



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

February 14, 2002

Docket No. 04008980

License No. SMB-1541

John F. Lord  
Site Manager  
Heritage Minerals, Inc.  
One Hovchild Plaza  
4000 Route 66  
Tinton Falls, NJ 07753

SUBJECT: Confirmatory Survey for Heritage Minerals, Inc. Lakehurst, New Jersey site

Dear Mr. Lord

On October 19, 1999, the NRC staff approved the Final Status Survey (Decommissioning) Plan (FSSP) for remediation of the Heritage Minerals, Inc. (HMI) site. Licensed areas designated for remediation included the monazite pile and mill buildings to levels specified in the NRC Site Decommissioning Management Plan (SDMP) action plan criteria for unrestricted release. The Final Status Survey (FSS) for License Termination of HMI License SMB-1541 was performed by your contractor June through October 2001, and submitted to us on December 3, 2001. Your results indicated that residual contamination in soil and building surfaces were remediated to levels below the NRC's unrestricted release criteria.

Based upon the apparent readiness of the site for final NRC survey, in December 2001, the Oak Ridge Institute for Science and Education (ORISE), under NRC contract, performed independent confirmatory radiological survey activities of designated site locations. These locations included the monazite pile and surrounding area, and interior structures within the wet and dry mill buildings. The scope of confirmatory surveys included exposure rate measurements, alpha, beta, and gamma surface scans, alpha and beta surface activity measurements, and soil sampling.

In contrast to your surveys results, NRC surveys show that surface activity levels and radionuclide concentrations in the soil where the pile was removed and in adjacent areas to the pile were not remediated to meet unrestricted release guidelines. Preliminary results from the ORISE survey were discussed with you during the management meeting held on January 22, 2002, at the NRC Region I office. Enclosed is the preliminary survey results taken from the February 2002 draft ORISE report. The entire contents of the final report will be sent to you under separate cover.

We acknowledge your efforts to initiate site decommissioning and remove the monazite pile. However, additional strategies are warranted to complete necessary remediations. For contaminated soil, surveys and sampling should be performed in accordance with NUREG/CR-5849 to meet commitments in the FSSP. In addition, provide your strategy for verifying that all licensed material previously part of the pile has been successfully removed from the site. For

J. Lord  
Heritage Minerals, Inc.

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mill structures and surfaces, an accurate measure of activity should include alpha and beta activity to account for attenuation due to surface variations, not simply alpha surface activity as documented in your FSS.

You are requested to review the ORISE survey and respond to these issues. Please provide an updated schedule which includes plans for additional soil removal and remediation of mill buildings within 30 days of the date of this letter. Should you have any questions about the ORISE data or followup remediations, please contact me at (610) 337-5200 or Craig Gordon, Project Manager, at (610) 337-5216.

Thank you for your cooperation.

Sincerely,



<sup>for</sup>  
Ronald R. Bellamy, Chief  
Decommissioning and Laboratory Branch  
Division of Nuclear Materials Safety

Enclosures: Survey results tables, figures

cc:

Anthony J. Thompson, Esquire  
Hon. Michael Fressola, Mayor, Manchester Twp.  
Nancy Stanley, NJDEP

J. Lord  
Heritage Minerals, Inc.

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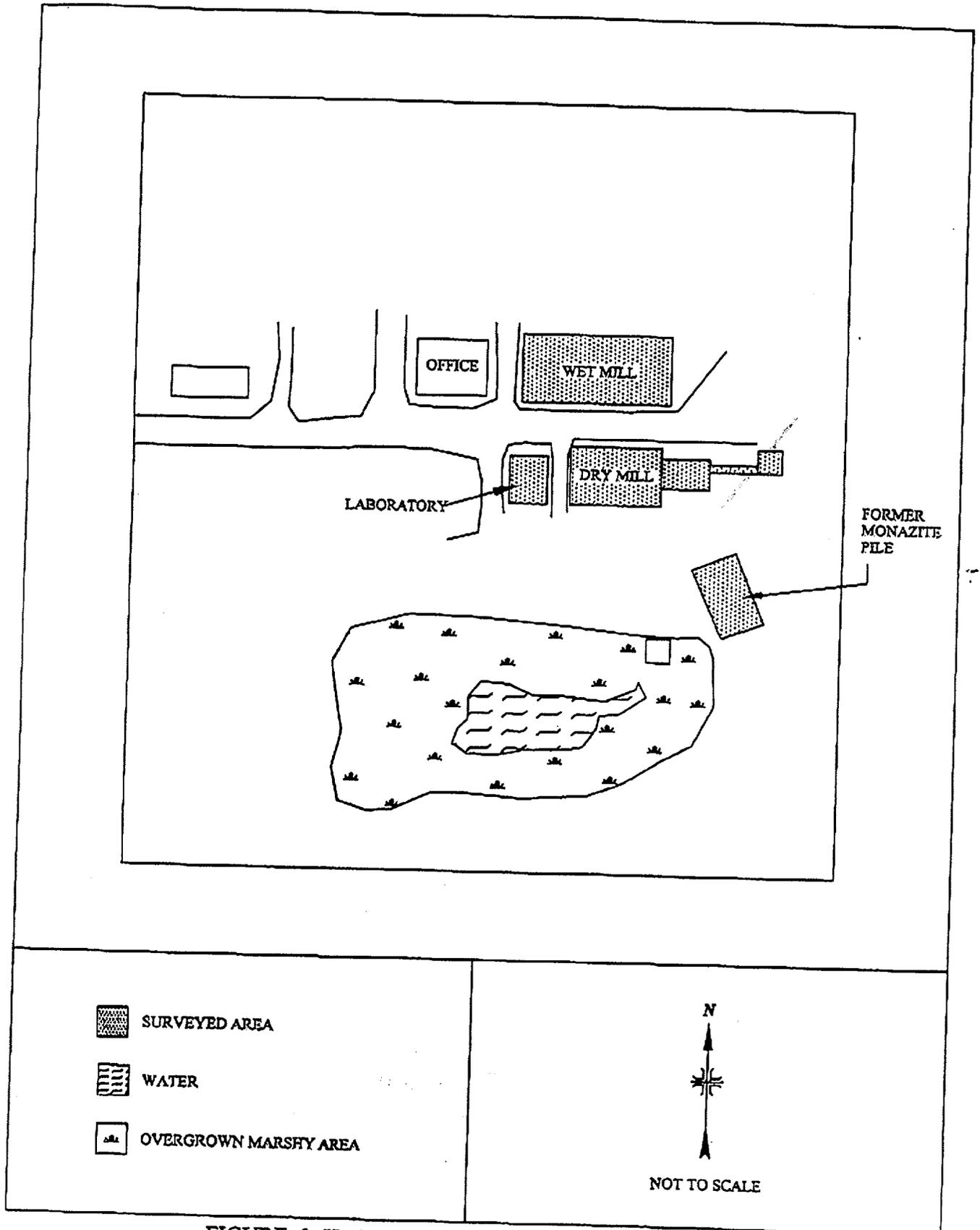
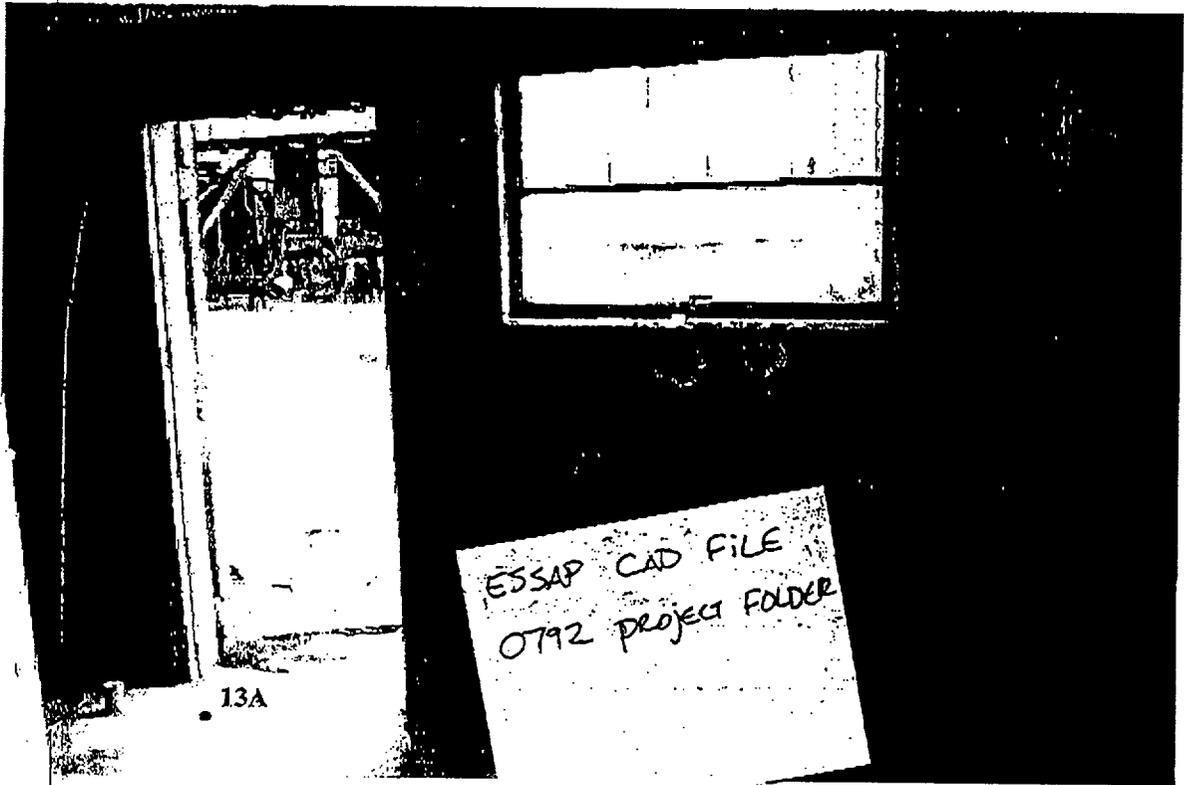


FIGURE 3: Heritage Minerals Site - Location of Surveyed Areas

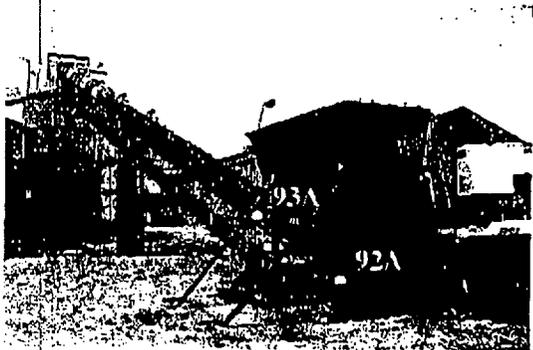


MEASUREMENT/SAMPLING  
LOCATIONS

● # SINGLE POINT

NOT TO SCALE

FIGURE 3: Laboratory — Location of Measurement 13A

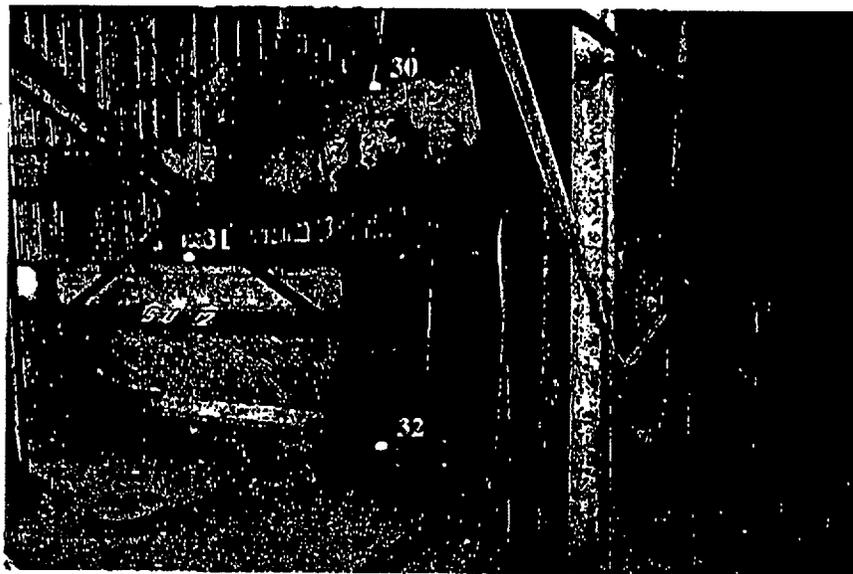
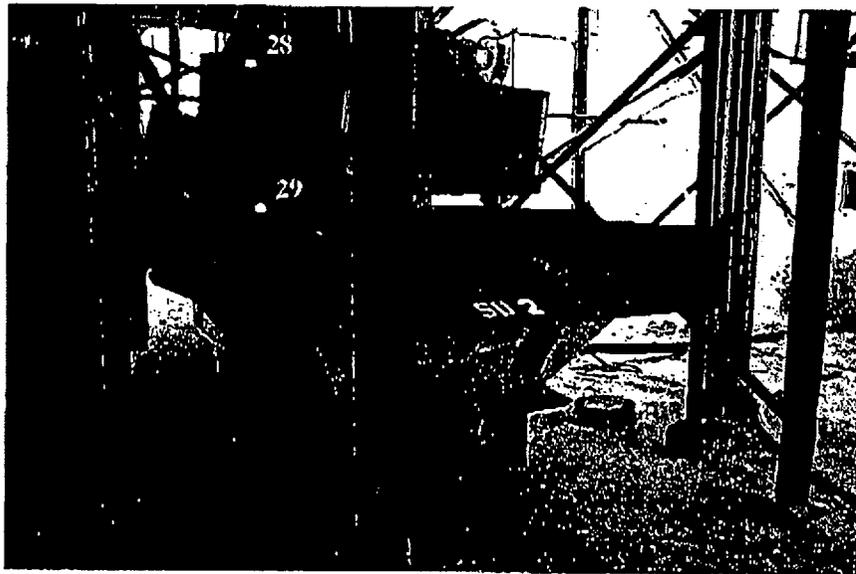


**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

NOT TO SCALE

FIGURE 4: Survey Unit 1 — Direct Measurement and Sampling Locations



**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

NOT TO SCALE

FIGURE 5: Wet Mill, Survey Unit 2— Direct Measurement and Sampling Locations

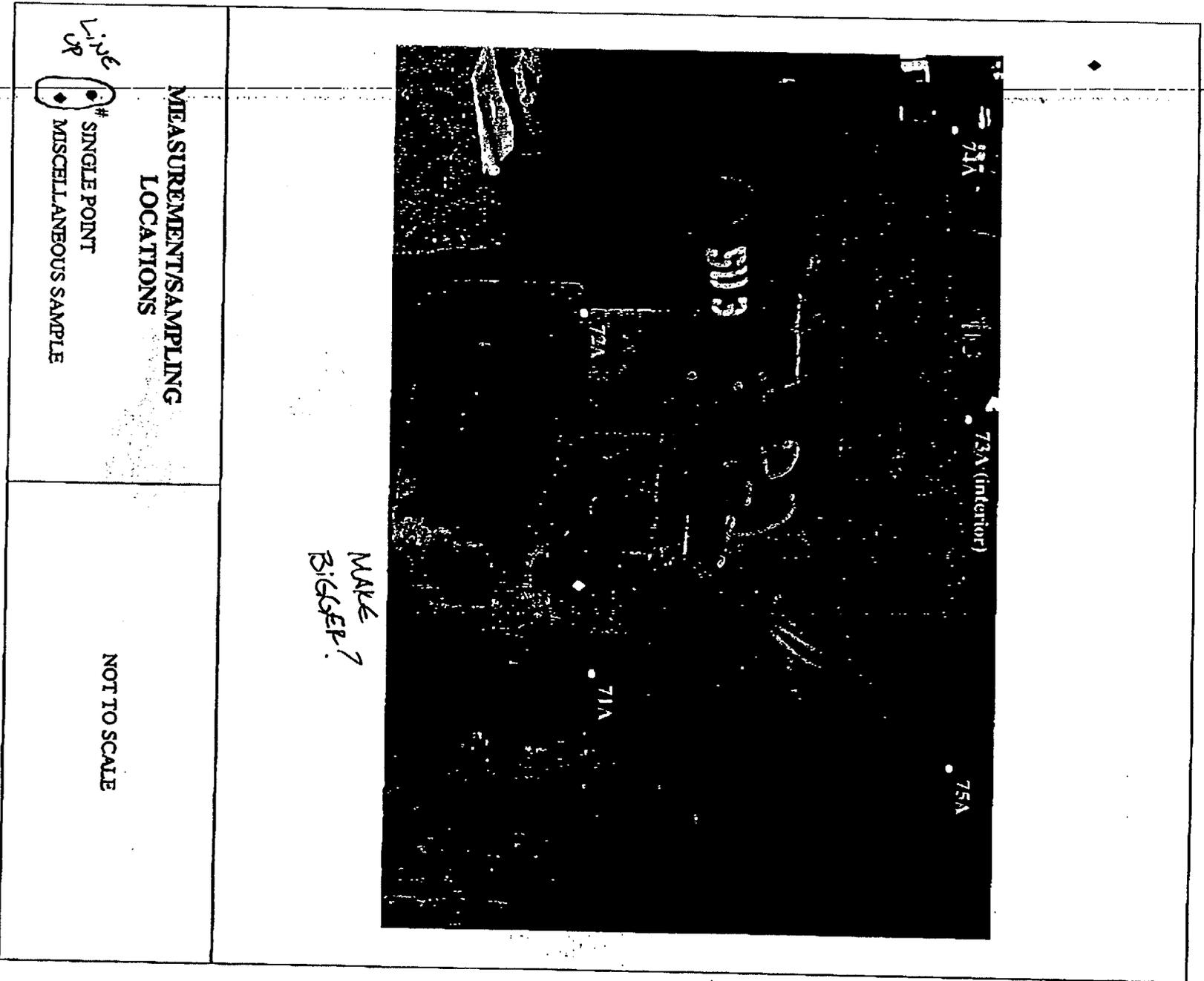
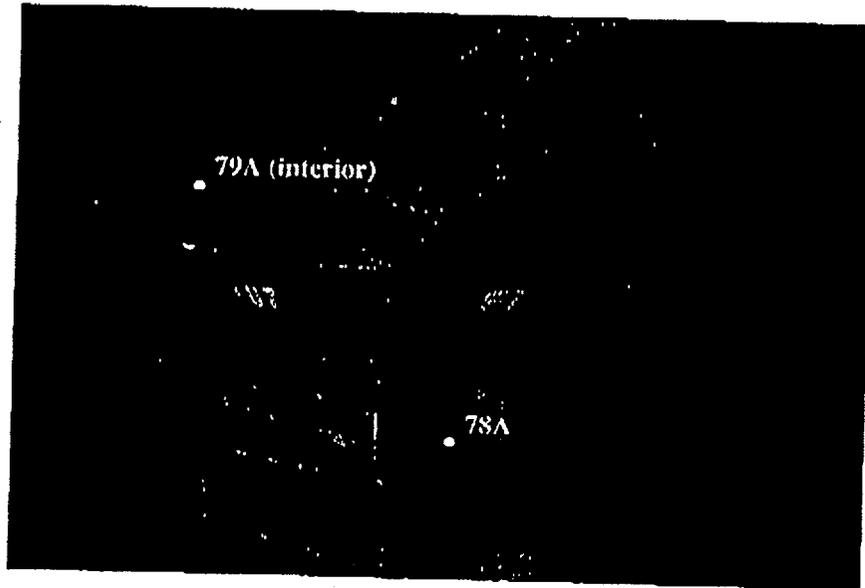
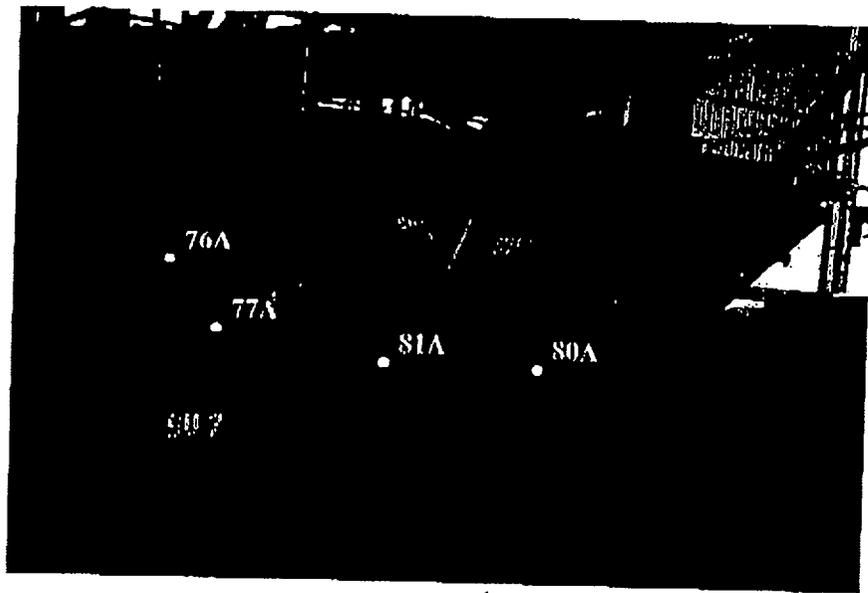


FIGURE 6: Wet Mill, Survey Unit 3 — Direct Measurement and Sampling Locations

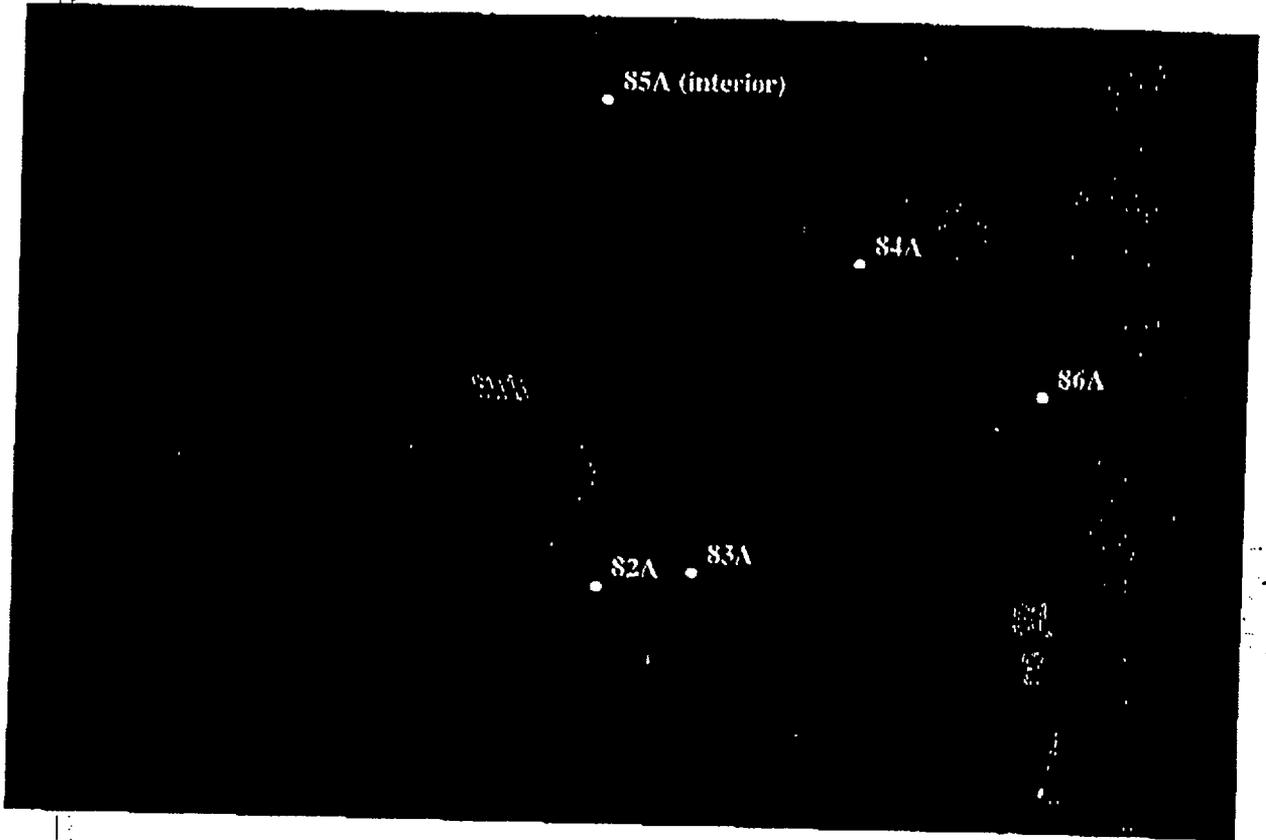


**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

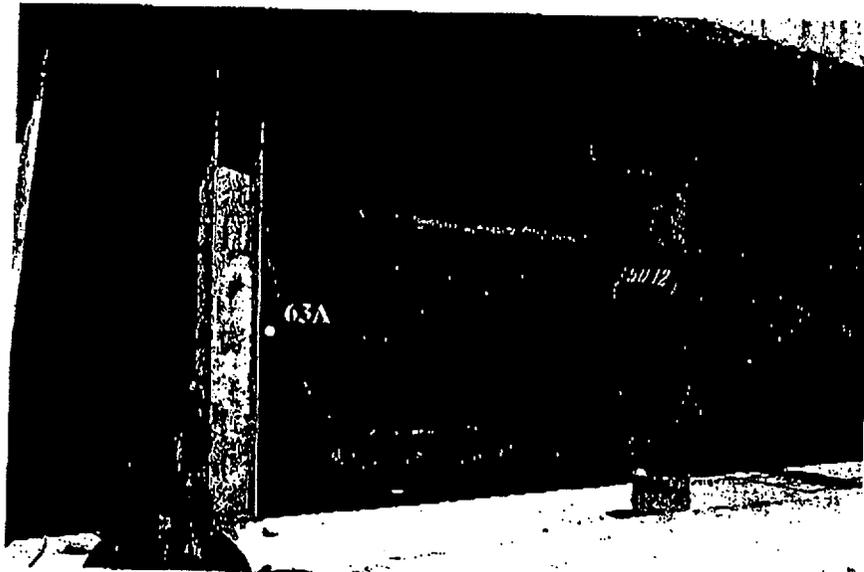
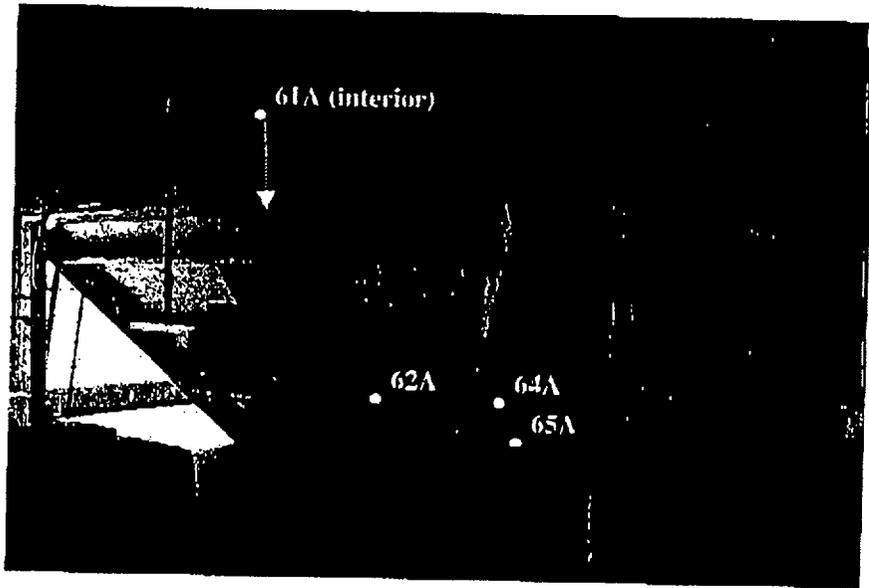
NOT TO SCALE

FIGURE 7: Wet Mill, Survey Unit 7 — Direct Measurement and Sampling Locations



<p><b>MEASUREMENT/SAMPLING LOCATIONS</b></p> <p>● # SINGLE POINT</p>	<p>NOT TO SCALE</p>
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FIGURE 8: Wet Mill, Survey Unit 9 — Direct Measurement and Sampling Locations

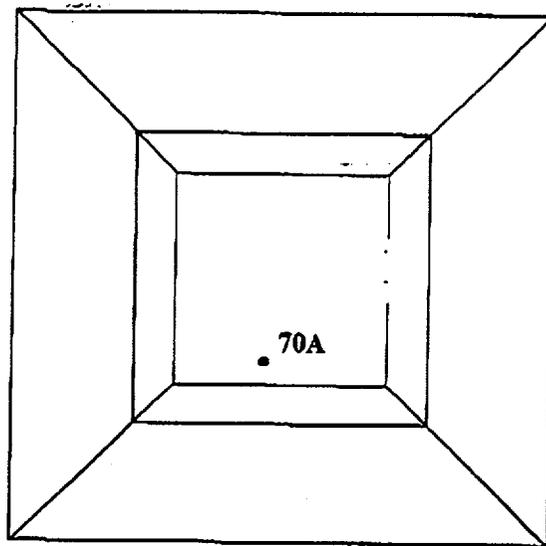
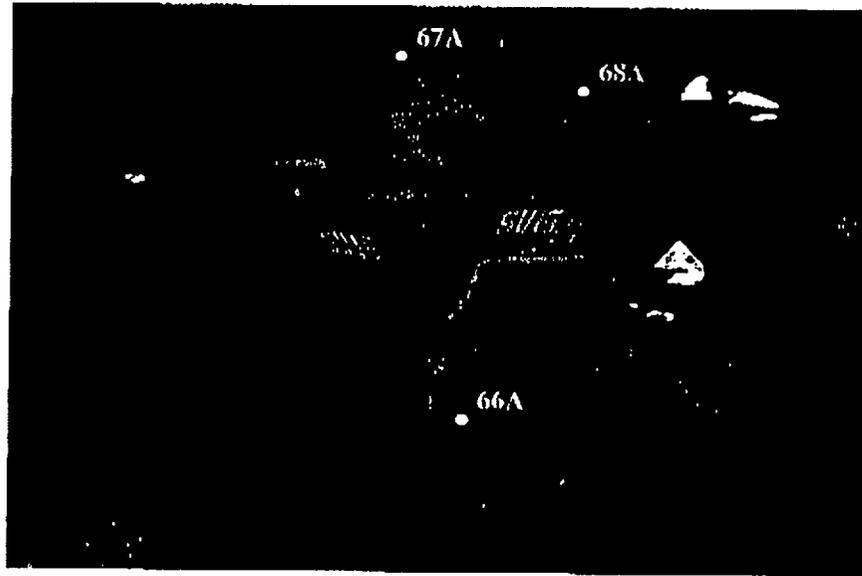


MEASUREMENT/SAMPLING  
LOCATIONS

• # SINGLE POINT

NOT TO SCALE

FIGURE 9: Wet Mill, Survey Unit 12 — Direct Measurement and Sampling Locations



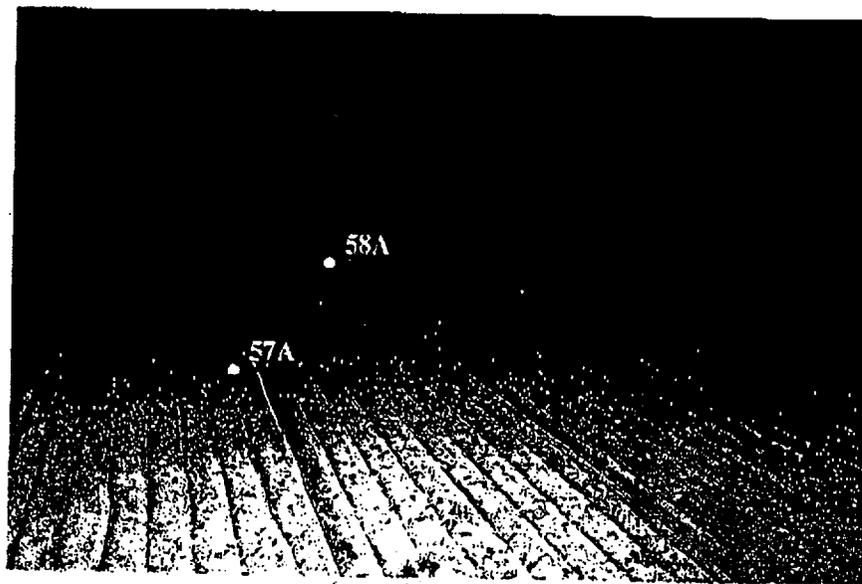
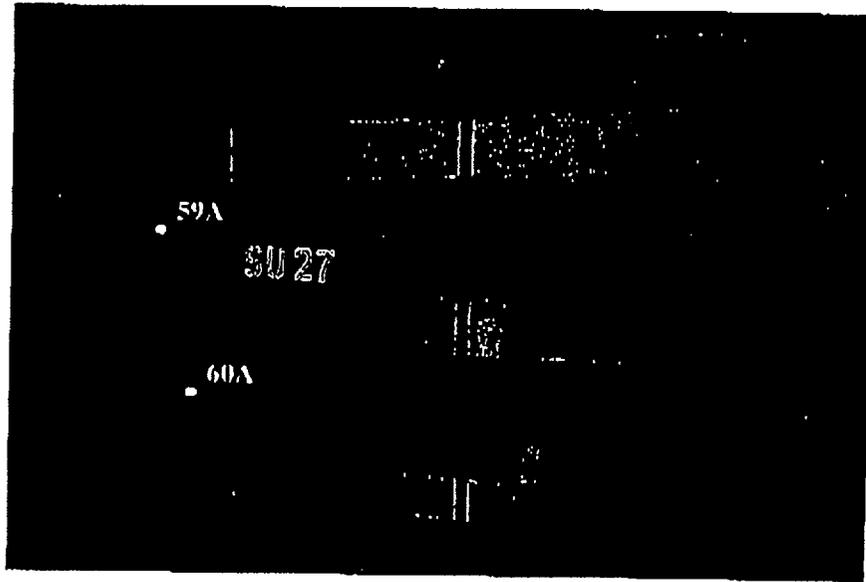
INTERIOR

MEASUREMENT/SAMPLING  
LOCATIONS

• # SINGLE POINT

NOT TO SCALE

FIGURE 10: Wet Mill, Survey Unit 15 — Direct Measurement and Sampling Locations



MEASUREMENT/SAMPLING  
LOCATIONS

● # SINGLE POINT

NOT TO SCALE

FIGURE 11: Wet Mill, Survey Unit 27 — Direct Measurement and Sampling Locations

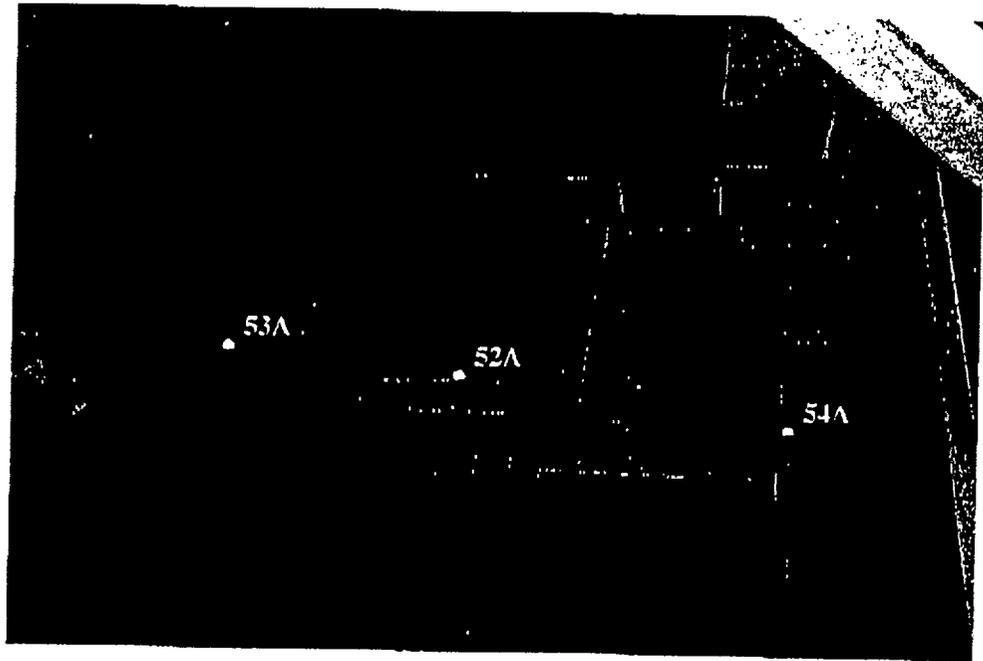


**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

NOT TO SCALE

FIGURE 12: Wet Mill, Survey Unit 30 — Direct Measurement and Sampling Locations

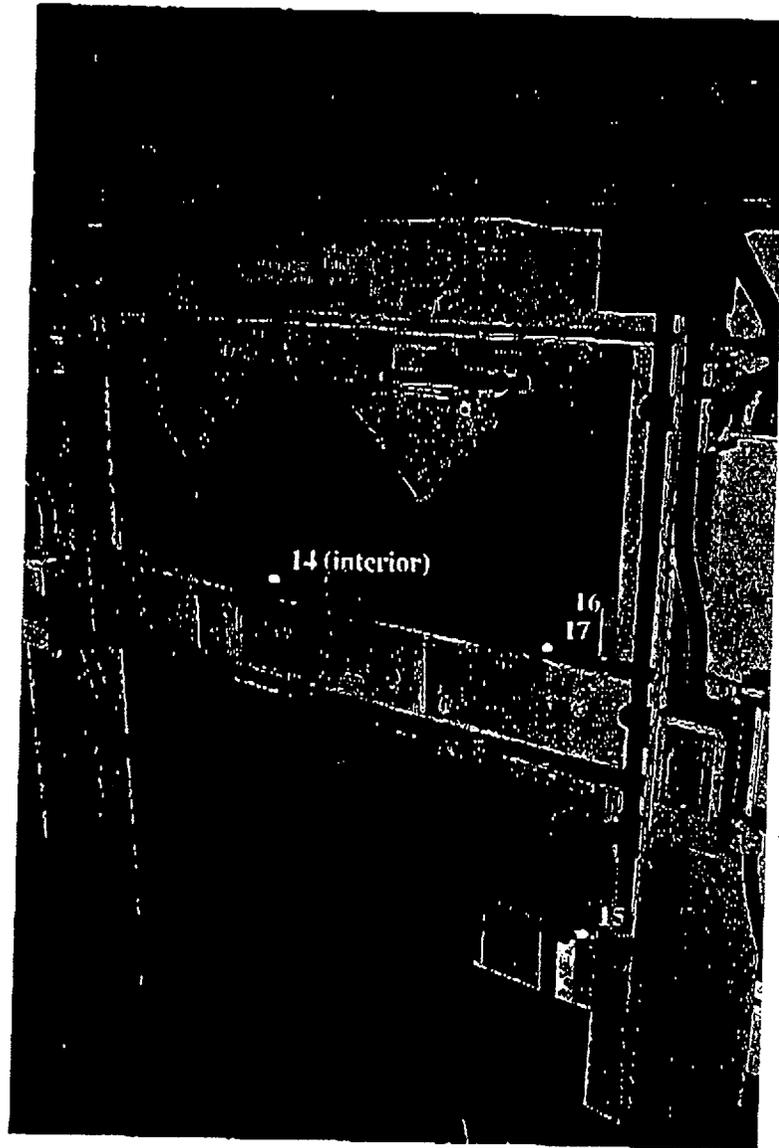


MEASUREMENT/SAMPLING  
LOCATIONS

• # SINGLE POINT

NOT TO SCALE

FIGURE 14: Wet Mill, Survey Unit 31 — Direct Measurement and Sampling Locations

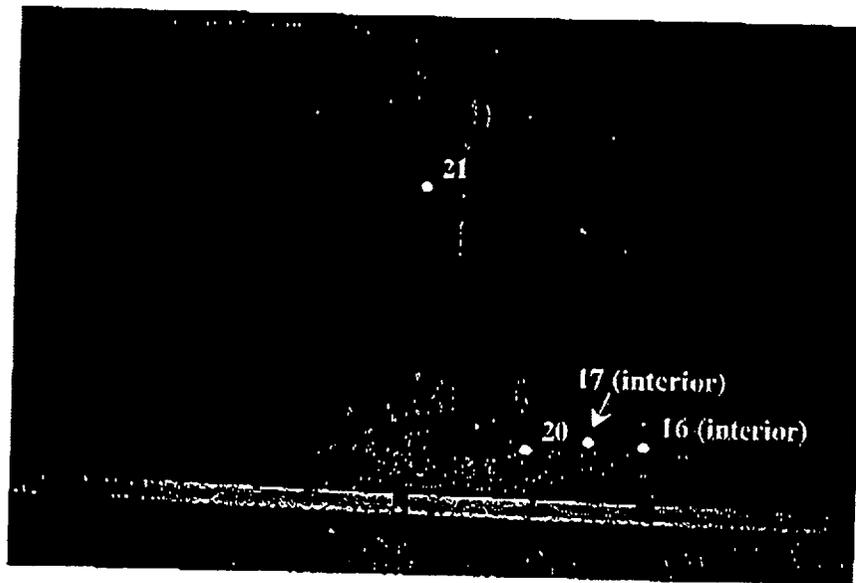
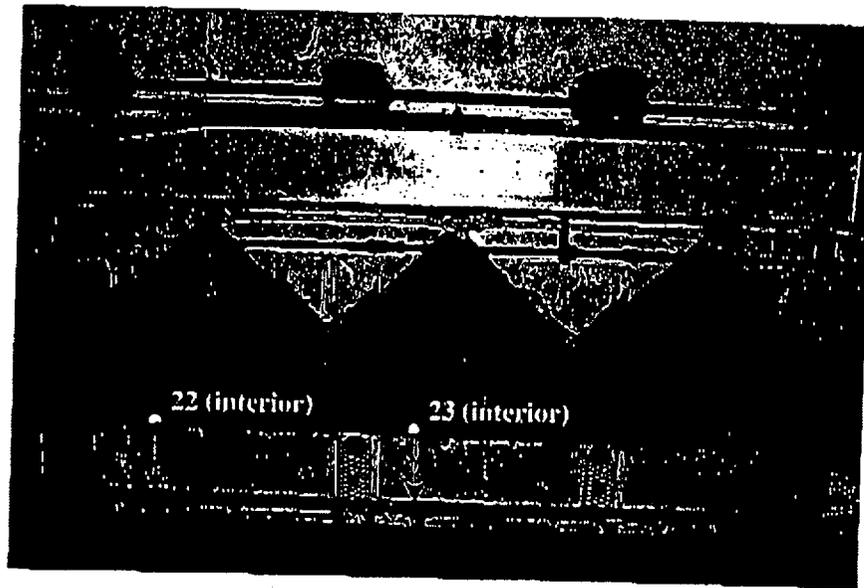


**MEASUREMENT/SAMPLING  
LOCATIONS**

• # SINGLE POINT

NOT TO SCALE

FIGURE 14: Dry Mill, Survey Unit 35 — Direct Measurement and Sampling Locations

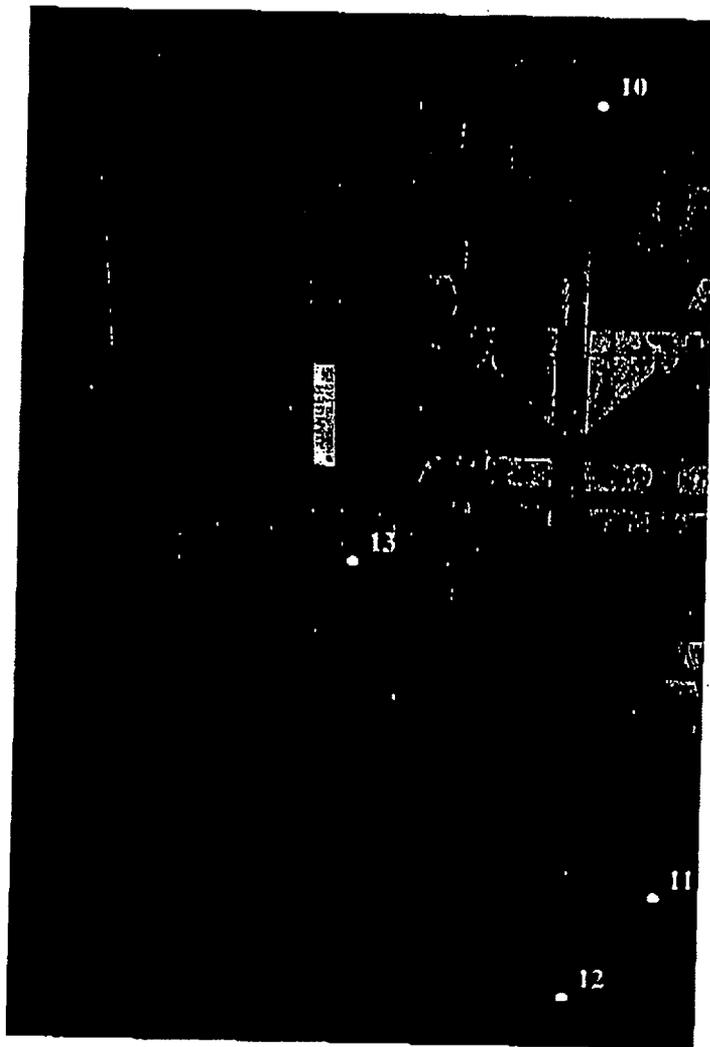


MEASUREMENT/SAMPLING  
LOCATIONS

● # SINGLE POINT

NOT TO SCALE

FIGURE 15: Dry Mill, Survey Unit 37 — Direct Measurement and Sampling Locations

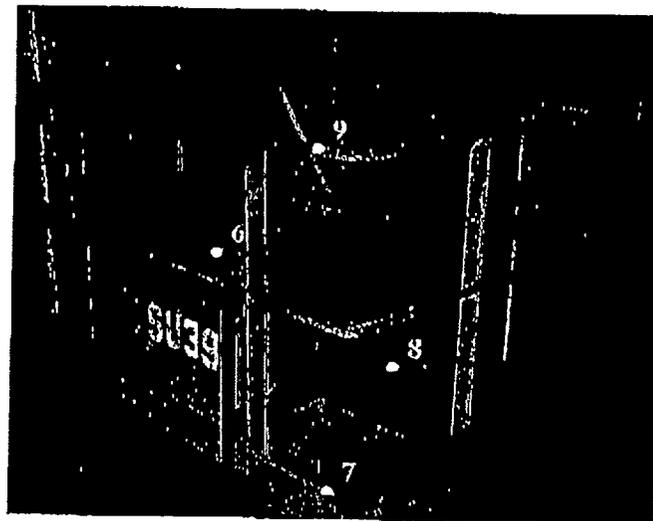


**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

NOT TO SCALE

FIGURE 16: Dry Mill, Survey Unit 38 — Direct Measurement and Sampling Locations

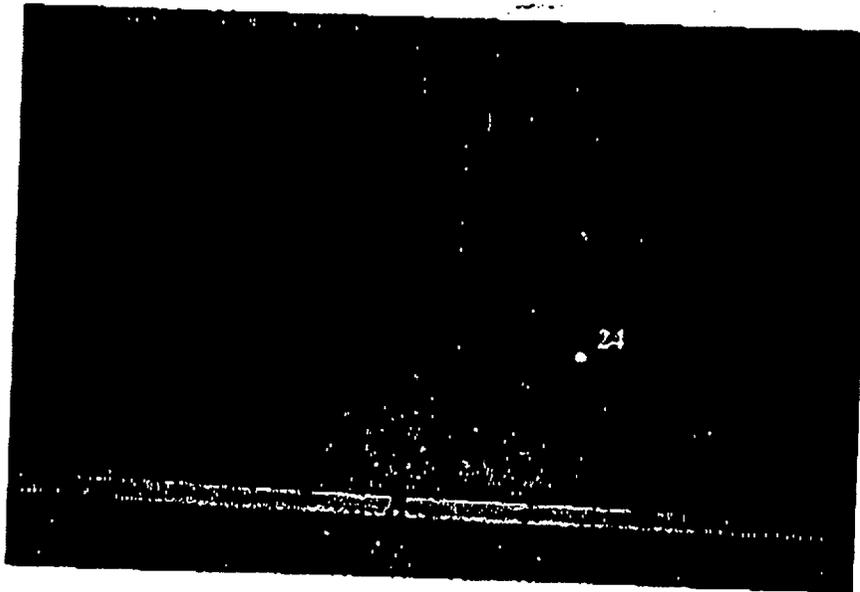
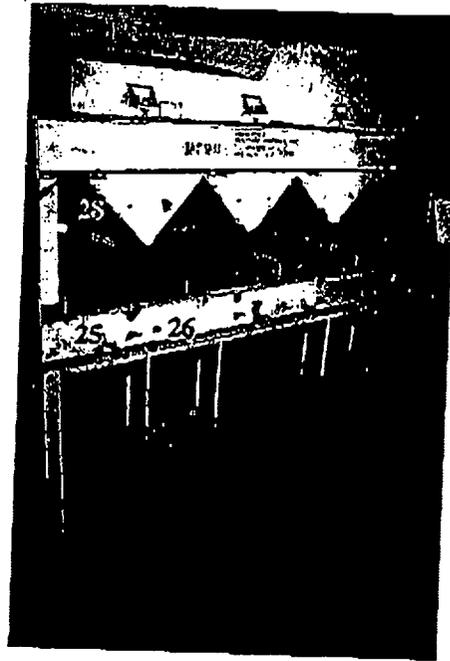


**MEASUREMENT/SAMPLING  
LOCATIONS**

- \* SINGLE POINT
- ◆ MISCELLANEOUS SAMPLE

NOT TO SCALE

FIGURE 18: Dry Mill, Survey Unit 39 — Direct Measurement and Sampling Locations

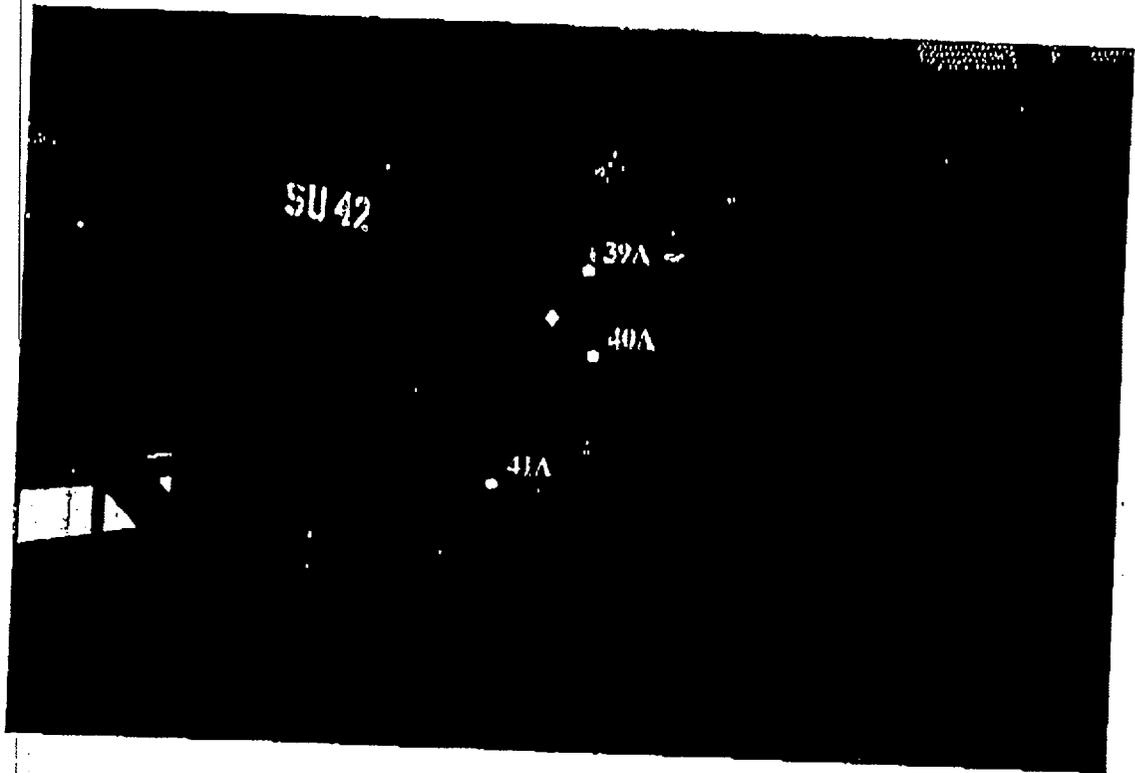


**MEASUREMENT/SAMPLING  
LOCATIONS**

● # SINGLE POINT

NOT TO SCALE

FIGURE 18: Dry Mill, Survey Unit 40 — Direct Measurement and Sampling Locations



**MEASUREMENT/SAMPLING  
LOCATIONS**

- # SINGLE POINT
- ◆ MISCELLANEOUS SAMPLE

NOT TO SCALE

FIGURE 19: Dry Mill Ground Floor, Survey Unit 42 — Direct Measurement and Sampling Locations

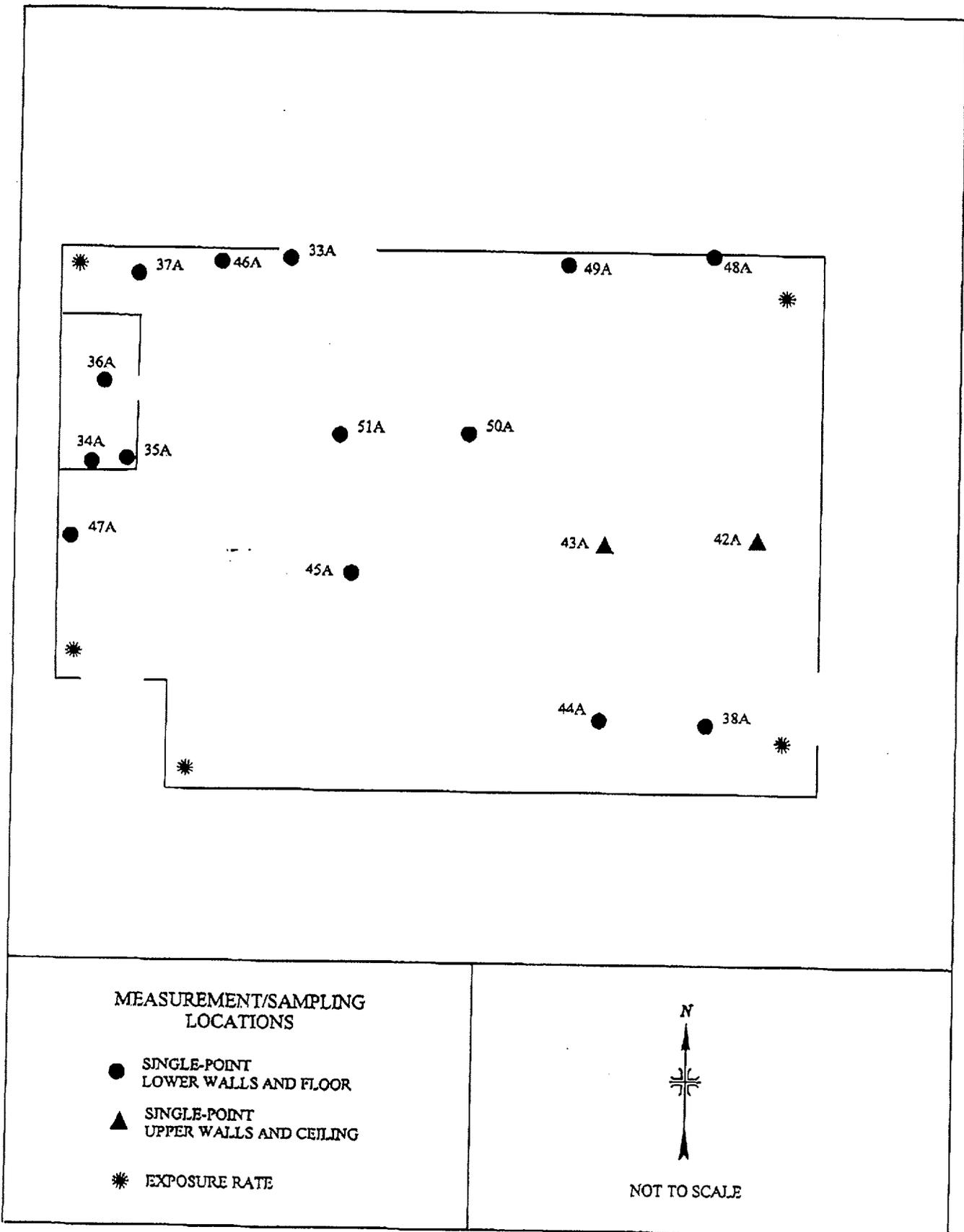


FIGURE 21: Dry Mill, Ground Floor - Measurement and Sampling Locations

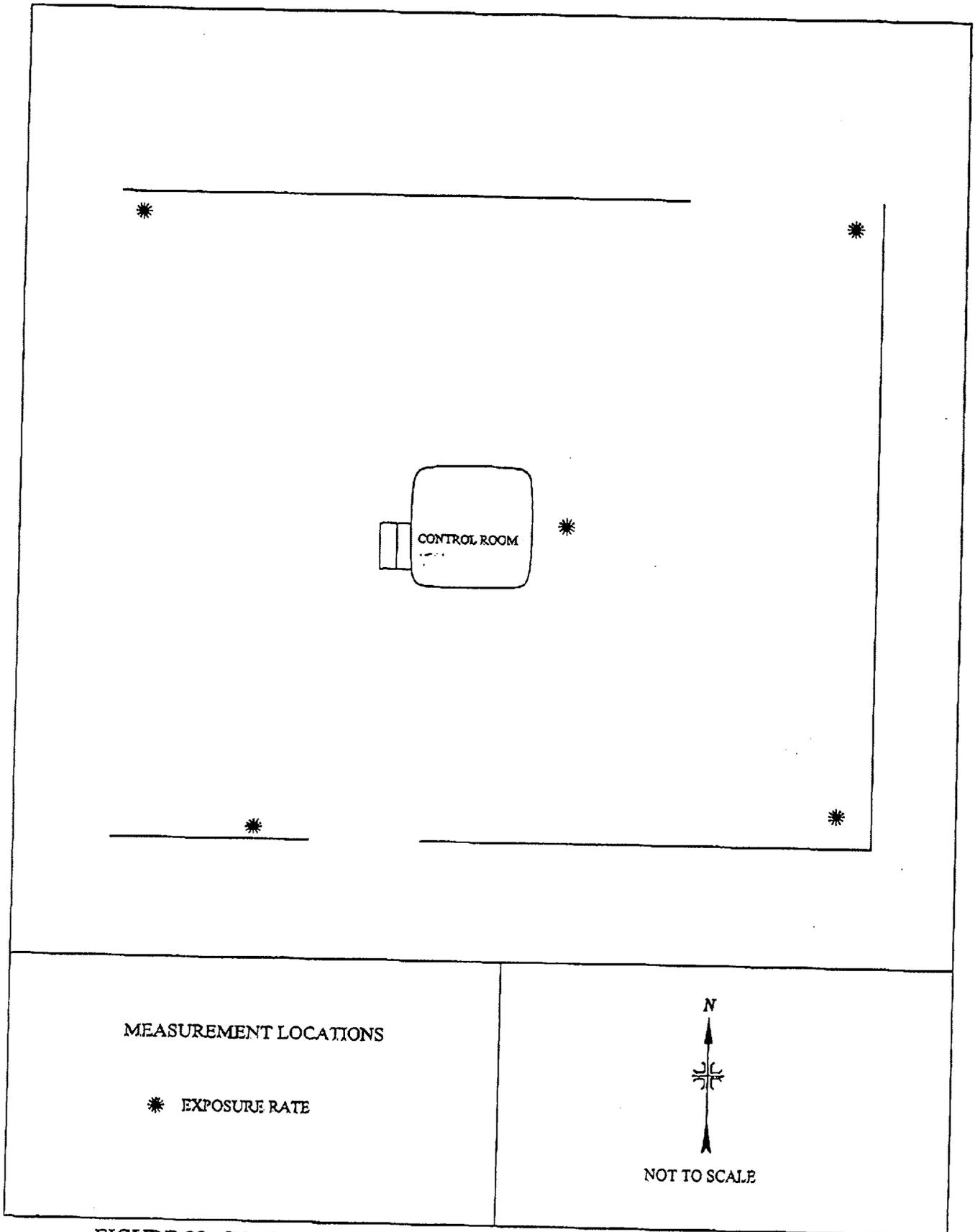


FIGURE 22: Wet Mill East End, Ground Floor - Exposure Rate Measurements

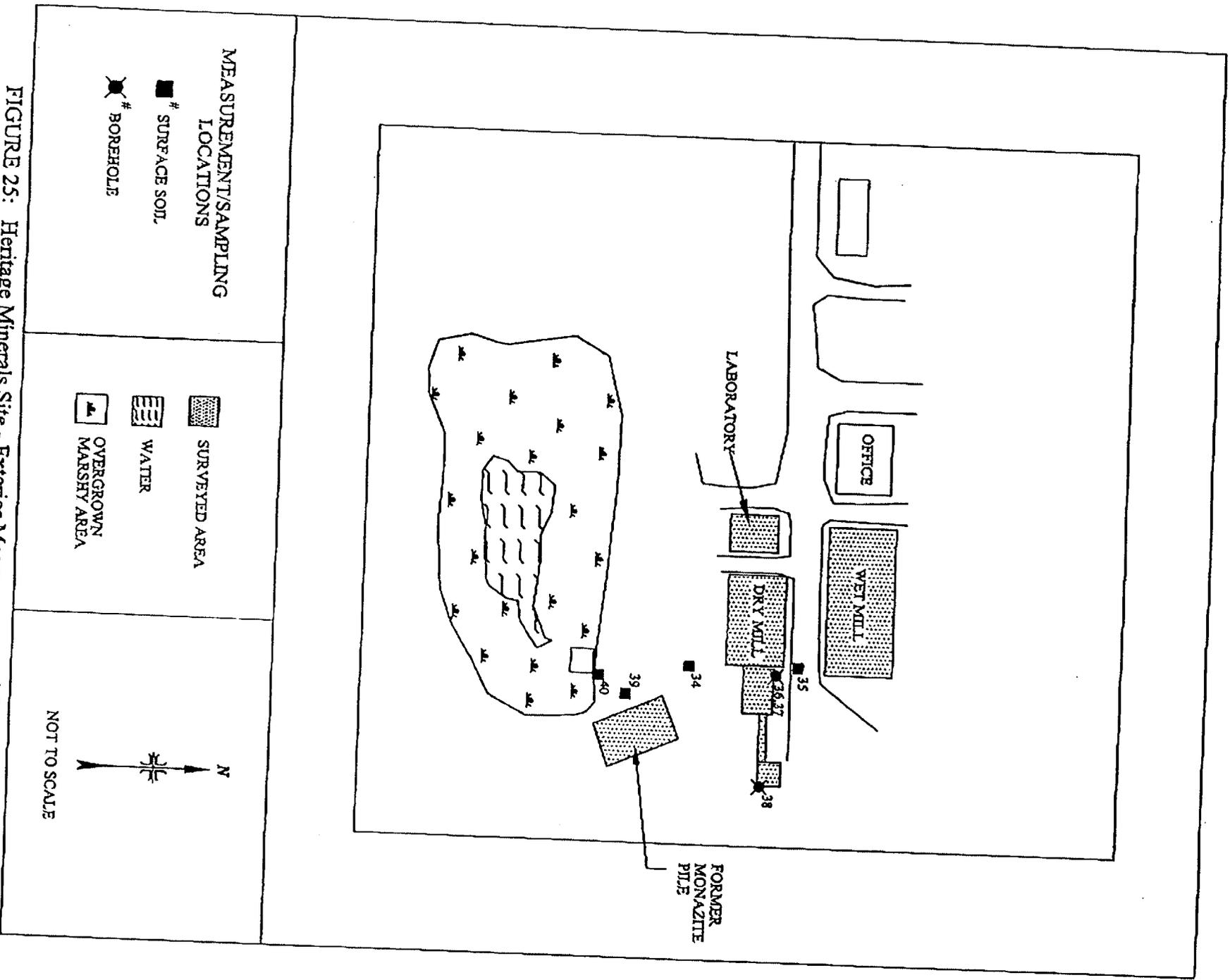


FIGURE 25: Heritage Minerals Site - Exterior Measurement and Sampling Locations

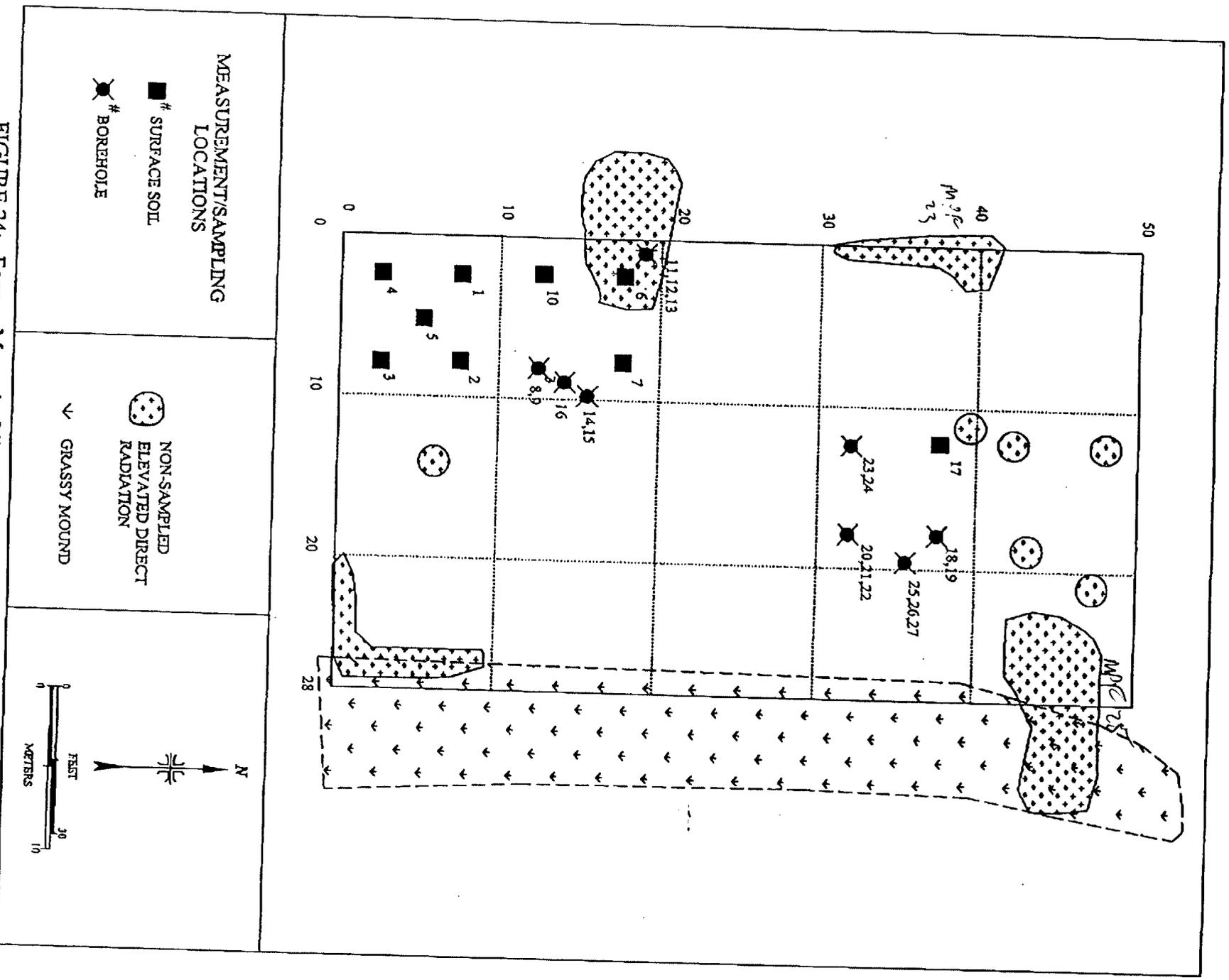


FIGURE 24: Former Monazite Pile - Measurement and Sampling Locations

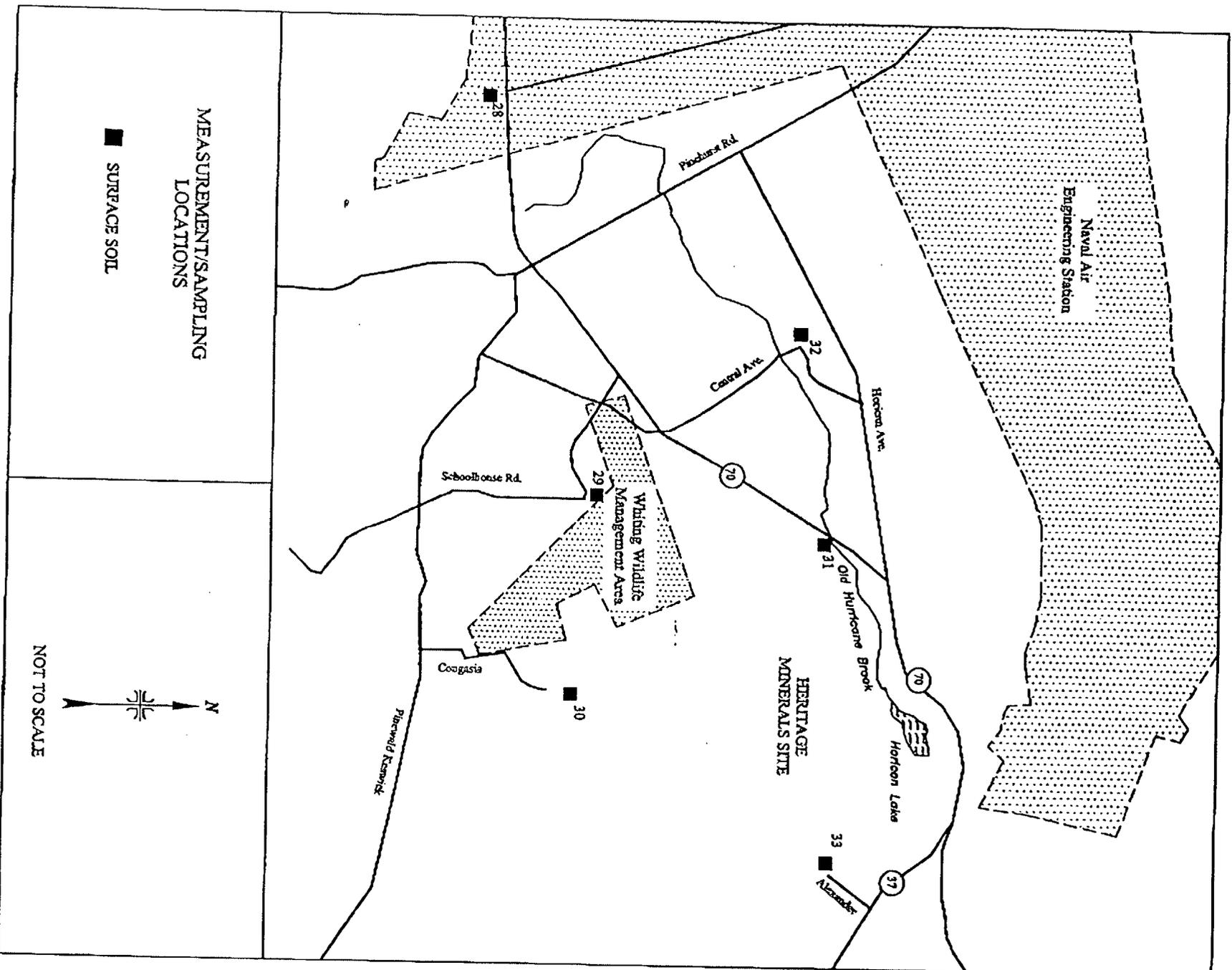


FIGURE 23: Heritage Minerals - Background Measurement and Sampling Locations

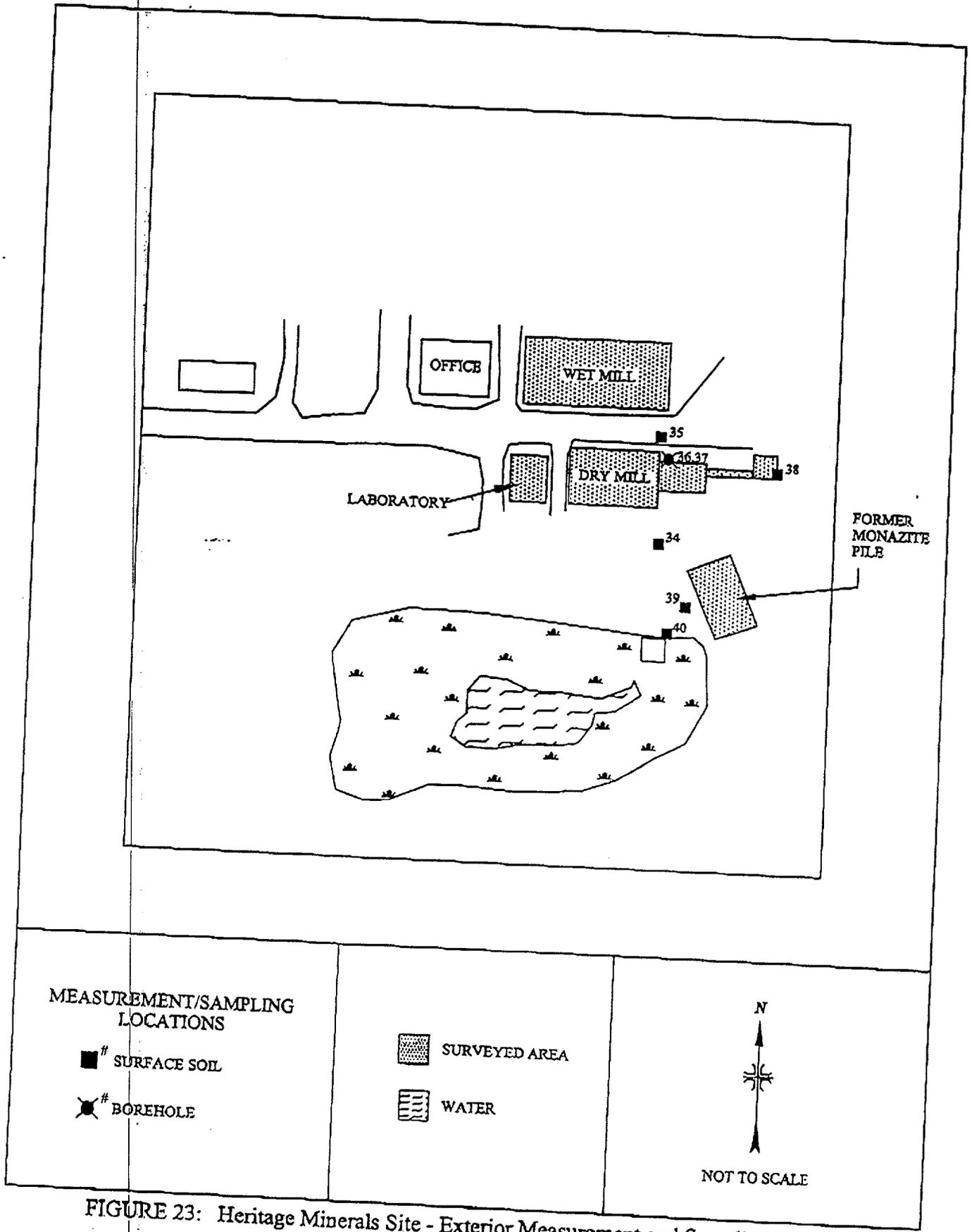


FIGURE 23: Heritage Minerals Site - Exterior Measurement and Sampling Locations

**TABLES**

**TABLE 1**  
**SUMMARY OF SURFACE ACTIVITY LEVELS**  
**HERITAGE MINERALS INCORPORATED FACILITY**  
**LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Lab Building</b>				

Room 1, Wall	9	-51	1	-3
Room 1, Table	NA	-44	0	-1
Room 1, Floor	NA	-200	0	1
Room 1, Door	NA	-73	3	3
Room 1, Wall	NA	-80	0	-4
Room 2, Cabinet	NA	130	0	-2
Room 2, Sink	NA	100	3	-2
Room 2, Floor	NA	-170	0	3
Room 2, Wall	NA	-160	0	-2
Room 2, Sink	NA	25	0	-1
Room 2, Bench	120	270	1	-3
Room 2, Floor	NA	-200	1	1
Room 3, Floor-13A	720	3,500	1	-4
Room 3, Sill	NA	740	1	-1
Room 3, Floor	NA	210	5	6
Room 3, Floor	NA	1,100	5	16
Room 4, Floor	NA	-170	3	1
Room 4, Sill	160	1,100	1	-2
Room 4, Floor	NA	-110	3	1
Room 4, Door	NA	-170	1	-3

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Lab Building (continued)</b>				
Room 5, Floor	NA	460	1	2
Room 5, Sill	120	300	5	-2
Room 5, Floor	NA	-130	0	-3
Room 5, Sill	NA	-100	3	2
Room 6, Wall	NA	-110	1	-2
Room 6, Floor	NA	-110	0	-3
Room 6, Floor	NA	-240	0	-2
Room 7, Floor	120	152	0	3
Room 7, Wall	310	1,100	1	1

Room 7, Floor	NA	-83	1	-3
Room 9, Sink	NA	200	1	-2
Room 9, Floor	NA	130	0	-1
<b>Wet Mill</b>				
SU1-92A	NA	4,400	0	-5
SU1-93A	NA	810	0	1
SU1-94A	NA	3,300	1	-2
SU1-95A	NA	5,400	1	-1
SU1-27	NA	2,100	0	-3
SU2-28	NA	1,900	1	-1
SU2-29	NA	1,600	5	-4

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Wet Mill (continued)</b>				
SU2-30	NA	1,200	3	-1
SU2-31	NA	1,000	1	2
SU2-32	230	3,100	0	-3
SU3-71A	NA	6,300	0	-1
SU3-72A	NA	3,700	0	3
SU3-73A	NA	2,300	3	3
SU3-74A	NA	5,100	0	-2
SU3-75A	NA	2,900	0	-2
SU7-76A	NA	3,800	0	5
SU7-77A	NA	5,800	3	2
SU7-78A	NA	3,600	0	-3
SU7-79A	320	6,100	0	20
SU7-80A	NA	2,900	1	-3
SU7-81A	NA	5,400	0	9
SU9-82A	NA	5,000	3	2
SU9-83A	1,200	7,200	0	1
SU9-84A	NA	8,600	5	-2
SU9-85A	NA	5,500	9	14
SU9-86A	NA	5,200	0	-1
SU12-61A	NA	17,000	0	5

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Wet Mill (continued)</b>				
SU12-62A	1,500	27,000	1	-1
SU12-63A	NA	8,900	3	5
SU12-64A	NA	5,600	1	4
SU12-65A	NA	4,000	3	-3
SU15-66A	NA	5,900	3	2
SU15-67A	700	9,500	0	1
SU15-68A	NA	7,600	0	-4
SU15-69A	NA	6,300	0	1
SU15-70A	NA	3,900	0	-1
SU27-57A	NA	19,000	1	10
SU27-58A	NA	11,000	0	-2
SU27-59A	140	19,000	0	-3
SU27-60A	NA	20,000	0	5
SU30-87A	NA	12,000	0	-2
SU30-88A	NA	3,300	0	-2
SU30-89A	NA	3,400	0	2
SU30-90A	NA	4,300	0	-3
SU30-91A	NA	2,200	3	5
SU31-52A	2,300	35,000	7	10
SU31-53A	NA	32,000	7	5

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Wet Mill (continued)</b>				
SU31-54A	NA	8,800	3	4
SU31-55A	NA	8,900	1	-3

SU31-56A	390	11,000	0	-2
<b>Dry Mill</b>				
SU35-14	NA	7,200	NA	NA
SU35-15	NA	3,500	0	3
SU35-16	NA	3,300	9	1
SU35-17	2,400	14,000	0	-1
SU37-18	NA	8,600	3	-1
SU37-19	NA	17,000	16	4
SU37-20	NA	8,100	13	-1
SU37-21	NA	3,500	11	11
SU37-22	NA	2,500	9	2
SU37-23	660	6,500	3	-1
SU38-10	NA	1,100	1	2
SU38-11	NA	250	3	12
SU38-12	NA	4,000	1	5
SU38-13	NA	1,800	0	6
SU39-1	NA	28,000	3	-2
SU39-2	200	28,000	9	2

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Dry Mill (continued)</b>				
SU39-3	2,600	89,000	5	21
SU39-4	NA	9,000	0	4
SU39-5	NA	9,500	NA	NA
SU39-6	NA	3,000	0	1
SU39-7	NA	8,300	33	25
SU39-8	NA	250	0	-2
SU39-9	NA	580	0	-2
SU40-24	NA	2,700	5	4
SU40-25	NA	21,000	0	3
SU40-26	1,100	23,000	1	4
SU40-27	NA	2,100	1	-3
SU40-28	NA	12,000	0	-2
SU42-39A	960	15,000	150	730
SU42-40A	NA	5,700	0	1

SU42-41A	NA	4,500	5	8
SU42-42A	2,400	16,000	3	-1
Floor - 33A	NA	1,600	0	-3
Floor - 34A	1,000	4,800	5	4
Desk - 35A	NA	3,400	0	-2
Floor - 36A	NA	73	1	-2

TABLE 1 (continued)

**SUMMARY OF SURFACE ACTIVITY LEVELS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Alpha	Alpha plus Beta <sup>b</sup>	Alpha	Beta
<b>Dry Mill (continued)</b>				
Floor - 37A	NA	6,200	1	-3
Column - 38A	370	6,600	13	20
I-Beam - 43A	670	12,000	3	5
I-Beam - 44A	NA	5,800	5	6
I-Beam - 45A	NA	4,600	5	36
Wall - 46A	NA	4,470	0	-3
Wall - 47A	560	6,100	0	2
Wall - 48A	NA	4,800	1	2
Floor - 49A	NA	6,130	1	5
Floor - 50A	NA	2,300	1	4
Floor - 51A	NA	2,100	0	4

<sup>a</sup>Refer to Figures 4 through 20.

<sup>b</sup>ESSAP performed alpha plus beta surface activity measurements. ESSAPs data indicates that the alpha contribution to the alpha plus beta surface activity measurements was less than ten percent.

**TABLE 2**  
**INTERIOR EXPOSURE RATES**  
**HERITAGE MINERALS INCORPORATED FACILITY**  
**LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Exposure Rate Range @ 1m ( $\mu$ R/h)
Laboratory	7 to 10
Wet Mill	8 to 17
Dry Mill	11 to 14
Background: Office Building	4 to 8

<sup>a</sup>Refer to Figures 21 through 22 for Wet and Dry Mill exposure rate locations. Exposure rate locations within the Laboratory and Main Office Building are not provided.

**TABLE 3**

**RADIONUCLIDE CONCENTRATIONS IN MISCELLANEOUS SAMPLES  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Location <sup>a</sup>	Radionuclide Concentration (pCi/g)					
	U-238	U-235	Total Uranium <sup>b</sup>	Th-228	Th-232	Total Thorium <sup>c</sup>
Dry Mill, SU39	59 ± 11 <sup>d</sup>	5.0 ± 2.4	120	310 ± 17	325 ± 26	640
Dry Mill, SU42	674.3 ± 138.4	31.2 ± 36.8	1400	1520 ± 130	1580 ± 150	3100
Wet Mill, SU3	408.7 ± 367.0	49.4 ± 130.4	870	690 ± 100	610 ± 260	1300

<sup>a</sup>Refer to Figures 7, 18, and 20.

<sup>b</sup>Total uranium concentrations are calculated based on a U-234 to U-238 activity ratio of 1:1 and U-235.

<sup>c</sup>Total thorium was calculated by summing the Th-228 and Th-232 results.

<sup>d</sup>Uncertainties represent the 95% confidence level, based only on counting statistics.

**TABLE 4**

**RADIONUCLIDE CONCENTRATIONS IN SOIL  
FORMER MONZITE PILE AND ADJACENT AREAS  
HERITAGE MINERALS INCORPORATED FACILITY  
LAKEHURST, NEW JERSEY**

Sample Number <sup>a</sup>	Depth (cm)	Exposure Rate @ 1m (μR/h)	Radionuclide Concentration (pCi/g)					
			U-238	U-235	Total Uranium <sup>b</sup>	Th-228	Th-232	Total Thorium <sup>c</sup>
<b>Monazite Pile</b>								
1	0-15	17	4.0 ± 1.0 <sup>d</sup>	0.1 ± 0.2	8.1	9.4 ± 0.5	9.1 ± 0.8	19
2	0-15	20	2.4 ± 1.0	0.1 ± 0.2	4.9	5.9 ± 0.3	5.8 ± 0.5	12
3	0-15	17	3.6 ± 1.0	0.1 ± 0.2	7.3	9.3 ± 0.5	9.1 ± 0.5	18
4	0-15	20	4.0 ± 1.1	0.1 ± 0.1	8.1	6.6 ± 0.4	6.4 ± 0.6	13
5	0-15	22	2.9 ± 0.9	0.1 ± 0.1	5.9	6.0 ± 0.3	5.8 ± 0.5	12
<b>Grid Block, N, E Surface (0-15 cm) Average</b>					6.9			15
6	0-15	30	10.6 ± 3.5	0.1 ± 0.4	21	21.0 ± 1.2	20.2 ± 1.8	41
7	0-15	15	1.1 ± 0.8	0.1 ± 0.1	2.3	2.8 ± 0.2	2.8 ± 0.3	5.6
8	0-15	25	12.2 ± 3.6	0.7 ± 0.7	25	40.0 ± 2.2	38.7 ± 3.3	79
9	15-30	NA	36.7 ± 5.6	1.1 ± 1.3	75	204.7 ± 10.9	210.6 ± 16.8	420
10	0-15	20	2.1 ± 0.8	0.1 ± 0.1	4.3	3.9 ± 0.2	3.8 ± 0.4	7.7
11	0-15	NA	49.6 ± 11.1	2.0 ± 2.5	100	330 ± 18	330 ± 27	660
12	15-30	NA	45 ± 30	7.9 ± 7.7	97	720 ± 39	820 ± 67	1540
13	30-45	NA	61 ± 23	1.5 ± 4.1	120	430 ± 23	460 ± 37	890

TABLE 4 (continued)

**RADIONUCLIDE CONCENTRATIONS IN SOIL  
FORMER MONZITE PILE AND ADJACENT AREAS  
HERITAGE MINERALS INCORPORATED FACILITY**

LAKEHURST, NEW JERSEY

Sample Number <sup>a</sup>	Depth (cm)	Exposure Rate @ 1m (μR/h)	Radionuclide Concentration (pCi/g)					
			U-238	U-235	Total Uranium <sup>b</sup>	Th-228	Th-232	Total Thorium <sup>c</sup>
14	0-15	20	17.0 ± 4.6	0.0 ± 0.7	34	64.0 ± 3.5	61.4 ± 5.0	130
15	15-30	NA	8.2 ± 3.2	-0.1 ± 0.5	17	23.8 ± 1.3	23.3 ± 2.0	47
16	15-30	30	50.8 ± 20.4	1.7 ± 4.7	103.3	377.1 ± 20.1	396.0 ± 32.6	770
<b>Grid Block 10N, OE Surface (0-15 cm) Average</b>								
17	0-15	15	7.5 ± 1.5	0.4 ± 0.3	15	13.6 ± 0.8	13.0 ± 1.1	27
18	0-15	18	19.0 ± 3.8	1.7 ± 1.1	40	29.9 ± 1.7	32.0 ± 2.9	62
19	15-30	NA	19.9 ± 4.7	2.2 ± 1.2	42	32.9 ± 1.9	35.3 ± 3.3	68
20	0-15	30	11.1 ± 3.2	0.6 ± 0.6	23	32.9 ± 1.8	32.7 ± 2.8	66
21	15-30	NA	15.3 ± 3.7	1.3 ± 0.7	32	46.9 ± 2.5	48.5 ± 4.0	95
22	30-45	NA	17.9 ± 4.4	1.2 ± 0.9	37	60.2 ± 3.2	61.1 ± 5.1	120
23	0-15	15	9.1 ± 1.8	0.4 ± 0.3	19	22.3 ± 1.2	21.8 ± 1.8	44
24	15-30	NA	7.4 ± 1.5	0.5 ± 0.2	15	16.3 ± 0.9	16.5 ± 1.4	33
25	0-15	20	22.8 ± 4.6	1.7 ± 1.5	47	89.1 ± 4.8	89.7 ± 7.4	180
26	15-30	NA	23.6 ± 5.1	1.7 ± 1.2	49	93.7 ± 5.1	94.8 ± 7.8	190
27	30-45	NA	8.1 ± 1.8	0.4 ± 0.3	17	15.2 ± 0.8	14.8 ± 1.3	30

TABLE 4 (continued)

RADIONUCLIDE CONCENTRATIONS IN SOIL  
 FORMER MONZITE PILE AND ADJACENT AREAS  
 HERITAGE MINERALS INCORPORATED FACILITY  
 LAKEHURST, NEW JERSEY

Sample Number <sup>a</sup>	Depth (cm)	Exposure Rate @ 1m (μR/h)	Radionuclide Concentration (pCi/g)

			U-238	U-235	Total Uranium <sup>b</sup>	Th-228	Th-232	Total Thorium <sup>c</sup>
<b>Grid Block 30N, 10E Surface (0-15 cm) Average</b>								
<b>Areas Outside the Monazite Pile Area</b>								
34	0-15	NA	23.4 ± 5.5	2.0 ± 1.3	49	30.6 ± 1.8	30.3 ± 3.0	61
35	0-15	NA	19.4 ± 5.4	0.7 ± 0.9	40	44.9 ± 2.5	46.2 ± 4.0	91
36	0-15	NA	9.5 ± 1.7	0.6 ± 0.3	20	15.6 ± 0.9	15.9 ± 1.3	32
37	15-30	NA	9.3 ± 1.9	0.8 ± 0.4	19	18.4 ± 1.0	18.1 ± 1.6	37
38	15-30	NA	6.8 ± 1.1	0.4 ± 0.2	14	10.7 ± 0.6	10.6 ± 0.9	21
39	0-15	NA	24.2 ± 6.2	0.9 ± 1.3	49	95.3 ± 5.2	97.1 ± 8.0	190
40	0-15	14	22.3 ± 5.3	2.4 ± 1.5	47	64.1 ± 3.6	70.2 ± 6.0	130
<b>Backgrounds</b>								
28	0-15	3	0.2 ± 0.2	0.1 ± 0.0	0.5	0.3 ± 0.0	0.3 ± 0.1	0.6
29	0-15	3	0.3 ± 0.2	0.0 ± 0.0	0.6	0.1 ± 0.0	0.2 ± 0.1	0.3
30	0-15	5	0.5 ± 0.3	0.0 ± 0.0	1.0	0.3 ± 0.0	0.3 ± 0.1	0.6
31	0-15	4	0.3 ± 0.4	0.0 ± 0.1	0.6	0.3 ± 0.0	0.3 ± 0.1	0.6
32	0-15	7	0.4 ± 0.4	0.0 ± 0.1	0.8	0.3 ± 0.0	0.3 ± 0.1	0.6

TABLE 4 (continued)

RADIONUCLIDE CONCENTRATIONS IN SOIL  
 FORMER MONZITE PILE AND ADJACENT AREAS  
 HERITAGE MINERALS INCORPORATED FACILITY  
 LAKEHURST, NEW JERSEY

Sample Number <sup>a</sup>	Depth (cm)	Exposure Rate @ 1m (μR/h)	Radionuclide Concentration (pCi/g)				
			U-238	U-235	Total Uranium <sup>b</sup>	Th-228	Th-232
<b>Grid Block 30N, 10E Surface (0-15 cm) Average</b>							
<b>Areas Outside the Monazite Pile Area</b>							

34	0-15	NA	23.4 ± 5.5	2.0 ± 1.3	49	30.6 ± 1.8	30.3 ± 3.0	61
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\*Refer to Figures 22 through 24.

\*Total uranium concentrations are calculated based on a U-234 to U-238 activity ratio of 1:1 and U-235.

\*Total thorium was calculated by summing the Th-228 and Th-232 results.

\*Uncertainties represent the 95% confidence level, based only on counting statistics.

**TABLE 5**  
**ANALYTICAL COMPARISON OF RSI SAMPLES**  
**HERITAGE MINERALS INCORPORATED FACILITY**  
**LAKEHURST, NEW JERSEY**

Sample Number	Radionuclide Concentration (pCi/g)			
	RSI		ESSAP	
	Total Uranium	Total Thorium	Total Uranium	Total Thorium
50722068	15	19	18	21
50722002	45	100	45	100
50722052	19	32	20	31

\*Total uranium calculated by doubling the Th-234 (63 KeV) concentration and adding the U-235 (143 KeV) concentration.

†Total thorium calculated by adding the Ac-228 (911 keV) concentration to the Pb-212 (239 keV) concentration.