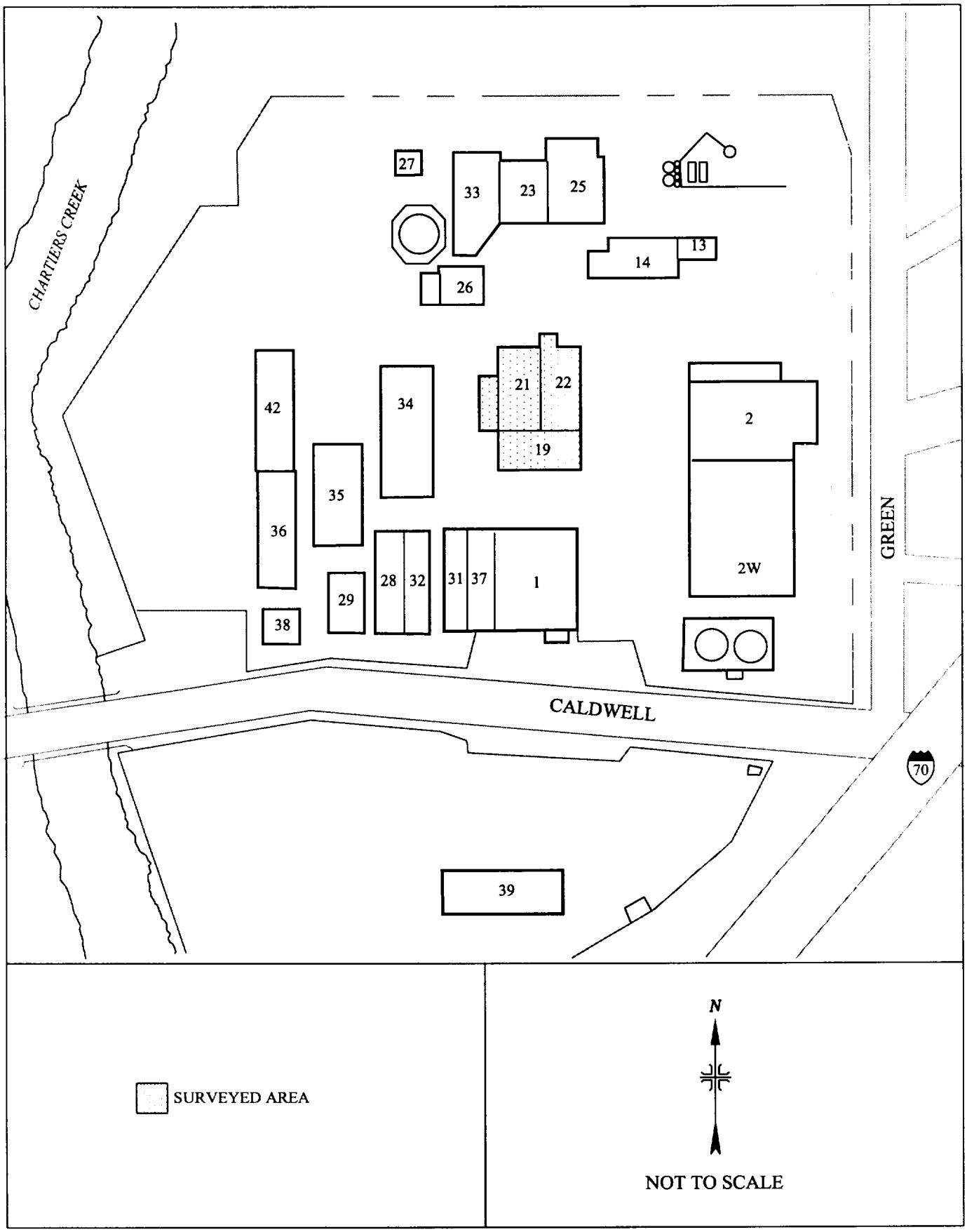


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

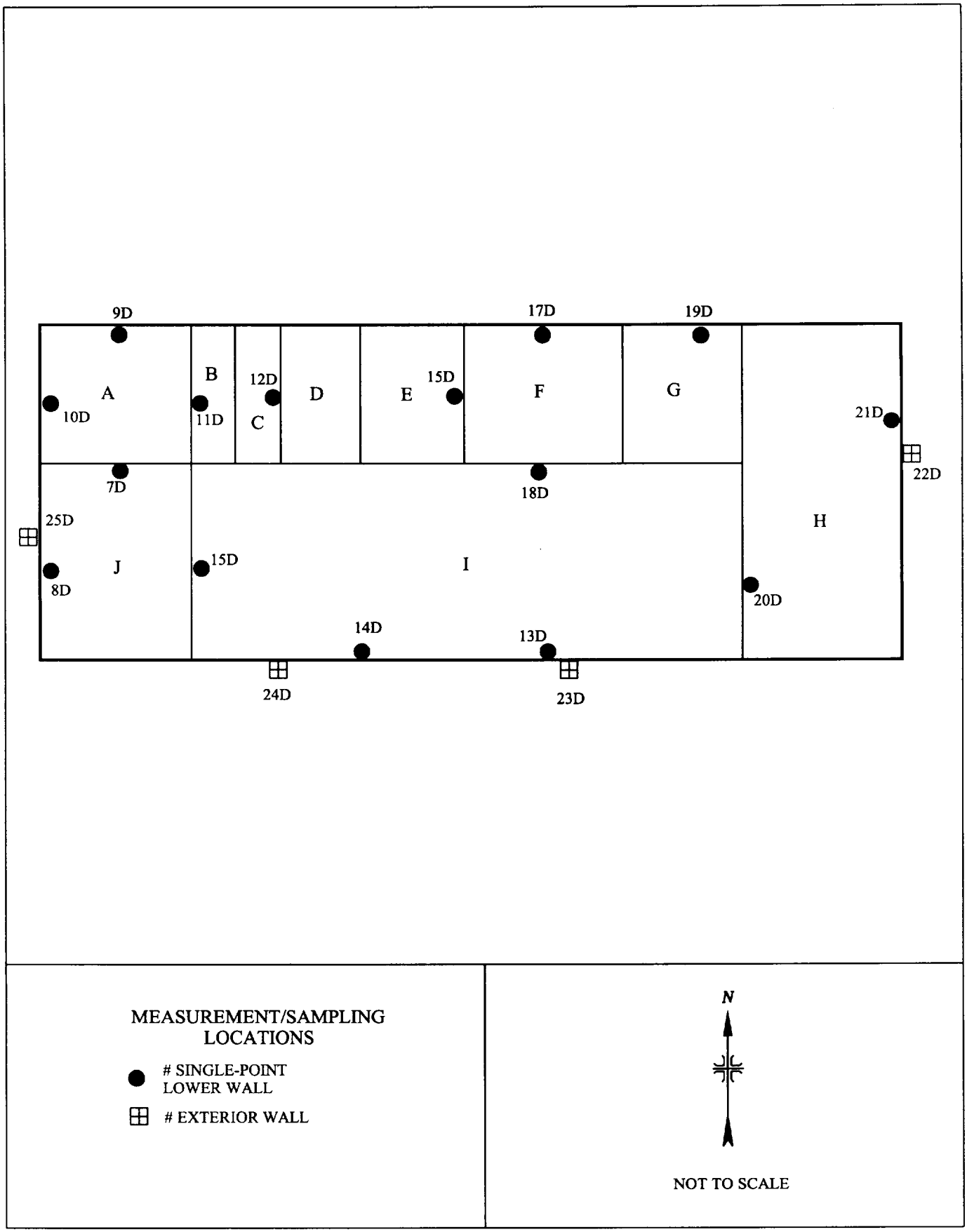
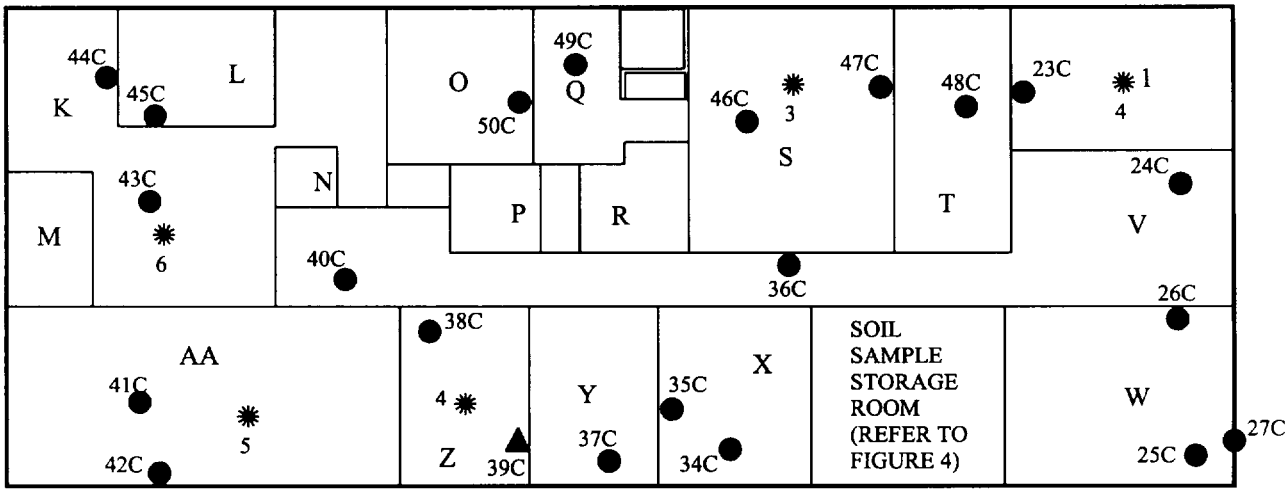


FIGURE 2: Building 19, First Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



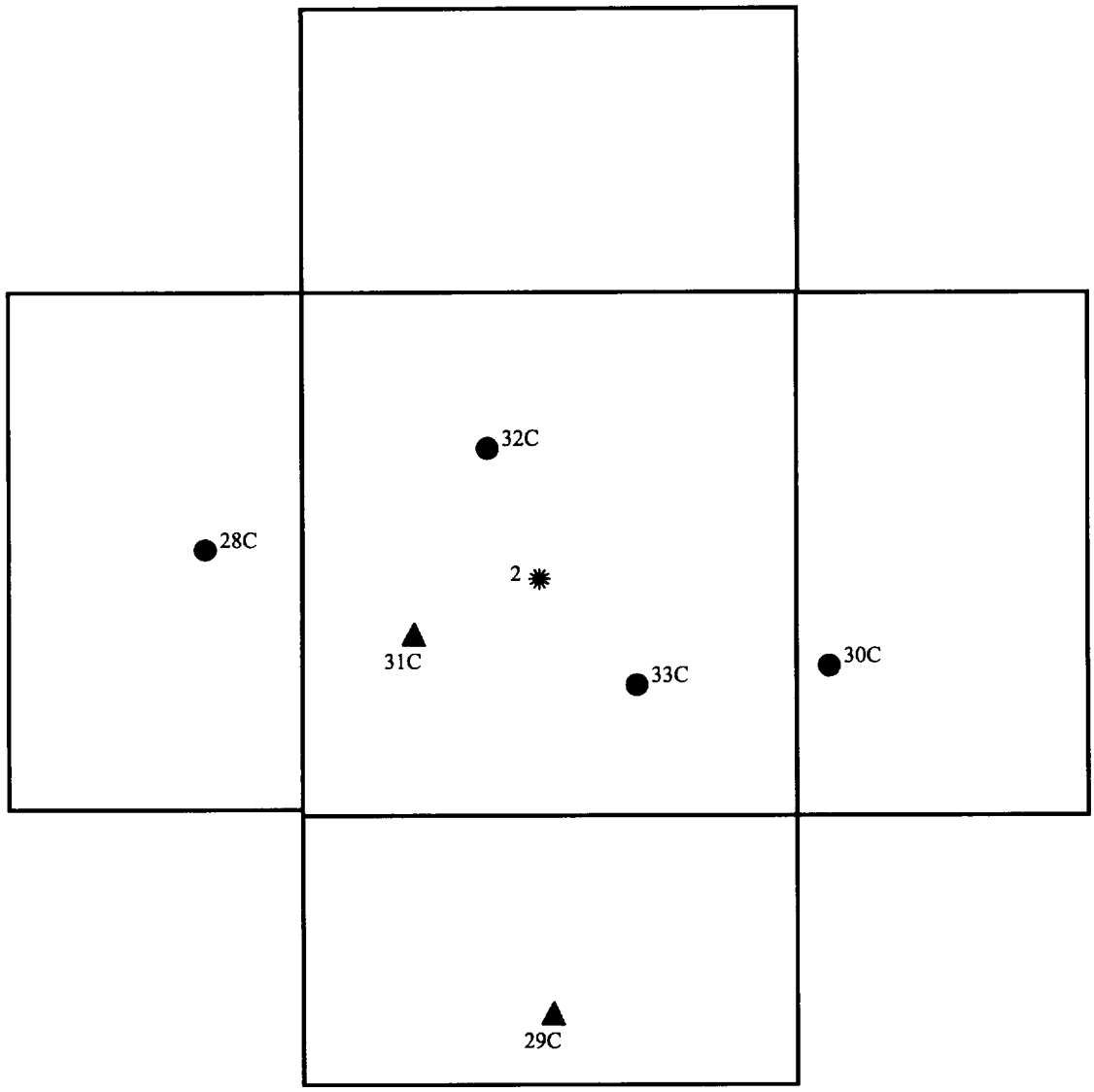
MEASUREMENT/SAMPLING LOCATIONS

- ● # SINGLE-POINT LOWER WALLS AND FLOOR
- ✸ # EXPOSURE RATE
- ▲ # SINGLE-POINT UPPER WALLS AND CEILING

N

NOT TO SCALE

FIGURE 3: Building 19, Second Floor; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

- # SINGLE-POINT LOWER WALLS AND FLOOR
- # EXPOSURE RATE
- # SINGLE-POINT UPPER WALLS AND CEILING

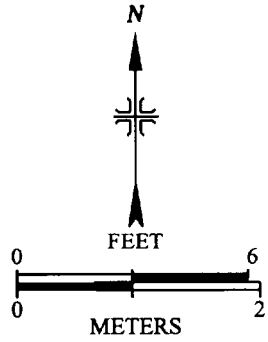
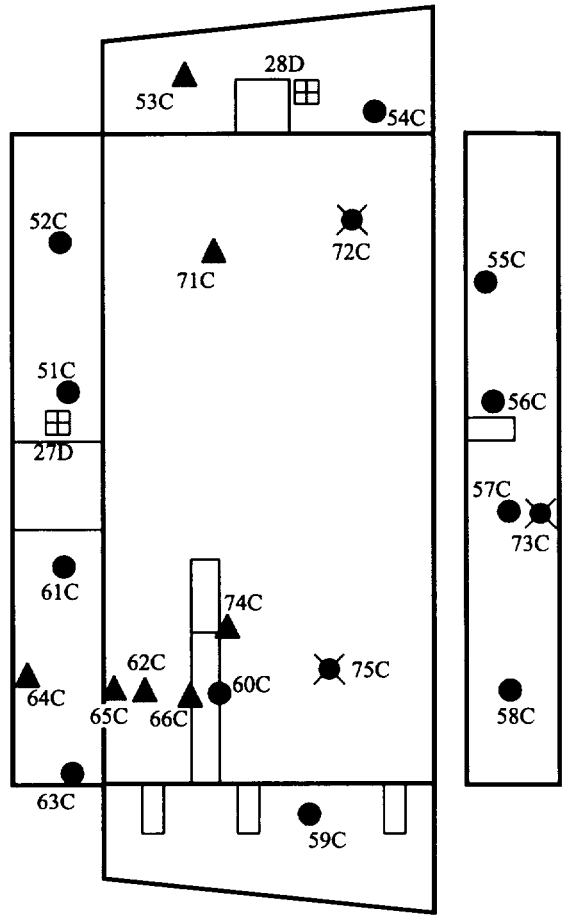


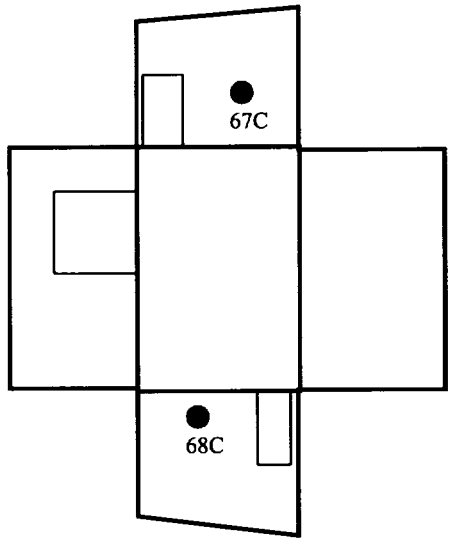
FIGURE 4: Building 19, Soil Sample Storage Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



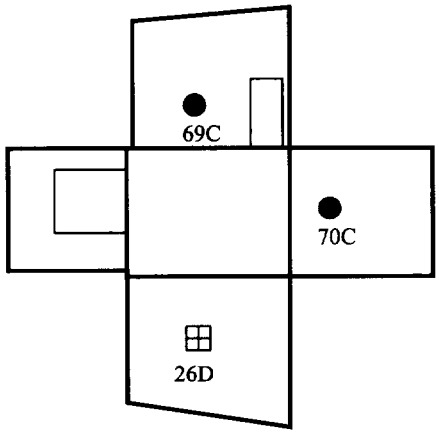
MEASUREMENT/SAMPLING LOCATIONS

- # SINGLE-POINT LOWER WALLS AND FLOOR
- # SINGLE-POINT UPPER WALLS AND CEILING
- # EQUIPMENT
- # EXTERIOR WALL

FIGURE 5: Building 21; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



NORTH WEST ROOM



SOUTH WEST ROOM

MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS

⊞ # EXTERIOR WALL

FIGURE 6: Building 21, North West & South West Rooms; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

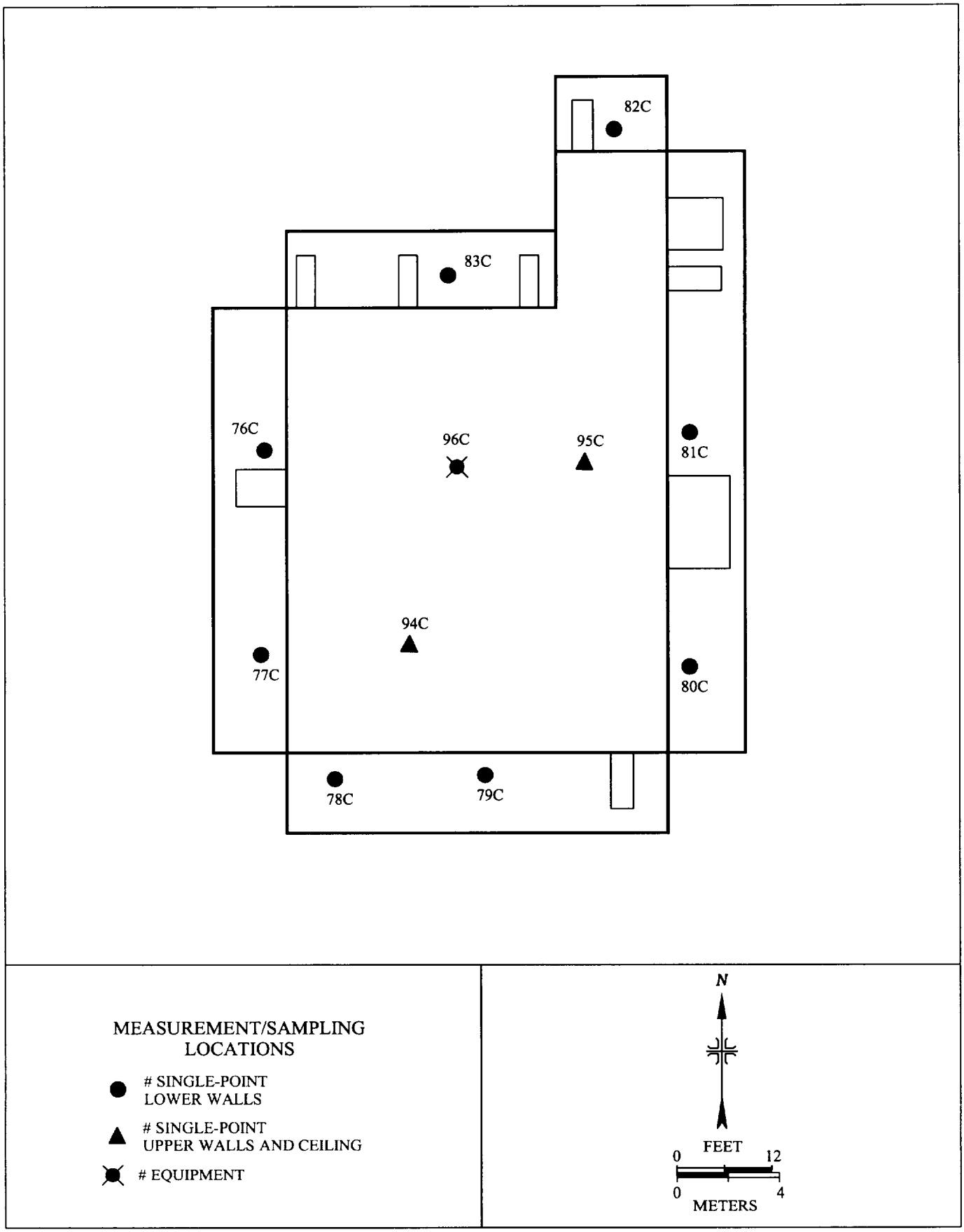


FIGURE 7: Building 22, Room F; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

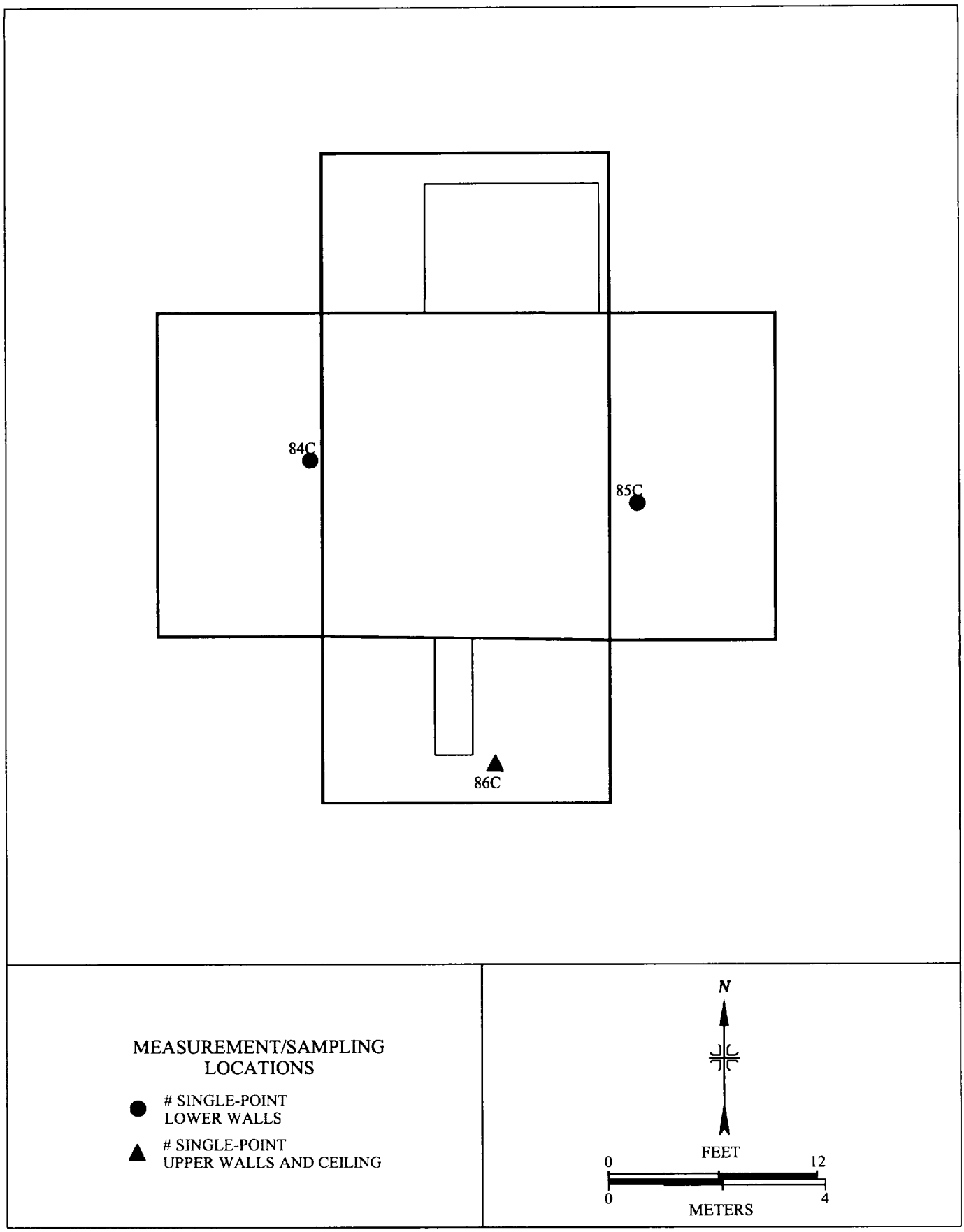


FIGURE 8: Building 22, Room B; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

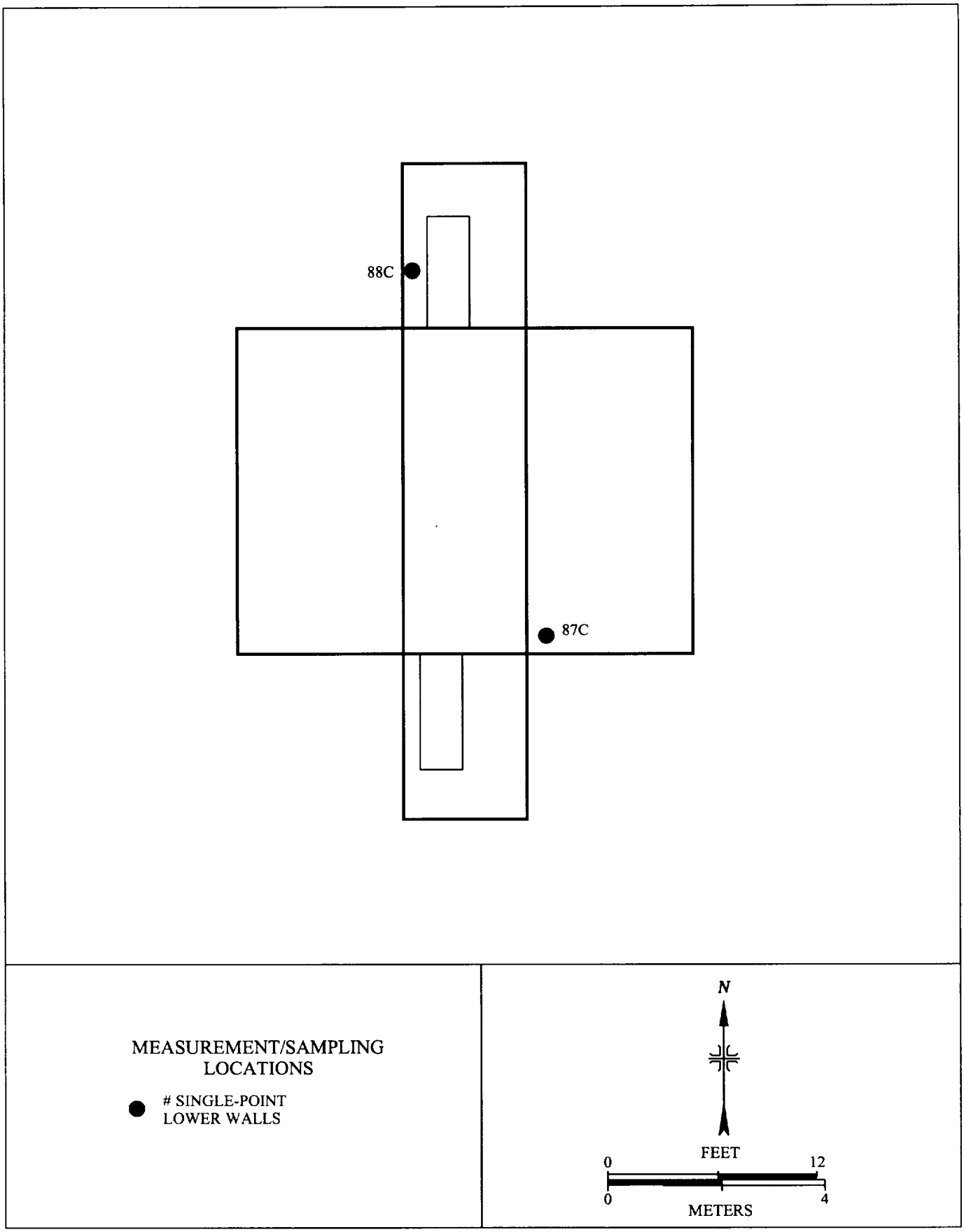
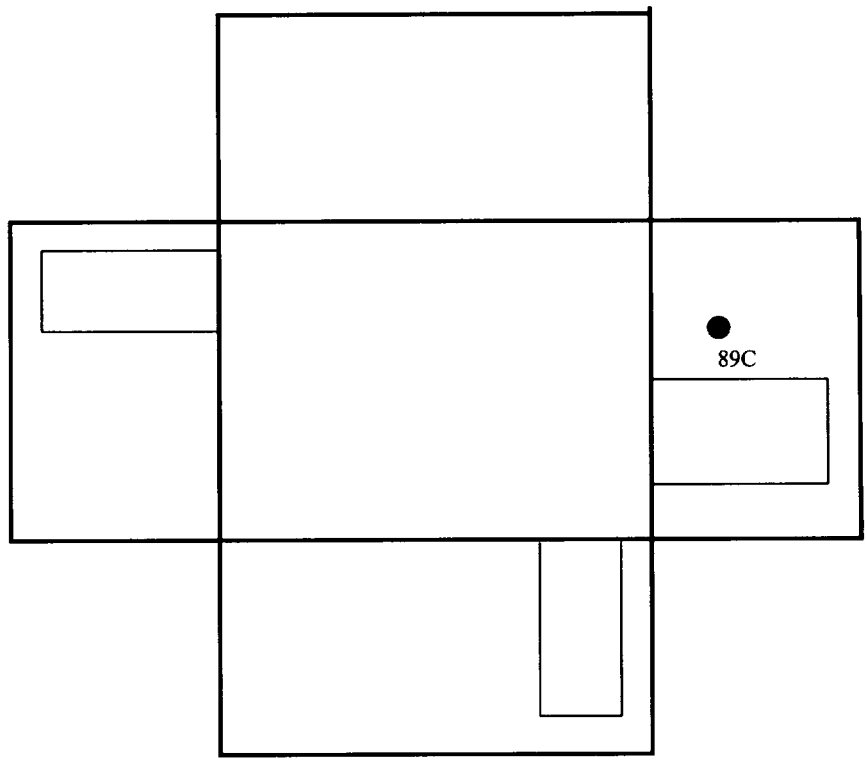


FIGURE 9: Building 22, Room A; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations



MEASUREMENT/SAMPLING LOCATIONS

● # SINGLE-POINT LOWER WALLS

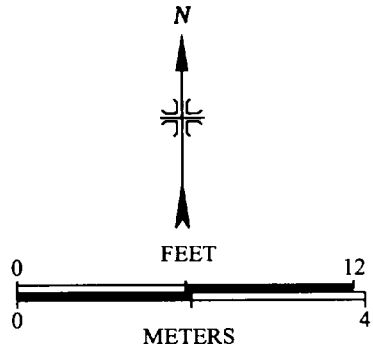


FIGURE 10: Building 22, Boiler Room , 2nd Floor Interior Room; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

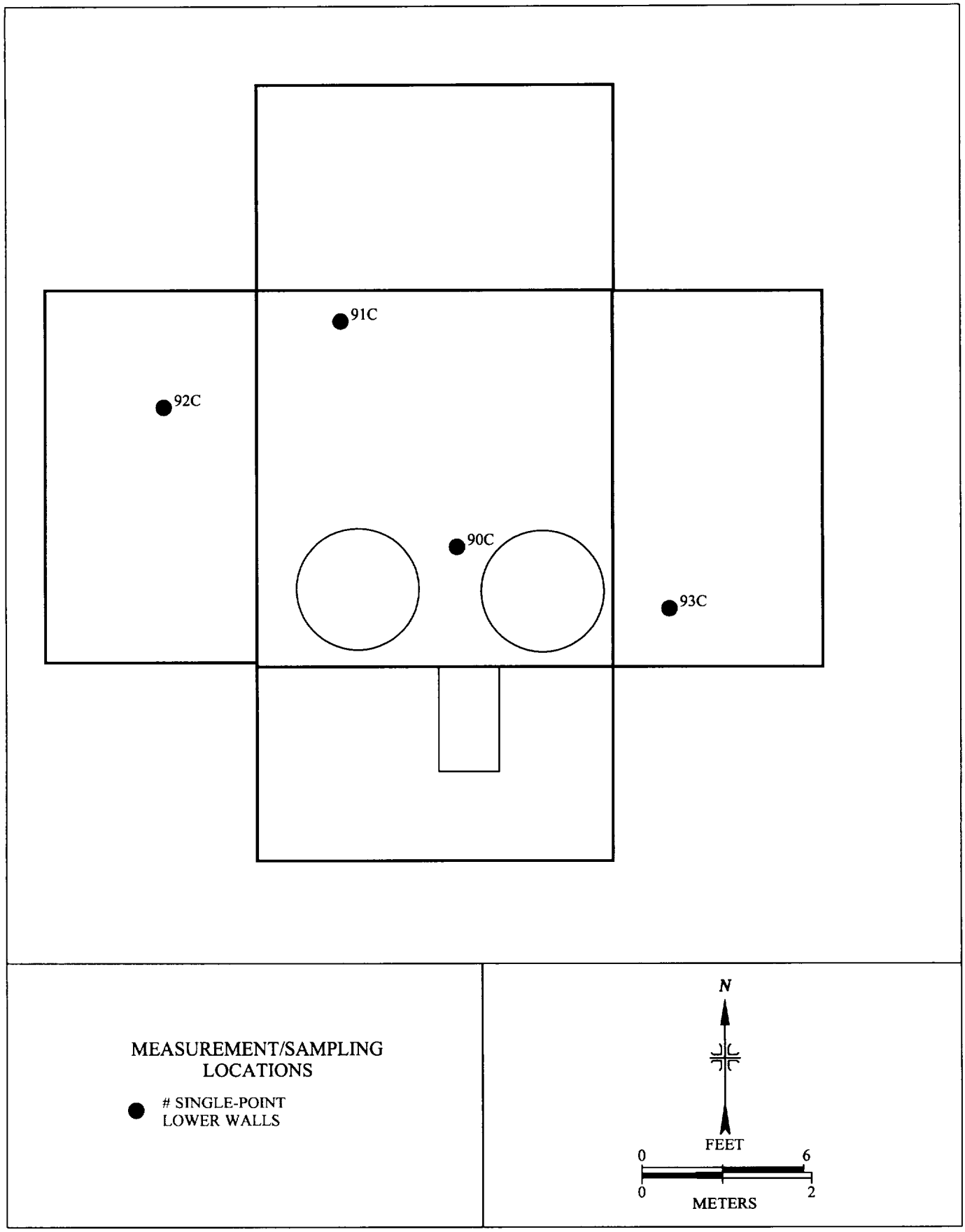


FIGURE 11: Building 22, Room G; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

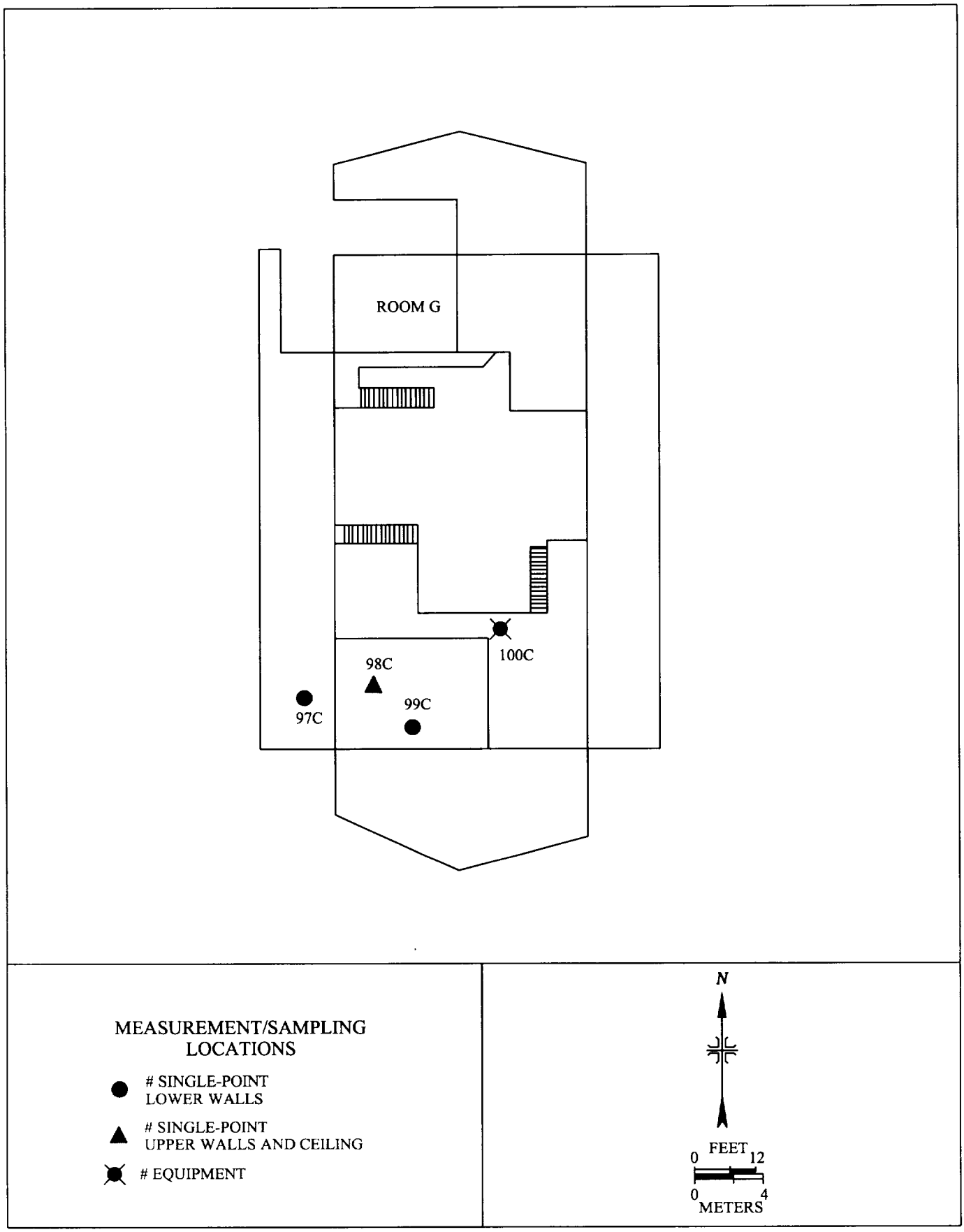


FIGURE 12: Building 22, South Mezzanine; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 19
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
First Floor					
7D	LW	---[d]	-480[c]	0	-1
8D	LW	---	-310	0	-1
9D	LW	---	-34	0	2
10D	LW	---	-57	0	1
11D	LW	---	-11	0	-4
12D	LW	---	83	2	-3
13D	LW	---	68	0	-2
14D	LW	-8	-190	0	2
15D	LW	0	-140	0	-4
16D	LW	-16	170	0	-3
17D	LW	-8	-310	0	-3
18D	LW	-8	-60	0	2
19D	LW	0	210	0	2

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 19
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
First Floor (Continued)					
20D	LW	8	-8	0	-2
21D	LW	8	-94	1	-1
Second Floor					
23C	LW	---	140	0	1
24C	F	35	-38	0	-4
25C	F	44	53	0	-1
26C	LW	18	110	0	-2
27C	LW	26	-570	1	-3
34C	F	-9	-26	0	-2
35C	LW	18	110	0	-3
36C	LW	---	130	0	5
37C	F	62	23	3	-1

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 19
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Second Floor (Continued)					
38C	F	26	-57	1	9
39C	UW	18	8	0	1
40C	F	18	120	0	1
41C	F	53	76	0	-2
42C	LW	26	38	1	3
43C	F	35	740[d]	0	-3
44C	LW	0	130	0	4
45C	LW	---	670	0	-1
46C	F	9	-38	0	-4
47C	LW	18	53	1	-1
48C	F	18	8	1	-3
49C	F	44	100	3	6
50C	LW	-9	300	1	1

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 19
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Second Floor Sample Storage Room					
28C	LW	9	-11	1	-1
29C	UW	---	280	0	1
30C	LW	-9	23	0	4
31C	C	---	690	1	-2
32C	F	26	-15	1	-2
33C	F	62	-60	0	5
Exterior Walls					
22D	EW	8	53	0	-4
23D	EW	24	-94	0	-2
24D	EW	48	23	0	-2
25D	EW	32	26	1	4

[a]Refer to Figures 2 -4.
[b]F = floor; LW = lower wall; UW = upper wall; EW = exterior wall; and C = ceiling.
[c]Measurement not performed.
[d]This measurement location was on a tile floor in the restroom. The elevated activity is a component of the naturally occurring radioactive material within the tile.

TABLE 2

EXPOSURE RATES
BUILDING 19, SECOND FLOOR
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Exposure Rate @ 1m (μR/h)
1	10
2	10
3	10
4	9
5	10
6	11

[a]Refer to Figures 3 and 4.

TABLE 3

SURFACE ACTIVITY LEVELS
BUILDING 21
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Main Room					
51C	LW	35	250	0	4
52C	LW	26	350	1	-3
53C	UW	18	440	0	3
54C	LW	-9	-53	0	2
55C	LW	---[c]	98	0	3
56C	LW, I-beam	---	30	0	-2
57C	LW	---	79	0	-1
58C	LW, I-beam	---	87	0	-3
59C	LW	35	-4	0	-2
60C	LW	18	130	0	-1
61C	LW	---	230	3	2
62C	UW, I-beam	---	0	0	3

TABLE 3 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 21
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Main Room (Continued)					
63C	LW	---	500	0	-1
64C	UW	---	220	3	-1
65C	C, I-beam	---	590	0	-3
66C	UW	---	23	1	-1
71C	C, I-beam	---	45	0	-3
72C	E, Light	---	380	1	2
73C	E, Crane	---	710	1	3
74C	C, I-beam	---	-4	1	2
75C	E, Crane	---	240	0	6
Exterior Walls					
27D	EW	---	91	0	2
28D	EW	---	-8	1	6

TABLE 3 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 21
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
North West Room					
67C	LW	9	-38	0	1
68C	LW	26	49	1	-2
South West Room					
26D	EW	32	-250	0	2
69C	LW	-9	-170	0	1
70C	LW	26	-30	3	4

[a]Refer to Figures 5 and 6.
[b]LW = lower wall; UW = upper wall; EW = exterior wall; C = ceiling; and E = equipment.
[c]Measurement not performed.

TABLE 4

SURFACE ACTIVITY LEVELS
BUILDING 22
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Room F					
76C	LW	---[c]	250	0	1
77C	LW	-8	170	1	1
78C	LW	-8	510	0	-4
79C	LW	87	750	1	14
80C	LW	16	-120	0	4
81C	LW	---	-30	1	2
82C	LW	---	300	0	2
83C	LW	---	-220	0	-3
94C	C, I-beam	---	370	0	-1
95C	C, I-beam	---	340	0	4
96C	E, Exhaust Pipe	---	160	0	-1

TABLE 4 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 22
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Room B					
84C	LW	-8	-220	0	-2
85C	LW	-16	-250	0	7
86C	UW	---	-160	0	-6
Room A					
87C	LW	---	-250	3	7
88C	LW	---	-140	0	2
Boiler Room					
89C	LW	---	-290	1	-1
Room G					
90C	F	---	3,900	0	-1
91C	F	---	2,100	0	2
92C	LW	---	370	1	-1

TABLE 4 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 22
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Room G (Continued)					
93C	LW	---	-340	1	-1
Post-RA 90C	F	---	1,100	---	---
Post-RA 90C	F	---	300	---	---
Post-RA 91C	F	---	280	---	---
South Mezzanine					
97C	LW	---	4	1	-3
98C	C	---	330	3	3
99C	F	---	730	0	2
100C	E, Crystalizer	---	510	0	1

[a]Refer to Figures 7 through 12.
[b]F = floor; LW = lower wall; UW = upper wall; EW = exterior wall; and C = ceiling; and E = equipment.
[c]Measurement not performed.

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ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

June 21, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
U.S. Nuclear Regulatory Commission
Division of Waste Management
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEYS OF BUILDING 23, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007A)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on two separate occasions. The first survey was performed April 17 and 18, 2002 and the follow-up survey was conducted during the period May 20 through 22, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Concurrence
Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
W. Beck, ORISE/ESSAP
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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy

LETTER REPORT
CONFIRMATORY SURVEYS OF BUILDING 23
MOLYCORP, INC., WASHINGTON FACILITY
WASHINGTON, PENNSYLVANIA
(DOCKET NO. 040-08778, RFTA NO. 02-007a)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the U.S. Nuclear Regulatory Commission (NRC) for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, most of the process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These

remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented final status survey (FSS) guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building for final status surveys as either radiologically affected or unaffected. The site history showed that radiological materials had been present within Building 23 and it was therefore classified as affected. In addition, the underside of the concrete floor that contacts the soil is also considered affected and will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared FSS reports.

SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there were approximately 21 buildings which remained on the site; however, dismantlement of some of the buildings has commenced. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 23 is approximately 32 meters (m) long by 20 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced concrete floor. There are separate floor levels. The building runs from north to south and has large roll top doors on the west side and personnel doors on the north and west sides. The east side opens into west side of Building 25 and the west side opens into the east side of Building 33.

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002a). The licensee's FSS results for Building 23 were not provided for review until ESSAP arrived on site for the initial and final confirmatory surveys (MACTEC 2002b and c).

SURVEY PROCEDURES

ESSAP performed initial confirmatory survey (ICS) activities for the shell of Building 23—excluding the floor—on April 17 and 18, 2002 and final confirmatory survey (FCS) activities on May 20 and 22, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and removable activity measurements during both surveys, and also included residue sampling and visual inspections during the FCS. A letter report, documenting the findings of the April 2002 ICS surveys, was submitted to the NRC (ORISE 2002a). These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002b, 2000, and 2001/2002c).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 23 was classified as affected. ESSAP initially conducted systematic and judgmental alpha plus beta activity scans during the ICS on the lower and upper walls, overhead structures and equipment (I-beams, purlins, rafters, ceilings, lights, fans, etc.), and process equipment surfaces. Survey coverage and scope was adjusted depending on findings as the survey progressed. In situations where significant residual contamination was identified, the scan coverage was limited and emphasis was placed on the documentation of the identified areas. Surface scans during the FCS were judgmental and focused on previously identified and/or similar areas or structures. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

Alpha and beta surface activity measurements were performed at eleven ICS locations on the lower and upper walls/surfaces. ESSAP performed beta activity measurements at each measurement location and alpha activity measurements at eight of the eleven direct measurement locations. Eight additional measurements were made on overhead structures and equipment during the FCS. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from eight of the direct measurement locations. No measurements were performed on the exterior walls. Measurement locations are shown on Figure 2.

RESIDUE SAMPLING

Two residue samples were collected from horizontal overhead surfaces.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002d). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Residue samples were analyzed by solid-state gamma spectroscopy and results reported in units of picocuries per gram (pCi/g).

The survey results were interpreted and compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u>

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

<u>Natural Uranium</u>

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous,

and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm^2 would result in about 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Building 23. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns include:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS, SURFACE ACTIVITY LEVELS AND RESIDUE CONCENTRATIONS

ICS alpha plus beta surface scans of representative areas identified contamination on metal walls, purlins, I-beams, and equipment within the building. The horizontal upper surfaces of I-beams and roof supports indicated surface activity levels exceeding the maximum guideline at locations 85A through 87A (Figure 2). These locations were marked for further investigation. Total and removable surface activity levels for Building 23 during the ICS are presented in Table 1. Alpha surface activity levels ranged from 18 to 370 dpm/100 cm^2 and beta surface activity levels ranged from -200 to 4,700 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -4 to 3 dpm/100 cm^2 for beta.

MACTEC and the NRC site representative were notified of these initial results. ESSAP recommended that MACTEC conduct thorough surveys of equipment and overhead structures and MACTEC subsequently performed additional surveys and/or remediation of identified areas and

marked those contaminated structural or equipment components that would not be remediated but rather, would be segregated for disposition as low-level waste. At the completion of the above activities, ESSAP remobilized to the site and performed the FCS. Visual inspections determined that MACTEC had marked for disposition structural components identified as contaminated during the ICS and their own subsequent surveys. The FCS surface scans concentrated on unmarked upper surfaces (purlins and I-beams) within the building. The horizontal upper surfaces of I-beams and roof supports were again found to have surface activity levels exceeding the average and/or maximum guideline at locations 1 through 3 and 6 through 8 (Figure 2). The FCS total and removable surface activity levels are also presented in Table 1. Beta surface activity levels ranged from 11 to 4,500 dpm/100 cm^2. Removable activity levels were not measured; however, the two residue sample concentrations were 40 and 57 pCi/g for Th-228 and 49 and 58 pCi/g for Th-232.

COMPARISON OF RESULTS WITH GUIDELINES

Ten of the nineteen measurement locations in Building 23 had total beta activity levels in excess of the average guideline while six measurements exceeded the maximum guideline. For those measurements that exceeded the average but did not exceed the maximum guidelines, additional scanning determined that the contamination was distributed—not localized—on those surfaces.

Guidelines for residue samples are not provided; however, the data indicated that there is removable/loose contamination on the horizontal upper surfaces within the building.

SUMMARY

During the periods of April 17 through 18 and May 20 through 22, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 23 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans, alpha and beta surface activity measurements, and residue sampling.

Based on the confirmatory survey results, it is ESSAP's opinion that the building's support beams, purlins, and equipment did not meet the NRC guidelines for release for unrestricted use. MACTEC decided that the items that did not meet the release guidelines would be marked for disposal as low-level waste and each item marked was recorded in a MACTEC site logbook. ESSAP personnel walked through the building to visually inspect that all such equipment had been identified and marked accordingly. All direct measurements on wall surfaces and remaining unmarked items, excluding purlins or support I-beams, were within guidelines.

Therefore, the outer shell walls, other than those sections that were marked, are within the guidelines. This report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were not performed.

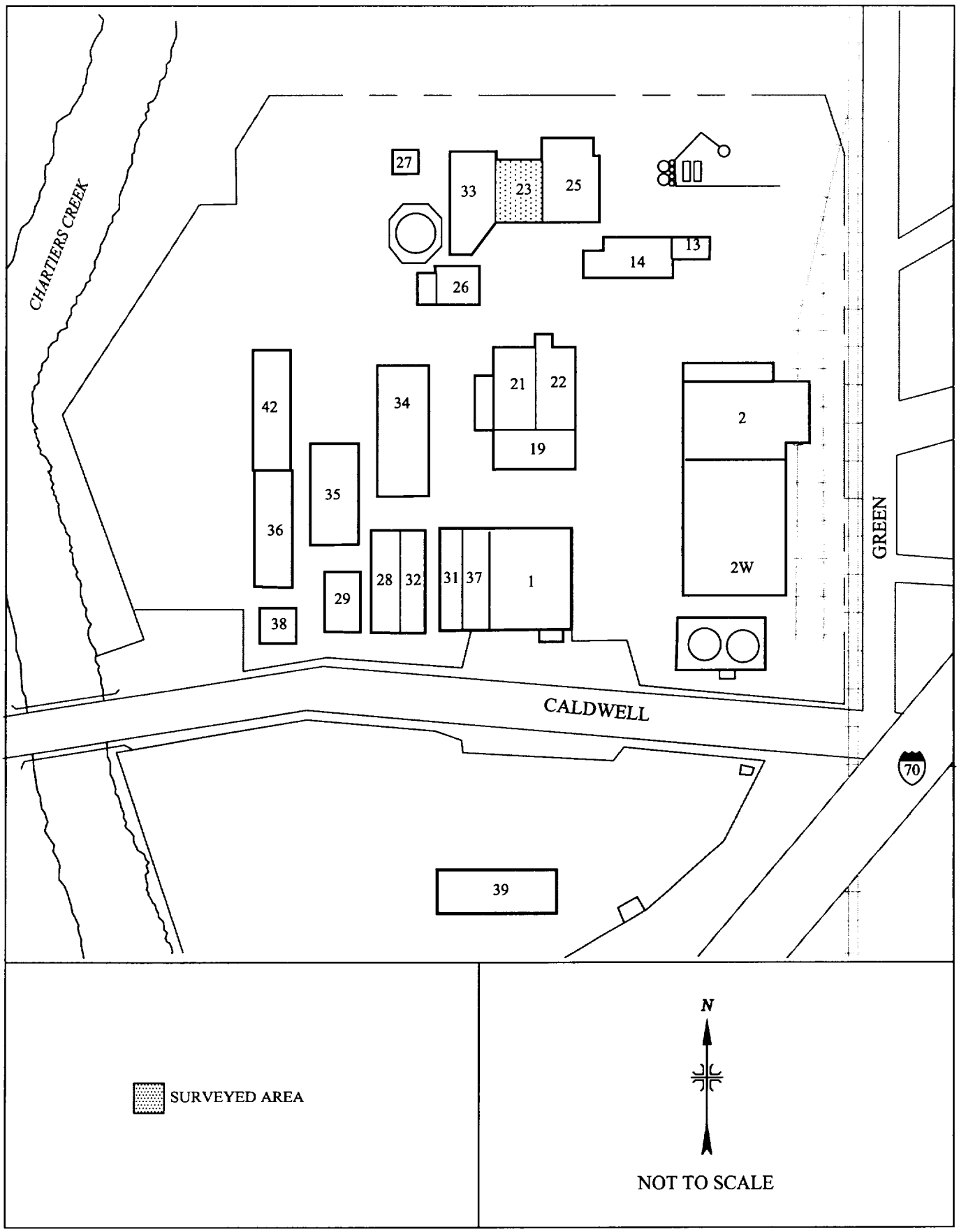

FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

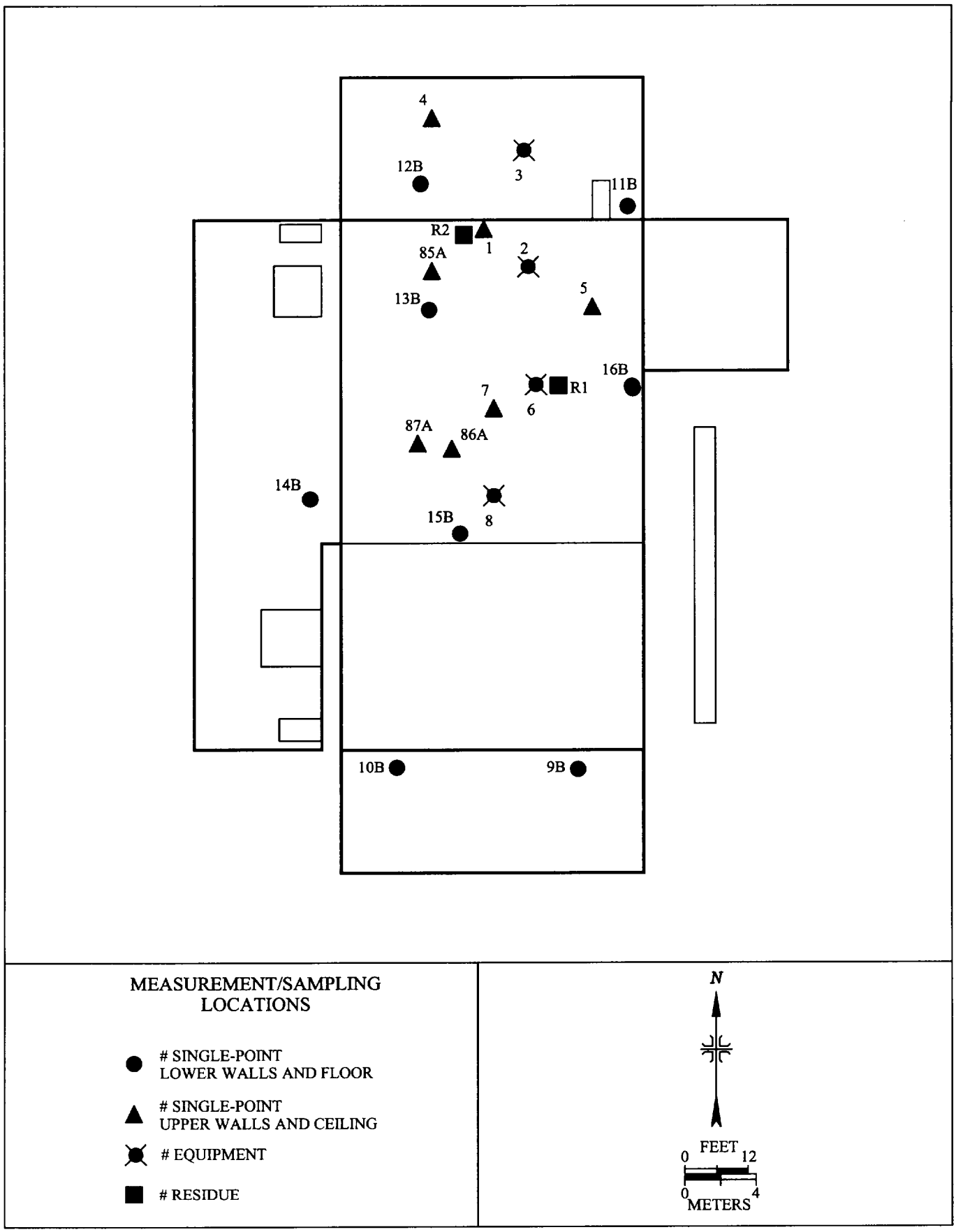

FIGURE 2: Building 23; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 23
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey					
9B	LW	190	-200	0	-2
10B	LW	35	45	0	3
11B	LW, I-Beam	120	1,000[c]	1	-1
12B	LW, I-Beam	370	640	0	-2
13B	LW, I-Beam	53	-140	1	-2
14B	LW	18	190	0	-3
15B	LW, I-Beam	62	-53	1	-4
16B	LW, I-Beam	250	79	0	-2
85A	C, I-Beam	---[d]	4,700[c]	---	---
86A	C, I-Beam	---	2,600[c]	---	---
87A	C, I-Beam	---	1,600[c]	---	---
Final Confirmatory Survey					
1	C, I-Beam	---	2,400[c]	---	---
2	E, Light	---	1,100[c]	---	---

TABLE 1 (Continued)

SURFACE ACTIVITY LEVELS
BUILDING 23
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Final Confirmatory Survey (Continued)					
3	E, Exhaust Fan	---	1,000[c]	---	---
4	UW	---	30[c]	---	---
5	C	---	11[c]	---	---
6	E, Hopper	---	4,500[c]	---	---
7	C, I-Beam	---	2,600[c]	---	---
8	E	---	2,600[c]	---	---

[a]Refer to Figure 2.
[b]LW = lower wall; UW = upper wall; C = ceiling, and E = equipment.
[c]Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface $Counts_{unshielded}$-Surface $Counts_{shielded}$)-(BKG $Counts_{unshielded}$-BKG $Counts_{shielded}$).
[d]Measurement not performed.

REFERENCES

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Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

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U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

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ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

June 21, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
U.S. Nuclear Regulatory Commission
Division of Waste Management
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEYS OF BUILDING 25, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on two separate occasions. The first survey was performed on April 17, 2002 and the follow-up survey was conducted on May 20 and 22, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy

LETTER REPORT
FINAL CONFIRMATORY SURVEYS OF BUILDING 25
MOLYCORP, INC., WASHINGTON FACILITY
WASHINGTON, PENNSYLVANIA
(DOCKET NO. 040-08778, RFTA NO. 02-007a)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the U.S. Nuclear Regulatory Commission (NRC) for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, most of the process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA

Facility which implemented final status survey (FSS) guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building for final status surveys as either radiologically affected or unaffected. There was no history of radiological materials present within this building, therefore, MACTEC initially classified this building as unaffected. However, based on ESSAP's initial confirmatory surveys (ICS), the building was reclassified as affected and MACTEC performed additional final status survey procedures for affected buildings and presented the new data as FSS data to ESSAP. In addition, the underside of the concrete floor that contacts the soil is also considered affected and will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared FSS reports.

SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there were approximately 21 buildings which remained on the site; however, dismantlement of some of the buildings has commenced. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 25 is approximately 36 meters (m) long by 20 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced concrete floor. The building runs from north to south and has large roll top doors on the south, east and west sides and personnel doors on the north and east sides. The west side opens into the east side of Building 23.

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002a). The licensee's initial FSS results for Building 25 were provided for review prior to ESSAP's ICS activities (MACTEC 2002b). After the ICS activities identified residual activity in excess of guideline values, the licensee changed the classification of Building 25 to affected and performed additional FSS activities. The additional FSS results were not provided for review until ESSAP arrived on site for the final confirmatory survey (FCS) (MACTEC 2002c).

SURVEY PROCEDURES

ESSAP performed ICS activities for the shell of Building 25—excluding the floor—on April 17 and FCS activities on May 20 and 22, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and removable activity measurements during both surveys, and also included visual inspections during the FCS. A letter report, documenting the findings of the April 2002 ICS surveys, was submitted to the NRC (ORISE 2002a). These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002b, 2000, and 2001/2002c).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 25 was initially classified as unaffected. ESSAP initially conducted systematic and judgmental alpha plus beta activity scans during the ICS on the lower wall and exterior wall surfaces in Building 25. Initial survey data indicated significant residual contamination remained on lower wall I-beams and purlins along the east wall requiring the reclassification of the building to affected. Surface scans during the FCS were judgmental and focused on previously identified and/or similar areas or structures. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

Alpha and beta surface activity measurements were performed at eight ICS locations on the lower walls. ESSAP performed alpha and beta activity measurements at each of the direct measurement locations. Eight additional measurements were made on overhead structures and six additional measurements were made on the exterior walls during the FCS. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figure 2.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002d). Smears were analyzed for gross

alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2).

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u>

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

<u>Natural Uranium</u>

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm^2 would result in about 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2,000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Building 25. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns include:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS AND SURFACE ACTIVITY LEVELS

ICS alpha plus beta surface scans of the lower walls identified two areas of elevated surface activity levels on the purlins and I-beams along the east wall within the building near measurement locations #20B and #21B (Figure 2). These locations were marked for further investigation. Total and removable surface activity levels for Building 25 during the ICS are presented in Table 1. Alpha surface activity levels ranged from 26 to 350 dpm/100 cm^2 and beta surface activity levels ranged from -110 to 2,500 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -4 to 5 dpm/100 cm^2 for beta.

MACTEC and the NRC site representative were notified of these initial results. ESSAP recommended that MACTEC conduct thorough surveys of the overhead structures and horizontal surfaces and consider reclassifying the building as affected. MACTEC subsequently changed the classification to affected and performed additional surveys and/or remediation of identified areas and marked those contaminated structural components that would not be remediated but rather, would be segregated for disposition as low-level waste. At the completion of the above activities, ESSAP remobilized to the site and performed the FCS. Visual inspections determined that MACTEC had marked for disposition structural components identified as contaminated during the ICS and their own subsequent FSS activities. The FCS surface scans concentrated on unmarked upper surfaces

(purlins and I-beams) within the building. One location (measurement location 7C) on a horizontal upper surface in the mezzanine was found to have surface activity levels exceeding the average guideline (Figure 2). A review of the FSS data package indicated that this beam along with several others should have been marked and segregated for disposal as low-level waste based on MACTEC's data results. MACTEC personnel revisited the area to mark these beams which included the beam found by ESSAP personnel. The FCS total and removable surface activity levels are also presented in Table 1. Alpha surface activity levels ranged from -16 to 56 dpm/100 cm^2 and beta surface activity levels, excluding measurement location 7C (which was 1,500 dpm/100 cm^2), ranged from -68 to 810 dpm/100 cm^2. Removable activity levels ranged from 0 to 7 dpm/100 cm^2 for alpha and -2 to 9 dpm/100 cm^2 for beta.

COMPARISON OF RESULTS WITH GUIDELINES

Four of the 22 measurement locations in Building 25 had total beta activity levels in excess of the average guideline; none exceeded the maximum guideline. For those measurements that exceeded the average, but did not exceed the maximum guidelines, additional scanning determined that the contamination was distributed—not localized—on those horizontal surfaces. Each of the measurement locations that exceeded the average guideline was marked for segregation as low-level waste by MACTEC personnel.

SUMMARY

During the periods of April 17 and May 20 and 22, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 25 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements and sampling.

Based on the confirmatory survey results, it is ESSAP's opinion that several of the building's support beams and purlins did not meet the NRC guidelines for release for unrestricted use. MACTEC decided that the items that did not meet the release guidelines would be marked for disposal as

low-level waste and each item marked was recorded in a MACTEC site logbook. ESSAP personnel walked through the building to visually inspect that all such equipment had been identified and marked accordingly. All direct measurements on exterior walls and other unmarked items, excluding purlins and roof support I-beams, were within guidelines.

Therefore, the outer shell walls, other than those sections that were marked, are within the guidelines. This report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were not performed.

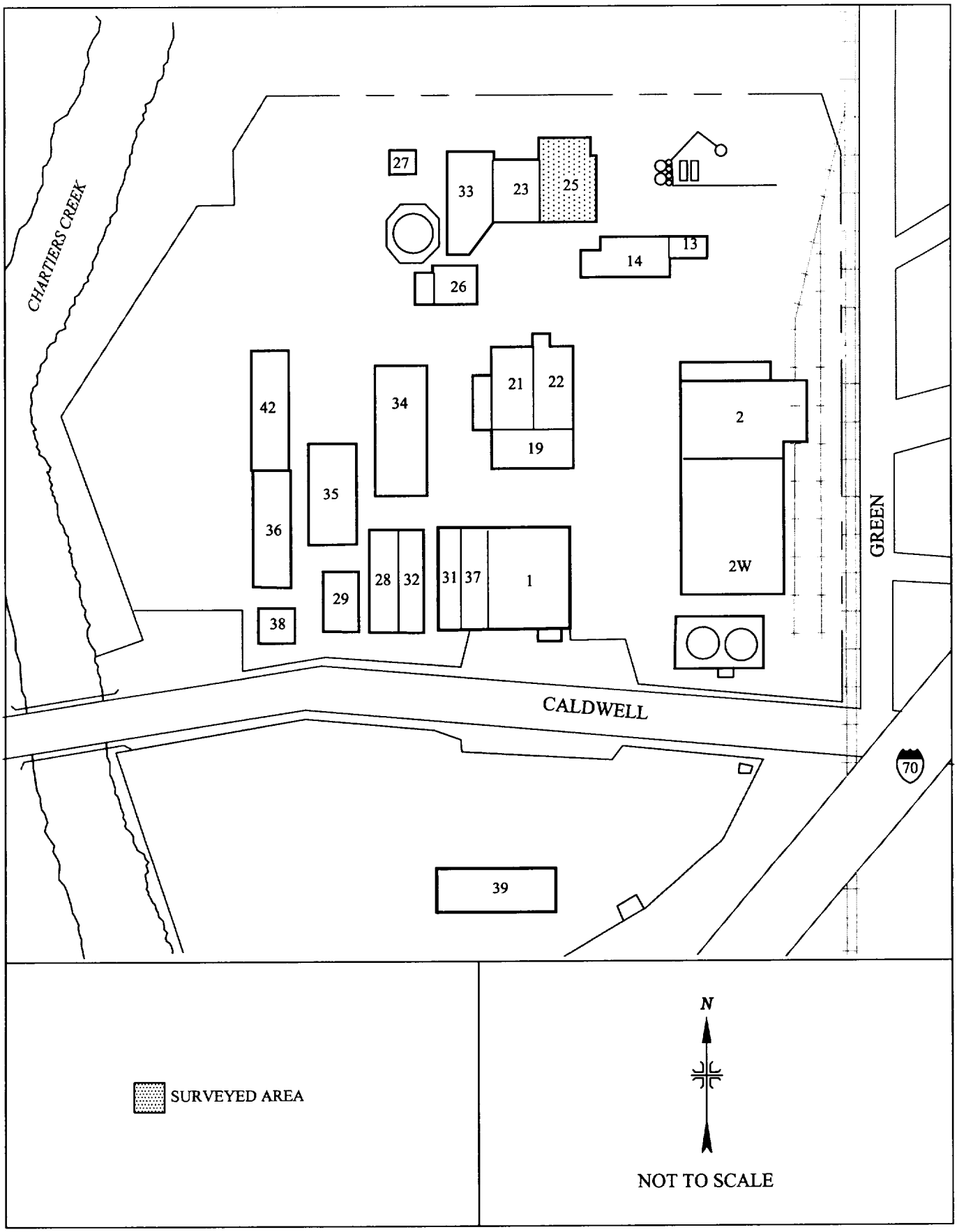

FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

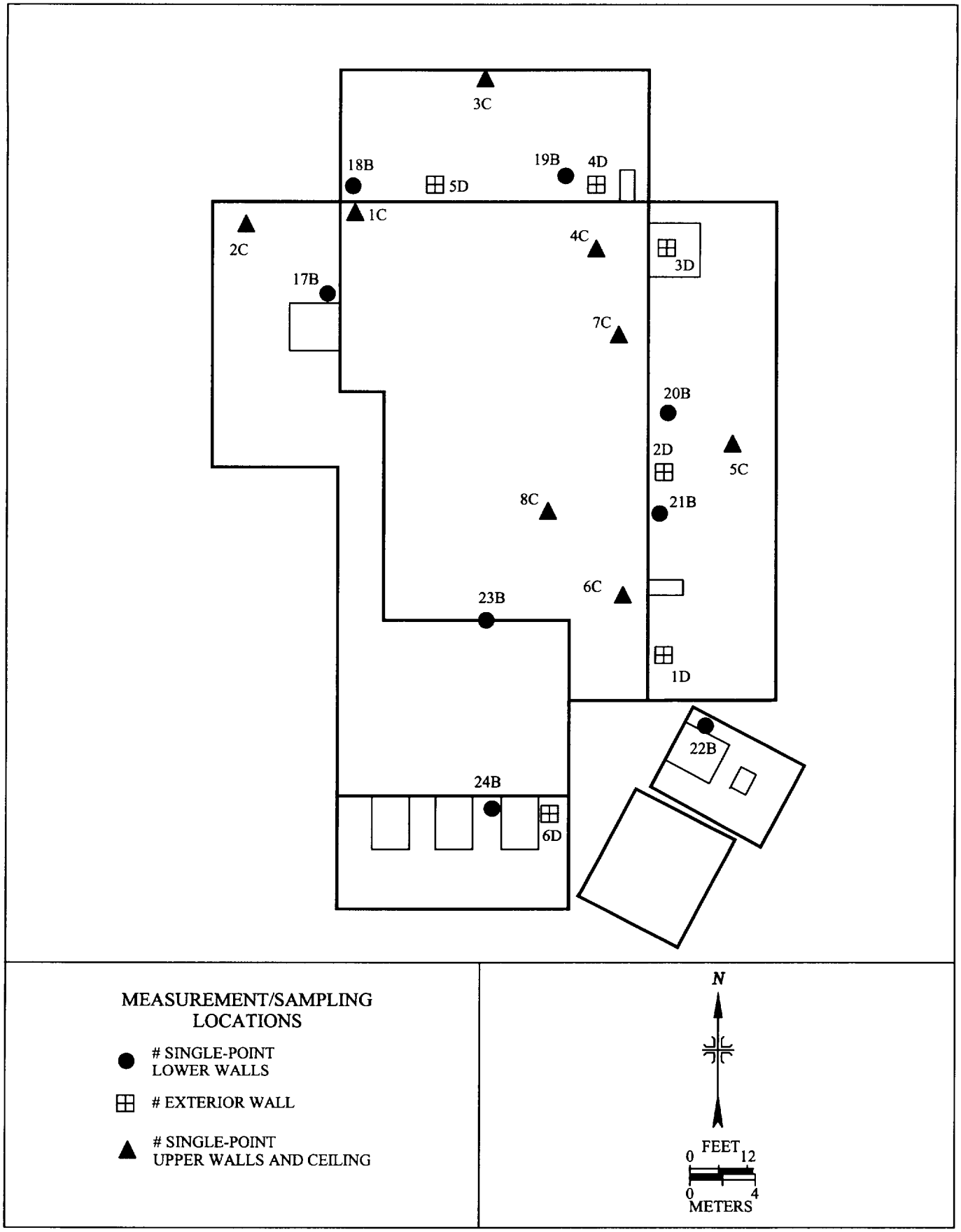

FIGURE 2: Building 25; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 25
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey					
17B	LW	260	550[c]	0	-1
18B	LW	79	91[c]	0	4
19B	LW	26	200	0	5
20B	LW, Purlin	350	1,700[c]	1	-2
21B	LW, I-Beam	97	2,500[c]	0	-3
22B	LW	26	-34	0	-4
23B	LW	71	-110[c]	0	-2
24B	LW	26	330	0	5
Final Confirmatory Survey					
1C	C, I-Beam	---[d]	-68	1	2
2C	UW	---	45	1	4
3C	UW	---	23	0	2
4C	C, I-Beam	---	610	1	-1

TABLE 1 (Continued)

SURFACE ACTIVITY LEVELS
BUILDING 25
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Final Confirmatory Survey (Continued)					
5C	UW	---	11	1	1
6C	C, I-Beam	---	570	3	2
7C	C, I-Beam	---	1,500	7	2
8C	C, I-Beam	---	810	0	2
1D	EW	-8	42	0	1
2D	EW	-8	-19	1	3
3D	EW	-16	200	1	9
4D	EW	-8	34	0	4
5D	EW	24	110	1	-2
6D	EW	56	53	1	1

[a]Refer to Figure 2.
[b]LW = lower wall, UW = upper wall, EW = exterior wall, and C = ceiling..
[c]Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface $Counts_{unshielded}$-Surface $Counts_{shielded}$)-(BKG $Counts_{unshielded}$-BKG $Counts_{shielded}$).
[d]Measurement not performed.

REFERENCES

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June 21, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T -7F27
U.S. Nuclear Regulatory Commission
Division of Waste Management
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 28, MOLYCORP INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

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Enclosure

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LETTER REPORT
CONFIRMATORY SURVEY OF BUILDING 28
MOLYCORP INC., WASHINGTON FACILITY
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Building 28 is 36 meters (m) long by 9 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has a large roll top door at the north end and a personnel door on the west wall at the south end (Figure 2). The building's east wall adjoins to the west wall of Building 32 (Figure 1).

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002a). The licensee's initial FSS results for Building 28 were provided for review prior to ESSAP's ICS activities (MACTEC 2002b). After the ICS activities identified residual activity in excess of guideline values, the licensee changed the classification of Building 28 to affected and performed additional FSS activities. The additional FSS results have not been provided for ESSAP's review.

SURVEY PROCEDURES

ESSAP performed ICS activities for the shell and floor of Building 28 on April 16 through 18, 2002 and final confirmatory survey (FCS) activities on May 22, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, exposure rate measurements, and also included visual inspections during the FCS. A letter report, documenting the findings of the April 2002 ICS surveys, was submitted to the NRC (ORISE 2002a). These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002b, 2000, and 2001/2002c).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 28 was classified as unaffected. ESSAP initially conducted systematic and judgmental alpha plus beta activity scans during the ICS on the floor; lower, upper and exterior walls; and, overhead structures (I-beams, purlins, rafters, ceilings, etc.). After alpha plus beta scans in the affected adjacent Building 32 identified elevated beta radiation on the roof support beams, ESSAP returned to Building 28 and performed cursory alpha plus beta scans on the roof supports. Survey coverage and scope was adjusted depending on findings as the survey progressed. In situations where significant residual contamination was identified, the scan coverage was limited and emphasis was placed on the documentation of the identified areas. Surface scans during the FCS were judgmental and focused on previously identified and/or similar areas or structures. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

SURFACE ACTIVITY MEASUREMENTS

As part of the ICS activities, alpha and beta surface activity measurements were performed at five locations on the floor (at one location a 1 m^2 average was performed), five locations on the lower walls, and at three locations on the exterior walls (Figure 2). After elevated beta radiation was identified on the adjacent Building 32 roof supports, ESSAP performed beta surface activity measurements at four locations on the upper walls and ceilings. Six additional measurements were made on overhead structures during the FCS. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from several of the direct measurement locations. Measurement locations are shown on Figure 2.

EXPOSURE RATE MEASUREMENTS

Exposure rates, measured at five locations, were performed at one meter above the surface using a micro-rem meter.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002d). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Exposure rates were reported in units of microroentgens per hour (μR/h).

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u>

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

<u>Natural Uranium</u>

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous,

and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm^2 would result in about 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2,000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

The NRC guideline for exposure rates at one meter above building surfaces is 5 μR/h above background (NRC 1991).

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Building 28. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns include:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS AND SURFACE ACTIVITY LEVELS

ICS alpha plus beta surface scans of representative areas identified contamination on the floor at locations #31 and #32 and on the ceiling I-beams at locations #88A through #91A (Figure 2). Gamma floor surface scans also detected several areas of elevated radiation. These locations were marked for further investigation. Total and removable surface activity levels for Building 28 during the ICS are presented in Table 1. Alpha surface activity levels for the floor and lower walls ranged from 0 to 320 dpm/100 cm^2 and beta surface activity levels ranged from -68 to 960 dpm/100 cm^2. At measurement location #32, elevated beta activity in excess of the average guideline was identified. MACTEC personnel performed additional remedial activities at this location while ESSAP was on-site. ESSAP's post-remediation beta activity measurement at this location was

-34 dpm/100 cm^2. Beta surface activity levels on the roof supports and upper walls ranged from 1,000 to 2,000 dpm/100 cm^2. Removable activity levels for all measurement locations ranged from 0 to 3 dpm/100 cm^2 for alpha and -4 to 5 dpm/100 cm^2 for beta. Site background exposure rates averaged 10 μR/h; Building 28 exposure rates, presented in Table 2, ranged from 10 to 15 μR/h.

MACTEC and the NRC site representative were notified of these initial results. ESSAP recommended that MACTEC conduct thorough surveys of the overhead structures and horizontal surfaces and consider reclassifying the building as affected. MACTEC subsequently changed the classification to affected and performed additional surveys and/or remediation of identified areas and marked those contaminated structural components that would not be remediated, but rather would be segregated for disposition as low-level waste.

At the completion of the above activities, ESSAP remobilized to the site and performed the FCS. Visual inspections determined that MACTEC had marked for disposition structural components identified as contaminated during the ICS and their own subsequent FSS activities. The FCS surface scans concentrated on unmarked upper surfaces (purlins and I-beams) within the building. Two measurement locations #1 and #2 on a horizontal upper surface metal beam were found to have beta surface activity levels exceeding the average guideline (Figure 2). MACTEC personnel revisited the area to mark several wall beams which included the beams found by ESSAP personnel. The FCS total and removable surface activity levels are also presented in Table 1. Beta surface activity levels ranged from 260 to 1,500 dpm/100 cm^2. Removable activity measurements were not made for the FCS activities.

COMPARISON OF RESULTS WITH GUIDELINES

Eight of the 22 measurement locations in Building 28 had total beta activity levels in excess of the average guideline; one was at the maximum guideline. For those measurements that exceeded the average but did not exceed the maximum guidelines, additional scanning determined that the contamination was distributed—not localized—on those surfaces. Each of the measurement locations that exceeded the average guideline was marked for segregation as low-level waste by MACTEC personnel. The exposure rates within Building 28 were within the guideline.

SUMMARY

During the period of April 16 through 18, 2002 and on May 22, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 28 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Based on the confirmatory survey results, it is ESSAP's opinion that several of the building's support beams and purlins did not meet the NRC guidelines for release for unrestricted use. MACTEC decided that the items that did not meet the release guidelines would be marked for disposal as low-level waste and each item marked was recorded in a MACTEC site logbook. ESSAP personnel walked through the building to visually inspect that all such equipment had been identified and marked accordingly. All direct measurements on exterior walls and other unmarked items, excluding purlins and roof support I-beams, were within guidelines.

Therefore, the outer shell walls, other than those sections that were marked, are within the guidelines. This report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.

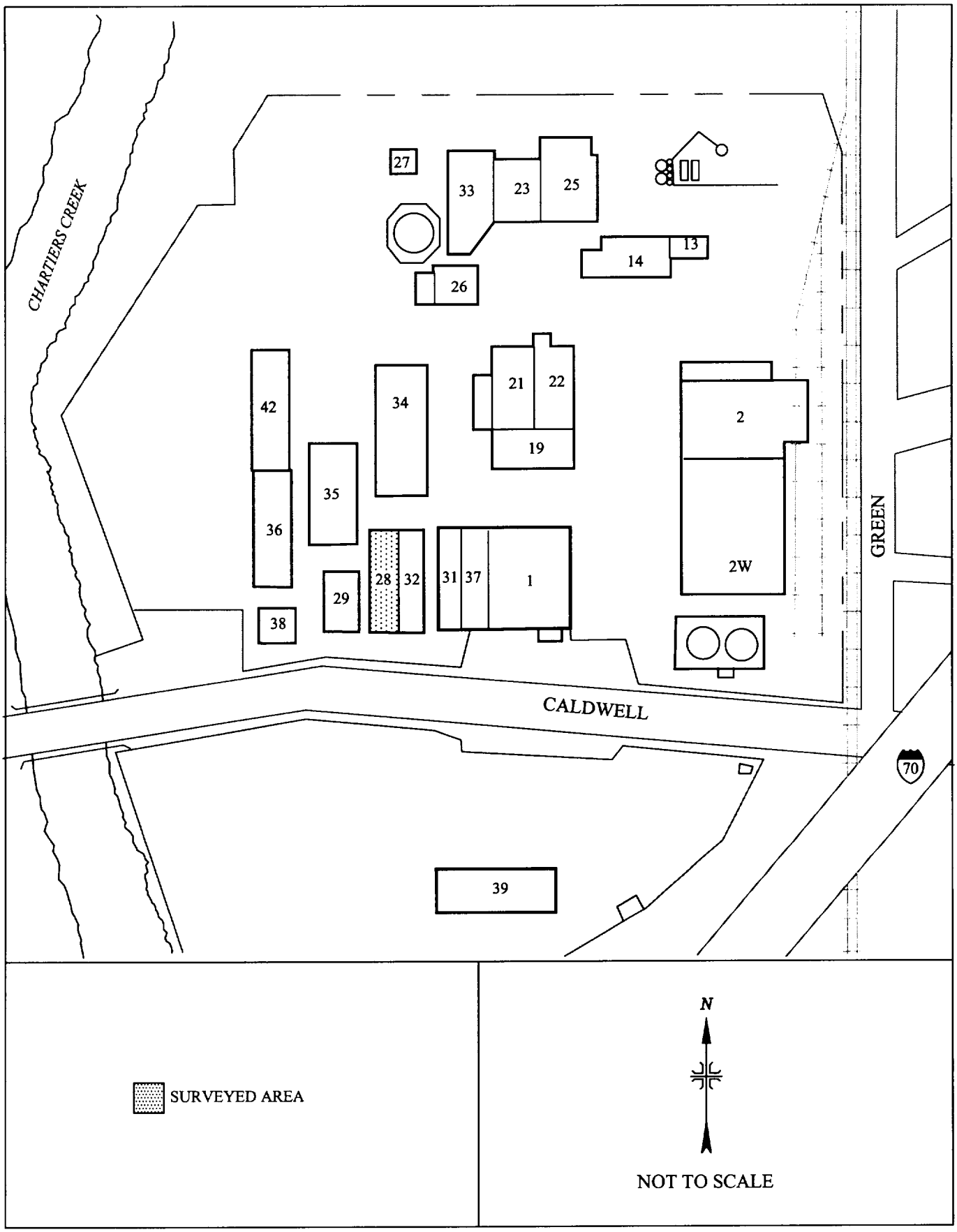

FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

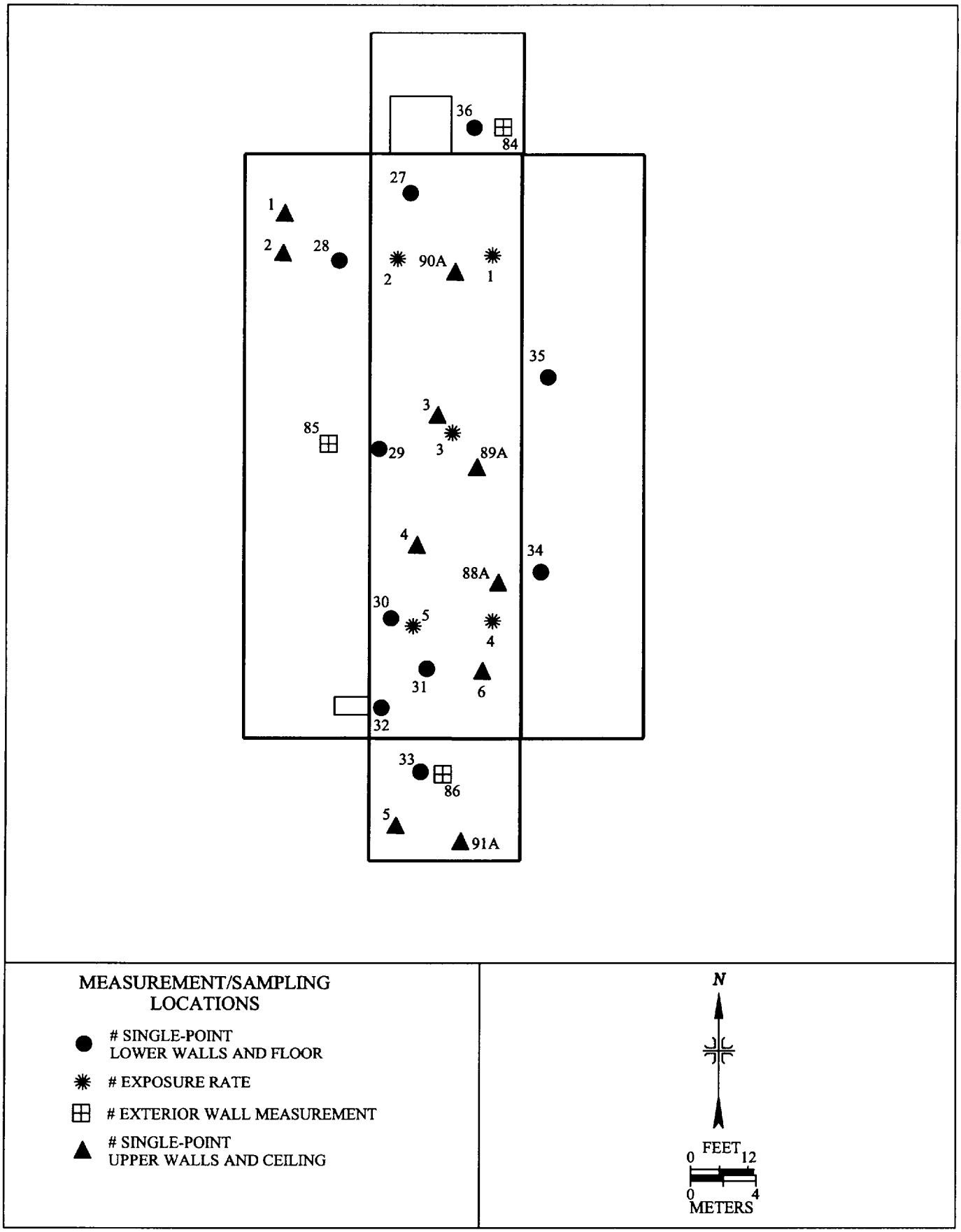

FIGURE 2: Building 28; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 28
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey					
27	F	0	-60[c]	0	-2
28	LW	320	960[c]	0	-3
29	F	95	610[c]	0	1
30	F	24	23[c]	0	2
31	F	16	-68[c]	0	-1
32	F	---[d]	-34[c]	0	-4
33	LW	48	320	0	-2
34	LW	8	250	1	2
35	LW	0	130	0	2
36	LW	32	310	0	1
88A	C, I-Beam	---	1,000	---	---
89A	C, I-Beam	---	2,000	---	---
90A	C, I-Beam	---	1,800	---	---

TABLE 1 (Continued)

SURFACE ACTIVITY LEVELS
BUILDING 28
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey (Continued)					
91A	UW, I-Beam	---	1,500	---	---
84	EW	32	130	0	3
85	EW	---	760	3	4
86	EW	---	160	0	5
Final Confirmatory Survey					
1	UW	---	1,000[c]	---	---
2	UW	---	1,500[c]	---	---
3	C, I-Beam	---	450	---	---
4	C, I-Beam	---	260	---	---
5	UW	---	340	---	---
6	C, I-Beam	---	650	---	---

[a]Refer to Figure 2.
[b]F = floor; LW = lower wall; UW = upper wall; EW = exterior wall, and C = ceiling.
[c]Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface $Counts_{unshielded}$-Surface $Counts_{shielded}$)- (BKG $Counts_{unshielded}$-BKG $Counts_{shielded}$).
[d]Measurement not performed.

TABLE 2

EXPOSURE RATES
BUILDING 28
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Exposure Rate @ 1m (μR/h)
1	15
2	10
3	10
4	12
5	12

[a]Refer to Figure 2.

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MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

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ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

July 5, 2002

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
Division of Waste Management
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 34, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on two separate occasions. The first survey was performed on April 16 and 18, 2002 and the follow-up survey was conducted on May 21, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
W. Beck, ORISE/ESSAP
T. Vitkus, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
D. Condra, ORISE/ESSAP
File/812

LETTER REPORT
CONFIRMATORY SURVEY OF BUILDING 34
MOLYCORP, INC., WASHINGTON FACILITY
WASHINGTON, PENNSYLVANIA
(DOCKET NO. 040-08778, RFTA NO. 02-007a)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the U.S. Nuclear Regulatory Commission (NRC) for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were

performed under the Decommissioning Plan for the Washington, PA facility which implemented final status survey (FSS) guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building as either radiologically affected or unaffected. There was no history of radiological materials present within this building, therefore, MACTEC initially classified this building as unaffected. However, based on initial confirmatory survey (ICS) activities, the building was reclassified as affected and MACTEC performed additional FSS procedures for affected buildings.

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

ESSAP's ICS activities on the ceiling, equipment, and the walls (lower, upper and exterior) indicated that residual contamination above the average and maximum guidelines remained within the building on unmarked/unidentified building surfaces (ORISE 2002a). Based on ESSAP's ICS, MACTEC performed additional FSS procedures and presented the new data to ESSAP and the NRC.

SITE DESCRIPTION

The Molycorp, Inc., Washington site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometer (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton

Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 34, a building which housed several furnaces, is approximately 36 meters (m) long by 18 m wide with an approximately 8 m high metal frame and truss structure with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from north to south and has large roll top doors on all sides and personnel doors on the north, east and south sides. A dirt/sand burn pit is centered in the building along the west wall (Figure 2).

DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the FSS radiological instrumentation and procedures (MACTEC 2002a). The licensee's initial FSS results for Building 34 (when classified as unaffected) were provided for review prior to ESSAP's ICS activities (MACTEC 2002b). After the ICS activities identified residual activity in excess of guideline values, the licensee performed additional FSS activities. The additional FSS results were also provided for review prior to ESSAP's arriving on site for the final confirmatory survey (FCS) (MACTEC 2002c).

SURVEY PROCEDURES

ESSAP performed ICS activities for the shell and equipment of Building 34—including a small portion of the floor—on April 16 and 18, 2002 and FCS activities on overhead surfaces on May 21, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and removable activity measurements during the ICS activities. FCS activities included alpha plus beta surface scans, beta surface activity measurements and visual inspections. A letter report, documenting the findings of the April 2002 ICS, was submitted to the NRC (ORISE 2002a). These activities were conducted in accordance with a site-specific survey plan,

submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002b, 2000, and 2001/2002c).

REFERENCE SYSTEM

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

SURFACE SCANS

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 34 was originally classified as unaffected. However, during the ICS activities, contamination was found on the floor surface near the wall/burn pit interface. ESSAP personnel discontinued survey activities within the building as it no longer met NUREG/CR-5849 classification guidance for unaffected areas. The building's classification was changed from unaffected to affected and MACTEC personnel performed affected area FSS activities on the building's shell—it was decided by MACTEC, with NRC concurrence, that the FSS of the concrete floor slab would be performed at a later date (MACTEC 2002c). After the reclassification of the building, ESSAP conducted systematic and judgmental alpha plus beta activity scans during the ICS on the ceiling, equipment, and walls (lower, upper, and exterior). Survey coverage and scope was adjusted depending on findings as the survey progressed. In situations where significant residual contamination was identified, the scan coverage was limited and emphasis was placed on the documentation of the identified areas. Surface scans during the FCS were judgmental and focused on previously identified and/or similar areas or structures (excluding the floor) and on the upper surfaces. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were not performed on the floor surfaces since the floor was excluded from the confirmatory survey activities.

SURFACE ACTIVITY MEASUREMENTS

Alpha and beta surface activity measurements were performed at eight ICS locations on the floor prior to (and resulting in) the classification change of the building's floor and walls (the equipment classification was not changed by MACTEC). Beta surface activity measurements were performed at four locations on the lower walls, eight locations on the upper walls and ceiling, five locations on the exterior walls and six locations on equipment surfaces. ESSAP performed beta activity measurements at each measurement location and alpha activity measurements at each of the eight floor direct measurement locations. Additional measurements were made at twelve locations on ceiling structures during the FCS—a post-remedial action (post-RA) measurement was performed at location 12 after MACTEC personnel had vacuumed the residue from the ceiling I-beam. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each ICS direct measurement location; none were collected from the FCS direct measurement locations. Measurement locations are shown on Figure 2.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002d). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2).

The survey results were interpreted and compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

Natural Thorium

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

Natural Uranium

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the beta activity level corresponding to 1,000 alpha dpm/100 cm^2 is 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's final status survey documentation for Building 34. The review and subsequent ESSAP surveys indicated that there were basic issues concerning MACTEC's radiological survey procedures. These concerns included:

- instrument calibration
- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews

SURFACE SCANS AND SURFACE ACTIVITY LEVELS

ICS alpha plus beta surface scans of the floor identified an area of elevated alpha plus beta radiation on the west side of the building near measurement locations 40A, 41A and 42A (Figure 2). Total and removable surface activity levels for the floor are presented in Table 1. Alpha surface activity levels ranged from -16 to 320 dpm/100 cm^2 and beta surface activity levels ranged from -30 to 5,300 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -4 to 7 dpm/100 cm^2 for beta. Due to these findings, the building was reclassified by MACTEC as affected.

ICS alpha plus beta surface scans of the lower, upper and exterior walls and the ceiling identified areas of elevated alpha plus beta radiation on the roof support beams at measurement locations 62A through 68A (Figure 2). These areas were marked for further investigation. Total and removable surface activity levels for Building 34 walls and ceiling are presented in Table 1. Beta surface activity levels ranged from 63 to 2,100 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -3 to 19 dpm/100 cm^2 for beta.

MACTEC did not perform affected area FSS activities on equipment surfaces; therefore, ESSAP personnel performed cursory ICS activities on the equipment surfaces. Limited alpha plus beta surface scans of the equipment did not identify any areas of elevated alpha plus beta radiation on the surveyed equipment surfaces. Total and removable surface activity levels for Building 34 equipment surfaces are presented in Table 1. Beta surface activity levels ranged from -41 to 430 dpm/100 cm^2. Removable activity levels ranged from 0 to 1 dpm/100 cm^2 for alpha and -4 to 8 dpm/100 cm^2 for beta.

MACTEC and the NRC site representative were notified of these initial results. ESSAP recommended that MACTEC conduct thorough surveys of the overhead structures and horizontal

surfaces and consider reclassifying the equipment surfaces as affected. MACTEC subsequently performed additional surveys and/or remediation of identified areas and marked those contaminated structural components that would not be remediated but rather, would be segregated for disposition as low-level waste. At the completion of the above activities, ESSAP remobilized to the site and performed the FCS. Visual inspections determined that MACTEC had marked for disposition structural components identified as contaminated during the ICS and their own subsequent FSS activities. The FCS surface scans concentrated on unmarked upper surfaces (roof support purlins and I-beams) within the building. Eight of the twelve ceiling FCS measurements on the horizontal upper surfaces were found to have surface activity levels exceeding the average guideline with beta surface activity levels ranging from 250 to 1,300 dpm/100 cm^2. The FCS total surface activity levels are also presented in Table 1. MACTEC personnel revisited these areas to mark these beams found by ESSAP personnel and to check additional beams. At measurement location 12, the beta surface activity level was 1,200 dpm/100 cm^2 prior to MACTEC personnel performing additional remediation activities (vacuuming); the post-RA result was 250 dpm/100 cm^2.

COMPARISON OF RESULTS WITH GUIDELINES

Eighteen of the 43 measurement locations in Building 34 had total beta activity levels in excess of the average guideline; four exceeded the maximum guideline. Three of the four measurement locations that exceeded the maximum guideline were on the floor. The remaining measurements that exceeded the average but did not exceed the maximum guidelines were on overhead horizontal surfaces. Additional scanning determined that the contamination was distributed and not localized on the roof support structural components. Each of the measurement locations that exceeded the average guideline was marked for segregation as low-level waste by MACTEC personnel.

SUMMARY

During the periods of April 16 and 18 and May 21, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 34 at the Molycorp, Inc. Washington facility in Washington,

Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements.

Survey results indicated that fixed and removable activity levels for the floor exceeded the applicable guidelines. ESSAP's survey findings for the floor warranted the reclassification of the building according to NUREG/CR-5849 guidance. Due to the findings, MACTEC reclassified the building as affected and performed affected area FSS activities on the lower and upper walls and asked ESSAP to perform affected area confirmatory survey activities on the building shell and equipment. ESSAP recommended that an affected area FSS also be performed on the equipment, but this was not done by MACTEC. It was decided that the floors would receive the affected area FSSs at a later date.

Based on the confirmatory survey results, it is ESSAP's opinion that several of the building's support beams and purlins did not meet the NRC guidelines for release for unrestricted use. MACTEC decided that the items that did not meet the release guidelines would be marked for disposal as low-level waste and each item marked was recorded in a MACTEC site logbook. ESSAP personnel walked through the building to visually inspect that all such surfaces had been identified and marked accordingly. Confirmatory direct measurements on roof structural support beams identified residual contamination above guidelines. MACTEC personnel marked these and adjacent locations as contaminated. The remaining direct measurements on exterior walls and internal building structural components were within guidelines.

Therefore, the outer shell walls, other than those sections that were marked, are within the guidelines. With the limited exception during the ICS activities that resulted in the reclassification of the building from unaffected to affected, this report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were not performed.

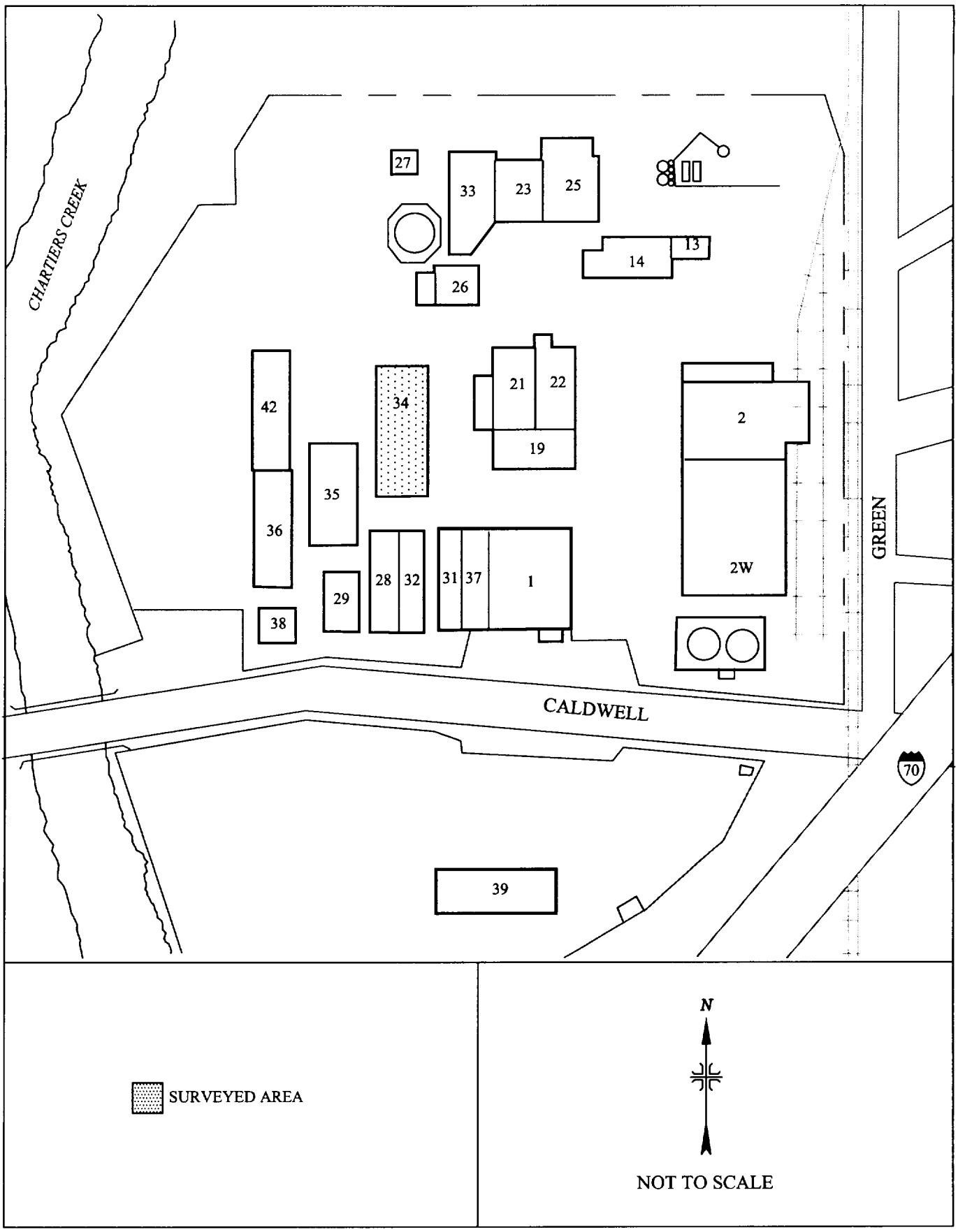

FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

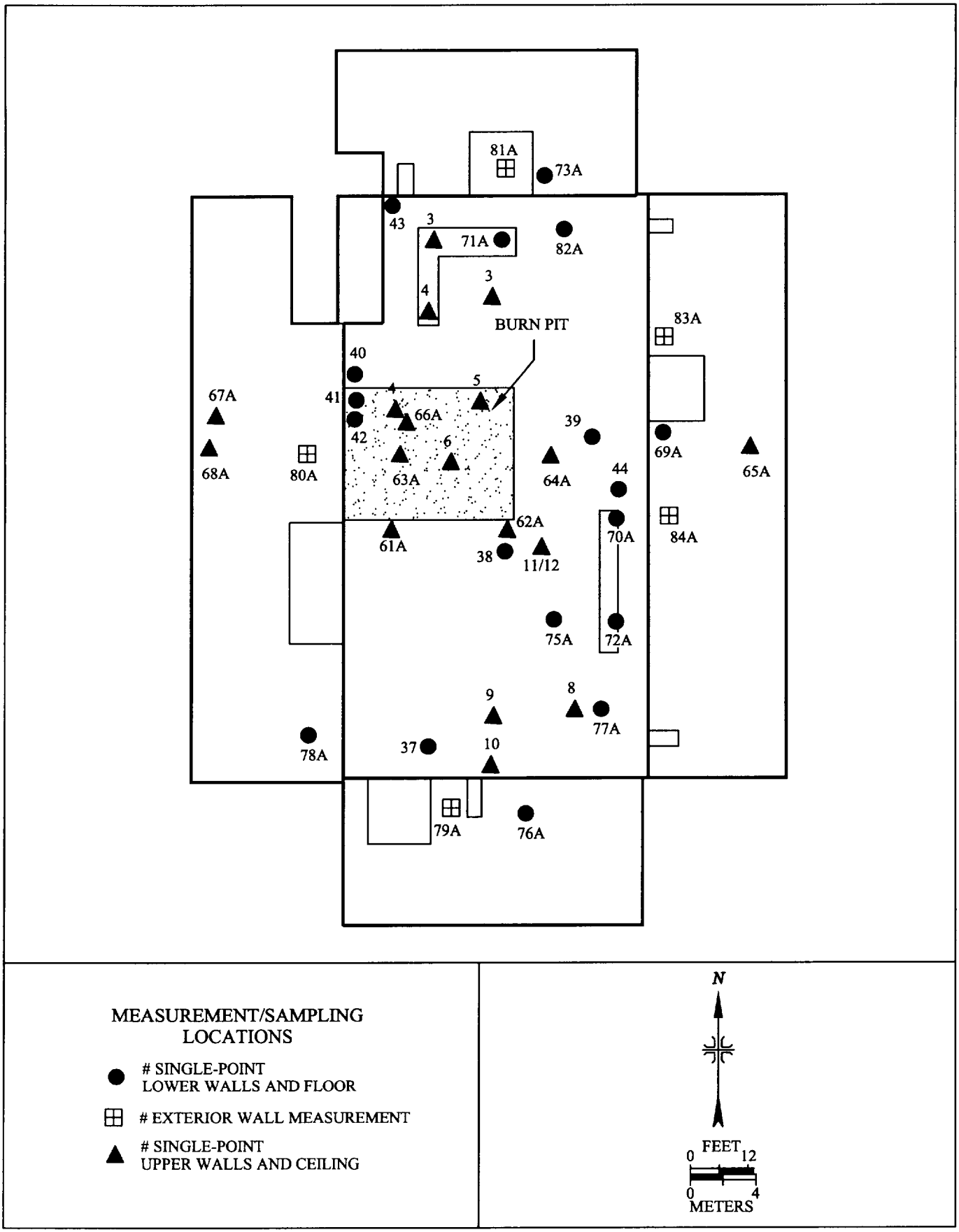

FIGURE 2: Building 34; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 34
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey					
37	F	-16	170[c]	1	-2
38	F	-8	-23[c]	0	7
39	F	16	-30[c]	0	3
40	F	240	2,400[c]	0	-3
41	F	320	4,800[c]	0	4
42	F	300	5,300[c]	1	1
43	F	48	8[c]	0	-4
44	F	24	190[c]	0	-1
61A	C, I-beam	---[d]	590	0	2
62A	C, I-beam	---	1,700[c]	---	---
63A	C, I-beam	---	1,300[c]	---	---
64A	C, I-beam	---	880[c]	---	---
65A	C, I-beam	---	1,900[c]	---	---

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 34
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey (Continued)					
66A	C, I-beam	---	2,100	---	---
67A	C, I-beam	---	950	---	---
68A	C, I-beam	---	1,800	---	---
69A	LW	---	310	1	6
70A	E	---	79	0	-3
71A	E	---	430	1	1
72A	E	---	41	0	1
73A	LW	---	180	1	-2
75A	E	---	310	0	8
76A	LW	---	95	1	4
77A	E	---	-41	1	-4
78A	LW	---	63	1	-2
79A	EW	---	340	1	19

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 34
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Initial Confirmatory Survey (Continued)					
80A	EW	---	520	0	2
81A	EW	---	400	1	-3
82A	E	---	16	0	-1
83A	EW	---	340	0	-2
84A	EW	---	420	0	1
Final Confirmatory Survey					
1	C, I-beam	---	450[c]	---	---
2	C, I-beam	---	1,000[c]	---	---
3	C, I-beam	---	460[c]	---	---
4	C, I-beam	---	700[c]	---	---
5	C, I-beam	---	610[c]	---	---
6	C, I-beam	---	1,100[c]	---	---
7	C, I-beam	---	1,300[c]	---	---

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 34
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface[b]	Total Activity (dpm/100 cm^2)		Removable Activity (dpm/100 cm^2)	
		Alpha	Beta	Alpha	Beta
Final Confirmatory Survey (Continued)					
8	C, I-beam	---	590[c]	---	---
9	C, I-beam	---	770[c]	---	---
10	C, I-beam	---	940[c]	---	---
11	C, I-beam	---	850[c]	---	---
12	C, I-beam	---	1,200[c]	---	---
12 Post-RA	C, I-beam	---	250[c]	---	---

[a]Refer to Figure 2.
[b]F = floor; LW = lower wall; UW = upper wall; EW = exterior wall; C = ceiling; and E = equipment.
[c]Due to elevated ambient gamma radiation from contaminated soils and/or contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface $Counts_{unshielded}$-Surface $Counts_{shielded}$)-(BKG $Counts_{unshielded}$-BKG $Counts_{shielded}$).
[d]Measurement not performed.
[e]Measurement performed after MACTEC personnel performed additional remedial actions.

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