October 20, 1994

Thomas Frasso
Logistics Director
SMH (US) Incorporated
1817 William Penn Way
Lancaster, PA 17604

Dear Mr. Frasso:

This is in reference to your letter dated January 19, 1994 with attached contamination survey results to request the removal of 941 Wheatland Avenue as a place of use for NRC License No. 37-03572-06. We have reviewed your submittals and within the scope of our review, no further deficiencies were identified.

Based on our review of your submittals and on the results of our confirmatory surveys on August 5, August 30, and September 14, 1994 at your facility located at 941 Wheatland Avenue, Lancaster, Pennsylvania and the survey attached to your letter dated September 23, 1994, we have amended the enclosed license to remove 941 Wheatland Avenue as a place of use on your NRC license and thereby release this address for unrestricted use with respect to the use of NRC licensed material.

If you have any questions regarding this letter, please call David Everhart of this office at (610) 337-6936. Thank you for your cooperation in this matter.

Sincerely,

Original Signed by:
Elizabeth Ullrich

for Mohamed M. Shanbaky, Chief
Research and Development Section
Division of Radiation Safety
and Safeguards

OFFICIAL RECORD COPY - C:\DOC\LIC\SMHAMND.APP - 10/20/94

ML 10

License No: 37-03572-06
Docket No: 030-12704
Control No: 119261

Enclosure:
Amendment No. 11

bcc:
M. Shanbaky, RI
D. Everhart, RI

DOCUMENT NAME: C:\DOC\LIC\SMHAMND.APP

OFFICE	DRSS/RI	DRSS/RI	DRSS/RI	DRSS/RI
NAME	DEverhart	MShanbaky		
DATE	10/20/94	10/20/94	10/ /94	10/ /94

OFFICIAL RECORD COPY

170089

SMH FAX TRANSMITTAL MEMO

TO: DAVE Everhart FROM: Tom Frasso

ATTN: PHONE:

FAX NO: REF. NO: DATE:

REMARKS: Please give me a call as soon as possible. Thanks.

37-03572-06

RADIATION PHYSICS, INCORPORATED
P.O. Box 513
Campbelltown, PA 17010-0513
717-838-1111

Date: September 23, 1994

To: Ken Nolt
Radiation Safety Officer

From: Thomas E. Woolley
Manager, Radiological Services

Subject: Wheatland Ave. Facility Decommissioning

Attached please find the result for smear #6 S-26, collected at your Wheatland Ave. Facility on Sept. 22, 1994. This result was generated by a Beckman liquid scintillation counter (Model LS 6000IC) using a sampling and counting protocol specific to your isotope of concern. The result of the smear is 311 dpm/100 cm^2 for ^3H.

119261

FAX REC'D SEP 23 1994

OFFICIAL RECORD COPY

ML 10

ID:RPI-GMEARS 23 SEP 1994 10:09

USER: 1 COMMENT:3H + 14C ,10 MIN.

PRESET TIME :	10.00						
DATA CALC :	AUTO DPM	H# : NO	SAMPLE REPEATS:	1	PRINTER	: STD
COUNT BLANK :	YES	IC# :YES	REPLICATES :	1	RS232	: OFF
TWO PHASE :	NO	ADC : NO	CYCLE REPEATS :	1		
SCINTILLATOR:	LIQUID	LUMEX: NO	LOW SAMPLE REJ:	0		
LOW LEVEL :	NO	HALF LIFE CORRECTION DATE:			none	

ISOTOPE 1: 3H %ERROR: 0.00 FACTOR:1.0000 BKG. SUB: 0
ISOTOPE 2: 14C %ERROR: 0.00 FACTOR:1.0000 BKG. SUB: 0

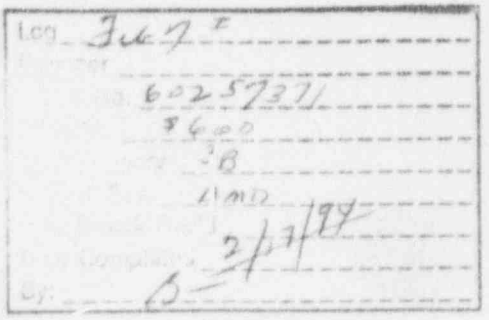
SAM NO	POS	TIME MIN	IC#	3H DPM	3H %ERROR	14C DPM	14C %ERROR	3H DPM	3H EFF-1	LUMEX %	ELAPSED TIME
B1	22-1	10.00	9.487	27.90	11.97	14.70	16.50	85.97	32.45	1.32	10.91
		Blank Average DPM for 3H : 85.97 COEF. OF VAR: 0.000									
1	22-3	10.00	4.929	187.90	4.61	14.50	16.61	310.60	47.38	0.49	21.47

(US) Inc.
a company of SMH Swiss Corporation for Microelectronics and Watchmaking Industries Ltd

030-12704

January 19, 1994

U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415



ATTN: Mr. David Everhart

Mail Control Number: 115031

Dear Mr. Everhart

Subject: Decommissioning Wheatland Ave and Financial Assurance

PLEASE EXPEDITE DUE TO POSSIBLE SALE OF FACILITY

In accordance with several phone conversations with both myself and Mr. Thomas Woolley of Radiation Physics, Inc. the following information is submitted in support of decommissioning the SMH (US) Inc. facility at 941 Wheatland Ave, Lancaster PA 17604, under Materials Licence 37-03572-06:

1) Contamination Survey Results

2) License Amendment Fee of $600.00 for license type 3B

Also the following information is submitted in reference to your September 13, 1993 letter (control No. 115031) concerning our financial assurance and Letter of Credit (the numbered items correspond with the numbered items in your letter):

1) Now that we have completed the decommissioning effort at the Wheatland Ave. facility, SMH (US) Inc. feels the cost associated with this cleanup to be a fair representation of costs necessary for our remaining facility at 1817 William Penn Way. The major difference between the decommissioning of 941 Wheatland Ave and any future decommissioning of 1817 William Penn Way would be the relocation of inventory to another licensed facility (St. Croix, V.I.), and the cleaning of work surfaces and shelving. (NOTE: both the inventory and the work surfaces had been moved to 1817 William Penn Way earlier in 1993)

Both the inventory relocation and cleaning of work surfaces and shelving have been previously identified in the 1991 Decommissioning Funding Plan. These costs are outlined in detail on pages 7 - 10 in the DFP and are still considered accurate with the exception of the assembly room which has been relocated to our

119261
FEB 2 1994

1817 William Penn Way, Lancaster, PA 17604 Telephone: (717) 394-7161 Telefax: (717) 394-2030

Virgin Island plant in 1992 as outlined in our DFP. This exception will actually lower our decommissioning costs since the assembly operation is no longer in existence.

The NRC estimated costs of $427,315 seems to be extraordinarily high most likely due to the fact that the Appendices A and E of NUREG/CR-1754 pertain mainly to laboratory type facilities versus our operation for watch repair and some assembly of components with cured luminous paint. These components with cured luminous paint while slightly less secure than fully sealed sources, presents much less possibility for contamination and resulting decontamination expense than most forms in which the isotopes could be used.

Also the NRC cost estimate is assuming disposition of 63.54 cubic meters of waste where SMH (US) Inc. will clean virtually the entire facility versus waste disposal. As we have proved in past and current decommissioning efforts H3 cleans up very well with soap and water washdowns. Also demonstrated in the DFP the washwater can be disposed via sanitary sewer after testing.

The following summary of the costs incurred during decontamination of the first floor and basement of 941 Wheatland Ave versus the estimated costs in the DFP should also show you our original DFP was and still offers enough dollars to cover any future decommissioning efforts required:

	ACTUAL COSTS	ESTIMATED COSTS
Contractor hours	$ 254.40	$1,676
SMH Staff hours	$1,125.00	$1,547
Radiation Physics	$1,368.00	$1,000
Smears	$1,951.75	$5,500
Waste(copper tubing)	$1,950.00 (1 drum)	$2,562(2-55 gal-drums)
Total	$6,649.15	$12,286

2) Our total cost estimate for decommissioning is $40,349 which includes both our Wheatland Ave and William Penn Way facilities. (When the decommissioning of Wheatland Ave facility is finalized this cost estimate will be reduced significantly.) If we add the normal 25% contingency factor the cost estimate will be $50,436. It is our understanding according to 10CFR Part 30.35 (d) that financial assurance be submitted in amounts of either $75,000, $150,000 or $750,000. SMH-(US) Inc. has provided financial assurance in the amount of $75,000.

3) SMH (US) Inc. will review the DFP each time of license renewal.

4) Per your request a signed statement to draw on the Letter of Credit will be added to the Letter of Credit reading

> "I certify that the amount of the draft is payable pursuant to regulations issued under authority of the U.S. Nuclear Regulatory Commission"

the underlined being changed from "SMH (US) Inc., AKA SMH (US) Services, Inc."

5) The Swiss Bank Corporation, New York Branch has refused to include this statement in the Letter of Credit. Per SMH Legal Counsel this omission does not effect the validity of the Letter of Credit and SMH (US) Inc. proposes to exclude this statement. The SMH (US) Legal Department is available to discuss the language of our Letter of Credit if necessary.

6) SMH (US) Inc. will establish a stand-by trust fund. Will the NRC accept the Swiss Bank Corporation as the holder of this fund?

7) If the NRC accepts the above, SMH (US) Inc. will proceed with the necessary changes and originally signed, completely executed copies of the modified documents will be forwarded to your attention as soon as possible.

If you should have any questions regarding this correspondance please do not hesitate to contact me at telephone number (717)-399-3765 or fax number (717)-399-3397.

Sincerely,

Thomas G. Frasso

Thomas G. Frasso
Logistics Director

CONTAMINATION SURVEY RESULTS

IN SUPPORT OF DECOMMISSIONING FOR

THE SMH(US), INC. FACILITY

941 WHEATLAND AVENUE

LANCASTER, PA

Prepared by
Radiation Physics, Inc.

In Reference to:
SMH (US), Inc.
License Number
37-03572-06

December 1993

CONTAMINATION SURVEY RESULTS
FOR THE SMH(US), INC. FACILITY
941 WHEATLAND AVENUE
LANCASTER, PA

Prepared by: Thomas E Woolley Date: 1-12-94
Thomas E. Woolley
Manager Radiological Services
Radiation Physics, Inc.

Reviewed by: Kenneth L. Nolt Date: 1/25/94
Ken Nolt
Radiation Safety Officer
SMH(US), Inc.

Reviewed by: Kenneth L Miller Date: 1-11-94
Kenneth L. Miller, CHP
Vice President
Radiation Physics, Inc.

Approved by: Thomas G. Frasso Date: 1/25/94
Thomas Frasso
Logistics Director
SMH(US), Inc.

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CONTAMINATION SURVEY RESULTS
IN SUPPORT OF DECOMMISSIONING FOR
THE SMH(US), INC. FACILITY
941 WHEATLAND AVENUE
LANCASTER, PA

INTRODUCTION

The licensee is authorized by license number 37-03572-06 to possess up to 1,000 curies each of watch components containing ^{3}H as Radium Chemie PS 363 Tritiated Luminous Paint and ^{147}Pm as W. Maier Promethium Oxalate Paint. Components were obtained from overseas suppliers and were certified by the suppliers as meeting the regulations of the U.S. Nuclear Regulatory Commission. From 1977 to 1986 the licensee was authorized for ^{3}H only. In 1986 ^{147}Pm was added to the license and sealed gas sources were deleted from the license.

In June of 1990 the watch assembly operation of SMH(US), Inc. was moved from the third floor of the company's facility at 941 Wheatland Avenue, Lancaster, PA to its new facility located at 1817 William Penn Way, Lancaster, PA. Shortly after this move, the third floor of 941 Wheatland Ave. was surveyed and decontaminated (see Appendix A).

In July of 1993 the licensee moved the remaining licensed activities from the 941 Wheatland address to the new facility at 1817 William Penn Way. These remaining activities had been restricted to the first floor and basement areas of the Wheatland Avenue Facility. Shortly after the move, surveys were performed to determine any residual contamination and to guide decontamination/decommissioning efforts.

PRELIMINARY SURVEYS

On July 20, 1993 the licensee's Radiation Safety Officer performed preliminary smear surveys of the First Floor Areas (see Figures 4 and 5) to determine extent of residual contamination and to provide guidance in planning decontamination efforts. The samples taken were analyzed by Radiation Physics, Inc. using liquid

scintillation counting. The results are listed as Wipe Survey Results on pages 4 and 5 of this report. This preliminary survey indicated one area with contamination exceeding the action level of 1000 DPM/100 cm^2. This area was given special attention when the entire area was scrubbed. Radiation Physics, Inc. was then asked to come in and perform a thorough contamination survey.

SURVEY PROCEDURE AND FINDINGS

On September 1, 1993, Radiation Physics, Inc. mapped out the First Floor and Basement areas (see Figures 4, 5 & 6) and divided the areas into a grid using a one meter grid system. An area of 100 cm^2 was swiped at the center of each grid using a polyfoam smear. 145 smears were taken and placed into individual liquid scintillation counting vials that were numbered and labeled with the grid locations. Following the surveys the samples were analyzed using liquid scintillation counting with counting windows selected to permit the discrimination between ^{3}H and ^{147}Pm. No ^{147}Pm contamination was found. The results of these surveys are listed as Phase I Survey Results and are contained on pages 6 through 12 of this report. The survey identified nine areas in excess of the contamination limit of 1000 DPM/100 cm^2 and in the need of further cleaning.

The nine areas of contamination identified by the Phase I Survey were again decontaminated and on September 28, 1994, Radiation Physics again surveyed these areas. These previously contaminated areas were divided into square meter grids and again surveyed in the same manner as described above. A total of 45 swipes were taken and analyzed using liquid scintillation counting. The results are listed as Phase II Survey Results and are contained on pages 13 through 15 of this report.

The Phase II Surveys indicated two areas in excess of the

contamination limit and one area of 955 DPM/100 cm^2. All three areas were once again decontaminated and resurveyed on October 20, 1993. The results are listed as Phase III Survey Results on page 16 of this report.

One area of contamination in excess of the limit remained. However, when sample averaging of the results were applied for that five smear grid area, the average result was determined to be less the contamination action limit of 1000 DPM/100 cm^2 (see Phase III Survey Results, page 17 of this report).

In addition to the surface areas, a sample was also taken from the vacuum line that was used to remove dust particles from watch interiors during repair and reassembly (see Scoping Survey Results, page 5 of this report). The results indicated microcurie quantities of ^3H remained in this line. The line and the vacuum pump were packaged and placed in storage at the 1817 William Penn Way Facility to await decontamination or disposal as radioactive waste.

CONCLUSION

The decommissioning process began with a review of the licensed activities at the 941 Wheatland Avenue, Lancaster, PA facility. Through this review the licensee identified all areas within the facility that had been used for licensed activities. Over the course of several months, the decommissioning effort consisted of surveying followed by decontamination of all areas found to be contaminated. Follow up surveying and further decontamination efforts continued until all areas were within the guidelines specified in NUREG/CR-1754 (Appendix B) for the decommissioning of non-fuel cycle nuclear facilities.

The licensee feels that it has demonstrated successful decontamination of this facility and requests approval to return the entire facility to unrestricted use.

Scoping Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA

Samples Collected by:
Kenneth Nolt, RSO
SMH(US), Inc.
Collected: 7/20/93

SMH(US) Smear ID Number	Grid ID Number	Location Description	^{3}H DPM/ 100 cm^2
1st Floor, 941 Wheatland Ave., (Figure 5)			
W-01	S-50	Window Sill	422
W-02	R-49	Radiator Surface	497
W-03	S-40	Radiator Surface	369
W-04	O-28	Ceiling/Air Vent Surface	443
W-05	N-18	Floor/Ceiling Support Beam Surface	491
W-06	P-18	Floor Surface	680
W-07	P-33	Floor Surface	476
W-08	P-40	Floor Surface	491
W-09	S-18	Wall Surface	456
W-10	L-36	Wall Surface	372
W-11	O-46	Air Handler Room/Floor Surface	1137*
W-12	A-38	Window Bling/Surface Area	418
W-13	A-11	Window Blind/Surface Area	378
W-14	D-45	Ceiling/Air Vent Surface	410
W-15	A-12	Wall Surface	478
W-16	F-21	Floor/Ceiling Support Beam Surface	374
W-17	A-10	Radiator Surface	337
W-18	J-01	Radiator Surface	281

* Areas to be decontaminated

Scoping Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA

Samples Collected by:
Kenneth Nolt, RSO
SMH(US), Inc.
Collected: 7/20/93

SMH(US) Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
1st Floor, 941 Wheatland Ave., (Figure 5)			
W-19	G-06	Floor Surface	443
W-20	G-12	Floor Surface	354

Smear taken inside 0.75" vacuum line removed from facility

SMH(US) Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
W-21	NA	Vacuum Line/Interior	16160

160,392 cm^2 of pipe and fittings removed --> 11.7 uCi total

* Areas to be decontaminated

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
1st Floor, 941 Wheatland Ave., Klause Office, (Figure 5)			
I-001	C-02	Wall Surface and Window Sill	280
I-002	I-02	Wall Surface and Window Sill	266
I-003	A-10	Floor and Wall Surface	311
I-004	F-10	Floor Surface	288
I-005	C-16	Floor Surface	769
I-006	J-16	Floor and Wall Surface	365
I-007	A-22	Floor and Wall Surface	1129*
I-008	F-22	Floor Surface	713
I-009	C-01	Floor Surface	742
I-010	J-28	Floor and Wall Surface	418
I-011	A-34	Floor and Wall Surface	364
I-012	F-34	Floor and Wall Surface	817
1st Floor, 941 Wheatland Ave., Grid Map, (Figure 4)			
I-013	S-51	Floor and Wall Surface	552
I-014	Q-51	Floor and Wall Surface	473
I-015	S-49	Floor Surface	390
I-016	Q-49	Floor Surface	416
I-017	S-47	Floor and Wall Surface	453
I-018	Q-47	Floor Surface	769
I-019	P-49	Floor Surface	602
I-020	R-44	Floor Surface	768
I-021	P-44	Floor Surface	976

* Areas to be decontaminated

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
I-022	O-44	Floor Surface	376
I-023	N-44	Floor Surface	433
I-024	L-44	Floor Surface	609
I-025	S-44	Wall Surface and Window Sill	545
I-026	Q-42	Floor Surface	355
I-027	O-42	Floor Surface	320
I-028	N-42	Floor Surface	359
I-029	M-42	Floor Surface	198
I-030	S-40	Floor and Wall Surface	887
I-031	R-40	Floor Surface	254
I-032	Q-40	Floor Surface	426
I-033	O-40	Floor Surface	195
I-034	M-40	Floor Surface	290
I-035	S-38	Floor and Wall Surface	316
I-036	Q-38	Floor Surface	195
I-037	O-38	Floor Surface	223
I-038	N-38	Floor Surface	239
I-039	N-39	Floor Surface	257
I-040	R-36	Floor Surface	231
I-041	P-36	Floor Surface	217
I-042	O-36	Floor Surface	242
I-043	N-36	Floor Surface	330
I-044	M-36	Floor Surface	289

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^{3}H DPM/ 100 cm^2
I-045	S-34	Floor and Wall Surface	6071*
I-046	Q-34	Floor Surface	203
I-047	O-34	Floor Surface	154
I-048	N-34	Floor Surface	188
I-049	M-34	Floor Surface	207
I-050	S-32	Floor and Wall Surface	3165*
I-051	Q-34	Floor Surface	258
I-052	O-32	Floor Surface	238
I-053	N-32	Floor Surface	177
I-054	M-32	Floor Surface	436
I-055	R-30	Floor Surface	193
I-056	Q-30	Floor Surface	324
I-057	P-30	Floor Surface	256
I-058	N-30	Floor Surface	438
I-059	L-30	Floor Surface	355
I-060	S-28	Floor and Wall Surface	3496*
I-061	Q-28	Floor Surface	476
I-062	P-28	Floor Surface	271
I-063	N-28	Floor Surface	193
I-064	M-28	Floor Surface	271
I-065	R-26	Floor Surface	1004*
I-066	P-26	Floor Surface	245
I-067	O-26	Floor Surface	161

* Areas to be decontaminated

Phase I Survey Results
CMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
I-068	N-26	Floor Surface	183
I-069	L-20	Floor and Wall Surface	260
I-070	S-24	Floor and Wall Surface	425
I-071	A-24	Floor Surface	255
I-072	O-24	Floor Surface	229
I-073	N-24	Floor Surface	207
I-074	M-24	Floor Surface	134
I-075	R-22	Floor Surface	300
I-076	P-22	Floor Surface	222
I-077	O-22	Floor Surface	189
I-078	N-22	Floor Surface	166
I-079	L-22	Floor Surface	163
I-080	S-20	Floor and Wall Surface	530
I-081	Q-20	Floor Surface	191
I-082	O-20	Floor Surface	203
I-083	N-20	Floor Surface	360
I-084	M-20	Floor Surface	158
I-085	R-18	Floor Surface	329
I-086	P-18	Floor Surface	208
I-087	O-18	Floor Surface	114
I-088	N-18	Floor Surface	216
I-089	L-18	Floor Surface	128
I-090	S-16	Floor and Wall Surface	1053*

* Areas to be decontaminated

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
I-091	Q-16	Floor Surface	166
I-092	O-16	Floor Surface	149
I-093	N-16	Floor Surface	199
I-094	M-16	Floor Surface	241
I-095	N-15	Floor Surface	322
I-096	M-13	Floor Surface	156
I-097	N-12	Floor Surface	121
I-098	L-12	Floor Surface	148
I-099	M-11	Floor Surface	267
I-100	L-11	Floor Surface	205
I-101	O-06	Floor Surface	130
I-102	M-09	Wall Surface	81
I-103	K-09	Floor Surface	166
I-104	A-09	Wall Surface and Window Sill	110
I-105	L-06	Floor Surface	240
I-106	F-08	Ceiling-Air Vent Surfaces	91
I-107	I-18	Floor Surface	167
I-108	A-24	Window Sill	79
I-109	A-24	Floor-Ceiling Post	62
I-110	D-28	Above Drop Ceiling	121
I-111	A-36	Window Sill	88
I-112	H-36	Floor Surface	276
I-113	J-46	Wall Surface	60

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
I-114	H-49	Floor Surface	591
I-115	B-48	Floor Surface	112
I-116	K-43	Floor Surface	163
I-117	K-30	Floor Surface	136
I-118	S-12	Window Sill	84
I-119	R-13	Floor Surface	255
I-120	P-11	Under Sink	906
I-121	N-12	Wall Surface	51
I-122	P-21	Ceiling-Air Vent Surface	530
I-123	P-39	Ceiling-Air Vent Surface	281
I-124	N-47	Floor Surface	1735*
I-125	N-47	Top Surface Air Handling Unit	612
I-126	L-46	Floor Surface	1245*
I-127	P-49	Floor Surface	202
I-128	M-50	Floor Surface	120
I-129	O-06	Floor Surface	103
I-130	R-08	Floor Surface	197
Basement, 941 Wheatland Ave., Vacuum Pump Room (Figure 6)			
I-131	A-02	Floor Surface	747
I-132	A-04	Floor Surface	521
I-133	C-02	Floor Surface	624
I-134	C-04	Floor Surface	677
I-135	D-02	Floor Surface	917
I-136	D-01	Wall Surface	157

Phase I Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/1/93

RPI Smear ID Number	Grid ID Number	Location Description	^{3}H DPM/ 100 cm^2
I-137	B-01	Wall Surface	488
I-138	A-03	Wall Surface	342
I-139	C-06	Floor Surface	354
I-140	B-08	Floor Surface	310
I-141	G-09	Floor Surface	164
I-142	G-04	Floor Surface	551
I-143	J-06	Floor Surface	225
I-144	D-12	Floor Surface	159
I-145	A-07	Door Surface	2717*

* Areas to be decontaminated

Phase II Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/28/93

Purpose: Post-decontamination survey in the one square meter areas around nine grids identified as greater than 1000 DPM/cm^2 in Phase I.

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
1st Floor, 941 Wheatland Ave., Klause Office, (Figure 5)			
001	A-22-1	Wall	90
002	A-22-2	Wall	89
003	A-22-3	Floor and Wall	99
004	A-22-4	Floor and Wall	104
005	A-22-5	Floor and Wall	92
1st Floor, 941 Wheatland Ave., (Figure 4)			
006	L-46-1	Floor and Wall	304
007	L-46-2	HVAC Unit Surface	351
008	L-46-3	Floor	117
009	L-46-4	HVAC Surface	177
010	L-46-5	Floor and Wall	150
011	N-47-1	HVAC Unit Surface	152
012	N-47-2	Floor	1067*
013	N-47-3	Floor	128
014	N-47-4	HVAC Unit Surface	172
015	N-47-5	HVAC Unit Surface	238
016	S-34-1	Window Sill	169
017	S-34-2	Radiator Surface	184
018	S-34-3	Floor and Wall	160
019	S-34-4	Floor	113

* Areas to be decontaminated

Phase II Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/28/93

Purpose: Post-decontamination survey in the one square meter areas around nine grids identified as greater than 1000 DPM/cm^2 in Phase I.

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
020	S-34-5	Floor Surface and Floor/Wall Joint	505
021	S-32-1	Window Sill	184
022	S-32-2	Radiator Surface	114
023	S-32-3	Floor and Wall	231
024	S-32-4	Floor	164
025	S-32-5	Floor and Wall Joint	11437*
026	S-60-1	Window Sill	132
027	S-60-2	Radiator Surface	137
028	S-60-3	Floor and Wall	692
029	S-60-4	Floor	141
030	S-60-5	Floor and Wall Joint	955
031	S-65-1	Floor	194
032	S-65-2	Floor	176
033	S-65-3	Floor	152
034	S-65-4	Radiator Surface	380
035	S-65-5	Floor and Wall Joint	130
036	S-90-1	Radiator Surface	90
037	S-90-2	Floor and Wall Joint	896
038	S-90-3	Window Sill	107
039	S-90-4	Floor	122
040	S-90-5	Floor	142

* Areas to be decontaminated

Phase II Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 9/28/93

Purpose: Post-decontamination survey in the one square meter areas around nine grids identified as greater than 1000 DPM/cm^2 in Phase I.

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
Basement, 941 Wheatland Ave., Vacuum Pump Room, (Figure 6)			
041	A-07-1	Door and Door Frame	80
042	A-07-2	Floor	111
043	A-07-3	Door Surface	87
044	A-07-4	Wall	75
045	A-07-5	Wall	77

Phase III Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 10/20/93

Purpose: Post-decontamination survey in the one square meter areas around three grids identified as greater than 1000 DPM/cm^2 in Phase II.

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
1st Floor, 941 Wheatland Ave., (Figure 5)			
146	S-60-1	Floor and Wall Joint	45
147	S-60-2	Radiator Surface	8
148	S-60-3	Wall Above Radiator	29
149	S-60-4	Floor Surface	253
150	S-60-5	Wall Area Right and Radiator	69
151	S-32-1	Floor and Wall Joint	4047
152	S-32-2	Radiator Surface	7
153	S-32-3	Floor and Wall Joint	235
154	S-32-4	Floor Surface	60
155	S-32-5	Wall Surface and Floor/Wall Joint	49
156	N-47-1	HVAC Surface (Side)	227
157	N-47-2	Floor	98
158	N-47-3	Floor	18
159	N-47-4	Floor and Top of Foam Covered Pipe	106
160	83	HVAC Surface (Top)	83

Phase III Survey Results
SMH(US), Inc. Facility
941 Wheatland Ave.
Lancaster, PA 17601

Samples Collected By:
Radiation Physics, Inc.
Collected: 10/20/93

Purpose: To determine the sample average for the five smear results for grid S-32 (Phase III).

RPI Smear ID Number	Grid ID Number	Location Description	^3H DPM/ 100 cm^2
151	S-32-1	Floor and Wall Joint	4047
152	S-32-2	Radiator Surface	7
153	S-32-3	Floor and Wall Joint	235
154	S-32-4	Floor Surface	60
155	S-32-5	Wall Surface and Floor/Wall Joint	49

Sample Averaging*

Mean = 880

Weighted Mean = 880 (1-100/10000) + 11437 (100/10000)

= 871 + 114

= 985 H3 DPM/ 100 cm2

* NUREG/CR-5849 ORAU-92/C57 Manual for conducting Radiological Surveys in Support of License Termination (8.5.2)

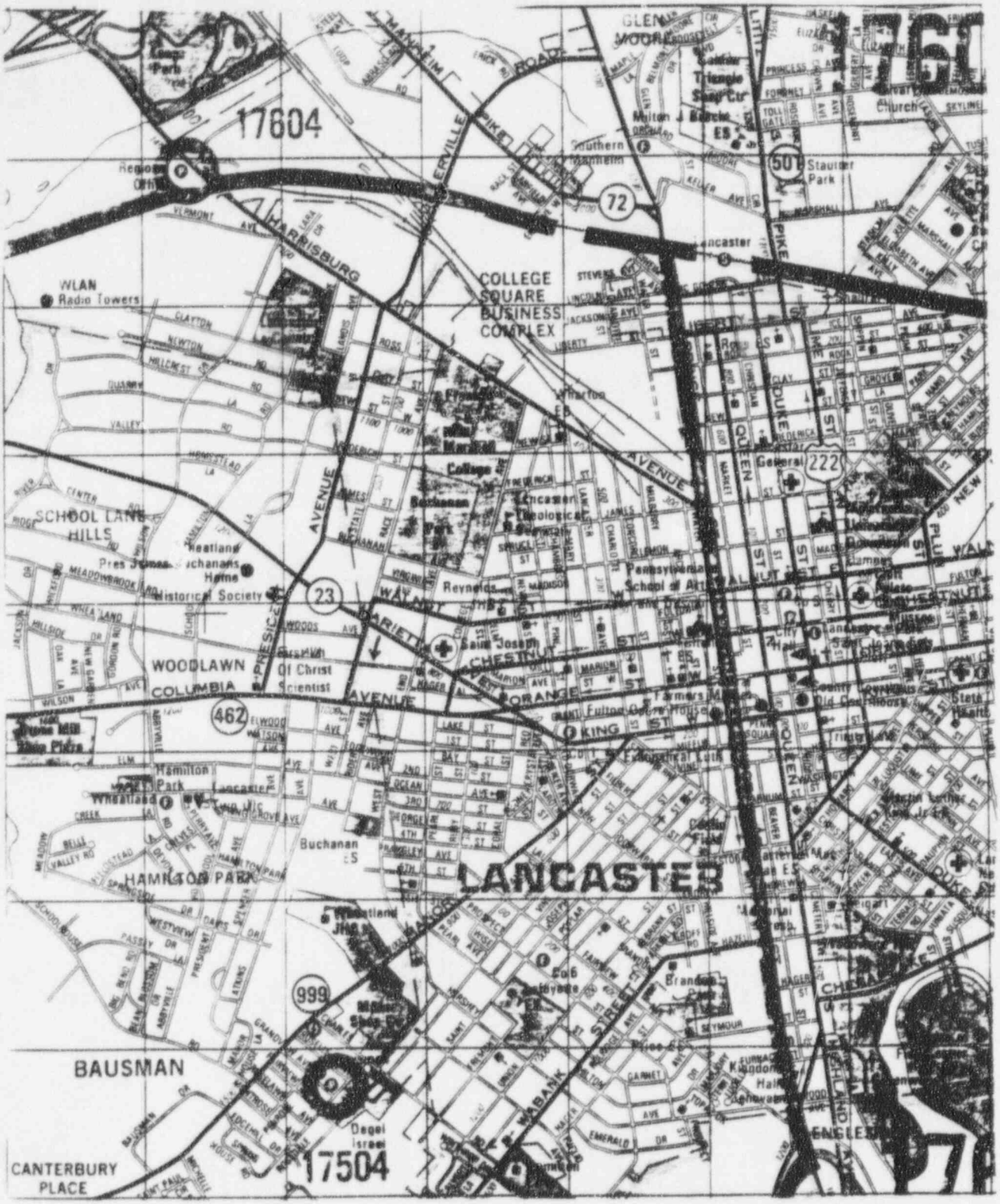
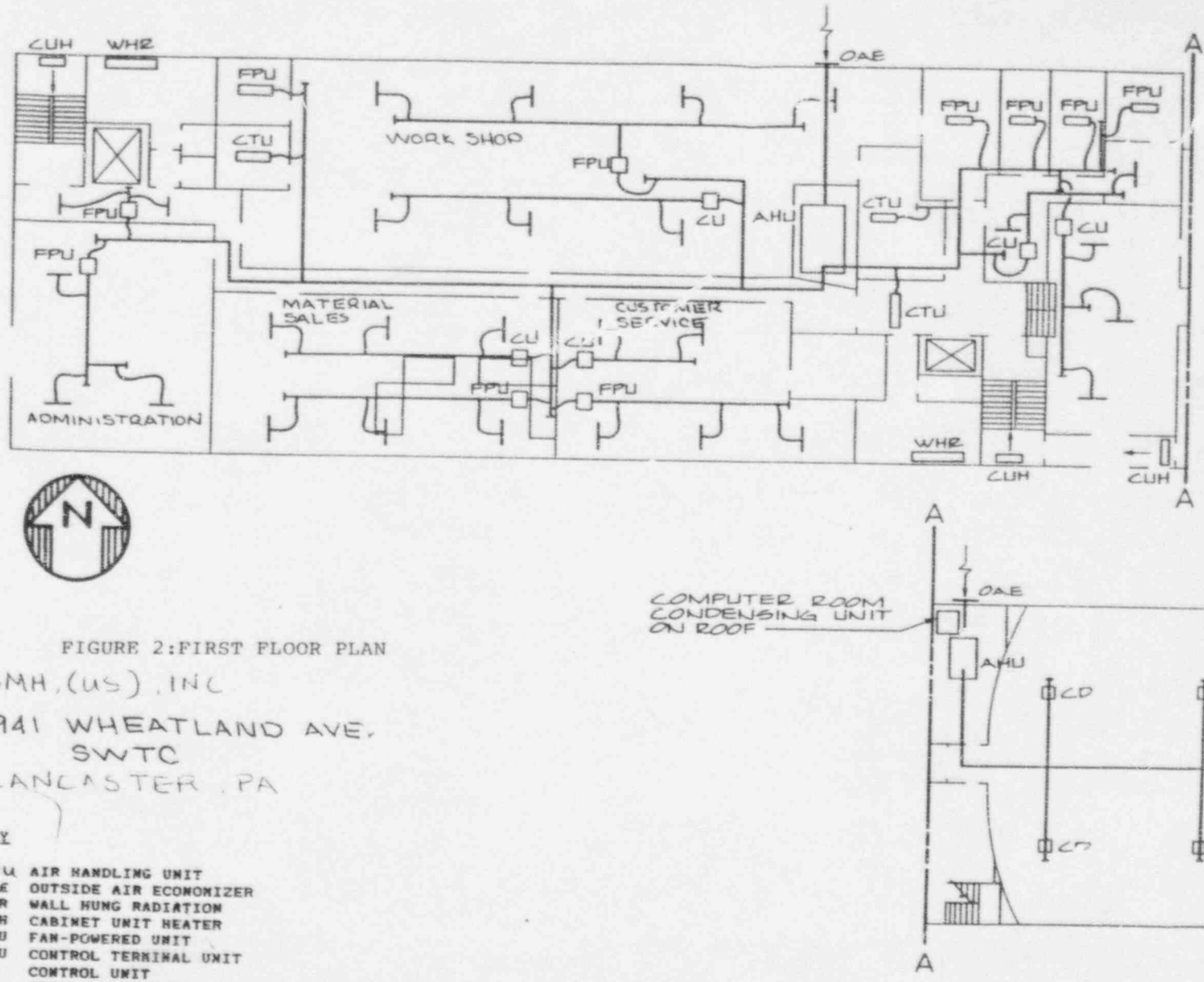


FIGURE 1: LANCASTER, PA
SMH(US), INC.
941 WHEATLAND AVE. (↓)



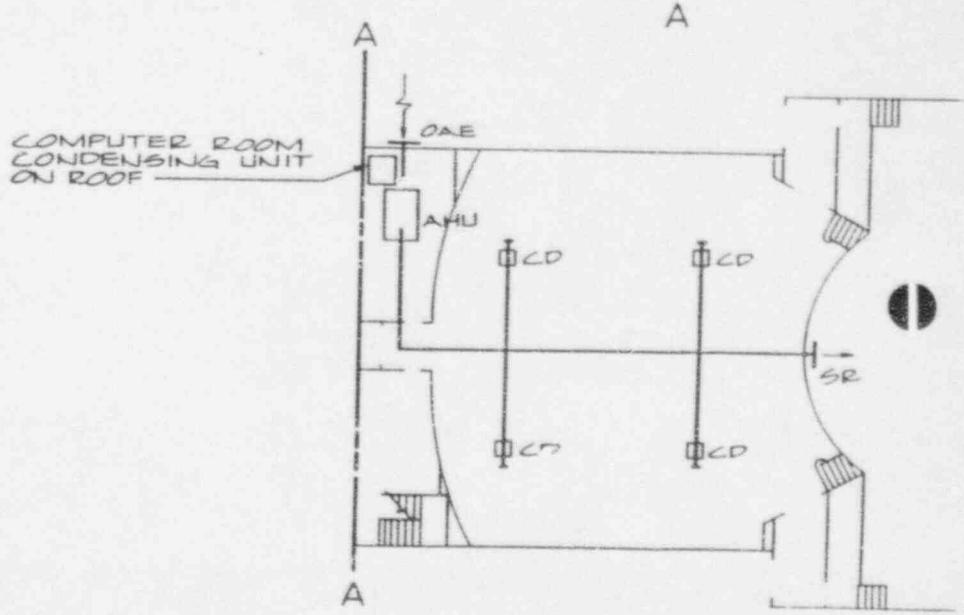


FIGURE 2:FIRST FLOOR PLAN

SMH,(US),INC

941 WHEATLAND AVE.
SWTC
LANCASTER, PA

KEY

AHU	AIR HANDLING UNIT
OAE	OUTSIDE AIR ECONOMIZER
WHR	WALL HUNG RADIATION
CUH	CABINET UNIT HEATER
FPU	FAN-POWERED UNIT
CTU	CONTROL TERMINAL UNIT
CU	CONTROL UNIT
CD	CEILING DIFFUSER
SR	SUPPLY REGISTER

BARTON ASSOCIATES, INC. CONSULTING ENGINEERS 416 NORTHBY STREET • YORK, PENNSYLVANIA 17403	JOB NO. 87034	FIRST FLOOR PLAN

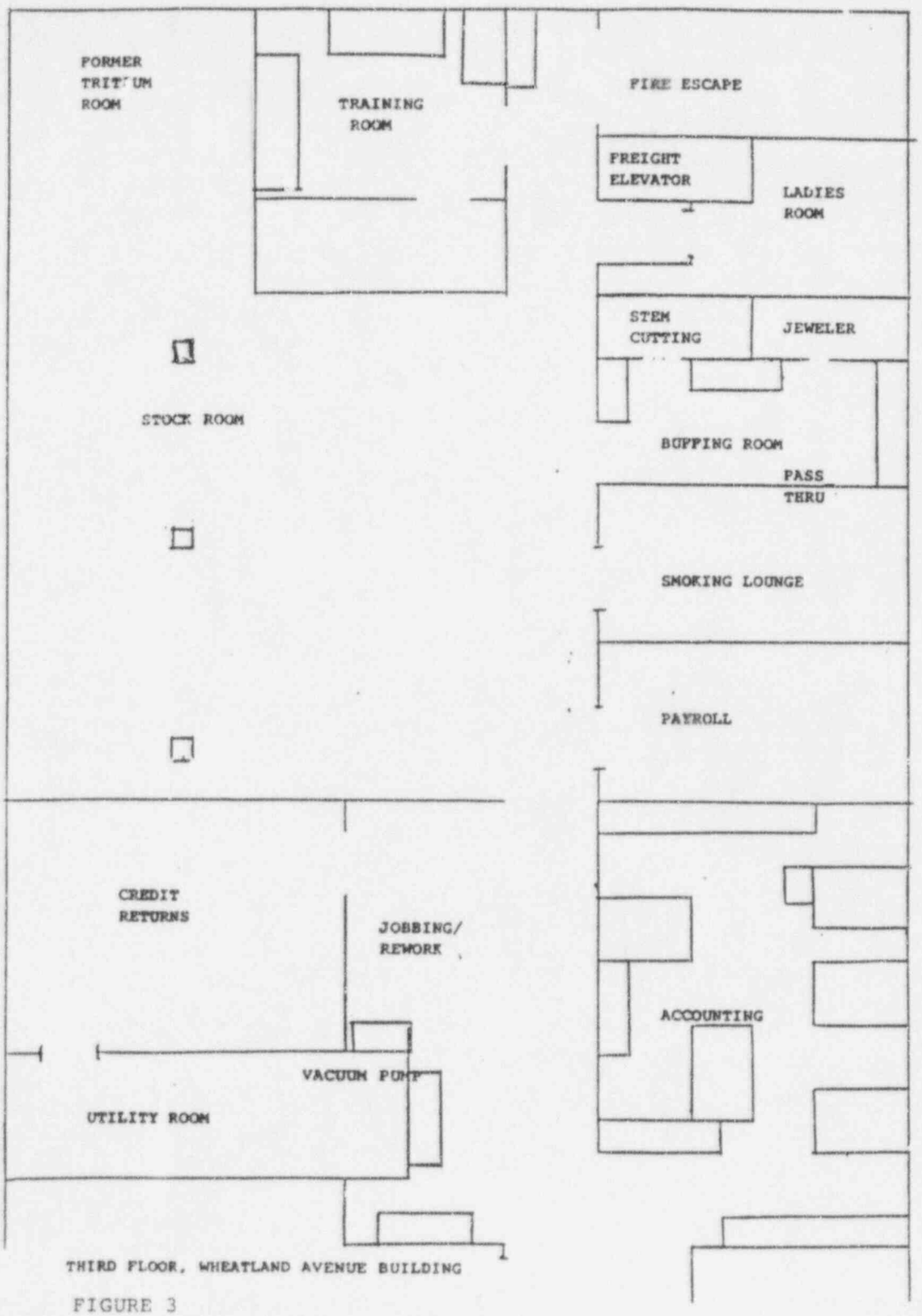

FORMER TRITIUM ROOM
TRAINING ROOM
FIRE ESCAPE
FREIGHT ELEVATOR
LADIES ROOM
STEM CUTTING
JEWELER
STOCK ROOM
BUFFING ROOM
PASS THRU
SMOKING LOUNGE
PAYROLL
CREDIT RETURNS
JOBBING/ REWORK
ACCOUNTING
VACUUM PUMP
UTILITY ROOM
THIRD FLOOR, WHEATLAND AVENUE BUILDING

FIGURE 3

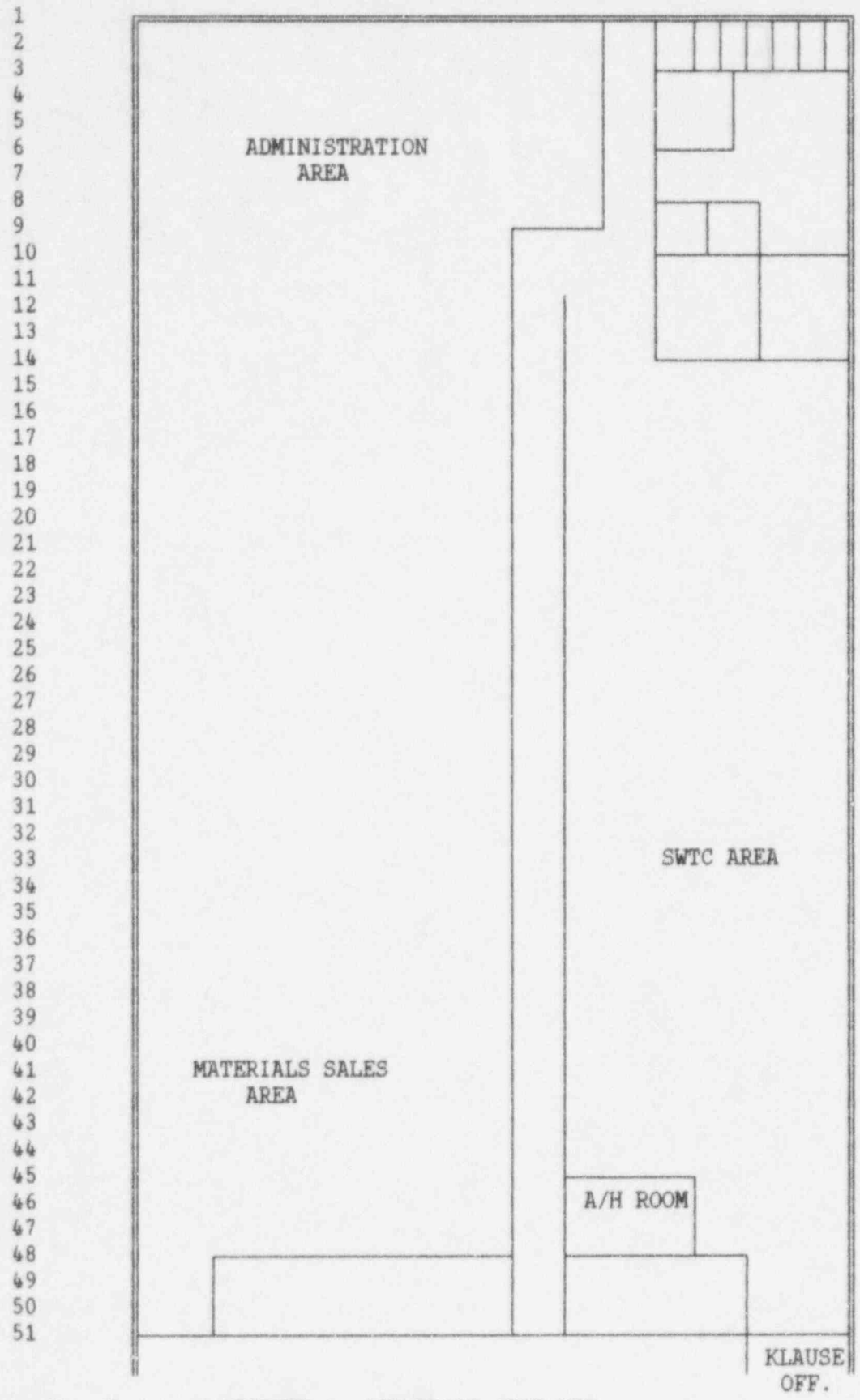


FIGURE 4: 1ST FLOOR GRID MAP
SMH(US), INC., 941 WHEATLAND AVE.
LANCASTER, PA

119261

OFFICIAL RECORD COPY ML 10

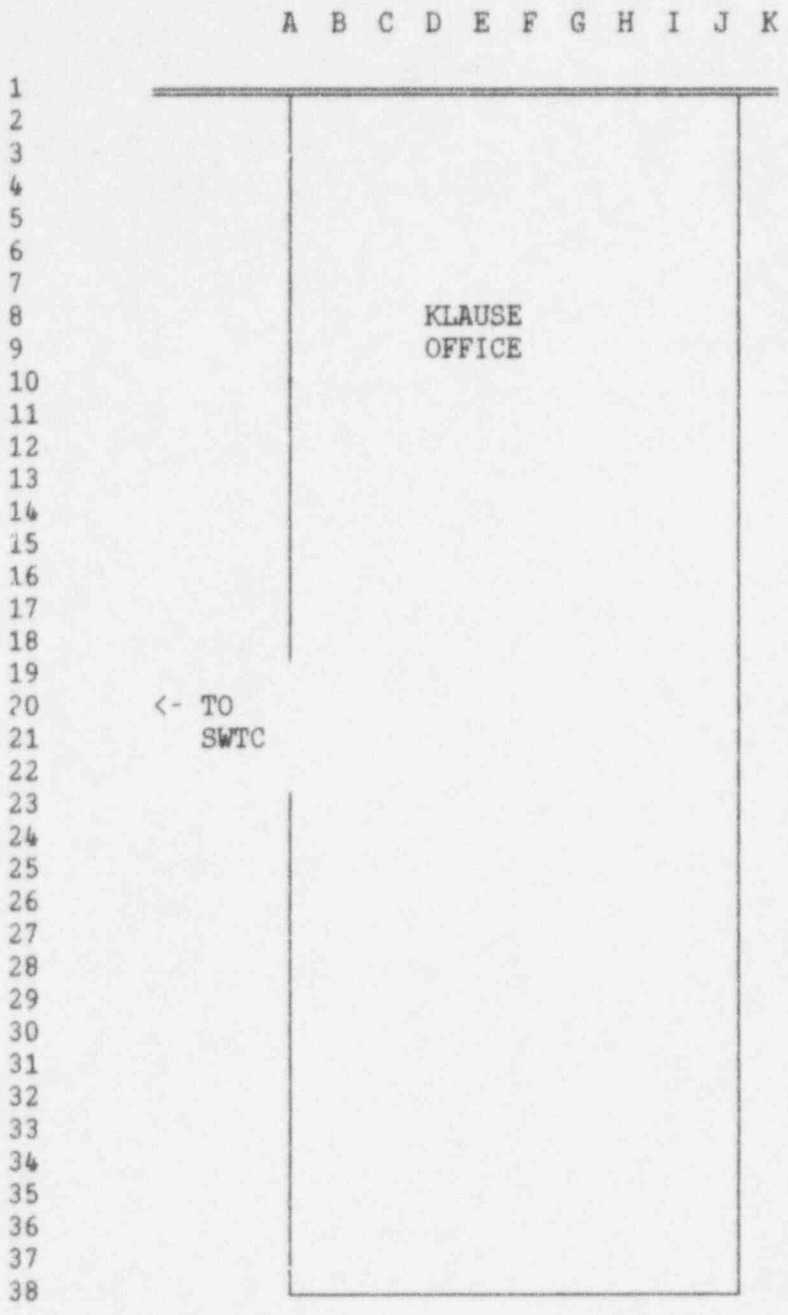


FIGURE 5: 1ST FLOOR KLAUSE OFFICE/GRID MAP
SMH(US), INC., 941 WHEATLAND AVE.
LANCASTER, PA

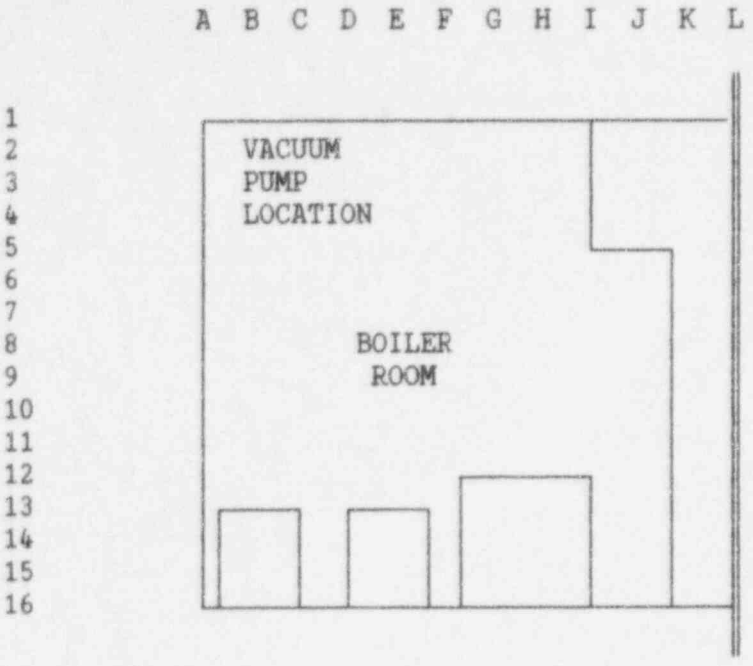


FIGURE 6: BASEMENT VACUUM PUMP ROOM/GRID MAP
SMH(US), INC., 941 WHEATLAND AVE.
LANCASTER, PA

APPENDIX A

SMH(US), INC.
DECOMMISSIONING FUNDING PLAN
FOR MATERIALS LICENSE
37-03572-06

SMH(US), Inc.
DECOMMISSIONING FUNDING PLAN
for
MATERIALS LICENSE
37-03572-06

Prepared by

Radiation Physics, Inc.
P.O. Box 357
Hershey, PA 17033

March 8, 1991

SMH(US), Inc.
DECOMMISSIONING FUNDING PLAN
for
MATERIALS LICENSE
37-03572-06

Prepared by

Radiation Physics, Inc.
P.O. Box 357
Hershey, PA 17033

March 8, 1991

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SMH(US), Inc.
DECOMMISSIONING FUNDING PLAN
for
MATERIALS LICENSE
37-03572-06

I. INTRODUCTION

In 1988 the Nuclear Regulatory Commission (NRC) adopted regulations requiring that licensees provide assurance that funds will be available to decommission facilities when the licenses are terminated. For facilities with existing licenses the effective date for compliance was July 27, 1990. The amount of funds that must be set aside is determined by the amount and type of radioactive material allowed by the license. There are four basic categories, as determined by formulas published in the regulations. The amount to be set aside in these categories is $0, $75,000, $150,000, or $750,000. If the license exceeds the $750,000 category the licensee is required to submit a Decommissioning Funding Plan (DFP) to estimate the actual decommissioning costs. The option to submit a DFP is also available for licensees in any of the other categories. The amounts to be set aside are separate and additive for each license. However, if a DFP is prepared, it can include all licenses in one plan.

SMH(US), Inc. is currently licensed (1) under License 37-03572-06 to possess and use up to 1,000 Ci each of hydrogen-3 and promethium-147 in timepieces, hands, and dials, to which specified types of luminous paint has been applied, for assembly into watchcases and storage incident to distribution of the watches and (2) under License 37-03572-08E to distribute timepieces, dials, and hands with the same specifications. Only the possession license is considered in this presentation because the material under the distribution license is in the form of sealed sources and no curie limit is stated.

There are a variety of ways to provide assurance that funds for decommissioning will be available. These include the following:

Prepaid deposits such as a trust fund, escrow account, certificate of deposit, government bond, or deposit of government securities.

A surety method such as a surety bond (open ended or with automatic renewal, or line of credit. A parent company guarantee can also be used.

An external sinking fund coupled with a surety method, with the surety decreasing as the sinking fund increases.

SMH(US) failed to submit the Financial Assurance Plan by the July 27, 1990 due date because of reorganizations and personnel changes that included loss of the RSO and later the individual who was to have

replaced him. The RSO responsibility devolved each time on the Assistant RSO currently named in the license, who did not discover the ommission(s) until several months after the due date. SMH(US) received an order from the NRC, dated January 4, 1991, on January 9, 1991 to produce the mandated Funding Assurance Plan by February 3, 1991. This was extended to March 4, 1991 by Dr. Bellamy after discussion of the situation with Dr. William P. Kirk, Radiation Physics, Inc. On February 28, Dr. Bellamy granted a further extension to March 11, 1991.

In December 1990, SMH(US) retained Radiation Physics, Inc. to assist with:

(1) defining the current radiological situation in facilities now or previously used under the possession License;

(2) preparing applications for license revisions that accurately reflect the current situation as the changes described occur, including identifying a new RSO and responsible individuals; and

(3) preparing a Decommissioning Funding Plan and Funding Assurance Plan.

Radiation Physics, Inc has prepared the estimates provided herein of the decommissioning costs associated with the SMH(US) possession license at the Lancaster, PA facilities. SMH(US) will provide assurance of the funds in documents to be submitted concurrently with the DFP.

II. HISTORY OF POSSESSION LICENSE ACTIVITIES AND FUTURE PLANS

The Hamilton Watch Company, the predecessor to SMH(US),Inc.,started working with timepieces containing tritium, as sealed gas sources used for backlighting digital watches, in 1977. In the early 1980's emphasis shifted to assembly of timepieces using dials and hands painted with tritiated luminous paint and in 1986 the license was extended to include promethium oxalate luminous paint. In 1987 the sealed gas sources were dropped from the license which now authorizes up to 1,000 curies each of components containing hydrogen-3 as Radium Chemie PS 363 Tritiated Luminous Paint and W. Maier Promethium Oxalate Luminous Paint. Components are obtained from mostly overseas suppliers and are certified by the suppliers to meet NRC regulations.

Until 1987, all work involving ^{3}H or ^{147}Pm, except for watch repair done by the Swiss Watch Technical Center (SWTC), was done on the third floor of 941 Wheatland Avenue, Lancaster, PA. The configuration of the facility is shown in Appendix A. After use of sealed gas sources ended, the "tritium Room" was not used except for occasional repairs to the digital watches which has since stopped. Because there is minimal potential for respiratory hazard from the completed components now being used to assemble timepieces, assembly, QA/QC work, component

storage etc has been housed in conventional light manufacturing space with no particular provision for work station ventilation except for vacuum dust brushes used to remove dust from timepiece parts as they are being assembled.

The watch assembly operation was completely relocated from the third floor of 941 Wheatland Avenue to the SMH(US) building at 1817 William Penn Way in June 1990 and is currently operated in the configuration shown in Appendix B. The third floor was partly decontaminated at that time and presently exists as shown in Appendix C. Most of the space is used for storage and only the areas shown as "Accounting" and "Payroll" are currently occupied by personnel on a regular basis. These areas are located where the assembly shop had been located.

Somethime in 1991, SMH(US) intends to relocate the major part of its assembly operations to its Virgin Islands plant and the remainder, the specialty timepiece assembly, could potentially be sold to an as yet unnamed independent company (with a separate license). At that time, the inventory of radioactive components will be transferred to one of the recipient licensees and the entire area decontaminated, as necessary, to below 1,000 dpm/100 cm^2 removable contamination. The SWTC will then relocate from the first floor and basement of 941 Wheatland Avenue and the space they now occupy (Appendix D) decontaminated to below 1,000 dpm/100 cm^2 and released for other use. It is anticipated that the SWTC will use the lab furniture currently used by the assembly operation augmented with part of its current furniture. Any furniture, shelving etc from either the assembly area or SWTC that is not needed will be decontaminated and either used elsewhere or scrapped.

After these changes are completed, the only operations at SMH(US) in Lancaster that will use/handle unsealed radioactive components will be the SWTC. License requirements, if any, for that work will be determined later but will be much lower than the current limits.

No changes in the distribution license are currently planned.

The only other area listed on the possession license is the Haworth building at 1702 Hempstead Road. From March 1987 to March 1989, about 25% of this building, now used as a warehouse, was used for receipt and exchange of defective Swatch watches. This operation did not involve opening the watches and the potential for contamination was very limited. The Swatch watch exchange is now located in the basement of 941 Wheatland Avenue.

The authorized possession limits for both ^{3}H and ^{147}Pm would put SMH(US) in the $750,000 category for Funding Assurance. The form in which these materials are used - cured luminous paint on completed components which are handled only to assemble the timepieces - however, while slightly less secure than fully sealed sources, prevents much less possibility for contamination and resulting decontamination

expense than most forms in which the isotopes could be used. For this reason, it was decided to develop a DFP to estimate what the actual costs would likely be.

III. CURRENT STATUS

A. 1702 Hempstead Road

The areas of this building that had been used for the Swatch watch exchange for a period of two years was surveyed by Dr. Kirk on February 5, 1991. The entire building is now used as a warehouse and is mostly filled with stacks of palleted merchandise. The results of that survey are reported in Appendix D. Twenty-one smears were taken at locations indicated on the building sketch in appendix D and analyzed by liquid scintillation counting for tritium and ^{147}Pm. All ^{147}Pm results were <MDA and were not reported. Tritium results ranged from <MDA to 66 DPM/100 cm^2. There is no need for further consideration of this building in a DFP.

B. 1817 William Penn Way

The entire assembly operation in this building was surveyed on January 5, 1991 and/or February 5, 1991 and the results are given in Appendix E. The results from a substantial number of smears taken in the assembly room, the QA/QC room, the stock room, and the buffing room exceeded the 2,200 DPM/100 cm^2 provided in license conditions. Initial decontamination of the Buffing Room and the Assembly Room was attempted on Mar. 2 &3, 1991 and weekly washdown of work stations by the employee assigned to that station instituted per the revised Radiological Safety Procedures to be submitted with the application for license revision being prepared concurrently with this DFP. Those rooms were resurveyed on March 4 with the results given in Appendix F-3. Noteworthy reductions were obtained in most locations but additional work is required. The remainder of the Stock Room will be cleaned after the assembly operations are transferred out and prior to the SWTC moving in.

C. 941 Wheatland Avenue - Third Floor

A survey of the western 2/3 of the third floor, occupied by the assembly operations until June 1991, was conducted by RPI on January 5, 1981 and/or January 18, 1991. The results are given in Appendix F. The results from a substantial number of the smears taken exceeded 1,000 dpm/cm^2 especially in the areas formerly occupied by the "Tritium Room", and the "Training Room", and in the utility room adjacent to "Credit Returns." The source of contamination in the utility room is the vacuum pump that had services the vacuum dust brushes used in the assembly area. The areas currently occupied by Accounting and Payroll were well below the 1,000 dpm/100 cm^2 limit for release to unrestricted use except for two areas on the exterior wall.

Because this space was no longer used for activities involving radioactive components and to provide data to estimate the costs fo decontamination of similar spaces incident to decommissioning, it was decided to proceed with decontamination of the third floor.

The entire area formerly used by assembly was washed down over the period of February 16-20, 1991 by a commercial cleaning service supervised by SHM(US)) personnel. Cleaning staff wore boots and gloves while doing the washing. Venetian blinds, which had a layer of slightly contaminated dust, were washed in a local carwash. The vacuum pump in the utility room was removed and stored for disposal.

The area was resurveyed on February 21, 1991. Results are given in Appendix G. Although the levels were considerably lower than found on the previous survey, some additional decontamination was required on the floors in the utility room and one or two places in the old Tritium Room. Additional decontamination was accomplished and the piping from the third floor vacuum system removed during the period February 22-March 3, 1991. The area was resurveyed on March 4 and, with the exception of two smears on the floor of the old tritium room area (1,012, 1,516 dpm/100 cm^2), completely met the requirement for conversion to unrestricted use (See Appendix G-3). Because the average of six smears taken in a area of about 200 ft^2 was 652 DPM/100 cm^2, considerably below the 1,000 DPM/100 cm^2 requirement, the space is considered acceptable for unrestricted use.

D. 941 Wheatland Avenue - First Floor and Basement - SWTC

The SWTC has not historically been considered part of licensed operations and had apparently not been routinely surveyed prior to Dec.1988 when RPI staff conducted a survey which revealed that some areas had tritium levels comparable to the assembly area. A partial survey, on Feb 5, 1991, at locations found to be most heavily contaminated in the Dec.1988 survey, indicates levels are substantially lower than in 1988. Complete surveys and decontamination, including removal of the vacuum system, will be undertaken in connection with the scheduled move to 1817 William Penn Way this Summer.

IV. ESTIMATED COSTS OF REMAINING DECONTAMINATION

A. General

For purposes of this plan, costs are estimated as if all operations were being decommissioned at one time even though two of the three potentially contaminated facilities will be decontaminated and released to general you during the current year. This will result in significant overestimation of the costs remaining if and when the remaining operations under the license are terminated.

B. Basis for cost estimation

The time required and costs for decontaminating the third floor of 941 Wheatland Avenue are considered to be a reasonable basis for estimating the costs of decontaminating the present assembly operation at 1817 William Penn Way and SWTC operations in the first floor and basement of 941 Wheatland in as much as the type of work conducted there was similar to that now conducted in assembly and SWTC. If anything, the potential for problems from the operations conducted there was greater than the present operation.

The results of the intial survey are given in Appendix F. At the time of the initial survey, smears from the areas identified on the plan (Appendix C) by Accounting, Payroll, Jobbing/Rework, Credit Returns, and Dial Transfer, which account for about half of the 7,000 ft² total area, tested below 1,000 DPM/100 cm² except for a few on the outside walls. Whether these low levels represent the situation when the assembly operation was relocated or result from cleaning done later is not known for certain although the relatively better state of cleanliness in those rooms indicates the latter is probable.

The first washdown was successful in reducing contamination levels to below 1,000 dpm/100 cm² except for the floors in the old tritium room, the utility room, and the training room. The removable contamination levels in these areas were reduced by factors of 2 to 6. In addition to the floors, one work table tested slightly higher than in the original survey, and one wall smear was slightly above the limit.

After the second washdown, all tests were below 1,000 dpm/100 cm² and the area can be released for general use.

The costs of surveys and cleanup for this area were as follows:

Item	Contractor Hours	SMH(US) Hours	HP Hours	Smears	55 gal.drums Waste
Initial Survey		3	3	100	
First Washdown	60	15			
Resurvey			2	100	
Second Washdown	16	4			
Removing Vacuum System		16			1
Resurvey			0.5	20	
Total	76	38	5.5	220	1

Cost:			
	Contractor Hours	76 @ $10 =	$ 760.00
	SMH(US) Hours	38 @ $25 =	950.00
	HP Hours	5.5 @ $100 =	550.00
	Smears -	220 @ $10 =	2,200.00
	Waste -	1 drum @ $1,025 =	1,025.00
	Total	=	$5,485.00

From this experience, it was decided to use the following assumptions for estimating the rest of decommissioning:

1. Basic Washdown - Contractor time (floors, walls etc) at 116.7 ft² floor area per contractor hour (including adjacent walls and radiators).

2. Work Stations - 15 minutes contractor time each.

3. Shelving - 3-1/3 minute per linear foot.

4. One SMH(US) employee hour per four contractor hours.

5. Special items, such as removal of vacuum systems extra.

6. HP Time and number of smears determined by particular situation.

7. Allowance for redecontamination and resurvey - 25% of items 1-6 above.

8. Solid waste at rate of $1,025 per 55-gal drum pre RSO price lists.

9. Wash water will be disposed via sanitary sewer after testing.

10. Time for inventory and shipment of license material additional.

Items 2 and 3 per contractor bid. Item 6 estimated by Dr. Kirk from inspection of particular areas and from surveys done.

C. Estimation for decommissioning of Assembly Operation at 1817 William Penn Way

		Total Cont. Hr	SMH Hrs.
1. Quality Control			
900 ft² @ 116.7 ft²/hour	= 7.7 hr		
81 LF shelf @ 3-1/3 min/LF	= 4.5 hr	16.0	4.0
14 Work Stations @ 15 min	= 3.5 hr		
2. Stock Room			
3100 ft² @ 116.7 ft²/hr	= 26.6 hr		
1728 LF shelf @ 3-1/3 min/LF	= 96.0 hr	126.4	31.6
15 Work Stations @ 15 min	= 3.8 hr		
3. Assembly Room			
2700 ft² @ 116.7 ft²/hr	= 23.0 hr		
45 LF shelf @ 3-1/3 min	= 2.5 hr	38.0	9.5
50 Work Stations @ 15 min	= 12.5 hr		

4. Boxing Room

1,000 ft² @ 116.7 ft²/hr	= 8.6 hr		
210 LF Shelf @ 3-1/3 min	= 11.7 hr	21.8	5.5
6 Work Stations @ 15 min	= 1.5 hr		

5. Buffing Room/Vacuum pump closet

400 ft² @ 116 ft²/hr	= 3.4 hr		
18 LF shelf @ 3-1/3 min	= 1.0 hr	6.7	1.7
9 Work Stations @ 15 min	= 2.3 hr		

Total hours for basic cleaning	208.9	52.3

Time Summary

Item	Contractor Hours	SMH(US) Hours	HP Hours	Smears	55 gal.drums Waste
Decontamination	208.9	52.3	7	442	1
Remove Vacuum System		16.0	2	50	1
Allow.for repeat decontamination	52.2	17.1	2.2	123	0.5
Total	261.1	85.4	11.2	615	2.5

Cost Totals - Decontamination of assembly operation.

Contractor Hours	261.1 @	$10/hr	= $ 2,611.00
SMH Staff Hours	85.4 @	25/hr	= 2,135.00
HP Hours	11.2 @	100/hr	= 1,120.00
Smears	615 @	$10 ea	= 6,150.00
Waste -2.5 55-gal drums	@$1,025 ea		= 2,562.50
Subtotal - decontamination			= $14,578.50

Other costs

	Est. Hours
Inventory of radioactive components -	40
Identification of batches/certificates -	8
Estimation of activity -	4
Sorting into shipments - Virgin Islands Local Co.	8
Checking licenses of recipients -	2
Packaging for shipment -	4
Labeling -	2
Subtotal	68 hr

68 hours @ $50/hour = $3,400

Total Estimate - Assembly Operation

Decontamination	=	$14,578.50
Other	=	3,400.00
Total	=	17,578.00

D. Swiss Watch Technical Center - 941 Wheatland Avenue - First Floor and Part of Basement

1. Basic Decontamination

a. First Floor

			Contractor Hours	SMH Staff Hours
7,000 ft² @ 116.7 ft²/hr	=	60 hr		
288 LF shelf @ 3-1/3 min	=	16 hr	96	24
48 Work Stations @15 min	=	12 hr		
2 storage carousels	=	8 hr		

b. Basement

3,500 ft² @ 116.7 ft²/hr	=	30 hr		
100 LF Shelves @3-1/3 min	=	5.6 hr	38.1	9.5
10 Work Stations @ 15 min	=	2.5 hr		

2. Time Summary

Item	Contractor Hours	SMH(US) Hours	HP Hours	Smears	55 gal.drums Waste
Initial Survey			4	220	
First Floor Decon	96	24.0			1
Basement Decon	38.1	9.5			
Remove vacuum syst.		16.0			1.5
Resurvey			4	220	
25% Allowance for repeat decon etc	33.5	12.4	2	110	NA
Subtotal (hrs)	167.6	61.9	10	550	2.5

3. Cost Totals - Decontamination

Contractor Hours	167.6	@ $10/hr	=	$ 1,676.00
SMH Staff Hours	85.4	@ 25/hr	=	1,547.50
HP Hours	10.0	@ 100/hr	=	1,000.00
Smears	550	@ $10 ea	=	5,500.00
Waste -2.5 55-gal drums		@$1,025 ea	=	2,562.50
Subtotal - decontamination			=	$12,286.00

4. Other costs

	Est. Hours
Inventory of radioactive components -	20
Identification of batches/certificates -	4

Estimation of activity -	4
Sorting into shipments -	6
Checking licenses of recipients -	2
Packaging for shipment -	4
Labeling -	2
Subtotal - other	42 hr

42 hours @ $50/hour = $2,100

5. Total Estimate - SWTC

Decontamination	=	$12,286.00
Other	=	2,100.00
Total	=	14,386.00

V. ESTIMATED TOTAL COSTS FOR DECOMMISSIONING

The estimated total costs of decommissioning if everything were to be done at one time is therefore estimated to be:

Third Floor 941 Wheatland Ave.	=	$5,485 *
SWTC (1st.Fl.+ 1/2 basement 941 Wheatland Ave.	=	12,186
Assembly - 1817 Wm.Penn Way	=	14,578
Management - 2 weeks @4,000	=	8,000
		$ 40,249

Provided that current plans are executed on schedule, by the end of 1991 everything except the 1817 William Penn Way Building will have been decontaminated and the residual decommissioning costs will be of the order of $15,000.

No decommissioning costs have been estimated for activities under the distribution license in as much as the activity covered under that license is in the form of sealed sources and there is no activity limit specified in the license.

Appendix A. Former facility configuration - 941 Wheatland Ave, 3rd Floor

941 WHEATLAND AVE.
3RD FLOOR

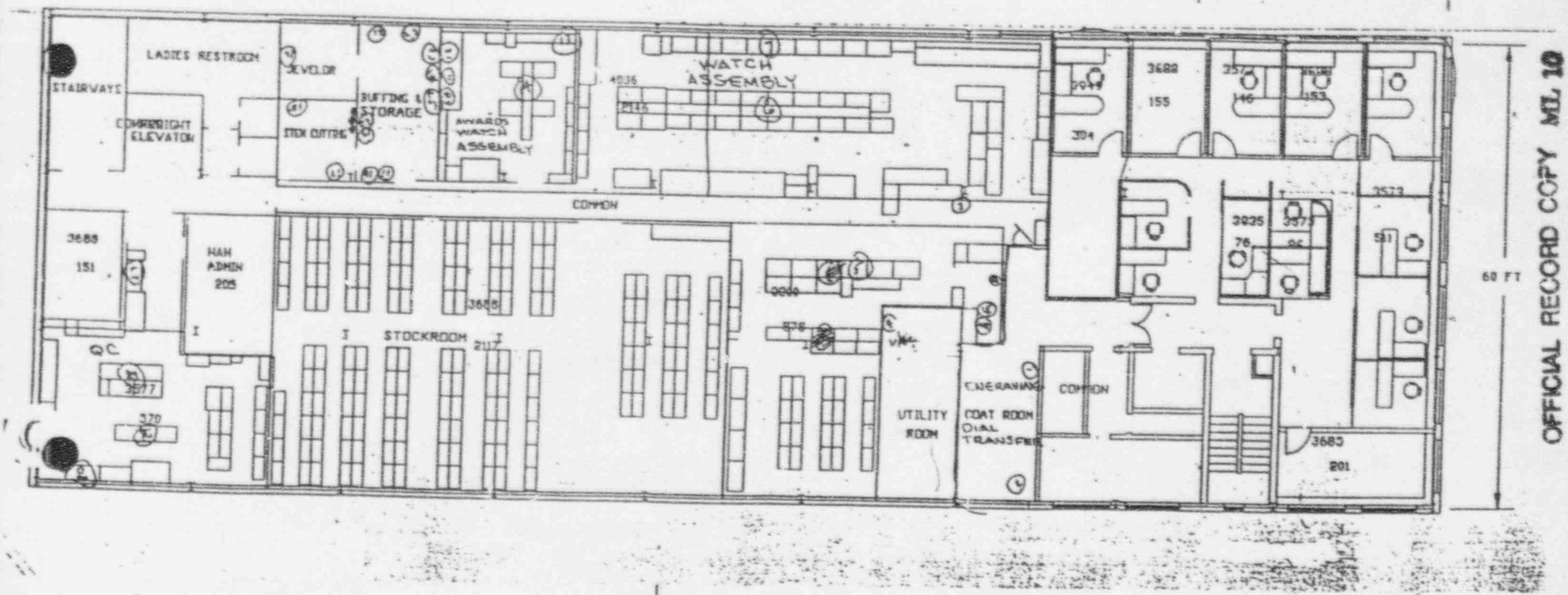
119251

3RD FLOOR SQUARE FOOT ALLOCATIONS

C.C.	DISCRIPTION	SQ. FT.
3573	PURCHASING	753
3577	QUALITY CONTROL	370
3685	MFG/SVTC MANAGMENT	801
3688	MRP/PPS	2576
3800	REWORK & JOBBING	878
3935	FACILITIES WHEATLAND	76
3949	SHOP ADMINISTRATION	304
4036	ASSEMBLY WATCHES	2146
HAMILTON ADMINISTRATION		805
COMMON AREA		2091
	TOTAL	10800

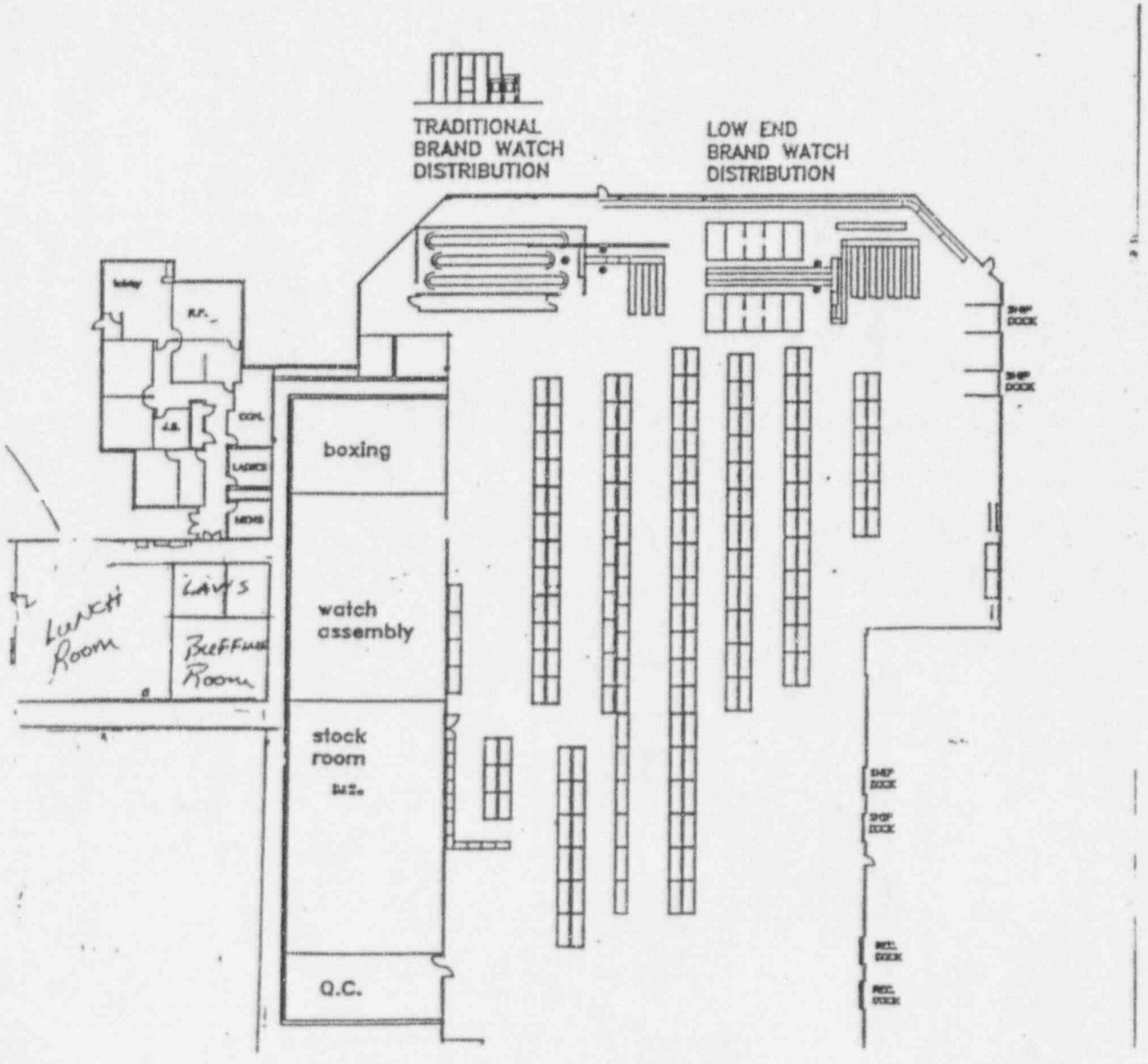
*** - 230V 1ph outlet on transformer, 208V 1ph outlet on

SMH - U.S.
941 WHEATLAND AVE.
LANCASTER, PA 17604
DATE: 10-1986 REV NO: 1
LOCATION: 3rd FLOOR
DRAWN BY: AVN

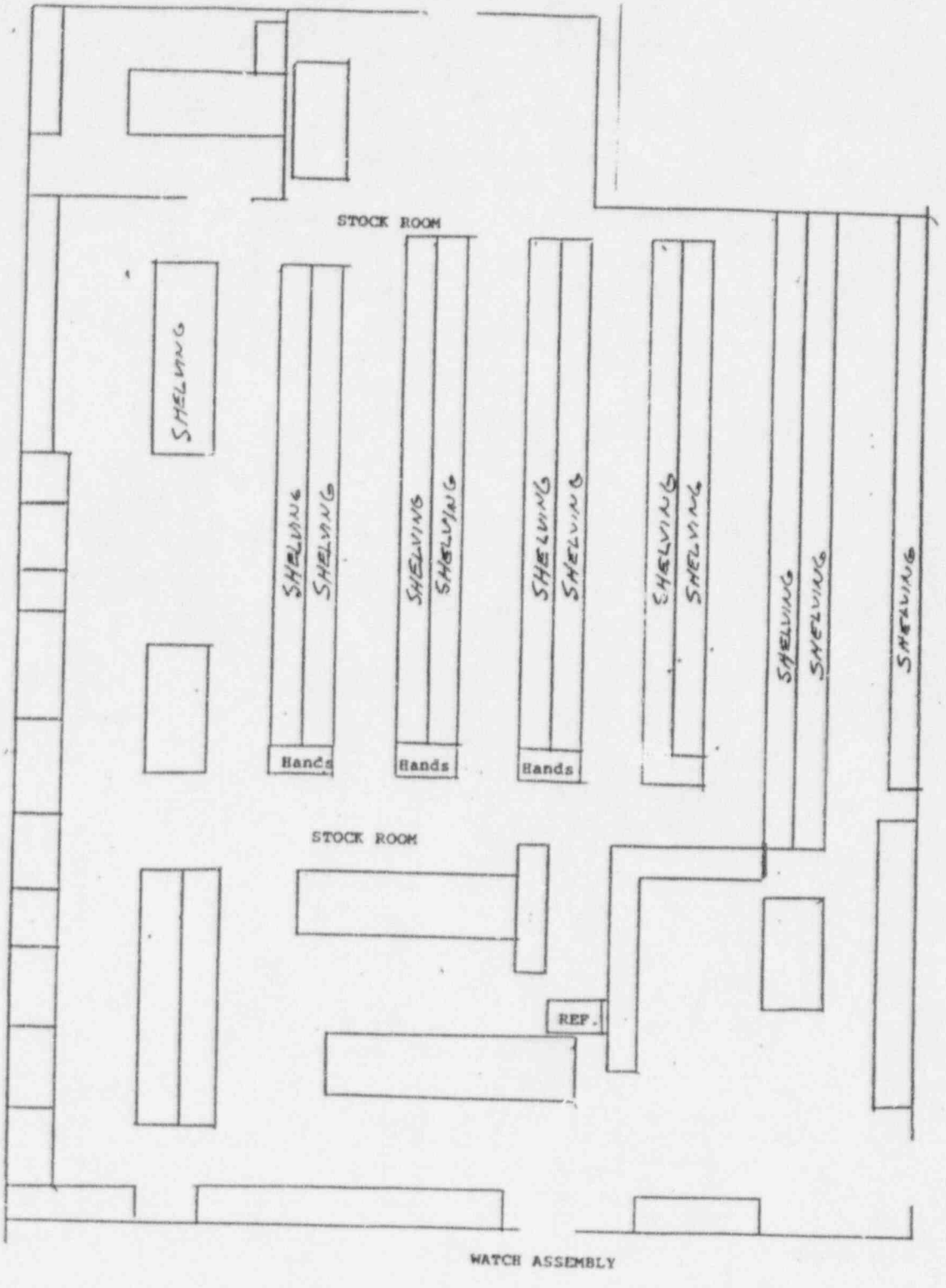


OFFICIAL RECORD COPY MIL 10

Appendix B-1 Facility Layout - Current Assembly Operations in 1817 William Penn Way. Overall Layout.



Appendix B-3. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Stock Room.



Estimation of activity -	4
Sorting into shipments -	6
Checking licenses of recipients -	2
Packaging for shipment -	4
Labeling -	2
Subtotal - other	42 hr

42 hours @ $50/hour = $2,100

5. Total Estimate - SWTC

Decontamination	=	$12,286.00
Other	=	2,100.00
Total	=	14,386.00

V. ESTIMATED TOTAL COSTS FOR DECOMMISSIONING

The estimated total costs of decommissioning if everything were to be done at one time is therefore estimated to be:

Third Floor 941 Wheatland Ave.	=	$5,485 *
SWTC (1st.Fl.+ 1/2 basement 941 Wheatland Ave.	=	12,186
Assembly - 1817 Wm.Penn Way	=	14,578
Management - 2 weeks @4,000	=	8,000
		$ 40,249

Provided that current plans are executed on schedule, by the end of 1991 everything except the 1817 William Penn Way Building will have been decontaminated and the residual decommissioning costs will be of the order of $15,000.

No decommissioning costs have been estimated for activities under the distribution license in as much as the activity covered under that license is in the form of sealed sources and there is no activity limit specified in the license.

Appendix A. Former facility configuration - 941 Wheatland Ave, 3rd Floor

941 WHEATLAND AVE.
3RD FLOOR

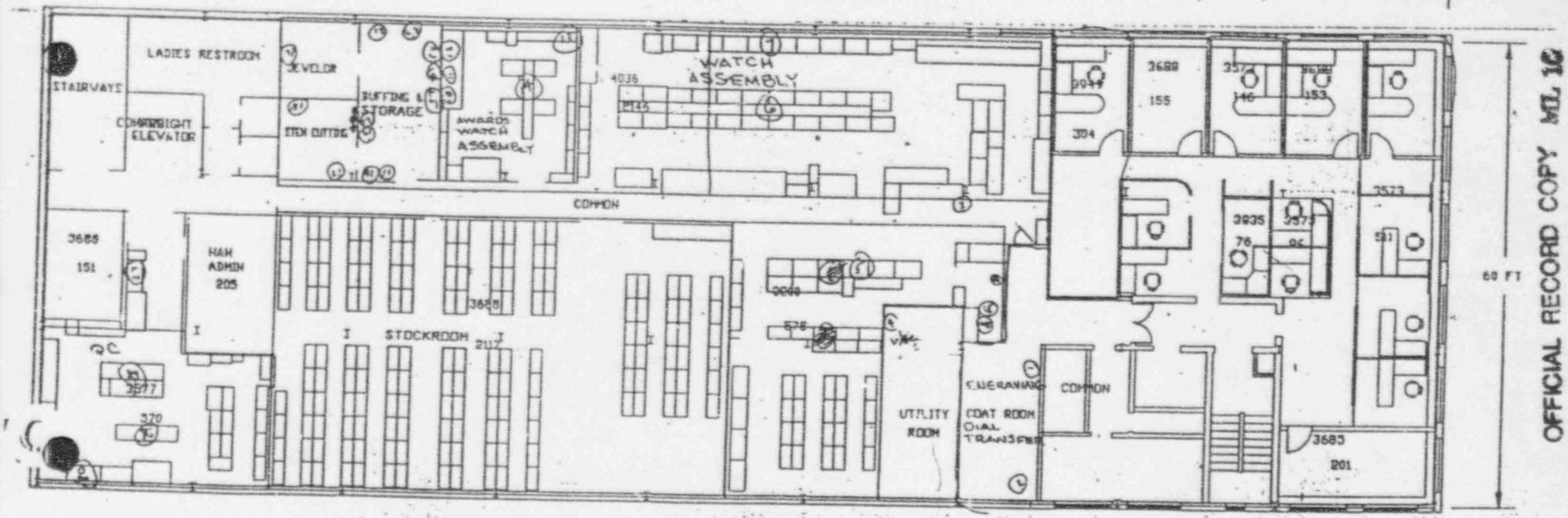
119261

3RD FLOOR SQUARE FOOT ALLOCATIONS

C.C.	DISCRIPTION	SQ. FT.
3573	PURCHASING	753
3577	QUALITY CONTROL	370
3685	MFG/SVTC MANAGMENT	801
3688	MRP/PPS	2576
3800	REWORK & JOBBING	878
3935	FACILITIES WHEATLAND	76
3949	SHOP ADMINISTRATION	304
4036	ASSEMBLY WATCHES	2146
HAMILTON ADMINISTRATION		205
COMMON AREA		3091
	TOTAL	10500

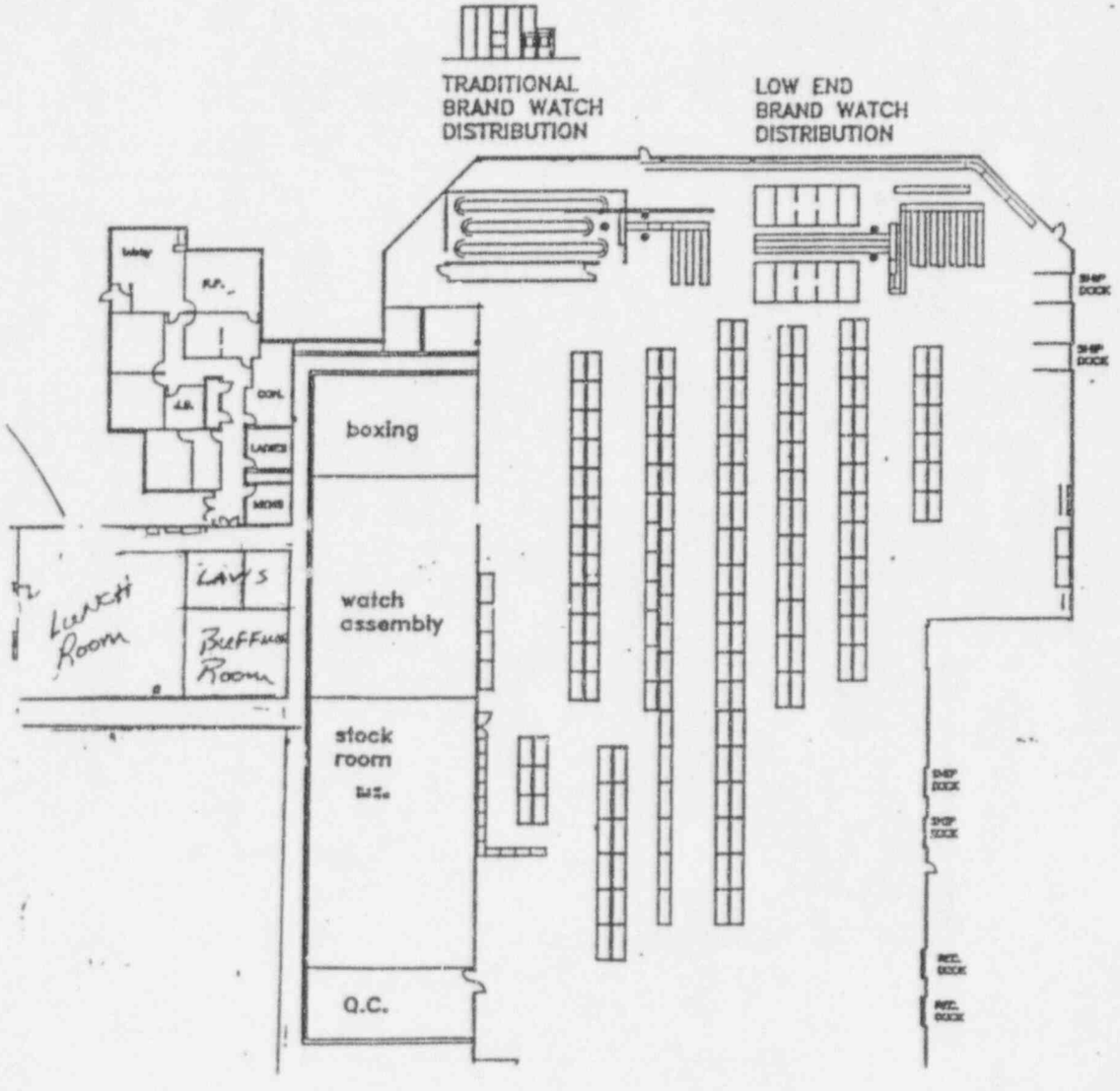
*** - 230V 1ph outlet on transformer, 208V 1ph outlet on

HMH - U.S.
941 WHEATLAND AVE.
LANCASTER, PA 17604
DATE: 10-1986 REV NO: 1
LOCATION: 3rd FLOOR
DRAWN BY: AVN

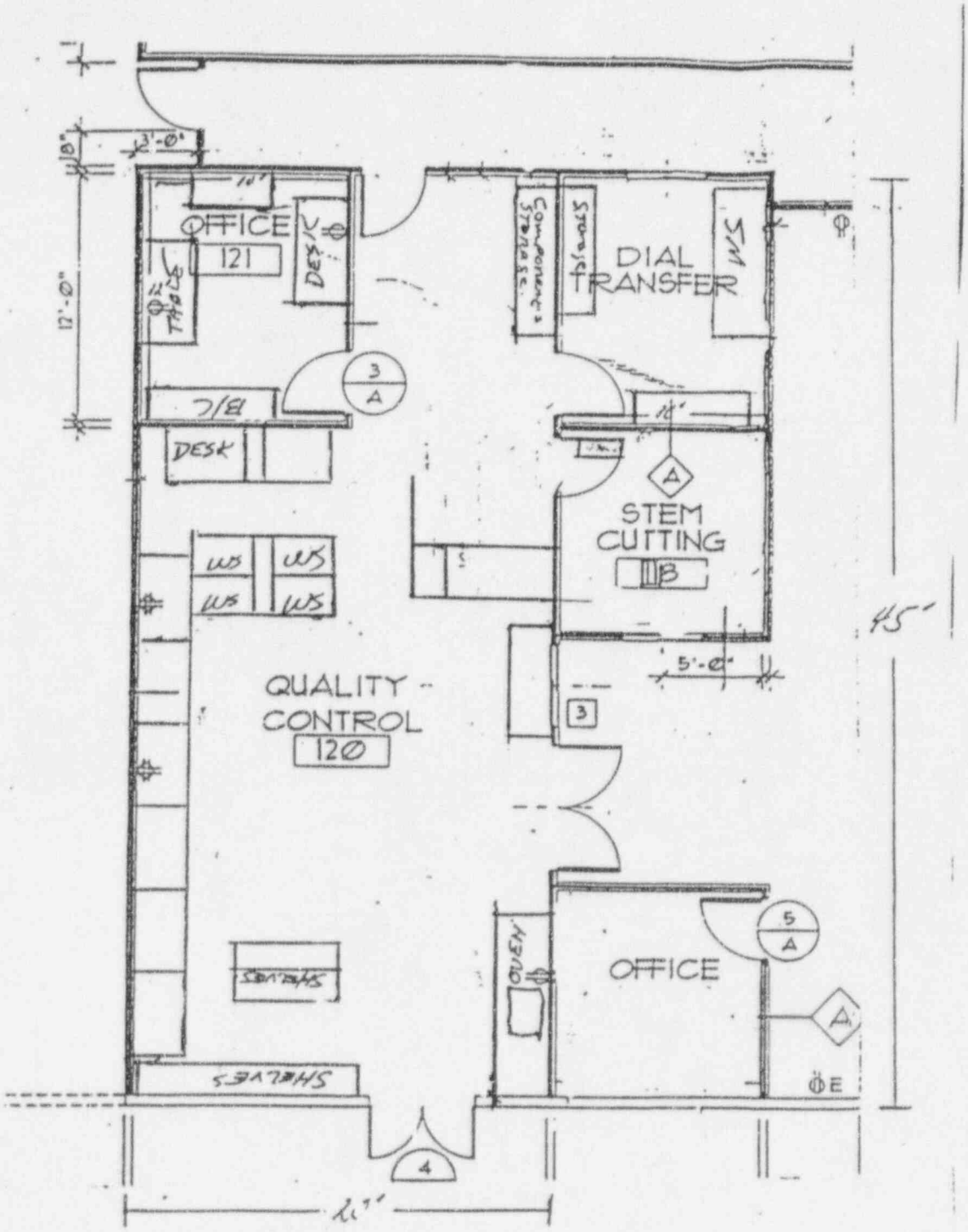


OFFICIAL RECORD COPY MIL 10

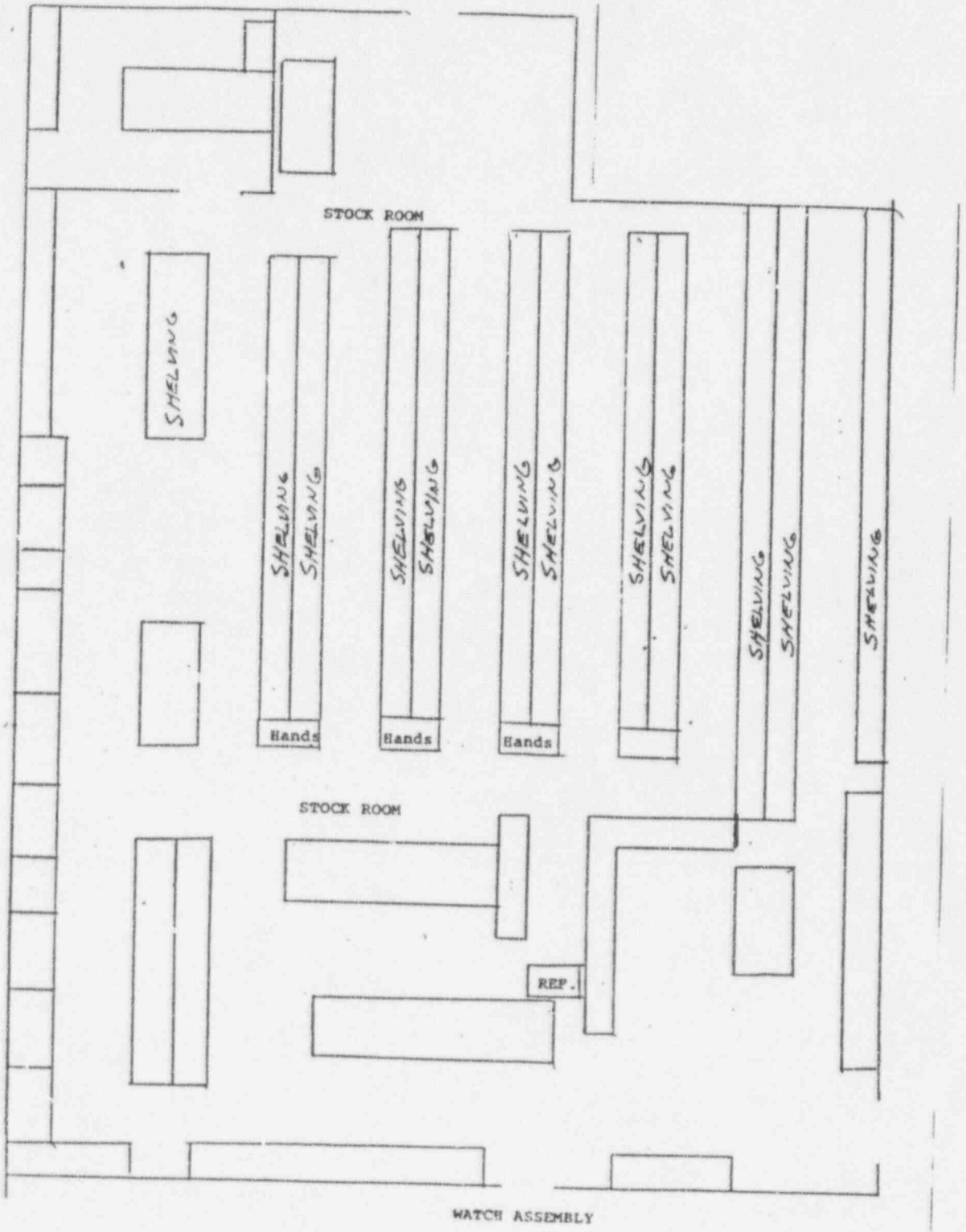
Appendix B-1 Facility Layout - Current Assembly Operations in 1817 William Penn Way. Overall Layout.



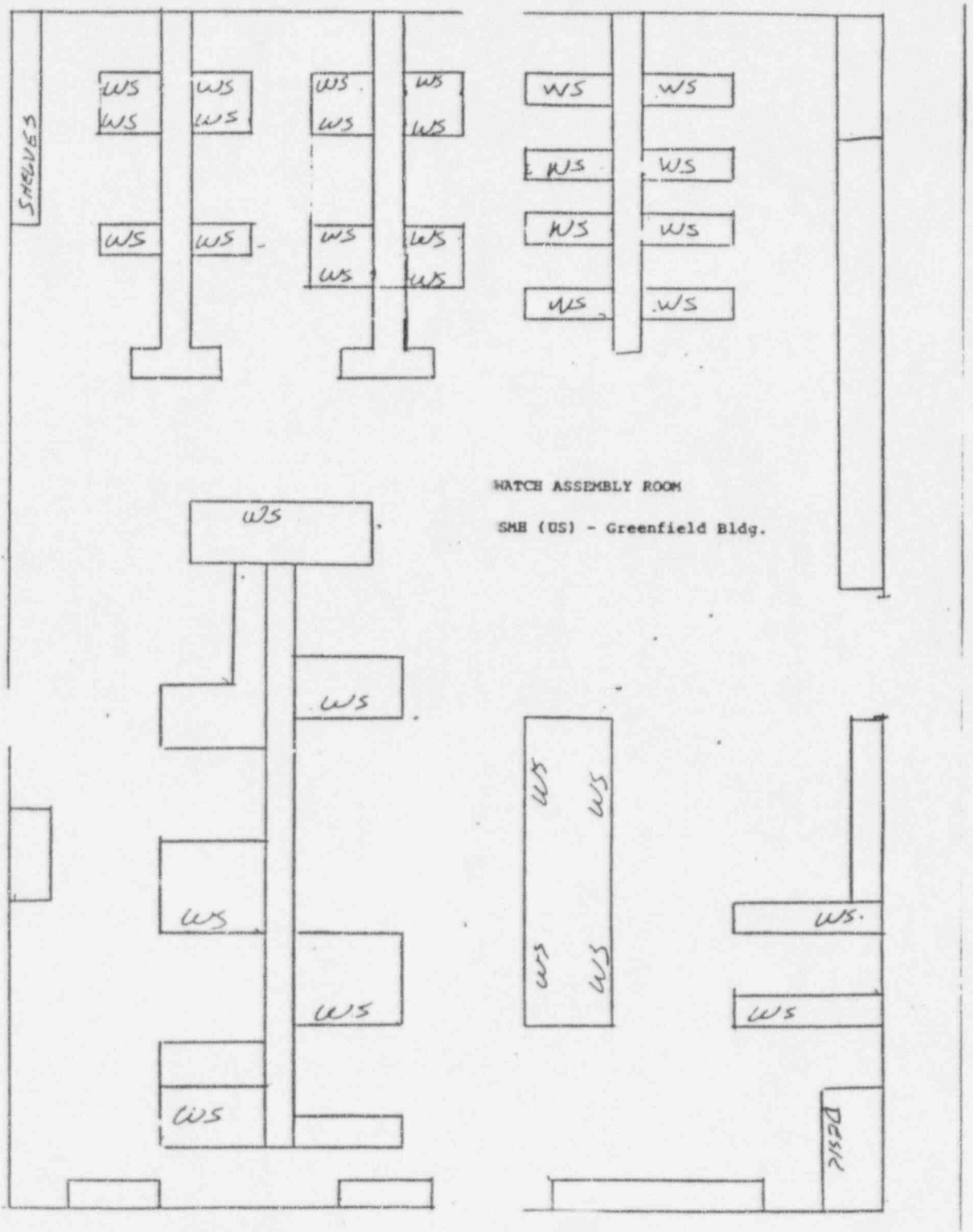
Appendix B-1. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Quality Control.



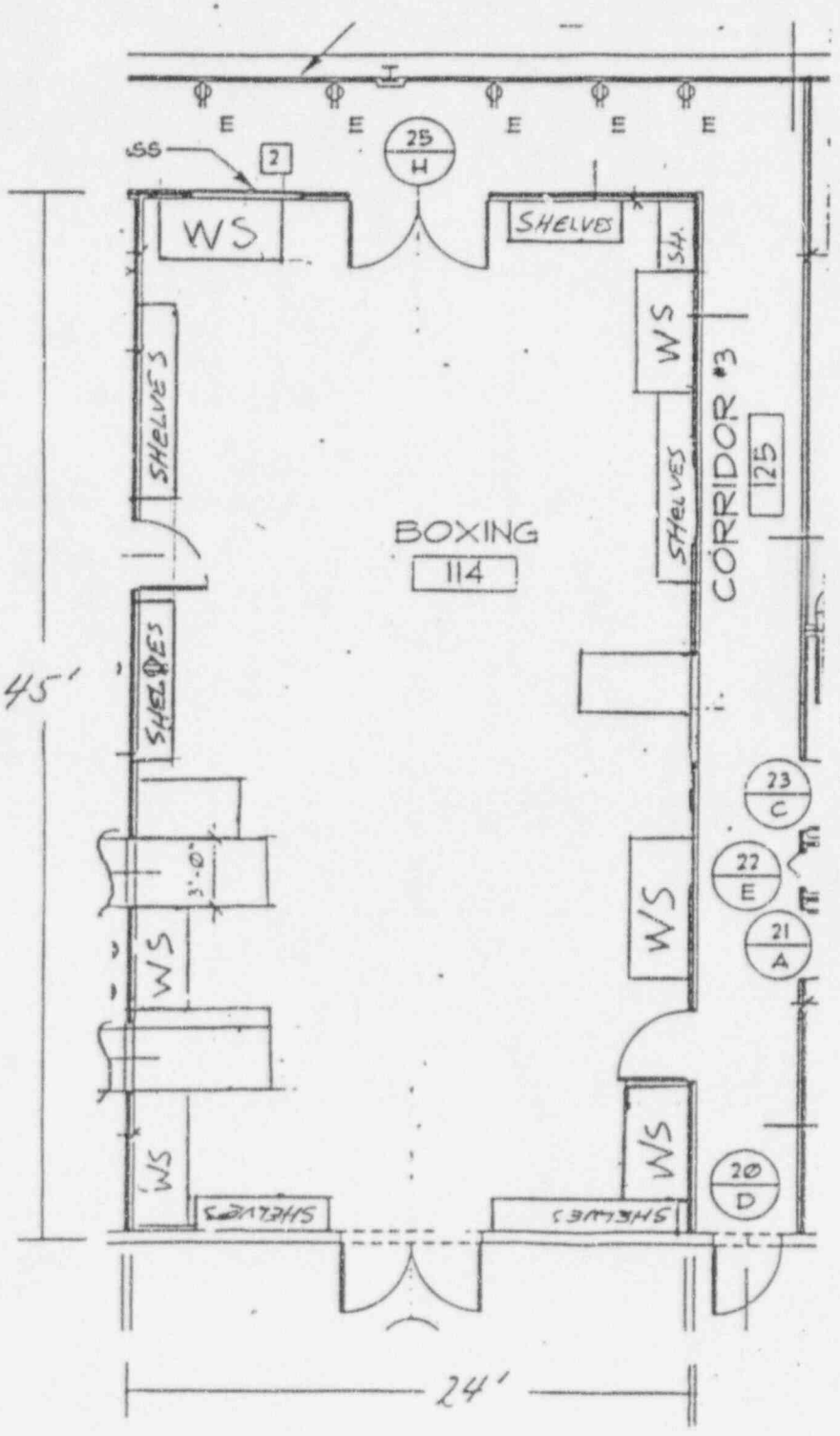
Appendix B-3. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Stock Room.



Appendix B-4. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Assembly Room.

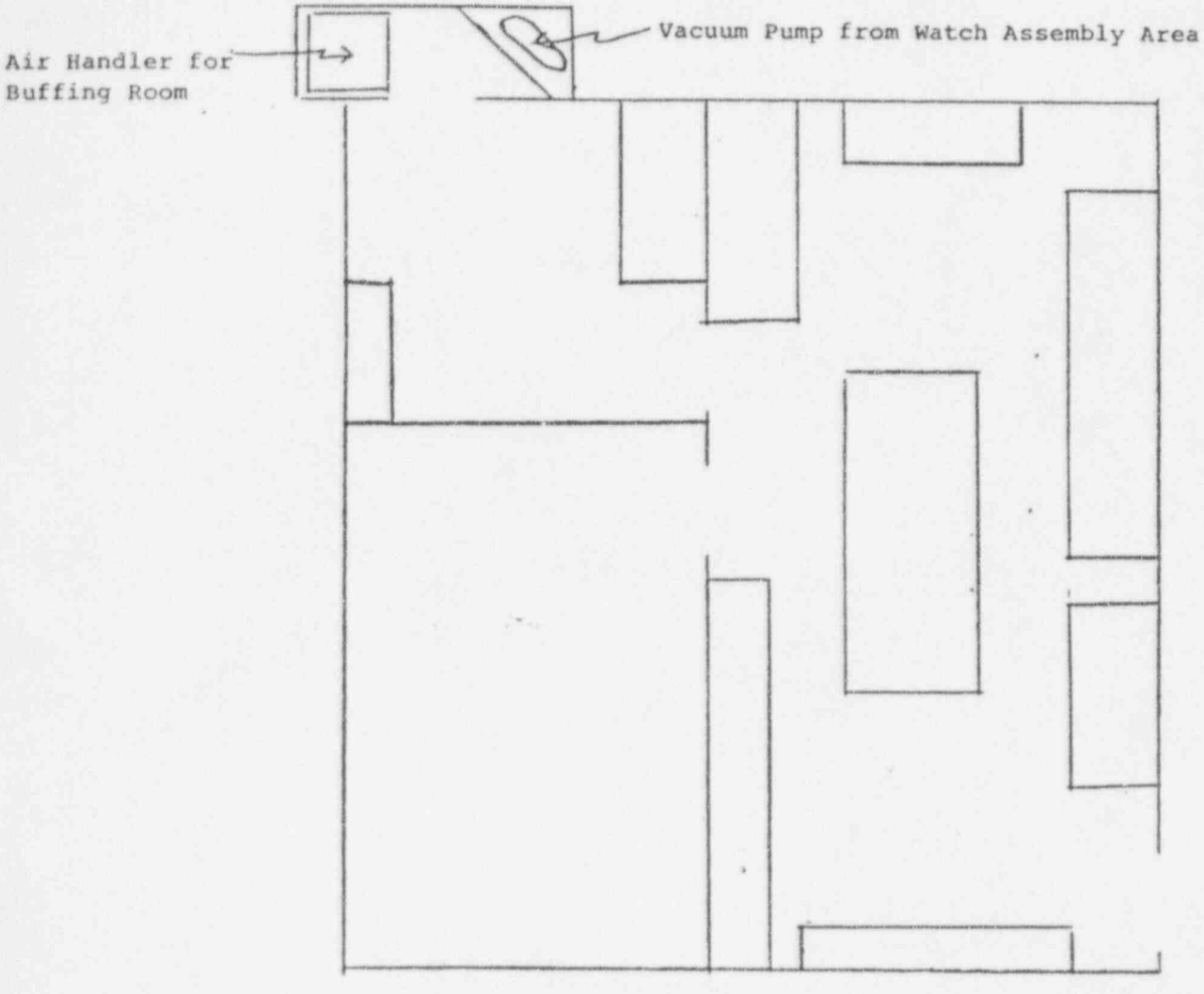


Appendix B-5. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Boxing Area.

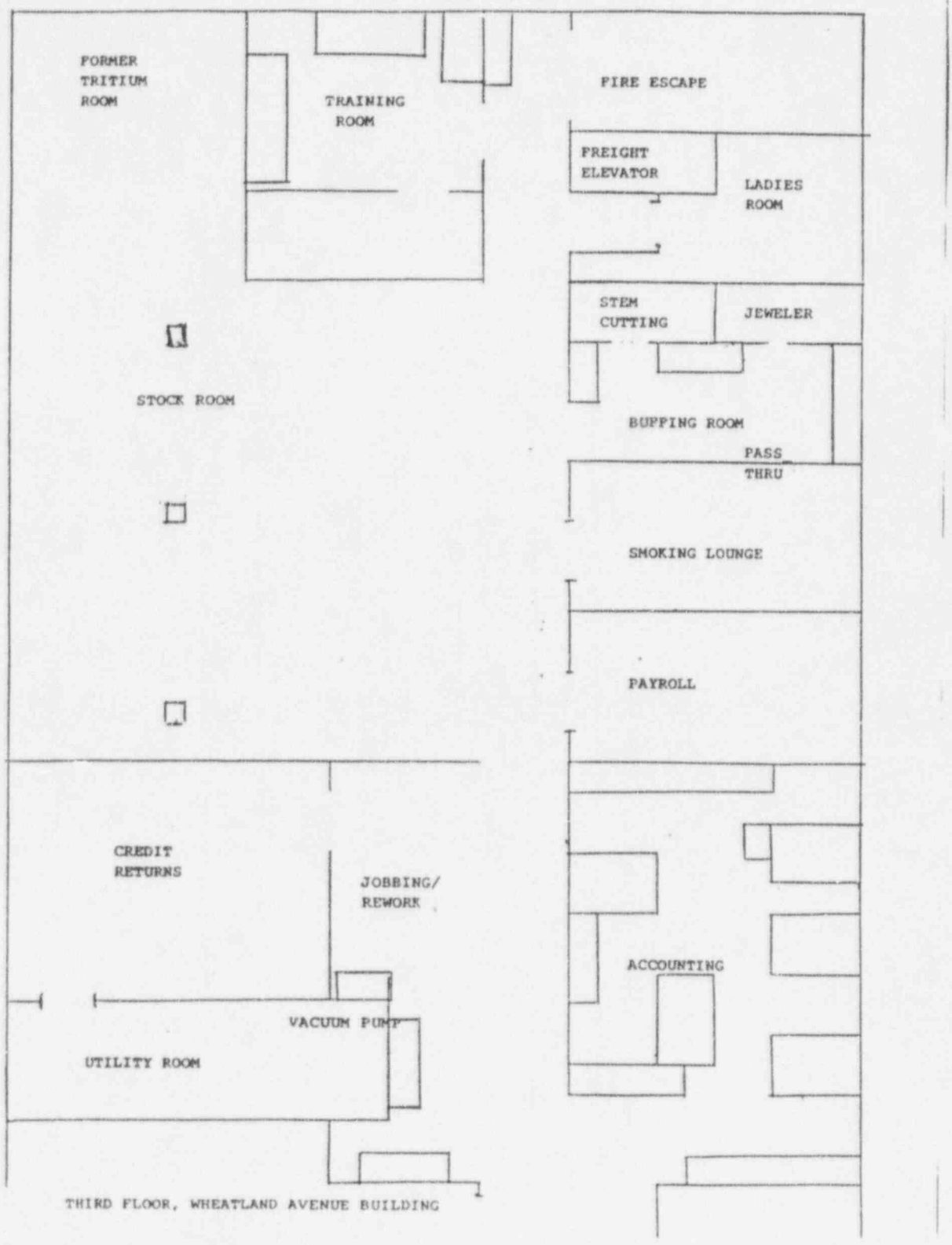


119261

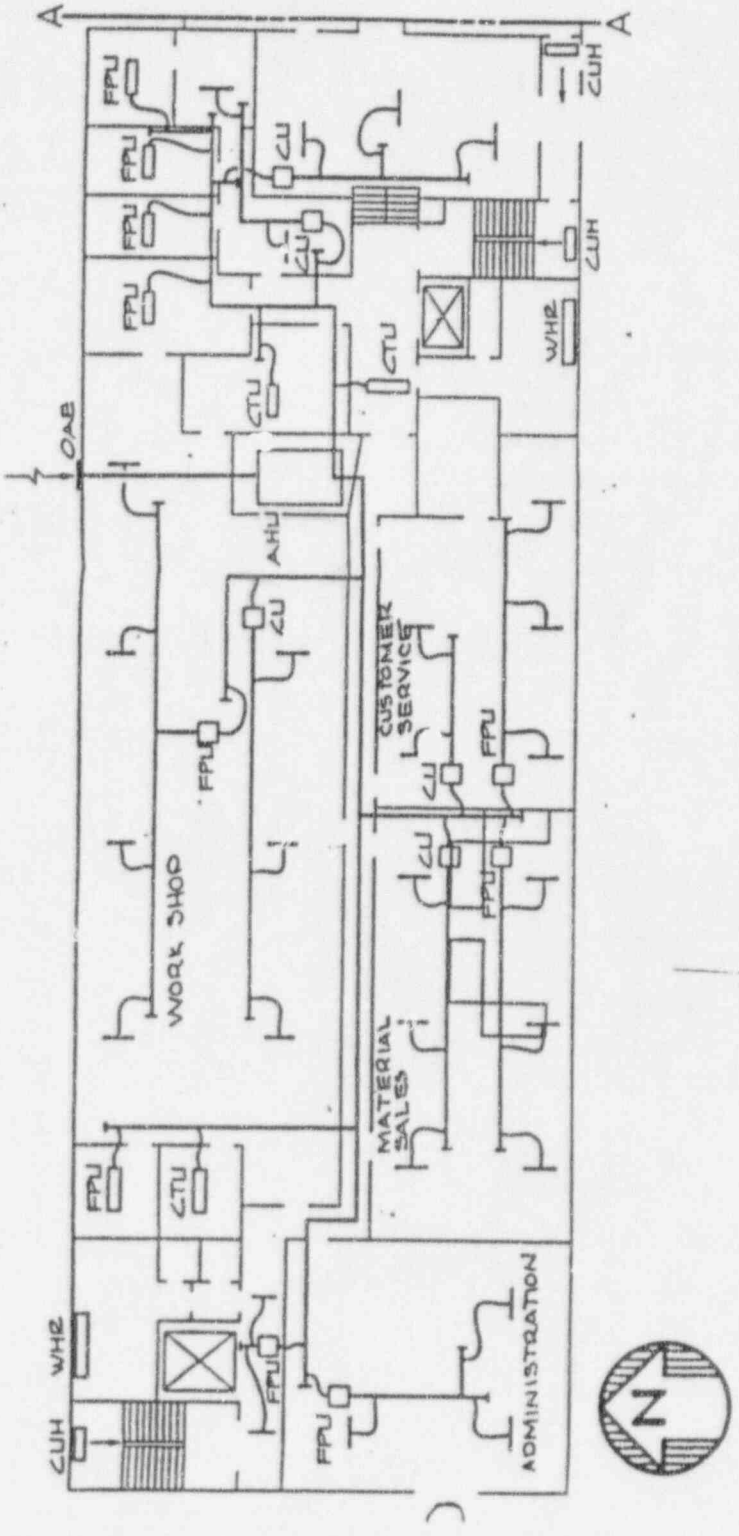
Appendix B-6. Facility Layout - Current Assembly Operations in 1817 William Penn Way. Buffing Room/ Vacuum System.



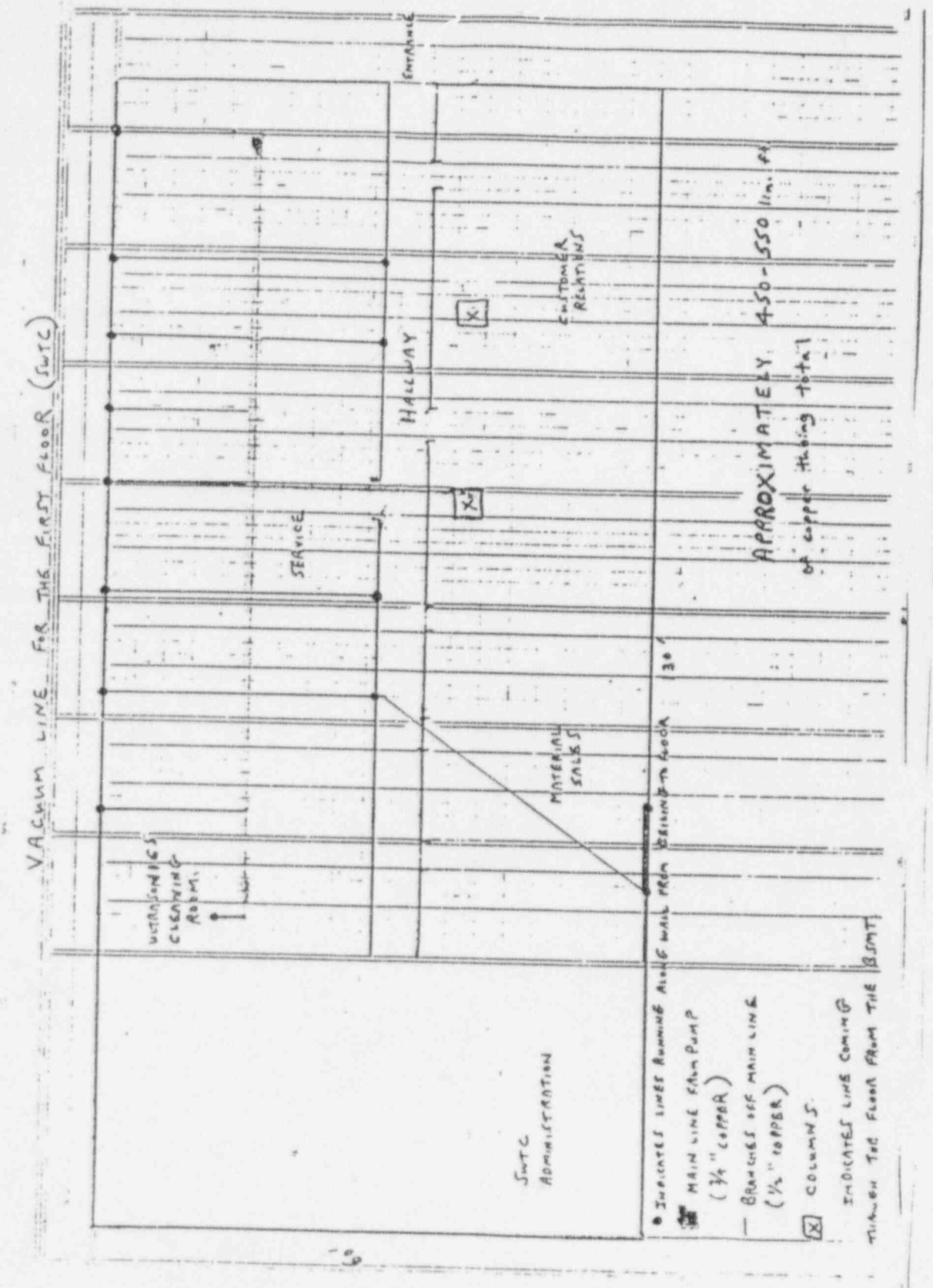
Appendix C. Present layout - Third Floor, 941 Wheatland Avenue



Appendix D-1. Swiss Watch Technical Center - First Floor and Basement
941 Wheatland Avenue. Overall Layout .



Appendix D-2. Swiss Watch Technical Center - First Floor and Basement
941 Wheatland Avenue. Vacuum System.



APPENDIX E. SURVEY RESULTS - 1702 Hempstead Road - Data

CONTAMINATION SURVEY - SMH (US), FEBRUARY 5, 1991. 1702 HEMPSTEAD ROAD

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
D-7	547	10	54.7	401	10	40.1	14.7	21.0	0.41	36	0.16
D-8	553		55.3			40.1	15.3	20.2		37	0.17
D-9	538		53.8			40.1	13.8	22.3		34	0.15
D-10	532		53.2			40.1	13.2	23.2		32	0.14
D-11	671		67.1			40.1	27.1	12.1		66	0.30
D-12	591		59.1			40.1	19.1	16.5		46	0.21
D-13	555		55.5			40.1	15.5	20.0		38	0.17
D-14	551		55.1			40.1	15.1	20.5		37	0.17
D-15	577		57.7			40.1	17.7	17.7		43	0.19
D-16	549		54.9			40.1	14.9	20.8		36	0.16
D-17	598		59.8			40.1	19.8	16.0		48	0.22
D-18	523		52.3			40.1	12.3	24.8		30	0.13
D-19	456		45.6			40.1	5.6	52.7		<MDA[1]	<MDA[1]
D-20	580		58.0			40.1	18.0	17.4		44	0.20
D-21	442		44.2			40.1	4.2	69.4		<MDA	<MDA
D-22	472		47.2			40.1	7.2	41.3		<MDA	<MDA
D-23	468		46.8			40.1	6.8	43.7		<MDA	<MDA
D-24	463		46.3			40.1	6.3	47.0		<MDA	<MDA
D-25	543		54.3			40.1	14.3	21.6		33	0.15
D-26	408		40.8			40.1	0.8	379		<MDA	<MDA
D-27	379		37.9			40.1	-2.1	-130		<MDA	<MDA

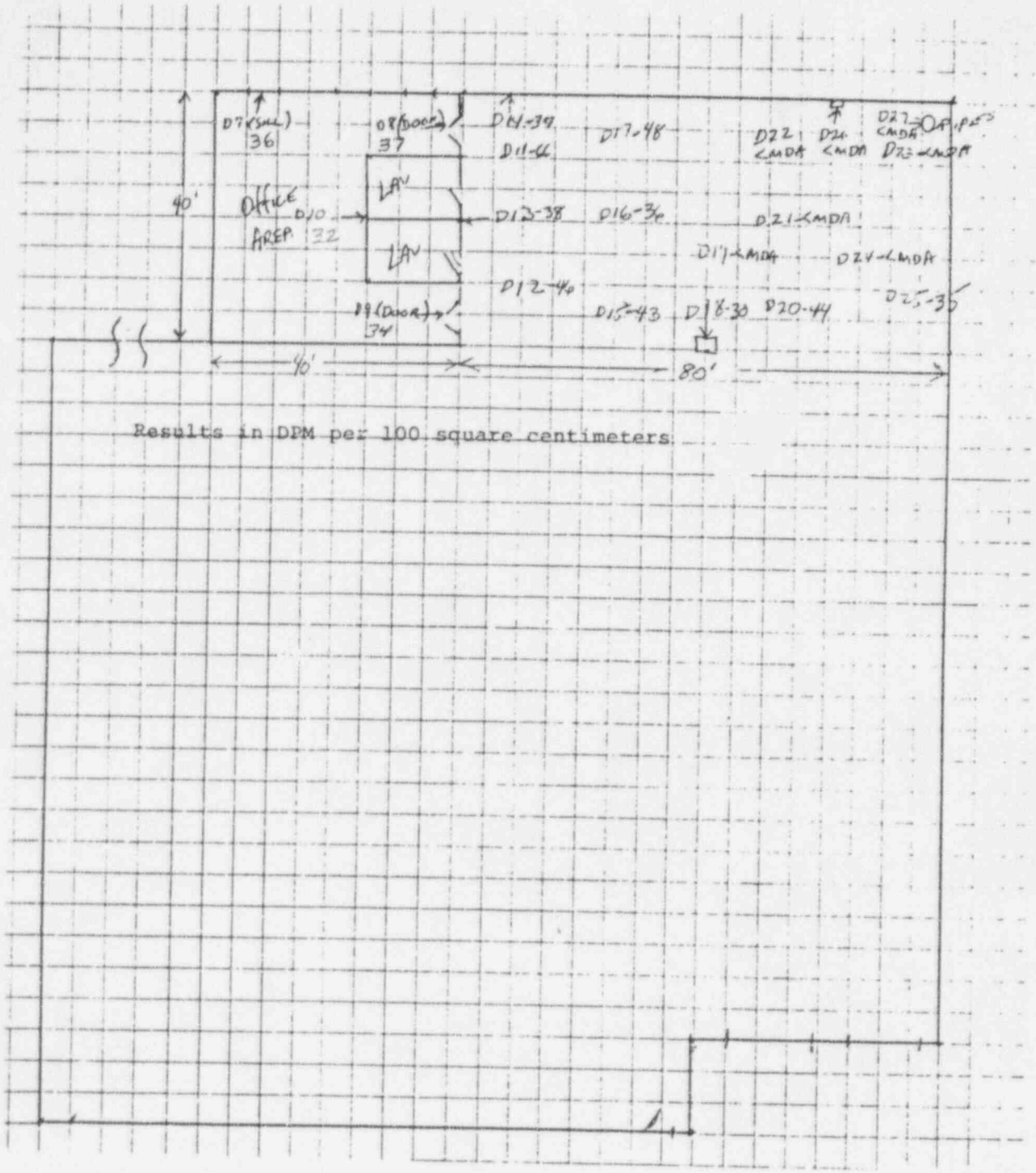
Note: 1. <MDA = less than minimum detectable activity = $(4.66((BG.CT)^{1/2}/BG.Time)$ = 23 x cm² = 23.8 dpm/100 cm²

Smear location per attached sketch.

= 0.1 x 10^{-6} uCi/cm².

= 1 x 10^{-7} uCi/cm².

Appendix E. SURVEY RESULTS, 1702 Hempstead Road - Plot of Data



Results in DPM per 100 square centimeters

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way
1. Initial Survey, Jan.5, 1991 - Data

CONTAMINATION SURVEY - SMH (US), JANUARY 5, 1991. GREENFIELD BUILDINGS

SMEAR	GR.COUNT	CT TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm2
A-1	1,637	10	163.7	281	10	28.1	135.6	3.2	0.10	1,356	6.11
A-2	878		87.8			28.1	59.7	5.7		597	2.69
A-3	1,153		115.3			28.1	87.2	4.3		872	3.93
A-4	1,269		126.9			28.1	98.8	4.0		988	4.45
A-5	890		89.0			28.1	60.9	5.6		609	2.74
A-6	744		74.4			28.1	46.3	6.9		463	2.09
A-7	1,423		142.3			28.1	114.2	3.6		1,142	5.14
A-8	1,632		163.2			28.1	135.1	3.2		1,351	6.09
A-9	5,295		529.5			28.1	501.4	1.5		5,014	22.59
A-10	2,338		233.8			28.1	205.7	2.5		2,057	9.27
A-11	6,060		606.0			28.1	577.9	1.4		5,779	26.03
A-12	10,138		1,013.8			28.1	985.7	1.0		9,857	44.40
A-13	1,029		102.9			28.1	74.8	4.8		748	3.37
A-14	1,351		135.1			28.1	107.0	3.8		1,070	4.82
A-15	1,467		146.7			28.1	118.6	3.5		1,186	5.34
A-16	826		82.6			28.1	54.5	6.1		545	2.45
A-17	795		79.5			28.1	51.4	6.4		514	2.32
A-18	3,272		327.2			28.1	299.1	2.0		2,991	13.47
A-19	2,116		211.6			28.1	183.5	2.7		1,835	8.27
A-20	1,638		163.8			28.1	135.7	3.2		1,357	6.11
A-21	2,596		259.6			28.1	231.5	2.3		2,315	10.43
A-22	1,423		142.3			28.1	114.2	3.6		1,142	5.14
A-23	656		65.6			28.1	37.5	8.2		375	1.69
A-24	1,156		115.6			28.1	87.5	4.3		875	3.94
A-25	4,351		435.1			28.1	407.0	1.7		4,070	18.33
A-26	1,446		144.6			28.1	116.5	3.6		1,165	5.25
A-27	6,141		614.1			28.1	586.0	1.4		5,860	26.40
A-28	3,071		307.1			28.1	279.0	2.1		2,790	12.57
A-29	1,524		152.4			28.1	124.3	3.4		1,243	5.60
A-30	2,677		267.7			28.1	239.6	2.3		2,396	10.79
A-31	5,132		513.2			28.1	485.1	1.5		4,851	21.85
A-32	1,389		138.9			28.1	110.8	3.7		1,108	4.99
A-33	3,398		339.8			28.1	311.7	1.9		3,117	14.04
A-34	1,556		155.6			28.1	127.5	3.4		1,275	5.74
A-35	1,151		115.1			28.1	87.0	4.3		870	3.92
A-36	2,064		206.4			28.1	178.3	2.7		1,783	8.03
A-37	16,084		1,608.4			28.1	1,580.3	0.8		15,803	71.18
A-38	1,916		191.6			28.1	163.5	2.9		1,635	7.36
A-39	3,261		326.1			28.1	298.0	2.0		2,980	13.42
A-40	2,047		204.7			28.1	176.6	2.7		1,766	7.95
A-41	4,325		432.5			28.1	404.4	1.7		4,044	18.22
A-42	2,689		268.9			28.1	240.8	2.3		2,408	10.85
A-43	1,337		133.7			28.1	105.6	3.8		1,056	4.76
A-44	871		87.1			28.1	59.0	5.8		590	2.66
A-45	1,725		172.5			28.1	144.4	3.1		1,444	6.50
A-46	2,030		203.0			28.1	174.9	2.7		1,749	7.88
A-47	1,220		122.0			28.1	93.9	4.1		939	4.23
A-48	4,986		498.6			28.1	470.5	1.5		4,705	21.19
A-49	1,160		116.0			28.1	87.9	4.3		879	3.96
A-50	1,314		131.4			28.1	103.3	3.9		1,033	4.65

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

1. Initial Survey, Jan.5, 1991 - Data (Cont.)

CONTAMINATION SURVEY - SMH (US), JANUARY 5, 1991. GREENFIELD BUILDING (CONT)

SMEAR	GR.COUNT	CT TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm2
A-51	987		98.7			28.1	70.6	5.0		706	3.18
A-52	1,859		185.9			28.1	157.8	2.9		1,578	7.11
A-53	2,703		270.3			28.1	242.2	2.3		2,422	10.91
A-54	872		87.2			28.1	59.1	5.7		591	2.66
A-55	46,162		4,816.2			28.1	4,788.1	0.5		47,881	215.68
A-56	746		74.6			28.1	46.5	6.9		465	2.09
A-57	4,823		482.3			28.1	454.2	1.6		4,542	20.46
A-58	1,193		119.3			28.1	91.2	4.2		912	4.11
A-59	1,904		190.4			28.1	162.3	2.9		1,623	7.31
A-60	6,796		679.6			28.1	651.5	1.3		6,515	29.35
A-61	648		64.8			28.1	36.7	8.3		367	1.65
A-62	611		61.1			28.1	33.0	9.1		330	1.49
A-63	3,267		326.7			28.1	298.6	2.0		2,986	13.45
A-64	1,162		116.2			28.1	88.1	4.3		881	3.97
A-65	4,932		493.2			28.1	465.1	1.6		4,651	20.95
A-66	3,736		373.6			28.1	345.5	1.8		3,455	15.56
A-67	4,751		475.1			28.1	447.0	1.6		4,470	20.14
A-68	3,149		314.9			28.1	286.8	2.0		2,868	12.92
A-69	6,664		666.4			28.1	638.3	1.3		6,383	28.75
A-70	3,740		374.0			28.1	345.9	1.8		3,459	15.58
A-71	16,691		1,669.1			28.1	1,641.0	0.8		16,410	73.92
A-72	3,312		331.2			28.1	303.1	2.0		3,031	13.65
A-73	9,909		990.9			28.1	962.8	1.0		9,628	43.37
A-74	6,514		651.4			28.1	623.3	1.3		6,233	28.08
A-75	4,911		491.1			28.1	463.0	1.6		4,630	20.86
A-76	15,832		1,583.2			28.1	1,555.1	0.8		15,551	70.05
A-77	48,065		4,806.5			28.1	4,778.4	0.5		47,784	215.24
A-78	18,768		1,876.8			28.1	1,848.7	0.7		18,487	83.27
A-79	34,516		3,451.6			28.1	3,423.5	0.5		34,235	154.21
A-80	5,299		529.9			28.1	501.8	1.5		5,018	22.60
A-81	3,621		362.1			28.1	334.0	1.9		3,340	15.05
A-82	15,207		1,520.7			28.1	1,492.6	0.8		14,926	67.23
A-83	10,057		1,005.7			28.1	977.6	1.0		9,776	44.04
A-84	18,299		1,829.9			28.1	1,801.8	0.8		18,018	81.16
A-85	16,103		1,610.3			28.1	1,582.2	0.8		15,822	71.27
A-86	12,852		1,285.2			28.1	1,257.1	0.9		12,571	56.63
A-87	5,816		581.6			28.1	553.5	1.4		5,535	24.93
A-88	5,114		511.4			28.1	483.3	1.5		4,833	21.77
A-89	8,588		858.8			28.1	830.7	1.1		8,307	37.42
A-90	9,015		901.5			28.1	873.4	1.1		8,734	39.34
A-91	4,719		471.9			28.1	443.8	1.6		4,438	19.99
A-92	4,044		404.4			28.1	376.3	1.7		3,763	16.95
A-93	4,765		476.5			28.1	448.4	1.6		4,484	20.20
A-94	6,478		647.8			28.1	619.7	1.3		6,197	27.91
A-95	2,967		296.7			28.1	268.6	2.1		2,686	12.10
A-96	2,481		248.1			28.1	220.0	2.4		2,200	9.91
A-97	5,591		559.1			28.1	531.0	1.4		5,310	23.92
A-98	3,238		323.8			28.1	295.7	2.0		2,957	13.32
A-99	8,065		806.5			28.1	778.4	1.2		7,784	35.06
A-100	12,016		1,201.6			28.1	1,173.5	0.9		11,735	52.86

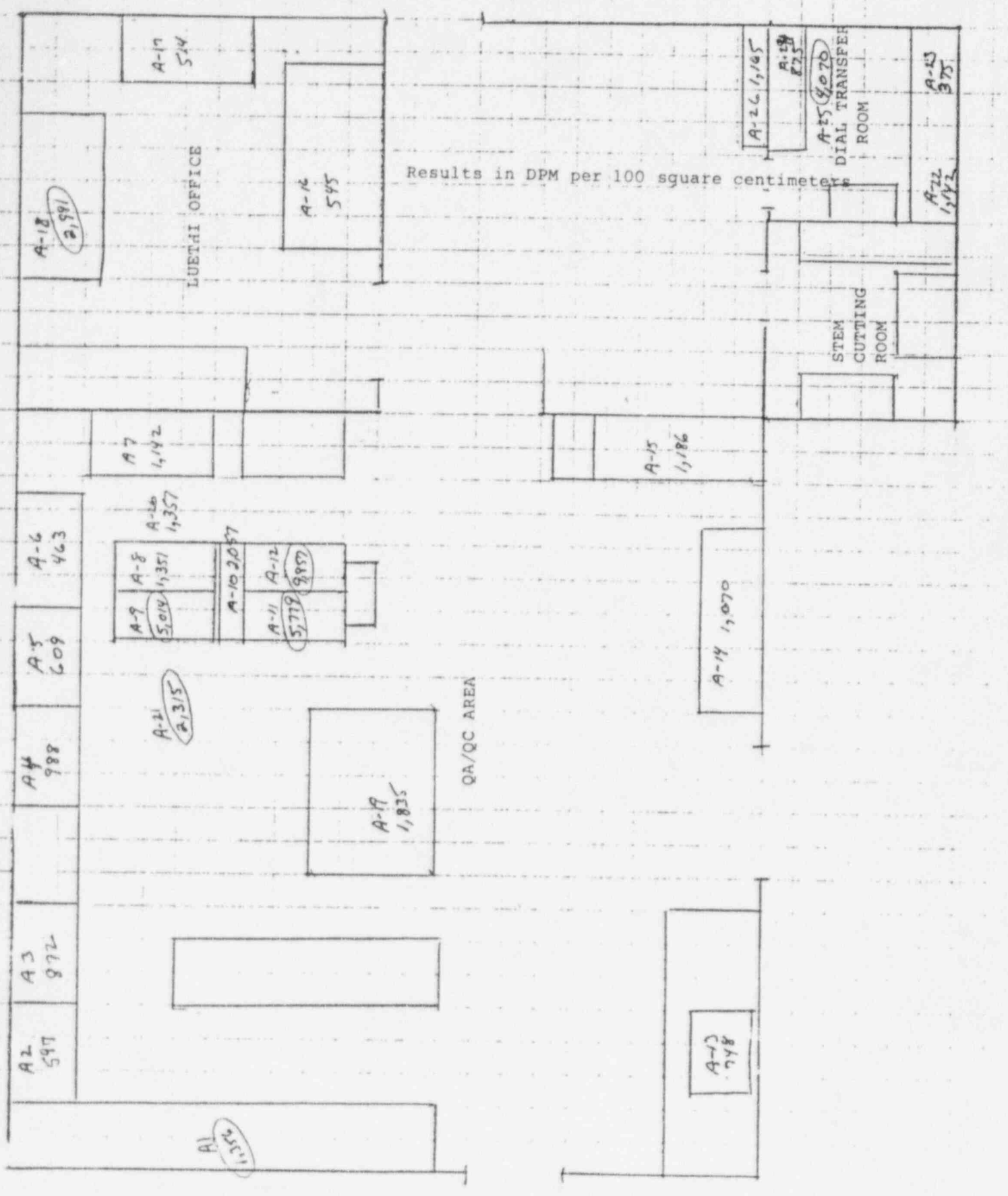
APPENDIX F. SURVEY RESULTS - 1817 William Penn Way
1. Initial Survey, Jan.5, 1991. Data (Cont.)

CONTAMINATION SURVEY - SMH (US), JANUARY 5, 1991. GREENFIELD BUILDING (CONTINUED)

SMEAR	GR.COUNT	CT TIME	NCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC	DPM/100 CM²	10^{-6} uCi/cm²
B-1	16,540	10	1,654.0	306	10	30.6	1,623.4	0.8	0.10	16,234	73.13
B-2	3,079		307.9			30.6	277.3	2.1		2,773	12.49
B-3	7,085.0		708.5			30.6	677.9	1.3		6,779	30.54
B-4	4,066.0		406.6			30.6	376.0	1.8		3,760	16.94
B-5	1,145		114.5			30.6	83.9	4.5		839	3.78
B-6	5,336		533.6			30.6	503.0	1.5		5,030	22.66
B-7	2,392		239.2			30.6	208.6	2.5		2,086	9.40
B-8	910.0		91.0			30.6	60.4	5.8		604	2.72
B-9	874.0		87.4			30.6	56.8	6.0		568	2.56
B-10	1,204		120.4			30.6	89.8	4.3		898	4.05
B-11	1,274		127.4			30.6	96.8	4.1		968	4.36
B-12	1,902		190.2			30.6	159.6	2.9		1,596	7.19
B-13	916		91.6			30.6	61.0	5.7		610	2.75
B-14	706		70.6			30.6	40.0	8.0		400	1.80
B-15	1,354		135.4			30.6	104.8	3.9		1,048	4.72
B-16	1,270		127.0			30.6	96.4	4.1		964	4.34
B-17	9,353		935.3			30.6	904.7	1.1		9,047	40.75
B-18	961		96.1			30.6	65.5	5.4		655	2.95
B-19	2,460		246.0			30.6	215.4	2.4		2,154	9.70
B-20	2,361		236.1			30.6	205.5	2.5		2,055	9.26
B-21	2,128		212.8			30.6	182.2	2.7		1,822	8.21
B-22	1,084		108.4			30.6	77.8	4.8		778	3.50
B-23	8,701		870.1			30.6	839.5	1.1		8,395	37.82
B-24	5,187		518.7			30.6	488.1	1.5		4,881	21.99

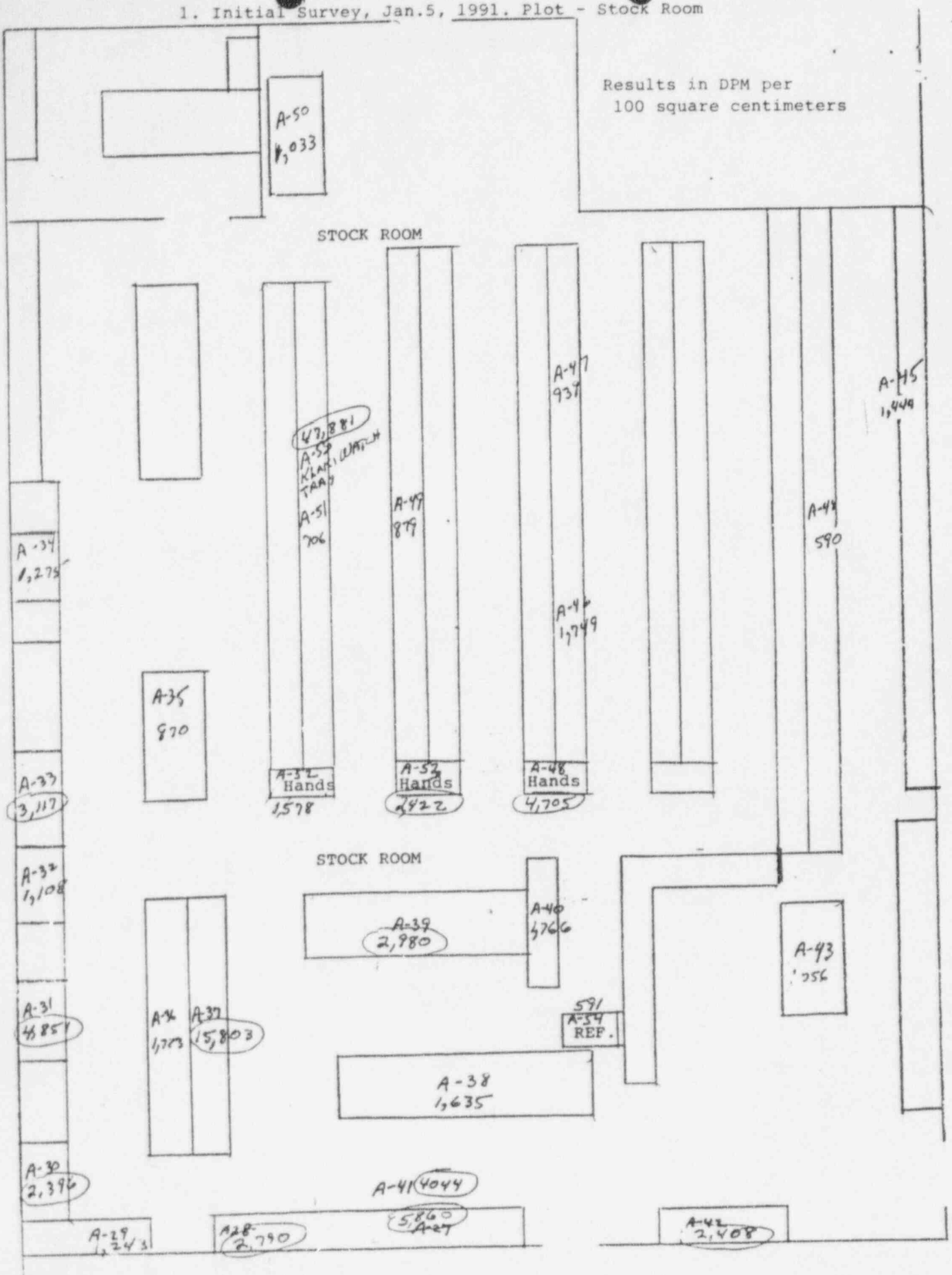
APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

1. Initial Survey, Jan. 5, 1991. Plot = QC Area



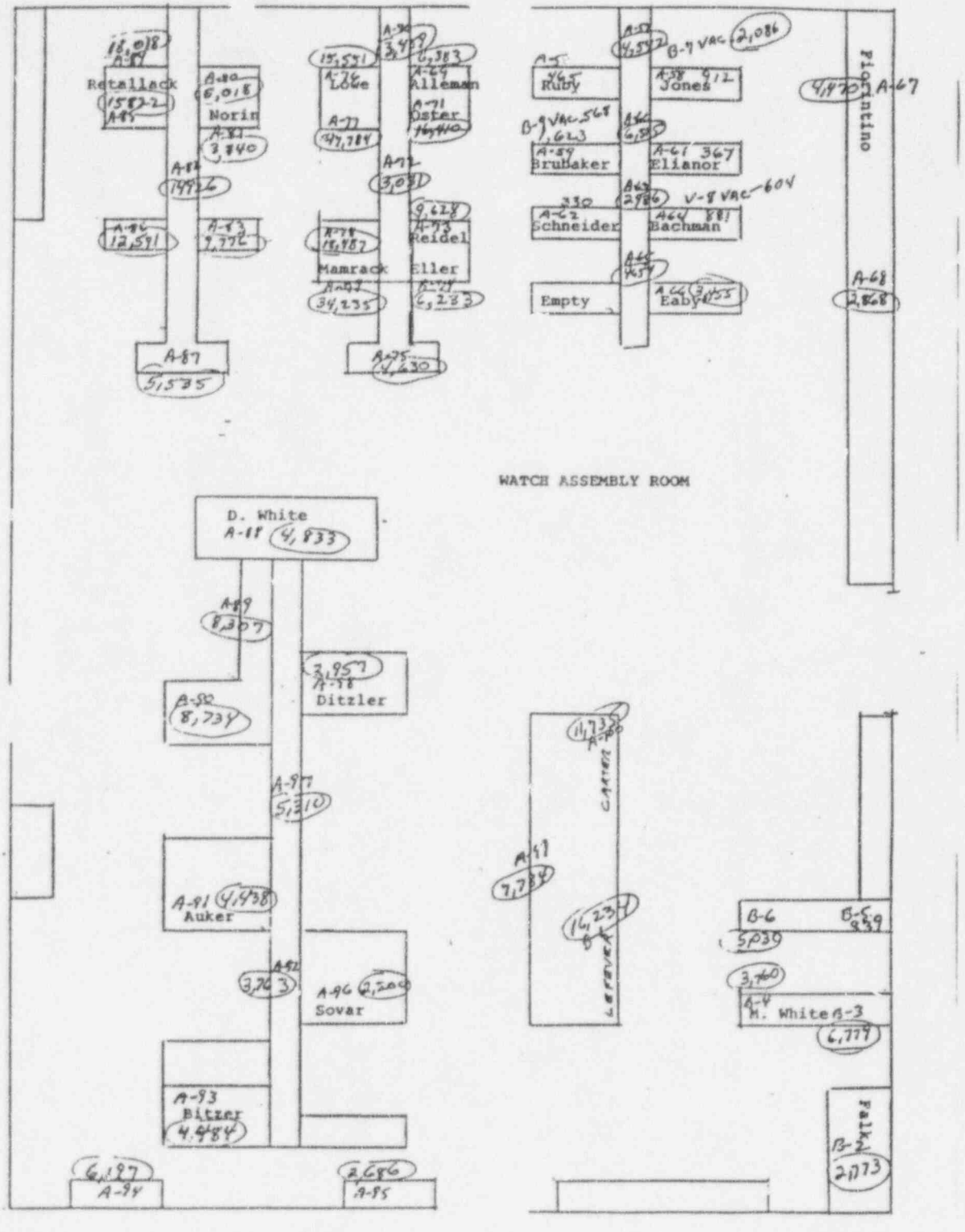
APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

1. Initial Survey, Jan.5, 1991. Plot - Stock Room



APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

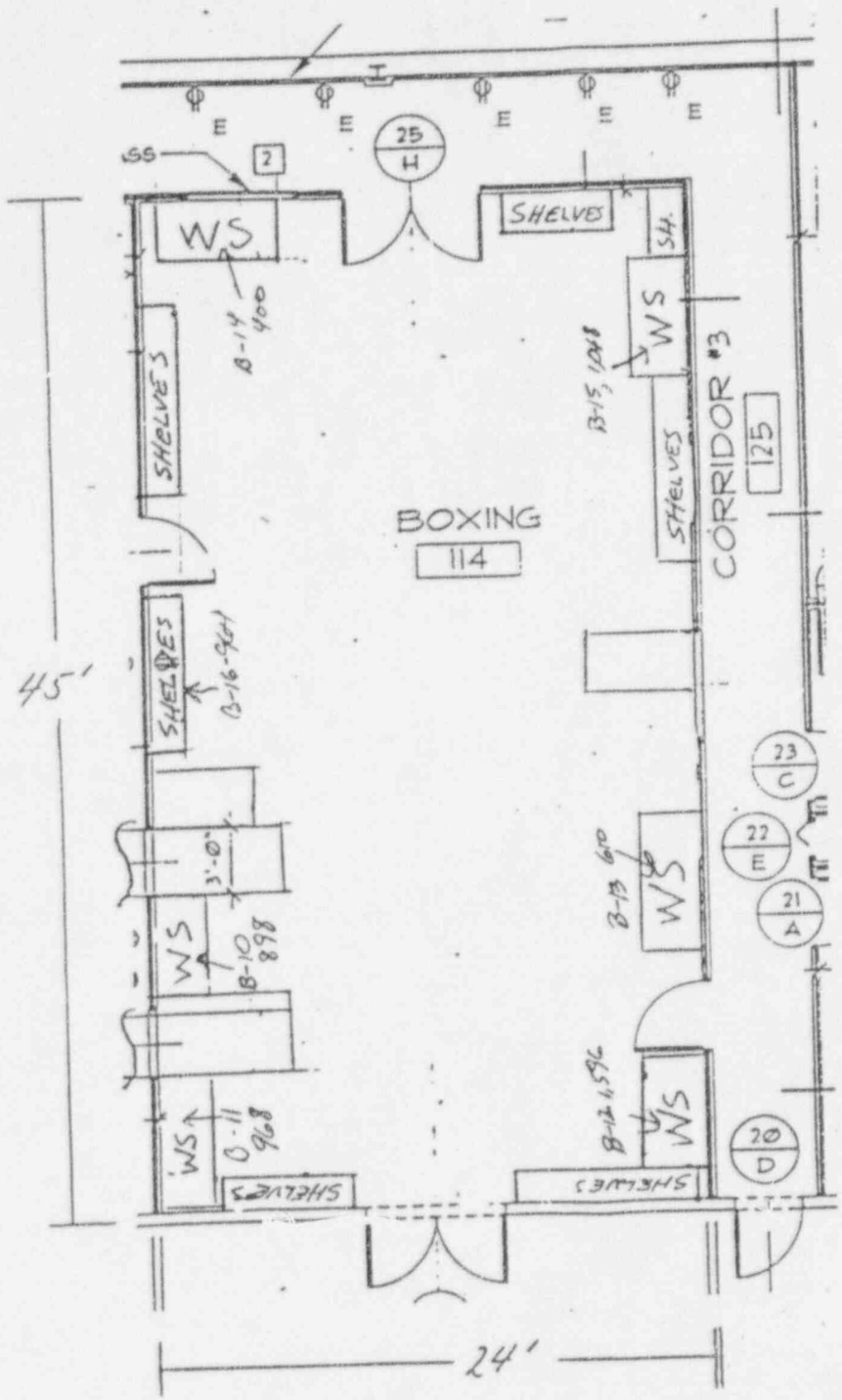
1. Initial Survey, Jan.5, 1991. Plot - Assembly Room



Results in DPM per 100 square centimeters

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

1. Initial Survey, Jan.5, 1991. Plot - Boxing Area

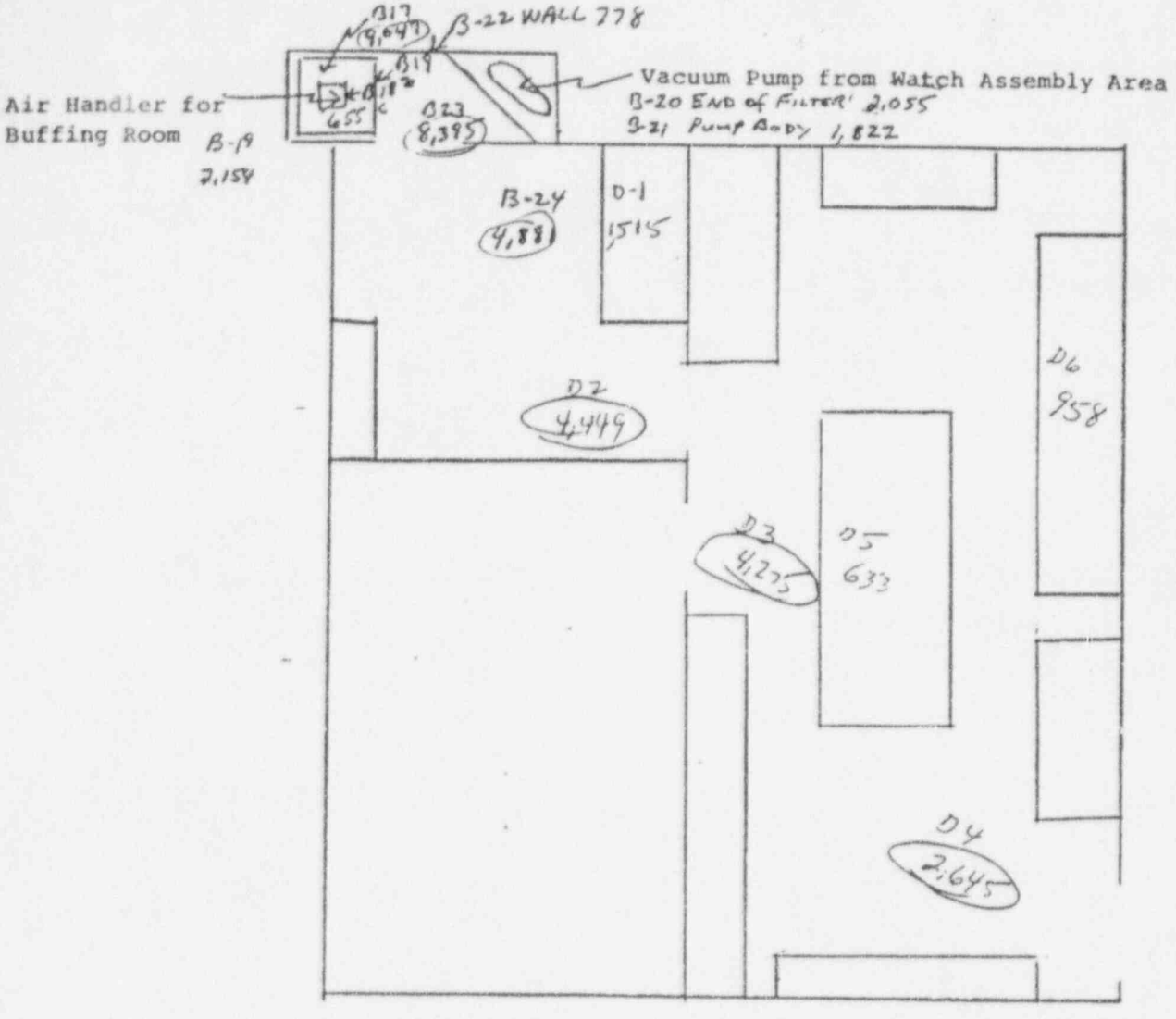


Results in DPM per 100 square centimeters

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

1. Initial Survey, Jan.5, 1991. Plot - Buffing Room

2. Followup Survey, Feb.5, 1991



Results in DPM per 100 square centimeters

Smears B-17-23 taken on Jan.5, 1991

Smears D1-6 taken on Feb.5, 1991

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way
1. Followup Survey, Feb.5, 1991. Data.

CONTAMINATION SURVEY - SMH (US), FEBRUARY 5, 1991. 1817 WILLIAM PENN WAY

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
D-1	6,611	10	661.1	401	10	40.1	621.1	1.3	0.41	1,515	6.82
D-2	18,643		1,864.3			40.1	1,824.3	0.8		4,449	20.04
D-3	17,926		1,792.6			40.1	1,752.6	0.8		4,275	19.25
D-4	11,245		1,124.5			40.1	1,084.5	1.0		2,645	11.91
D-5	2,995		299.5			40.1	259.5	2.2		633	2.85
D-6	4,328		432.8			40.1	392.8	1.8		958	4.31

Smears taken in buffing room with locations per attached sketch.

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way
3. Post Decon. Survey, Mar.4, 1991 - Data

CONTAMINATION SURVEY - SMH (US), MARCH 4, 1991. 1817 William Penn Way

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM² 10^{-4}	µCi/cm²
E-35	6,897	10	689.7	290	10	29.0	660.7	1.3	0.43	1,537	6.92
E-36	1,674		167.4			29.0	138.4	3.2		322	1.45
E-37	373		37.3			29.0	8.3	31.0		19	0.09
E-38	5,380		538.0			29.0	509.0	1.5		1,184	5.33
E-39	5,448		544.8			29.0	515.8	1.5		1,200	5.40
E-40	8,367		836.7			29.0	807.7	1.2		1,878	8.46
E-41	9,319		931.9			29.0	902.9	1.1		2,100	9.46
E-42	3,354		335.4			29.0	306.4	2.0		713	3.21
E-43	2,660		266.0			29.0	237.0	2.3		551	2.48
E-44	10,783		1,078.3			29.0	1,049.3	1.0		2,440	10.99
E-45	14,512		1,451.2			29.0	1,422.2	0.9		3,307	14.90
E-46	13,909		1,390.9			29.0	1,361.9	0.9		3,167	14.27
E-47	1,630		163.0			29.0	134.0	3.3		312	1.40
E-48	1,605		160.5			29.0	131.5	3.3		306	1.38
E-49	1,465		146.5			29.0	117.5	3.6		273	1.23
E-50	1,085		108.5			29.0	79.5	4.7		185	0.83
E-51	2,417		241.7			29.0	212.7	2.4		495	2.23
E-52	691		69.1			29.0	40.1	7.8		93	0.42
E-53	5,984		598.4			29.0	569.4	1.4		1,324	5.96
E-54	666		66.6			29.0	37.6	8.2		87	0.39
E-55	674		67.4			29.0	38.4	8.1		89	0.40
E-56	546		54.6			29.0	25.6	11.3		60	0.27
E-57	1,027		102.7			29.0	73.7	4.9		171	0.77
E-58	713		71.3			29.0	42.3	7.5		98	0.44
E-59	637		63.7			29.0	34.7	8.8		81	0.36
E-60	3,243		324.3			29.0	295.3	2.0		687	3.09
E-61	531		53.1			29.0	24.1	11.9		56	0.25
E-62	37,190		3,719.0			29.0	3,690.0	0.5		8,581	38.65
E-63	6,991		699.1			29.0	670.1	1.3		1,558	7.02
E-64	2,114		211.4			29.0	182.4	2.7		424	1.91
E-65	11,970		1,197.0			29.0	1,168.0	0.9		2,716	12.24
E-66	7,981		798.1			29.0	769.1	1.2		1,789	8.06
E-67	2,702		270.2			29.0	241.2	2.3		561	2.53
E-68	2,006		200.6			29.0	171.6	2.8		399	1.80
E-70	1,014		101.4			29.0	72.4	5.0		168	0.76
E-71	18,594		1,859.4			29.0	1,830.4	0.8		4,257	19.17
E-72	72,070		7,207.0			29.0	7,178.0	0.4		16,693	75.19
E-73	33,809		3,380.9			29.0	3,351.9	0.6		7,795	35.11
E-74	38,379		3,837.9			29.0	3,808.9	0.5		8,858	39.90
E-75	35,769		3,576.9			29.0	3,547.9	0.5		8,251	37.17
E-76	29,822		2,982.2			29.0	2,953.2	0.6		6,868	30.94
E-77	52,522		5,252.2			29.0	5,223.2	0.4		12,147	54.72
E-78	7,645		764.5			29.0	735.5	1.2		1,710	7.70
E-79	13,466		1,346.6			29.0	1,317.6	0.9		3,064	13.80

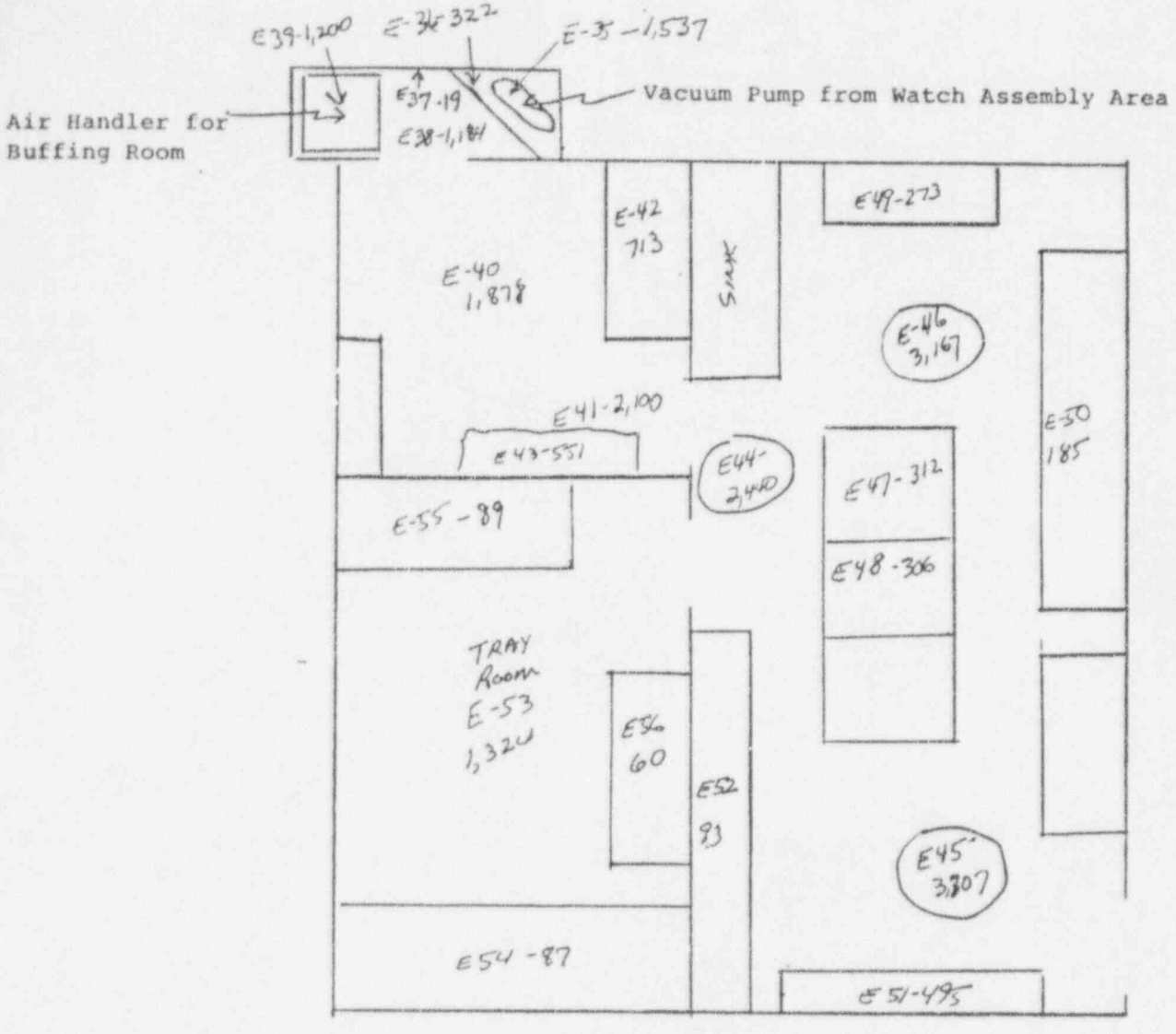
APPENDIX F. SURVEY RESULTS - 1817 William Penn Way
3. Post Decon. Survey, Mar.4, 1991 - Data (Cont.)

CONTAMINATION SURVEY - SMH (US), MARCH 4, 1991. 1817 William Penn Way (Cont)

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM² 10⁻⁶ uCi/cm²	
E-80	45,686	10	4,568.6	290	10	29.0	4,539.6	0.5	0.43	10,557	47.55
E-81	20,300		2,030.0			29.0	2,001.0	0.7		4,653	20.96
E-82	7,988		798.8			29.0	769.8	1.2		1,790	8.06
E-83	15,799		1,579.9			29.0	1,550.9	0.8		3,607	16.25
E-84	44,669		4,466.9			29.0	4,437.9	0.5		10,321	46.49
E-85	144,793		14,479.3			29.0	14,450.3	0.3		33,605	151.38
E-86	61,665		6,166.5			29.0	6,137.5	0.4		14,273	64.29
E-87	51,211		5,121.1			29.0	5,092.1	0.4		11,842	53.34
E-88	32,152		3,215.2			29.0	3,186.2	0.6		7,410	33.38
E-89	2,157		215.7			29.0	186.7	2.6		434	1.96
E-90	3,008		300.8			29.0	271.8	2.1		632	2.85
E-91	3,069		306.9			29.0	277.9	2.1		646	2.91
E-92	11,716		1,171.6			29.0	1,142.6	1.0		2,657	11.97
E-93	13,382		1,338.2			29.0	1,309.2	0.9		3,045	13.71
E-94	5,054		505.4			29.0	476.4	1.5		1,108	4.99
E-95	1,372		137.2			29.0	108.2	3.8		252	1.13
E-96	28,907		2,890.7			29.0	2,861.7	0.6		6,655	29.98
E-97	19,740		1,974.0			29.0	1,945.0	0.7		4,523	20.38
E-98	8,444		844.4			29.0	815.4	1.1		1,896	8.54
E-99	16,715		1,671.5			29.0	1,642.5	0.8		3,820	17.21
E-100	12,355		1,235.5			29.0	1,206.5	0.9		2,806	12.64
F-1	2,198		219.8			29.0	190.8	2.6		444	2.00
F-2	3,807		380.7			29.0	351.7	1.8		818	3.68
F-3	11,347		1,134.7			29.0	1,105.7	1.0		2,571	11.58
F-4	2,115		211.5			29.0	182.5	2.7		424	1.91
F-5	1,036		103.6			29.0	74.6	4.9		173	0.78
F-6	869		86.9			29.0	57.9	5.9		135	0.61
F-7	3,626		362.6			29.0	333.6	1.9		776	3.49
F-8	2,707		270.7			29.0	241.7	2.3		562	2.53
F-9	20,131		2,013.1			29.0	1,984.1	0.7		4,614	20.78
F-10	24,842		2,484.2			29.0	2,455.2	0.6		5,710	25.72
F-11	30,529		3,052.9			29.0	3,023.9	0.6		7,032	31.68
F-12	14,753		1,475.3			29.0	1,446.3	0.8		3,363	15.15
F-13	5,351		535 1			29.0	506.1	1.5		1,177	5.30
F-14	3,797		379.7			29.0	350.7	1.8		816	3.67
F-16	4,317		431.7			29.0	402.7	1.7		937	4.22
F-17	5,753		575.3			29.0	546.3	1.4		1,270	5.72
F-18	3,155		315.5			29.0	286.5	2.0		666	3.00
F-19	12,346		1,234.6			29.0	1,205.6	0.9		2,804	12.63
F-20	13,261		1,326.1			29.0	1,297.1	0.9		3,017	13.59
F-21	878		87.8			29.0	58.8	5.8		137	0.62
F-22	3,844		384.4			29.0	355.4	1.8		827	3.72
F-23	1,326		132.6			29.0	103.6	3.9		241	1.09
F-24	9,528		952.8			29.0	923.8	1.1		2,148	9.68

APPENDIX F. SURVEY RESULTS _ 1817 William Penn Way

3. Post-Decon Survey, Mar.4, 1991 - Plot, Buffing Room

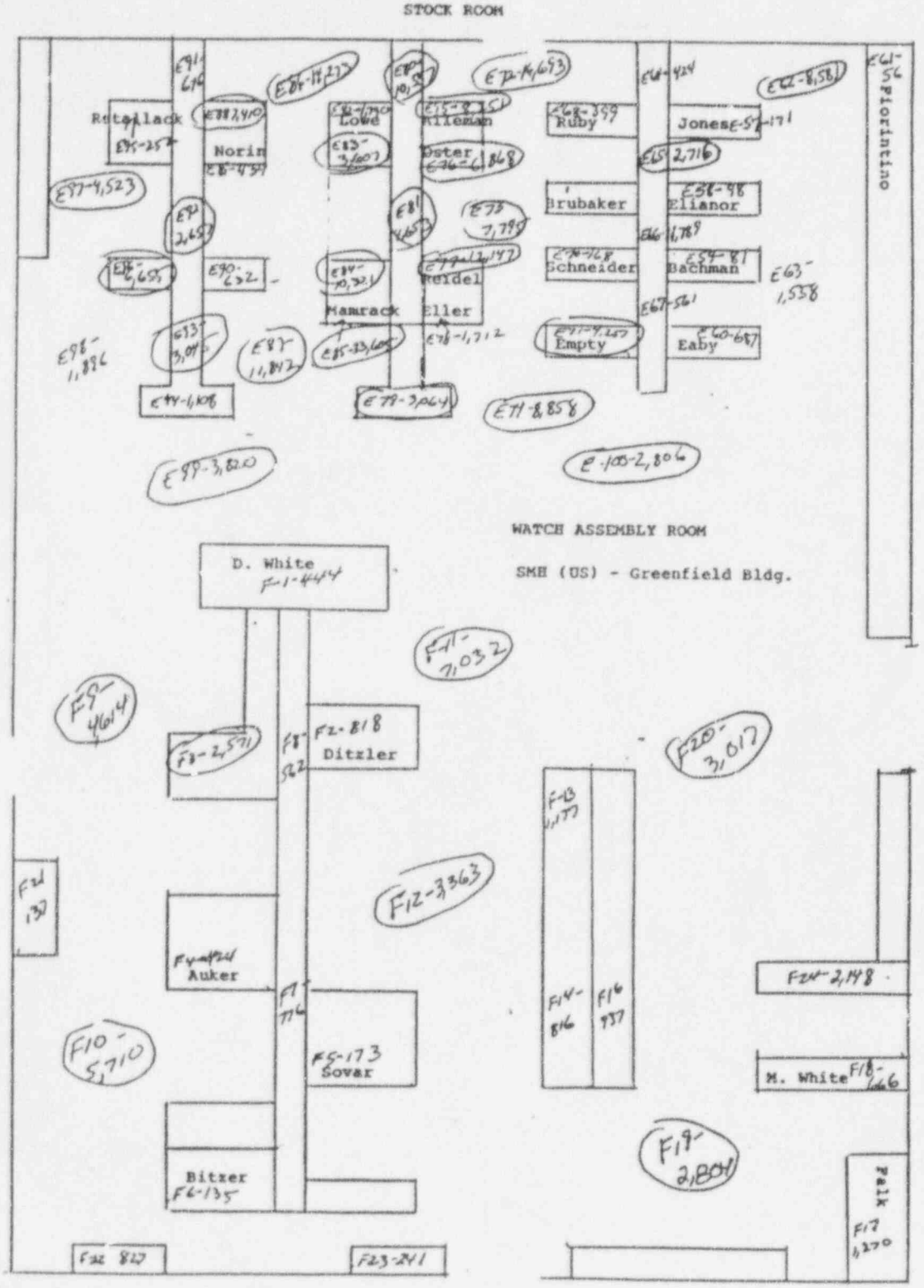


Results in DPM per 100 square centimeters

119261

APPENDIX F. SURVEY RESULTS - 1817 William Penn Way

3. Post Decon.Survey, Mar.4, 1991 - Plot, Assembly Room



Results in DPM per 100 square centimeters.

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
1. Initial Survey, Jan.5 &18, 1991 - Data

CONTAMINATION SURVEY - SMH (US), JANUARY 5, 1991. WHEATLAND AVENUE BUILDING

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
B-25	411	10	41.1			30.6	10.5	25.5	0.10	105	0.47
B-26	389		38.9			30.6	8.3	31.8		83	0.37
B-27	542		54.2			30.6	23.6	12.3		236	1.06
B-28	498		49.8			30.6	19.2	14.8		192	0.86
B-29	380		38.0			30.6	7.4	35.4		<MDA¹	<MDA¹
B-30	429		42.9			30.6	12.3	22.0		123	0.55
B-31	383		38.3			30.6	7.7	34.1		<MDA	<MDA
B-32	512		51.2			30.6	20.6	13.9		206	0.93
B-33	383		38.3			30.6	7.7	34.1		<MDA	<MDA
B-34	392		39.2			30.6	8.6	30.7		86	0.39
B-35	361		36.1			30.6	5.5	47.0		<MDA	<MDA
B-36	413		41.3			30.6	10.7	25.1		107	0.48
B-37	364		36.4			30.6	5.8	44.6		<MDA	<MDA
B-38	533		53.3			30.6	22.7	12.8		227	1.02
B-39	549		54.9			30.6	24.3	12.0		243	1.09
B-40	361		36.1			30.6	5.5	47.0		<MDA	<MDA
B-41	447		44.7			30.6	14.1	19.5		141	0.64
B-42	360		36.0			30.6	5.4	47.8		<MDA	<MDA
B-43	331		33.1			30.6	2.5	101		<MDA	<MDA
B-44	678		67.8			30.6	37.2	8.4		372	1.68
B-45	1,333		133.3			30.6	102.7	3.9		1,027	4.63
B-46	469		46.9			30.6	16.3	17.1		163	0.73
B-47	379		37.9			30.6	7.3	35.9		<MDA	<MDA
B-48	465		46.5			30.6	15.9	17.5		159	0.72
B-49	1,515		151.5			30.6	120.9	3.5		1,209	5.45
B-50	476		47.6			30.6	17.0	16.4		170	0.77
B-51	575		57.5			30.6	26.9	11.0		269	1.21
B-52	1,713		171.3			30.6	140.7	3.2		1,407	6.34
B-53	1,325		132.5			30.6	101.9	4.0		1,019	4.59
B-54	988		98.8			30.6	68.2	5.3		682	3.07
B-55	978		97.8			30.6	67.2	5.3		672	3.03
B-56	421		42.1			30.6	11.5	23.4		115	0.52
B-57	728		72.8			30.6	42.2	7.6		422	1.90
B-58	438		43.8			30.6	13.2	20.7		132	0.59
B-59	706		70.6			30.6	40.0	8.0		400	1.80
B-60	816		81.6			30.6	51.0	6.6		510	2.30
B-61	617		61.7			30.6	31.1	9.8		311	1.40
B-62	745		74.5			30.6	43.9	7.4		439	1.98
B-63	2,286		228.6			30.6	198.0	2.6		1,980	8.92
B-64	1,624		162.4			30.6	131.8	3.3		1,318	5.94
B-65	1,755		175.5			30.6	144.9	3.1		1,449	6.53
B-66	2,468		246.8			30.6	216.2	2.4		2,162	9.74
B-67	2,141		214.1			30.6	183.5	2.7		1,835	8.27

Note: 1. <MDA = less than minimum detectable activity = (4.66((BG.CT)$^{1/2}$/BG.Time)

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
1. Initial Survey, Jan.5 &18, 1991 - Data (Cont.)

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
B-68	5,882		588.2			30.6	557.6	1.4	0.10	5,576	25.12
B-69	5,021		502.1			30.6	471.5	1.5		4,715	21.24
B-70	7,470		747.0			30.6	716.4	1.2		7,164	32.27
B-71	4,993		499.3			30.6	468.7	1.6		4,687	21.11
B-72	8,810		881.0			30.6	850.4	1.1		8,504	38.31
B-73	1,730		173.0			30.6	142.4	3.2		1,424	6.41
B-74	712		71.2			30.6	40.6	7.9		406	1.83
B-75	822		82.2			30.6	51.6	6.5		516	2.32
B-76	719		71.9			30.6	41.3	7.8		413	1.86
B-77	938		93.8			30.6	63.2	5.6		632	2.85
B-78	1,345		134.5			30.6	103.9	3.9		1,039	4.68
B-79	1,756		175.6			30.6	145.0	3.1		1,450	6.53
B-80	961		96.1			30.6	65.5	5.4		655	2.95
B-81	843		84.3			30.6	53.7	6.3		537	2.42
B-82	1,772		177.2			30.6	146.6	3.1		1,466	6.60
B-83	867		86.7			30.6	56.1	6.1		561	2.53
B-84	673		67.3			30.6	36.7	8.5		367	1.65
B-85	2,677		267.7			30.6	237.1	2.3		2,371	10.68
B-86	2,636		263.6			30.6	233.0	2.3		2,330	10.50
B-87	5,569		556.9			30.6	526.3	1.5		5,263	23.71
B-88	3,686		368.6			30.6	338.0	1.9		3,380	15.23
B-89	4,306		430.6			30.6	400.0	1.7		4,000	18.02
B-90	17,687		1,768.7			30.6	1,738.1	0.8		17,381	78.29
B-91	2,069		206.9			30.6	176.3	2.8		1,763	7.94
B-92	4,760		476.0			30.6	445.4	1.6		4,454	20.06
B-93	1,625		162.5			30.6	131.9	3.3		1,319	5.94
B-94	1,889		188.9			30.6	158.3	3.0		1,583	7.13
B-95	1,144		114.4			30.6	83.8	4.5		838	3.77
B-96	2,194		219.4			30.6	188.8	2.6		1,888	8.50
B-97	1,105		110.5			30.6	79.9	4.7		799	3.60
B-98	680		68.0			30.6	37.4	8.4		374	1.68
B-99	801		80.1			30.6	49.5	6.7		495	2.23
B-100	967		96.7			30.6	66.1	5.4		661	2.98

Note: 1. <MDA = less than minimum detectable activity = $<4.66((BG.CT)^{1/2}/BG.Time)$

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
1. Initial Survey, Jan.5 &18, 1991 - Data (Cont.)

CONTAMINATION SURVEY - SMH (US), JANUARY 5, 1991. WHEATLAND AVENUE BUILDING (CONTINUED)

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm2
C-1	457	10	45.7	306	10	30.6	15.1	18.3	0.10	151	0.68
C-2	1,196		119.6			30.6	89.0	4.4		890	4.01
C-3	884		88.4			30.6	57.8	6.0		578	2.60
C-4	3,566		356.8			30.6	326.2	1.9		3,262	14.69
C-5	786		78.6			30.6	48.0	6.9		480	2.16
C-6	486		48.6			30.6	18.0	15.6		180	0.81
C-7	791		79.1			30.6	48.5	6.8		485	2.18
C-8	436		43.6			30.6	13.0	21.0		130	0.59
C-9	1,057		105.7			30.6	75.1	4.9		751	3.38
C-10	656		65.6			30.6	35.0	8.9		350	1.58
C-11	521		52.1			30.6	21.5	13.4		215	0.97
C-12	397		39.7			30.6	9.1	29.1		91	0.41
C-13	428		42.8			30.6	12.2	22.2		122	0.55
C-14	707		70.7			30.6	40.1	7.9		401	1.81
C-15	1,233		123.3			30.6	92.7	4.2		927	4.18
C-16	722		72.2			30.6	41.6	7.7		416	1.87
C-17	820		82.0			30.6	51.4	6.5		514	2.32
C-18	334		33.4			30.6	2.8	90.4		<MDA¹	<MDA¹
C-19	433		43.3			30.6	12.7	21.4		127	0.57
C-20	414		41.4			30.6	10.8	24.8		108	0.49
C-21	402		40.2			30.6	9.6	27.7		96	0.43
C-22	690		69.0			30.6	38.4	8.2		384	1.73
C-23	564		56.4			30.6	25.8	11.4		258	1.16

Note: 1. <MDA = less than minimum detectable activity = $(4.66((BG.CT)^{1/2}/BG.Time)$

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
1. Initial Survey, Jan.5 &18, 1991 - Data (Cont.)

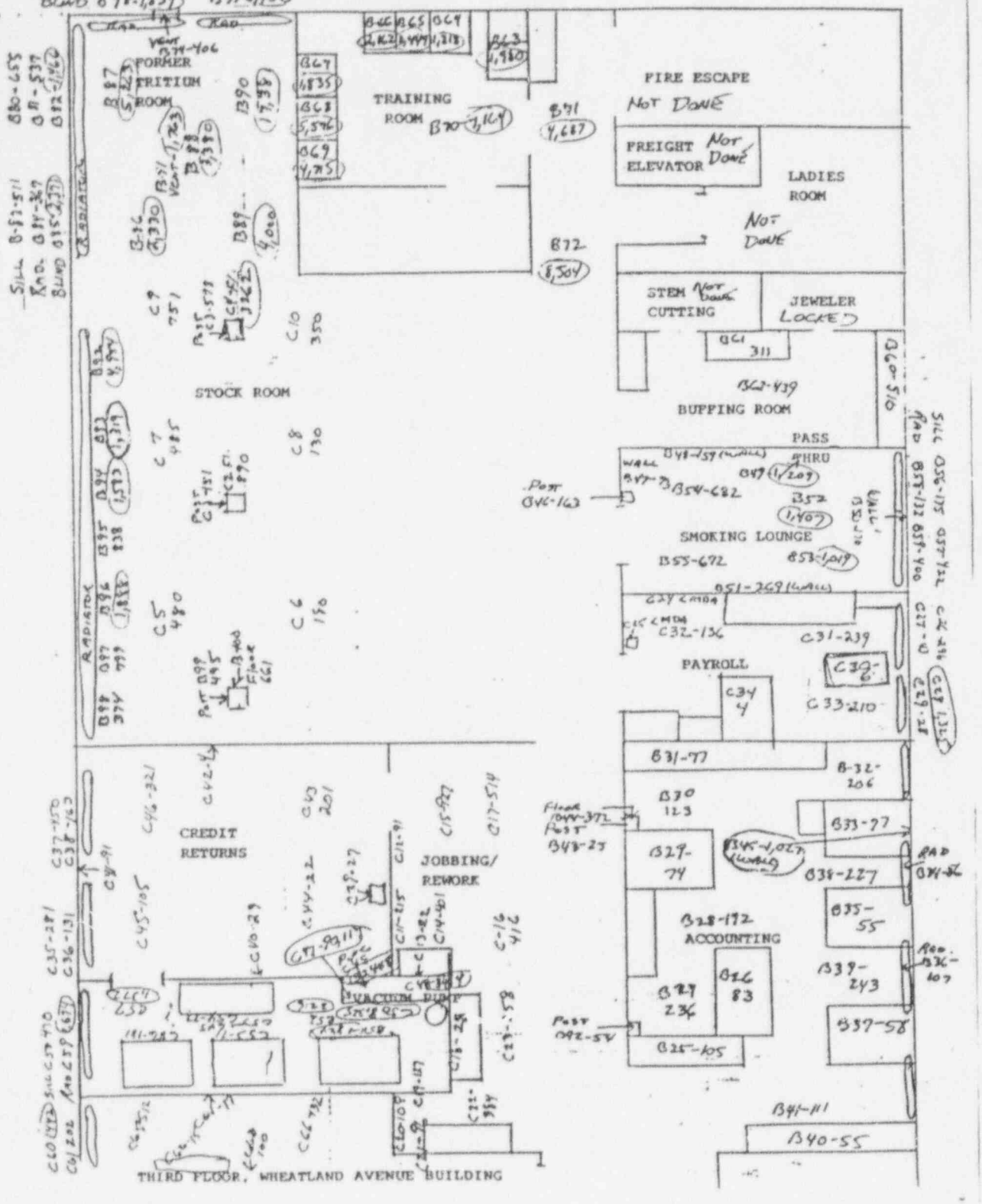
CONTAMINATION SURVEY - SMH (US), JANUARY 18, 1991. WHEATLAND AVENUE BUILDING

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100CM²	10^{-6} uCi/cm²
C-24	288	10	28.8	297	10	29.7	-0.9	-269	0.10	<MDA[1]	<MDA[1]
C-25	296		29.6			29.7	-0.1	-2435		<MDA	<MDA
C-26	593		59.3			29.7	29.6	10.1		296	1.33
C-27	340		34.0			29.7	4.3	58.7		<MDA	<MDA
C-28	1,622		162.2			29.7	132.5	3.3		1,325	5.97
C-29	325		32.5			29.7	2.8	89.1		<MDA	<MDA
C-30	303		30.3			29.7	0.6	408		<MDA	<MDA
C-31	536		53.6			29.7	23.9	12.1		239	1.08
C-32	433		43.3			29.7	13.6	19.9		136	0.61
C-33	507		50.7			29.7	21.0	13.5		210	0.95
C-34	301		30.1			29.7	0.4	611		<MDA	<MDA
C-35	578		57.8			29.7	28.1	10.5		281	1.27
C-36	428		42.8			29.7	13.1	20.6		131	0.59
C-37	747		74.7			29.7	45.0	7.2		450	2.03
C-38	460		46.0			29.7	16.3	16.9		163	0.73
C-39	324		32.4			29.7	2.7	92.3		<MDA	<MDA
C-40	326		32.6			29.7	2.9	86.1		<MDA	<MDA
C-41	388		38.8			29.7	9.1	28.8		91	0.41
C-42	301		30.1			29.7	0.4	611		<MDA	<MDA
C-43	498		49.8			29.7	20.1	14.0		201	0.91
C-44	319		31.9			29.7	2.2	113		<MDA	<MDA
C-45	402		40.2			29.7	10.5	25.2		105	0.47
C-46	618		61.8			29.7	32.1	9.4		321	1.45
C-47	90,414		9,041.4			29.7	9,011.7	0.3		90,117	405.93
C-48	8,411		841.1			29.7	841.4	1.1		8,414	37.90
C-49	132,743		13,274.5			29.7	13,244.8	0.3		132,448	596.61
C-50	8,622		862.2			29.7	832.5	1.1		8,325	37.50
C-51	2,121		212.1			29.7	182.4	2.7		1,824	8.22
C-52	2,513		251.3			29.7	221.6	2.4		2,216	9.98
C-53	368		36.8			29.7	7.1	36.3		<MDA	<MDA
C-54	374		37.4			29.7	7.7	33.6		<MDA	<MDA
C-55	942		94.2			29.7	64.5	5.5		645	2.91
C-56	478		47.8			29.7	18.1	15.4		181	0.82
C-57	4,669		466.9			29.7	437.2	1.6		4,372	19.69
C-58	767		76.7			29.7	47.0	6.9		470	2.12
C-59	1,971		197.1			29.7	167.4	2.8		1,674	7.54
C-60	1,739		173.9			29.7	144.2	3.1		1,442	6.50
C-61	499		49.9			29.7	20.2	14.0		202	0.91
C-62	312		31.2			29.7	1.5	164		<MDA	<MDA
C-63	397		39.7			29.7	10.0	26.3		100	0.45
C-64	314		31.4			29.7	1.7	145		<MDA	<MDA
C-65	809		80.9			29.7	51.2	6.5		512	2.31
C-66	429		42.9			29.7	13.2	20.4		132	0.59
C-67	469		46.9			29.7	17.2	16.1		172	0.77

Note: 1. <MDA = less than minimum detectable activity = $<4.66[(BG.CT)^{1/2}/BG.Time)$

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

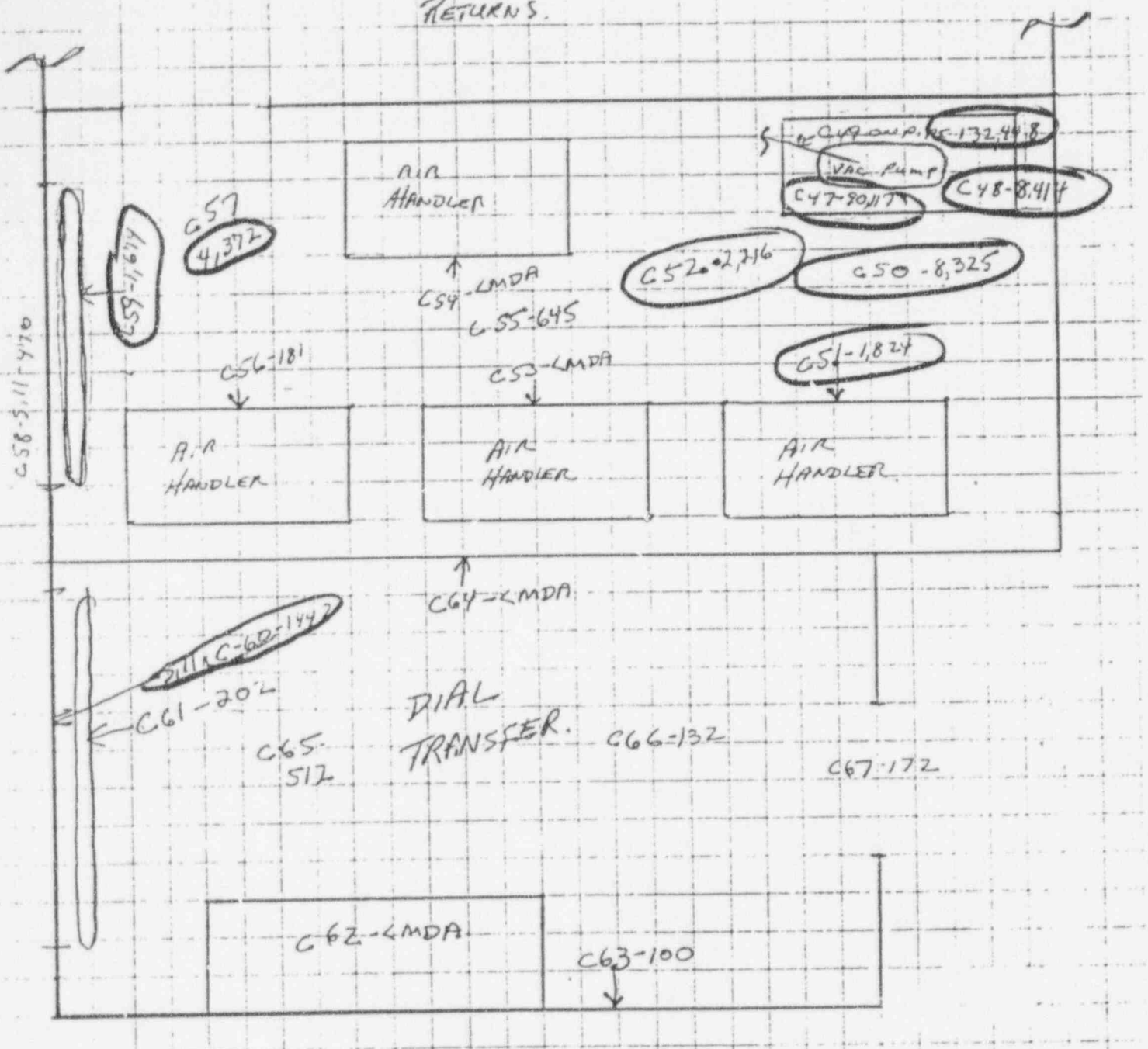
1. Initial Survey, Jan 5 & 18, 1991. Plot except utility room and dial transfer.



Results in DPM per 100 square centimeters

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

1. Initial Survey, Jan5 & 18, 1991. Plot - utility room & dial transfer.



Results in DPM per 100 square centimeters

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
2. Followup Survey, Feb.21, 1991 - Data

CONTAMINATION SURVEY - SMH (US), FEBRUARY 21, 1991. 941 Wheatland Avenue

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
D-36	816	10	81.6	240	10	24.0	57.6	5.6	0.43	134	0.60
D-37	843		84.3			24.0	60.3	5.5		140	0.63
D-38	1,873		187.3			24.0	163.3	2.8		380	1.71
D-39	955		95.5			24.0	71.5	4.8		166	0.75
D-40	592		59.2			24.0	35.2	8.2		82	0.37
D-41	424		42.4			24.0	18.4	14.0		43	0.19
D-42	441		44.1			24.0	20.1	13.0		47	0.21
D-43	635		63.5			24.0	39.5	7.5		92	0.41
D-44	1,135		113.5			24.0	89.5	4.1		208	0.94
D-45	915		91.5			24.0	67.5	5.0		157	0.71
D-46	467		46.7			24.0	22.7	11.7		53	0.24
D-47	1,410		141.0			24.0	117.0	3.5		272	1.23
D-48	1,479		147.9			24.0	123.9	3.4		288	1.30
D-49	1,966		196.6			24.0	172.6	2.7		401	1.81
D-50	1,192		119.2			24.0	95.2	4.0		221	1.00
D-51	1,739		173.9			24.0	149.9	3.0		349	1.57
D-52	3,801		380.1			24.0	356.1	1.8		828	3.73
D-53	1,032		103.2			24.0	79.2	4.5		184	0.83
D-54	2,540		254.0			24.0	230.0	2.3		535	2.41
D-55	1,350		135.0			24.0	111.0	3.6		258	1.16
D-56	459		45.9			24.0	21.9	12.1		51	0.23
D-57	560		56.0			24.0	32.0	8.8		74	0.34
D-58	399		39.9			24.0	15.9	15.9		37	0.17
D-59	1,693		169.3			24.0	145.3	3.0		338	1.52
D-60	570		57.0			24.0	33.0	8.6		77	0.35
D-61	340		34.0			24.0	10.0	24.1		23	0.10
D-62	522		52.2			24.0	28.2	9.8		66	0.30
D-63	930		93.0			24.0	69.0	5.0		160	0.72
D-64	532		53.2			24.0	29.2	9.6		68	0.31
D-65	345		34.5			24.0	10.5	23.0		24	0.11
D-66	7,182		718.2			24.0	694.2	1.2		1,614	7.27
D-67	3,030		303.0			24.0	279.0	2.0		649	2.92
D-68	2,922		292.2			24.0	268.2	2.1		624	2.81
D-69	4,127		412.7			24.0	388.7	1.7		904	4.07
D-70	5,677		567.7			24.0	543.7	1.4		1,264	5.70
D-71	10,652		1,065.2			24.0	1,041.2	1.0		2,421	10.91
D-72	656		65.6			24.0	41.6	7.2		97	0.44
D-73	863		86.3			24.0	62.3	5.3		145	0.65
D-74	1,600		160.0			24.0	136.0	3.2		316	1.42
D-75	3,164		316.4			24.0	292.4	2.0		680	3.06
D-76	1,336		133.6			24.0	109.6	3.6		255	1.15
D-77	3,363		336.3			24.0	312.3	1.9		726	3.27
D-78	3,107		310.7			24.0	286.7	2.0		667	3.00
D-79	37,604		3,760.4			24.0	3,736.4	0.5		8,689	39.14
D-80	3,618		361.8			24.0	337.8	1.8		786	3.54
D-81	9,973		997.3			24.0	973.3	1.0		2,263	10.20

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
2. Followup Survey, Feb.21, 1991 - Data (Cont.)

CONTAMINATION SURVEY - SMH (US), FEBRUARY 21, 1991. 941 Wheatland Avenue (Cont.)

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM² 10⁻⁶ uCi/cm²	
D-82	4,072	10	407.2	240	10	24.0	383.2	1.7	0.43	891	4.01
D-83	425		42.5			24.0	18.5	13.9		43	0.19
D-84	497		49.7			24.0	25.7	10.6		60	0.27
D-85	728		72.8			24.0	48.3	6.4		113	0.51
D-86	339		33.9			24.0	9.9	24.3		23	0.10
D-87	456		45.6			24.0	21.6	12.2		50	0.23
D-88	837		83.7			24.0	59.7	5.5		139	0.63
D-89	238		23.8			24.0	-0.2	-1093		-0	-0.00
D-90	2,403		240.3			24.0	216.3	2.4		503	2.27
D-91	1,443		144.3			24.0	120.3	3.4		280	1.26
D-92	1,044		104.4			24.0	80.4	4.5		187	0.84
D-93	996		99.6			24.0	75.6	4.6		176	0.79
D-94	946		94.6			24.0	70.6	4.9		164	0.74
D-95	2,886		288.6			24.0	264.6	2.1		615	2.77
D-96	3,970		397.0			24.0	373.0	1.7		867	3.91
D-97	3,025		302.5			24.0	278.5	2.0		648	2.92
D-98	401		40.1			24.0	16.1	15.7		37	0.17
D-99	399		39.9			24.0	15.9	15.9		37	0.17
D-100	3,745		374.5			24.0	350.5	1.8		815	3.67
E-1	3,253		325.3			24.0	301.3	2.0		701	3.16
E-2	582		58.2			24.0	34.2	8.4		80	0.36
E-3	444		44.4			24.0	20.4	12.8		47	0.21
E-4	2,599		259.9			24.0	235.9	2.3		549	2.47
E-5	14,181		1,418.1			24.0	1,394.1	0.9		3,242	14.60
E-6	22,323		2,232.3			24.0	2,208.3	0.7		5,136	23.13
E-7	374		37.4			24.0	13.4	18.5		31	0.14
E-8	12,586		1,258.6			24.0	1,234.6	0.9		2,871	12.93
E-9	7,717		771.7			24.0	747.7	1.2		1,739	7.83
E-10	13,296		1,329.6			24.0	1,305.6	0.9		3,036	13.68
E-11	691		69.1			24.0	45.1	6.8		105	0.47
E-12	441		44.1			24.0	20.1	13.0		47	0.21
E-13	6,737		673.7			24.0	649.7	1.3		1,511	6.81
E-14	842		84.2			24.0	60.2	5.3		140	0.63
E-15	927		92.7			24.0	68.7	5.0		160	0.72
E-16	720		72.0			24.0	48.0	6.5		112	0.50
E-17	6,462		646.2			24.0	622.2	1.3		1,447	6.52
E-18	7,771		777.1			24.0	753.1	1.2		1,751	7.89
E-19	291		29.1			24.0	5.1	45.2		12	0.05
E-20	1,505		150.5			24.0	126.5	3.3		294	1.33
E-21	1,098		109.8			24.0	85.8	4.3		200	0.90
E-22	1,034		103.4			24.0	79.4	4.5		185	0.83
E-23	712		71.2			24.0	47.2	6.5		110	0.49
E-24	1,324		132.4			24.0	108.4	3.6		252	1.14
E-25	1,283		128.3			24.0	104.3	3.7		243	1.09
E-26	476		47.6			24.0	23.6	11.3		55	0.25

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
2. Followup Survey, Feb.21, 1991 - Data (Cont.)

CONTAMINATION SURVEY - SMH (US), FEBRUARY 21, 1991. 941 Wheatland Avenue (Cont.)

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
E-27	657		65.7			24.0	41.7	7.2	.43	97	0.44
E-28	293		29.3			24.0	5.3	43.6		12	0.06
E-29	370		37.0			24.0	13.0	19.0		30	0.14
E-30	2,224		222.4			24.0	198.4	2.5		461	2.08
E-31	7,867		786.7			24.0	762.7	1.2		1,774	7.99
E-32	1,854		185.4			24.0	161.4	2.8		375	1.69
E-33	15,595		1,559.5			24.0	1,535.5	0.8		3,571	16.09

Smear taken inside inlet pipe (0.75" copper) to vacuum line.

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM	uCi/cm
E-34	1,344,096		134,409.6			24.0	134,385	0.1	0.43	312,525	0.14

271 ft. tube removed --> 8260 cm -->1.2 mCi total

0.000041

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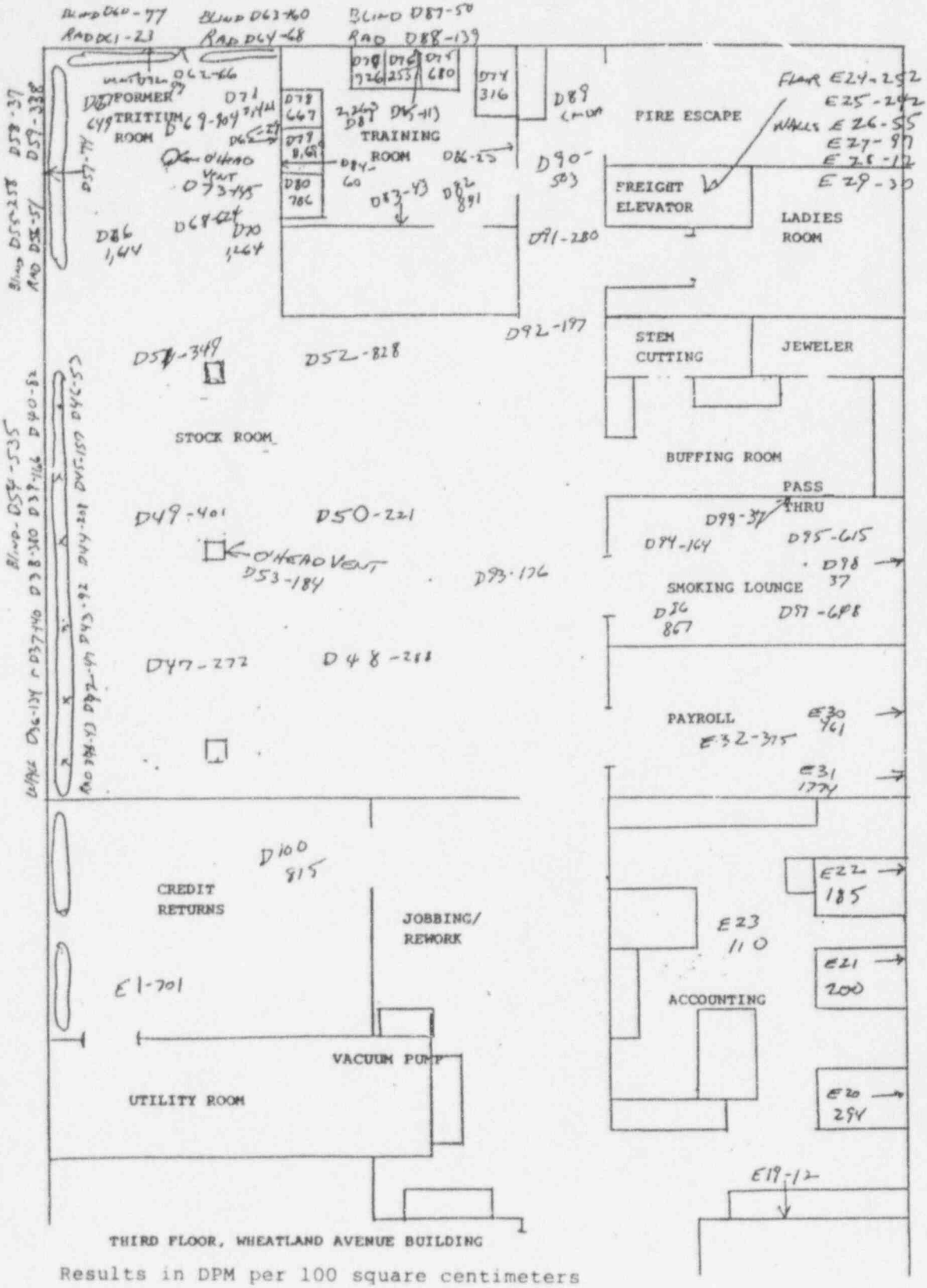
APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

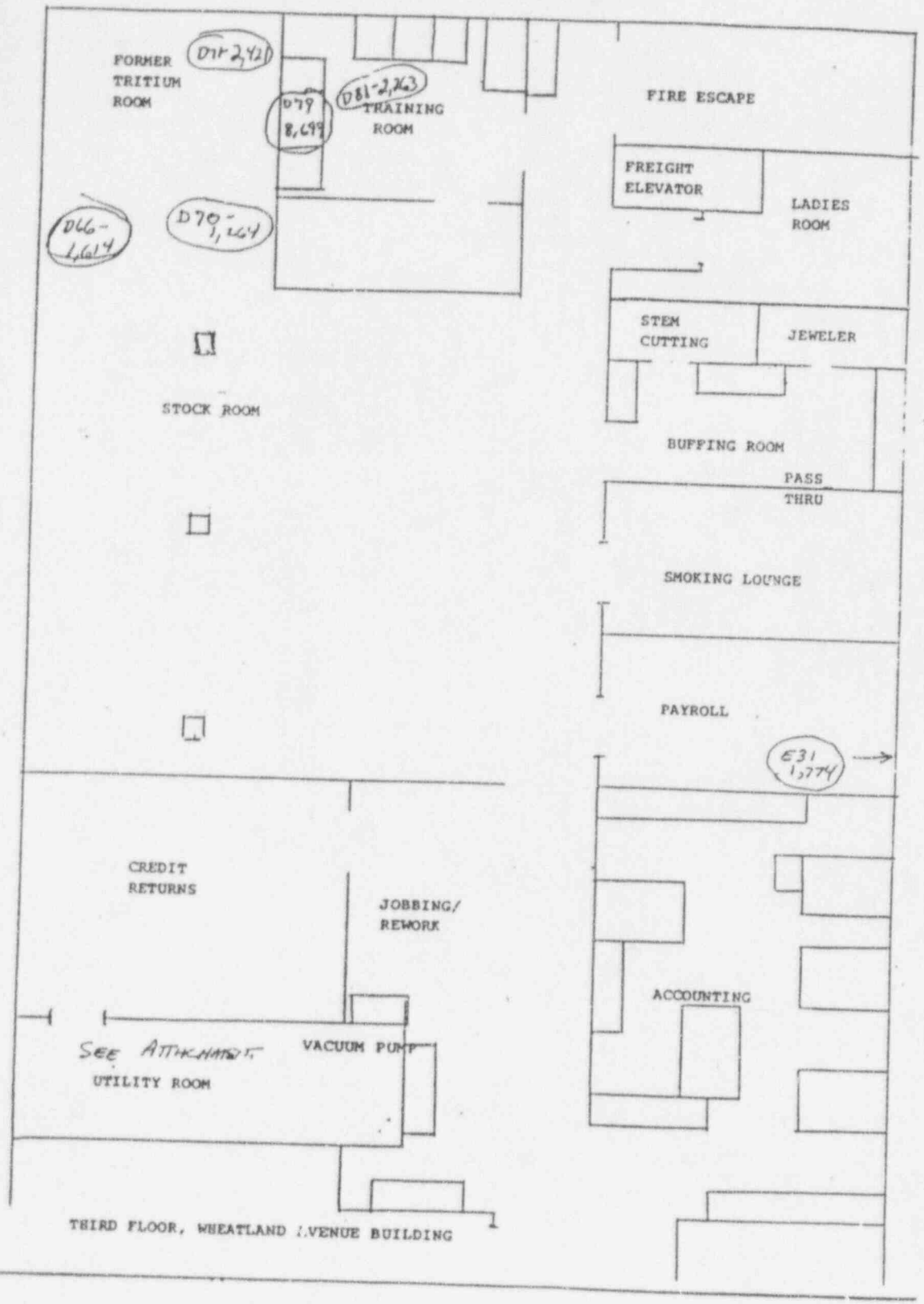
2. Followup Survey, February 21, 1991. Plot- all data except utility room



Results in DPM per 100 square centimeters

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

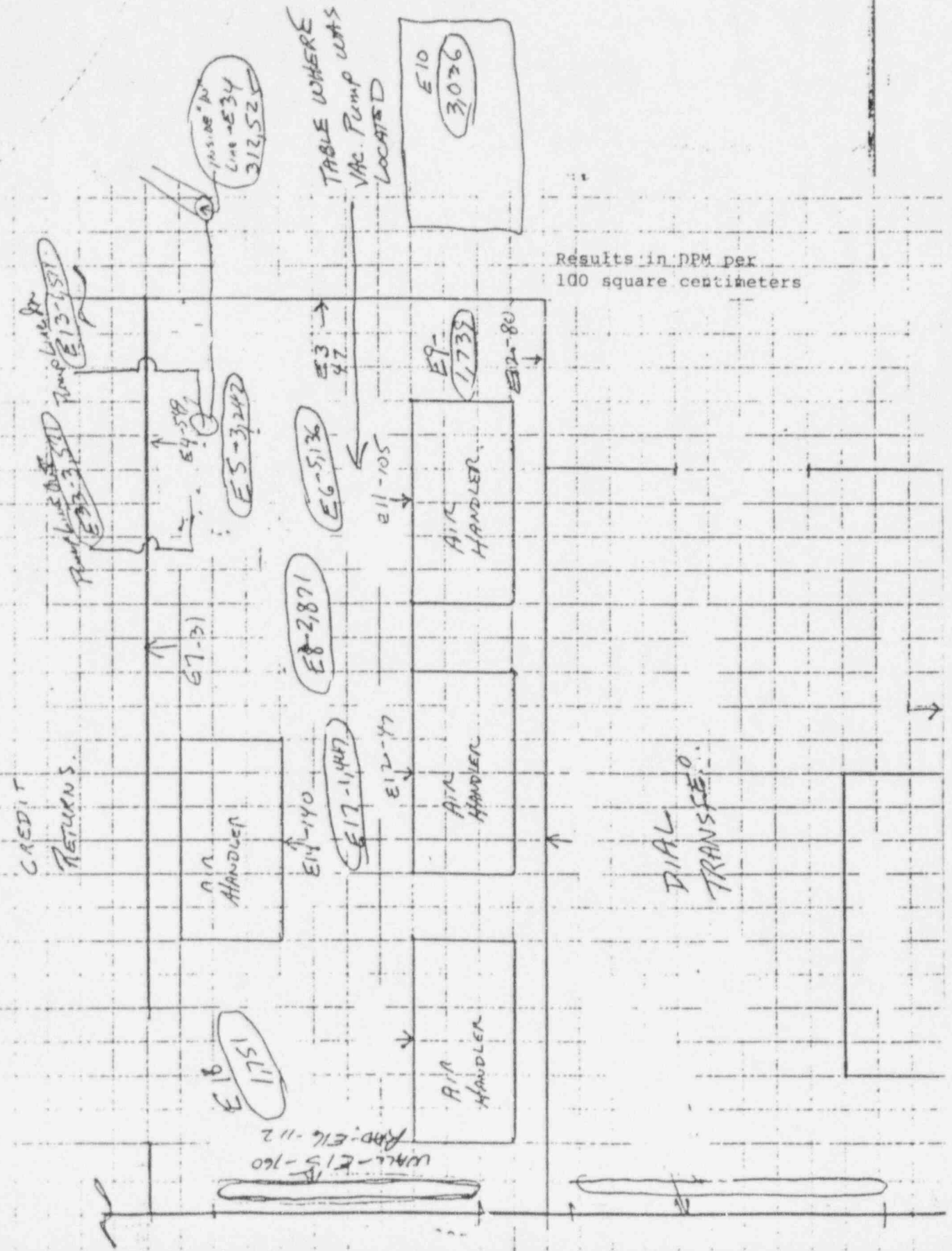
2. Followup Survey, February 21, 1991. Plot- Data >1,000 dpm/100 cm2.



Results in DPM per 100 square centimeters

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

2. Followup Survey, February 21, 1991. Plot - Utility Room



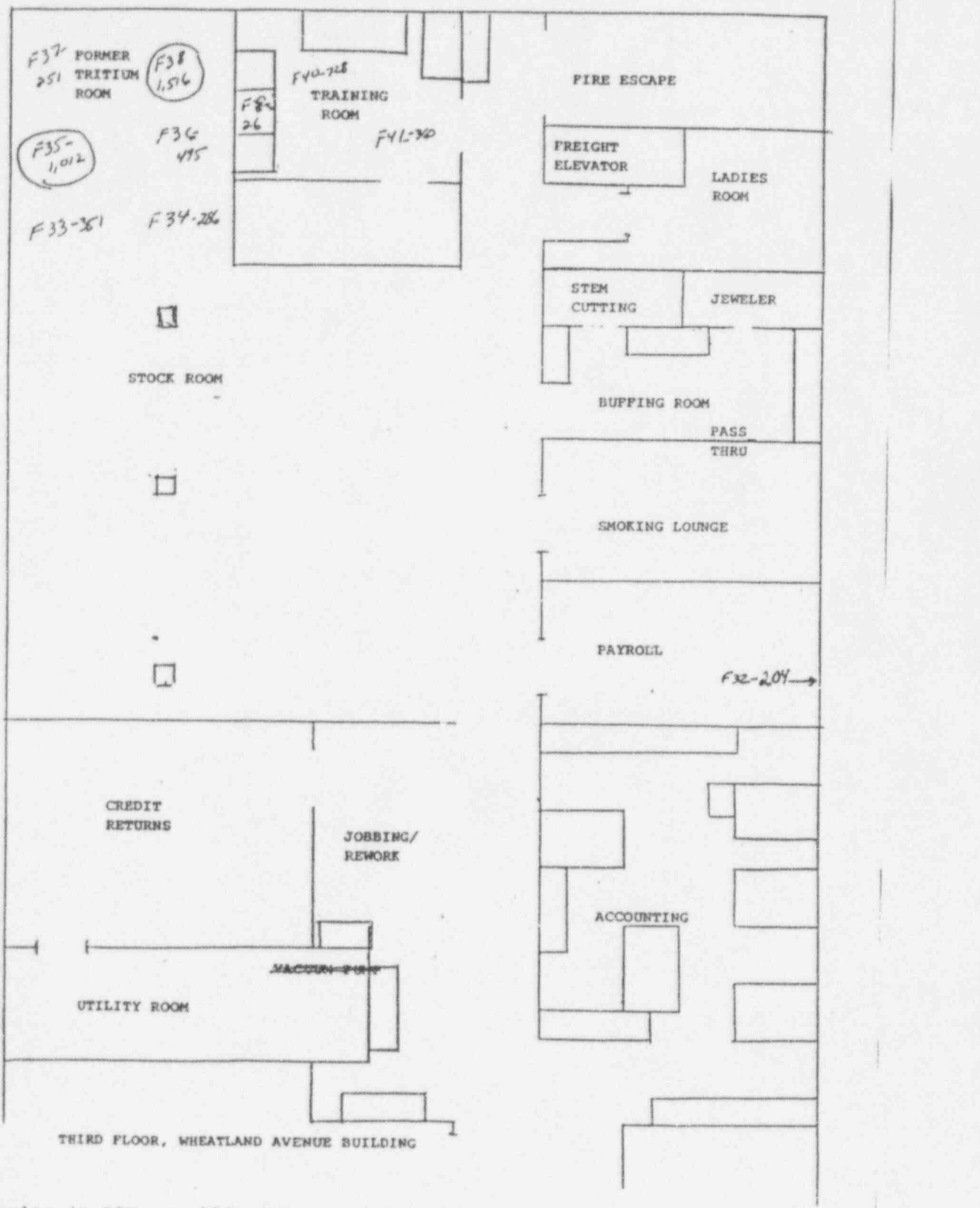
APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor
3. 2nd.Post Decon Survey, Mar.4, 1991 - Data

CONTAMINATION SURVEY - SMH (US), MARCH 4, 1991. 941 Wheatland Avenue

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10⁻⁶ uCi/cm²
F-25	1,334		133.4			29.0	104.4	3.9		243	1.09
F-26	345		34.5			29.0	5.5	45.8		13	0.06
F-27	480		48.0			29.0	19.0	14.6		44	0.20
F-28	1,077		107.7			29.0	78.7	4.7		183	0.82
F-29	436		43.6			29.0	14.6	18.5		34	0.15
F-30	434		43.4			29.0	14.4	18.7		33	0.15
F-31	291		29.1			29.0	0.1	2,410		0	0.00
F-32	1,166		116.6			29.0	87.6	4.4		204	0.92
F-33	1,800		180.0			29.0	151.0	3.0		351	1.58
F-34	1,950		195.0			29.0	166.0	2.9		386	1.74
F-35	4,640		464.0			29.0	435.0	1.6		1,012	4.56
F-36	2,417		241.7			29.0	212.7	2.4		495	2.23
F-37	1,371		137.1			29.0	108.1	3.8		251	1.13
F-38	6,810		681.0			29.0	652.0	1.3		1,516	6.83
F-39	400		40.0			29.0	11.0	23.9		26	0.12
F-40	3,422		342.2			29.0	313.2	1.9		728	3.28
F-41	1,838		183.8			29.0	154.8	3.0		360	1.62

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

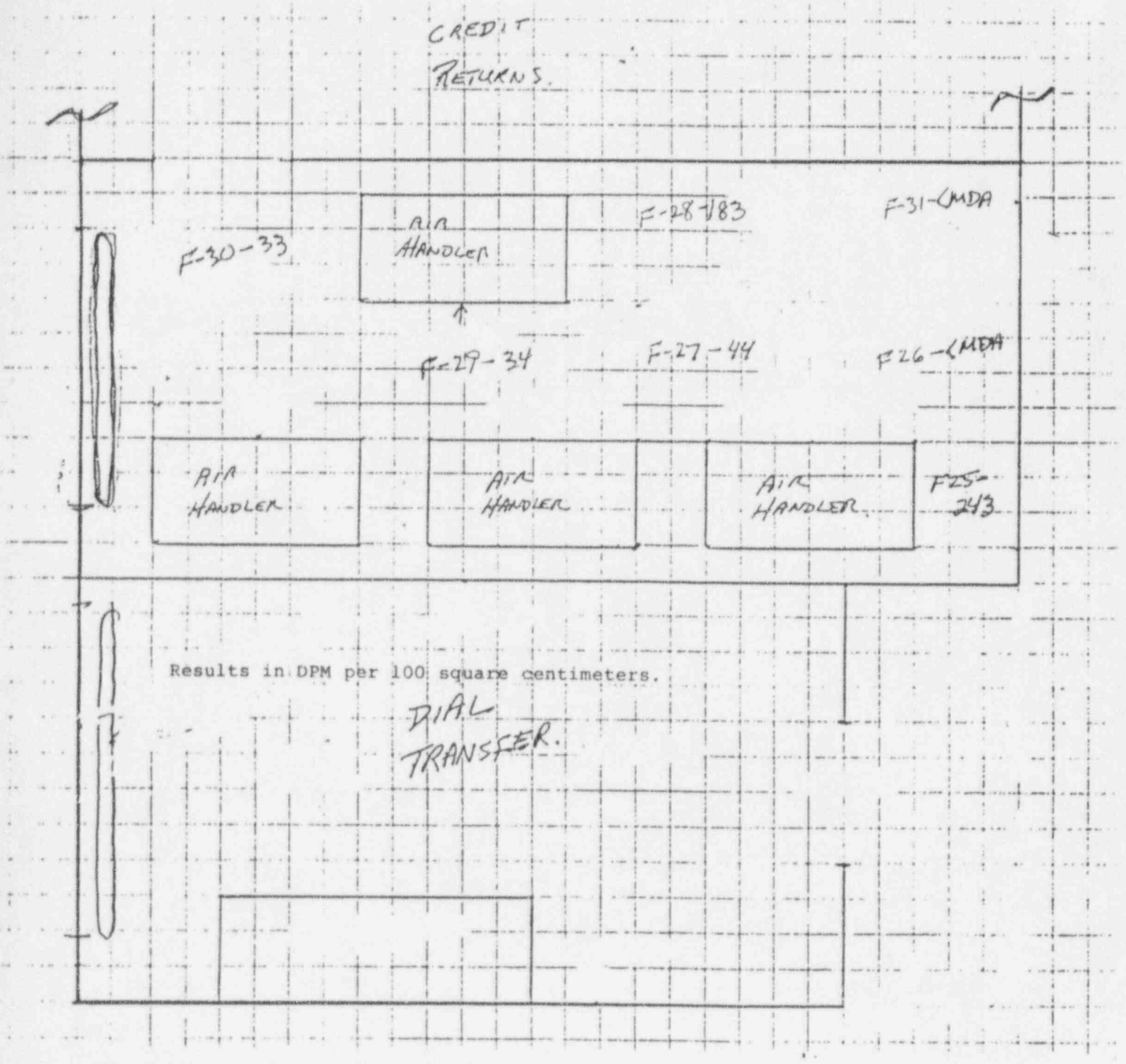
3. Post 2nd. Decontamination, Mar.4, 1991 - Plot (except utility room)



Results in DPM per 100 square centimeters

APPENDIX G. SURVEY RESULTS - 941 Wheatland Avenue, Third Floor

3. Post 2nd. Decon., Mar.4, 1991 - Plot, Utility Room



APPENDIX H. SURVEY RESULTS - 941 Wheatland Avenue - SWTC
1. Spot Survey, Feb.5, 1991. - Data

CONTAMINATION SURVEY - SMH (US) FEBRUARY 5, 1991. 941 WHEATLAND AVENUE[1]

SMEAR	GR.COUNT	CT.TIME	GCPM	BG.COUNT	BG.TIME	BG.CPM	NET CPM	S.D.%	EFFIC.	DPM/100 CM²	10^{-6} uCi/cm²
D-28	416	10	41.6	401	10	40.1	1.6	184	0.41	<MDA[2]	<MDA[2]
D-30	6,368		636.8			40.1	596.8	1.4		1,455	6.56
D-31	11,154		1,115.4			40.1	1,075.4	1.0		2,623	11.81
D-32	472		47.2			40.1	7.2	41.3		<MDA	<MDA
D-33	401		40.1			40.1	0.1	5662		<MDA	<MDA
D-34	2,722		272.2			40.1	232.2	2.4		566	2.55
D-35	3,953		395.3			40.1	355.3	1.9		866	3.90

Note: 1. Incomplete survey to spot check areas in SWTC and related areas found to be contaminated in 12/88 survey. Coverage of SWTC <<10%.
2. <MDA = less than minimum detectable activity = <4.66((BG.CT)$^{1/2}$/BG.Time)

Smear locations as follows:

D-28 Work station in basement where watch exchange in handled.
D-29 Blank
D-30 Sayda bench in main SWTC work area.
D-31 R. Book bench " " " " "
D-32 Opening table - receiving area
D-33 Boxes full of old watches for exchange - basement.
D-34 Work bench in quick repair.
D-35 Al Roger's bench in main SWTC work area.

One paper smear numbered D-70 was also taken at the same location as D-35 and counted for alpha contamination using a AB-WT smear counting head on a Pylon AB-5 counter. The result was below detection limits (<MDA).

APPENDIX B

U.S. NUCLEAR REGULATORY COMMISSION
GUIDELINES FOR SURFACE CONTAMINATION

NUREG/CR-1754

Technology, Safety and Costs of Decommissioning Reference Non-Fuel-Cycle Nuclear Facilities

Prepared by E. S. Murphy

Pacific Northwest Laboratory
Operated by
Battelle Memorial Institute

Prepared for
U.S. Nuclear Regulatory
Commission

and restoration of the site by backfilling and planting vegetation after waste removal is completed. A final radiation survey to verify that the radioactivity remaining on the site is less than release limits is performed prior to release of a site for unrestricted use. Decommissioning is assumed to be performed by a contractor hired by the owner or operator of the site.

Decommissioning costs include the costs of staff labor, equipment, supplies, soil sample analyses, waste management, and a contractor's fee. Total costs shown in Table 2.8-1 are the sum of planning and preparation, actual decommissioning, and termination survey costs. All costs are expressed in early 1978 dollars and include a 25% contingency. Approximately 75% of the cost of decommissioning a site with a contaminated ground surface, and approximately 90% of the cost of the removal option for decommissioning a tailings pile is related to waste management (i.e, the packaging, transportation, and disposal of soil and waste exhumed from the sites).

Occupational radiation doses are estimated on the basis of an assumed average dose rate of 0.1 mrem/hr to decommissioning workers. This exposure level was estimated on the basis of experience at tailings sites and low-level waste burial grounds and chosen conservatively.

2.9 ACCEPTABLE CONTAMINATION LEVELS FOR UNRESTRICTED RELEASE OF NON-FUEL-CYCLE NUCLEAR FACILITIES

Two documents recognized by regulatory agencies and the nuclear industry as providing guidance on acceptable levels of radioactive surface contamination for the release of facilities for unrestricted use are the present NRC guidelines for decontamination of facilities and equipment prior to release for unrestricted use[1] and the draft ANSI standard on residual surface contamination.[2] Table 2.9-1 shows a comparison of published guidelines on acceptable surface contamination levels for unrestricted release, with values calculated on an assumed radiation dose limit basis of 5 mrem/year to an individual who works for 2000 hr/yr in a room that is uniformly contaminated with residual amounts of individual radioisotopes. The NRC, as part of its reevaluation of decommissioning policy, might put guidance on residual contamination limits in

TABLE 2.9-1. Comparison of Calculated and Published Guidelines for Acceptable Residual Surface Contamination

Isotope	Residual Surface Contamination that Will Result in 5 mrem/year to Exposed Individual[a] dpm/100 cm²		NRC Guidelines[b] on Total Residual Surface Contamination (dpm/100 cm²)	Draft ANSI Standard[c] on Total Residual Surface Contamination (dpm/100 cm²)	Typical Survey Type Detector	Typical Detection Limits (dpm/100 cm²)
^{3}H	950	21 000 000	5 000 (0.2 mrad/hr)[d]	5 000	[f]	
^{14}C	80	1 800 000	5 000 (0.2 mrad/hr)[d]	5 000		
^{125}I	0.25	5 500	100	Nondetectable[e]	Thin window G-M probe or thin plastic scintillator with count rate meter	5 000
					NaI(Tl) scintillator with count rate meter	1 000
^{147}Pm	0.28	6 200	5 000 (0.2 mrad/hr)[d]	5 000		
					NaI(Tl) scintillator or G-M probe with count rate meter	1 000
^{241}Am	0.00008	0.4	100	Nondetectable[e]		
					Zn(S) scintillator or gas flow proportional counter with count rate meter	100

(a) The estimated residual radioactive contamination that will result in a maximum annual dose of 5 mrem to a critical organ. The scenario for exposure involves an individual working for 40 hr/wk, 50 wk/yr in a large room contaminated with individual isotope. A resuspension factor of 5×10^{-6} m^{-1} and a breathing rate of 230 cm^3/sec are assumed. (A resuspension factor of 5×10^{-5} m^{-1} is assumed for iodine.)

(b) Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for B_2 product, Source, or Special Nuclear Material, U.S. Nuclear Regulatory Commission, Washington, DC, November 1976.

(c) Draft American National Standard, Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to be Released for Uncontrolled Use, ANSI N13.12 (Draft), American National Standards Institute, New York, NY, August 1978.

(d) Average radiation limits associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 10 cm, measured through not more than 7 milligrams/cm² of total absorber.

(e) The instrument utilized for this measurement shall be calibrated to measure at least 100 pCi of contamination spread over 100 cm² (i.e., 220 dpm/100 cm²).

(f) Portable counters generally cannot be used to detect tritium because the beta particle energy is too low (E_{max} = 0.018 MeV) to allow the particle to enter the counter window. This is the usual mean of surveying for tritium contamination on surfaces.

the form of an annual dose limit. It is expected that the dose limit, if one is chosen, may be on the order of 5 mrem/year to a realistically exposed individual.[7] The assumptions made to calculate surface contamination levels that result in the 5 mrem/year exposure are detailed in Appendix C.

Results shown in Table 2.9-1 suggest that guidance on residual surface contamination for unrestricted release for some isotopes has been set much lower than surface contamination levels that would result in the modest exposure allowable to a worker in an unconditionally released facility. Provided that contamination at these lower levels can be detected, this is in keeping with the ALARA philosophy of minimizing exposure to ionizing radiation.

In Table 2.9-1, some typical survey-type instruments for detecting surface contamination are listed and representative detection limits are given for comparison with current residual contamination limits. (Information about instruments and techniques for the detection and measurement of surface contamination is given in Appendix C.) For alpha-emitting radioisotopes, pure beta emitters of moderate to high energy, and most beta-gamma emitters, current residual contamination limits appear to have been set at about the limits of detection of typical survey-type instruments. For low-energy beta emitters and for radioisotopes that decay by electron capture and emit only low-energy gamma rays and x-rays, it may be very difficult to measure surface contamination at the limits set by regulatory guidance. The question of establishing residual contamination limits that are meaningful in terms of detection capabilities of commercially available survey instruments is currently receiving detailed investigation under an NRC contract with the Oak Ridge National Laboratory.

2.10 FACILITATION OF DECOMMISSIONING

Factors that would facilitate the decommissioning of non-fuel-cycle nuclear facilities can be categorized as design considerations, operating practices, and research needs. Laboratory design considerations include the careful planning of laboratory facilities to minimize difficult-to-decontaminate situations and the use of construction materials that are easily decontaminable. Operating procedures should be designed to maintain surface contamination at low levels

APPENDIX C

DETAILS OF DECOMMISSIONING OF REFERENCE SITES

This appendix provides details to support the description of the decommissioning of sites presented in Chapter 7. The reference sites include 1) a site with a contaminated underground waste line and hold-up tank, 2) a site with a contaminated ground surface, and 3) a tailings pile/evaporation pond containing uranium and thorium residues. The reference sites are described in Section 7.3 of NUREG/CR-1754.[1]

The decommissioning alternatives for contaminated sites are 1) site stabilization followed by long-term care and 2) removal of the contaminated material to an approved shallow-land burial ground. Details of the technology and costs of these two alternatives are given in another report on the technology, safety, and costs of decommissioning a low-level waste burial ground.[2] For convenience of reference, brief descriptions of several site stabilization options are given in Section G.1 of NUREG/CR-1754.[1]

The following key bases and assumptions are used for estimating manpower requirements and costs:

1. The decommissioning of a site is performed by a contractor hired by the owner/operator of the site. Separate contractors might be hired for the site survey and for the actual decommissioning operations. (In some instances, the owner/operator would perform his own site survey.) The impact on decommissioning costs of utilizing contractors is discussed in Section D.1 of NUREG/CR-1754.[1]

2. To determine the total time required to decommission a radioactively contaminated site, an estimate is made of the time required for efficient performance of the work by a postulated work crew. This time estimate is then increased by 50% to provide for preparation and set-up time, rest [illegible]ds, etc. (ancillary time).

3. All radioactive wastes from the decommissioning of contaminated sites are shipped by truck a distance of 800 km to a shallow-land burial ground.

4. Transportation and waste disposal operations are subcontracted activities. The manpower costs for the transportation and disposal of radioactive material are included in the total costs of these items.

5. Decommissioning includes the backfilling of a site from which wastes have been exhumed and the restoration of the decommissioned site by

grading the site and/or planting grass or other appropriate vegetative cover. Costs of backfilling and site restoration are included in the costs of decommissioning.

6. If a site is to be released for unrestricted public use, the final decommissioning activity is a site survey to verify that residual levels of radioactivity are below unrestricted release limits. Costs of this final radiation survey are included in the estimated costs of decommissioning.

7. All costs are in January 1988 dollars.

For ease in evaluating time and manpower requirements for the decommissioning of sites, each decommissioning alternative is divided into a sequence of tasks or steps. For the site stabilization alternative, the steps are:

- planning and preparation (including initial site survey)
- mobilization/demobilization
- site stabilization
- revegetation.

For the removal alternative, the steps are:

- planning and preparation (including initial site survey)
- mobilization/demobilization
- remove overburden
- exhume and package contaminated material
- transport and dispose of contaminated material at a shallow-land burial ground
- backfill and restore site
- termination site survey.

C.1 DETAILS OF DECOMMISSIONING A CONTAMINATED UNDERGROUND DRAIN LINE

Time and manpower requirements and total costs for the exhumation and disposal of a contaminated drain line, hold-up tank, and soil are presented in this section. The reference site is described in Section 7.3.1 of NUREG/CR-1754.[1] Procedures for decommissioning a drain line and hold-up tank are given in Section G.2.1 of that same document.

Details of estimated time and manpower requirements for removing a contaminated drain line and hold-up tank are presented in Table C.1. The radiological survey that precedes site decommissioning is performed by a work crew consisting of a foreman and two health physics technicians from the site owner's organization. A foreman and an equipment operator are required during excavation of the trench. Exhumation and packaging of a 20-m-long, 0.1-m-diameter drain line, a 1.5-m-diameter, 2-m-high cylindrical hold-up tank, and contaminated soil are performed by a crew that includes a foreman, an equipment operator, a pipefitter, and two technicians. A health physics technician is present during excavation and exhumation operations to make radiological measurements. An equipment operator and a technician backfill and grade the site after exhumation operations are completed. The final site survey is performed by a foreman and two health physics technicians.

Costs details for removing a contaminated drain line and hold-up tank are presented in Table C.2. The total cost of decommissioning the site is estimated to be about $69,200. A contractor's fee is included in the total cost as described in Section 0.1 of NUREG/CR-1754.[1] It is assumed that soil samples are sent to a commercial laboratory for analysis. Waste management costs are based on a requirement for 7 m^3 of plastic-lined plywood boxes to contain the exhumed material and contaminated soil.

Only about 13% of the total decommissioning costs are due to disposal charges, with most of this due to disposal of the hold-up tank. Volume reduction of the hold-up tank via sectioning and supercompaction was not analyzed because of the lack of any significant savings potential.

Unit cost factors for the removal of a contaminated drain line and hold-up tank are given in Table C.3. The cost factors for manpower, equipment, and materials are given in $/$m^3$ (rectangular volume occupied by both the tank and drain line combined). These unit cost factors are also a function of the depth at which the drain line is buried, hence the H term. The soil analysis cost factor is given in $/m (linear length) of the drain line while the package, transportation, and disposal cost factors are given in $/$m^3$ of waste volume. The waste volume unit factor is given in m^3 of waste volume generated per rectangular volume of the tank and drain line combined.

TABLE C.1. Details of Estimated Time and Manpower Requirements for the Removal of a Contaminated Drain Line and Hold-Up Tank

Operator	Time (Days)[a]	Worker Man-Days						Total Man-days	Manpower Costs ($ thousands)[c,d]
		Supervisor[b]	Foreman	Equipment Operator	Craftsman	Health Physics Technician	Technician		
Planning and Preparation	5	5	5	--	--	4	--	14	3.51
Mobilization/ Demobilization	2	1	2	2	--	--	2	7	2.04
Remove Overburden	1.5	0.75	1.5	1.5	--	1.5	--	5.25	1.42
Exhume and Package Drain Line	3	1.5	3	3	3	3	6	19.5	5.01
Exhume and Package Hold Up Tank	2.5	1.25	2.5	2.5	2.5	2.5	5	16.25	4.17
Backfill and Restore Site	1	0.5	--	1	--	--	1	2.5	0.72
Final Site Survey	2	1	2	--	--	4	--	7	1.44
Totals	17	11	16	10	5.5	15	14	71.5	18.31

(a) 50% ancillary time is included in estimate.
(b) Charged half-time to project.
(c) Costs are in January 1988 dollars. Number of cost figures shown is for computational accuracy only.
(d) 25% contingency not included.

TABLE C.2. Cost Details for the Removal of a Contaminated Drain Line and Hold-up Tank

Cost Item	Cost ($ thousands)(a)
Manpower	18.31
Equipment	16.50
Materials	2.82
Soil Analyses	6.40
Contractor's Fee(b)	3.07
Waste Management	
Packaging	0.70
Transportation	0.32
Disposal	7.32
Subtotal	55.44
25% Contingency	13.86
Total	69.3

(a) Costs are in January 1988 dollars. Number of figures shown is for computational accuracy only.

(b) Based on 8% of the sum of contractor's charges for manpower, equipment, materials, and packaging.

TABLE C.3. Estimated Unit Factors for Removal of a Contaminated Drain Line and Hold-Up Tank[a]

Cost Item	Unit Factor[a]
Manpower ($K/m^3 of tank and pipe)	3.23 + 0.29H
Equipment ($K/m^3 of tank and pipe)	2.90 + 0.26H
Materials ($K/m^3 of tank and pipe)	0.50 + 0.05H
Soil Analysis ($K/m of pipe length)	0.32
Waste Volume ($m^3 waste/$m^3 of tank and pipe)	1.40
Packaging ($K/m^3 waste)	0.10
Transportation ($K/m^3 waste)	0.05
Disposal ($K/m^3 waste)	1.05

(a) Costs are in January 1988 dollars.
(b) H is the depth at which the drain line is buried.

C.2 DETAILS OF DECOMMISSIONING A CONTAMINATED GROUND SURFACE

Time and manpower requirements and total costs for the removal of contaminated soil from a reference site are evaluated in this section. The reference site is described in Section 7.3.2 of NUREG/CR-1754.[1] It is assumed to be contaminated with radioactive residue from uranium processing operations that was trucked to the site from another location, dumped on the site, and used as fill material. Procedures for removing contaminated ground surface are given in Section G.3.1 of NUREG/CR-1754.[1]

Details of estimated time and manpower requirements for removing a contaminated ground surface are presented in Table C.4. Radiological surveys are performed by a work crew consisting of a foreman and three health physics technicians from the site owner's organization. The contractor's work crew for removal of approximately 1000 m^2 of contaminated soil includes a foreman, two equipment operators, and two laborers. This crew is assisted by a health physics technician. Backfilling and grading of the site (after soil removal operations are completed) is accomplished by a work crew that includes a foreman, two equipment operators, and a laborer.

Cost details for removing a contaminated ground surface are presented in Table C.5. The total cost of decommissioning the site is estimated to be about $1,329,000.

Approximately 7% of the total decommissioning cost is related to the initial and final site surveys. More than 70% of the cost of site surveys is associated with the analysis of soil samples. If adequate records exist, or if visual inspection of the site permits an area of contaminated soil to be located with reasonable accuracy, it may be possible to reduce the number of soil samples collected for analysis. For example, if samples are collected from the centers of 20-m by 20-m survey blocks instead of from the 10-m by 10-m blocks used as a basis for the cost estimates of Table C.4, the number of soil samples and the cost of sample analyses would decrease by a factor of 4.

Most of the cost of soil removal (approximately 89% of total) is related to the packaging, transportation, and disposal of the exhumed material. Packaging costs could be substantially reduced if the soil were transported to the shallow-land burial ground in plastic-lined dump trucks instead of being packaged in plywood boxes. Transportation charges are not significantly affected by the type of vehicle used to transport the soil, but are affected by the distance from the contaminated site to the burial ground. Disposal costs are not significantly affected by alternative modes of packaging or transport since these costs are directly proportional to the volume of soil requiring removal.

Disposal costs account for about 73% of the total decommissioning cost. No savings through volume reduction is possible since soil is not compactible or combustible.

Unit cost factors for the removal of contaminated ground surface are given in Table C.6. The cost factors for manpower, equipment, materials, and soil analysis are given in $/m^2$ (area) of the site. The packaging, transportation, and disposal cost factors are given in $/m^3$ of waste volume. The waste volume unit factor is given in m^3 of waste volume generated per area (m^2) of the site.

TABLE C.4. Details of Estimated Time and Manpower Requirements for the Removal of a Contaminated Ground Surface

Operator	Time (Days)[a]	Worker Man Days						Total Man-days	Manpower Costs ($ thousands)[c,d]
		Supervisor[b]	Foreman	Equipment Operator	Health Physics Technician	Truck Driver	Laborer		
Planning and Preparation	20	20	20	--	30	--	--	70	16.36
Mobilization/ Demobilization	2	1	2	4		--	4	11	3.11
Exhume and Package Contaminated Soil	12	6	12	24	12	--	24	78	20.67
Backfill and Restore Site	3	1.5	3	6		8	3	21.5	5.86
Final Site Survey	5	2.5	5	--	12	--	--	22.5	5.44
Totals	42	31	42	34	57	8	31	203	50.44

(a) 50% ancillary time is included in estimates.
(b) Charged half-time to project.
(c) Costs are in January 1988 dollars. Number of cost figures shown is for computational accuracy only.
(d) 25% contingency not included.

TABLE C.5. Cost Details for the Removal of Contaminated Ground Surface

Cost Item	Cost ($ thousands)[a]
Manpower	50.44
Equipment	38.40
Materials	19.20
Soil Analyses	76.80
Contractor's Fee[b]	16.17
Waste Management	
Packaging	94.14
Transportation	102.53
Disposal	1065.90
Subtotal	1463.58
25% Contingency	365.90
Total	1829.5

(a) Costs are in January 1988 dollars. Number of figures shown is for computational accuracy only.

(b) Based on 8% of the sum of contractor's charges for manpower, equipment, materials, and packaging.

TABLE C.6. Estimated Unit Factors for Removal of Contaminated Ground Surface[a]

Cost Item	Unit Factor
Manpower ($K/m^2 of site)	0.005
Equipment ($K/m^2 of site)	0.004
Materials ($K/m^2 of site)	0.002
Soil Analysis ($K/m^2 of site)	0.008
Waste Volume ($m^3 waste/$m^2 site)	0.100
Packaging ($K/m^3 waste)	0.094
Transportation ($K/m^3 waste)	0.103
Disposal ($K/m^3 waste)	1.066

(a) Costs are in January 1988 dollars.

C.3 DETAILS OF DECOMMISSIONING A TAILINGS PILE/EVAPORATION POND

Time and manpower requirements and total costs for decommissioning a tailings pile/evaporation pond by the alternatives of 1) stabilization or 2) removal are evaluated in this section. Annual requirements and costs of long-term care following stabilization are also evaluated.

The tailings pile/evaporation pond is described in Section 7.3.3 of NUREG/CR-1754.[1] It is actually a settling pond that contains the residue from ore refinery operations in which tin slag is processed for the recovery of niobium and tantalum. The residue from these operations contains 0.2 wt% U_3O_8 and 0.5 wt% ThO_2. The pond measures 100 m long by 50 m wide by 5 m deep with a 2.5 to 1 slope on each side. It contains 16,400 m^3 of glassy residue weighing 4.1×10^7 kg.

Procedures for decommissioning the pile/pond by the two alternatives are given in Section 6.4.1 of NUREG/CR-1754.[1]

Details of estimated time and manpower requirements for decommissioning the pile/pond are presented in Table C.7. Cost details are presented in Table C.8.

C.3.1 Site Stabilization Alternative

The asphalt for the hard cover over the tailings pile/evaporation pond is delivered to the site in tanker trucks. It is then transferred to a self-propelled soil stabilizer for application to the surface of the pile/pond. The asphalt is applied at an assumed rate of 50 ℓ/m^2. Two days are required to complete this operation, which is performed by a work crew consisting of a foreman, two equipment operators, and two laborers.

The soil used as backfill over the hard cover is hauled to the site in 10-m^3 dump trucks. Approximately 5,600 m^3 of soil is required. After the soil is in place, it is graded to the specified contours and compacted with a roller. Six days are required to complete this operation, which is performed by a work crew that includes a foreman, two equipment operators, eight truck drivers, and two laborers.

After the soil cover over the pile/pond is compacted and contours are established, the area is planted with grass. Two equipment operators and two laborers perform this operation.

The total cost of site stabilization is estimated to be about $334,000. About half of this cost is for the asphalt and the soil used to establish the cover over the tailings pile.

The total annual cost of long-term care is estimated to be about $11,000. Manpower costs represent almost 60% of this cost.

Unit cost factors for the site stabilization and annual long-term care of a tailings pile are given in Table C.9. All of the cost factors (manpower, equipment, materials, and soil analysis) are given in $/m^2 (area) occupied by the tailings pile.

C.3.2 Removal Alternative

Two work crews, working at opposite ends of the pile/pond, are employed to remove and package the residue from the pile/pond. Each crew includes three equipment operators and three laborers. A foreman supervises the work, and a health physics technician assists the crews. Bulldozers and front-end loaders are used to break up the residue and load it into 1.2-m by 1.2-m by 2.4-m (3.4-m^3) plastic-lined plywood boxes for shipment to the shallow-land burial ground. Approximately 5,700 boxes are required for the 19,000 m^3 of tailings residue and contaminated soil removed from the site. The boxes are shipped by truck to the burial ground. Shipments are weight-limited, and are restricted to four boxes per flat-bed trailer. Therefore, 1442 shipments must be made to decommission the site.

After the contaminated material is removed, soil is brought from off-site in 20-m^3-capacity scraper-haulers to fill the hole. The site is then graded and seeded with grass.

Approximately 114 work days (23 weeks) are required to remove the contaminated material and restore the site.

The total cost of the removal option is estimated to be about $31 million. Most of this cost (approximately 81%) is associated with the disposal of the exhumed material. The waste management cost could be reduced by about $1.6 million if the contaminated material was transported to the shallow-land burial ground in plastic-lined 10-m^3-capacity dump trucks instead of being packaged in plywood boxes. No savings through volume reduction is possible since soil is not compactible or combustible.

Unit cost factors for the removal of a tailings pile are given in Table C.10. The cost factors for manpower, equipment, materials, and soil analysis are given in $/m^3 (volume) of the tailings pile. The packaging, transportation, and disposal cost factors are given in $/m^3 of waste volume. The waste volume unit factor is given in m^3 of waste volume generated per m^3 of tailings pile.

TABLE C.7. Details of Estimated Time and Manpower Requirements for Decommissioning a Tailings Pile/Evaporation Pond

Operation	Time (Days)[a]	Worker Man-Days							Total Man-days	Manpower Cost[b,c,d] ($ thousands)
		Supervisor[b]	Foreman	Equipment Operator	Truck Driver	Health Physics Technician	Laborer	Secretary		
Site Stabilization Option										
Planning and Preparation	20	20	20	--	--	10	--	20	70	15.71
Mobilize/Demobilize	2	1	2	4	--	--	4	--	11	3.11
Placement of Asphalt Layer	2	1	2	4	--	2	4	--	13	3.44
Placement of Soil Cover	6	3	6	12	40	2	12	--	75	19.20
Revegetation	2	1	--	2	--	--	2	--	5	1.43
Totals	32	26	30	22	40	14	22	20	174	42.89
Long Term Care (Annual Values)										
Administration	2	2	--	--	--	--	--	2	4	0.84
Site Maintenance	3	--	3	3	--	--	3	--	9	1.80
Environmental Surveillance	1	--	--	--	--	2	--	--	2	0.33
Vegetation Management	4	--	4	--	--	--	8	--	12	2.22
Totals	10	2	7	3	--	2	11	2	27	5.19
Removal Option										
Planning and Preparation	20	20	20	--	--	10	--	20	70	15.71
Mobilize/Demobilize	4	2	4	24	--	--	24	--	54	14.86
Exhume and Package Tailings	90	45	90	540	--	90	540	--	1,305	349.16
Backfill and Restore Site	20	10	20	40	100	--	40	--	210	54.96
Final Site Survey	5	3	5	--	--	10	--	--	18	3.79
Totals	139	80	139	604	100	110	604	20	1,657	438.48

(a) 50% ancillary time is included in estimates.
(b) Charged half-time to project.
(c) Costs are in January 1988 dollars. Number of cost figures shown is for computational accuracy only.
(d) 25% contingency not included.

TABLE C.8. Cost Details for Decommissioning a Tailings Pile/Evaporation Pond

Cost Item	Cost ($ thousands)(a)		
	Site Stabilization	Long-Term Care (Annual Costs)	Pile Removal
Manpower	42.9	5.2	438.5
Equipment	36.7	1.6	163.6
Materials	160.4	0.8	127.0
Soil Analyses	7.9	1.6	11.1
Contractor's Fee(b)	19.2	--	201.5
Waste Management			
Packaging	--	--	1,790.2
Transportation	--	--	1,998.6
Disposal	--	--	20,269.9
Subtotal	267.1	9.1	25,000.4
25% Contingency	66.8	2.3	6,250.1
Total	334	11	31,250

(a) Costs are in January 1988 dollars. Number of figures shown is for computational accuracy only.
(b) Based on 8% of the sum of contractor's charges for manpower, equipment, materials, and packaging.

TABLE C.9. Estimated Unit Factors for Site Stabilization and Long-Term Care of a Tailings Pile/Evaporation Pond(a)

Cost Item	Site Stabilization	Long-Term Care (Annual Costs)
Manpower ($K/m^2 of pond)	0.0086	0.0010
Equipment ($K/m^2 of pond)	0.0073	0.0003
Materials ($K/m^2 of pond)	0.0321	0.0002
Soil Analysis ($K/m^2 of pond)	0.0016	0.0003

(a) Costs are in January 1988 dollars.

TABLE C.10. Estimated Unit Factors for Removal of a Tailings Pile/Evaporation Pond[a]

Cost Item	Unit Factor
Manpower ($K/m^3 of pile)	0.0267
Equipment ($K/m^3 of pile)	0.0100
Materials ($K/m^3 of pile)	0.0077
Soil Analysis ($K/m^3 of pile)	0.0007
Waste Volume ($m^3 waste/$m^3 of pile)	1.1585
Packaging ($K/m^3 of waste)	0.0942
Transportation ($K/m^3 of waste)	0.1052
Disposal ($K/m^3 of waste)	1.0668

(a) Costs are in January 1988 dollars.

C.4 REFERENCES

1. E. S. Murphy. 1981. Technology, Safety, and Costs of Decommissioning Reference Non-Fuel-Cycle Nuclear Facilities. NUREG/CR-1754, U.S. Nuclear Regulatory Commission Report by Pacific Northwest Laboratory, Richland, Washington.

2. E. S. Murphy and G. M. Holter. 1980. Technology, Safety, and Costs of Decommissioning a Reference Low-Level Waste Burial Ground, NUREG/CR-0570, Vols. 1 and 2, U.S. Nuclear Regulatory Commission Report by Pacific Northwest Laboratory, Richland, Washington.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03214
STATUS CODE: 0
FEE CATEGORY: 3B
EXP. DATE: 19990831
FEE COMMENTS: ALWAYS
DECOM FIN ASSUR REQD: Y

LICENSE FEE TRANSMITTAL

10/28/94
Sandy/Brenda,
"ORC" fee
sheet just to
confirm 119261.
Check fee
sheet provided
by you rec.
Mike

A. REGION

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: SMH (US) INC.
RECEIVED DATE: 940202
DOCKET NO: 3012704
CONTROL NO.: 119261
LICENSE NO.: 37-03572-06
ACTION TYPE: AMENDMENT

2. FEE ATTACHED
AMOUNT: _____
CHECK NO.: _____

3. COMMENTS

SIGNED _____
DATE _____

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED /__/)

1. FEE CATEGORY AND AMOUNT: _____

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT _____
RENEWAL _____
LICENSE _____

3. OTHER _____
_____

SIGNED _____
DATE _____

CMD: _____

MILESTONE 941024

MAIL CONTROL NO: 119261 DOCKET NO: 03012704 LICENSE NO: 37-03572-06__

NAME: SMH (US) INC._____ ACTION TYPE: 4

MILESTONE	MILESTONE DATE	NON-FEE: MILESTONE	REVIEWER	MILESTONE DATE	TICKLER DATE
01	940202	10	P0	940222	0_____
02	940204	13	K2	940805	0_____
03	940210	19	Q5	941020	941124
07	940217	20	Q5	941020	0_____
__	_____	21	K2	941020	0_____
__	_____	22	K2	941020	0_____
__	_____	__	__	_____	_____

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^T for ATtention, Home to SWitch ¤ Capture Off ¤ Local