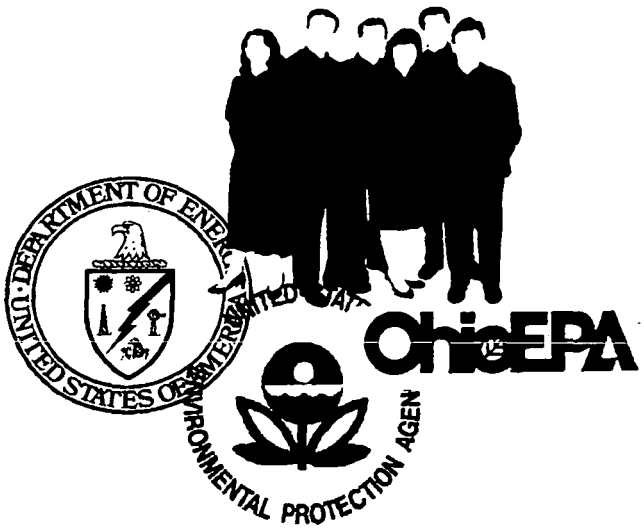
MOUND

Environmental Restoration Program

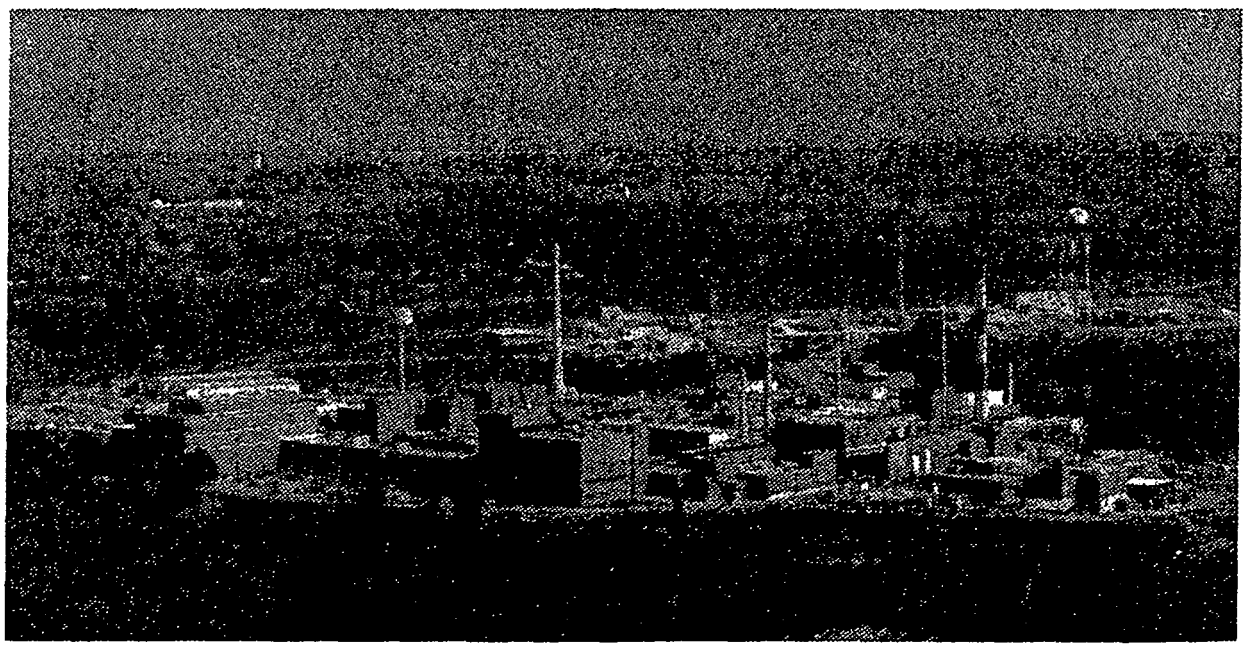


EG&G MOUND 30-03-04-02--9710220096

MOUND PLANT

Potential Release Site Package

PRS # 320/321/322/323/324/325



MOUND

Environmental Restoration Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period

The following potential release site (PRS) packages will be available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio beginning June 17, 1997. Public comment will be accepted on these packages from June 17, 1997, through July 18, 1997.

PRS 30:	Building 27 Propane Tank
PRS 129/130:	Former Solvent Storage Sites
PRS 241:	Soil Contamination - Main Hill Parking Lot Area
PRS 307:	Soil Contamination - Building 29
PRS 318:	PCB Transformer and Capacitor Locations
PRS 320-325:	Former Sites - Dayton Units 1-4/Dayton Warehouse/Scioto Facility
PRS 383:	Soil Contamination
PRS 408:	Soil Contamination - "Prism" Oil

Questions can be referred to Mound's Community Relations at (937) 865-4140.

REV	DESCRIPTION	DATE
PUBLIC RELEASE **0**	Available for comment.	**May 29, 1997**
FINAL **1**	Comment period expired. Comments. Recommendation page annotated.	**Sep. 29, 1997**

The Mound Core Team
P.O. Box 66
Miamisburg, Ohio 45343-0066

AUG 2 0 1997

Miamisburg Mound Community Improvement Corporation
720 Mound Road
COS Building 4221
Miamisburg, Ohio 45342-6714

Dear Mr. Bird:

The Core Team, consisting of the U.S. Department of Energy Miamisburg Environmental Management Project (DOE-MEMP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates the input provided by the public stakeholders of the Mound facility. The public stakeholders have significantly contributed to the forward progress that has been made on the entire release block strategy for establishing the safety of the Mound property prior to its return to public use after remediation and residual risk evaluation.

Attached please find responses to your July 14, 1997 comments on PRS packages 129/130, 241, 307, 318, 408, and 320/321/322/323/324/325. Document revisions in accordance with the attached responses are expected to be completed in August 1997.

Should the responses require additional detail, please contact Art Kleinrath at (937) 865-3597 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MEMP: Arthur W. Kleinrath
Arthur W. Kleinrath, Remedial Project Manager

USEPA: Timothy J. Fischer
Timothy J. Fischer, Remedial Project Manager

OHIO EPA: Brian K. Nickel
Brian K. Nickel, Project Manager

Subject	PRS 320/321/322/232/324/325 - Dayton Units I through IV, the Monsanto Warehouse, and the Marion facility
Version	Public Release May 29, 1997

SUBSTANTIVE COMMENTS:

1) The Core Team recommended No Further Action for the above-referenced PRSs (Dayton Units I through IV, the Warehouse, the Marion facility all owned and operated by the Monsanto Chemical Company). Their two primary reasons for this recommendation are that the PRSs were appropriately decontaminated of their principal contaminant, Polonium-210 (if actually present), and that these PRSs are outside the scope of the Mound CERCLA program and currently fall under the jurisdiction of the NRC and/or the Ohio and U.S. EPA's. Although these sites may not affect MMCIC directly, our concern for the community is that there is no documentation that the potential for other, more routine industrial chemicals/wastes to be present in the soil or groundwater at these sites was ever investigated. These other industrial chemicals/wastes may have included cleaning solvents (TCE, PCE, TCA), petroleum hydrocarbons involved in the rocket propellant manufacture, and/or components/by-products of the bismuth-polonium separation process (nitric and hydrochloric acids, impurity metals in the aluminum and bismuth). The PRS recommendation page states that these PRSs fall within the jurisdiction of the Ohio or U.S. EPA's, but none of these sites have ever been included on the USEPA CERCLIS list or the OEPA Master Sites Lists. Two of these PRSs are currently located in residential neighborhoods. If additional appraisal of these sites has been performed by the Ohio or U.S. EPA's, this information should be included in the PRS package.

RESPONSE:

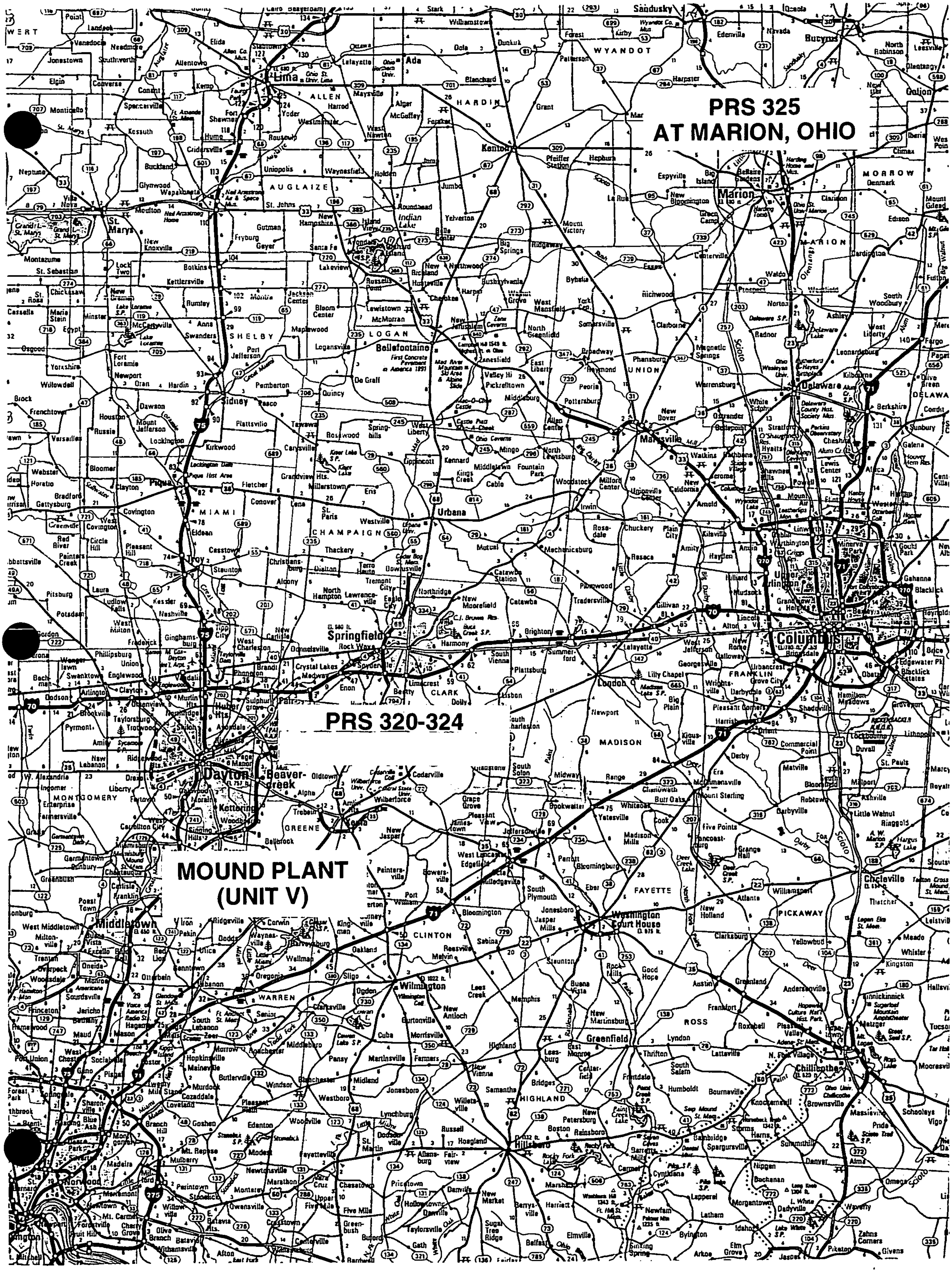
1) *These PRSs are not within the authority of the CERCLA program at Mound, and therefore not under the authority of the Mound Core Team. DOE will respond to comments on these PRSs under a separate letter.*

ERRATA:

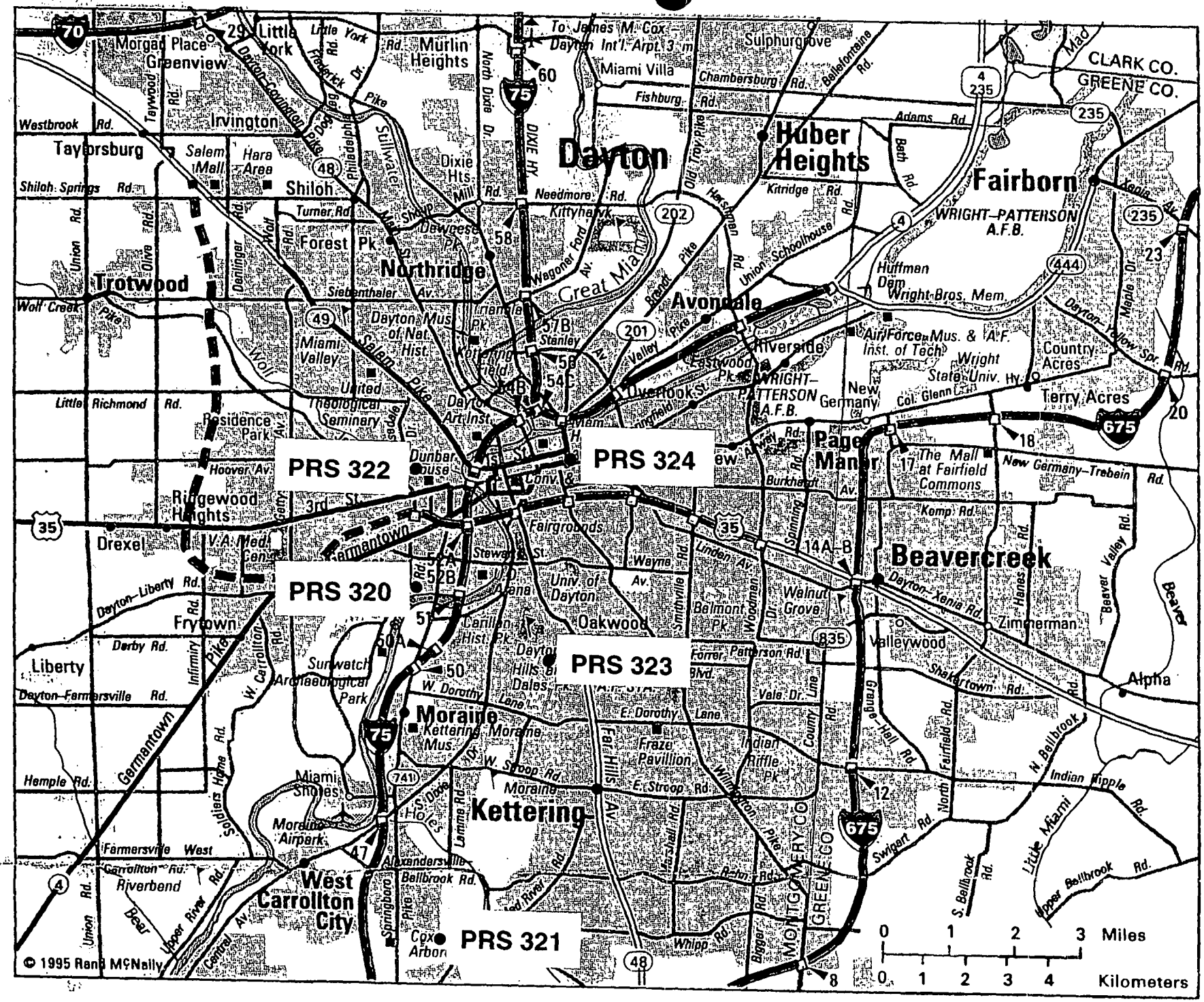
1) The signature page is incomplete: it does not include a signature for Art Kleinrath (DOE).

RESPONSE:

1) The original recommendation page was signed by Art Kleinrath (DOE), however, may have been omitted at the time of reprint. The public reading room copy will be checked to ensure the signed recommendation page accompanies the document.


PRS 325
AT MARION, OHIO
PRS 320-324
MOUND PLANT
(UNIT V)

Dayto


PRS 322
PRS 324
PRS 320
PRS 323
PRS 321
Dayton
Kettering
Moraine
Beavercreek
Fairborn
Huber Heights
Trotwood
Northridge
Avondale
Riverside
Page Manor
West Carrollton City
Oakwood
Drexel
Ridgewood Heights
Frytown
Liberty
Tayorsburg
Irvington
Shiloh
Miami Valley
Miami Shores
Moraine Airport
Riverbend
Farmersville West
Dayton Int'l. Arpt. 3 mi
WRIGHT-PATTERSON A.F.B.
Wright Bros. Mem.
Air Force Mus. & Inst. of Tech.
Wright State Univ.
Country Acres
Terry Acres
The Mall at Fairfield Commons
Huffman Dam
Fairgrounds
Univ. of Dayton
Walnut Grove
Belmont Pk
Valleywood
Zimmerman
Alpha
Sulphurgrove
Miami Villa
Murlin Heights
Dixie Hts.
Needmore
Kittyhawk
Great Miami
Stillwater
Dayton Mus. of Nat. Hist.
United Theological Seminary
Residence Park
Dunbar House
Conv. & Exh. Ctr.
Fairgrounds
Stewart St.
Sunwatch Archaeological Park
Hills & Dales Pk
Frazee Pavillion
Indian Riffle Pk
Kettering Mus.
Moraine
Alexandersville
Bellbrook Rd.
Springboro Pike
Cox Arbor
Germantown
Dayton-Liberty Rd.
Dayton-Farmersville Rd.
Dayton-Xenia Rd.
New Germany-Trebein
Dayton-Yellow Spr. Rd.
Shakertown Rd.
Swigert Rd.
Indian Ripple Rd.
Upper Bellbrook Rd.
Little Miami
Beaver
Wolf Creek
Little Richmond Rd.
Hoover Av.
Dayton-Cincinnati Pike
Philadelphia Pike
Frederick Pike
Brandt Pike
Harshman Rd.
Old Troy Pike
Wagoner Ford Rd.
Siebenthaler Av.
Salem Pike
Valley St.
Stanley Av.
Linden Av.
Wayne Av.
Smithville Rd.
Woodman Dr.
Burkhardt Av.
Kitridge Rd.
Union Schoolhouse Rd.
Chambersburg Rd.
Bellefontaine Rd.
Fishburg Rd.
Adams Rd.
Beth Rd.
Xenia Av.
Maple Dr.
Mad
Westbrook Rd.
Shiloh Springs Rd.
Turner Rd.
Forest Pk
Union Rd.
Olive Rd.
Taylorsburg
Salem Mall
Hara Area
Little York
Dixie Hwy.
North Dixie Dr.
Wilmington Pike
Whipp Rd.
Bigger Rd.
Marshall Rd.
Alex-Bellbrook Rd.
Hemple Rd.
Infirmary Rd.
Soldiers Home Rd.
Carrollton Rd.
Upper River Rd.
Central Av.
Bear
Lamme Rd.
S. Dixie
W. Dorothy Lane
E. Dorothy Lane
W. Stroop Rd.
E. Stroop Rd.
Forrer Patterson Rd.
Vale Dr.
County Line Rd.
Grange Hall Rd.
North Fairfield Rd.
N. Bellbrook
S. Bellbrook Rd.
Hanes
Beaver Valley Rd.
Komp Rd.
Spinning Rd.
Col. Glenn
Hy. 9
Germany
Wright
Stewart St.
Fairgrounds
Conv. & Exh. Ctr.
Dunbar House
Hills & Dales Pk
Carillon Hist. Pk
Dayton Art Inst.
Miami Valley
Dayton Mus. of Nat. Hist.
Kettering Field
Triangle Pk
Dewees Pk
Mill Rd.
Sheridan Rd.
Wolf Rd.
Darlinger Rd.
Getty
Olive Rd.
Union Rd.
Bear
Upper River Rd.
Central Av.
Springboro Pike
Cox Arbor
Alexandersville-Bellbrook Rd.
Bellbrook Rd.
Riverbend
Farmersville West
Carrollton Rd.
Moraine Airport
Miami Shores
Moraine
Kettering Mus.
Hills & Dales Pk
Frazee Pavillion
Indian Riffle Pk
Sunwatch Archaeological Park
Oakwood
Univ. of Dayton
Fairgrounds
Stewart St.
Dunbar House
Conv. & Exh. Ctr.
Dayton Art Inst.
Miami Valley
Dayton Mus. of Nat. Hist.
United Theological Seminary
Residence Park
Ridgewood Heights
Drexel
Frytown
Liberty
Dayton-Farmersville Rd.
Derby Rd.
Germantown
Dayton-Liberty Rd.
Hoover Av.
Little Richmond Rd.
Wolf Creek
Trotwood
Northridge
Forest Pk
Irvington
Tayorsburg
Westbrook Rd.
Shiloh Springs Rd.
Salem Mall
Hara Area
Shiloh
Morgan Place
Greenview
Little York
Murlin Heights
Miami Villa
Sulphurgrove
Huber Heights
Fairborn
Beavercreek
Page Manor
Avondale
Riverside
Oakwood
Kettering
Moraine
West Carrollton City
Alpha
CLARK CO.
GREENE CO.
MONTGOMERY CO.
GREENE CO.
0 1 2 3 Miles
0 1 2 3 4 Kilometers
© 1995 Rand McNally

1	2	3	4	5
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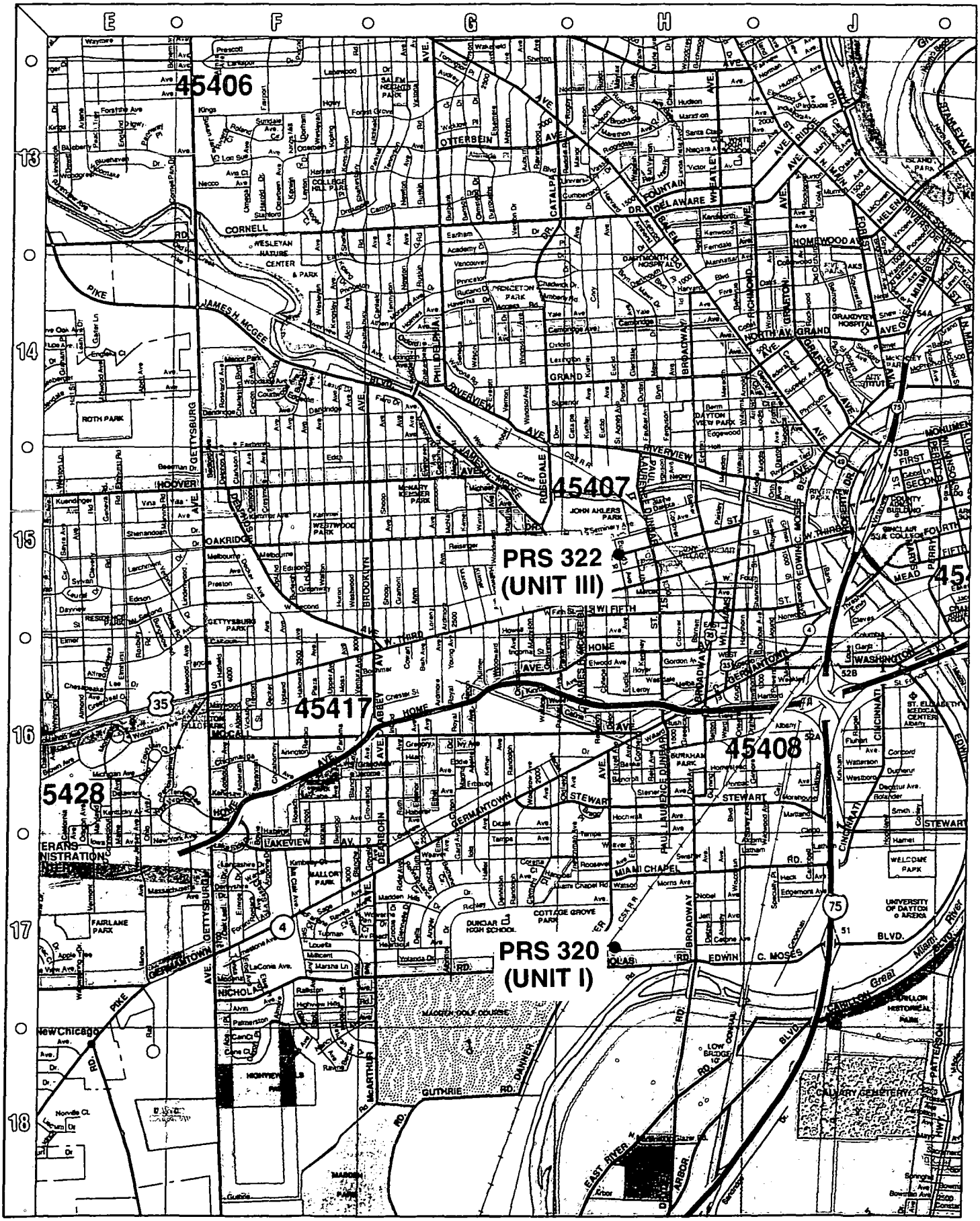
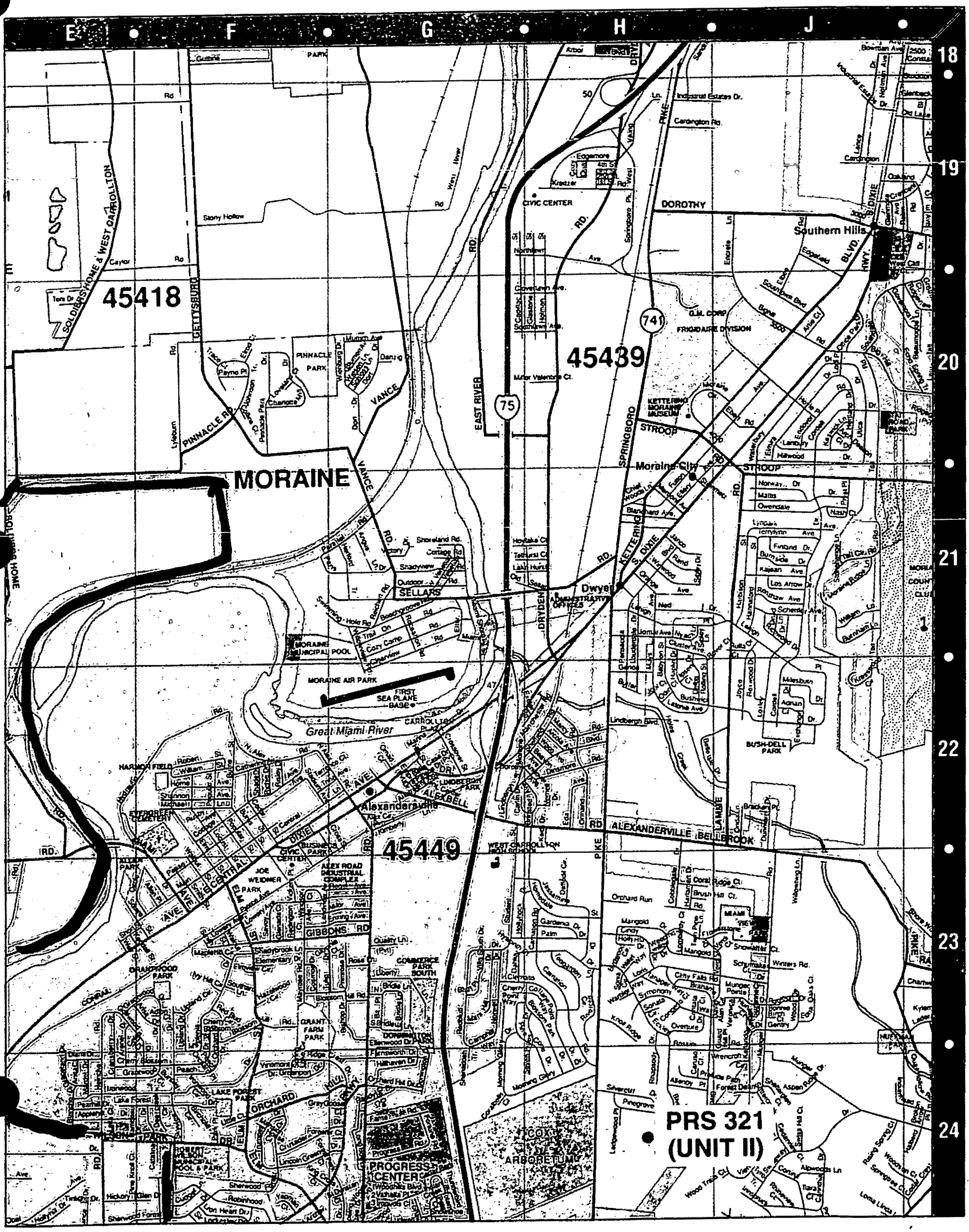
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

MAP 12



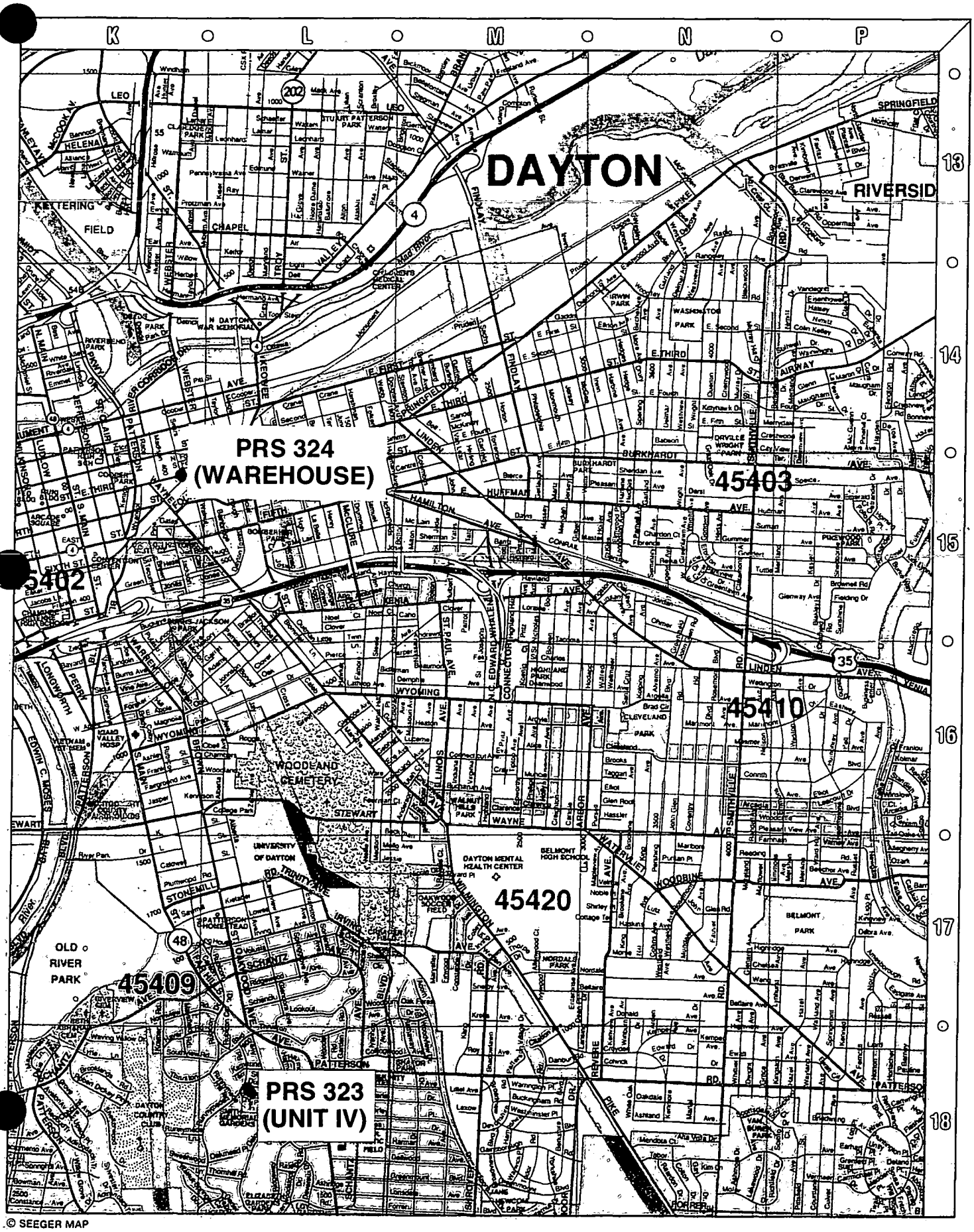
MAP 17



© SEEGER MAP

MAP 13

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25



© SEEGER MAP

PRS 320/321/322/323/324/325

PRS HISTORY:

In the summer of 1942, the United States organized the Manhattan Engineering District to develop an atomic weapon which became known as the Manhattan Project. In 1943, the Monsanto Chemical Company (Central Research Department in Dayton, Ohio) accepted responsibility for the chemistry and metallurgy for producing Polonium-210.[4] Operations began at the Central Research Facility located on Nicholas Road in Dayton, Ohio and became known as Unit I (PRS 320).[7] As the project progressed, other facilities were acquired. In 1943 an old unused building known as the Bonebreak Theological Seminary, located at 1601 West First Street, Dayton, Ohio, was rented. This facility became known as Unit III (PRS 322). In 1944 Monsanto acquired a facility known as the Runnymede Playhouse, located in Oakwood, Ohio which became known as Unit IV (PRS 323). In 1946, several floors of an old Warehouse in downtown Dayton at Third and Sears Street were leased. This facility was known only as " The Warehouse" (PRS 324). In 1947, a standby facility was constructed at Marion, Ohio at the same time the Mound Plant was being constructed. This facility was known only as "Marion" (PRS 325). In many of the historical documents Mound Plant is referred to as Unit V which was commissioned in 1948.[8]

During the early years, Monsanto also operated a facility for the production of rocket propellant. The location of this facility was one-fourth mile east off State Route 741 adjacent to the Saint Henry Catholic Church property. This facility was known as Unit II, however it was never associated with the Manhattan Project.[7]

Today all of these Units are no longer associated with the Mound Plant. Unit I was demolished and sold in the late 1980's. Unit III was returned to the Dayton Board of Education in 1950. Unit IV was transferred back the original owners (the Talbott family) in 1950.[6] The Warehouse was returned to the building manager for renting and the Marion facility was turned over to the General Services Administration in the early 1950's.[7]

CONTAMINATION:

Unit I did not produce polonium. However, various research projects did involve some radioisotopes. These projects involved relatively small quantities of isotopes such as carbon 14 and tritium. Radioactive material was not buried at Unit I. Radioactive waste was packaged and disposed of by the Nuclear Engineering Corporation (NECO) at their Maxie Flats burial grounds according to their license from the State of Kentucky.[7] At Unit II, scrap explosives were combusted onsite. No fuel wastes, refuse or other waste materials were buried onsite. Radioactive materials were not handled so there was no nuclear disposal to be considered.[7] The principal radioactive isotope involved was polonium-210, at units III and IV, which has a physical half-life of 138 days. At Unit III, all radioactive waste generated was packaged and shipped to Oak Ridge National Laboratory, Oak Ridge, Tenn., for burial.[7] The levels of radioactive contamination remaining at Unit III when it was returned to the Dayton Board of Education were (a) no detectable removable alpha contamination, and (b) maximum of 5000

disintegrations per minute per 100 square centimeters fixed alpha contamination. Considering the short half-life of polonium-210, within three years the quantity of polonium-210 remaining would have been reduced to 0.4 percent of the original amount and the quantity today would be so minute that it could be considered non-detectable.[8] Unit IV was decontaminated, dismantled, and the contaminated materials disposed of at the Mound Plant which is being addressed as part of PRS 72. When the Unit IV land was returned to the original owner, the soil had no detectable contamination. The contamination level of the material disposed of at the Mound Plant was 50,000 disintegrations per minute per 100 square centimeters. As the result of a request by the Department of Energy, all of the off-site units were re-evaluated in 1973 by Monsanto and it was concluded that the units were adequately cleaned and no additional action was required.[8]

READING ROOM REFERENCES:

1) Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report, Final December 1994. (pages 7-12)
2) Comprehensive Environmental Assessment and Response Program. U. S. Department of Energy , Albuquerque Operations Office, Albuquerque, New Mexico, April 1986. (pages 14-18)
3) Operable Unit 9, Site Scoping Report, Volume 7 - Waste Management , Final February 1993 (pages 20-33)
4) History of the Dayton Project, Monsanto Research Corporation, Mound Laboratory, Miamisburg, Ohio, June 1969. (pages 35-46)
5) Completion Report for Disposal of Unit III, Monsanto Chemical Company report No. MLM-393, Mound Laboratory, Miamisburg, Ohio, October 31, 1949. (pages 48-150)
6) Report No. 3 of Steering Committee for the Disposal of Units III and IV, (Completion Report for Disposal of Unit IV, Runnymeade Road and Dixon Avenue, Dayton, Ohio), Monsanto Chemical Company Report No. MLM-461, Mound Laboratory, Miamisburg, Ohio, April 17, 1950. (pages 152-260)
7) Historical Resume of Monsanto's Operation of the Dayton Project Sites, - Units I, II, III, IV, V, and others. Waste Disposal 1943-1980. Unpublished Report, Monsanto Research Corporation Mound Plant, Miamisburg, Ohio, December 20, 1979. (pages 262-266)
8) Decontamination and Decommissioning of AEC Facilities (Additional Information on Contaminated Ex-AEC Owned or Leased Facilities). Letter to R.L. Wainwright, Area Manager, U.S. Atomic Energy Commission from D.R. Story, Director of Administration, Mound Facility. (pages 268-272)

PREPARED BY:

Gary L. Coons, Member of EG&G Technical Staff

MOUND PLANT
PRS 320/321/322/323/324/325

FORMER SITES: DAYTON UNITS 1-4/DAYTON WAREHOUSE/SCIOTO FACILITY

RECOMMENDATIONS:

PRS 320 is outside the scope of the Mound CERCLA program and currently falls under the jurisdiction of NRC and/or the Ohio and US EPAs. The site has been sold to Quality Chemical Company. Therefore, PRS 320 is recommended for NO FURTHER ASSESSMENT.

PRS 321 was a commercial operation to produce rocket propellant and was never a part of DOE/ERDA/AEC activities. It is outside the scope of the Mound CERCLA program and currently falls under the jurisdiction of the NRC and/or the Ohio and US EPAs. This land is currently being developed as a residential area. Therefore, PRS 321 is recommended for NO FURTHER ASSESSMENT.

PRSs 322 and 323 are the only two of this group of PRSs that processed polonium. However, both of these sites were cleaned up in the late 1940's. (See closure reports attached to PRS package.) In addition, due to the short half-life of polonium (138 days), essentially all residual polonium would have decayed away. These PRSs are outside the scope of the Mound CERCLA program and currently fall under the jurisdiction of the NRC and/or the Ohio and US EPAs. Therefore, PRSs 322 and 323 are recommended for NO FURTHER ASSESSMENT.

PRS 324 involved only trace quantities of polonium. The warehouse was cleaned and released to the owner in 1949 for rental to other clients. In addition, this PRS is outside the scope of the Mound CERCLA program and currently falls under the jurisdiction of the NRC and/or the Ohio and US EPAs. Therefore, PRS 324 is recommended for NO FURTHER ASSESSMENT.

PRS 325 never became operational and no radioactive material was ever introduced into the facility. The facility was turned over to GSA in the 1950's for other possible government uses. In addition, this PRS is outside the scope of the Mound CERCLA program and currently falls under the jurisdiction of the NRC and/or the Ohio and US EPAs. Therefore, PRS 325 is recommended for NO FURTHER ASSESSMENT.

Per agreement with US EPA and Ohio EPA, since these PRSs are currently under the jurisdiction of the NRC and/or the US EPA and the Ohio EPA, and are outside the scope of the Mound CERCLA program, only the DOE Core Team Representative needs to sign the PRS package.

CONCURRENCE:

DOE/MEMP: Arthur K Kleinrath June 31997

Arthur W. Kleinrath, Remedial Project Manager (date)

REFERENCE MATERIAL
PRS 320/321/322/323/324/325

REFERENCE 1

Document Control No. _____

Environmental Restoration Program

OPERABLE UNIT 9 SITE SCOPING REPORT: VOLUME 12 – SITE SUMMARY REPORT

MOUND PLANT
MIAMISBURG, OHIO

December 1994

Final

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes[a]	Results	Ref
311	Site Survey Project Potential Hot Spot Location S0706	I-6	Grounds	Plutonium-238	6	(Cont.)			13	Table B.9 (Appendix E in Ref. 6)	6
312	Site Survey Project Potential Hot Spot Location S0971	J-9	Grounds	Thorium	6				14	Table B.9 (Appendix E in Ref. 6)	6
313	Site Survey Project Potential Hot Spot Location S0982	I-8	Grounds	Thorium	6						
314	Farm Trash Area	M-5	Historical	Waste oil	5, 18	Suspected, not confirmed			3, 4, 5, 6 14	Tables B.6, B.7, and B.8 Table B.9 RSS[c] Location S0237 (Appendix E in Ref. 6)	7 6
315	Waste Transport Vehicles	SITE-WIDE	In service	Explosives Programs wastes Mixed wastes Laboratory chemicals Low activity wastewater from SM/PP Complex to WD Building	4, 5, 18	None Suspected			No Data		
316	Trash Dumpsters	SITE-WIDE	In service	Solid wastes	4, 5, 18	None Suspected			No Data		
317	Ventilation Hoods	SITE-WIDE	In service	Paint fumes, Acidic and caustic gases Asbestos, Acetone, Trichloroethylene, Benzene, Chloroform, Toluene	4, 5, 18	None Suspected			No Data		
318	Transformers	SITE-WIDE	In service	Polychlorinated biphenyls	4	All PCB oils replaced			No Data		
319	Epoxy Tank Disposal	G-7 H-7	In service	Epoxy resins	5, 18	None Suspected			No Data	Table B.9	6
320	Dayton Unit I	Dayton	Historical	Radioisotopes (including plutonium-239) Spent acids (including hydrochloric acid)	1, 4	None Suspected			No Data		

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes*	Results	Ref
321	Dayton Unit II	Dayton	Historical	Explosives (including ammonium picrate and ammonium nitrate) Rocket propellant	1, 4	None Suspected			No Data		
322	Dayton Unit III	Dayton	Historical	Polonium-210, Tellurium, Bismuth, Cobalt, Nickel, Beryllium, Thorium	1, 4	Suspected Cobalt-60	S	4	No Data		
323	Dayton Unit IV	Dayton	Historical	Contaminants listed under Dayton Unit III	1, 4	Suspected Cobalt-60	S	4	No Data		
324	Dayton Warehouse	Dayton	Historical	Polonium-210	4	None Suspected			No Data		
325	Scioto Facility (Marion)	Scioto	Historical	Facility never used	4	None Suspected			No Data		
326	Building 36 Sanitary Sump (Tank 254)	G-9	In Service	Sanitary wastewater	25	None Suspected			No Data		
327	R-111 Calorimetry Bath (Tank 255)	E-6	Inactive	Deionized water with potential alpha contamination	25	None Suspected			No Data		
328	R-111 Calorimetry Bath (Tank 266)										
329	Building 62 Hot Waste Sump (Tank 258)	E-6	In Service	Sanitary wastewater with potential alpha contamination	25	None Suspected Tank removed			No Data		
330	Building 2 Fuel Oil Tank (Tank 260)	H-7	Historical	Fuel oil	25	Unknown			No Data		
331	Building 2 Tank (Tank 261)	H-7	Historical	Sanitary Wastes	25	Unknown Closed in place			No Data		
	ing G Waste Oil Tank (Tank 262)	E-7	Inactive	Waste oils	25	Unknown			No Data		
	ng 87 Explosive Surge Tank (Tank 263)	H-7	In Service	Exhaust air from explosives testing	25	None Suspected			No Data		
	ng 87 Explosive Surge Tank (Tank 264)										
	ng 87 Explosive Surge Tank (Tank 265)										

1 - Soil Gas Survey - Freon 11, Freon 113, Trans-1,2-Dichloroethylene, Cis-1,2-Dichloroethylene, 1,1,1-Trichloroethane, Perchloroethylene, Trichloroethylene, Toluene
2 - Gamma Spectroscopy - Thorium-228, -230, Cobalt-60, Cesium-137, Radium-224, -226, -228, Americium-241, Actinium-227, Bismuth-207, Bismuth-210m, Potassium-40
3 - Target Analyte List
4 - Target Compound List (VOC)
5 - Target Compound List (SVOC)
6 - Target Compound List (Pesticides/Polychlorinated Biphenyl)
7 - Dioxins/Furans
8 - Extractable Petroleum Hydrocarbons (EPH)/Total Petroleum Hydrocarbons (TPH)
9 - Lithium
10 - Nitrate/Nitrite
11 - Chloride
12 - Explosives
13 - Plutonium-238
14 - Plutonium-238, Thorium-232
15 - Cobalt-60, Cesium-137, Radium-226, Americium-241
16 - Tritium

Reference List

1. DOE 1986
2. DOE 1992a
3. DOE 1992c
4. DOE 1993a
5. EPA 1988a
6. DOE 1993d
7. DOE 1993c
8. DOE 1992d
9. Fentiman 1990
10. DOE 1992f
11. Styron and Meyer 1981
12. DOE 1993b
13. DOE 1993d
14. DOE 1991b
15. Halford 1990
16. DOE 1993e
17. DOE 1990
18. DOE 1992a
19. Rogers 1975
20. DOE 1992h
21. Dames and Moore 1976a, b
22. DOE 1992i
23. DOE 1992j
24. DOE 1994
25. EG&G 1994

Table V.3 lists the PRSs that are currently in the Mound D&D Program, as well as those PRSs recommended for inclusion in the program. The sites currently in the D&D Program are included in Operable Unit 6 for verification purposes are so noted in Table V.3. The glass melter sump was recommended for D&D (DOE 1993c), and is still active; therefore, it is listed in Table V.2 and is not recommended for D&D until the WD facility is shut down. The guidelines for inclusion of PRSs in the D&D Program are provided in Appendix C.

Eighteen PRSs are listed in Table V.4 that are not carried forward by the ER Program, the D&D Program, or Mound Plant operations and maintenance. These include two aboveground propane tanks (Building 43 tank and Building 27 tank) and two pieces of equipment that have been physically removed from the off-gas treatment system (leaf filter and iodine filter); three historical incinerators in the HH Building, WD Building (the Cyclone incinerator) and the Building 38 in-line incinerator that have all been removed from service and no longer exist; and the Building 38 waste compactors and the T Building, HH Building, and WS Building waste solidification units that have long been removed from service and the areas have undergone D&D. The concrete pad and the site of the historic Warehouse 14 have been checked for radioactivity several times and nothing has been found.

Five former Monsanto facilities predated the construction of Mound Plant. The facility at Marion Ohio was originally constructed as a duplicate of Mound's T Building, but was never put into operation. It was released by the General Services Administration in 1954. Of the five former Dayton Units, two did not process materials associated with the Manhattan Project, in which Mound Plant has its roots. The Dayton Warehouse served as an isolation laboratory and no contaminants are suspected. The two remaining Dayton Units, known as Dayton Unit III and Dayton Unit IV, were closed in 1950 (DOE 1993a). It is recommended that Dayton Units III and IV be evaluated under the Formerly Utilized Sites Remedial Action Program.

6. REFERENCES

Dames & Moore. 1976a. "Potable Water Standards Project Mound Laboratory." Report prepared for Monsanto Research Corporation. Cincinnati, Ohio. August 1976.

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REFERENCE 2

ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH

COMPREHENSIVE ENVIRONMENTAL ASSESSMENT AND RESPONSE PROGRAM

PHASE I:
INSTALLATION ASSESSMENT
MOUND

NOT FOR PUBLIC DISSEMINATION

May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.

April 1986

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Table II.2 Former Monsanto Facilities in the Dayton Area

Site Designation	Location and Mission
Unit I	Location--Monsanto Central Research Department Facilities, 1515 Nicholas Road, Dayton, Ohio Mission--The Dayton Project was organized and recruitment initiated at Unit I
Unit II	Location--Monsanto Rocket Propellant work off Betty Lane; site adjacent to present St. Henry Church on Ohio 741; north of Dayton Mall Mission--Dayton Project activities were not conducted at Unit II, which was operated independently as a production facility of rocket propellent
Unit III	Location--Bonebrake Theological Seminary, 1601 West First Street, Dayton, Ohio Mission--Unit III was used as the polonium research facility
Unit IV	Location--Runnymede Playhouse at Dixon Avenue and Runnymede Road in Oakwood, Ohio Mission--Unit IV was used as the polonium separation production facility
Warehouse	Location--Old warehouse at Third Street and Sears Street, Dayton, Ohio Mission--The warehouse was used for analysis of environmental monitoring samples, bioassay samples from project personnel, and preliminary biological studies on the effect of polonium on laboratory animals
Marion	Location--Duplicate production facility located in Marion, Ohio Mission--Marion was a standby facility for the Mound Laboratory T Building, but was never operated. Radioactive materials were never introduced to the facility

Planned Future Actions: MRC will continue to monitor tritium levels in the BVA and conduct remedial pumping actions to keep BVA water in compliance with the drinking water standard.

V.A.1.c. Plutonium in the Miami-Erie Canal. Residual ^{238}Pu remains in the Miami-Erie Canal, connected ponds, and associated waterways as a result of past activities at Mound, primarily from the rupture of a process waste line. An extensive investigation of the situation was conducted in the 1970s with the finding that the ^{238}Pu is not a health hazard. Follow-up studies have continued to confirm the original finding (USDOE 1979). MRC monitors for potential ^{238}Pu in air and drinking water to confirm that there is no health hazard. Due to the status of MRC activities (i.e., CEARP Phase V) a CERCLA finding under FFSDIF, PA, and PSI; and HRS and MHRS scoring are not appropriate.

Planned Future Actions: MRC will continue to monitor for potential ^{238}Pu in air and drinking water to confirm that the residual plutonium does not pose a health risk.

V.A.1.d. Hazard Ranking System (HRS) and Modified HRS (MHRS) Scores. The HRS is applied to those CERCLA sites with positive findings for the CERCLA FFSDIF, PA, and PSI (see App. D). The HRS is applied to category 1 area B (App. D). Area B is an engineered landfill (Fig. V.3.). The landfill system could contain up to 1,000 ft^3 of nonradioactive hazardous substances. Based on the detailed records search, including interviews with MRC employees, it appears that insignificant quantities of nonradiological hazardous substances remain outside of the engineered landfill. Radioactive materials were not placed in the landfill. No releases from the landfill are known to have occurred. The resulting HRS Migration Mode Score is 13. Areas C and I potentially contain small quantities of hazardous substances, however, no releases from these areas have been detected. There is not sufficient information to calculate a HRS Migration Mode scores for areas C and I. The MHRS is not applied to any sites at Mound.

V.A.2. Former Monsanto Facilities. Waste management activities at former Monsanto facilities, which are summarized below, are based on Meyer (1979) and the CEARP Phase I MRC staff interviews (Interviews 1985). Additional discussion of the former Monsanto facilities is presented in Sec. II.B. and Table II.2.

V.A.2.a. Unit I. In the Dayton Project, polonium was not produced at Unit I. Various research projects were undertaken that involved radioisotopes. This work was done on behalf of the Atomic Energy Commission (AEC), and Oak Ridge National Laboratory took possession of and responsibility for all packaged nuclear waste from the Unit I site. There is no evidence of onsite disposal. The CERCLA Finding for Unit I is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Actions: No future action is warranted at Unit 1.

V.A.2.b. Unit II. Dayton Project activities were not conducted at Unit II. Scrap explosives were combusted onsite. No fuel wastes, refuse or other waste materials were ever buried onsite. Radioactive materials were not handled at Unit II. The CERCLA Finding for Unit II is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No future action is warranted at Unit II.

V.A.2.c. Unit III. Radioactive wastes generated at Unit III were ultimately packaged according to U.S. Department of Transportation (DOT) regulations and shipped on government vehicles to Oak Ridge National Laboratory for onsite burial. The principal isotope involved was ^{210}Po, which has a physical half-life of 138 days. No materials were buried onsite at Unit III, sent to city landfills, or other disposal facilities.

All operations ceased at Unit III in 1948. The facilities and site were completely decontaminated and turned over to the Dayton Board of Education, the site owner. The CERCLA Finding for Unit III is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at Unit III.

V.A.2.d. Unit IV. Radioactive wastes were managed the same as at Unit III. The principal isotope was ^{210}Po. All operations at Unit IV were ceased and transferred to Mound Laboratory late in 1948. By spring 1950, all radioactively contaminated Unit IV structures, services, and utilities were removed, packaged and shipped to Oak Ridge for disposal. Clean fill dirt replaced the excavated soil and the site was landscaped and returned to the original owner. The CERCLA Finding for Unit IV is negative

for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at Unit IV.

V.A.2.e. Warehouse. Operations were limited to trace quantities of ^{210}Po from the analysis of environmental monitoring samples, bioassay samples from the project personnel and preliminary biological studies on the effect of polonium on laboratory animals. To the best of current knowledge, samples, waste materials, and plated copper disc from the polonium analyses were discarded into the general warehouse wastes because the amount and concentration of polonium was so small. Warehouse operations, including equipment, were transferred to Mound Laboratory in 1948-1949. The area was decontaminated and returned to the building manager to rent to other clients. The CERCLA Finding for the Warehouse is negative for FFSDIF, PA, and PSI; therefore, HRS and MHRS Migration Mode Scores are not calculated.

Planned Future Action: No further action is warranted at the Warehouse.

V.A.2.f. Marion. The facility at Marion, Ohio, never became operational and no hazardous substances, including radioactive materials, were ever used at the facility. By the mid 1950s, all process equipment, instrumentation, and supplies were transferred to Mound. The facility was turned over to the GSA for other possible government use or sale. The CERCLA Finding for Marion is negative for FFSDIF, PA, and PSI; therefore, a HRS Migration Mode Score is not calculated.

Planned Future Actions: No further action is warranted at Marion.

V.A.2.g. Hazard Ranking System (HRS) and Modified HRS (MHRS). The HRS and MHRS are not applied to the former Monsanto facilities because the CERCLA findings for FFSDIF, PA, and PSI are negative for the facilities.

V.A.3. Summary of Planned Future Actions for Potential CERCLA Sites. Potential sites identified during CEARP Phase I (the equivalent of USDOE CERCLA Order 5480.14 Phase I) are presented in Table V.A.3. As appropriate, the results for the potential sites are summarized based on a negative, positive, or uncertain finding for the following USEPA CERCLA program elements: (1) FFSDIF and (2) PA, SI [CEARP preliminary SI (PSI)], and HRS evaluation.

REFERENCE 3

Circulates

Document Control No. _____

Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT: VOLUME 7 - WASTE MANAGEMENT

MOUND PLANT
MIAMISBURG, OHIO

February 1993

FINAL
(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

2. HISTORY OF KEY PROJECTS AT MOUND: WASTE GENERATION

Mound, originally called Mound Laboratory, has been a research, development, and production facility since its beginnings in the late-1940s. As an integral part of the DOE (originally the AEC, and briefly, the ERDA), Mound has performed work in support of weapons and nonweapons energy programs with emphasis on explosives and nuclear technology. Historical projects have included research and production of polonium-210 and plutonium-238, thorium and protactinium-231, radium-226 and actinium-227, and stable isotopes of noble gases such as helium, argon, neon, krypton, and xenon. Tritium recovery has been a large part of plant operations since the 1950s.

The following subsections summarize the salient features of the major programs at Mound. Each subsection includes an overview of the project activity, the general scale of the project, dates, process descriptions associated with the project, wastes generated by the project, and the disposition of the wastes, if known. The ideal program cycle includes research, pilot plant, production, and then D&D phases. Not all programs followed the entire ideal cycle. Locations referred to in the following subsections are shown on Figure 2.1.

2.1. POLONIUM PROJECT

In the summer of 1942, the COE organized the Manhattan Engineer District. The purpose of the District's Manhattan Project was to build an atomic bomb. Polonium-210 was vital to this program, because it was to be used in a neutron source that would ensure initiation of a chain reaction. The polonium project was undertaken by MCC at the company's Central Research Department in Dayton, Ohio, in September 1943 (Gilbert 1969), and became known as the Dayton Project. Subsequently, polonium-based neutron sources were produced for other industrial and research applications.

In 1954, the Mound began a program using polonium-210 to convert nuclear energy to useable electric energy. This application of nuclear energy, using a thermoelectric principle, was demonstrated that same year, and in February, Mound received a directive to fabricate a polonium-powered model steam-electric plant (Roberson 1954). A model was built and demonstrated in 1954 (Olt et al. 1954). In 1956, a conceptual design to produce a mercury boiler fueled with polonium was described (Hittman 1956). By 1958, an RTG powered by polonium-210 was built.

The power density of polonium is unique and made it attractive as a power source. One pound of polonium-210 occupies a volume of approximately 3 cubic inches and produces heat at the rate of 3.6×10^6 British Thermal Units (BTUs) per minute or about 64 kilowatts of electric power. With a thermal energy output of 120 watts per g, polonium-210 was selected initially for use in the RTG.

Known as SNAP, these generators convert the thermal energy generated by radioactive decay to electrical energy. The first SNAP-3A, fueled with polonium-210, provided power to a satellite radio transmitter. The use of satellites powered by SNAP for global communication was first demonstrated under President Eisenhower in 1961, at which time the President's peace message was broadcast via a satellite containing a radio transmitter powered by the SNAP-3A RTG.

Because polonium-210 has a short half-life (138 days), its usefulness was limited for application on long duration satellite and space probe missions. Polonium research and production at Mound were eventually phased out in 1971.

2.1.1. Project Description

Prior to 1944, polonium had not been isolated in pure form or in any appreciable quantity. Therefore, any program involving the recovery, purification, and fabrication of polonium metal from a variety of sources required an understanding of the chemical and physical properties and the metallurgy of polonium-210. The Dayton Project's goal was to develop an understanding of the properties of polonium and its metallurgy (Gilbert 1969).

Initially, the recovery of polonium was attempted from naturally occurring sources such as lead-containing wastes from uranium, vanadium, and radium refining operations. Upon investigation, it became apparent that sufficient quantities of polonium could not be recovered from these sources without processing prohibitively large amounts of material. To obtain polonium in the quantities needed, other approaches to its production were investigated, and the transmutation of bismuth metal to polonium-210 by neutron irradiation was selected for production scale operations.

2.1.2. Process Description

In February 1949, the polonium operations were transferred from Dayton to Mound (Moyer 1956). At this time, the process for producing polonium-210 had been decided upon. Polonium-210 would be produced by the transmutation of bismuth by neutron bombardment. The reaction proceeds as shown in the equation

$$_{83}Bi^{209} + {}_{0}n^{1} \rightarrow {}_{83}Bi^{210} \rightarrow {}_{84}Po^{210} + \beta^{-}$$

with the $_{83}Bi^{210}$ decaying to polonium-210 in 5.4 days. All polonium processing activities at Mound involving irradiated bismuth were conducted on the first and second floors of T Building. Initially, bismuth, in the form of 12-inch by 3-3/4-inch by 3-3/4-inch bricks weighing 58 pounds, was irradiated

in the Clinton reactor at Oak Ridge, Tennessee. Subsequently, bismuth metal was cast into slugs and inserted into 2S aluminum cans. Aluminum covers were welded to the cans, sealing in the bismuth metal. This operation and the neutron irradiation were performed at the Hanford operations facility in Richland, Washington, where a higher neutron flux was achievable.

After irradiation, the aluminum cans containing bismuth were shipped to Mound in lead casks that provided radiation shielding. Upon arriving at Mound, the aluminum cans were removed from the casks and stored in a pool of water that provided further shielding until they were removed for use in the polonium recovery process. The pool was located on the second floor of T Building. The lead casks were surveyed for radiation and, if necessary, were rinsed with water to remove surface contamination. They were then shipped back to the Hanford facility for reuse. Numerous approaches to decanning were investigated including mechanical cutting, chemical dissolution, and melting the bismuth in a furnace and pouring it out of the can. In those instances where the aluminum can was separated from the bismuth slug, the aluminum can was shipped to Oak Ridge for burial.

In the polonium production process, the separation of the bismuth slug from the aluminum can was accomplished by chemical dissolution. This occurred on the second floor of T Building where the can was dissolved in a 17 percent hydrochloric acid bath. The bismuth slug did not react with hydrochloric acid and was removed from the bath and washed with water to prepare it for dissolution. The aluminum used in fabricating the can and the bismuth contained impurities such as iron, silicon, cobalt, lead, tin, zinc, silver, chromium, vanadium, and gallium. Upon irradiation, these impurities produced gamma-emitting isotopes that, at the time of bismuth processing, created a radiation health hazard.

The processing techniques for bismuth and polonium varied depending on the required form and purity and because of the research and development nature of this program. Most bismuth research and development was performed in the R Building. As the knowledge of physical and chemical properties grew, it was applied to production techniques to meet and improve product purity requirements.

2.1.2.1. Chemical Separation of Polonium from Irradiated Bismuth

The separation of polonium-210 from bismuth took place on the second floor of the T Building. This chemical separation process is shown in Figure 2.2. The process is generally described by Huddleston et al. (1963). The process began with the dissolution of the bismuth metal slug in a mixture of nitric and hydrochloric acids (Lonadier and Huddleston 1964). During this step, gaseous nitric acid, nitrogen dioxide, and hydrogen gas were generated. These gases were passed through a caustic scrubber, and the acidic components were neutralized before being exhausted through the high efficiency particulate air (HEPA) filter bank to the building's stack. After the bismuth slug was completely dissolved, the resulting solution was denitrated by the addition of formic acid and heating the solution to 100°C.

The next step in the process involved the separation of polonium from the polonium-bismuth solution. The polonium was recovered from the mixture by passing the solution over a bed of 140- to 200-mesh bismuth metal powder. The polonium was deposited on the bismuth powder and the filtrate was sent to the HH Building where it was processed as a waste. The aluminum chloride and bismuth chloride wastes were processed in the HH Building until other commitments for space required moving the waste treatment facility to the T Building in 1959. The polonium waste treatment facility was set up on the first floor of T Building, but the waste continued to be referred to as HH sludge.

The bismuth-polonium powder was redissolved in a mixture of nitric and hydrochloric acid, and the resulting solution was denitrated with formic acid. The denitrated solution was again passed over bismuth powder and polonium was reduced on the surface of the bismuth powder. The supernatant solution, containing some polonium, was returned for recycling to the previous concentration step in the process. When a polonium concentration of approximately 15,000 parts per million (ppm) was reached, the polonium-bismuth powder was dissolved in hydrochloric acid catalyzed by hydrogen peroxide. The polonium in this solution was reduced using stannous chloride, and the polonium was filtered from the solution and washed with stannous chloride and a dilute hydrazide hydrogen chloride solution. After the polonium metal was washed, it was redissolved using hydrochloric acid and hydrogen peroxide. This solution was then treated with ammonium hydroxide, and the polonium was precipitated as the hydroxide. The hydroxide was filtered and washed to prepare it for the final step of polonium purification. The polonium hydroxide was redissolved in nitric acid, and the polonium was electroplated onto a platinum gauze electrode. The polonium metal was then ready for fabrication.

Other processes have been developed at Mound to separate polonium-210 from bismuth. Two additional processes, the silver process and the tellurium process, were actually employed on a production scale. Both processes could be used with the denitrated solution of the bismuth slugs. In the case of the silver process, the polonium spontaneously deposited onto the silver surface as polonium metal. Bismuth was not reduced by silver and therefore remained in solution. Next, the silver containing polonium was dissolved in nitric acid. This solution was treated with ammonium hydroxide, which precipitated the polonium. The silver remained in solution as a silver ammonium ion.

The tellurium process was used following the first step of polonium concentration using bismuth powder. Telluric acid and stannous chloride were added to a denitrated solution of polonium and bismuth, and the solution was heated. The tellurium precipitated and coagulated, and the polonium co-precipitated with the tellurium. This process resulted in the precipitation of some bismuth, which was eliminated by repeating the process. After the second precipitation step, the washed precipitate was dissolved in aqua regia, and the polonium recovery proceeded as in the bismuth process.

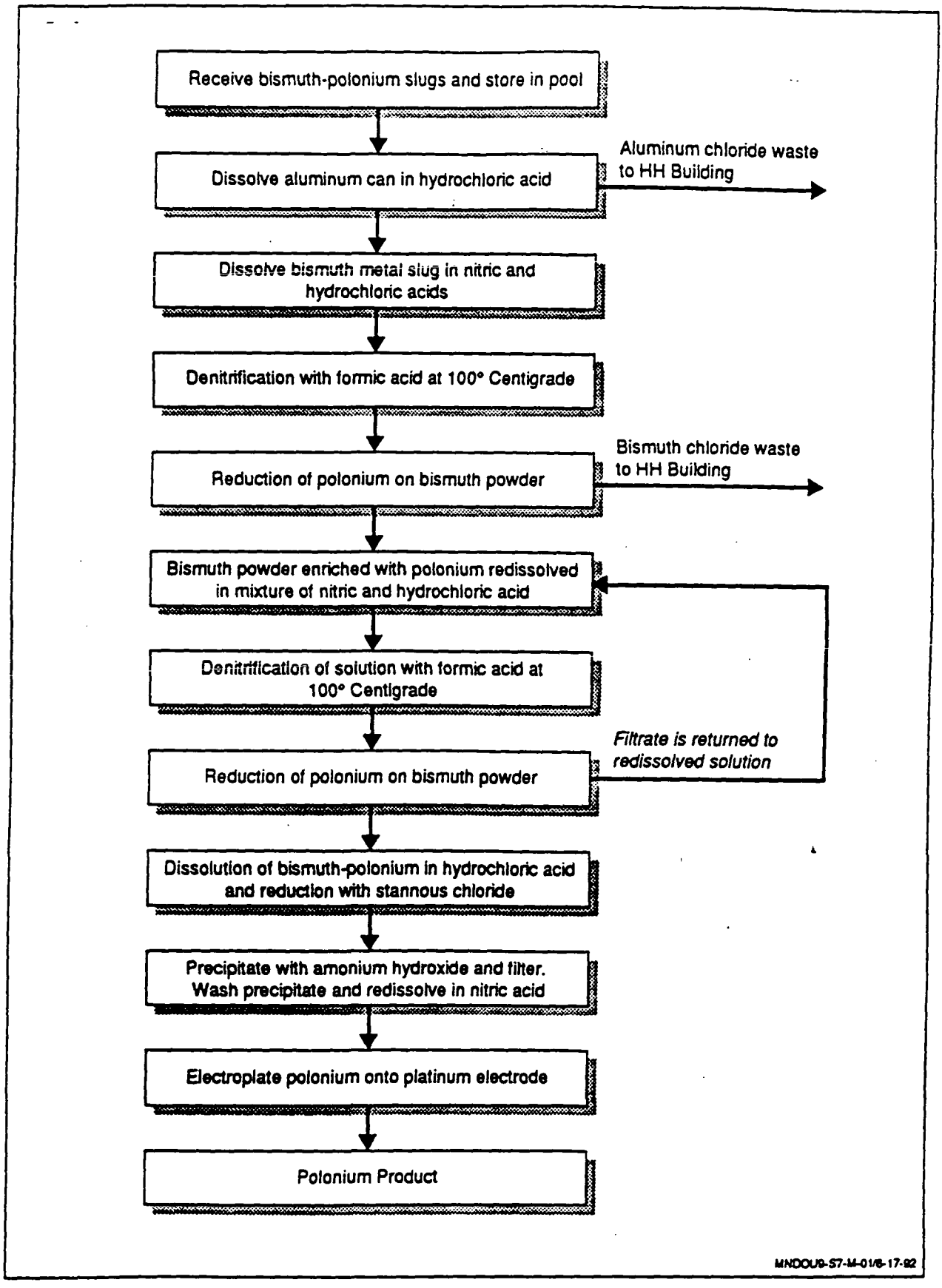

Figure 2.2. Bismuth-polonium separation process.

2.1.2.2. Bismuth Metal Recovery

At the beginning of the polonium program, the bismuth oxychloride sludge produced in the HH Building was stored at Mound for possible recovery of the bismuth and re-irradiation at the Hanford facility (McEwen 1952b). In 1948, an electrolytic process was developed that successfully recovered bismuth, and in March 1950, seven bismuth slugs were produced from recovered metal. These were sent to Hanford for neutron irradiation. In 1952, Mound constructed a bismuth metal recovery facility in the HH Building, with the capacity to produce 17,000 pounds of bismuth annually, that would process the accumulated drums of bismuth sludge (Belcher 1952b). The amount of sludge being stored at Mound in 1952 was equivalent to 62,000 pounds of bismuth. This amount of sludge represented approximately 200 55-gallon drums, which were reportedly stored inside of T Building (Grasso 1991b). In 1953, a large quantity of high purity bismuth was located at the Brookhaven National Laboratory. This material, amounting to 64 tons, was made available to Mound and was sufficient to satisfy requirements for several years. This eliminated the need for the recovery facility and the recommendation was made that it be dismantled (Anson et al. 1953).

2.1.2.3. Separation of Polonium from Bismuth by Distillation

A major element of the polonium program was to develop improved processes for the separation of polonium from bismuth. During the period from 1949 to 1952, Mound conducted experimental work on the separation of polonium by distillation (Endebrock and Engle 1953). This work turned into a materials research program; however, as of 1953, no satisfactory alloys had been found that remained inert to bismuth and polonium under the conditions required for distillation.

2.1.3. Waste Generation

Liquid and gaseous wastes were generated in the T, HH, and WD buildings resulting from the production of polonium-210. In T Building, two aqueous waste streams were generated as a result of the aluminum can and irradiated bismuth slug separation and the polonium-210 recovery and purification processes. These waste streams were highly acidic and contained high concentrations of chloride, nitrate, aluminum, and bismuth. In addition to their acid nature, these waste streams contained gamma- and beta-emitting radioisotopes that were generated during the neutron irradiation of trace elements contained in the aluminum can and bismuth metal. The trace impurity metals contained in 2S aluminum included iron, manganese, copper, lead, tin, zinc, silicon, titanium, nickel, magnesium, chromium, vanadium, bismuth, and gallium (Payne 1948, Lange 1963). The trace impurity metals found in bismuth included silver, arsenic, calcium, cadmium, iron, magnesium, tellurium, selenium, and antimony (Lange 1963). As a result of neutron activation, gamma-emitting isotopes of

4.16. AREA 13, POLONIUM-CONTAMINATED WOOD FROM DAYTON UNIT IV (HISTORICAL)

Area 13 is northeast of Building 49 in the Test Fire Area, in the south-central portion of Mound (Figure 4.1). In 1950, wood contaminated with polonium-210 from Dayton Unit IV was deposited in Area 13. Wood from the walls was not contaminated and was sold for salvage. The flooring, however, was too contaminated to remove from the plant. In July 1955, the wood flooring and other combustible materials were burned. Metal and other non-combustible materials were saturated with fuel oil and burned (Meyer 1955a, 1955d, 1956b). Residue was surveyed for radioactivity in August 1955. No alpha activity was detected, but some beta or gamma contamination was detected (Garner 1991). The residual material was moved and buried in the southern part of the Historic Landfill (Meyer 1955a,e). The 1982 to 1985 radiological site survey of Area 13 detected low levels of plutonium-238 in soils, but no thorium activity.

4.17. SOLID RADIOACTIVE WASTE COMPACTORS

Two solid radioactive waste compactors were located in Building 38 (Figure 4.1). The first compactor became operational in July 1974. Its purpose was to compact radioactive wastes containing less than 10 nCi/g of TRU radionuclides. The second compactor became operational in December 1974. This unit was used to compact solid wastes containing greater than 10 nCi/g of TRU radionuclides. The second compactor was enclosed in a specially designed room that allowed containment of any radioactivity released from the compaction process. The room was also designed with special features to allow simplified decontamination in the event of a radioactive release. The compacted waste was either shipped for off-plant burial or sent to INEL for 20-year retrievable storage (McClain 1975). These compactors were removed from service and dismantled in 1987 (Geichman 1991).

Compactors currently operating are in the T Building and the SW/R Building. Compatible LSA beta wastes are placed in plastic bags, inserted into 55-gallon drums, and reduced in volume through compaction. Another compactor is installed in the WD Building for the compaction of alpha wastes (MRC 1987).

4.18. HH BUILDING

The HH Building has served as a general purpose building over the life of the plant, having served originally as a waste treatment facility and more recently as a process facility. The building was constructed in 1948 to treat the concentrated solutions from the polonium operations. Design of the building, equipment, sumps, and piping was determined early during plant design and was based on experience in operating the Dayton units (Mead 1947). From 1949 to 1960, aqueous waste containing

map of the hot waste burial areas (Hebb 1972), dated February 15, 1972. A copy of the "hot waste burial sites" map (Drawing No. SK-2281) is provided in Appendix A. The areas identified included only those areas with radiologic contamination, which were assigned numbers. These numbered area designations (e.g., Area 2, Area 10) are retained for use in the ER Program (DOE 1992g) and this report. Fifteen areas were first identified in 1972, and an additional eight areas have been identified since (DOE 1991c). The initial identification of the radiologically contaminated areas was followed by the need to sample and confirm the levels of contamination. Ten years passed from the time the contaminated areas were identified until the sampling was funded and performed. In 1982, the Site Survey Project (Stought et al. 1988) began a three-year effort to conduct radiological surveys and sample analyses of the identified areas of contamination. The results of the Site Survey Project are referred to in this report and detailed in the Site Scoping Report: Volume III - Radiological Survey Report (DOE 1991c).

In 1984, the ER Program, then called the CEARP, conducted an installation assessment under contract to the DOE, Albuquerque Operations Office. Under the CEARP installation assessment, 10 areas that had potentially released contaminants to the environment were identified. These areas were designated by letters (e.g., Area B, Area J). These area designations are also retained in the ER Program (DOE 1992g) and are used in this report.

6.1.1.1. Area 2, Thorium- and Polonium-Contaminated Wastes (Historical)

Area 2 is south of the overflow pond along the west-central border of the plant (Figure 6.1). The area forms part of the historic landfill, but was distinguished in the 1972 map of hot waste burial areas (Hebb 1972). The area received several different lots of residual materials in the 1950s and 1960s. In 1955, wood ash and debris from a fire that had consumed the polonium-contaminated flooring from the Dayton units (Area 13) was buried along the southern margin of the historic landfill. The burial occurred in an irregular trench, 12 to 14 ft deep, which was covered by a few feet of soil (Thomas 1990). Between 1955 and 1964, some 2,000 to 5,000 crushed 55-gallon drums were also buried. These drums were the remains of the thorium repackaging operations that occurred in Areas 1, 3, and 9. The drums were empty, but probably contained residual thorium sludge materials. In 1965, sandblasting sand from the cleaning operations within the WD Building were buried in the southern parts of the historic landfill. The sandblasting operations were part of the cleaning of the large clariflocculator tanks used for processing wastes from polonium production (Garner 1991).

Area 2 is believed to occupy about 15,000 ft^2 and is at least partially covered by the site sanitary landfill constructed in 1977. Results of a magnetic survey conducted in Area 2 in 1990 indicated that some of the burials may lie under the present position of the road intersection (DOE 1990b). This is

Later versions of the map appeared in the waste management site plans of the mid-1970s (e.g., MRC 1974c) with the correct thorium-232 isotope identified.

The contamination levels within Area 7, reported as a result of the Site Survey Project investigation, are plutonium-238 and thorium concentrations of 7.40 and 20.52 pCi/g, respectively, in surface samples (DOE 1991c). Other radionuclides detected included radium-226 (2 pCi/g), cesium-137 (1.2 pCi/g), and tritium (5.23 nCi/L).

6.1.1.4. Area 8, Thorium-Contaminated Soils from Areas 1 and 9 (Historical)

Area 8 is northwest of Building 31, on the SM/PP Hill in the eastern portion of Mound (Figure 6.1), and encompasses approximately 25,000 ft^2 (MRC 1985a). Area 9 and Area 1 were contaminated by the repackaging of the thorium-232 sludges in 1965 and 1966. When these areas were scraped to remove the surficial contamination (in 1965), the soils were disposed of in Area 8 and Area 12. During the 1982 to 1985 Radiological Site Survey (DOE 1991c), plutonium-238 was detected at a maximum concentration of 24.4 pCi/g in a surface sample; all other surface samples were less than 10 pCi/g. The maximum thorium concentration was 254.3 pCi/g in a subsurface sample at a depth of 80 inches.

6.1.1.5. Area 10, Debris from Dayton Units (Historical)

Area 10 is west of Building 30, on the slope of the SM/PP Hill, in the east-central portion of Mound (Figure 6.1) (DOE 1991c). It was used for the disposal of concrete contaminated with polonium-210 from the Dayton operations. The concrete was deposited in 1950 and, because of the short half-life of polonium-210 (138.4 days), is no longer radioactive (DOE 1992g). One hundred and sixty truckloads of debris were brought to Mound from Dayton Unit IV (Halbach 1950), and 100 truckloads were brought from Unit III. It is unknown how much of this was stored in Warehouse 10, the tropical huts, or dumped in Area 10. Many of the temporary buildings at Unit III were also razed and brought to Mound when that facility was decommissioned. Some more recent concrete disposal may also have occurred, but nothing is known for certain. The area is estimated to be approximately 150 ft by 100 ft. The single surface soil sample collected from Area 10 during the 1982 to 1985 Radiological Site Survey had a plutonium-238 concentration of 11.8 pCi/g and a thorium concentration of less than 2 pCi/g (DOE 1991c).

6.1.1.6. Area 12, Thorium-Contaminated Soil from Area 1

Area 12 is west of Building 38, on the SM/PP Hill, in the eastern portion of Mound (Figure 6.1) (DOE 1991c). In 1965, soil contaminated with thorium-232 was transferred to Area 12 from Area 1, when

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REFERENCE 4

HISTORY OF THE DAYTON PROJECT

HISTORY OF THE DAYTON PROJECT

Keith V. Gilbert

June 1969

Monsanto Research Corporation

A Subsidiary of Monsanto Company

MOUND LABORATORY

Miamisburg, Ohio

Operated for

United States Atomic Energy Commission

U.S. Government Contract No. AT-33-1-GEN-53

1

The development of the $60-million Atomic Energy Commission production and research facility in Miamisburg can be traced to an origin in 1926 when the Thomas and Hochwalt Laboratories were established in Dayton. This firm was acquired by Monsanto Chemical Company in 1936 to carry on long-range and fundamental scientific study on a company wide basis.

In March 1939, only a few weeks after the discovery of uranium fission, the possible military importance of atomic energy was called to the attention of the U. S. Government. In the autumn of 1939, the first Government committee on uranium was created. The initial work was done in various universities with the overall effort being somewhat loosely organized. By the end of 1941, an extensive review indicated that an increased effort on the uranium project should be undertaken under the administration of a more formal organization. This decision was approved by President Roosevelt. In the summer of 1942, the Army Corps of Engineers organized the Manhattan Engineer District for this purpose.

Charles A. Thomas, Project Director, 1943 - 1945.

Dr. Charles Allen Thomas was director of Monsanto's Central Research Department in Dayton when, in 1943, he was called to Washington for a conference with General Leslie Groves. Groves had been assigned responsibility for the Manhattan Project in September, 1942. Also present at the conference was James Conant who had been president of Harvard University prior to his appointment to the National Defense Research Committee. After swearing Thomas to secrecy, they revealed to him the top secret plan to build an atomic bomb. Following several days of meetings and discussions, Monsanto accepted the responsibility for the chemistry and metallurgy of radioactive polonium—work to become known as the Dayton Project.

Polonium was vital to the construction of an atomic bomb as a

James H. Lum,
Laboratory Director,
1943 - 1945

source of neutrons, subatomic particles which would assure initiation of a chain reaction. Discovered by Pierre and Marie Curie in 1898, polonium was named to honor Poland, her home. Prior to Monsanto's involvement in the Manhattan Project no weighable quantities of the pure element had ever been isolated and preparation of the pure metal called for the development of revolutionary scientific techniques.

Monsanto began preliminary organization and personnel recruiting at the Company's Central Research Department on Nicholas Road in Dayton in September 1943. When the Dayton Project began to expand to other temporary locations during World War II, the original Nicholas Road location was designated as Unit I. Dr. James H. Lum from Monsanto was appointed Laboratory Director

W. C. Fernelius,
Asst. Laboratory Director,
1944 - 1945,
Laboratory Director,
1945 - 1946.

and Dr. W. C. Fernelius from Ohio State University was appointed Associate Laboratory Director.

Early in July 1943 it became apparent that quarters entirely separate from the Unit I were needed for the polonium operation. Construction of a new research laboratory was impossible due to time and material limitations, and rental space was at a premium. An old three and one-half story building at 1601 W. First Street in Dayton, Ohio, was leased by Monsanto. This building had been constructed in 1879 to house Bonebrake Theological Seminary. It was later used as a normal school, then as a warehouse by the Dayton Board of Education. It required considerable repair (every window in the building was broken, many interior walls had to be replastered, and

the staircase from the second to the third floor was missing). Also, extensive renovation was necessary to fit the building for service as a chemical research laboratory. This site became known as Unit III and all activities were transferred in October 1944.

A lack of scientific equipment plagued the project from the outset. Total initial laboratory supplies at the Seminary building consisted of a "bushel basket" filled with assorted chemical glassware. One of the major jobs in the early days was procuring necessary equipment to stock a research laboratory.

Going away party for W. C. Fernelius at Unit III. Shown l. to r. are Joseph Spicka, Ed Larson, Fernelius, Carl Rollinson, Malcolm Haring and Joseph Burbage.

Unit III site in 1948. Cafeteria is shown in foreground and corner of physics building in left foreground.

This was no easy job with the war on, and it was made more difficult due to the secret nature of the project. No official priority rating was obtainable because any official relationship with the Manhattan Engineer District had to be avoided for security reasons. Fortunately, a statement that Monsanto was engaged in critical government work was normally adequate to obtain the necessary materials. Where this failed, scientists either improvised or managed to get by without the equipment. All Manhattan Project work at Dayton was secret and the security regulations were rigid. Armed guards were on-site 24 hours a day to prevent unauthorized access to the laboratory. Employes were not authorized to discuss the nature of their work away

from the laboratory. Even inside the plant extra security precautions were taken. Polonium was referred to by code names to avoid accidental compromise. Security also made it difficult to attract new employes for they could be told nothing specific about the work they would be doing. Indeed, few if any of the employes knew that they were ultimately working on the atomic bomb. Very early in the project's development, Arthur Compton, a leading U. S. physicist, visited Dayton and spoke to the technical employes at Unit III. As his speech progressed he divulged that the work was in the nature of development of a secret weapon, "we don't know how far Germany has progressed; but whoever gets the answer first will win the war". As he reached this point, however, Dr. Lum, fearing a breach of security, rapidly changed the subject. This proved to be the biggest hint about the nature of their work that the Monsanto employes received until the bomb was dropped on Japan.

Growth of the project provided additional problems. New employes were moving to Dayton to apply their scientific skills to the project. Housing was difficult to find, particularly rental housing for men with families. Bachelors found quarters in rooming houses, at the YMCA or shared apartments when they could be found. The project's business office worked with local realtors to locate family housing and anxious employes scanned the newspaper daily. It was through a newspaper advertisement that a 16 room house in the fashionable Oakwood section of Dayton was found for rental. Since the rental fee was much too high for one family, three Monsanto employes rented the structure and three families shared the house. The home was unique both in its size and its lavishness. The living room contained a full size pipe organ which would have been adequate for a large church. The fireplace was large enough for the children to hide behind the andirons. Although there was a four-car garage, none of the new residents had an automobile. The Monsanto wives used children's wagons to bring their groceries home from the store. Shopping expeditions by the wives must have been a sight to the neighbors who were accustomed to sending their butlers to do the shopping.

A group of 30 to 40 men with the Army's Special Engineer Detachment (SED) were also assigned to the Dayton Project. Although military men, they wore civilian clothes for security purposes. The top secret nature of the project presented special problems to these young, healthy, apparent civilians in their off-duty hours. One of these men was stopped by the police who requested his identification. His Class A pass showing special detached duty was not adequate, however, and he was taken to the local jail. Such emergencies were expected, and an officer at Wright Field had been designated as a contact man for identification of the SED personnel. As luck would

have it, though, he could not be reached that night and the hapless SED man spent the entire night in jail.

As the magnitude of the polonium production program unfolded and the staff grew to meet enlarged scientific demands, it became apparent that additional laboratory space would be required. The Dayton Project had expanded rapidly from its small beginning to almost 200 persons in less than a year. In February 1944 the Runnymeade Playhouse in Oakwood was rented by the Army Corps of Engineers and turned over to Monsanto. It was difficult, however, to obtain a lease on the property. The Signal Corps had used the property previously and local residents were unhappy with the constant movement of property and equipment in and out of the neighborhood, one of the most prestigious in Dayton.

The location, designated Unit IV, was chosen primarily because there stood the only building of adequate size in Dayton that could be occupied immediately. The rental agreement stipulated that the building was to be turned back to the owners in its original condition. The building had been erected in 1927 to provide recreational facilities for the Talbott family, and it provided some of the most unique facilities ever encountered in a scientific laboratory. These facilities included a corrugated glass roof, several greenhouses, an indoor tennis court with

Unit IV site, Runnymeade Playhouse.

Entrance to Unit IV viewed down the columned portico. Only the front doorknob remains today.

green cork floor, a stage, a squash court, lounges, and an outdoor swimming pool.

To quell the neighbors' complaints, no deliveries were made to the site by commercial carriers. Rather deliveries were made to Unit III, where they were reloaded onto smaller government vehicles and shuttled to Runnymeade. Still, the installation

Loading dock at Unit IV. Shipments were shuttled from Unit III using small government vehicles. Corrugated glass roof is visible in the background.

of security fencing, 24 hour per day exterior lighting and armed guards patrolling the site displeased the neighbors, who had no idea of the urgency of the processes being conducted inside the fence.

Extensive alterations to the exterior of the main building were not required, but the interior presented many problems in constructing process facilities and laboratories. Care was exercised in making as few changes as possible in the building to alleviate the problem of restoration upon vacating the site. Precautions were taken to minimize annoyances such as noise, smoke and dirt to avoid undue criticism from the residential area.

It became known, however, after the explosion of the first atomic weapons, that the work at the playhouse utilized radioactive material. The citizens of Oakwood showed a good bit of concern and the frequency of complaints increased markedly. "We found a dead bird in our yard, it must have flown over your plant. Please come over and check it." "There is some brown dust on my porch. You had better look into it." are examples. One resident called to complain that the side of her home was becoming discolored and asked Monsanto to investigate. A local testing laboratory was hired to examine the situation and reported that the problem was caused by

rusting window screens and had no relationship to work at Runnymeade. It is significant to note that not a single accident occurred at either Monsanto location causing any injury to the public.

Great care was taken to assure the safety of the surrounding areas. Trucks equipped with radiation detection equipment made regularly scheduled runs throughout the greater Dayton area. Even as far as 75 miles distant, air and soil and water were sampled to ensure that radioactivity was not released in the community.

Radioactivity in the laboratory had to be carefully controlled. Here, scientists were working with the largest amounts of polonium ever isolated, and the associated radioactivity was significant. Employes who were exposed to significant amounts of radioactivity on a daily basis were checked regularly both for their own health, and to assure that no contamination was leaving the laboratory and entering the community. Schedules were established for delivery of the purified polonium which were exceptionaly hard to meet. It became an art to delay the courier arriving to pick up the polonium. Some deadlines were so close that an employe would be sent to talk with the courier and to keep him occupied while the final touches were put on the packages. Still, all commitments were met and shipments were made on schedule.

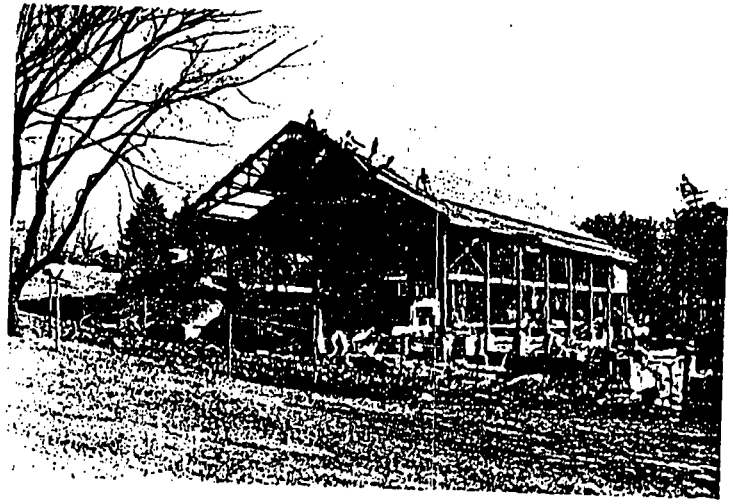
As early as 1946 it became evident that a permanent polonium production facility was needed. Thus a project which some thought might last only six months had grown to a state of permanence. Among the locations considered for the proposed facility was a site midway between the atomic plants at Los Alamos, New Mexico and Hanford, Washington. A Tennessee location near the Oak Ridge Atomic plant was also investigated. The Dayton area was finally selected for a number of reasons among which were a good supply of skilled labor and adequate water and power supplies. The site selected for Mound Laboratory was on a hill 878 feet above the sea level and about 200 feet above the Miami River in Miamisburg, Ohio. Adjacent to the laboratory is the largest conical Indian mound in the state of Ohio. From this prehistoric burial gound the laboratory derived its name.

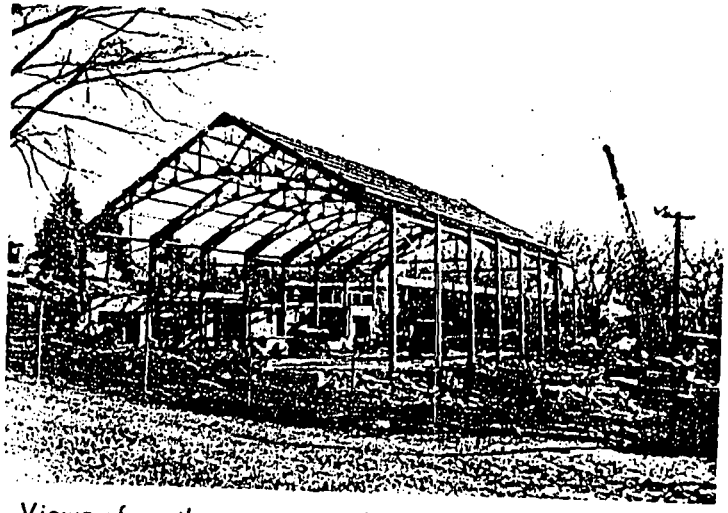
Mound Laboratory became the first permanent Atomic Energy Commission facility when it was first occupied in May 1948. There were, in total, 14 major buildings constructed in the original $25.5-million complex with a total floor area of 366,000 square feet. Polonium processing was started in February 1949.

It was decided that it would be both less expensive and safer to dismantle the Unit IV location than to restore it to its original condition. Surveys made after the transfer of operations to Mound Laboratory showed that the interior of the playhouse was highly contaminated. Demolition was started in February 1950 and completed later the same year. The remains were moved to Mound Laboratory by truck and stored. The excavation was filled with dirt, covered with sod, and returned to the original owners.

Unit III, on the other hand, exhibited levels of radioactivity which were low enough to allow decontamination. After equipment was removed, the building was cleaned and returned to the Board of Education in 1950. The Unit I location still operates as the Dayton Laboratory of Monsanto Research Corporation.

The defense work that began during 1943 was narrowly based on production of radioisotopes. Since then it has expanded into the development and production of functional components for weapons. For a number of years this light manufacturing has been the mainstay of the Laboratory.





Views of southwest corner of Unit IV during dismantling operations in 1950.

Interior of Unit IV during dismantling operations. All material was loaded into 55 gallon drums for removal from the site. The stage is visible in the background.

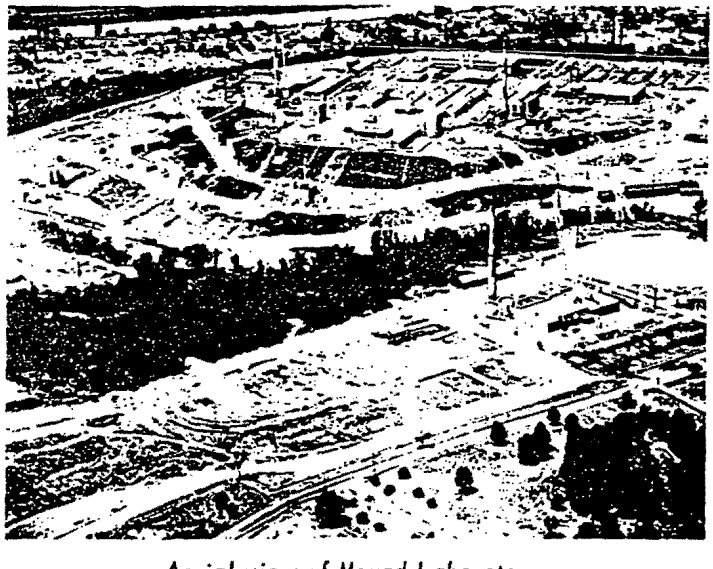
John Bradley Director of Explosives Operations, holds the knob to the front door of Runnymeade Playhouse. Bradley came to the Dayton Project with the Army's Special Engineer Detachment in 1945.

Production of plutonium-238 grew out of our early work with polonium-210. Plutonium-238 is processed in unprecedented quantities to supply a burgeoning demand for heat sources to be used in thermoelectric energy conversion systems. The basic physical, chemical, and nuclear properties of these nuclides are being studied intensively. Our experience in handling radioactivity led also to research with plutonium-239, a fuel for nuclear power reactors.

The isotopic heat source programs began with the development of a small thermoelectric generator powered by a radioactive isotope. Satellites orbiting the earth are confirming the potential of isotopic generators which convert isotopic heat to electrical energy. By the early sixties the Laboratory was firmly established as the country's leading manufacturer of these power sources.

The separation of stable isotopes of the noble gases utilizing thermal diffusion of gases began as an expansion of our isotopic research in the mid-fifties. By 1964 theoretical and applied research had established the Laboratory as the free world's chief supplier of these isotopes.

As new programs appear MRC will continue to diversify in its research, development, and production for the Atomic Energy Commission. As new applications are found for isotopes in space exploration, medical research, and other technical frontiers, Mound Laboratory will create its future.



Aerial view of Mound Laboratory.

REFERENCE 5

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MOUND LABORATORY
Operated By
MONSANTO CHEMICAL COMPANY

COMPLETION REPORT

FOR

DISPOSAL OF UNIT III

1601 W. FIRST STREET

DAYTON, OHIO

REPORT NO. 1 OF STEERING COMMITTEE OF UNITS III AND IV

[redacted]

Date: October 31, 1949

Prepared By: F. L. Halbach
F. L. Halbach
Chairman, Steering Committee

Approved By: M. M. Haring
M. M. Haring
Laboratory Director

~~RESTRICTED DATA~~

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COMPLETION REPORT FOR DISPOSAL OF MONSANTO UNIT III

THE PROBLEM

After Monsanto Chemical Company moved its operations in the last months of 1948 and the first two months of 1949 to Mound Laboratory, Miamisburg, Ohio, Monsanto and the Dayton Area Office of the Atomic Energy Commission were confronted with the problem of the disposal of the original laboratories at 1601 W. First Street, Dayton, Ohio, hereafter designated Monsanto Unit III, and at Runnymeade Road and Dixon Avenue, designated Monsanto Unit IV.

A Planning Committee, set up to plan for appropriate disposal of these units, at a meeting on February 25, 1949 established a Steering Committee as follows:

"A general Steering Committee will be established to care for the whole job of disposal. It primary function (and sole duty temporarily) will be to coordinate all phases of the disposal program." (From Planning Committee Report MLM C.F. No. 49-2-63, see TAB A.)

The Steering Committee was later temporarily inactivated. At a second meeting of the Planning Committee in April, 1949, it was agreed to proceed with work of disposal of both units under Engineering Division supervision (same as original Steering Committee) with a full time Engineer-in-charge to be obtained, if possible, from Scioto project personnel and a full time Health Supervisor to be loaned from Atomic Energy personnel at Oak Ridge, Tennessee. The work of the Steering Committee for Unit III was defined to coordinate and organize all phases of the disposal program,

including decontamination and dismantling as required, to permit return of the property to its original owners. Thus, only the physical aspects of the project came under Steering Committee supervision. Termination of service contracts, negotiations pertinent to the return of Unit III, handling of scrap sales, and decision as to decontamination levels were the work of others.

Thus, the problem under discussion in this report may be defined as the decontamination and partial dismantling of Unit III, within the fence line, to permit return of the property to its original owners, the Dayton Board of Education. (Note the absence of definition of decontamination levels.)

This report then summarizes the disposal work at Unit III as carried out under the supervision of the Steering Committee.

FACTORS AFFECTING THE PROBLEM AND THEIR SUBSEQUENT TREATMENT

1. History of Unit III to December, 1948

For a brief history of Unit III, see TAB B wherein are listed excerpts from the "Historical Report, Dayton Project" - Document Number M-286.

2. Transfer of Radioactive Property

To date there has been no definition of maximum contamination levels for return of buildings, grounds, drives, walks, and similar property (as is presented by this problem) to their original owner.

The only information furnished relative to contamination levels for equipment and material entering commercial channels is defined in a letter to the Dayton Area Manager (see TAB C). It is questionable whether this ruling is applicable in the case of buildings, grounds, etc. as are presented by the problem at Unit III.

Additional information and several questions directly pertaining to the problem are presented in a letter to the Chief, Applied Biophysics Branch, Division of Biology and Medicine (see TAB D).

3. Preliminary Work in Connection with Disposal Program

Reference is made to TAB A covering the initial report of the Planning Committee. Meanwhile, the work of the Steering Committee was postponed to allow major laboratory and building property and material items not of a fixed nature to be decontaminated and transferred to Mound Laboratory under Evaluation Committee supervision. Surveys of manpower required and preliminary estimates of time and money were prepared. Informal meetings between Monsanto and Atomic Energy Commission personnel were held. Finally, at the second meeting of the Planning Committee, in April, 1949 it was agreed:

a. To proceed at once with active phase of program.

b. Work to be done under Engineering Division (reactivated Steering Committee) with a full time Engineer-in-charge obtained, if possible, from Scioto project and a full time Health Supervisor, loaned from the Atomic Energy Commission.

c. Work to be concentrated at Unit III to permit return of this property to the Board of Education as soon as possible; work at Unit IV to be started with a token force to clean up after preliminary work there by others.

It should be pointed out that in early discussion meetings the following procedures had been discussed as possible methods for disposal of Unit III:

a. Remove all property items and materials not necessary for building operations, and allow residual activity to decay (a process that might require more than five years, and necessitates a guard force and maintenance during this period).

b. Purchase of original buildings; followed by complete dismantling and restoration of grounds.

c. Decontamination and partially dismantling to limits, if possible, satisfactory for return of buildings and grounds to the Board of Education.

As previously mentioned, Method (c) was selected as the procedure to be followed. On that basis the Steering Committee proceeded with organization of the disposal program for both Units III and IV.

4. Dismantling Project History May through October, 1949

A summary of the work in connection with Unit III is given in TAB E. Additional information pertinent to this part of the report is given as follows:

TAB F - Work Orders for the Dismantling of Units III and IV

TAB G - Tentative Levels for Proceeding with Work at Unit III

TAB H - Change House, Clothing, and Health Procedures - Unit III

TAB I - Survey of General Outside Area - Unit III

TAB J - Report on Dismantling Units III and IV

TAB K - Meeting of Planning Committee, July 23, 1949

TAB L - Final Survey - Unit III

TAB M - Supplement to Final Survey - Unit III (Monsanto)

5. Health Phases of the Disposal and Decontamination Project at Unit III

a. Preliminary and final surveys have already been discussed under Dismantling Project History and TABS I, L, and M.

b. Air samples were taken during all stages of the project, and were counted at Unit III to maintain closest control possible over operations and thus, maintain strict adherence to establish maximum permissible limits for air levels, and protect working personnel from excessive contamination. A breakdown of these tests is given in TAB N. It is significant that:

1. Eighty-four and three tenths per cent of all samples were less than 3,000 d./min./m.^{3}, the maximum limit for which no respiratory protection is required.

2. Ninety-seven and seven tenths per cent of all samples were less than 25,000 d./min./m.^{3}, the maximum permissible limit for which respirators can be used.

3. Only seven times was it necessary to cease work in any areas due to excessive contamination. In such cases, men were transferred to work in less contaminated areas.

These results clearly indicate the care with which this project was carried out. Personnel in many cases wore respirators for their own protection when air contamination might be expected, even though tests later indicated such protection was unnecessary.

c. Urine samples were collected twice weekly. The summary of results of these checks is given in TAB O. The most significant feature disclosed by this summary is that not one man had a count over 12 c./min./50 ml. during the work of decontaminating and partially dismantling Unit III. In

view of the fact that in excess of 12,000 man-hours were expended on the project, and that the nature of the work indicated we could expect considerable difficulty from contamination, this record becomes highly important. Since the major portion of contamination has been removed during this project, it is quite unlikely that any work in the future in the nature of alterations or repairs would present any serious difficulty from the contamination standpoint.

6. Safety Record

No major or lost time accidents occurred during this work at Unit III. Minor injuries were treated on the spot by personnel of the Health Division, and injured employees were sent to Mound Laboratory Medical Section for checkup and further treatment, if necessary. Medical Section maintained thorough follow-up on all such minor injuries. Precautions were taken to prevent contamination of any open cuts or wounds, and personnel so affected were transferred to clean work.

7. Property Items

All property items were handled in accord with established procedures and with regard for contamination levels (see TABS C and G). This phase of the work was handled in close collaboration with the Evaluation Committee, likewise established by the Planning Committee on February 25, 1949, whose partial duty was to pass on disposal of all contaminated equipment and apparatus. As some members of this committee would likely be active in negotiations with the Board of Education, concerning ultimate return of Unit III, it was very essential that they be consulted regularly, particularly in connection with items that were parts of building or

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or building equipment, and which might help effect a better settlement with the Board of Education.

At the termination of the Steering Committee's work in connection with this project, the Planning Committee and Business Division were advised that our work was completed, and that property was ready for termination of service contracts, subsequent draining of lines, and any other matters deemed necessary by the Planning Committee at this state of the project.

CONCLUSIONS

1. Monsanto Unit III within the property lines has been decontaminated as closely as possible to the tentative levels established as a basis for this project, and as defined to be the function of the Steering Committee.

2. All property and material items, other than those building items which are required for return of this property to the Board of Education, or are not economical to salvage, have been disposed of in accordance with existing regulations for property transfer, contamination levels, usefulness, and salvage value.

3. The high percentage of low air levels of contamination during the work at Unit III, plus the fact that in over 12,000 man-hours, not one man became "hot," based on urine counts, is highly significant. As most of the contamination has now been removed, it is unlikely that any future alterations, repairs, or dismantling will present any serious contamination problems.

4. Decontamination to levels lower than the tentative ones used as a basis for this project would be uneconomical, if not impossible. Based on our experience, the cost of working toward lower levels would be very high, recontamination would be difficult to eliminate, and extensive dismantling and alteration would be required.

5. Decontamination levels twice the tentative ones used on this job would enable work to be carried out far more economically. On many occasions more time was expended in lowering levels from 10,000 d./min./100 cm.^{2} to 5,000 d./min./100 cm.^{2} than from levels of the order of 100,000 d./min./100 cm.^{2} to 10,000 d./min./100 cm.^{2} In addition, the problem of recontamination is lessened. Whether such a level would materially enhance the health hazard for future alterations is certainly debatable.

6. Experience on this project indicates that maximum permissible limits set for air contamination could possibly be raised for similar projects or work. Careful health supervision naturally must be maintained.

7. Evaluation of some decontamination methods is desirable, particularly in view of project success with wet methods of laying dusts as a means of keeping air levels down, and use of acids for some types of surface decontamination.

8. If levels used as basis for this job are acceptable, this method of disposal is more economical than other methods originally discussed.

STEERING COMMITTEE OPINION

In view of the health records and surveys (see TABS L, M, N, and O), it is the opinion of the Steering Committee that the major portion of contamination has been removed from Unit III, and it is very unlikely that any

future dismantling, repair, or alteration work will present any serious problem from the contamination standpoint. Consequently, we feel that Monsanto Unit III can now be returned to the Dayton Board of Education with the provision that Monsanto be notified prior to any major changes within the next three years in the remaining buildings or sewer and service lines, so that necessary health surveys and measures can be taken prior to undertaking such work.

RECOMMENDATION

Definite contamination levels for work or projects of this type should be established.

REPORT OF THE COMMITTEE TO PLAN FOR THE DISPOSAL OF UNITS III AND IV

A committee was appointed to plan for appropriate disposal of Units III and IV whenever these activities may begin. The committee consisted of:

J. J. Burbage	-	Assistant Laboratory Director
J. E. Bradley	-	Section Chief, Decontamination and Survey
M. M. Haring (Chairman)	-	Laboratory Director
J. J. Spicka	-	Business Manager
R. A. Staniforth	-	Division Director, Research and Development
N. Varley	-	Deputy Area Manager
J. R. Wiesler	-	Division Engineer

The committee met in the conference room of Mound Laboratory at 9:00 A.M., February 25, 1949.

Certain facts were first established.

1. Among these were the tolerances set for moving contaminated equipment, etc. Dr. Failla ruled a year or more ago that no piece of equipment may be declared surplus or otherwise sent into the channels of industry unless it shows a direct reading on an alpha meter of less than two divisions, i.e., six disintegrations per minute per square centimeter. Of course the wipe test must be zero. In addition we had set, last summer, a suitable tolerance for moving equipment from Units III and IV to Mound Laboratory. This is 100 disintegrations per minute per square centimeter, with a zero wipe test.

2. A discussion of the present status of Units III and IV confirmed the following. Most of Unit III is fairly "clean" and can be decontaminated on surfaces fairly readily. However, extensive disturbance of floors, walls or plumbing will undoubtedly stir up much "hot" dust which is presently in cracks, etc. Incidentally such disturbance would be very costly. The Quonset hut is quite hot, on the interior, and so are one or two laboratories in the main building. Almost all of Unit IV is very "hot." Decontamination would be almost impossible. In any case the Atomic Energy Commission has ruled that it be dismantled completely.

3. There is a great deal of valuable material at both sites that can certainly be salvaged. There is also a great deal of material the cost of salvage of which would greatly outweigh the recoverable value. To accomplish the task of disposal as economically as possible, these and several other factors must be carefully balanced.

4. Whoever accomplishes the task of wrecking and/or restoration must be adequately protected for the job. In most cases this will mean special clothing, gloves, masks, and often ventilated hoods. He and his surroundings must be fully monitored during the whole task.

5. It is most important, from the standpoint of public and industrial relations, that neighbors and workmen, other than our own, do not have their suspicions aroused concerning the unusual hazards of the operations. This means that the special protection mentioned in (4) must not be apparent to them.

6. Whoever does the wrecking and restoration must have an intimate knowledge of both sites so that hazards, both present and future, are

minimized. We are the only ones who really know or should be fully acquainted with these facts.

7. In view of the foregoing facts, the committee was unanimous that our own staff must restore Unit III and wreck the interior of Unit IV. A subcontractor, e.g., Maxon Construction Company, can then, in all probability, safely wreck the outside of Unit IV.

8. We are severely limited in our own forces to accomplish this work. However, we have presently at Units III and IV about thirty-six guards, most of whom cannot be absorbed into the Mound Laboratory staff. Many of these men have considerable "handy-man" talent and, under suitable tutelage from our Engineering Department, could do much of the work. Those selected would, of course, be reclassified as general mechanics, drivers, etc. This would extend their possible period of employment by Monsanto, but there is no escaping the necessity of additional personnel during the period of disposal. These guards, being cleared, would be very valuable in meeting this need. Last fall, when discussing personnel requirements, it was pointed out that at least twenty men would be required for the purpose.

9. We have very extensive storage facilities at Scioto Laboratory which would be ideal to care for valuable contaminated equipment during a few years of "cooling off." Such equipment could be "cocoonized," covered with a strippable plastic, or left "as is" depending on its nature and the degree of contamination.

10. There is adequate storage in the hidden back corners of Mound Laboratory to pile up contaminated material destined for destruction. None should be shipped to Oak Ridge. It is hoped that our contaminated

burnable waste incinerator will be a reality by next Christmas. When this occurs, all such material can be permanently disposed of.

11. Unit IV is not to be touched, according to W. J. Williams, until it is certain the "T" Building will do what is expected of it. This does not appear to be possible before June, 1949. It is desirable to return Unit III to the Dayton School Board as soon as possible. Therefore, it is quite possible we should start on Unit III rather than Unit IV.

12. Spraying of interiors with a plastic to fasten down activity is an attractive possibility, if one can get at the activity. However, most of it is hidden and will dust out at each step. In addition, the cost would be extreme. An estimate of $11,000 to so treat the interior of Unit IV was made last summer. Mr. Wiesler says this figure is far too low. The committee considers spraying a useful additional precaution but no substitute for standard procedures.

In view of the foregoing, certain procedures applicable to both Units III and IV were set up.

1. All things not contaminated and immediately useful to us should be moved to Mound Laboratory. They will have to be put into one of Maxon's construction warehouses until they can be sorted, inventoried, and permanently stored. Presently we are overwhelmed in this matter, the best estimate being six months to clear up the situation as of the moment.

2. All telephones must be carefully surveyed. If "clean" they can be returned to the Telephone Company. If "hot," as the majority are, they will be decontaminated to zero wipe test and exchanged for "cold" telephones in low risk areas at Mound Laboratory wherever possible. In this fashion

the number of instruments we will be forced to buy will be kept to a minimum.

3. A committee has been appointed whose duty it will be to pass on all contaminated apparatus or equipment presently at Units III and IV. It is most important that the amount of scrapped items be kept to a minimum. To this end, this committee will determine the following points:

a. Possibility of economical decontamination. Such items will be put in stores at Mound Laboratory or declared surplus property.

b. Possibility of using certain equipment in "hot" areas at Mound Laboratory with little further treatment.

c. Advisability of storing in warehouses at Scioto Laboratory to "cool off." The committee will also determine whether such items are to be "cocoonized," coated with a strippable plastic or left "as is."

d. Exactly what apparatus and equipment should go to the scrap pile at Mound Laboratory.

This evaluation committee is as follows:

J. J. Burbage (for Unit IV)	- Assistant Laboratory Director
M. M. Haring (general referee)	- Laboratory Director
R. A. Miller (or J. E. Bradley)	- Section Chief, Health Instruments
R. D. Shiffer (or F.L. Halbach)	- Plant Engineer
J. J. Spicka (chairman)	- Business Manager
R. A. Staniforth (for Unit III)	- Division Director, Research and Development

4. As the evaluation committee proceeds through the various rooms and buildings, our engineering, health, and business personnel will proceed to act on its findings.

5. Remove air conditioning units from the attic.

6. Vacuum clean and spray the attic.

7. Remove all contaminated mechanical, electrical, and plumbing equipment for disposal as recommended by the evaluation committee.

8. Tear out the whole interior of the Quonset hut.

9. Survey the interior of the shell of the Quonset hut. If cold it can be sold "as is where is" or disposed of as agreed on with the School Board. If hot it should be sprayed with plastic and left.

10. Clean out, i.e., sweep, all rooms.

11. Survey all rooms, decontaminate where indicated, and resurvey to establish the fact of decontamination.

12. Fence and guard houses should be left.

13. Return property to the School Board with the agreement that no major changes in walls, floors, or sewer lines be made within five years without seeking our aid in survey, etc.

14. Any of the items above may be modified if survey indicates they are necessary or unnecessary.

UNIT IV

1. Dispose of all cold mechanical, plumbing, heating, and lighting equipment by warehousing at Mound Laboratory or declaring surplus property.

2. Remove all contaminated mechanical, electrical, and plumbing equipment for disposal as recommended by the evaluation committee.

3. Spray interior as indicated by survey.

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5. A general steering committee will be established to care for the whole job of disposal. Its primary function (and temporarily sole duty) will be to coordinate all phases of the disposal program and see that things are carried through. The committee will submit reports at bi-weekly intervals to management. The committee is as follows:

L. E. Byriel	- Area Office Supervisor
F. L. Halbach (chairman) (or R. D. Shiffer)	- Chief Design Engineer
J. E. Bradley (or R. A. Miller)	- Section Chief, Survey and Decontamination

6. Both steering and evaluation committees should avail themselves of the services and advice of W. D. Woods, Legal Advisor to the Director, whenever any question pertaining to the contract or other legal matter arises. If further help from any of the division is indicated, they should approach the division director concerned.

The tentative specific programs for Units III and IV are as follows:

UNIT III

1. Dispose of all cold mechanical, plumbing, heating, and lighting equipment as the forthcoming agreement with the Dayton School Board may indicate.

2. Sell the tropical huts, "as is where is."

3. Remove and scrap all duct work, except that used to heat the third floor.

4. Remove and scrap all benches, hoods, and temporary partitions except those on the third floor.

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4. Tear out all rooms, partitions, etc., built in any hot operating area. Tear out ceiling, wall, and floor linings in the same areas. This will be a particularly hazardous operation. Spraying may be resorted to where indicated, but is not expected to be of much use owing to the spongy porous nature of much of the material to be removed. Ventilated hoods and special clothing may have to be worn throughout.

5. All hot wreckage material should be sorted into burnable and non-burnable categories and hauled to the scrap piles at Mound Laboratory. The trucks used for this service will probably have to be considered expendable since their decontamination may prove to be impossible.

6. Sweep out all loose dirt.

7. Spray interior of shell wherever indicated by survey.

8. Hand over the shell of the building and surrounding small structures to Maxon for razing as arranged by the Atomic Energy Commission.

9. Material from razing should be put on the scrap piles at Mound Laboratory.

/s/ M. M. Haring
Laboratory Director

MMH:ek
2/28/49

FACTORS AFFECTING THE PROBLEM

HISTORY OF UNIT III

"Early in the summer of 1943 it became obvious that someone had to produce large quantities of polonium. This was undertaken by Monsanto at Dayton. ... Dr. Thomas became Project Director; Dr. Hochwalt, Assistant Project Director; and Dr. Lum, Laboratory Director. ... Meanwhile, Thomas, Hochwalt, and Lum had determined that the old Bonebrake Seminary at First Street and Euclid Avenue, later known as the Green Normal School, and at that time a somewhat bettered warehouse belonging to the Dayton School Board was available on a rental basis and could be made serviceable. It came into the hands of the Project on October 15, 1943 at which time a guard was mounted. All activities were transferred to it October 25, 1943. See plot plan, Unit III Area, September, 1943, and also photograph, Unit III, Structure Prior to Occupancy, September, 1943. ... Work immediately was started to place the building in condition to be used for laboratory purposes. This site was identified as Unit III. Beneficial occupancy was made about November 1, 1943. Considerable remodeling was required to place the building in usable condition. ... In addition two guard houses, a small chemical storage shed, and a fence were erected. The third floor of the main building was renovated and necessary changes made to provide services. ...

In November, 1944, a wooden warehouse building was erected at Unit III. ...

Early in 1945 it was decided to construct several temporary buildings on the land leased from the Board of Education: Offices and Cafeteria; Physics

Laboratory and Locker Rooms; Laundry and Glass Blowing Shop; Machine Shop; and Power Plant. ... A new main guard house was erected near the southeast corner of the property. A cyclone fence was erected following the boundary of the property. ...

Considerable difficulty was experienced in the proper operation of balances and electronic equipment, so a very definite need for an air conditioned building became evident the early part of 1946. This building was numbered "C." Beneficial occupancy was made in October. Space for stockroom and warehousing was constantly becoming inadequate. Accordingly, two portable aluminum buildings 20' wide by 54' long were placed on the premises of Unit III. ...

On December 4, 1946 work was started to erect on the Unit III Site, a Stransteel Quonset Hut, 40' by 100' to carry on [redacted] production. This building is designated as "L," and a portion of it allocated for much needed office space. Construction of Building "L" also necessitated changes in fence line, moving of guard house, "K" and erection of four additional tropical hut buildings to house machinery, maintenance supplies, and miscellaneous material. ...

See plot plan, Unit III Area, October, 1947.

See photograph, Unit III Area, October, 1947.

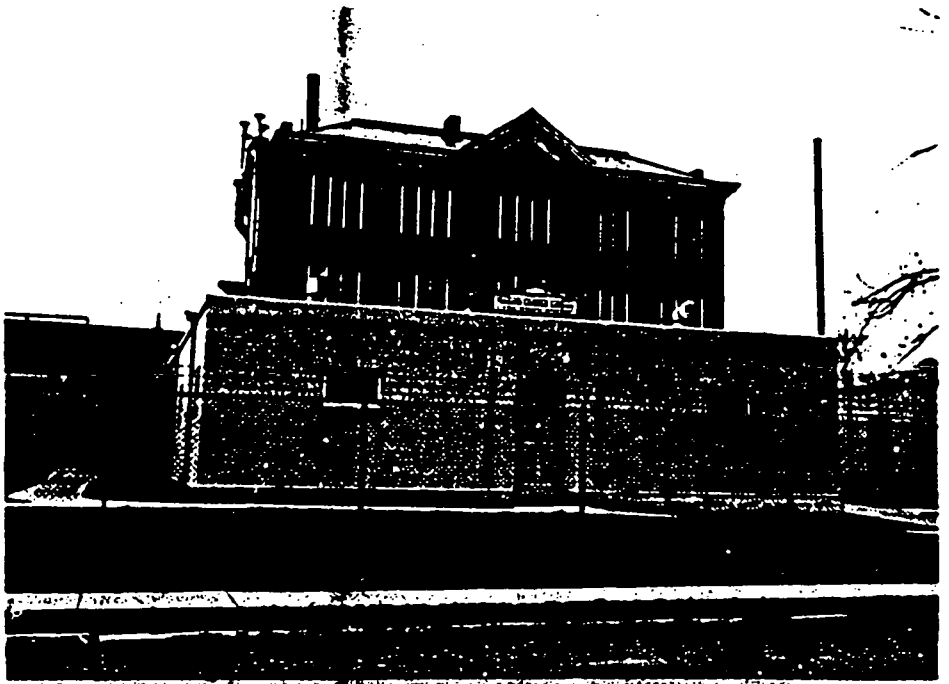
The research activities of the Dayton project divided themselves early into general research and development research. In the first stages development research was greatly stressed. ... (Note: Both phases of this research were carried out at Unit III.)

[redacted], formerly made at Los Alamos, were brought under Monsanto direction with original planning started in June, 1946, and actual making beginning in July, 1947, in the Quonset Hut at Unit III. ...

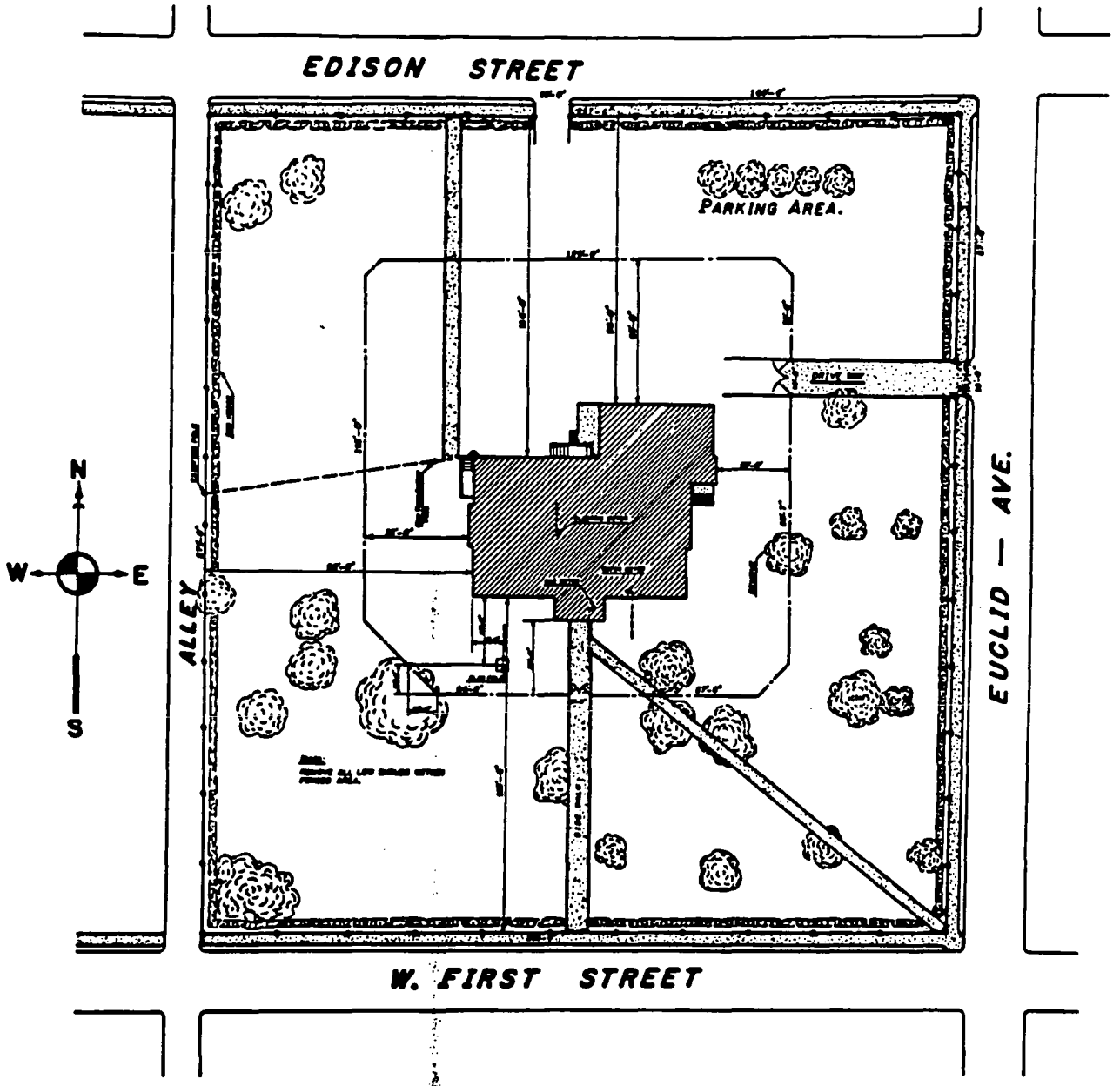
Every laboratory working with radioactivity has the problem of protecting the workers against the health hazards arising from various radiations. The Dayton Project was no exception. Besides polonium alphas, betas, and gammas from RaE and also from silver and iron, - which occur as impurities in bismuth, - and neutrons were considered. ... Despite all efforts, contamination persisted at a higher level than desired."

Note: It is this so-called contamination (in our case entirely alpha) which makes this disposal of Unit III a rather complex, difficult, potentially hazardous, and expensive problem.

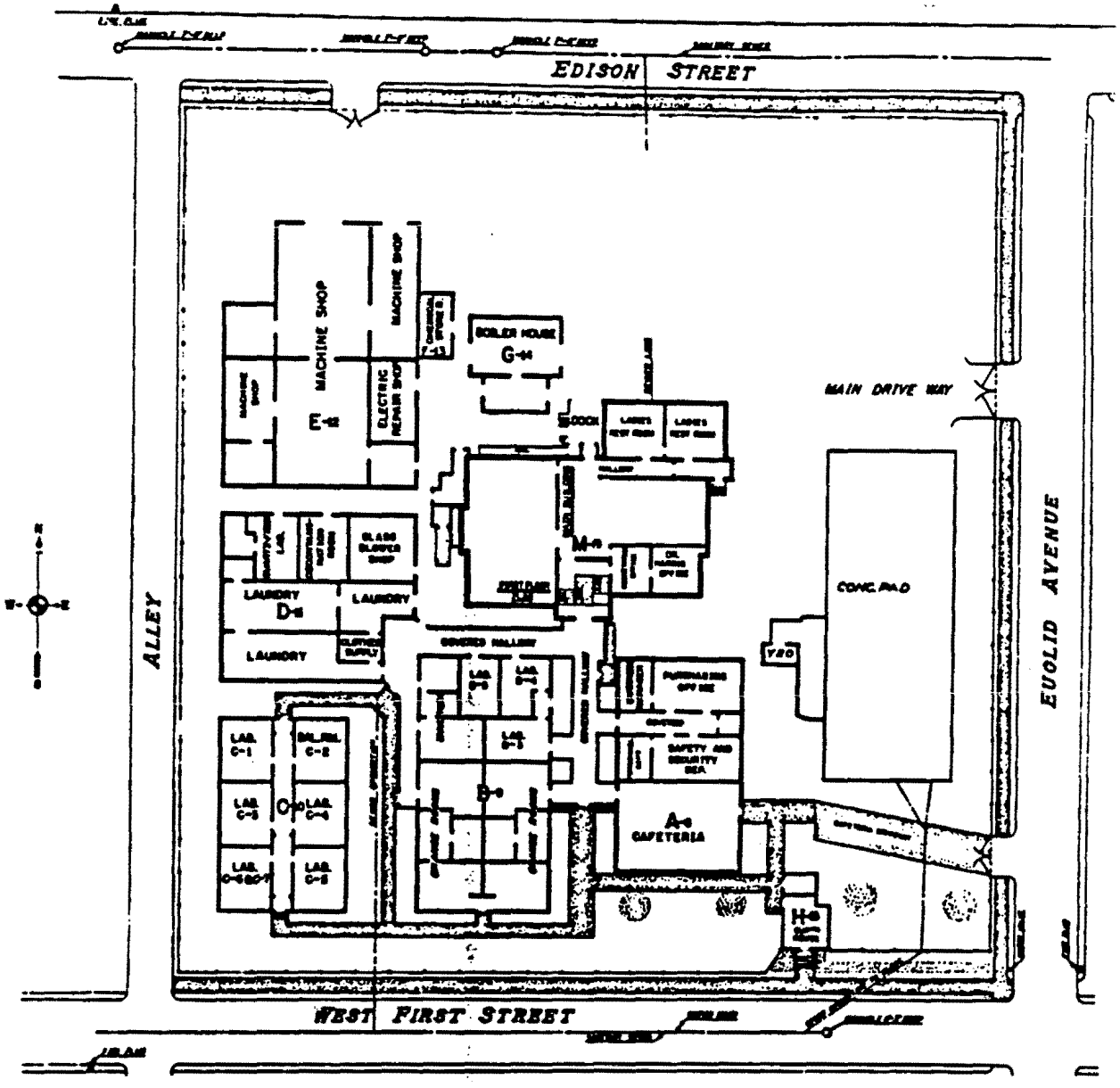
47248 UNIT 3 STRUCTURE PRIOR TO OCCUPANCY SEPTEMBER 1943



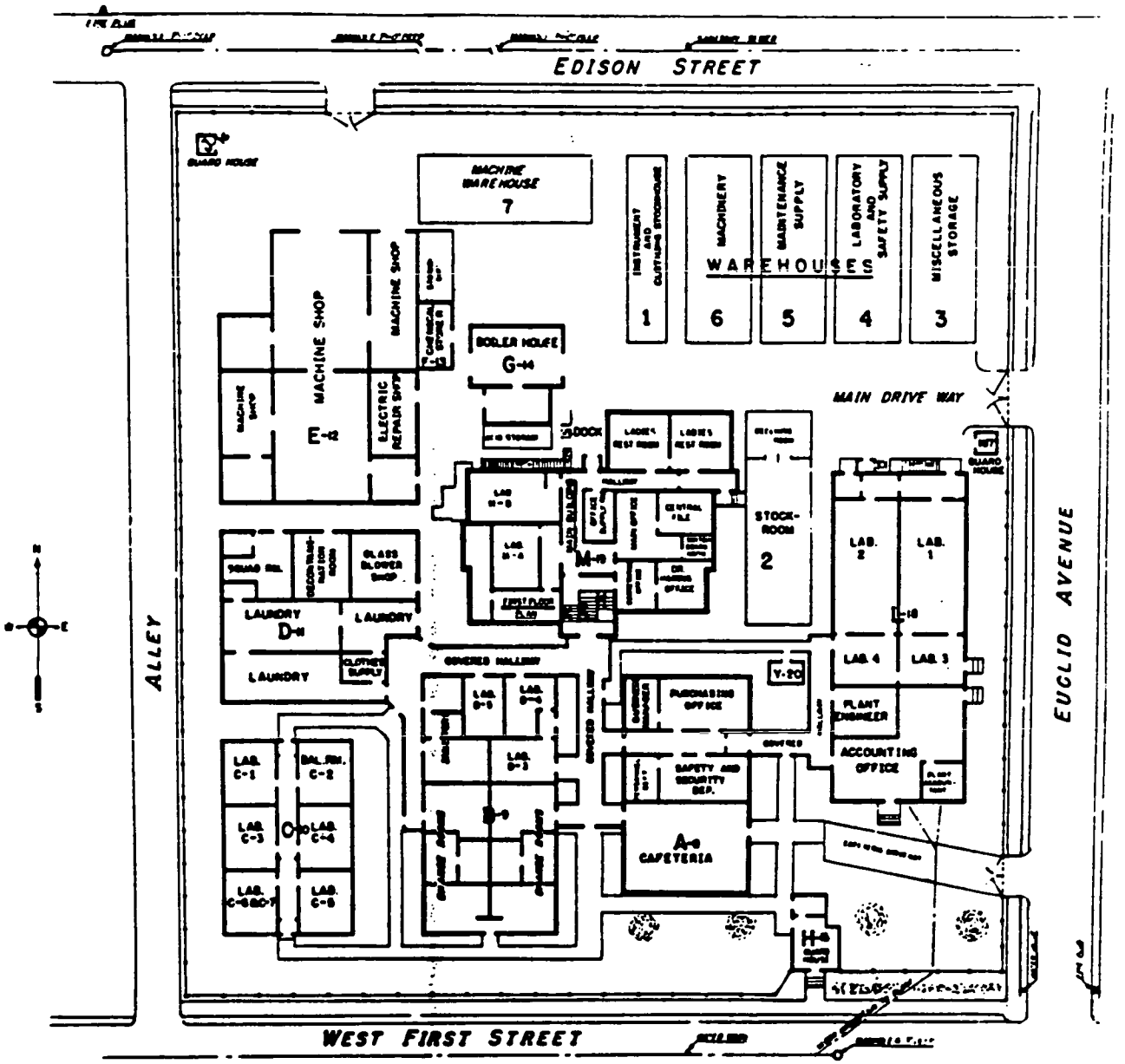
47247 UNIT 3 AREA OCTOBER 1947



PLOT PLAN UNIT 3 PRIOR TO OCCUPANCY SEPTEMBER 1943



PLOT PLAN UNIT 3 AREA OCTOBER 1949



PLOT PLAN UNIT 3 AREA OCTOBER 1947

TAB C

UNITED STATES
ATOMIC ENERGY COMMISSION

EIDMW-3

Oak Ridge, Tennessee
February 10, 1947

United States Atomic Energy Commission
Dayton Area
Dayton, Ohio

Attention: Colonel R. J. Kasper, Area Engineer

Subject: RETENTION OF RADIOACTIVE PROPERTY AND SALVAGE MATERIAL

1. It is essential that action be taken to prevent radioactive material from entering commercial channels. You will establish necessary procedures to insure that it is impossible for materials of this type to lose their identity or to enter commercial channels through sales or transfer of surplus property, salvage, and scrap.

2. Material which gives greater than two times background on the instrument Victoreen 263, or greater than two divisions on the most sensitive scale of the Zueto will be considered sufficiently contaminated to justify withholding them from commercial channels until policies and procedures governing the disposition can be formulated.

3. In the event the instruments referred to in Paragraph 2 are not available, they may be obtained by submission of AEC Form 500 to the Instrument Production Section, Research Division, in accordance with District Circular Letter (Research Control 47-1) dated 27 August 1946.

4. The present procedures now governing the transfer of property and material between installations of the Atomic Energy Commission is not affected by this directive.

ATOMIC ENERGY COMMISSION

/s/ P. F. Kromer, Jr.
Colonel Corps of Engineers
Deputy Manager, Field Operations

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TAB D

MLM-393

June 30, 1949

Dr. Lauriston S. Taylor, Chief
Applied Biophysics Branch, Div. of Biol. & Med.
Joe Deal
Applied Biophysics Branch, Div. of Biol. & Med.
VISIT TO DAYTON

REFER TO SYMBOL: BM:LJD

On Friday, June 24, 1949, Dr. Stoeckle and I spent the day at the Dayton Area. Since they have moved to Mound Laboratory, they now have the problem of the disposing of the old plant which consisted of two sites in the city of Dayton, one of them known as "Runneymeade Playhouse" and the other, the old School House. The disposal of Runneymeade Playhouse will not pose the same difficulties since the Monsanto Health Division will be in complete charge of the operation, which consists of tearing the building down and storing it. I do not mean to imply that this will be an easy job. However, it will be under control.

The main problem at present is the disposal of the School House. Since the building does not belong to the Government but to the Dayton city school system and the School Board is looking forward to having it returned in the future, this poses a rather knotty problem. The Manager at Dayton has decided that he will make as thorough a clean-up as possible of the building without going into major construction or destruction with the idea of having a thorough survey at the completion of the clean-up. His staff will prepare a staff paper based on their findings. Mr. Dunbar felt that he had two possible choices. This was one and the other was not to do anything but write a staff paper making recommendations.

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They have arbitrarily set as the limit of decontamination 5,000 disintegrations per minute as read on a Victoreen alpha survey meter. This corresponds, roughly, to 50 disintegrations per minute per square centimeter of area. In addition, a piece of filter paper wiped over the area will not show any contamination. Because of the inaccessibility of a number of places in the school building and because of the fact that pipes and electrical conduits, etc., are contaminated and can not be surveyed, they are faced with a number of questions. Some of these are:

1. Will they be able to decontaminate and renovate the building, then return it to the School Board on a calculated risk basis.

2. What are the implications if they should return the building on a calculated risk plan.

3. Is their level of decontamination satisfactory.

4. Should they lease the building for several more years and allow the activity to decay.

5. Should they buy the building and tear it down.

We discussed a number of these possibilities without really trying to come to any general agreement, since anything we would have decided would have been premature. There was some talk of turning the building over to the School Board with the provision that any major repair work would have to be supervised by the Monsanto health people. This did not seem very practical to me since once you lose control of the building you have no way of actually being certain that they don't do some work by ignorance on the part of the man doing the work or a slip-up in procedures or maybe the people would just not be willing to bother to wait on somebody to come from Miamisburg to make a survey.

One of the major considerations that was facing the health physics people at the time we were there was that they will not be able to decontaminate the roof. It was my opinion that since they had already made the decision to do the best clean-up they could, that this would be a problem for them to decide themselves rather than waiting to get an indication from some higher authority as to whether their 5,000 level is adequate. However, it would be of great assistance if they could get some indication on the general acceptance or rejection of their decontamination level. This is a rather arbitrary figure and was calculated independently by two groups there. The assumptions behind this figure are: (1) that they would accept in their new plant anything that contained as many as 10,000 disintegrations per minute provided that none of the contamination would wipe off; and (2) 5,000 disintegrations per minute is roughly either 10 or 100 times the level set for returning stuff to commercial channels. This latter figure is one I am not familiar with but I do know that before the AEC took over from the Manhattan District, there were some sad experiences due to releasing contaminated materials through the sale of surplus property. Because of this, an extremely low figure was set for the release of scrap on the open market. I am not sure about the history of this figure nor am I sure of what it is. However, it is a figure that can be dug out of the files.

In general, the situation does not seem impossible nor critical. The staff at Dayton, with the help of Mr. Hayden from Dr. Holland's office, seem to be feeling their way along and meeting each situation as it arises. I would recommend that we make an effort to consider this decontamination figure and then wait for the staff study that Mr. Dunbar will prepare.

DISPOSAL OF UNIT III

The Engineer-in-charge was obtained from Monsanto design force on the Scioto Laboratory Project, and reported for duty on May 2, 1949, which date marks the beginning of the disposal program at both Units III and IV.

Work orders were assigned to the various jobs involved in dismantling Units III and IV (see TAB F).

Personnel were obtained on temporary transfer basis due to reduction in force in Security and Business Divisions. Other personnel were obtained as required on temporary loan from Engineering, Business, Operations, and Health Divisions.

The Health Supervisor, on temporary loan from the Atomic Energy Commission, Oak Ridge, Tennessee, reported for duty on May 23, 1949.

Work was started simultaneously at Unit III, and at Mound Laboratory, in connection with preparation of a storage site for contaminated wastes.

Due to the feeling that contamination levels established for property transfer to commercial channels were not applicable to this problem, tentative levels were established for work at Unit III (see TAB G). It was pretty well agreed that decontamination to levels mentioned in TAB C would be uneconomical, if not impossible to achieve.

Change house, clothing, and health procedures were established for Unit III to safeguard personnel, minimize possibility of high urine counts, and lessen tendency for recontamination (see TAB H).

The following maximum permissible limits for air levels and necessary protection required were established:

0- 3,000 d./min./m.^{3}	-	no protection required
3,000-25,000 d./min./m.^{3}	-	respirators required
25,000-50,000 d./min./m.^{3}	-	assault masks required
Over-50,000 d./min./m.^{3}	-	work ceases in such areas until levels drop

The same maximum limit of 12 c./min./50 ml. for urine samples as is used at Mound Laboratory was used on this project.

In connection with health surveys, it was pointed out early that accurate and thorough readings in remote and less accessible spots were not possible, and that it was likely under normal conditions for some levels higher than the levels set, to go undetected until later surveys, and possibly undetected at all. This was corroborated when the final survey was made.

Warehouses used during construction of Mound Laboratory were turned over for our use for:

1. Temporary storage of clean equipment and materials.
2. Temporary storage of contaminated equipment and materials.

Definition as given in TAB C was used to differentiate between clean and contaminated equipment. Items contaminated in excess of 5,000 d./min./100 cm.^{2} were decontaminated and/or packaged in a manner compatible with type, size, and shape of equipment.

Contaminated scrap materials were separated into combustible and non-combustible categories, and stored separately at the contaminated storage site so that combustible material could later be used in incinerator program. All

such material was handled in accordance with levels established in TAB G.

Decontamination methods in many cases had to be decided on the spot, and were dependent on contamination level, type of material, shape, and location. It was agreed that for purposes of this project the most drastic methods could be used on any object compatible with restoration.

Only one truck was available for handling contaminated equipment. Rather than contaminate a second truck, it was found necessary in the last weeks of the project to work six days on the hauling end of the job.

The six tropical huts at Unit III were dismantled, since they were too contaminated for public sale. Later they were again set up on the contaminated storage site to house scrap materials too bulky to package. Also, the Quonset hut, being too contaminated for public sale, was later dismantled and transferred to the contaminated storage site for erection and storage of additional materials.

Personnel were mostly reclassified as general mechanics (later maintenance mechanics, 2nd class) so that any type of job on the project could be assigned to any man, making necessary allowance for individual's physical condition and capabilities.

A preliminary survey of the general outside area was made in June (see TAB I). Already recontamination was becoming a problem.

The Engineer-in-charge originally procured for the job left Monsanto in June. The final report prepared by him is reproduced as TAB J. The assistant engineer took over project supervision and additional personnel were procured from the Operations Division to provide supervision at both units.

A preliminary survey of building roofs, exterior vertical surfaces, and Quonset hut exterior was made in early July. Summary of survey showed the following:

Roofs of Buildings

69 Areas	0- 5,000 d./min./100 cm.^{2}
15 Areas	5,000-50,000 d./min./100 cm.^{2}
1 Area	Over-50,000 d./min./100 cm.^{2}

Quonset Hut Exterior

12 Areas	0- 2,800 d./min./100 cm.^{2}
1 Area	Over-50,000 d./min./100 cm.^{2}

(Off scale area in this case can be decontaminated. However, level is in excess of that permitted for sale to public.)

Exterior Vertical Surfaces

44 Areas	0- 5,000 d./min./100 cm.^{2}
8 Areas	5,000-50,000 d./min./100 cm.^{2}
2 Areas	Over-50,000 d./min./100 cm.^{2}

A third meeting of the Planning Committee was held on July 23, 1949 to reach an agreement on questions brought about by work at Unit III, pertaining to acceptable levels for return of Unit III to the Board of Education, and to treatment of asphalt floors, roofs, Quonset hut, building exterior vertical surfaces, and ground area, including walks and drives. Decisions are listed in Progress Report for the period July 16-31, and shown at TAB K.

The "C" Building air conditioning unit was dismantled and transferred to Fairchild Engine and Airplane Company, Oak Ridge, Tennessee. The main building air conditioning unit was transferred to Mound Laboratory, since no

other project showed any interest in this item. The 100 H.P. boiler was transferred to the U. S. Engineers, Louisville District Office.

We had been advised by decontamination personnel that there was no satisfactory method of decontaminating concrete surfaces. However, during work at Unit III, it was found possible to do a satisfactory decontamination job quickly and easily on unpainted concrete surfaces, with cleansers and nitric and hydrochloric acids. Use of a concrete floor machine such as that which the Tennant Company manufactures was not very satisfactory due to unevenness of concrete surfaces.

Practically every type of decontamination procedure was used at one time or another on the project. Floor sanders, hand sanders, paint removers, acid washes, detergents, actual removal of contaminated parts were all among the methods employed. Wet methods of laying dusts proved very successful in keeping air levels down. Painting of contaminated laboratory furniture, hoods, and other equipment of a similar nature proved a very satisfactory method of fixing contamination and enabled dismantling to proceed with decreased likelihood of raising air levels. Use of vacuum cleaners and portable fans during dismantling operations, likewise, helped maintain low air levels. Painting was not recognized as a means of decontamination for this work.

Due to success with decontamination of concrete and maintenance of low air levels by use of wet methods of laying dusts, the request was made that we carry out some field experimental work on these methods and evaluate the results obtained. This work was not, however, to conflict with the main disposal project. If results merit it, a separate report will be issued later in this regard.

From Unit III the following property, materials, and scrap were transferred to Mound Laboratory:

100 loads - All types of contaminated scrap

35 loads - Property items and usable materials to Warehouses 10 and 13

In addition, the six tropical huts, a Quonset hut, and two small guard houses were transferred to Mound Laboratory. Likewise, approximately thirty loads of unsalvageable clean scrap were transferred to the Dayton dumping grounds.

Clean salvageable metal scrap, and surplus lockers and cabinets were set aside for sale on "as is-where is" basis. Most wood scrap was eventually found to be too contaminated for sale, and was transferred accordingly to the Mound Laboratory storage site.

The Health Supervisor left the project at the end of September. His final survey was issued in a report to the Chief, Biology and Medicine Division, Oak Ridge, Tennessee (see TAB L). This report lists twelve areas not completed at the end of September. Final survey on these twelve areas was made by personnel from Monsanto Health Division and is given in supplement to final survey (see TAB M). Work outside the fence line was not included in this disposal program for very obvious reasons. Surveys of drain and sewer lines are not feasible; all such lines, however, were water flushed copiously during dismantling operations.

The work at Unit III under this committee was completed in October. At this time the Business Division was advised accordingly so that they could proceed with termination of service contracts and other phases of the program coming under their supervision.

TAB F

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May 3, 1949

WORK ORDERS FOR THE DISMANTLING OF UNITS III AND IV

The following Work Order numbers have been assigned to the various jobs comprising the work required for the dismantling of Units III and IV:

42-130-3 - All time and material required for the dismantling of Unit III should be charged to this Work Order number.

42-131-3 - All time and material required for the dismantling of Unit IV should be charged to this Work Order number.

42-132-1 - All labor and material for the construction of the areas at Mound Laboratory for the storage of dismantled materials and equipment from either Units III or IV should be charged to this number.

The time and labor charged to these Work Orders should include those of salaried and supervisory personnel as well as hourly personnel used in the actual dismantling or construction.

/s/ J. R. Wiesler

JRW/ras

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TAB G

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Mr. Herman Holsopple May 5, 1949

DISMANTLING OF UNIT III

The following points were agreed upon as a tentative basis from the health standpoint for procedure with work at Unit III.

1. Any piece of equipment or structural material or surface that cannot be reduced to a zero wipe is to be removed.

2. For our purpose any object is considered clean that shows a direct reading of 500 d./min./100 cm.^{2} or less.

3. Any loose or easily removable piece of equipment or structural part that shows a direct reading greater than 500 d./min./100 cm.^{2} is to be removed for storage in contaminated warehouse or consigned to waste storage site.

4. Our primary objective is to reduce our contaminated areas to a level of 5,000 d./min./100 cm.^{2} or less.

In some spots it will be definitely impossible to attain this level. Such cases are to be considered individually.

5. After the work has progressed to a point defined by Items 1 through 4, a second meeting will be held to discuss any irregularities and their subsequent treatment.

Meeting was attended by K. A. Dunbar, D. H. Naimark, E. A. Langdon, representing Atomic Energy Commission; J. E. Bradley and F. L. Halbach, representing Monsanto Chemical Company.

/s/ F. L. Halbach

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TAB H

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UNIT III - CHANGE HOUSE, CLOTHING, AND HEALTH PROCEDURES

REGULAR EMPLOYEES

1. The only clean area will be the covered hallway to the main building and the clothing supply room as well as the clean locker room and hallway to it from the east entrance.

2. Entrance will be by the West First Street entrance, to the clothing supply room, hence to the clean locker room via the clean area.

3. Personal clothing will be left in lockers and clean protective clothing worn to the hot locker room to pick up shoes. Paper slippers will be provided.

4. Protective clothing will consist ofcoveralls, underwear, hat, socks, and shoes as well as gloves, respirators, etc. as required for special jobs. Each day should be started with clean protective clothing. Work clothing, including shoes, will be left in the "dirty" side of the locker room.

5. Eating - A clean place for lunch will be provided in the Cafeteria. No one will be allowed in the Cafeteria or out the gate while wearing protective clothing. Lunches should be left in the Cafeteria, at the time of reporting for work.

6. Drinking Water - A drinking fountain will be provided in the clean cafeteria area and one in the basement for use while work clothing is being worn.

7. Smoking - There will be no smoking while wearing work clothing except in the "dirty" side of the locker room, after washing and checking the hands. Every effort should be made to prevent contact of the hands with the contaminated clothing.

8. Samples - Urine samples should be submitted each Monday and Wednesday. They should be collected at the time of reporting for work in the Change House near the first street entrance. Containers will be available there. Samples may be placed in the box provided in the Guard House. If for any reason a sample cannot be collected at that time, every precaution should be taken to prevent contamination of the sample at the time it is collected.

9. Exceptions - Truck drivers who will not be admitted to Unit V while wearing white clothes will wear colored clothes and cover then with laboratory coats while in this area.

/s/ R. Hayden

TAB I

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SURVEY OF GENERAL OUTSIDE AREA - UNIT III

The following survey was made to determine extent of contamination of grounds, drives, walks, etc. at Unit III. Survey was made by J. Bruce on June 23, 1949, using alpha meter. From the readings shown one can readily see the possibilities of recontamination.

Location	Reading
Immediately back of main building	42,300 d./min./100 cm.^{2}
Entrance to Warehouse No. 3	900 d./min./100 cm.^{2}
Left side Euclid Avenue Gate	21,150 d./min./100 cm.^{2}
Gutter outside same gate	>84,600 d./min./100 cm.^{2}
Right side same gate	>84,600 d./min./100 cm.^{2}
In front of same gate	>84,600 d./min./100 cm.^{2}
Gutter by curb, Euclid Avenue	21,150 d./min./100 cm.^{2}
Middle of street	5,500 d./min./100 cm.^{2}
Sidewalk, same area	>84,600 d./min./100 cm.^{2}
Sidewalk, side guard house	>84,600 d./min./100 cm.^{2}
North end of Quonset hut (walk)	>84,600 d./min./100 cm.^{2}
Sidewalk, by temporary Carpenter Shop	7,420 d./min./100 cm.^{2}
Handrail, main gate	44,000 d./min./100 cm.^{2}
Sidewalk, north entrance to Marlite Room	>84,600 d./min./100 cm.^{2}
Sidewalk, west entrance to Marlite Room	>84,600 d./min./100 cm.^{2}
Walk between main building and laundry	83,000 d./min./100 cm.^{2}
Walk outside laundry double doors	42,300 d./min./100 cm.^{2}
Walk in front of decontamination room	82,000 d./min./100 cm.^{2}

Location	Reading
Walk in front of "C" Building	4,500 d./min./100 cm.^{2}
Walk in front of B-2 door	13,000 d./min./100 cm.^{2}
Walk between boiler room and acid storage rooms	22,000 d./min./100 cm.^{2}
Walk in front of boiler room	45,000 d./min./100 cm.^{2}

TAB J

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Mr. F. L. Halbach June 24, 1949

REPORT ON DISMANTLING UNITS III AND IV

Attached herewith is a report of activities to date covering the dismantling of Units III and IV, together with copy of Organization Chart and Change House procedure.

Actual dismantling of contaminated laboratories and definite procedures pertaining thereto started May 23, 1949, at which time Mr. Robert Hayden of A.E.C. arrived to supervise monitoring activity levels. During this period five contaminated laboratories and the laundry area have been dismantled and decontamination progressed to such a point that we believe it is feasible to reach the tentative levels set up by the Steering Committee with the organization as presently set up. A very rough estimate of $1.10/cu. ft. is made for cost of labor, material, and equipment in laboratories requiring complete dismantling with possible completion date of October 1, 1949. If factual cost data substantiate these estimates it appears more feasible to continue with immediate dismantling of Unit III and decontamination although an increase to 10,000 alpha d./min./100 cm.^{2} is recommended as more easily obtained.

The cooperation of all departments as well as the men assigned to the work has been excellent.

I believe the group is well organized and can do the work required although I would recommend that an early official decision be made as to the acceptability of the levels now being used.

/s/ Herman L. Holsopple

HLH/ras

REPORT ON DISMANTLING UNITS III AND IV

(May 1 through June 24, 1949)

WORK OUTLINE

The scope of work set up by the Steering Committee under the direction of Messrs. Halbach and Bradley consisted of the following:

1. Prepare a contaminated storage area south of Warehouse No. 7 at Unit V using dismantled warehouses from Unit III for storage of loose contaminated scrap. This work was completed in May.

2. Dismantle laboratory equipment and decontaminate Unit III in the entirety for return of permanent buildings to the School Board. Maximum permissible limits tentatively set to date are a maximum of 5,000 alpha d./min./100 sq. cm. direct reading and zero wipe. Zero wipe is defined as no detectable reading on a sample using an alpha meter. Contaminated equipment over 500 alpha d./min./100 cm.^{2} having salvage value is packaged or painted to hold contamination during transportation and removed to Warehouse No. 10 to permit decay of activity for ultimate disposal by sale or transfer. Scrap lumber and material is either painted to fix contamination or boxed for removal to contaminated scrap yard.

3. Dismantle laboratory equipment and decontaminate Unit IV in entirety to permit ultimate wrecking of buildings by outside contractor. Disposition of equipment is as above under Item 2.

METHODS

Experience previously gained by a group of workmen wrecking equipment at Unit IV without adequate dust control and frequent air sampling indicated

that careful technique of dust control would be required for successful dismantling.

Tests were made using frequent wetting, vacuum cleaners, and spray painting both with and without ventilation.

To date air levels requiring use of respirators only, have been maintained by careful cleaning, with vacuum cleaner, spray painting of exposed surfaces and continued operation of exhaust system. Dismantling of benches and hoods is done as carefully as possible with under surfaces cleaned and painted as above.

This entire operation requires skill and experience correlated to air samples.

Harrell and Rose were assigned to ripping out laboratory equipment and developed the techniques that have so far proven successful.

General dismantling procedure is as follows:

1. Room survey by Health Group is made with installations coded as follows:

   a. White - clean may remain.

   b. Yellow - contaminated - no wipe, may be removed to storage or scrap.

   c. Red - contaminated with wipe, to be painted before removal.

2. Electrician assigned to work kills all services to installations marked for removal excepting exhaust and lights.

3. Gas, air, and water supply shut off as required.

4. Dismantling group vacuum cleans entire room.

5. Painters spray paint all installations marked in RED.

6. Dismantlers proceed to remove painted items, vacuum cleaning under surfaces.

7. After all equipment and contaminated installations are removed a resurvey is made of walls and ceilings with areas marked with readings showing over permissible levels.

8. Removal of contaminated surfaces by washing, sanding, or grinding as required is done by the decontamination group with concurrent checking by Health Surveyor.

Evidence to date indicates very shallow penetration of contamination in plaster, asphalt tile, and concrete. Direct washing will not decontaminate surfaces to direct readings required in most cases.

PERSONNEL

Initial personnel as of May 1, 1949 consisted of nine men formerly on the Guard Force who were working a six-day week and were to be terminated. Four of these men were not permitted to do heavy lifting and as the work progressed this force was increased to a total of 21 men as shown on attached Organization Chart.

On May 23, 1949 all personnel went on a five-day work schedule with a general change of classification and approximate increase of 15 per cent. In general, the job moral was good through the change and remains good.

While no rigid boundaries are fixed it became evident that considerable job training for the various operations was required and a fairly successful attempt has been made to define specialized jobs at Unit III.

1. Harrell and Rose each head a group of two men each to carry through dismantling procedures. Their resourcefulness and initiative in orderly procedure and dust control has been responsible for low air levels to date.

2. Pebley heads a group of two for decontamination work which includes all surface removal necessary to reach required limits. He has shown considerable interest and ability in developing methods.

3. Staley and Linville, being limited to light work, have been assigned to all painting both in the laboratories for dust control and in the painting shop where necessary additional painting is done preparatory to hauling contaminated material to the scrap yard.

4. Takacs and Klotzbach are carpenters assigned to work principally on crating and boxing for both Units III and IV. A power saw has been set up at Unit III for using scrap lumber as available and it is believed that such custom-made boxes are more economical and satisfactory than to attempt to purchase containers to specifications.

5. Watren, electrician, and Smith, pipefitter, handle all respective services and clear the laboratories as required at Unit III and IV prior to dismantling.

6. Clothing requirements have required the full time of one man to date with Buford assigned to sorting, checking, and handling.

7. Trucking facilities and driver are furnished by Transportation with Long assigned to assist the driver. One two-ton stake truck to date has been sufficient to handle the output with an average of approximately 1 1/2 loads per day.

8. Work at Unit IV to date has consisted of cleaning up and painting with Chrisman, Kent, and Miller handling and painting items for transportation.

9. Care of grounds at Unit IV is handled by Howe and Walker.

HEALTH

Surveying and monitoring air samples is under the supervision of Mr. R. Hayden who set up counting equipment at both Units III and IV for current checks of air samples.

Maximum permissible limits established to date are as follows:

3,000 alpha d./min. per cu. meter	- no protection required
3,000-25,000 alpha d./min. per cu. meter	- use respirators
25,000-50,000 alpha d./min. per cu. meter	- use assault masks
Over 50,000 alpha d./min. per cu. meter	- workmen are removed

With methods outlined previously the job to date has continued with use of respirators only. For painting with Amercoat assault masks have been used.

A urine count of 12 alpha counts per minute per 50 milliliter is used for the maximum permissible level of individuals working in the nominal high risk areas. To date at Unit III no counts above this have been detected. With close supervision by the Health Group and careful training of the personnel in methods established the above tolerances have not proven to be an undue hardship and should be met with present procedures. It is not believed that increased allowable air counts would materially expedite the work as experience has shown that the least relaxation of care will throw the sample to two and three times the tolerances set by the Health Group.

A Change House procedure has been set up as outlined by the Health Group which provides for a clean area locker room and low risk area covering all plant areas adjacent to laboratories being dismantled.

Laboratories being dismantled are classified as high risk requiring additional clothing.

Smoking is permitted in the low risk change room and eating in the clean area only.

Very good compliance has been obtained from the personnel to date.

Urine samples are collected Monday and Wednesday with reports forwarded to the Health Supervisor.

COSTS

No cost figures are available from which a reliable estimate can be made at this time. The June cost figures should provide some reasonable data as during this month operations have been fairly uniform. It is evident that as allowable levels are lowered, the difficulty and cost rapidly increases. Practically, the lower limit is probably that found in the so-called clean contiguous areas such as the yards and ground from which recontamination occurs.

As a statement of opinion only, it is believed that a tolerance of 10,000 alpha d./min./100 cm.^{2} would greatly facilitate decontamination as surrounding yard and walk areas have direct readings ranging to 85,000 alpha d./min./100 cm.^{2}

A unit cost estimate may be made with the following assumptions:

Total volume of laboratories contaminated	70,000 cu. ft.
Volume of contaminated laboratories dismantled and decontaminated to date	14,000 cu. ft.
Man-hours expended to date	3,000
Direct labor at $2.00 per hour	$6,000
Material and equipment charges	$6,000
	$12,000
Overhead 50 per cent labor	3,000
15 per cent material	900
Unit Cost $1.10/cu. ft.	$15,900

On the above basis it is estimated that with the present organization and considering increased efficiency with experience gained, Unit III would be completed approximately October 1, 1949 at a cost of approximately $100,000.00 including $20,000.00 for miscellaneous areas to be decontaminated which were not included in the laboratories volumes shown.

A second alternative to the above is to remove only equipment known to be highly contaminated and of indefinite levels which should reduce the above estimate by 20 per cent of labor and material cost (decontamination group) and by the $20,000.00 item or to $64,000.00. Assuming two years required for decay of activity estimated at 125,000 d./min., with approximately $30,000 expense for guard services, it appears to present about equal cost. With immediate dismantling, however, the plant can be placed in use and hazards eliminated.

A third alternative to close the plant as is with only removal of saleable items presents the possibility of continued expense for an unknown

period, but probably from five to ten years guard service and maintenance again in this case would probably be greater than the cost of immediate removal.

Similar reasoning applied to Unit IV indicates the advisability of removing the highly contaminated equipment within the building but to date no estimate can be given as to the difficulty of decontaminating the structural surfaces to a level sufficiently low to permit access to private contractor.

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REPORT OF STEERING COMMITTEE FOR DISPOSAL OF UNITS III AND IV

PERIOD - JULY 16-31, 1949

GENERAL

At a meeting of the Planning Committee, on July 23, 1949, attended by M. M. Haring, Chairman, J. E. Bradley, K. A. Dunbar, F. L. Halbach, E. A. Langdon, J. R. Wiesler, and W. D. Woods, the following conclusions were reached:

1. No official decision can at present be given on an over-all acceptable level for return of Unit III to the Board of Education. Tentative levels previously established will be met as closely as possible, and a final completion report with health surveys attested by Health Supervisor issued when work is finished. This report will serve as a guide in deciding final status insofar as return to the Board of Education goes.

2. No definite levels were fixed for work at Unit IV; however, it was agreed that levels higher than those set for work at Unit III could be used, with actual limits determined by field conditions and judgment of Steering Committee, Engineer-in-charge, and Health Supervisor. (Up to 50,000 d./min./100 cm.^{2} direct reading with zero wipe.)

3. Asphalt Tile Floors - As survey shows wood flooring under the asphalt tile will range from 0-20,000 d./min./100 cm.^{2}, it will not be necessary to remove top floor.

4. Roofs - No other treatment is required for roof areas other than possible use of asphalt paint over spots excessively contaminated, inasmuch as repairs to such areas would not be very extensive, if at all.

5. Quonset Hut - As the Quonset hut will be too contaminated to sell to the public, it was decided to dismantle and move the building to Mound Laboratory.

6. Building Vertical Exterior Surfaces - No treatment of any brick, stone, cement block, or other similar outside surface is required other than possible coating of excessively contaminated spots with clear lacquer.

7. Grounds, Walks, and Drives - Grounds will be scraped as needed or treated in some equivalent manner. Walks will be painted with concrete paint as required.

8. On completion of the dismantling work at Unit III, the buildings and fence gates are to be padlocked. After this time no guard or watchman service will be provided.

TAB L

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Harry Stoeckle, M.D., Chief, Biology and Medicine Division, Oak Ridge, Tennessee
R. E. Hayden

October 3, 1949

FINAL SURVEY - UNIT III

The final survey represents the most accurate of all surveys made of cleaned areas. An estimated fifty per cent of the total floor area was covered. An estimated ten per cent of the vertical surfaces and less accessible horizontal surfaces was covered.

The objective of the cleaning process was to leave all areas with no detectable wipe and a direct reading of less than 5,000 alpha d./min./100 cm.^{2} as measured with various alpha meters available. A wipe in this case represents the rubbing of about 40 square inches of surface with a 4.25 cm. disk of number 1 Whatman filter paper held with two fingers. The abbreviation N.D. (not detectable) indicates that no observable reading is obtained on an alpha meter with a sensitivity of from 250 to 500 disintegrations per dimension. This would probably result in the detection of about 500 d./min. over the area of the filter disk involved. Efforts to evaluate these wipes in a parallel plate chamber were hopelessly unsuccessful due to false readings caused by chemical ionization from the reagents used to clean the surfaces and due to protruding fibres producing false counts due to arcing.

As spots not conforming to the limits set were found, they were reduced where possible until they did conform. In a few cases it seemed impractical to expend the effort needed to make them conform. In these cases, the readings are tabulated.

The first column of the table indicates a reading recorded, in most cases, before cleaning started. The blanks indicate that no readings

were recorded. Readings reported as greater than (>) indicated that they were higher than could be read on the meters available at the time. A higher reading in the final survey does not necessarily indicate an increase in activity but only the use of an instrument with a higher range.

The high spot on the floor of Room 25B is one which was missed in a previous survey due to its small area ~100 cm.^{2} The adjacent floor had been replaced. Since there was no wipe on the spot, it was considered impractical to remove and replace the floor.

The high spots in the roof were not cleaned because it appeared impractical. Also, previous readings indicate that the activity is eroded away much faster than could be expected from decay alone. This should be even more rapid during the fall rainy season. The roof drains were not cleaned because they represent an accumulation point for activity as it is eroded from the roof and would become "hot" again. Also, it is obvious that they are equally "hot" inside where measurements cannot be taken and where they could not be cleaned. Also, replacement drains would accumulate activity in like manner. The rectangular pit in the laundry could not be cleaned. It is to be filled with concrete. The five sq. ft. area under the concrete ledge in the north side of the Marlite Room could not be cleaned with acid. It is not accessible to any grinding tool. It was not considered of sufficient importance to necessitate removal with pneumatic drills. It has been covered with clear shellac so there is no detectable reading.

The following areas have not been cleaned: (as of 9/30/49.)

1. Quonset Slab - Work is in progress and is about 70 per cent complete. The paint is being ground off the north end and it is anticipated that the nitric acid will complete the decontamination.

2. Warehouse 3, Asphalt Slab - This is moderately contaminated due to traffic. It is anticipated that the nitric acid will reduce it to less than 5,000 d./min./100 cm.^{2}

3. Stockroom Hot Mix Slab - Efforts to clean this with nitric acid were unsuccessful. It is in the process of being torn up. It is expected to be complete on September 30, 1949. It will be trucked loose to "hot" waste storage at Unit V. Several negative wipes indicate that all loose activity has been removed.

4. Fire Escape - This is in the process of being sanded and is about 80 per cent complete.

5. Steel Loading Platform and Adjacent Concrete Steps and Slab - The platform has not been cleaned since it is in use. The adjacent areas have not been cleaned since they would become recontaminated in cleaning the platform. This represents an estimated one-man day.

6. Locker Rooms and Adjacent Hallway - These are being cleaned and are an estimated 50 per cent complete. They should be complete on October 3, 1949.

7. Concrete Driveway and Remaining Walks - These can probably be cleaned with nitric acid when it no longer is necessary to use them. The wood walks may be removed. The areas involved are small.

8. Garage - Surplus scrap for sale is stored in this building so it must be removed before a survey can be made. The area was originally

"cool" so no major decontamination problems are anticipated.

9. Cafeteria - This is in use as an office, counting room and lunch room. It was originally "cool" and should show only a few "hot" spots where people have stepped off the protective paper walkways.

10. Guard House - The floor is covered but "hot" spots are anticipated. The wood floor should be easily cleaned by sanding.

11. Grounds Inside the Fence - It is most likely that a layer of dirt will need to be removed in the most active areas.

12. Areas Outside the Fence - The sidewalk and street gutters are "hot" for considerable distances, particularly on Euclid Avenue and Edison Street.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
"C" Building					
Vestibule N. maximum	15,000		4600	N.D.	9/13
Vestibule to C_1 door			0-3300	N.D.	9/13
C_1 to partition, one spot max.			3000	N.D.	9/13
C_1 to partition, all other parts			<500	N.D.	9/13
Partition to S. exit door			<500	N.D.	9/13
S Vestibule			<500	N.D.	9/13
Concrete S threshold			0-3000	N.D.	9/13
All hallway walls			<500	N.D.	9/13
Office floor			<500	N.D.	9/13
Office walls and ceiling			<500	N.D.	9/13
C-5 floor			<500	N.D.	9/13
C-5 walls and ceiling			<500	N.D.	9/13
C-4 floor N room			<500	N.D.	9/13
C-4 floor spot near center drain			800	N.D.	9/13
C-4 N room walls, shelves, ceiling, and cabinets			<-500	N.D.	9/13
C-4S room floor			<500	N.D.	9/13
C-4 S room floor spot near N door			700	N.D.	9/13
C-4 walls, benches, cabinets, and sink			<500	N.D.	9/13
C-3 floor			<500	N.D.	9/13
C-3 walls, benches, and ceiling			<500	N.D.	9/13
C-3 sink			1500	N.D.	9/13

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
C-2 floor			<500	N.D.	9/15
C-2 walls, ceiling, cabinets, and sink			<500	N.D.	9/15
C-1 SE room, spot - floor	90,000	10,000	1800	N.D.	9/15
C-1 SE room, spot - floor			4500	N.D.	9/15
C-1 SE room, spot - floor			4000	N.D.	9/15
C-1 SE room, spot - floor			4800	N.D.	9/15
C-1 SE room, remaining floor	10,000		1500	N.D.	9/15
C-1 W room, main floor	>90,000	25,000	~3000	N.D.	9/15
C-1 W room, spots			4500	N.D.	9/15
C-1 E room, floor	50,000	5,000	<500	N.D.	9/15
C-1 E room, floor - spot			1500	N.D.	9/15
C-1 E room, floor - spot near door			4800	N.D.	9/15
C-1 E room, wall and ceiling			<500	N.D.	9/15
C-1, W room, walls and ceiling			<500	N.D.	9/15
C-1, SE room, walls and ceiling			<500	N.D.	9/15
C-1, hoods, benches, etc.	>90,000		Removed		
"B" Building					
Covered walkway SE end	15,000		1500	N.D.	9/15
Covered walkway, corner area	20,000		600	N.D.	9/15
Covered walkway, W end	30,000		1500	N.D.	9/15
Covered walkway, NW corner	30,000		1500	N.D.	9/15
Covered walkway, SW end	15,000		500	N.D.	9/15

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Room B-1	900		900	N.D.	9/15
Spur to Cafeteria	10,000		<5000	N.D.	9/15
B-2 hallway	10,000		600	N.D.	9/15
B-2 floor, maximum	40,000		<500	N.D.	9/15
B-2 walls, ceiling, and fixtures	<500		<500	N.D.	9/15
B-3 floor, walls, and ceiling	<500		<500	N.D.	9/15
B-4, floor, maximum	35,000		<500	N.D.	9/15
B-4, sink, fixtures, wall, etc.	<500		<500	N.D.	9/15
B-5 floor	>86,000		1500	N.D.	9/15
B-5 walls, ceiling, etc.	~50,000		<500	N.D.	9/15
B-6 floor	10,000		<1500	N.D.	9/15
B-6 walls, fixtures, etc.	<-500		<500	N.D.	9/15
B-6 shower room floor	<500		<500	N.D.	9/15
B-7 floor, maximum	7500		<500	N.D.	9/15
B-8 floor	8000		<500	N.D.	9/15
B-8 shower section	<500		<500	N.D.	9/15
B-9 W side	8000		<500	N.D.	9/20
B-9 E side	8000		<500	N.D.	9/20
B-9 shower room	<500		<500	N.D.	9/20
Laundry Building					
Floor S side	~30,000		<5000	N.D.	9/20
Floor N side W end	>64,000		<5000	N.D.	9/20

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Floor N side E end	~20,000		2800	N.D.	9/20
Floor, soap room	~10,000		<500	N.D.	9/20
Walls, pipes, and fixtures	~8000		1200	N.D.	9/20
Glass Blowing Room					
Floor S center, spot	>64,000		<500	N.D.	9/22
Floor, several spots	6000-18,000		<500	N.D.	9/22
Walls, ceiling, fixtures, etc.	<500		<500	N.D.	9/22
Quartz Fibre Room					
Floor, W room, center spot	40,000		5000	N.D.	9/22
Floor, E room	<500		<500	N.D.	9/22
Walls, ceiling, and fixtures			<500	N.D.	9/22
Decontamination Room					
Walls	10,000		<600	N.D.	9/23
Heater	8000-30,000		<500	N.D.	9/23
Hood, sinks, etc.	10,000		Removed	N.D.	9/23
Floor	15,000		3000	N.D.	9/23
Main Building					
Floor, attic	10,000		<500	N.D.	9/22
Stairs, attic, maximum	15,000		1000	N.D.	9/22
Room 38 - floor	6000		<500	N.D.	9/22
Walls, ceiling	<500		<500	N.D.	9/22

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Fixtures, bench, spot	12,000		5000	N.D.	9/22
Fixtures - all other	< 500		< 500	N.D.	9/22
Room 43					
Floor, maximum	>90,000		< 500	N.D.	9/22
Walls, ceiling, fixtures	~ 600		~600	N.D.	9/22
Rest room floor	20,000		< 500	N.D.	9/22
Walls, ceiling, fixtures	< 500		< 500	N.D.	9/22
Room 41 - floor - spots	50,000		< 500	N.D.	9/22
Window sills	8,000		3000	N.D.	9/22
Walls, ceiling and fixtures	< 500		< 500	N.D.	9/22
Room 40 - floor	15,000		< 500	N.D.	9/22
Walls, ceiling, and fixtures	< 500		< 500	N.D.	9/22
Concrete drain	12,000		< 500	N.D.	9/22
Room 40 - floor	30,000		< 500	N.D.	9/22
Walls, ceiling, and fixtures	< 500		< 500	N.D.	9/22
Window sills	< 500		< 500	N.D.	9/22
First Aid Room					
Floor at entrance	10,000		< 500	N.D.	9/22
All other parts	< 500		< 500	N.D.	9/22
Room 32 - floor maximum	50,000		< 500	N.D.	9/22
Walls, fixtures, etc.	< 500		< 500	N.D.	9/22
Hood	>60,000		Removed		
Sink	>60,000		Removed		

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Room 33 - floor	20,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 34 - floor	20,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 35 - floor	20,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 36 - floor - spots	25,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 37 - floor	15,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 45 - floor - spots	35,000		<500	N.D.	9/22
All other parts	<500		<500	N.D.	9/22
Room 44 - floor	20,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
3rd Floor Halls - floors	~20,000		<500	N.D.	9/22
3rd Floor Halls - walls, etc.	<500		<500	N.D.	9/22
Stairs between 3rd and 2nd floors	20,000		<700	N.D.	9/22
Stair rails	10,000		<500	N.D.	9/22
2nd floor hall	30,000		<500	N.D.	9/22
Rooms 21B and 21C - hoods	>90,000		Removed	N.D.	9/22
Rooms 21B and 21C - floor	50,000		~1000	N.D.	9/22
Window sills	20,000		5000	N.D.	9/22
Fluorescent lights	10,000		<500	N.D.	9/22

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Benches	~50,000		Removed		
Lead vault	50,000		Removed		
Steam pipes	10,000		<1000	N.D.	9/22
Room 23 - floor - spots	15,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 24 - floor	35,000		~1500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Room 25B - floor	>50,000		<5000	N.D.	9/22
Light fixtures	15,000		1000	N.D.	9/22
Window sills	50,000		5000	N.D.	9/22
Radiators	50,000		5000	N.D.	9/22
Dry boxes, sinks, benches	>90,000		Removed	N.D.	9/22
Floor - spot	>90,000		50,000	N.D.	9/22 Cannot be cleaned
Room 27 - floor ~100 cm.^{2}	15,000		<500	N.D.	9/22
All other parts	<500		<500	N.D.	9/22
Room 28 - floor	50,000		<1000	N.D.	9/22
Benches	>50,000		Removed		
Stairs between 1st and 2nd floor	25,000		<500	N.D.	9/22
Window sills, hall	15,000		<500	N.D.	9/22
Stairs - spots - maximum	25,000		5000	N.D.	9/22
Stair rails	15,000		<500	N.D.	9/22

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Room 11A and 11B - floor					
Window sills	50,000		<1000	N.D.	9/22
Light fixtures	8000		<1000	N.D.	9/22
Pipes	8000		<1000	N.D.	9/22
Hoods	>60,000		Removed	N.D.	9/22
Benches	>60,000		Removed	N.D.	9/22
Sinks	>60,000		Removed	N.D.	9/22
Room 10C - all parts	<500		<500	N.D.	9/22
Room 15A - floor	10,000		<500	N.D.	9/22
Walls and fixtures	<1000		<1000	N.D.	9/22
Radiators	10,000		5000	N.D.	9/22
Window sills	15,000		3000	N.D.	9/22
Locker room - hot side floor	18,000		Inc.	Survey	Not cleaned
Locker room - cold side floor	11,000		Inc.	Survey	Not cleaned
Walls and fixtures	<500		Inc.	Survey	Not cleaned
Vestibule - floor	15,000		Inc.	Survey	Not cleaned
Window sills	6000		Inc.	Survey	Not cleaned
Fluorescent fixtures	6000		Inc.	Survey	Not cleaned
Hall - 1st floor					
Radiator	5000		5000	N.D.	9/22
Walls and fixtures	<500		<500	N.D.	9/22
Stairs 1st floor to basement	10,000		<3000	N.D.	9/22

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Room 28 W room					
Hoods	15,000		Removed		
Floor	10,000		<500	N.D.	9/22
Duct ends	<500		<500	N.D.	9/22
Fixtures, walls, etc.	<500		<500	N.D.	9/22
Room 28 E side - floor	10,000		<500	N.D.	9/22
Hoods	50,000		Removed		
Walls, fixtures, etc.	15,000		<1000	N.D.	9/22
Room 28 S side - floor	15,000		<500	N.D.	9/22
Bench	50,000		<500	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Window sills	10,000		<500	N.D.	9/22
Assay room - bench	1200		1200	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Floor	10,000		1000	N.D.	9/22
Gas valve room - floor	8000		<5000	N.D.	9/27
Walls, fixtures, etc.	500		<500	N.D.	9/22
Janitors Supply room - floor	10,000		<3000	N.D.	9/22
Water softeners room - floor	30,000		<1000	N.D.	9/22
Walls, fixtures, switch boxes	10,000		<3000	N.D.	9/22
Water softener	500		<500	N.D.	9/22
Carpenter shop - floor	10,000		<3000	N.D.	9/22
Walls, fixtures, etc.	500		<500	N.D.	9/22

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Sink	8000		<5000	N.D.	9/22
Window sill	6000		5000	N.D.	9/22
Plumbing shop - floor	10,000		<3000	N.D.	9/22
Walls, fixtures, etc.	<500		<500	N.D.	9/22
Window sill	14,000		<5000	N.D.	9/22
Marlite rooms					
S side - floor	>70,000		Removed		
S side - walls	>70,000		Removed		
S side - dry boxes, hoods, etc.	>70,000		Removed		
S side - fixtures and ducts	50,000		Removed		
S side - floor after tile removed	30,000		<5000	N.D.	9/29
N side - floor asphalt	>70,000		Removed		
N side - floor concrete	50,000		<5000	N.D.	9/29
N side - walls	50,000		Removed		
N side - window sills	13,000		<5000	N.D.	9/29
N side - pipes	10,000		<5000	N.D.	9/29
Hoods and benches	>70,000		Removed		
Concrete ledge	>70,000		<5000	N.D.	9/29
5 sq. ft. area under ledge	>70,000		64,000	N.D.	9/29
Machine Shop					
SE office - floor	10,000		<500	N.D.	9/23
SE office - walls and fixtures	<500		<500	N.D.	9/23
SE office - floor spot	10,000		2000	N.D.	9/23

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Large room - S end	8000		<500	N.D.	9/23
Walls, fixtures, large room	<500		<500	N.D.	9/23
Electrical Shop	8000		<1500	N.D.	9/23
Electrical Shop - walls and fixtures	<500		<500	N.D.	9/23
W room - floor	6000		<500	N.D.	9/23
W room - walls and fixtures	<500		<500	N.D.	9/23
SW office - floor	<500		<500	N.D.	9/23
SW office - walls and fixtures	<500		<500	N.D.	9/23
Warehouse 3 slab - doorway	10,000		Inc.		
Warehouse 3 slab - S center	6000		Inc.		
Warehouse 3 slab - SE corner	3200		Inc.		
Warehouse 3 slab - E center	5200		Inc.		
Warehouse 3 slab - center	4500		Inc.		
Warehouse 3 slab - W center	3000		Inc.		
Warehouse 3 slab - NW end	2500		Inc.		
Warehouse 3 slab - NE end	1500		Inc.		
Warehouse 3 slab - N center	2500		Inc.		
Concrete driveway - W end	6400		Inc.		
Concrete driveway - center	12,000		Inc.		
Concrete driveway - E end	6000		Inc.		
Stockroom slab - N end	15,000		Removed	N.D.	9/30
Stockroom slab - center	30,000		Removed	N.D.	9/30
Stockroom slab - S end	64,000		Removed	N.D.	9/30

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Asphalt walk - N end	12,000		Removed	N.D.	9/30
Asphalt walk - center	24,000		Removed	N.D.	9/30
Asphalt walk - S end	50,000		Removed	N.D.	9/30
East steps	25,000		Inc.		9/30
N side steel platform	64,000		Inc.		9/30
Boiler room - E door	64,000		Inc.	N.D.	9/30
Boiler room - center	9000		Inc.	N.D.	9/30
Boiler room - W door	6000		Inc.	N.D.	9/30
Boiler room - N side door	15,000		Inc.	N.D.	9/30
Boiler room - S side door	6000		Inc.	N.D.	9/30
Boiler room - N side walkway	54,000		Inc.	N.D.	9/30
Roof					
"C" Building, NW corner	6000		1500	N.D.	9/20
"C" Building, NE corner	3000		1000	N.D.	9/20
"C" Building, N center	3000		1000	N.D.	9/20
"C" Building, W center	1000		900	N.D.	9/20
"C" Building, SE corner	600		500	N.D.	9/20
"C" Building, SW corner	600		500	N.D.	9/20
"C" Building, center	1000		900	N.D.	9/20
"A" Building, NE corner			600	N.D.	9/20
"A" Building, SE corner	<500		<500	N.D.	9/20
"A" Building, SW corner	<500		<500	N.D.	9/20
"A" Building, NW corner			900	N.D.	9/20

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Covered Walkway, N end	10,000		6000	N.D.	9/20
Covered Walkway, S end	<500		<500	N.D.	9/20
"B" Building, NE corner			6000	N.D.	9/20
"B" Building, NW corner	12,000		6000	N.D.	9/20
"B" Building Roof, SE corner	600	N.D. (7/13)	<500	N.D.	9/19
"B" Building Roof, SW corner	5000	N.D. (7/13)	<500	N.D.	9/19
"B" Building Roof, center	12,000		900	N.D.	9/19
"B" Building Roof Drain, NW corner			46,000	N.D.	9/19
"B" Building Roof Drain, N side			25,000	N.D.	9/19
Pipe tunnel roof	45,000		500-35,000	N.D.	9/19
Main Building Roof, NW corner	18,000		6000	N.D.	9/19
Main Building Roof, NE corner			2500	N.D.	9/19
Main Building Roof, SE corner			2500	N.D.	9/19
Main Building Roof, SW corner			7000	N.D.	9/19
Main Building Roof, center			6000	N.D.	9/19
Main Building Roof, near trap door			2000	N.D.	9/19
Machine Shop Roof, SE			<500	N.D.	7/13
Machine Shop Roof, SE side center			<500	N.D.	7/13
Pipe tunnel roof			<500	N.D.	7/13
Machine Shop Roof, SE corner			6000	N.D.	7/13
Machine Shop Roof, N side center			6000	N.D.	7/13
Machine Shop Roof, NW corner			<500	N.D.	7/13
Pipe tunnel roof, N end			<500	N.D.	7/13

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Garage roof, NW corner			<500	N.D.	7/13
Garage roof, NE corner			<500	N.D.	7/13
Garage roof, center			<500	N.D.	7/13
Garage roof, SW corner			<500	N.D.	7/13
Garage roof, W side center			<500	N.D.	7/13
Acid room roof, NE corner			3500	N.D.	7/13
Acid room roof, NW corner			1200	N.D.	7/13
Acid room roof, SW corner			1200	N.D.	7/13
Acid room roof, SE corner			2000	N.D.	7/13
Boiler room roof, SW corner			<500	N.D.	7/13
Boiler room roof, SE corner			<500	N.D.	7/13
Boiler room roof, NE corner			<500	N.D.	7/13
Boiler room roof, NW corner			<500	N.D.	7/13
Base of stack			1400	N.D.	7/13
Vault roof center			<500	N.D.	7/13
Laundry roof - SE corner	9000	N.D.	3600	N.D.	7/13
Laundry roof - NE corner	6000	N.D.	900	N.D.	7/13
Laundry roof - NW corner	3000	N.D.	600	N.D.	7/13
Laundry roof - SW corner	4000	N.D.	500	N.D.	7/13
Laundry roof - center	12,000	N.D.	5000	N.D.	7/13
Laundry roof, E side drain	>50,000	N.D.	32,000	N.D.	7/13
Laundry roof, N side outer	5000	N.D.	4000	N.D.	7/13
Laundry Rectangular pit	>64,000	N.D.	>72,000	N.D.	7/13

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Laundry, W side center	13,000	N.D.	1800	N.D.	7/13
Laundry, S side center	6000	N.D.	<5000	N.D.	7/13
Grounds					
Road in back of main building	42,300		7000	N.D.	9/22
Entrance to Warehouse 3	900		9000	N.D.	9/22
L side of No. 3 gate	21,000		4000	N.D.	9/22
Gutter outside No. 3 gate, L side	>85,000		198,000	N.D.	9/22
R side of No. 3 gate	>85,000		50,000	N.D.	9/22
Front of No. 3 gate	>85,000		28,000	N.D.	9/22
Gutter outside of No. 3 gate, R side	21,000		248,000	N.D.	9/22
Middle of street in front of No. 3 gate	5500		600	N.D.	9/22
Sidewalk in front of No. 3 gate	>85,000		50,000	800	9/22
Sidewalk to guard house by No. 3 gate	>85,000		182,000	N.D.	9/22
Sidewalk by coal bin	7400		<5000	N.D.	9/22
Handrail outside main gate	44,000		<500	N.D.	9/22
Sidewalk at N entrance to Marlite	>85,000		<5000	N.D.	9/29
Sidewalk at W entrance to Marlite	>85,000		900	N.D.	9/22
Doorway to compressor room	83,000		5000	N.D.	9/29
Front of laundry - double doors	42,000		1000	N.D.	9/22
Sidewalk by decontamination room	82,000		<5000	N.D.	9/29
Sidewalk in front of "C" Building	4500		<500	N.D.	9/22

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Sidewalk in front of E-2	13,000		<5000	N.D.	9/29
Between furnace and acid rooms	22,000		<5000	N.D.	9/29
Front of furnace room	45,000		<5000	N.D.	9/29
Quonset slab N half	>5,000,000	Yes	Inc.	Yes	9/29
Quonset slab S half	~50,000	Yes	Inc.	Yes	9/29
Warehouse No. 3 slab S center	18,000		Inc.	Inc.	9/29
Warehouse No. 3 slab SE corner	1300		Inc.	Inc.	9/29
Warehouse No. 3 slab SW corner	5000		Inc.	Inc.	9/29
Warehouse No. 3 slab, center	5000		Inc.	Inc.	9/29
Warehouse No. 3 N half	1200		Inc.	Inc.	9/29
Stockroom hot mix slab N end	30,000		Removed		Could not be cleaned
Stockroom hot mix slab, center	30,000		Removed		Could not be cleaned
Stockroom hot mix slab, S end	20,000		Removed		Could not be cleaned
Fire escape	50,000		<5000	N.D.	9/30
Guard House			Inc.		
Cellar Stairs	60,000		Inc.		
Cafeteria	<500		Inc.		
Steel loading platform	>64,000		Inc.		

Inc. - Incomplete

R. E. Hayden

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TAB M

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SUPPLEMENT TO FINAL SURVEY OF UNIT III

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Warehouse No. 3, Asphalt Slab South center, one spot	68,000	2500	15,000	N.D.	10/27
Southeast corner, one spot			10,000	N.D.	10/27
All other (south end)			<4000	N.D.	10/27
All north end			<2000	N.D.	10/27
Stockroom Hot Mix Slab			Removed		
Fire Escape, First flight	85,000		<5000	N.D.	10/18
Second flight	50,000		<5000	N.D.	10/18
Third flight	20,000		<5000	N.D.	10/18
Steel Loading Platform	>144,000	5000			
Platform			500-2000	N.D.	10/19
Steps and handrail			1000	N.D.	10/19
Brace supporting No. 2 step			10,000	N.D.	10/19
Locker rooms and adjacent hallway					
West change room, Floor	20,000	1000	<500	N.D.	10/12
Fixtures	10,000	1000	<500	N.D.	10/12
Ceiling	<500	N.D.	<500	N.D.	10/12
Walls (spots)	10,000		<500	N.D.	10/12
East change room, Floor	20,000		<500	N.D.	10/28
Window sills	10,000		<500	N.D.	10/28
Walls			<500	N.D.	10/28
Ceiling			<500	N.D.	10/28
Fixtures			<500	N.D.	10/28
Hallway			<500	N.D.	10/28

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Concrete Drive and Walls, Drive (1 small strip north side)			7000	N.D.	10/28
Other			500	N.D.	10/28
Walks			500	N.D.	10/28
Garage, West end, one spot			2800	N.D.	10/25
All other			<500	N.D.	10/25
Cafeteria, Spots on floor					
East doorway	144,000		<500	N.D.	10/13
North of door	75,000		<500	N.D.	10/13
South side of room	5000-15,000		<500	N.D.	10/13
Southwest corner	20,000		<500	N.D.	10/13
Center of room	5000		<500	N.D.	10/13
West doorway	70,000		<500	N.D.	10/13
Shelves	15,000		<500	N.D.	10/13
All other			<500	N.D.	10/13
Guard House, Four spots on floor	10,000		<500	N.D.	10/28
All other			<500	N.D.	10/28
Quonset vault			<2000	N.D.	10/31
Boiler house, Floor (large room)	10,000-15,000	500	<500	N.D.	10/13
Floor (small room)	5000-50,000	2000	<1000	N.D.	10/13
Walls			<500	N.D.	10/13
Main Building Basement steps	5000-50,000		500-5000	N.D.	10/18

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe	Date 1949
Concrete slab (drum storage) 2 spots	20,000		10,000	N.D.	10/19
All other	<5000		<500	N.D.	10/19
Grounds, Rear of Main Building			<5000	N.D.	10/27
Behind Quonset slab			<3000	N.D.	10/27
All other			<500	N.D.	10/27

Quonset Slab Survey
10/28/49

332 readings < 5,000 d./min./100 cm.^{2}

83 readings 5,000-10,000 d./min./100 cm.^{2}

56 readings 10,000-20,000 d./min./100 cm.^{2}

42 readings 20,000-50,000 d./min./100 cm.^{2}

33 readings >50,000 d./min./100 cm.^{2}

Of these 33 readings > 50,000 d./min./100 cm.^{2} the highest reading was 1,402,500 d./min./100 cm.^{2} with four readings > 1,000,000 d./min./100 cm.^{2} There were no detectable wipes in any of these spots.

Since decontamination can proceed no further and this slab shows no wipe test and is very well constructed, we strongly recommend painting. If this does not meet approval, the only recourse is to have Maxon break up and remove this slab. This, however, is undesirable because considerable amounts of contamination may be spread by concrete dust.

Note: All readings are d./min./100 cm.^{2}

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AIR SAMPLES AT UNIT III IN d./min./m.^{3}

	0 to 1,000	1,000 to 3,000	3,000 to 10,000	10,000 to 25,000	25,000 to 50,000	Over 50,000	TOTAL
May and June	101	26	21	3	0	3	154
July	115	25	14	4	4	3	165
August	136	36	28	5	3	1	209
September	51	12	5	0	0	0	68
October							
TOTAL	403	99	68	12	7	7	596
Per Cent of Total	67.7	16.6	11.4	2.0	1.2	1.2	100.0

Note: Most of the work requiring air sampling was completed by mid-September which accounts for the small number of samples in that month. No samples were taken during October.

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TAB Q

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SUMMARY OF URINE SAMPLE AT UNIT III IN c./min./50 ml.

	0	1	2	3	4	5	6	7	8	TOTAL
May and June	54	12	10	10	1	1	0	0	0	88
July	47	18	10	3	1	2	2	0	0	83
August	48	13	4	2	2	3	0	0	1	73
September through 19, 1949	22	10	8	2	1	3	2	0	0	48
October	—	—	—	—	—	—	—	—	—	—
TOTAL	171	53	32	17	5	9	4	0	1	292

Note: No tabulation for insufficient samples, or after September 19, 1949.

Six samples were initially over 12 c./min./50 ml., but rechecks proved them to be in error.

No samples were over 8 c./min./50 ml.

The most significant factor revealed by this summary is the fact that not one man became "hot" while working on this project even though in excess of 12,000 man-hours were put in on this disposal program at Unit III.

FLH/rca

REFERENCE 6

This Document Consists of 116 Pages
This is Copy 6 of 14A

MLM-461

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DATE 6/20/50 INITIALS SKH

MLM-MU-50-64-0015

Contract Number AT-33-1-GEN-53

MOUND LABORATORY
Operated By
MONSANTO CHEMICAL COMPANY
MIAMISBURG, OHIO

Classification changed to Unclassified by
authority of Leroy V. Jones, Ltr of 7/31/74
by Alberta V. Weedin 8/2/74

REPORT NO. 3 OF STEERING COMMITTEE
FOR DISPOSAL OF UNITS III AND IV

(Completion Report for Disposal of Unit IV,
Runnymeade Road and Dixon Ave. Dayton, Ohio)

[redacted]

Date: April 17, 1950

Prepared By: F. L. Halbach
F. L. Halbach
Chairman, Steering Committee

Approved By: M. M. Haring
M. M. Haring
Laboratory Director

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THE PROBLEM

After Monsanto Chemical Company moved its operations in the last months of 1948 and the first two months of 1949 to Mound Laboratory, Miamisburg, Ohio, Monsanto and the Dayton Area Office of the Atomic Energy Commission were confronted with the problem of the disposal of the original laboratories at 1601 W. First Street, Dayton, Ohio, hereafter designated Monsanto Unit III, and at Runnymeade Road and Dixon Avenue, designated Monsanto Unit IV.

A Planning Committee, set up to plan for appropriate disposal of these units, at a meeting on February 25, 1949 established a Steering Committee as follows:

"A general Steering Committee will be established to care for the whole job of disposal. Its primary function (and sole duty temporarily) will be to coordinate all phases of the disposal program." (From Planning Committee Report MLM C.F. No. 49-2-63, see TAB A.)

The Steering Committee was later temporarily inactivated. At a second meeting of the Planning Committee late in April, 1949, it was agreed to proceed with the work of disposal of both units under Engineering Division supervision (functioning as the original Steering Committee) with a full time Engineer-in-charge to be obtained, if possible, from Scioto project personnel. The work of the Steering Committee for Unit IV was defined to "coordinate all phases of the disposal program and see that things are carried through." (Note the absence of definition of decontamination levels.)

Thus the problem covered by this report may be defined as the decontamination and partial dismantling of Unit IV, so that an outside

contractor subsequently engaged to complete the wrecking job can carry out that part of the work with contamination, and consequent health protective measures, reduced to a minimum

The contamination referred to throughout this report is entirely due to polonium

FACTORS AFFECTING THE PROBLEM AND THEIR SUBSEQUENT TREATMENT

1. History of Unit IV

For a brief history of Unit IV, see TAB B, wherein are listed excerpts from the "Historical Report, Dayton Project," Document Number M-286.

2. Transfer of Radioactive Property

To date there has been no definition of maximum contamination levels for return of property such as the grounds area of Unit IV to their original owner.

The only information furnished along these lines pertain to contamination levels for equipment and material entering commercial channels as defined in a letter to the Dayton Area Manager (see TAB C). In the case of Unit IV, no equipment or material will be sent to any location other than designated storage areas at Mound Laboratory. The grounds area, after dismantling by others is complete, will be removed, as needed, so as to conform to the low levels mentioned in TAB C.

Additional information and several questions directly pertaining to the problem are presented in a letter to the Chief, Applied Biophysics Branch, Division of Biology and Medicine (see TAB D).

3. Preliminary Work in Connection with the Disposal Program

The report listed under TAB A gives the initial conclusions, plans, and recommendations of the Planning Committee. Meanwhile, the work of the Steering Committee was postponed to permit property and material not of a fixed nature to be transferred to Mound Laboratory under Evaluation Committee supervision. In addition, surveys and preliminary estimates were prepared, and informal meetings between Monsanto and Atomic Energy Commission were held to discuss various phases of the job. Finally, at a second meeting of the Planning Committee in April, 1949 it was agreed:

a. To proceed at once with the active phase of the disposal program.

b. The work would be under Engineering Division supervision (reactivated Steering Committee) with a full time Engineer-in-charge, obtained from the Scioto project, and a full time Health Supervisor, loaned from the Atomic Energy Commission.

c. The work was to be concentrated at Unit III to permit return of this property to the Board of Education as soon as possible; the work at Unit IV was to be started with a small token force to clean up, decontaminate and remove debris resulting from widespread contamination from earlier work there.

On this basis the Steering Committee proceeded with organization of the disposal program for both units, and the active work at Unit IV.

4. Disposal Project History through February 3, 1950

A summary of the work in connection with Unit IV is given in TAB E. Final health surveys are listed in TAB F. The physical work by Monsanto

was completed on February 3, 1950 and Planning Committee and Atomic Energy Commission were advised so that plans could be formulated for further work by the dismantling contractor.

5. Health Phases of the Disposal and Decontamination Project

a. Preliminary and final surveys have already been covered under TABS E and F.

b. Air samples were taken during all stages of the project, and are counted on the spot at Unit IV so as to maintain closest possible control over operations, and protect personnel from excessive airborne contamination. A breakdown of these tests is given in TAB G. This summary shows that:

(1). Fifty two per cent of all samples were less than 3,000 d./min./m.^{3}, the maximum limit for which no respiratory protection is required.

(2). Ninety and one-half per cent of all samples were less than 25,000 d./min./m.^{3}, the maximum limit for which respirators can be used.

(3). Ninety six and four-tenths per cent of all samples were less than 50,000 d./min./m.^{3}, the maximum level for which assault masks can be used.

(4). Thirty five times during the project the air levels exceeded 50,000 d./min./m.^{3}, and it was necessary to temporarily stop work in areas concerned. In all such cases, personnel were transferred to less contaminated areas, with no stoppage of overall work.

These results clearly indicate the care with which the project work was carried out as far as maintaining lowest possible air levels was

concerned. In view of the gross contamination problem at Unit IV it further shows the effectiveness of wet methods of keeping air levels down.

Personnel in many cases wore respirators for their own protection, when air contamination might be expected, even though tests later indicated such protection was unnecessary.

c. Urine samples were collected twice weekly. The summary of these checks is given in TAB H. During the project three men became "hot" with the highest count being 30 c./min./50 ml. Total "hot" time was 360 manhours out of a total of approximately 18,000 manhours expended on the project. Men so concerned were of course transferred to cold area work during the periods they were classified "hot." Since the major part of the contamination has now been removed, it is quite unlikely that future work by the dismantling contractor should result in any of his personnel becoming "hot," measured by the same limit we used, providing recommended procedures are followed.

6. Safety Record

No major or lost time accidents occurred during the work at Unit IV. Minor injuries were treated on the spot. Injured employees were sent to Mound Laboratory Medical Section for checkup and further treatment, if necessary. The Medical Section maintained thorough follow-up on all such minor injuries. Precautions were taken to prevent contamination of any open cuts or wounds, and personnel so affected were transferred to clean work until such wounds healed.

7. Property

Property items were handled in accord with established procedures for transfer and regard for contamination levels. This phase of the work was handled in close collaboration with the Evaluation Committee, whose partial duty was to pass on disposal of all contaminated equipment and apparatus.

CONCLUSIONS

1. Monsanto Unit IV has been decontaminated as closely as possible, as shown by the final Health Survey, to within the level used as an upper limit for this project, and as defined to be the function of the Steering Committee.

2. All property, material, and scrap coming within the scope of this project have been disposed of in accordance with regulations for property transfer, contamination levels, usefulness, and salvage value. No material of any kind was sent to any public dumping ground.

3. It is unlikely that future dismantling work will present any problems from the contamination standpoint, providing the contractor follows procedures similar to those used by Monsanto.

4. Decontamination to levels lower than the one used for this project would have involved considerably more time, expense, and to have reached similar levels as used for Unit III would have been practically impossible to achieve by any method short of dismantling.

5. Experience on this project indicates that maximum limits set for air contamination could possibly be raised for similar projects or work. Close health supervision of course must be maintained.

TAB A - REPORT OF THE COMMITTEE TO PLAN FOR THE DISPOSAL OF UNITS III AND IV

A committee was appointed to plan for appropriate disposal of Units III and IV whenever these activities may begin. The committee consisted of:

J. J. Burbage	-	Assistant Laboratory Director
J. E. Bradley	-	Section Chief, Decontamination and Survey
M. M. Haring (Chairman)	-	Laboratory Director
J. J. Spicka	-	Business Manager
R. A. Staniforth	-	Division Director, Research and Development
N. Varley	-	Deputy Area Manager
J. R. Wiesler	-	Division Engineer

The committee met in the conference room of Mound Laboratory at 9:00 A.M., February 25, 1949.

Certain facts were first established.

1. Among these were the tolerances set for moving contaminated equipment, etc. Dr. Failla ruled a year or more ago that no piece of equipment may be declared surplus or otherwise sent into the channels of industry unless it shows a direct reading on an alpha meter of less than two divisions, i.e., six disintegrations per minute per square centimeter. Of course the wipe test must be zero. In addition we had set, last summer, a suitable tolerance for moving equipment from Units III and IV to Mound Laboratory. This is 100 disintegrations per minute per square centimeter, with a zero wipe test.

2. A discussion of the present status of Units III and IV confirmed the following. Most of Unit III is fairly "clean" and can be decontaminated

on surfaces fairly readily. However, extensive disturbance of floors, walls, or plumbing will undoubtedly stir up much "hot" dust which is presently in cracks, etc. Incindentally such disturbance would be very costly. The Quonset hut is quite "hot," on the interior, and so are one or two laboratories in the main building. Almost all of Unit IV is very "hot." Decontamination would be almost impossible. In any case the Atomic Energy Commission has ruled that it be dismantled completely.

3. There is a great deal of valuable material at both sites that can certainly be salvaged. There is also a great deal of material the cost of salvage of which would greatly outweigh the recoverable value. To accomplish the task of disposal as economically as possible, these and several other factors must be carefully balanced.

4. Whoever accomplishes the task of wrecking and/or restoration must be adequately protected for the job. In most cases this will mean special clothing, gloves, masks, and often ventilated hoods. He and his surroundings must be fully monitored during the whole task.

5. It is most important, from the standpoint of public and industrial relations, that neighbors and workmen, other than our own, do not have their suspicions aroused concerning the unusual hazards of the operations. This means that the special protection metioned in (4) must not be apparent to them.

6. Whoever does the wrecking and restoration must have an intimate knowledge of both sites so that hazards, both present and future, are minimized. We are the only ones who really know or should be fully acquainted with these facts.

7. In view of the foregoing facts, the committee was unanimous that our own staff must restore Unit III and wreck the interior of Unit IV. A subcontractor can then, in all probability, safely wreck the outside of Unit IV.

8. We are severely limited in our own forces to accomplish this work. However, we have presently at Units III and IV about 36 guards, most of whom cannot be absorbed into the Mound Laboratory staff. Many of these men have considerably "handy-man" talent and, under suitable tutelage from our Engineering Department, could do much of the work. Those selected would, of course, be reclassified as general mechanics, drivers, etc. This would extend their possible period of employment by Monsanto, but there is no escaping the necessity of additional personnel during the period of disposal. These guards, being cleared, would be very valuable in meeting this need. Last fall, when discussing personnel requirements, it was pointed out that at least 20 men would be required for the purpose.

9. We have very extensive storage facilities at Scioto Laboratory which would be ideal to care for valuable contaminated equipment during a few years of "cooling off." Such equipment could be "cocoonized," covered with a strippable plastic, or left "as is" depending on its nature and the degree of contamination.

10. There is adequate storage in the hidden back corners of Mound Laboratory to pile up contaminated material destined for destruction. None should be shipped to Oak Ridge. It is hoped that our contaminated burnable waste incinerator will be a reality by next Christmas. When this occurs, all such material can be permanently disposed of.

11. Unit IV is not to be touched, according to W. J. Williams, until it is certain the "T" Building will do what is expected of it. This does not appear to be possible before June, 1949. It is desirable to return Unit III to the Dayton School Board as soon as possible. Therefore, it is quite possible we should start on Unit III rather than Unit IV.

12. Spraying of interiors with a plastic to fasten down activity is an attractive possibility, if one can get at the activity. However, most of it is hidden and will dust out at each step. In addition, the cost would be extreme. An estimate of $11,000 to so treat the interior of Unit IV was made last summer. J. R. Wiesler says this figure is far too low. The committee considers spraying a useful additional precaution but no substitute for standard procedures.

In view of the foregoing, certain procedures applicable to both Units III and IV were set up.

1. All things not contaminated and immediately useful to us should be moved to Mound Laboratory. They will have to be put into one of Maxon's construction warehouses until they can be sorted, inventoried, and permanently stored. Presently we are overwhelmed in this matter, the best estimate being six months to clear up the situation as of the moment.

2. All telephones must be carefully surveyed. If "clean" they can be returned to the Telephone Company. If "hot," as the majority are, they will be decontaminated to zero wipe test and exchanged for "cold" telephones in low risk areas at Mound Laboratory wherever possible. In this fashion the number of instruments we will be forced to buy will be kept to a minimum.

3. A committee has been appointed whose duty it will be to pass on all contaminated apparatus or equipment presently at Units III and IV. It is most important that the amount of scrapped items be kept to a minimum. To this end, this committee will determine the following points:

a. Possibility of economical decontamination. Such items will be put in stores at Mound Laboratory or declared surplus property.

b. Possibility of using certain equipment in "hot" areas at Mound Laboratory with little further treatment.

c. Advisability of storing in warehouses at Scioto Laboratory to "cool off." The committee will also determine whether such items are to be "cocoonized," coated with a strippable plastic or left "as is."

d. Exactly what apparatus and equipment should go to the scrap pile at Mound Laboratory.

This evaluation committee is as follows:

J. J. Burbage (for Unit IV)	-	Assistant Laboratory Director
M. M. Haring (General Referee)	-	Laboratory Director
R. A. Miller (or J. E. Bradley)	-	Section Chief, Health Instruments
R. D. Shiffer (or F. L. Halbach)	-	Plant Engineer
J. J. Spicka (Chairman)	-	Business Manager
R. A. Staniforth (for Unit III)	-	Division Director, Research and Development

4. As the evaluation committee proceeds through the various rooms and buildings, our engineering, health, and business personnel will proceed to act on its findings.

5. A general steering committee will be established to care for the whole job of disposal. Its primary function (and temporarily sole duty) will be to coordinate all phases of the disposal program and see that things are carried through. The committee will submit reports at biweekly intervals to management. The committee is as follows:

L. E. Byriel	- Area Office Supervisor
F. L. Halbach (Chairman)(or R. D. Shiffer)	- Chief Design Engineer
J. E. Bradley (or R. A. Miller)	- Section Chief, Survey and Decontamination

6. Both steering and evaluation committes should avail themselves of the services and advice of W. D. Woods, Legal Advisor to the Director, whenever any question pertaining to the contract or other legal matter arises. If further help from any of the divisions is indicated, they should approach the Division Director concerned.

The tentative specific programs for Units III and IV are as follows

UNIT III

1. Dispose of all cold mechanical, plumbing, heating, and lighting equipment as the forthcoming agreement with the Dayton School Board may indicate.

2. Sell the tropical huts, "as is where is."

3. Remove and scrap all duct work, except that used to heat the third floor.

4. Remove and scrap all benches, hoods, and temporary partitions except those on the third floor.

5. Remove air conditioning units from the attic.

6. Vacuum clean and spray the attic.

7. Remove all contaminated mechanical, electrical, and plumbing equipment for disposal as recommended by the evaluation committee.

8. Tear out the whole interior of the Quonset hut.

9. Survey the interior of the shell of the Quonset hut. If "cold" it can be sold "as is where is" or disposed of as agreed on with the School Board. If "not" it should be sprayed with plastic and left.

10. Clean out, i.e., sweep, all rooms.

11. Survey all rooms, decontaminate where indicated, and resurvey to establish the fact of decontamination.

12. Fence and guard houses should be left.

13. Return property to the School Board with the agreement that no major changes in walls, floors, or sewer lines be made within five years without seeking our aid in survey, etc.

14. Any of the items above may be modified if survey indicates they are necessary or unnecessary.

UNIT IV

1. Dispose of all cold mechanical, plumbing, heating, and lighting equipment by warehousing at Mound Laboratory or declaring surplus property.

2. Remove all contaminated mechanical, electrical, and plumbing equipment for disposal as recommended by the evaluation committee.

3. Spray interior as indicated by survey.

4. Tear out all rooms, partitions, etc., built in any not operating area. Tear out ceiling, wall, and floor linings in the same areas. This will be a particularly hazardous operation. Spraying may be resorted to

where indicated, but is not expected to be of much use owing to the spongy porous nature of much of the material to be removed. Ventilated hoods and special clothing may have to be worn throughout.

5. All hot wreckage material should be sorted into burnable and non-burnable categories and hauled to the scrap piles at Mound Laboratory. The trucks used for this service will probably have to be considered expendable since their decontamination may prove to be impossible.

6. Sweep out all loose dirt.

7. Spray interior of shell wherever indicated by survey.

8. Hand over the shell of the building and surrounding small structures to Maxon for razing as arranged by the Atomic Energy Commission.

9. Material from razing should be put on the scrap piles at Mound Laboratory.

TAB B

TAB B - FACTORS AFFECTING THE PROBLEM

History of Unit IV

"It was speedily realized that Unit III would not suffice for production, so a further search was made for space. ...

In February, 1944 negotiations acquired the Runnymeade Playhouse in Oakwood, a suburb of Dayton, This location was called unit IV. Since this building is located in one of the finest residential sections of the city, some difficulty was encountered in leasing negotiations by Monsanto. However, condemnation proceedings were instituted and the property leased by the Government. This location was chosen primarily because it was the only building in Dayton that could be occupied immediately. It afforded sufficient floor space, head room, necessary services and, also, was approved by the security officials. It is owned by the Talbott Realty Company whose holdings are, primarily, the estate of the Talbott family. ... In addition to the main building there is a one and one half story garage, the main floor of which was converted into a carpenter shop and locker rooms.

Work was immediately started to erect three guard houses and a fence. Alterations to the main building were not extensive, but the interior presented many problems in constructing process facilities and laboratories. Care was exercised in making as few changes as possible in the building and the existing services to alleviate the problem of restoration upon vacating this site. ... Careful consideration was given in order to minimize annoyances such as noise, smoke, and dirt so as not to incur undue criticism from the residential area. ... Operations began in May, 1944. ...

In May, 1944 it was decided that the Bismuth Process was superior to the Lead Dioxide Process for the manufacture of polonium. Consequently, numerous changes were made in the production facilities located on the main floor of Unit IV. The equipment used in the Lead Dioxide Process was dismantled and shipped to Oak Ridge. In its place small laboratories designed for the Bismuth Process were constructed.

In 1945 a fireproof storage vault was erected on the grounds at Unit IV for storage of classified materials."

See Figure 1, Plot Plan, Unit IV, July, 1945.

See Figure 2, Unit IV, Main Guard House Entrance.

See Figure 3, Unit IV, N.W. View of Main Building.

See Figure 4, Unit IV, Rear View of Main Building.

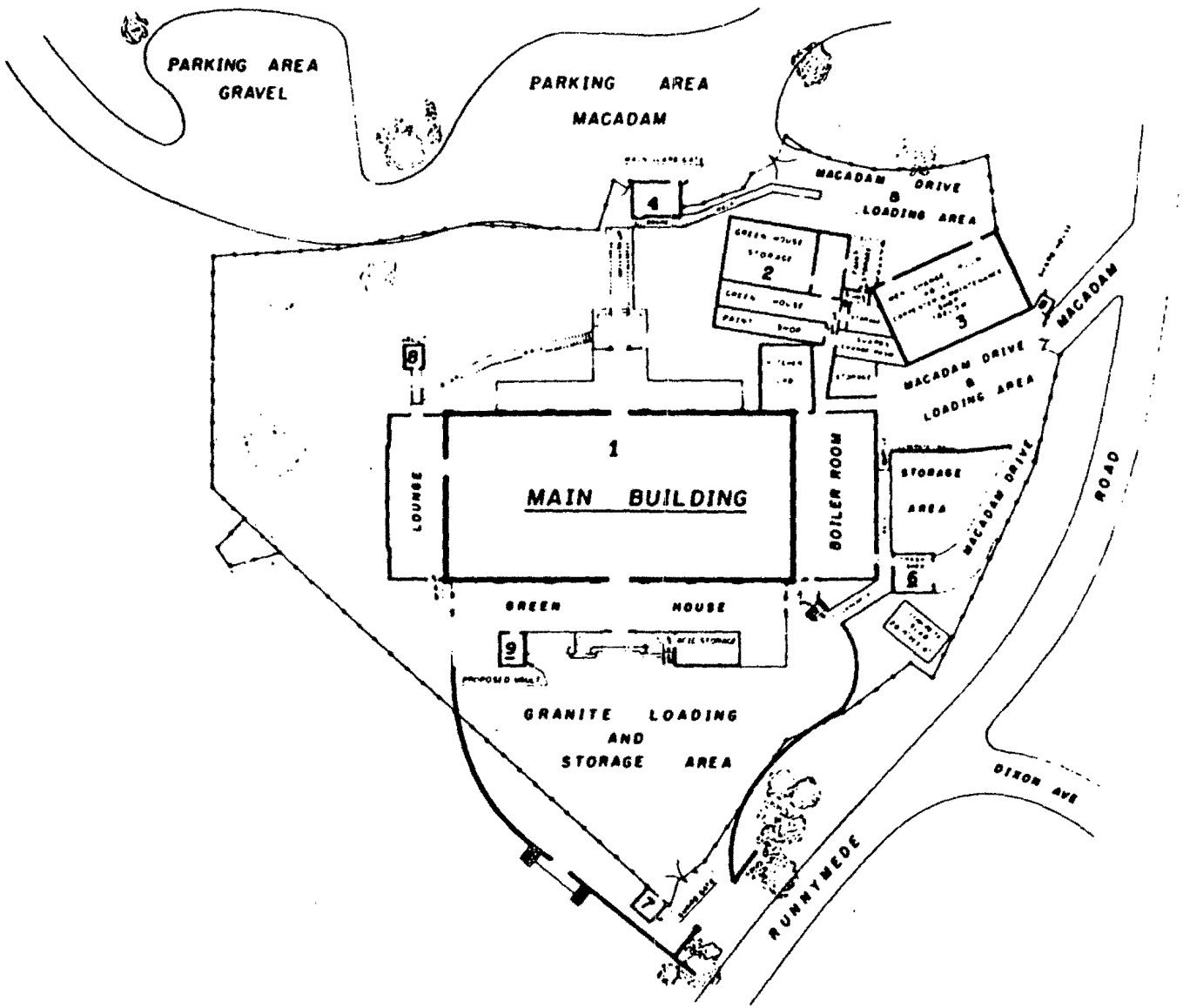
See Figure 5, Unit IV, S.W. View of Main Building.

See Figure 6, Unit IV, S.E. View of Main Building, Change House and Shop Building.

See Figure 7, Unit IV, Change House and Shop Building.

"Every laboratory working with radioactivity has the problem of protecting the workers against the health hazards arising from various radiations. The Dayton Project was no exception. ... Despite all efforts, contamination persisted at a higher level than desired."

Note: It is this contamination in this case entirely from polonium, which makes this disposal of Unit IV a complex, difficult, potentially hazardous and expensive problem.



PLOT PLAN, UNIT IV. JULY, 1947

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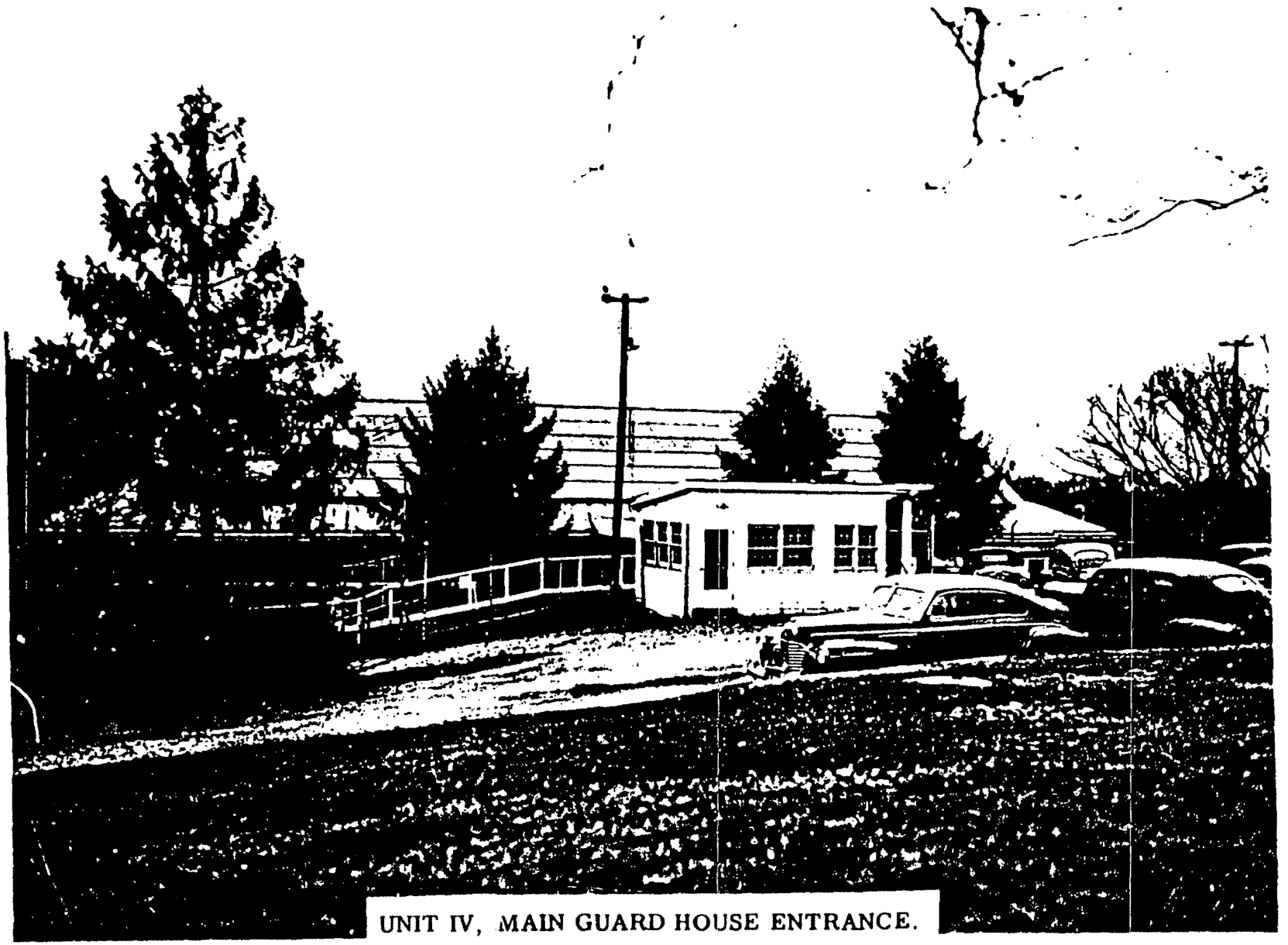
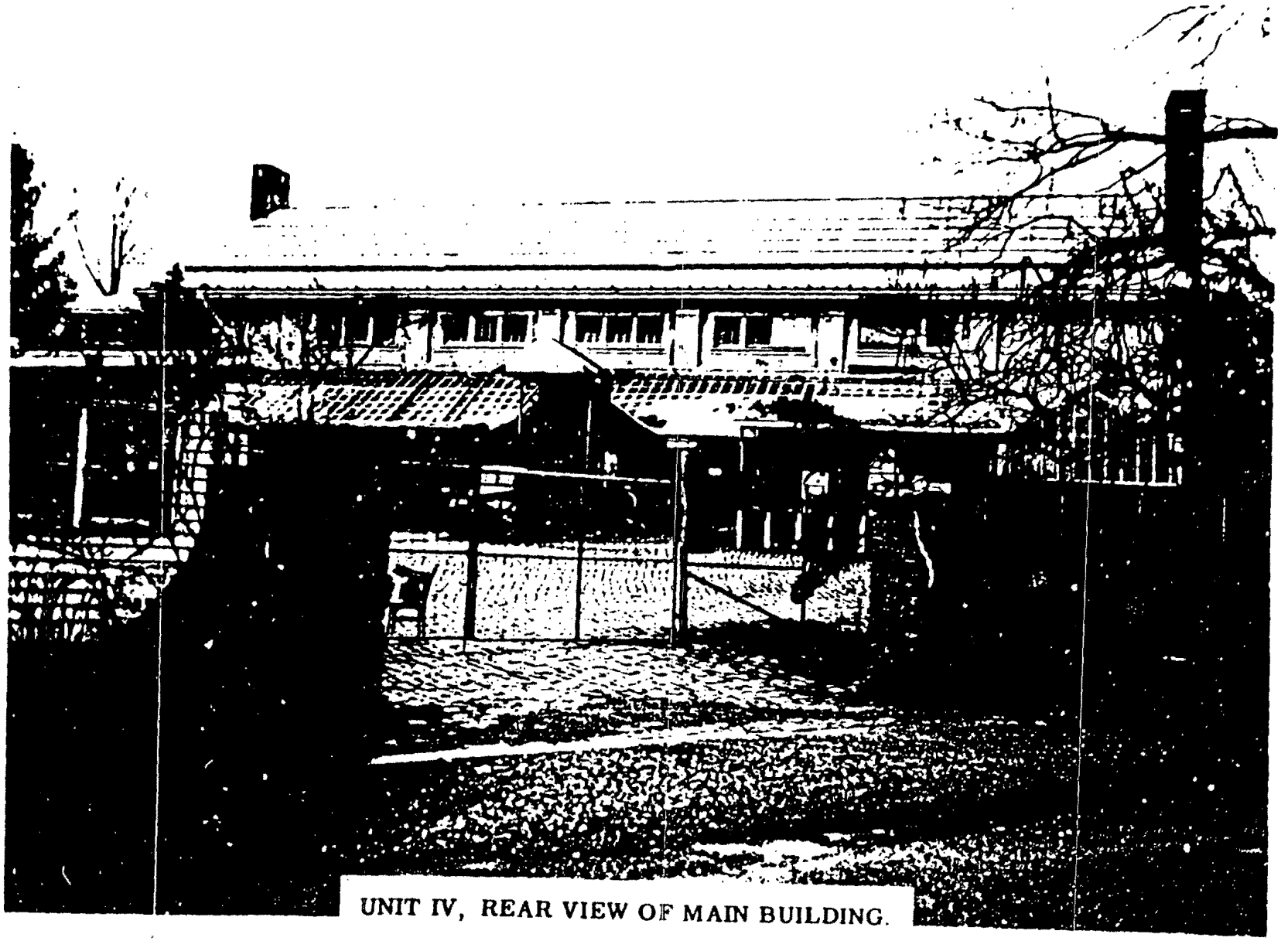


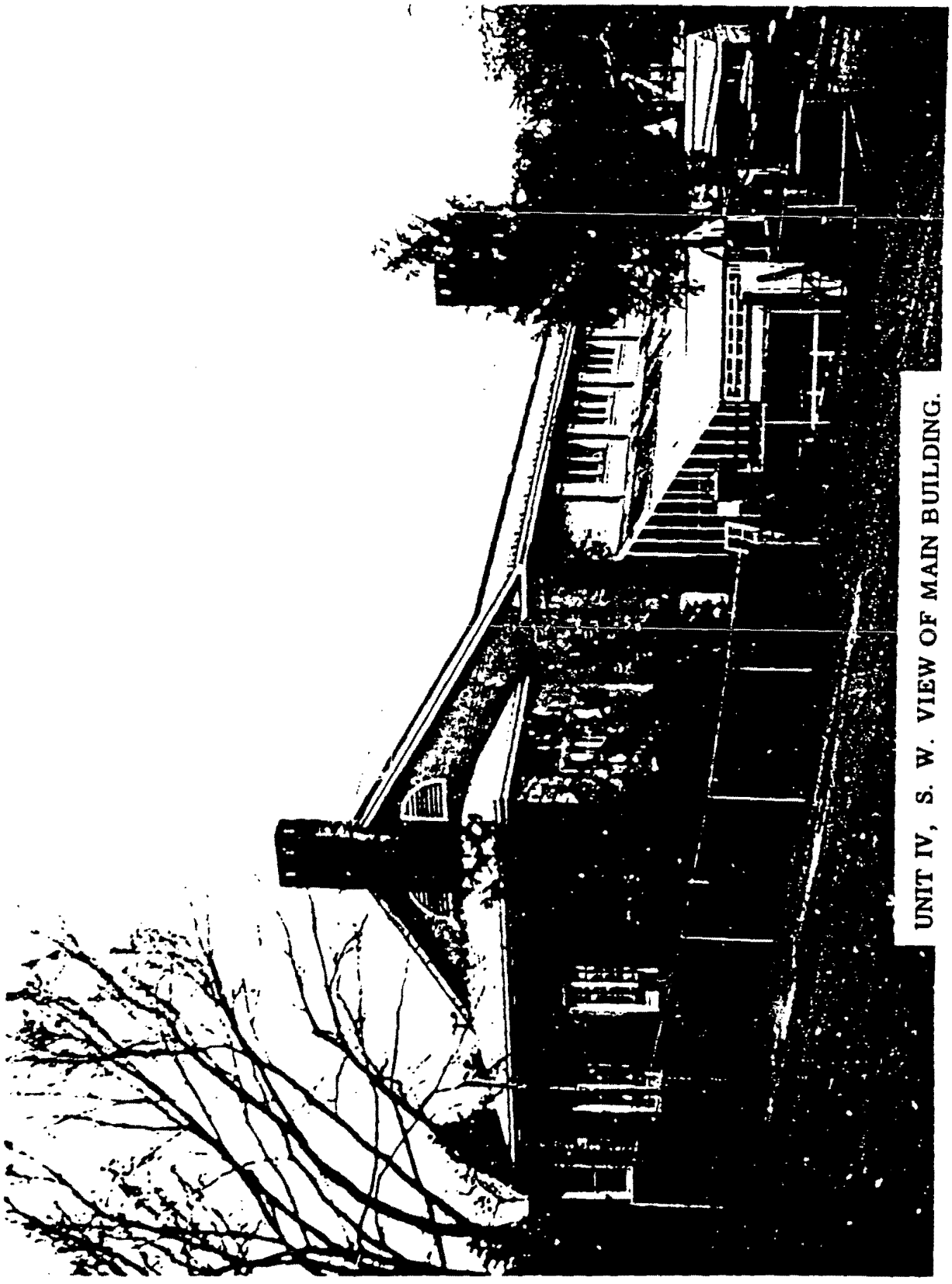
UNIT IV, MAIN GUARD HOUSE ENTRANCE.

FIGURE 3

UNIT IV, N. W VIEW OF MAIN BUILDING



UNIT IV, REAR VIEW OF MAIN BUILDING.



UNIT IV, S. W. VIEW OF MAIN BUILDING.

UNIT IV, S. E. VIEW OF MAIN BUILDING
CHANGE HOUSE AND SHOP BUILDING.

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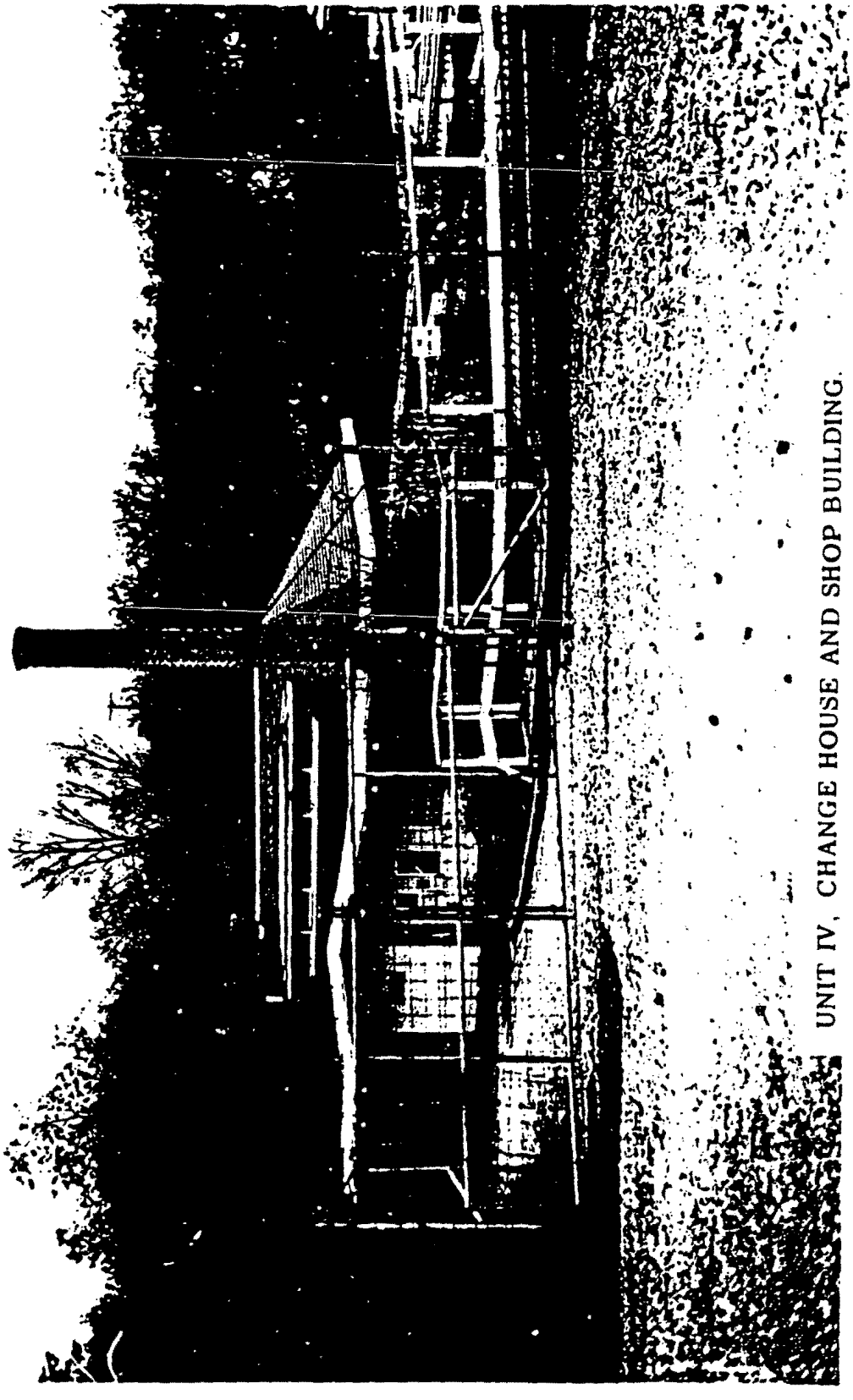
FIGURE 7



UNIT IV, CHANGE HOUSE AND SHOP BUILDING.

TAB C

TAB C - RETENTION OF RADIOACTIVE PROPERTY AND SALVAGE MATERIAL

UNITED STATES
ATOMIC ENERGY COMMISSION

EIDMW-3

Oak Ridge, Tennessee
February 10, 1947

United States Atomic Energy Commission
Dayton Area
Dayton, Ohio

Attention: Colonel R. J. Kasper, Area Engineer

Subject: RETENTION OF RADIOACTIVE PROPERTY AND SALVAGE MATERIAL

1. It is essential that action be taken to prevent radioactive material from entering commercial channels. You will establish necessary procedures to insure that it is impossible for materials of this type to lose their identity or to enter commercial channels through sales or transfer of surplus property, salvage, and scrap.

2. Material which gives greater than two times background on the instrument Victoreen 263, or greater than two divisions on the most sensitive scale of the Zueto will be considered sufficiently contaminated to justify withholding them from commercial channels until policies and procedures governing the disposition can be formulated.

3. In the event the instruments referred to in Paragraph 2 are not available, they may be obtained by submission of AEC Form 500 to the Instrument Production Section, Research Division, in accordance with District Circular Letter (Research Control 47-1) dated 27 August 1946.

4. The present procedures now governing the transfer of property and material between installations of the Atomic Energy Commission is not affected by this directive.

ATOMIC ENERGY COMMISSION

/s/ P. F. Kromer, Jr.
Colonel Corps of Engineers
Deputy Manager Field Operations

TAB D

UNCLASSIFIED

MCM-[illegible]

TAB D - LETTER TO CHIEF, APPLIED BIOPHYSICS BRANCH, DIV. OF BIOL. AND MED

June 30, 1949

Dr. Lauriston S. Taylor, Chief
Applied Biophysics Branch, Div. of Biol. & Med.
Joe Deal
Applied Biophysics Branch, Div. of Biol. & Med.

VISIT TO DAYTON

REFER TO SYMBOL: BM:LJD

On Friday, June 24, 1949, Dr. Stoeckle and I spent the day at the Dayton Area. Since they have moved to Mound Laboratory, they now have the problem of disposing of the old plant which consisted of two sites in the city of Dayton, one of them known as "Runneymeade Playhouse" and the other, the old School House. The disposal of Runneymeade Playhouse will not pose the same difficulties since the Monsanto Health Division will be in complete charge of the operation, which consists of tearing the building down and storing it. I do not mean to imply that this will be an easy job. However, it will be under control.

The main problem at present is the disposal of the School House. Since the building does not belong to the Government but to the Dayton city school system and the School Board is looking forward to having it returned in the future, this poses a rather knotty problem. The Manager at Dayton has decided that he will make as thorough a clean-up as possible of the building without going into major construction or destruction with the idea of having a thorough survey at the completion of the clean-up. His staff will prepare a staff paper based on their findings. Mr. Dunbar felt that he had two possible choices. This was one and the other was not to do anything but write a staff paper making recommendations.

They have arbitrarily set as the limit of decontamination 5,000 disintegrations per minute as read on a Victoreen alpha survey meter. This corresponds, roughly, to 50 disintegrations per minute per square centimeter of area. In addition, a piece of filter paper wiped over the area will not show any contamination. Because of the inaccessibility of a number of places in the school building and because of the fact that pipes and electrical conduits, etc., are contaminated and can not be surveyed, they are faced with a number of questions. Some of these are:

1. Will they be able to decontaminate and renovate the building, then return it to the School Board on a calculated risk basis.

2. What are the implications if they should return the building on a calculated risk plan.

UNCLASSIFIED

3. Is their level of decontamination satisfactory.

4. Should they lease the building for several more years and allow the activity to decay.

5. Should they buy the building and tear it down.

We discussed a number of these possibilities without really trying to come to any general agreement, since anything we would have decided would have been premature. There was some talk of turning the building over to the School Board with the provision that any major repair work would have to be supervised by the Monsanto health people. This did not seem very practical to me since once you lose control of the building you have no way of actually being certain that they don't do some work by ignorance on the part of the man doing the work or a slip-up in procedures or maybe the people would just not be willing to bother to wait on somebody to come from Miamisburg to make a survey.

One of the major considerations that was facing the health physics people at the time we were there was that they will not be able to decontaminate the roof. It was my opinion that since they had already made the decision to do the best clean-up they could, that this would be a problem for them to decide themselves rather than waiting to get an indication from some higher authority as to whether their 5,000 level is adequate. However it would be of great assistance if they could get some indication on the general acceptance or rejection of their decontamination level. This is a rather arbitrary figure and was calculated independently by two groups there. The assumptions behind this figure are: (1) that they would accept in their new plant anything that contained as many as 10,000 disintegrations per minute provided that none of the contamination would wipe off; and (2) 5,000 disintegrations per minute is roughly either 10 or 100 times the level set for returning stuff to commercial channels. This latter figure is one I am not familiar with but I do know that before the AEC took over from the Manhattan District, there were some sad experiences due to releasing contaminated materials through the sale of surplus property. Because of this, an extremely low figure was set for the release of scrap on the open market. I am not sure about the history of this figure nor am I sure of what it is. However, it is a figure that can be dug out of the files.

In general, the situation does not seem impossible nor critical. The staff at Dayton, with the help of Mr. Hayden from Dr. Holland's office seem to be feeling their way along and meeting each situation as it arises. I would recommend that we make an effort to consider the decontamination figure and then wait for the staff study that Mr. Dunbar will prepare.

TAB E - DISPOSAL OF UNIT IV

The Engineer-in-charge was obtained from the Monsanto design staff on the Scioto Laboratory Project, and reported for duty on May [illegible], 1949 which date marks the beginning of the disposal program at both Units III and IV.

Work orders were assigned to the individual units and for preparation of a storage site at Mound Laboratory.

Personnel were obtained on a temporary transfer basis due to a reduction in force in the Security and Business Divisions. Other personnel were obtained as required on temporary loan from Engineering, Business, Operations, and Health Divisions.

The Health Supervisor, on temporary loan from the Atomic Energy Commission, Oak Ridge, Tennessee, reported for duty on May 23, 1949.

Work was first started in connection with preparation of a storage site for contaminated wastes at Mound Laboratory.

Prior to starting any actual work at Unit IV a preliminary health survey was made to measure spread of contamination from earlier work under direction of the Evaluation Committee. During this work it was found that contamination had been spread over pretty much of the entire Unit IV area. It was necessary to close the auditorium to presonnel for several weeks after this occurred. This survey still showed excessive contamination of walls, offices, locker rooms, and main guard house; in many cases exceeding 200,000 d./min./100 cm.^{2} Consequently, decontamination work in these areas had to be carried out prior to tackling the main job of

disposal. Floors and walls were cleaned, painted where necessary and paper laid on inside floors. A locker room was set up and rooms were provided for on-the-spot counting of air samples, and for supervisory and health personnel.

Change house and health procedures were established similar to those used at Unit III in connection with smoking, eating, clothing change showers, and washing of hands.

The following maximum permissible limits for air levels and necessary protection required for same were put into effect.

0- 3,000 d./min./m.^{3}	-	no protection required
3,000-25,000 d./min./m.^{3}	-	respirators required
25,000-50,000 d./min./m.^{3}	-	assault masks required
Over-50,000 d./min./m.^{3}	-	work ceases in such areas until air levels fall to within workable limits

The same maximum limit of 12 c./min./50 ml. for urine samples as is used at Mound Laboratory, was used on this project to determine work status of individual personnel.

Warehouses used during construction of Mound Laboratory were turned over for our use for:

1. Temporary storage of clean equipment and materials.
2. Temporary storage of contaminated equipment and materials.

Definition as given in TAB C was used to differentiate between clean and contaminated equipment. Items contaminated in excess of 5,000 d./min./100 cm.^{2} were decontaminated and/or packaged in a manner compatible with type, size, and shape prior to storage.

The first part of the disposal program consisted mainly of clean-up, decontamination, and disposal of materials, equipment and scrap that had been accumulated during earlier work. Scrap materials were separated into combustible and non-combustible categories, and stored separately at the contaminated storage site so that combustible material could later be used in incinerator development program, or burned, if this unit has been meanwhile perfected and installed. Extreme care had to be taken in handling these materials, as contamination was mainly dust borne and easily stirred up. All piles of scrap, hoods, entire laboratories including floors and walls were spray painted to fix as much of the contamination as possible. (At this early date, wet methods of fixing dusts had not been thoroughly tested.)

The Engineer-in-charge left Monsanto in June. The Assistant Engineer took over project supervision, and additional personnel obtained from the Operations Division to provide supervision at both Units III and IV.

No definite levels had ever been fixed for the final work at Unit IV. Due to the fact that Unit IV was to be completely wrecked, and all material from same to be sent to Mound Laboratory, it was felt that levels higher than those set for the work at Unit III could be used. At a meeting of the Planning Committee on July 23rd, called to discuss this and other problems that had arisen up to this date, it was agreed that levels higher than those for Unit III were definitely in order, and while no definite levels were fixed, it was further agreed that actual limits should be determined by field conditions, and the judgment and experience

of the Steering Committee, Engineer-in-charge and Health Supervisor, with approval given to an upper level of 50,000 d./min./100 cm.^{2} direct reading and zero wipe for a working basis. Consequently, these conditions actually served as the basis for the work at Unit IV.

The personnel on the job were mostly reclassified as General Mechanics (later Maintenance Mechanics, 2nd Class) so that any type of job on the project could be assigned to any man, making necessary allowance for individual's physical condition and capabilities.

The initial clean-up and disposal work was completed early in August. Due to vacations, illness, etc., personnel was cut to such a few men that work at Unit IV was stopped during most of August and remaining men transferred to Unit III, then nearing completion.

During this period, the Health Department made an extensive survey of the entire unit to serve as a starting basis for the active decontamination and disposal program. Strangely the preliminary roof insulation survey indicated levels low enough to warrant leaving it in place. It had always been thought that this insulation would be highly contaminated, and entail considerable time and work to remove.

Due to success to date with decontamination of concrete and maintenance of low air levels during dismantling work by use of wet methods of laying dusts, the request was made that some field experimental work on these methods be carried out. This work was not to conflict, however, with the main job of disposal. All this work was conducted at Unit IV and a separate evaluation report issued on the results of these tests. Wet methods continued to be used extensively

during dismantling operations. and use of water is probably the chief single factor which made it possible to maintain a continuing work schedule with a minimum of work stoppage.

Similarly as at Unit III, practically every type of decontamination procedure was used at one time or another. However at Unit IV, due to its ultimate disposal, if there was any question as to method the particular object in question was removed rather than decontaminated. In other words it was less time consuming to remove contaminated material than to attempt decontamination. Painting was not recognized as a means of decontamination for this work.

The Health Supervisor left the project at the end of September. Balance of work was carried out under Monsanto Health supervision. Final surveys are included as TAB F in this report.

Actual dismantling work was accelerated in September, due to advanced status of work at Unit III. Same procedures and methods as used there were carried over to work at Unit IV. The entire auditorium floor had to be removed down to the concrete sub-floor due to spotty though extensive contamination all the way through. The concrete sub-floor even required one complete acid wash, and additional spot acid washes. A final survey of the ceiling insulation showed that the levels (with two exceptions of 60,000) were less than 50,000 d./min./100 cm.^{2} direct and N.D. wipe test. Samples were sectioned, and tests showed very little contamination or any evidence of dusting. Accordingly, ceiling insulation was left in place. The east macadam drive and a ten-foot wide area of macadam and paving block at the south loading dock were removed entirely.

Celotex side walls were well below levels used for the project and were left in place. Roof areas were below levels for job with one exception, which item was removed. Concrete floors in the south greenhouse and storage areas were grossly contaminated and, as these areas were pretty well painted over, had to be removed entirely, since acid washes had little effect on painted concrete.

See Figures 1 and 2, Unit IV, Main Building Interior During Dismantling Operations. (Work 90 per cent complete.)

See Figure 3, Unit IV, Main Building Dock Area During Dismantling Operations.

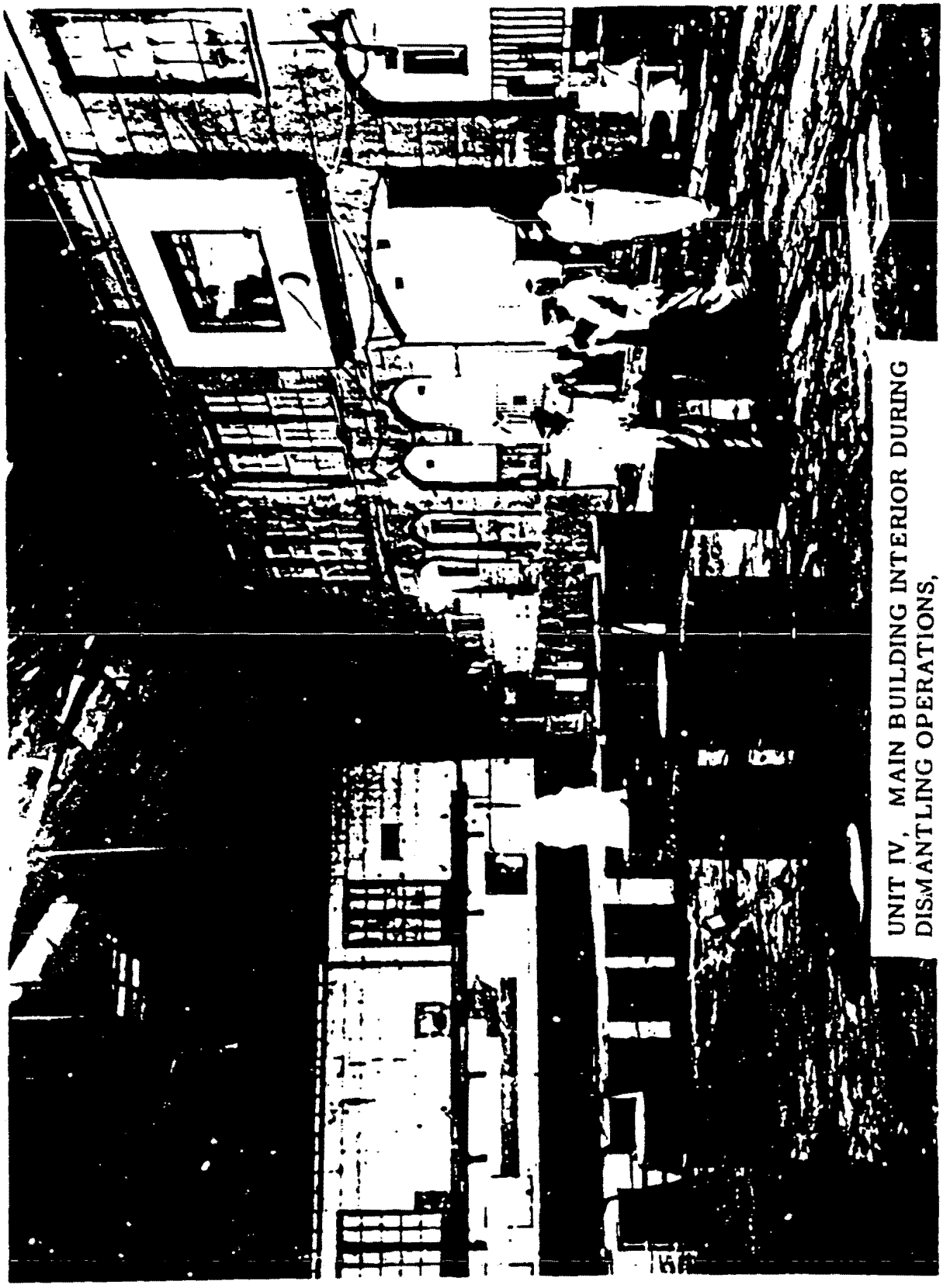
The following amounts of material were transferred from Unit IV to Mound Laboratory:

160 loads - All types of contaminated scrap

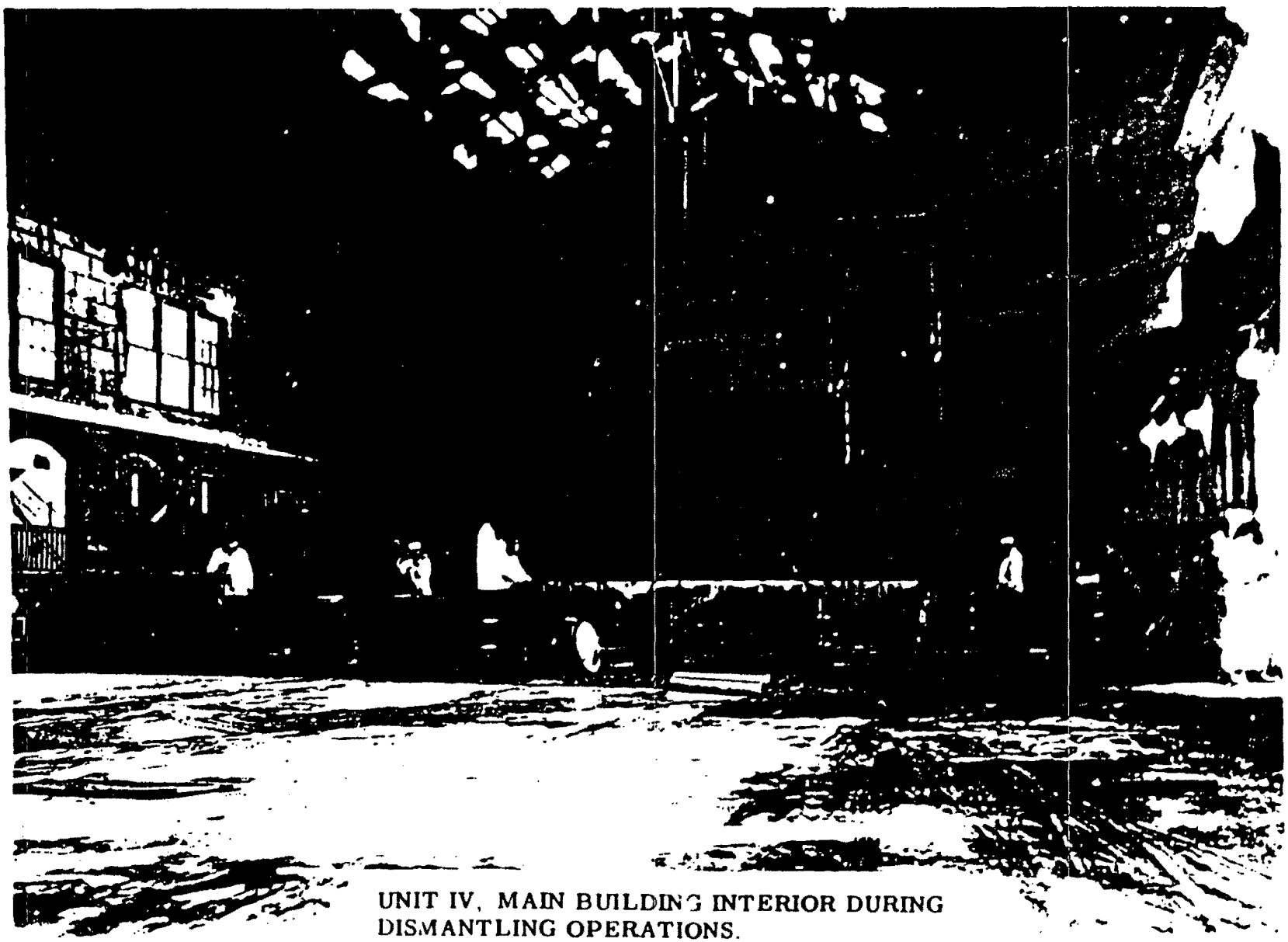
40 loads - Property items and usable materials

The final Health Surveys, see TAB F, were compiled, and disposal work under Steering Committee supervision completed on February 3, 1950.

FIGURE 1

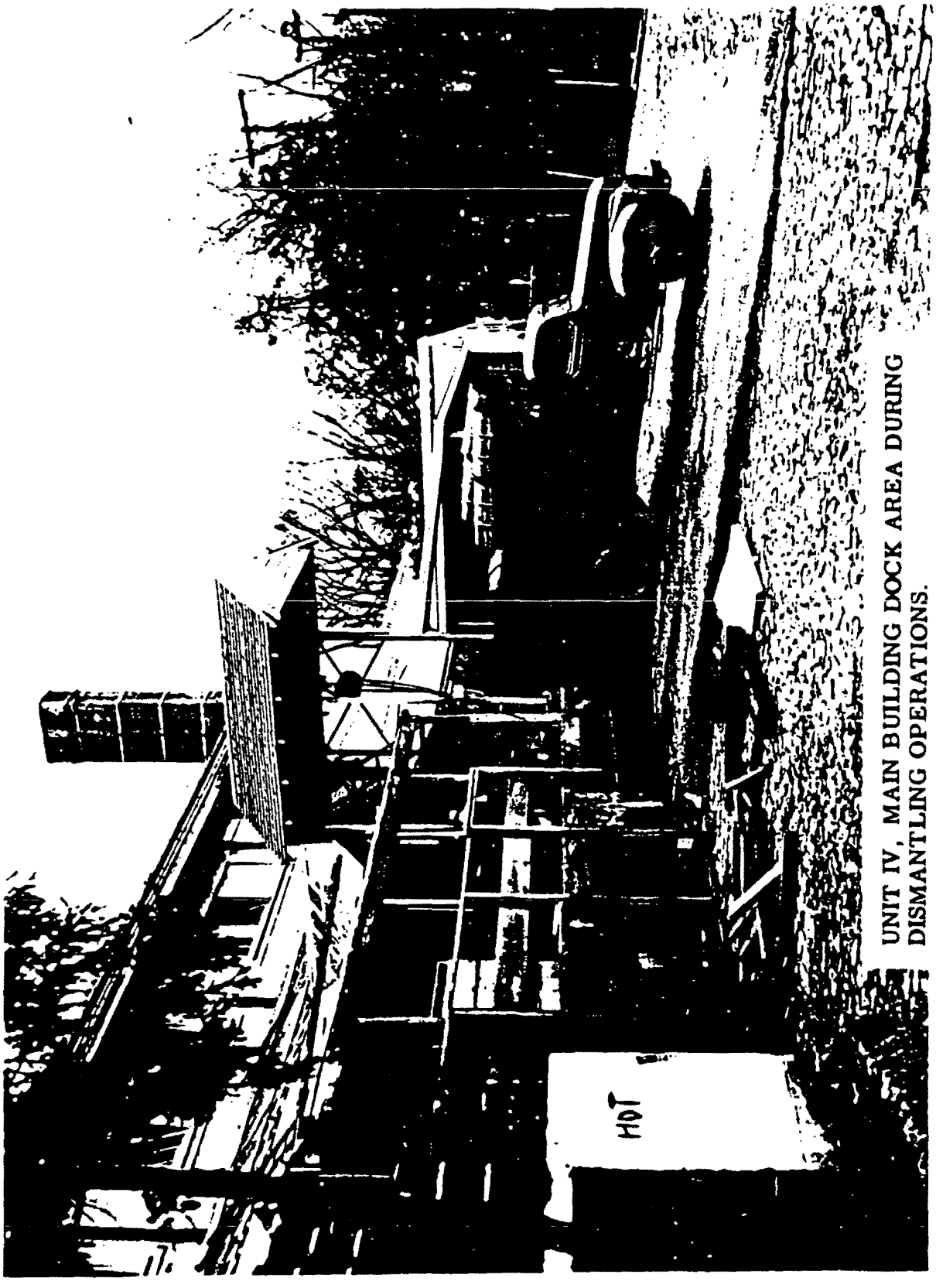


UNIT IV, MAIN BUILDING INTERIOR DURING DISMANTLING OPERATIONS,



UNIT IV, MAIN BUILDING INTERIOR DURING DISMANTLING OPERATIONS.

FIGURE 3



UNIT IV, MAIN BUILDING DOCK AREA DURING DISMANTLING OPERATIONS.

Final Dismantling of Unit IV

Since it was deemed advisable to demolish and remove from the site all existing structures, the Atomic Energy Commission arranged to purchase from the Talbott Realty Company the buildings on this property owned by the Talbott Estate. Accordingly, all buildings, as property of the Government, were to be razed.

Details of the demolition and removal of Government-owned facilities are contained in a Directive dated February 13, which also makes reference to the purchase of the buildings owned by the Talbott Realty Company, copy of which follows.

Contract AT-(33-1)-81 was awarded to the R. G. Mattern Company for demolition and removal work. Active work was started on February 10 and completion was estimated to be May 15.

Figures 4 through 19 indicate the progress made during this phase of the work.

Following also are copies of letters dated February 13 and February 14 to the R. G. Mattern Company from the Atomic Energy Commission which are of interest in connection with this work.

Conclusion

In view of the record at Unit IV we may conclude that other similarly contaminated buildings, drives, and grounds, after careful and thorough decontamination by operating Contractor personnel to levels approximating those used on this project, may be successfully razed or removed by outside wrecking contractors with a minimum of operating contractor advisory personnel and little likelihood of the small amount of the residual contamination causing any work stoppage, subsequent contamination of wrecking equipment or tools, or wrecking personnel becoming "hot," as measured in the usual manner.

UNITED STATES
ATOMIC ENERGY COMMISSION

In reply refer to:
E:RWD

P. O. Box 66
Miamisburg, Ohio
March 14, 1950

Mr. R. G. Mattern
2310 North Western Avenue
Dayton
Ohio

Dear Mr. Mattern:

Reference is made to Contract No. AT-(33-1)-81 and to our letter of instruction, dated February 14, 1950.

Recent surveys have disclosed that it is undesirable from a contamination standpoint to let building No. 3 remain for future use. It is requested, therefore, that you take the necessary action to completely dismantle building No. 3 and transport the resulting residue of materials to Mound Laboratory in accordance with procedures for the demolition of the balance of Unit 4.

Very truly yours,

/s/ R. W. DeLozier
Project Engineer

DeLozier/clh

CC: J. J. Spicka, Monsanto
M. W. Hicks, Monsanto
N. S. Talbott

UNITED STATES
ATOMIC ENERGY COMMISSION

In reply refer to:
EC:RWD

Post Office Box 66
Miamisburg, Ohio
February 14, 1950

Mr. R. G. Mattern
2310 North Western
Dayton, Ohio

Subject: INSTRUCTIONS FOR DEMOLITION OF UNIT IV

Dear Mr. Mattern:

Reference is made to Contract No. AT-(33-1)-81 with the Atomic Energy Commission for demolition of facilities at Runnymede Road and Dixon Avenue in the City of Oakwood, and to Article 7 b. of the subject contract. It is deemed advisable at this time to outline to you our desires with respect to salvage of certain materials. Therefore, the following listed materials will be so dismantled and handled that they can be used at another area:

1. The perimeter fence, gates, corner posts, etc.

2. The structural steel framework of the building designated as Main Building No. 1 on drawing entitled "Runnymede Building, Plot Plan Unit 4," dated 7-28-47, as shown in Appendix "B" to your contract.

3. All lavatory type facilities, including toilets, urinals, and washstands, and including taps, etc. affixed to the units.

4. The automatic hot water heater located in the Boiler Room of the Main Building.

The above instructions may be modified or supplemented from time to time as the work progresses; however, it looks at this time as if these will be all the materials required for salvage.

It is further requested that Building No. 3, as shown on "Runnymede Building, Plot Plan Unit 4" dated 7-28-47, be deferred for demolition until further advice from this office, and will be so occupied and

Mr R. G Mattern
February 1[illegible], 19[illegible]

utilized during the demolition operations looking to the possibility of this building remaining in good usable condition at the completion of your contract obligations.

Very truly yours,

/s/ R. W. DeLozier
Project Engineer

DeLozier/mw

cc: Mr. J. J. Spicka
Mr. M. W. Hicks
Mr. N. S. Talbott

UNITED STATES
ATOMIC ENERGY COMMISSION

In reply refer to:
MC:RWD

Post Office Box 66
Miamisburg, Ohio
February 13, 1950

Dr. M. M. Haring
Laboratory Director
Monsanto Chemical Company
Mound Laboratory
Miamisburg, Ohio

Subject: DIRECTIVE DAY-11

Dear Dr. Haring:

Transmitted herewith, as a matter of information to you and for your record, are three copies of Directive No. DAY-11, providing authority and necessary funds for demolition of Unit No. IV.

Very truly yours,

/s/ E. A. Walker
Assistant Area Manager

Encl.;
3 cys DAY-11

DeLozier/mw

UNCLASSIFIED

MLM-[illegible]

Dir. Consec. No. 912
Dir. No. Day-11

UNITED STATES
ATOMIC ENERGY COMMISSION

PEE:NV

Oak Ridge, Tennessee
February 13, 1950

Manager, Dayton Area
U. S. Atomic Energy Commission
Miamisburg, Ohio

Subject: DIRECTIVE FOR THE DEMOLITION AND REMOVAL OF COMMISSION-OWNED FACILITIES FROM THE TALBOTT CORPORATION PROPERTY, DAYTON, OHIO

Reference is made to memorandum from the Assistant Area Manager, Dayton Area, to the Director of Production and Engineering, Oak Ridge, dated January 26, 1950, subject, "Request for Directive Action."

Further reference is made to Commission obligations under Court Order (U.S. District Court, Southern District of Ohio, Civil No. 319). Conditions of the judgment rendered in this action stipulated, in part, that the Commission pay the defendant (The Talbott Realty Company) the sum of $138,750 and, in addition, shall "cause to be demolished and removed, all of said improvements, including the foundations to a depth of seven feet, render all the sewer lines fit for public use, cap utility lines, fill all holes and grade said land, etc."

Since the Monsanto Chemical Company has completed all preliminary work - consisting of the dismantling and removal of laboratory equipment and contaminated materials previously scheduled for removal prior to final demolition work - you are hereby authorized to proceed with demolition work.

Required work shall be accomplished as follows:

a. Dismantling and demolition work will be accomplished under a CPFF Prime Contract.

b. The Monsanto Chemical Company, under Contract No. AT-33-1-GEN-53, will assist in the work by (1) furnishing all equipment, tools, supplies, work clothing, fuel, etc., (2) conducting health-physics surveys as required and (3) furnishing other related services as required to supplement the work of the demolition contractor.

Use of available Commission-owned construction equipment is authorized.

Isolated storage for contaminated materials and equipment will be provided at Mound Laboratory.

UNCLASSIFIED

Subject: DIRECTIVE FOR THE DEMOLITION AND REMOVAL OF COMMISSION-OWNED FACILITIES FROM THE TALBOTT CORPORATION PROPERTY, DAYTON, OHIO

Work under this directive shall be completed by May 15, 1950.

Cost of the work authorized by this directive is estimated as follows:

Estimated cost to be incurred for removal of Commission-owned facilities by CPFF prime contract, including an allowance for fixed fee	$32,000
Estimated cost to be incurred by the Monsanto Chemical Company for furnishing material and equipment and assisting in the work including a 25% allowance for indirect costs	$23,000
TOTAL ESTIMATE COST	$55,000

When work under this directive is completed, a "Notice of Completion" shall be promptly transmitted to the Office of Production and Engineering.

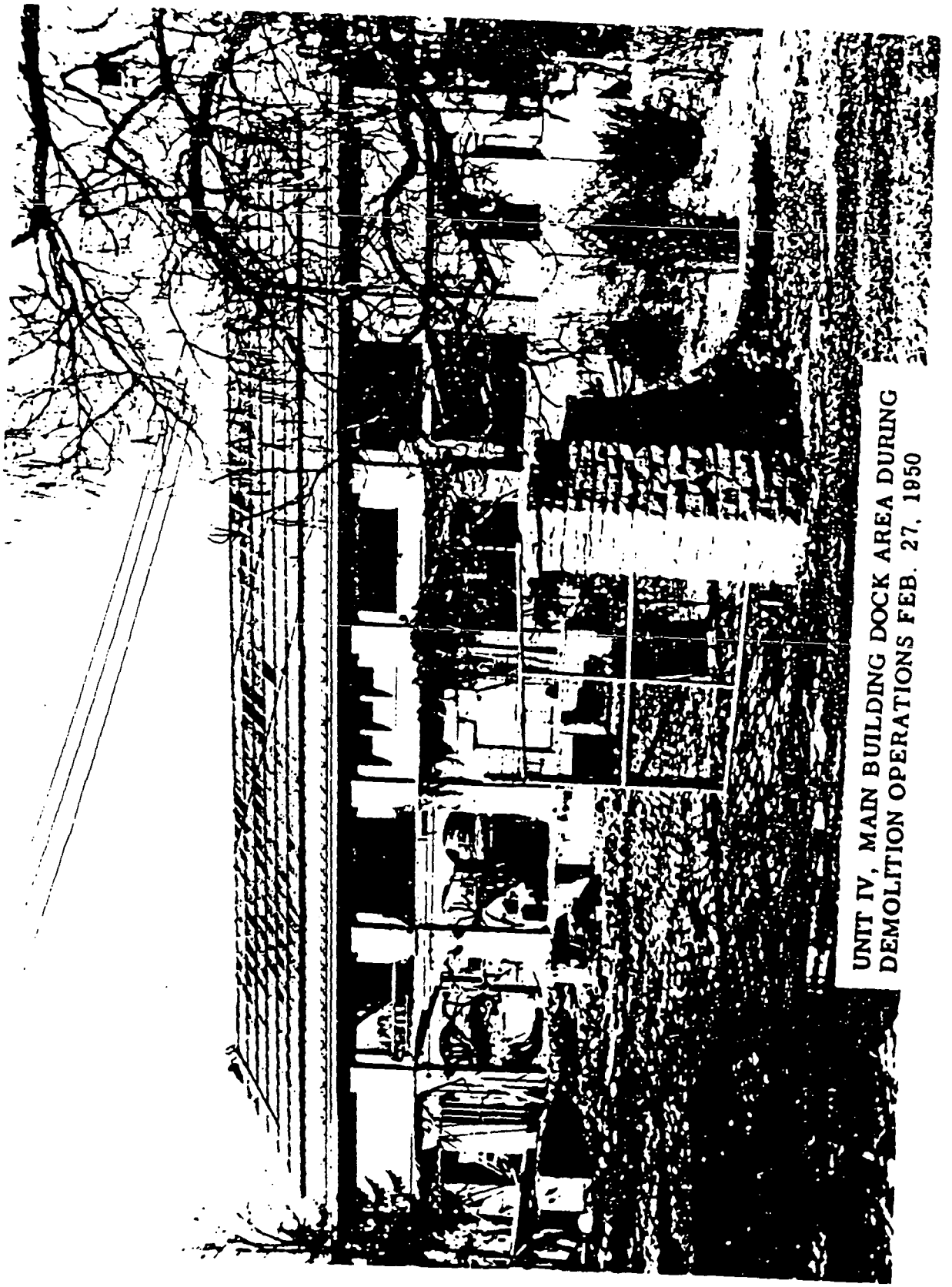
When final costs incurred under this directive are determined, a "Closing Statement of Costs" shall be prepared and submitted to the Office of Production and Engineering for distribution.

Authority is hereby granted to incur expenditures of $23,000 under Contract No. AT-33-1-GEN-53. Authority is also granted to incur expenditures of $32,000 under a CPFF prime contract. Funds for the work are available under Item Number 9 "Plant and Equipment," current Dayton Area budget submission.

/s/ C. Vander Bulck
for S. R. Sapirie
Acting Deputy Manager

UNIT IV, N. W. VIEW OF MAIN BUILDING DURING DEMOLITION OPERATIONS FEB. 27, 1950

FIGURE 5



UNIT IV, MAIN BUILDING DOCK AREA DURING DEMOLITION OPERATIONS FEB. 27, 1950

UNIT IV, MAIN BUILDING INTERIOR DURING DEMOLITION OPERATIONS FEB. 27, 1950

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UNIT IV, MAIN BUILDING INTERIOR
DURING DEMOLITION OPERATIONS FEB. 27, 1950.

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UNIT IV, MAIN BUILDING REAR VIEW, DURING DEMOLITION OPER^TIONS March 6, 1950.

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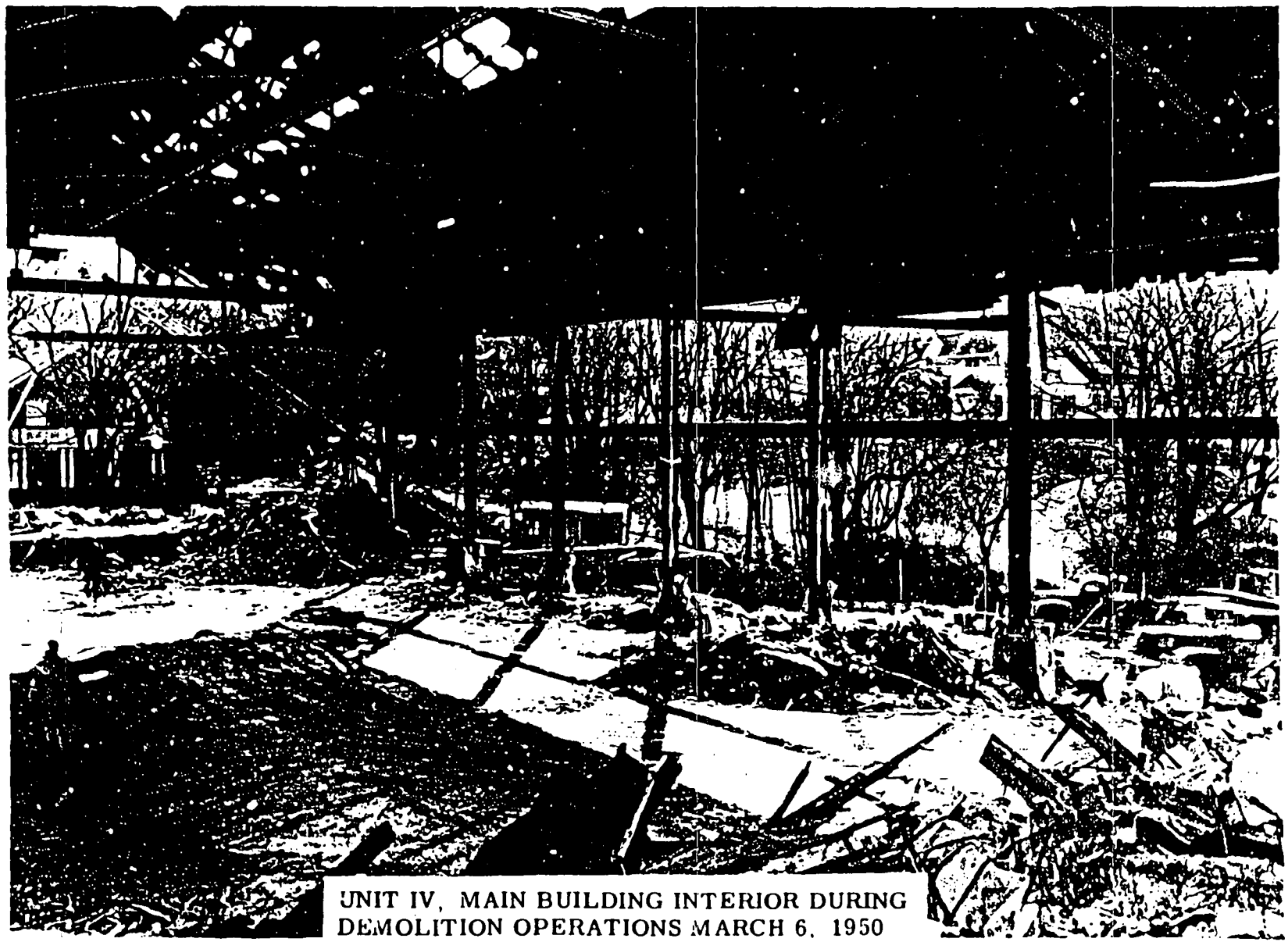

UNIT IV, MAIN BUILDING INTERIOR DURING DEMOLITION OPERATIONS MARCH 6, 1950

UNIT IV, N. W. VIEW OF MAIN BUILDING DURING DEMOLITION OPERATIONS MARCH 6, 1950

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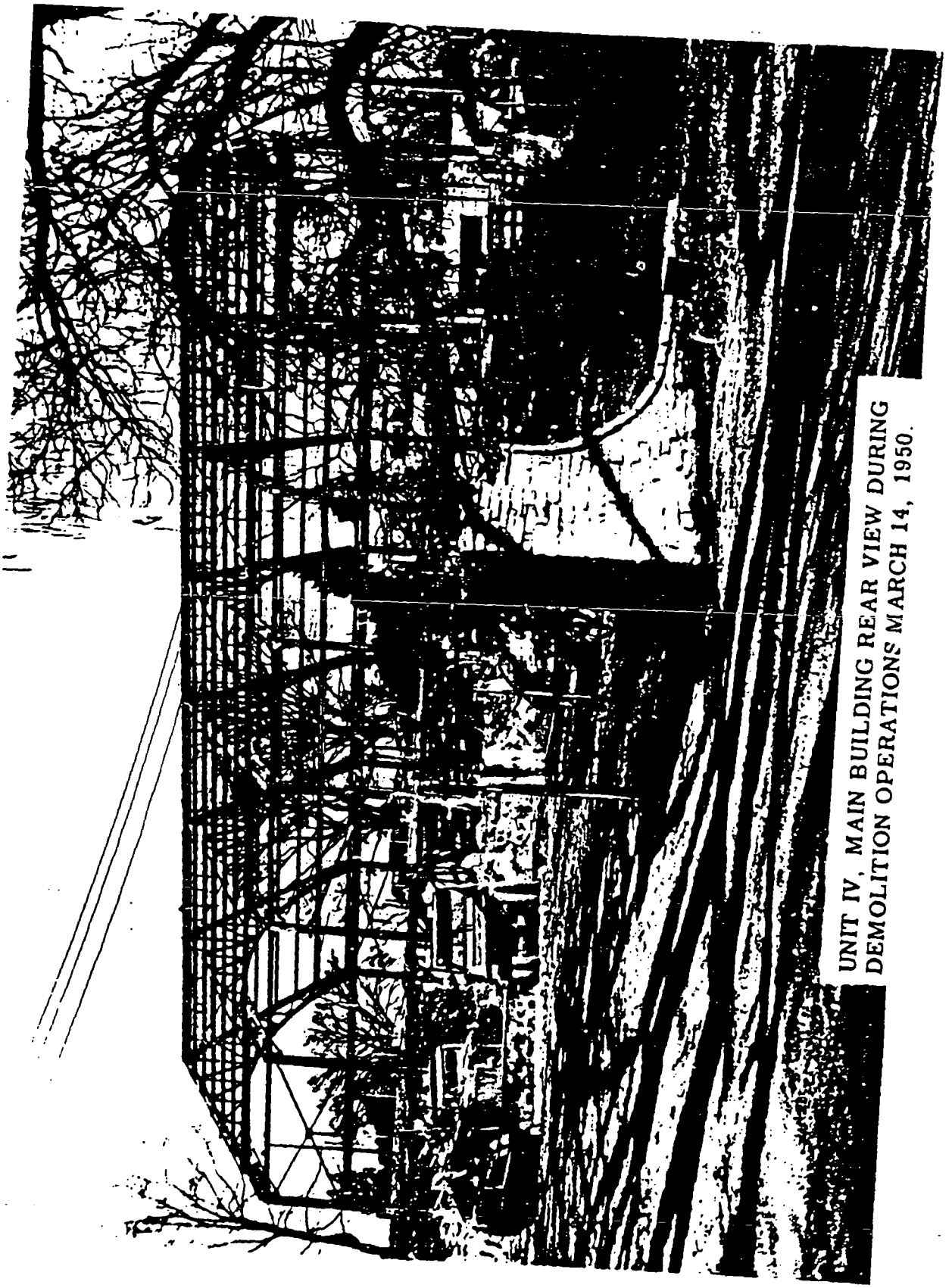
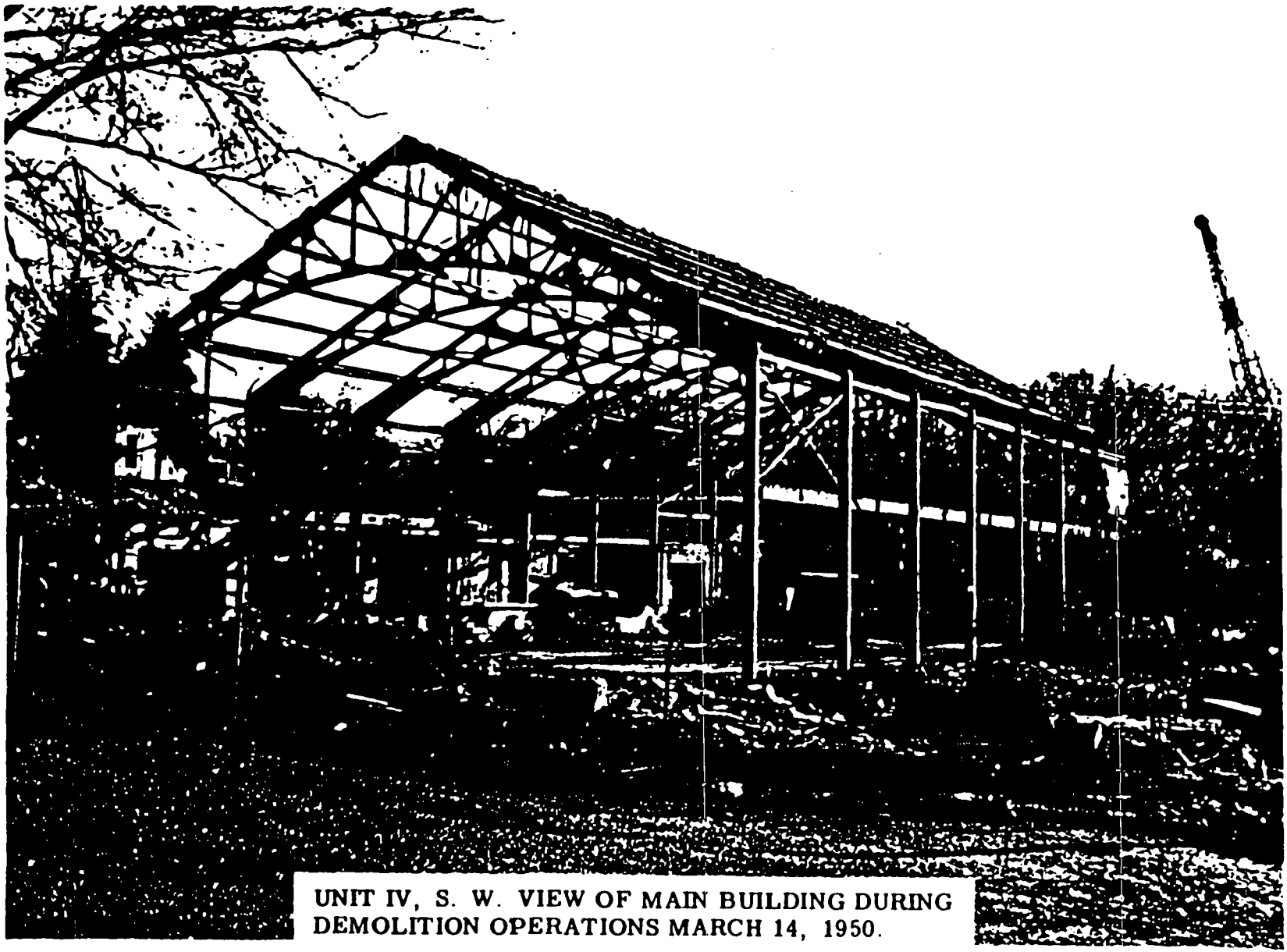
FIGURE 11



UNIT IV, MAIN BUILDING REAR VIEW DURING DEMOLITION OPERATIONS MARCH 14, 1950.



UNIT IV, S. W. VIEW OF MAIN BUILDING DURING DEMOLITION OPERATIONS MARCH 14, 1950.

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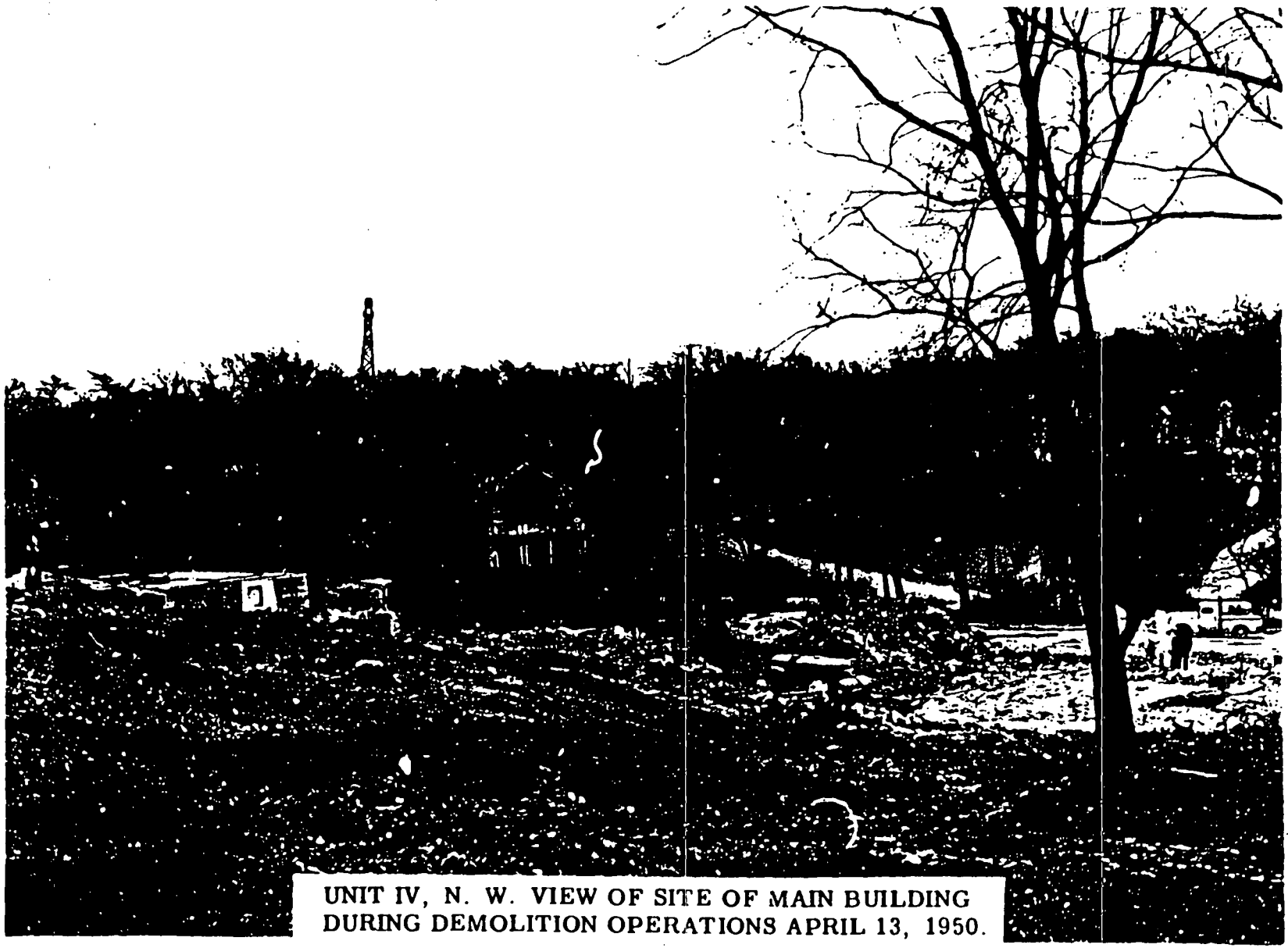
UNIT IV, SOUTH VIEW OF SITE OF MAIN BUILDING DURING DEMOLITION OPERATIONS APRIL 13, 1950.

205



UNIT IV, N. W. VIEW OF SITE OF MAIN BUILDING
DURING DEMOLITION OPERATIONS APRIL 13, 1950.

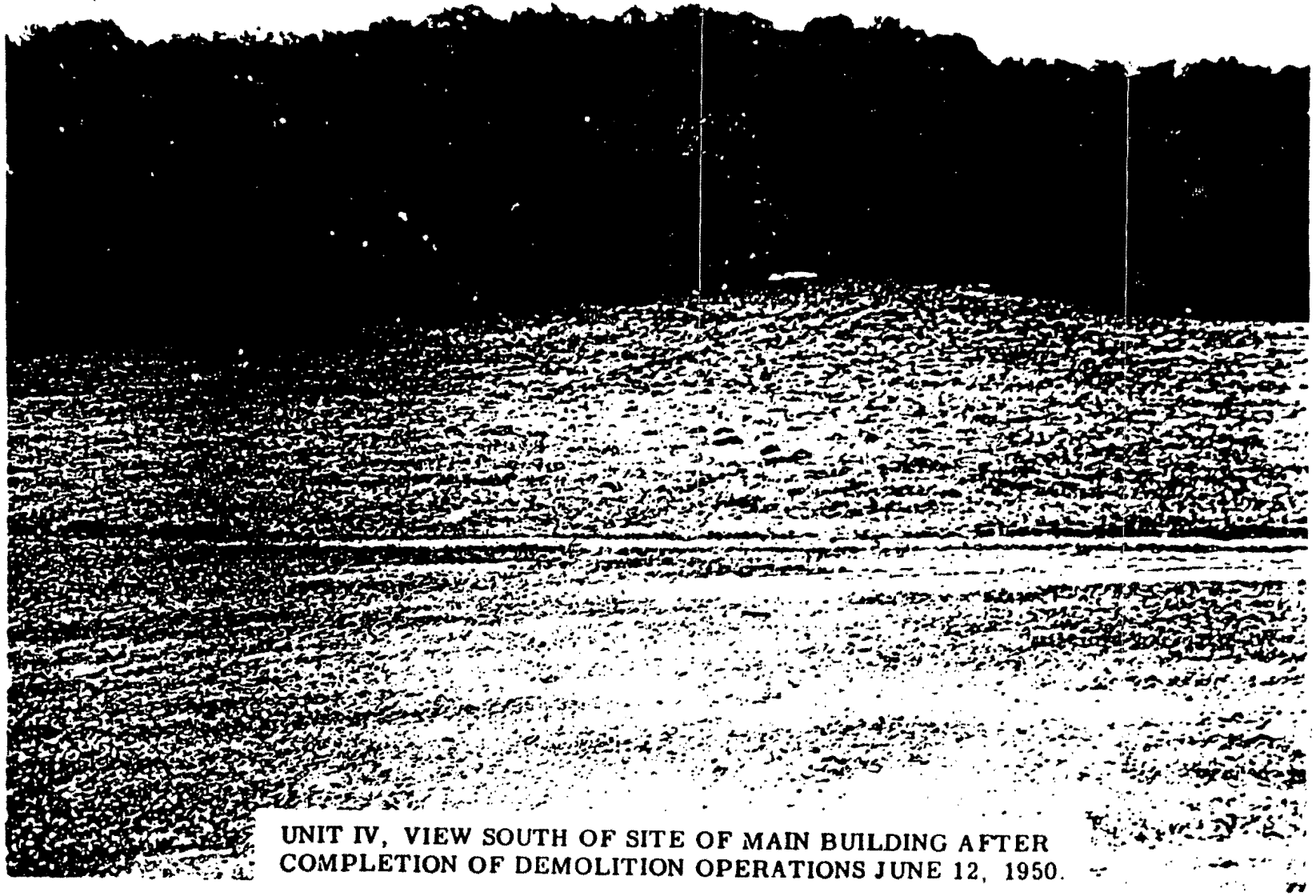
206

UNIT IV, SHOWING A PORTION OF CONCRETE FOUNDATIONS DURING DEMOLITION OPERATIONS APRIL 14, 1950.

500196

UNIT IV, SHOWING SITE OF MAIN BUILDING DURING DEMOLITION OPERATIONS MAY 15, 1950.

208



UNIT IV, VIEW SOUTH OF SITE OF MAIN BUILDING AFTER COMPLETION OF DEMOLITION OPERATIONS JUNE 12, 1950.

209

UNIT IV. VIEW NORTH FROM REAR ENTRANCE OF SITE OF MAIN BUILDING AFTER COMPLETION OF DEMOLITION OPERATIONS JUNE 12, 1950.

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FIGURE 19

UNIT IV. N. W. VIEW OF SITE OF MAIN BUILDING AFTER COMPLETION OF DEMOLITION JUNE 12, 1950.

TAB F

TAB F - FINAL SURVEY - UNIT IV

The final survey represents the most accurate of all surveys at Unit IV and covers all areas of the plant. This survey determined whether or not an area was sufficiently decontaminated to be turned over to an outside contractor for demolition. All surveys reported in the attached tables were made by B. I. Johnson of the Mound Laboratory Health Survey Section. An estimated fifty per cent (50%) of the total floor surface was covered. An estimated ten per cent (10%) of all vertical surfaces and less accessible horizontal surfaces was covered.

The objective of this cleaning process was to leave all areas with no detectable wipe and a direct reading of less than 50,000 alpha d./min./100 cm.^{2} as measured with the various alpha meters available. A wipe sample represents the rubbing of an area of approximately 40 square inches with a 4.25 cm. disk of filter paper held with two fingers. "Not detectable" means that no reading was detected on an alpha meter calibrated from 250 to 500 d./min./division, depending upon the sensitivity of the individual instrument. Efforts to evaluate these wipes in a parallel plate alpha chamber were unsuccessful due to false readings caused by chemical ionization from the reagents used to clean the surfaces, and due to protruding fibers producing false counts due to arcing.

If areas were found to be higher than the limits set, they were reduced by decontamination until a satisfactory level was reached. In some cases decontamination to a level of less than 50,000 d./min./100 cm.^{2} was impossible or impractical, in which case the area or item was dismantled and removed.

The first column in the taule indicates a reading recorded, in most cases, before cleaning started. The blanks indicate that no readings were recorded. Readings reported as greater than (>) indicated that they were higher than could be read on the meters available at that time.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Calorimeter Room (Assay)				
Floor northeast			11,780	N.D.
Floor north center			12,860	N.D.
Floor northwest			10,800	N.D.
Floor center			10,800	N.D.
Floor center			11,780	N.D.
Floor center			8,640	N.D.
Floor southeast			13,940	N.D.
Floor south center			7,560	N.D.
Floor southwest			10,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Air conditioning duct			3,240	N.D.
Light fixture			4,320	N.D.
Light fixture			2,160	N.D.
Light fixture			4,320	N.D.
Light fixture			4,320	N.D.
Hallway (Assay)				
Hall north			8,000	N.D.
Hall center			10,000	N.D.
Hall center			8,000	N.D.
Hall couth			6,000	N.D.
Wall west			0	N.D.
Wall east			0	N.D.
Counting Room (Assay)				
Floor northeast			27,020	N.D.
Floor northwest			21,600	N.D.
Floor center			32,420	N.D.
Floor center			27,020	N.D.
Floor southeast			27,020	N.D.
Floor southwest			24,840	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Lighting fixture			7,560	N.D.
Lighting fixture			8,640	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Szillard Chalmers Room (Assay)				
Floor northeast			16,200	N.D.
Floor northwest			17,280	N.D.
Floor southeast			19,440	N.D.
Floor southwest			10,700	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Lighting fixture			4,320	N.D.
Steam pipe			7,560	N.D.
Store Room (Assay)				
Floor north			13,940	N.D.
Floor southeast			8,640	N.D.
Floor southwest			5,400	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Receiving Room (Assay)				
Floor northeast			9,720	N.D.
Floor northwest			10,800	N.D.
Floor southeast			8,640	N.D.
Floor southwest			7,560	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Lighting fixture			3,240	N.D.
Balance Room (Microassay)				
Floor west	150,000	1,000	19,440	N.D.
Floor center	100,000	1,000	18,360	N.D.
Floor east			18,360	N.D.
Concrete table in center of room			12,860	N.D.
Concrete table in east part of room			13,940	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Door			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Rest Room off of East Counting Room				
Window sill			6,480	N.D.
Radiator			10,700	N.D.
Floor north			12,860	N.D.
Floor south			15,020	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Lavatory Room off of East Counting Room				
Window sill			2,160	N.D.
Radiator			0	N.D.
Lavatory			16,200	N.D.
Floor north			10,800	N.D.
Floor south			12,860	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Lounge off of East Counting Room				
Window sill			3,240	N.D.
Radiator			3,240	N.D.
Floor northeast			10,800	N.D.
Floor northwest			8,640	N.D.
Floor center			8,640	N.D.
Floor center			10,800	N.D.
Floor center			8,640	N.D.
Floor southwest			8,640	N.D.
Floor southeast			10,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
East Counting Room				
Window sill			5,400	N.D.
Radiator			5,400	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Floor northeast			23,760	N.D.
Floor northwest			12,860	N.D.
Floor center			8,640	N.D.
Floor center			16,200	N.D.
Floor center			10,800	N.D.
Floor center			16,200	N.D.
Floor southwest			8,640	N.D.
Floor southeast			10,800	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Health Counting Room				
Window sill			4,320	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Floor north			10,800	N.D.
Floor center			12,860	N.D.
Floor center			16,200	N.D.
Floor south			19,440	N.D.
Long Tom Counting Room				
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Floor northeast			8,640	N.D.
Floor northwest			10,800	N.D.
Floor southwest			8,640	N.D.
Floor southeast			6,480	N.D.
Firehose			2,160	N.D.
West Counting Room				
Window sill			2,160	N.D.
Radiator top			4,320	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Floor northeast			8,640	N.D.
Floor north center			8,640	N.D.
Floor northwest			10,800	N.D.
Floor center			6,480	N.D.
Floor center			6,480	N.D.
Floor center			8,640	N.D.
Floor southwest			6,480	N.D.
Floor south center			10,800	N.D.
Floor southeast			8,640	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Electronic Office and Supply				
Window sill			2,160	N.D.
Floor northeast			6,480	N.D.
Floor northwest			10,800	N.D.
Floor center			10,800	N.D.
Floor center			8,460	N.D.
Floor center			6,480	N.D.
Floor southwest			11,780	N.D.
Floor southeast			5,400	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Rest Room off of Electronic Room				
Wall north			0	N.D.
Wall west			0	N.D.
Wall south			0	N.D.
Door			0	N.D.
Floor west			12,800	N.D.
Floor east			10,800	N.D.
Lavatory Room				
Wall north			0	N.D.
Wall west			0	N.D.
Wall south			0	N.D.
Floor northeast			4,320	N.D.
Floor center			6,480	N.D.
Floor center			7,560	N.D.
Lavatory			0	N.D.
First Aid Room				
East window sill			10,800	N.D.
North window sill			21,600	N.D.
Lavatory			8,640	N.D.
East side of cabinet (shelves)			6,480	N.D.
West side of cabinet (shelves)			8,640	N.D.
Top of cabinet			10,800	N.D.
Floor northeast			5,400	N.D.
Floor northwest			5,400	N.D.
Floor southeast			10,800	N.D.
Floor southwest			12,860	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Property Office				
Window sill			8,640	N.D.
Radiator			12,860	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Floor northeast			3,240	N.D.
Floor northwest			10,800	N.D.
Floor center			6,480	N.D.
Floor center			7,560	N.D.
Floor center			10,800	N.D.
Floor southeast			3,240	N.D.
Floor southwest			4,320	N.D.
Hot Lounge				
Window sill			10,800	N.D.
Radiator			18,360	N.D.
Wall north			0	N.D.
Wall south			0	N.D.
Wall east			0	N.D.
Wall west			0	N.D.
Floor northeast			28,100	N.D.
Floor northwest			25,920	N.D.
Floor center			21,600	N.D.
Floor center			24,840	N.D.
Floor center			24,840	N.D.
Floor southeast			23,760	N.D.
Floor southwest			20,520	N.D.
Shower Room off of Hot Lounge				
Floor west			28,100	N.D.
Floor east			24,840	N.D.
Floor north			21,600	N.D.
Lavatory			9,720	N.D.
Window sill			5,400	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall west			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Operation's Office				
East window sill			5,400	N.D.
South window sill			8,640	N.D.
Radiator			10,800	N.D.
North wall			0	N.D.
East wall			0	N.D.
South wall			0	N.D.
West wall			0	N.D.
Floor northeast			9,720	N.D.
Floor northwest			11,780	N.D.
Floor center			12,860	N.D.
Floor center			12,860	N.D.
Floor center			9,720	N.D.
Floor southwest			12,860	N.D.
Floor southeast (steel trap door)			10,800	N.D.
Middle Section of Auditorium Beam of Ceiling Running North and South				
			2,160	N.D.
			3,240	N.D.
			2,160	N.D.
			1,080	N.D.
			2,160	N.D.
			3,500	N.D.
Center Beam Running East and West				
			1,080	N.D.
			2,160	N.D.
			1,080	N.D.
			3,240	N.D.
Cold Lounge				
Floor southwest			3,240	N.D.
Floor south center			4,320	N.D.
Floor southeast			6,480	N.D.
Floor southeast center			14,040	N.D.
Floor center	60,000	N.D.	9,720	N.D.
Floor northwest center			11,880	N.D.
Floor center	100,000	1,000	21,600	N.D.
Floor northeast center			12,960	N.D.
Floor center	60,000	N.D.	7,560	N.D.
Floor north center (by door)	200,000	1,500	8,640	N.D.
Floor northwest			6,480	N.D.

UNCLASSIFIED

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Cold Lounge				
Northwest radiator			20,520	N.D.
Southwest radiator			23,760	N.D.
Ledge around wall			4,320	N.D.
Mantle over fireplace			37,700	N.D.
Side of mantle			4,320	N.D.
Tile in front of fireplace			24,840	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Kitchen off of Cold Lounge				
Floor southeast			16,200	N.D.
Floor southwest (by door)			23,760	N.D.
Floor center			22,680	N.D.
Floor center			19,440	N.D.
Floor northeast			21,600	N.D.
Floor northwest			14,040	N.D.
Overhead cabinet			8,640	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Landing Outside of Cold Lounge				
Floor southeast			6,480	N.D.
Floor southwest			3,240	N.D.
Floor center			21,600	N.D.
Floor center			19,440	N.D.
Steps down to 2nd landing			12,960	N.D.
Second landing			24,840	N.D.
Steps down to 3rd landing			9,720	N.D.
Third landing			20,520	N.D.
Steps down to concrete floor			23,760	N.D.
Bannister			28,080	N.D.
Window sill by 2nd landing			10,800	N.D.
Walls			0	N.D.

UNCLASSIFIED

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Hallway off of Room above Squash Court				
Floor southeast			23,760	N.D.
Floor east center by door of auditorium			43,100	N.D.
Floor northeast			32,300	N.D.
Floor center			37,700	N.D.
Floor center			32,300	N.D.
Floor southwest			21,840	N.D.
Floor northwest			27,000	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Lavatory			33,540	N.D.
Drinking fountain			23,760	N.D.
Step down to squash court			14,040	N.D.
Step down to squash court			19,440	N.D.
Ladies Change Room				
Floor southwest			19,440	N.D.
Floor west center			23,760	N.D.
Floor northwest			27,000	N.D.
Floor south center			20,520	N.D.
Floor center			21,600	N.D.
Floor north center			16,200	N.D.
Floor in front of shower cabinets			32,300	N.D.
Floor in front of shower cabinets			23,760	N.D.
Floor southeast			22,680	N.D.
Floor northeast			32,300	N.D.
North shower cabinet floor			30,240	N.D.
North shower cabinet walk			3,240	N.D.
South shower cabinet floor			32,300	N.D.
South shower cabinet walk			4,320	N.D.
Window sill (north wall)			17,280	N.D.
Radiator west			6,480	N.D.
Radiator center			16,200	N.D.
Radiator east			12,960	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Property Office Adjoining Manager's Office				
Floor northeast (by door)			22,680	N.D.
Floor north center			34,460	N.D.
Floor northwest			37,700	N.D.
Floor southwest center			23,760	N.D.
Floor center			22,680	N.D.
Floor southeast center			19,440	N.D.
Floor center			17,280	N.D.
Floor southeast			24 940	N.D.
Floor south center			43,100	N.D.
Floor southwest			34,460	N.D.
Radiator			6,480	N.D.
Window sills (north) wall			4,320	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Manager's Inner Office				
Floor northeast			4,320	N.D.
Floor north center			6,480	N.D.
Floor northwest			6,480	N.D.
Floor center			3,240	N.D.
Floor center			10,800	N.D.
Floor southwest			6,480	N.D.
Floor south center			7,560	N.D.
Floor southeast			8,640	N.D.
Radiator			10,800	N.D.
Window sill (north wall)			6,480	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Manager's Outer Office				
Floor southwest			22,680	N.D.
Floor south center			19,440	N.D.
Floor west center			14,040	N.D.
Floor center			16,200	N.D.
Floor east center			12,960	N.D.
Floor northeast			14,040	N.D.
Floor north center (by door)			11,880	N.D.
Floor northwest			6,480	N.D.
Ledge on south wall (west)			34,460	N.D.
Ledge on south wall (center)			12,960	N.D.
Ledge on south wall (east)			16,200	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Manager's Outer Office				
East window sill			8,640	N.D.
Radiator			14,040	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south (glass)			0	N.D.
Wall west			0	N.D.
Telephone Exchange Room				
Floor northwest			14,040	N.D.
Floor center			16,200	N.D.
Floor center			12,960	N.D.
Floor southeast			11,880	N.D.
Floor southwest			10,800	N.D.
Radiator			4,320	N.D.
Window sill			12,960	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Vestibule and Steps				
Floor northeast			8,640	N.D.
Floor northwest			10,800	N.D.
Floor center			8,640	N.D.
Floor center			10,800	N.D.
Floor southeast			11,880	N.D.
Floor southwest			16,200	N.D.
Wall north (door)			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Window sill (east wall)			12,960	N.D.
First 5 steps down from vestibule			12,960	N.D.
Second 5 steps down from vestibule			8,640	N.D.
Third 5 steps down from vestibule			16,200	N.D.
Bannister			16,200	N.D.
Hallway Outside Counting Room				
Floor north			10,800	N.D.
Floor center			12,960	N.D.
Floor southeast			14,040	N.D.
Floor southwest			19,440	N.D.
Radiator			32,300	N.D.
Lavatory			30,240	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Design Laboratory				
Floor northeast			5,400	N.D.
Floor north center			23,760	N.D.
Floor northwest			37,800	N.D.
Floor center	70,000	3,000	45,360	N.D.
Floor center			16,200	N.D.
Floor center			21,600	N.D.
Floor southeast			24,840	N.D.
Floor south center			36,000	N.D.
Floor southwest			32,400	N.D.
Window sill south			12,960	N.D.
Window sill west			8,640	N.D.
Wall north			10,800	N.D.
Wall east			12,960	N.D.
Wall south			8,640	N.D.
Wall west			10,800	N.D.
Boiler Room				
Floor northeast corner			21,600	N.D.
Floor north center			3,240	N.D.
Floor north center of floor			16,200	N.D.
Floor northwest corner			6,480	N.D.
Floor center			35,660	N.D.
Floor center			5,400	N.D.
Floor center			15,020	N.D.
Floor southeast corner			32,420	N.D.
Floor south center			24,840	N.D.
Floor southwest corner			18,360	N.D.
Metal step leading to boiler room			2,160	N.D.
Metal step leading to boiler room			3,240	N.D.
Metal step leading to boiler room			0	N.D.
Metal step leading to boiler room			2,160	N.D.
Metal step leading to boiler room			4,320	N.D.
Coal hopper			2,160	N.D.
Coal hopper			0	N.D.
Coal hopper			3,240	N.D.
Coal hopper			4,320	N.D.
Boiler and pipework			2,160	N.D.
Boiler and pipework			0	N.D.
Boiler and pipework			3,240	N.D.
Boiler and pipework			5,400	N.D.
Boiler and pipework			2,160	N.D.
Boiler and pipework			0	N.D.
Boiler and pipework			3,240	N.D.
Boiler and pipework			6,480	N.D.
Boiler and pipework			3,240	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Coal Bin (Room adjoining Boiler Room)				
Floor			2,160	N.D.
Floor			3,240	N.D.
Floor			0	N.D.
Floor			2,160	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Storage Room Adjoining Boiler Room				
Floor northeast			5,400	N.D.
Floor north center			6,480	N.D.
Floor northwest			8,640	N.D.
Floor center			4,320	N.D.
Floor center			3,240	N.D.
Floor southeast			6,480	N.D.
Floor southwest			10,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
South Tunnel				
South wall			32,420	N.D.
South wall			9,720	N.D.
South wall			8,640	N.D.
South wall			6,840	N.D.
North wall			24,840	N.D.
North wall			27,020	N.D.
North wall			10,800	N.D.
North wall			30,260	N.D.
North wall			9,720	N.D.
Pipe work			8,640	N.D.
Pipe work			6,480	N.D.
Pipe work			3,240	N.D.
Pipe work			7,560	N.D.
Pipe work			10,800	N.D.
North Tunnel				
South wall			6,480	N.D.
South wall			8,640	N.D.
South wall			10,800	N.D.
South wall			11,780	N.D.
South wall			6,480	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
North Tunnel				
North wall			8,640	N.D.
North wall			3,240	N.D.
North wall			10,800	N.D.
North wall			6,840	N.D.
North wall			4,320	N.D.
North wall			8,640	N.D.
Pipe work			6,480	N.D.
Pipe work			10,800	N.D.
Pipe work			12,860	N.D.
Pipe work			11,780	N.D.
Pipe work			8,640	N.D.
Pipe work			6,480	N.D.
Upper Greenhouse				
North greenhouse floor northeast (dirt)			740	N.D.
Floor northwest (dirt)			370	N.D.
Floor center (dirt)			0	N.D.
Floor center (dirt)			0	N.D.
Floor southeast (dirt)			0	N.D.
Floor southwest (dirt)			555	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Steam pipe			555	N.D.
Center Greenhouse				
Northeast floor (concrete)			1,110	N.D.
North center floor (concrete)			1,480	N.D.
Northwest floor (concrete)			555	N.D.
Southeast floor (dirt)			370	N.D.
Southwest floor (dirt)			370	N.D.
Wall north			0	N.D.
Wall west			0	N.D.
Wall east			0	N.D.
Bench on south side			0	N.D.
South Greenhouse				
East floor (dirt)			370	N.D.
Center floor (dirt)			555	N.D.
West floor (dirt)			0	N.D.
North bench east end			370	N.D.
North bench west end			0	N.D.
South bench east end			0	N.D.
South bench west end			0	N.D.
West wall			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Shower Room off of Property Office				
Floor northeast			5,550	N.D.
Floor center			7,400	N.D.
Floor northwest			3,700	N.D.
Shower cabinet floor			2,405	N.D.
Shower cabinet walk			555	N.D.
North wall of Lavatory Room			0	N.D.
East wall of Lavatory Room			0	N.D.
South wall of Lavatory Room			0	N.D.
West wall of Lavatory Room			0	N.D.
Storage Vault (Northwest corner outside)				
Floor southeast			18,500	N.D.
Floor northeast			14,800	N.D.
Floor northwest			10,300	N.D.
Floor southwest			10,300	N.D.
Floor center			12,950	N.D.
North wall			0	N.D.
East wall			0	N.D.
West wall			0	N.D.
North outside wall			0	N.D.
East outside wall			0	N.D.
West outside wall			0	N.D.
Top			0	N.D.
Duct Room over Squash Court				
Floor northeast			14,800	N.D.
Floor north center			16,650	N.D.
Floor northwest			11,100	N.D.
Floor northeast center			7,400	N.D.
Floor southeast center			3,700	N.D.
Floor center			3,700	N.D.
Floor center			7,400	N.D.
Floor center			9,250	N.D.
Floor southeast			5,550	N.D.
Floor south center			11,100	N.D.
Floor southwest			3,700	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Window sill southwest			3,700	N.D.
Window sill west center			5,550	N.D.
Window sill northwest			3,700	N.D.
Radiator by west wall			9,250	N.D.
Radiator by east wall			7,400	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
East Half of South Greenhouse				
Northeast	92,800	2,220	Removed	
Northeast center	255,200	2,405	Removed	
North center	174,000	2,220	Removed	
Northwest center	116,000	2,220	Removed	
Northwest	348,000	2,775	Removed	
West center of walkway	1,000,000	3,700	Removed	
West center of walkway	2,000,000	3,700	Removed	
Center of walkway	3,000,000	5,250	Removed	
East center of walkway	500,000	20,000	Removed	
East center of walkway	1,000,000	30,000	Removed	
Southeast of walkway	>5,000,000	50,000	Removed	
Southeast center	1,000,000	40,000	Removed	
Center	2,000,000	30,000	Removed	
Southwest center	1,000,000	20,000	Removed	
Southwest	500,000	12,000	Removed	
Product Storage off of South Greenhouse				
Floor southeast	232,000	2,775	Removed	
Floor east center	208,800	1,850	Removed	
Floor northeast	139,200	2,405	Removed	
Floor center	255,200	2,220	Removed	
Floor center	290,000	1,850	Removed	
Floor center	266,800	1,110	Removed	
Floor southwest	174,000	740	Removed	
Floor west center	290,000	2,220	Removed	
Floor northwest	255,200	2,405	Removed	
Floor West Section of South Greenhouse (Pfaudler Storage)				
Floor northeast			23,720	N.D.
Floor north center			12,960	N.D.
Floor northwest			37,800	N.D.
Floor west center			21,600	N.D.
Floor center			11,880	N.D.
Floor southwest			10,800	N.D.
Floor south center			12,960	N.D.
Floor southeast			8,640	N.D.
Floor south center			14,040	N.D.
Floor center			24,840	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
South Greenhouse West Half of Center Section Floor				
Floor northwest	127,600	555	Removed	
Floor northwest center	104,400	1,110	Removed	
Floor north center	139,200	740	Removed	
Floor northeast center	84,200	740	Removed	
Floor northeast	208,800	555	Removed	
Floor east center of walkway	324,800	925	Removed	
Floor center of walkway	290,000	1,480	Removed	
Floor center of walkway	301,600	1,850	Removed	
Floor center of walkway	174,000	1,110	Removed	
Floor southwest	255,200	740	Removed	
Floor southwest center	324,800	370	Removed	
Floor south center	406,000	925	Removed	
Floor southeast center	440,800	555	Removed	
Floor southeast	324,800	370	Removed	
East Section of South Greenhouse				
Southeast	255,200	555	Removed	
East center	266,800	1,110	Removed	
North east	208,800	925	Removed	
North center	266,800	555	Removed	
Center	290,000	740	Removed	
South center	348,000	740	Removed	
Southwest	127,600	370	Removed	
West center	290,000	925	Removed	
Northwest	348,000	925	Removed	
Glass Roof of South Greenhouse				
East end of roof			22,000	N.D.
East end of roof			19,250	N.D.
East end of roof			29,250	N.D.
East end of roof			22,000	N.D.
East end of roof				
East end of roof			32,000	N.D.
Center of roof			24,750	N.D.
Center of roof			29,250	N.D.
Center of roof	55,000			
Center of roof			16,500	N.D.
Center of roof			17,650	N.D.
West end of roof			3,976	N.D.
West end of roof			2,840	N.D.
West end of roof			726	N.D.
West end of roof			1,704	N.D.
West end of roof			2,272	N.D.
West end of roof			3,408	N.D.
West end of roof			4,260	N.D.
West end of roof			8,250	N.D.
West end of roof			8,250	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Window Sill on South Upper Side of Auditorium				
East Group of Windows	69,600		Removed	
East Group of Windows	208,000		Removed	
East Group of Windows	150,800		Removed	
East Group of Windows	82,800		Removed	
Center Group of Windows			15,800	N.D.
Center Group of Windows	82,800		Removed	
Center Group of Windows	81,200		Removed	
Center Group of Windows	81,200		Removed	
West Group of Windows	82,800		Removed	
West Group of Windows	150,800		Removed	
West Group of Windows	104,400		Removed	
West Group of Windows	139,200		Removed	
South Vertical Wall of Auditorium Over Greenhouse (Concrete)				
East end of wall (by precipitron exhaust)			13,750	N.D.
East end of wall (by precipitron exhaust)			24,750	N.D.
East end of wall (by precipitron exhaust)			8,250	N.D.
East end of wall (by precipitron exhaust)			5,780	N.D.
Center section of wall			2,272	N.D.
Center section of wall			2,272	N.D.
Center section of wall			1,704	N.D.
Center section of wall			2,840	N.D.
West end of wall			2,272	N.D.
West end of wall			2,840	N.D.
West end of wall			3,124	N.D.
West end of wall			3,692	N.D.
West end of wall			2,272	N.D.
Roof of Acid Storage House				
North center section of roof			32,420	N.D.
Northwest section of roof			29,180	N.D.
Center section of roof			24,840	N.D.
Center section of roof			19,440	N.D.
Center section of roof			27,020	N.D.
Center section of roof			18,360	N.D.
Southeast section of roof			36,740	N.D.
South center section of roof			24,840	N.D.
Southwest section of roof			17,280	N.D.
Wire Mesh over Upper Part of Glass Roof over South Greenhouse				
Glass roof over south greenhouse			22,000	N.D.
Glass roof over south greenhouse			19,250	N.D.
Glass roof over south greenhouse			29,250	N.D.
Glass roof over south greenhouse			35,750	N.D.
Glass roof over south greenhouse			16,500	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
South Outside and Wall Inside Greenhouse				
East section of south wall			8,250	N.D.
East section of south wall			16,500	N.D.
East section of south wall			27,500	N.D.
East section of south wall			33,000	N.D.
Center section of south wall			20,050	N.D.
Center section of south wall			19,250	N.D.
Center section of south wall			18,250	N.D.
Center section of south wall			20,050	N.D.
Center section of south wall			8,250	N.D.
West section of south wall			5,500	N.D.
West section of south wall			3,408	N.D.
West section of south wall			2,840	N.D.
West section of south wall			5,680	N.D.
West section of south wall			4,260	N.D.
West Outside Wall of Cold Lounge				
West outside wall of cold lounge			0	N.D.
West outside wall of cold lounge			0	N.D.
West outside wall of cold lounge			0	N.D.
West outside wall of cold lounge			0	N.D.
West outside wall of cold lounge			0	N.D.
North Outside Wall of Women's Locker Room				
North outside wall of women's locker room			0	N.D.
North outside wall of women's locker room			0	N.D.
North outside wall of women's locker room			0	N.D.
North outside wall of women's locker room			0	N.D.
North outside wall of women's locker room			0	N.D.
West Outside Wall of Telephone Room				
West outside wall of Telephone Room			0	N.D.
West outside wall of Telephone Room			0	N.D.
West outside wall of Telephone Room			0	N.D.
North Outside Wall of Telephone Room				
North outside wall of Telephone Room			0	N.D.
North outside wall of Telephone Room			0	N.D.
North outside wall of Telephone Room			0	N.D.
North outside wall of Telephone Room			0	N.D.
East Outside Wall of Telephone Room				
East outside wall of Telephone Room			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Roof over Ladies Locker Room				
West section of roof			8,250	N.D.
West section of roof			11,000	N.D.
West section of roof			22,000	N.D.
West section of roof			8,250	N.D.
Center section of roof			5,500	N.D.
Center section of roof			5,496	N.D.
Center section of roof			5,500	N.D.
East section of roof			5,500	N.D.
East section of roof			5,212	N.D.
East section of roof			2,556	N.D.
East section of roof			4,260	N.D.
Roof over Cold Lounge			4,260	N.D.
Roof over Cold Lounge			1,704	N.D.
Roof over Cold Lounge			2,272	N.D.
Roof over Cold Lounge			2,840	N.D.
Roof over Cold Lounge			2,840	N.D.
Sides of chimney from fireplace			0	N.D.
Sides of chimney from fireplace			0	N.D.
Sides of chimney from fireplace			0	N.D.
Sides of chimney from fireplace			0	N.D.
Sides of chimney from fireplace			0	N.D.
Roof over Telephone Room and vestibule			0	N.D.
Roof over Telephone Room and vestibule			0	N.D.
Roof over Telephone Room and vestibule			0	N.D.
Roof over Telephone Room and vestibule			0	N.D.
Roof over Telephone Room and vestibule			0	N.D.
Railing around roof of Telephone Room and vestibule			0	N.D.
Railing around roof of Telephone Room and vestibule			0	N.D.
Railing around roof of Telephone Room and vestibule			0	N.D.
Railing around roof of Telephone Room and vestibule			0	N.D.
Spouting around roof of Telephone Room			5,680	N.D.
Spouting around roof of Telephone Room			4,260	N.D.
Spouting around roof of Telephone Room			2,272	N.D.
Spouting around roof of Telephone Room			3,408	N.D.
Copper Sheeting of Roof over Auditorium Proper				
West section of roof			1,420	N.D.
West section of roof			2,556	N.D.
West section of roof			1,988	N.D.
West section of roof			2,840	N.D.
West section of roof			3,124	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Copper Sheeting of Roof over Auditorium Proper				
West center section of roof			5,112	N.D.
West center section of roof			3,408	N.D.
West center section of roof			3,692	N.D.
West center section of roof			3,124	N.D.
Center section of roof			1,988	N.D.
Center section of roof			5,112	N.D.
Center section of roof			2,556	N.D.
Center section of roof			1,988	N.D.
Urine Collection Room in Old Changehouse				
Floor northeast			5,400	N.D.
Floor northwest			6,480	N.D.
Floor southeast			10,800	N.D.
Floor southwest			10,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Urine trough			3,240	N.D.
Locker Room over Garage				
Floor northeast			21,600	N.D.
Floor north center			20,520	N.D.
Floor northwest	60,000	N.D.	30,260	N.D.
Floor center			27,020	N.D.
Floor center	60,000	500	19,440	N.D.
Floor center			16,200	N.D.
Floor center			13,940	N.D.
Floor southwest			10,800	N.D.
Floor south center			21,600	N.D.
Floor southeast			32,420	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Hot side of Change House over Garage				
Shower cabinet			10,800	N.D.
Shower cabinet			13,940	N.D.
Shower cabinet			12,860	N.D.
Shower cabinet			10,800	N.D.
Walkway around shower cabinet			10,800	N.D.
Walkway around shower cabinet			13,940	N.D.
Walkway around shower cabinet			12,860	N.D.
Walkway around shower cabinet			12,860	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Hot Side of Change House over Garage				
Washroom				
Floor northeast			16,200	N.D.
Floor north center			21,600	N.D.
Floor northwest			13,940	N.D.
Floor center			16,200	N.D.
Floor center			15,020	N.D.
Floor center			10,800	N.D.
Floor southeast			16,200	N.D.
Floor south center			17,280	N.D.
Floor southwest			10,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Wash basin (trough on east side)			4,320	N.D.
Wash basin (trough on south side)			3,240	N.D.
Roof of Garage				
North side east end (sloping part of roof)			600	N.D.
North side center (sloping part of roof)			400	N.D.
North side center (sloping part of roof)			0	N.D.
North side center (sloping part of roof)			600	N.D.
North side west end (sloping part of roof)			0	N.D.
North side (tin over windows flat part of roof)			6,300	N.D.
North side (tin over windows flat part of roof)			4,200	N.D.
North side (tin over windows flat part of roof)			5,000	N.D.
North side (tin over windows flat part of roof)			4,200	N.D.
North side (tin over windows flat part of roof)			6,300	N.D.
West side of roof (sloping part of roof)			1,200	N.D.
West side of roof (sloping part of roof)			1,600	N.D.
West side of roof (sloping part of roof)			1,400	N.D.
West side of roof (sloping part of roof)			600	N.D.
Roof of Garage				
South side of roof (sloping part of roof)			800	N.D.
South side west end (sloping part of roof)			600	N.D.
South side center (sloping part of roof)			400	N.D.
South side center (sloping part of roof)			0	N.D.
South side center (sloping part of roof)			800	N.D.
South side east end (sloping part of roof)			600	N.D.
East side (sloping part of roof)			600	N.D.
East side (sloping part of roof)			400	N.D.
East side (sloping part of roof)			0	N.D.
East side (sloping part of roof)			800	N.D.
East side (sloping part of roof)			600	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Roof over Guards Locker Room and Tool Room				
Northeast part of roof			4,200	N.D.
North center of roof			3,200	N.D.
North center of roof			3,800	N.D.
Northwest of roof			2,800	N.D.
Center of roof			8,400	N.D.
Center of roof			6,300	N.D.
Center of roof			5,000	N.D.
Center of roof			8,400	N.D.
Southwest of roof			6,300	N.D.
South center of roof			5,000	N.D.
Southeast of roof			8,400	N.D.
Roof over Hot Storage				
Northeast part of roof			5,000	N.D.
Northwest part of roof			8,400	N.D.
Center part of roof			8,400	N.D.
Center part of roof			12,600	N.D.
Center part of roof			8,400	N.D.
Southeast part of roof			10,500	N.D.
South center part of roof			6,300	N.D.
Southwest part of roof			8,400	N.D.
Hot Storage Room				
Floor northeast (dirt floor)			27,020	N.D.
Floor north center (dirt floor)			30,260	N.D.
Floor northwest (dirt floor)			21,600	N.D.
Floor center (dirt floor)			11,780	N.D.
Floor center (dirt floor)			13,940	N.D.
Floor center (dirt floor)			16,200	N.D.
Floor southeast (dirt floor)			23,760	N.D.
Floor south center (dirt floor)			10,800	N.D.
Floor southwest (dirt floor)			15,020	N.D.
Ledge around east and south walls			19,440	N.D.
Ledge around east and south walls			17,280	N.D.
Ledge around east and south walls			27,020	N.D.
Ledge around east and south walls			16,200	N.D.
South wall			12,860	N.D.
West wall			6,480	N.D.
North wall			3,240	N.D.
East wall			6,480	N.D.

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Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Guards Locker Room				
Floor northeast			7,560	N.D.
Floor north center			5,400	N.D.
Floor northwest	100,000	500	11,780	N.D.
Floor center			3,240	N.D.
Floor center			4,320	N.D.
Floor center	100,000	500	10,800	N.D.
Floor southeast			8,640	N.D.
Floor south center			6,480	N.D.
Floor south west	100,000	500	11,780	N.D.
Wall south			2,160	N.D.
Wall west			3,240	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Lavatory			8,640	N.D.
Overhead pipe work			16,200	N.D.
Tool Room Adjoining Guards Locker Room				
Floor northeast	100,000	500	36,740	N.D.
Floor north center			32,420	N.D.
Floor center			30,260	N.D.
Floor northwest			23,760	N.D.
Floor center	100,000	1,000	27,020	N.D.
Floor center			24,840	N.D.
Floor southwest			28,100	N.D.
Floor south center			23,760	N.D.
Floor southeast			25,100	N.D.
Cabinet top (by north wall)			17,280	N.D.
Cabinet top shelf			23,760	N.D.
Cabinet bottom shelf			13,940	N.D.
Cabinet top (by south wall)			10,800	N.D.
Cabinet top shelf			17,280	N.D.
Cabinet middle shelf			23,760	N.D.
Cabinet bottom shelf			30,260	N.D.
Wall west			3,240	N.D.
Wall south			0	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Trash House				
Floor northeast			3,000	N.D.
Floor north center			2,600	N.D.
Floor southwest			4,200	N.D.
Floor center			6,300	N.D.
Floor center			8,400	N.D.
Floor center			3,000	N.D.
Floor southeast			2,000	N.D.
Floor south center			2,600	N.D.
Floor southwest			2,800	N.D.

UNCLASSIFIED

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Trash House				
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Wall north			0	N.D.
Wall outside north			0	N.D.
Wall outside east			0	N.D.
Wall outside south			0	N.D.
Wall outside west			0	N.D.
Top of building northeast			1,200	N.D.
Top of building north center			1,600	N.D.
Top of building northwest			2,000	N.D.
Top of building center			400	N.D.
Top of building center			4,200	N.D.
Top of building center			3,000	N.D.
Top of building southeast			2,600	N.D.
Top of building south center			2,000	N.D.
Top of building southwest			4,200	N.D.
Carpenter Shop (old Garage)				
Floor northeast			4,200	N.D.
Floor north center	75,000	N.D.	6,300	N.D.
Floor northwest			4,200	N.D.
Floor center	100,000	800	6,200	N.D.
Floor center			6,200	N.D.
Floor center			10,500	N.D.
Floor center	200,000	1,000	3,400	N.D.
Floor center			3,200	N.D.
Floor southwest			8,200	N.D.
Floor south center (by door)	100,000	500	8,200	N.D.
Floor southeast			10,500	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Garage door			4,200	N.D.
Garage door			3,400	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Maintenance Shop				
Floor northeast			3,000	N.D.
Floor north center			3,600	N.D.
Floor northwest	150,000	500	6,300	N.D.
Floor center	150,000	500	16,800	N.D.
Floor center			25,200	N.D.
Floor center			12,600	N.D.
Floor center			25,200	N.D.
Floor southeast			8,400	N.D.
Floor south center (by door)	200,000	2,000	14,700	N.D.
Floor southwest			16,800	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Door			6,300	N.D.
Auditorium Floor				
5 feet from north wall				
East			27,000	N.D.
East center			37,800	N.D.
Center			12,324	N.D.
West center			16,432	N.D.
West			10,270	N.D.
15 feet from north wall				
West			24,648	N.D.
West center			16,432	N.D.
Center			12,324	N.D.
East center			10,270	N.D.
East			8,216	N.D.
30 feet from north wall				
East			16,432	N.D.
East center			20,540	N.D.
Center			30,810	N.D.
West center			36,972	N.D.
West			26,702	N.D.
15 feet from south wall				
West			14,800	N.D.
West center			20,350	N.D.
Center			18,500	N.D.
East center			28,756	N.D.
East			30,810	N.D.
5 feet from south wall				
East			30,810	N.D.
East center			36,972	N.D.
Center			33,300	N.D.
West center			18,500	N.D.
West			12,950	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Auditorium Floor				
5 feet from north wall				
East			10,270	N.D.
East center			12,324	N.D.
Center			8,216	N.D.
West center			6,162	N.D.
West			8,216	N.D.
15 feet from north wall				
West			6,162	N.D.
West center			6,162	N.D.
Center			8,216	N.D.
East center			6,162	N.D.
East			8,216	N.D.
30 feet from north wall				
East			14,378	N.D.
East center			12,324	N.D.
Center			12,324	N.D.
West center			12,324	N.D.
West			8,216	N.D.
15 feet from south wall				
West			6,162	N.D.
West center			8,216	N.D.
Center			36,972	N.D.
East center			30,810	N.D.
East			36,972	N.D.
5 feet from south wall				
East			34,918	N.D.
East center			24,648	N.D.
Center			30,810	N.D.
West center			26,702	N.D.
West			30,810	N.D.
Wall Insulation				
East end of south wall in Auditorium - 4 ft. from floor			14,000	N.D.
East end of south wall in Auditorium - 4 ft. from floor			10,000	N.D.
East end of south wall in Auditorium - 4 ft. from floor			30,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			12,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			12,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			25,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			13,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			10,000	N.D.
East end of south wall in Auditorium - 6 ft. from floor			6,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			8,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			10,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			20,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			15,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			2,000	N.D.
East end of south wall in Auditorium - 10 ft. from floor			3,000	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Wall Insulation				
South wall east center in Auditorium - 4 ft. from floor			1,000	N.D.
South wall east center in Auditorium - 4 ft. from floor			1,200	N.D.
South wall east center in Auditorium - 4 ft. from floor			800	N.D.
South wall east center in Auditorium - 4 ft. from floor			1,400	N.D.
South wall east center in Auditorium - 4 ft. from floor			800	N.D.
South wall east center in Auditorium - 4 ft. from floor			1,000	N.D.
South wall east center in Auditorium - 6 ft. from floor			2,100	N.D.
South wall east center in Auditorium - 6 ft. from floor			1,500	N.D.
South wall east center in Auditorium - 6 ft. from floor			1,300	N.D.
South wall east center in Auditorium - 6 ft. from floor			2,000	N.D.
South wall east center in Auditorium - 6 ft. from floor			800	N.D.
South wall east center in Auditorium - 6 ft. from floor			1,000	N.D.
South east center in Auditorium - 10 ft. from floor			2,200	N.D.
South east center in Auditorium - 10 ft. from floor			2,000	N.D.
South east center in Auditorium - 10 ft. from floor			3,000	N.D.
South east center in Auditorium - 10 ft. from floor			800	N.D.
South east center in Auditorium - 10 ft. from floor			600	N.D.
South east center in Auditorium - 10 ft. from floor			500	N.D.
South wall west center in Auditorium - 4 ft. from floor			2,000	N.D.
South wall west center in Auditorium - 4 ft. from floor			3,000	N.D.
South wall west center in Auditorium - 4 ft. from floor			1,500	N.D.
South wall west center in Auditorium - 4 ft. from floor			800	N.D.
South wall west center in Auditorium - 4 ft. from floor			1,000	N.D.
South wall west center in Auditorium - 4 ft. from floor			6,000	N.D.
South west center in Auditorium - 6 ft. from floor			600	N.D.
South west center in Auditorium - 6 ft. from floor			1,000	N.D.
South west center in Auditorium - 6 ft. from floor			1,200	N.D.
South west center in Auditorium - 6 ft. from floor			800	N.D.
South west center in Auditorium - 6 ft. from floor			1,000	N.D.
South west center in Auditorium - 6 ft. from floor			900	N.D.
South west center in Auditorium - 10 ft. from floor			600	N.D.
South west center in Auditorium - 10 ft. from floor			1,400	N.D.
South west center in Auditorium - 10 ft. from floor			2,000	N.D.
South west center in Auditorium - 10 ft. from floor			1,800	N.D.
South west center in Auditorium - 10 ft. from floor			1,600	N.D.
South west center in Auditorium - 10 ft. from floor			1,000	N.D.
South wall west end of Auditorium - 4 ft. from floor			2,000	N.D.
South wall west end of Auditorium - 4 ft. from floor			2,000	N.D.
South wall west end of Auditorium - 4 ft. from floor			2,200	N.D.
South wall west end of Auditorium - 4 ft. from floor			1,600	N.D.
South wall west end of Auditorium - 4 ft. from floor			1,400	N.D.
South wall west end of Auditorium - 4 ft. from floor			2,000	N.D.
South west end of Auditorium - 6 ft. from floor			1,400	N.D.
South west end of Auditorium - 6 ft. from floor			1,600	N.D.
South west end of Auditorium - 6 ft. from floor			2,000	N.D.
South west end of Auditorium - 6 ft. from floor			1,800	N.D.
South west end of Auditorium - 6 ft. from floor			1,600	N.D.
South west end of Auditorium - 6 ft. from floor			1,000	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Wall Insulation				
South wall west end of Auditorium - 10 ft. from floor			800	N.D.
South wall west end of Auditorium - 10 ft. from floor			1,000	N.D.
South wall west end of Auditorium - 10 ft. from floor			1,400	N.D.
South wall west end of Auditorium - 10 ft. from floor			600	N.D.
South wall west end of Auditorium - 10 ft. from floor			800	N.D.
South wall west end of Auditorium - 10 ft. from floor			1,000	N.D.
South end of west wall in Auditorium - 4 ft. from floor			400	N.D.
South end of west wall in Auditorium - 4 ft. from floor			600	N.D.
South end of west wall in Auditorium - 4 ft. from floor			600	N.D.
South end of west wall in Auditorium - 4 ft. from floor			0	N.D.
South end of west wall in Auditorium - 4 ft. from floor			0	N.D.
South end of west wall in Auditorium - 4 ft. from floor			400	N.D.
South end of west wall in Auditorium - 6 ft. from floor			400	N.D.
South end of west wall in Auditorium - 6 ft. from floor			600	N.D.
South end of west wall in Auditorium - 6 ft. from floor			0	N.D.
South end of west wall in Auditorium - 6 ft. from floor			800	N.D.
South end of west wall in Auditorium - 6 ft. from floor			1,000	N.D.
South end of west wall in Auditorium - 6 ft. from floor			400	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			0	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			400	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			600	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			200	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			0	N.D.
South end of wall (west) in Auditorium - 10 ft. from floor			600	N.D.
North end of west wall - 4 ft. from floor			1,200	N.D.
North end of west wall - 4 ft. from floor			800	N.D.
North end of west wall - 4 ft. from floor			900	N.D.
North end of west wall - 4 ft. from floor			1,400	N.D.
North end of west wall - 4 ft. from floor			600	N.D.
North end of west wall - 6 ft. from floor			400	N.D.
North end of west wall - 6 ft. from floor			0	N.D.
North end of west wall - 6 ft. from floor			400	N.D.
North end of west wall - 6 ft. from floor			600	N.D.
North end of west wall - 6 ft. from floor			800	N.D.
North end of west wall - 6 ft. from floor			0	N.D.
North end of west wall - 10 ft. from floor			800	N.D.
North end of west wall - 10 ft. from floor			800	N.D.
North end of west wall - 10 ft. from floor			1,000	N.D.
North end of west wall - 10 ft. from floor			0	N.D.
North end of west wall - 10 ft. from floor			600	N.D.
North end of west wall - 10 ft. from floor			400	N.D.
West end of north wall - 4 ft. from floor			400	N.D.
West end of north wall - 4 ft. from floor			800	N.D.
West end of north wall - 4 ft. from floor			1,000	N.D.
West end of north wall - 4 ft. from floor			800	N.D.
West end of north wall - 4 ft. from floor			600	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Wall Insulation				
West end of north wall - 6 ft. from floor			0	N.D.
West end of north wall - 6 ft. from floor			400	N.D.
West end of north wall - 6 ft. from floor			400	N.D.
West end of north wall - 6 ft. from floor			600	N.D.
West end of north wall - 6 ft. from floor			1,000	N.D.
West end of north wall - 6 ft. from floor			800	N.D.
West end of north wall - 10 ft. from floor			400	N.D.
West end of north wall - 10 ft. from floor			600	N.D.
West end of north wall - 10 ft. from floor			800	N.D.
West end of north wall - 10 ft. from floor			1,000	N.D.
West end of north wall - 10 ft. from floor			0	N.D.
West end of north wall - 10 ft. from floor			300	N.D.
West center north wall in Auditorium - 4 ft. from floor			400	N.D.
West center north wall in Auditorium - 4 ft. from floor			600	N.D.
West center north wall in Auditorium - 4 ft. from floor			800	N.D.
West center north wall in Auditorium - 4 ft. from floor			0	N.D.
West center north wall in Auditorium - 4 ft. from floor			800	N.D.
West center north wall in Auditorium - 4 ft. from floor			1,000	N.D.
West center north wall in Auditorium - 6 ft. from floor			800	N.D.
West center north wall in Auditorium - 6 ft. from floor			1,200	N.D.
West center north wall in Auditorium - 6 ft. from floor			1,600	N.D.
West center north wall in Auditorium - 6 ft. from floor			400	N.D.
West center north wall in Auditorium - 6 ft. from floor			600	N.D.
West center north wall in Auditorium - 6 ft. from floor			800	N.D.
West center north wall in Auditorium -10 ft. from floor			600	N.D.
West center north wall in Auditorium -10 ft. from floor			400	N.D.
West center north wall in Auditorium -10 ft. from floor			400	N.D.
West center north wall in Auditorium -10 ft. from floor			0	N.D.
West center north wall in Auditorium -10 ft. from floor			800	N.D.
West center north wall in Auditorium -10 ft. from floor			300	N.D.
East center north wall in Auditorium - 4 ft. from floor			800	N.D.
East center north wall in Auditorium - 4 ft. from floor			600	N.D.
East center north wall in Auditorium - 4 ft. from floor			1,000	N.D.
East center north wall in Auditorium - 4 ft. from floor			2,000	N.D.
East center north wall in Auditorium - 4 ft. from floor			3,500	N.D.
East center north wall in Auditorium - 4 ft. from floor			1,000	N.D.
East center north wall in Auditorium - 6 ft. from floor			1,200	N.D.
East center north wall in Auditorium - 6 ft. from floor			1,400	N.D.
East center north wall in Auditorium - 6 ft. from floor			800	N.D.
East center north wall in Auditorium - 6 ft. from floor			1,000	N.D.
East center north wall in Auditorium - 6 ft. from floor			900	N.D.
East center north wall in Auditorium - 6 ft. from floor			800	N.D.
East center north wall in Auditorium - 10 ft. from floor			2,200	N.D.
East center north wall in Auditorium - 10 ft. from floor			2,000	N.D.
East center north wall in Auditorium - 10 ft. from floor			3,000	N.D.
East center north wall in Auditorium - 10 ft. from floor			800	N.D.
East center north wall in Auditorium - 10 ft. from floor			500	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Wall Insulation				
East end of north wall in Auditorium - 4 ft. from floor			800	N.D.
East end of north wall in Auditorium - 4 ft. from floor			1,000	N.D.
East end of north wall in Auditorium - 4 ft. from floor			2,000	N.D.
East end of north wall in Auditorium - 4 ft. from floor			2,500	N.D.
East end of north wall in Auditorium - 4 ft. from floor			1,000	N.D.
East end of north wall in Auditorium - 4 ft. from floor			600	N.D.
East end of north wall in Auditorium - 6 ft. from floor			800	N.D.
East end of north wall in Auditorium - 6 ft. from floor			800	N.D.
East end of north wall in Auditorium - 6 ft. from floor			800	N.D.
East end of north wall in Auditorium - 6 ft. from floor			1,000	N.D.
East end of north wall in Auditorium - 6 ft. from floor			1,500	N.D.
East end of north wall in Auditorium - 6 ft. from floor			800	N.D.
East end of north wall in Auditorium - 10 ft. from floor			800	N.D.
East end of north wall in Auditorium - 10 ft. from floor			1,000	N.D.
East end of north wall in Auditorium - 10 ft. from floor			600	N.D.
East end of north wall in Auditorium - 10 ft. from floor			400	N.D.
East end of north wall in Auditorium - 10 ft. from floor			400	N.D.
East end of north wall in Auditorium - 10 ft. from floor			800	N.D.
North end of east wall in Auditorium - 4 ft. from floor			400	N.D.
North end of east wall in Auditorium - 4 ft. from floor			800	N.D.
North end of east wall in Auditorium - 4 ft. from floor			2,000	N.D.
North end of east wall in Auditorium - 4 ft. from floor			3,000	N.D.
North end of east wall in Auditorium - 4 ft. from floor			2,500	N.D.
North end of east wall in Auditorium - 4 ft. from floor			400	N.D.
North end of east wall in Auditorium - 6 ft. from floor			600	N.D.
North end of east wall in Auditorium - 6 ft. from floor			400	N.D.
North end of east wall in Auditorium - 6 ft. from floor			1,000	N.D.
North end of east wall in Auditorium - 6 ft. from floor			800	N.D.
North end of east wall in Auditorium - 6 ft. from floor			600	N.D.
North end of east wall in Auditorium - 6 ft. from floor			600	N.D.
North end of east wall in Auditorium - 10 ft. from floor			600	N.D.
North end of east wall in Auditorium - 10 ft. from floor			1,000	N.D.
North end of east wall in Auditorium - 10 ft. from floor			1,200	N.D.
North end of east wall in Auditorium - 10 ft. from floor			400	N.D.
North end of east wall in Auditorium - 10 ft. from floor			600	N.D.
North end of east wall in Auditorium - 10 ft. from floor			800	N.D.
East Side of Auditorium (Outside)				
South end by Boiler Room			568	N.D.
South end by Boiler Room			852	N.D.
South end by Boiler Room			0	N.D.
South end by Boiler Room			1,136	N.D.
South end by Boiler Room			284	N.D.
North end by First Aid Room			852	N.D.
North end by First Aid Room			568	N.D.
North end by First Aid Room			1,136	N.D.
North end by First Aid Room			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
East Side of Auditorium (Outside)				
South wall of hot storage (outside)			1,420	N.D.
South wall of hot storage (outside)			1,704	N.D.
South wall of hot storage (outside)			1,136	N.D.
South wall of hot storage (outside)			1,420	N.D.
South wall of hot storage (outside)			852	N.D.
South wall of Guards Locker Room (outside)			5,550	N.D.
South wall of Guards Locker Room (outside)			8,250	N.D.
South wall of Guards Locker Room (outside)			4,260	N.D.
South wall of Guards Locker Room (outside)			3,692	N.D.
South wall of Maintenance Shop (outside)			1,420	N.D.
South wall of Maintenance Shop (outside)			852	N.D.
South wall of Maintenance Shop (outside)			568	N.D.
South wall of Maintenance Shop (outside)			1,136	N.D.
South wall of Maintenance Shop (outside)			0	N.D.
South wall of Carpenter Shop (outside)			568	N.D.
South wall of Carpenter Shop (outside)			852	N.D.
South wall of Carpenter Shop (outside)			284	N.D.
South wall of Carpenter Shop (outside)			568	N.D.
East wall of Carpenter Shop (outside)			0	N.D.
East wall of Carpenter Shop (outside)			0	N.D.
East wall of Carpenter Shop (outside)			0	N.D.
East wall of Carpenter Shop (outside)			0	N.D.
North wall of Old Locker Room (outside)			568	N.D.
North wall of Old Locker Room (outside)			1,704	N.D.
North wall of Old Locker Room (outside)			2,272	N.D.
North wall of Old Locker Room (outside)			1,136	N.D.
Janitor's Quarters (South Room)				
Floor northeast			5,500	N.D.
Floor north center			8,250	N.D.
Floor northwest			8,250	N.D.
Floor center			11,000	N.D.
Floor center			5,500	N.D.
Floor center			11,000	N.D.
Floor southeast			11,000	N.D.
Floor south center			8,250	N.D.
Floor southwest			5,500	N.D.
Wall north			0	N.D.
Wall east			0	N.D.
Wall south			0	N.D.
Wall west			0	N.D.
Radiator			3,408	N.D.
Window sill east			2,840	N.D.
Window sill south			3,690	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Janitor's Quarters				
Hallway south floor			22,000	N.D.
Hallway center floor			16,500	N.D.
Hallway north floor			13,750	N.D.
Wall west			0	N.D.
Wall east			0	N.D.
Shower Room				
Floor north			16,500	N.D.
Floor south			22,000	N.D.
Lavatory			1,52	N.D.
East window sill			5,500	N.D.
Shower cabinet			11,000	N.D.
North Room				
Floor northeast			16,500	N.D.
Floor north center (by door)			22,000	N.D.
Floor northwest			13,750	N.D.
Floor center			16,500	N.D.
Floor center			16,500	N.D.
Floor center			22,000	N.D.
Floor southeast			13,750	N.D.
Floor south center			13,750	N.D.
Floor southwest			16,500	N.D.
East window sill			3,692	N.D.
Radiator			3,124	N.D.
North wall			0	N.D.
East wall			0	N.D.
South wall			0	N.D.
West wall			0	N.D.
Glass Roof of Auditorium				
Top ridge (horizontal copper surface) west			2,272	N.D.
Top ridge (horizontal copper surface) west center			2,840	N.D.
Top ridge (horizontal copper surface) west center			4,260	N.D.
Top ridge (horizontal copper surface) center			5,112	N.D.
Top ridge (horizontal copper surface) east center			3,124	N.D.
Top ridge (horizontal copper surface) east center			5,680	N.D.
Top ridge (by precipitron exhaust) east			13,750	N.D.
Top ridge (by precipitron exhaust) east			22,000	N.D.
Glass part of roof north side east			0	N.D.
Glass part of roof north side east center			0	N.D.
Glass part of roof north side center			0	N.D.
Glass part of roof north side west center			0	N.D.
Glass part of roof north side west			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Glass Roof of Auditorium				
Glass part of roof south side east			0	N.D.
Glass part of roof south side east center			0	N.D.
Glass part of roof south side center			0	N.D.
Glass part of roof south side west center			0	N.D.
Glass part of roof south side west			0	N.D.
Lower edge of glass north side			0	N.D.
Lower edge of glass north side			0	N.D.
Lower edge of glass north side			0	N.D.
Lower edge of glass north side			0	N.D.
Eaves trough on north side of roof			8,250	N.D.
Eaves trough on north side of roof			8,250	N.D.
Eaves trough on north side of roof			8,250	N.D.
Eaves trough on north side of roof			5,500	N.D.
Main Guard House				
Floor northeast			16,200	N.D.
Floor north center			12,960	N.D.
Floor northwest			19,440	N.D.
Floor center			17,280	N.D.
Floor center			20,520	N.D.
Floor center			8,640	N.D.
Floor southeast			12,960	N.D.
Floor south center			16,200	N.D.
Floor southeast			21,600	N.D.
South window sill			12,960	N.D.
East window sill			19,440	N.D.
North window sill			22,680	N.D.
West window sill			14,040	N.D.
North wall			0	N.D.
East wall			0	N.D.
South wall			0	N.D.
West wall			0	N.D.
Counter			11,880	N.D.
Outside walls			0	N.D.
Top (outside)			4,320	N.D.
South Guard House				
Floor northeast			4,108	N.D.
Floor north center			12,324	N.D.
Floor northwest			6,152	N.D.
Floor center			8,216	N.D.
Floor center			4,108	N.D.
Floor southeast			8,216	N.D.
Floor south center			6,152	N.D.
Floor southwest			10,270	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
South Guard House				
East window sill			4,108	N.D.
North window sill			6,152	N.D.
West window sill			4,108	N.D.
South window sill			4,108	N.D.
Locker on south side of room			6,152	N.D.
East wall			0	N.D.
South wall			0	N.D.
West wall			0	N.D.
North wall			0	N.D.
South wall outside			0	N.D.
East wall outside			0	N.D.
North wall outside			0	N.D.
West wall outside			0	N.D.
Roof			1,152	N.D.
Roof			4,108	N.D.
East Guard House				
Floor northwest			14,378	N.D.
Floor northeast			16,432	N.D.
Floor southeast			12,324	N.D.
Floor southwest			16,432	N.D.
East window sill			10,270	N.D.
North window sill			6,162	N.D.
North wall			0	N.D.
East wall			0	N.D.
West wall			0	N.D.
South wall			0	N.D.
Outside wall			0	N.D.
Roof			4,108	N.D.
Guard House				
Area in front of Guard House			1,600	N.D.
Area in front of Guard House			2,400	N.D.
Area 20 ft. east of north Guard House			2,400	N.D.
Area 20 ft. east of north Guard House			600	N.D.
Area 20 ft. east of north Guard House			800	N.D.
Area 40 ft. east of north Guard House			400	N.D.
Area 40 ft. east of north Guard House			0	N.D.
Area 40 ft. east of north Guard House			0	N.D.
Area 60 ft. east of north Guard House			0	N.D.
Area 60 ft. east of north Guard House			0	N.D.
Area 60 ft. east of north Guard House			0	N.D.
Area 80 ft. east of north Guard House			0	N.D.
Area 80 ft. east of north Guard House			400	N.D.
Area 80 ft. east of north Guard House			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Area 100 ft. east of north Guard House			0	N.D.
Area 100 ft. east of north Guard House			0	N.D.
Area 100 ft. east of north Guard House			0	N.D.
Area 120 ft. east of north Guard House near Runnymeade			0	N.D.
Area 120 ft. east of north Guard House near Runnymeade			0	N.D.
Area 120 ft. east of north Guard House near Runnymeade			0	N.D.
Area 20 ft. west from north Guard House			0	N.D.
Area 20 ft. west from north Guard House			0	N.D.
Area 20 ft. west from north Guard House			0	N.D.
Area 40 ft. west from north Guard House			0	N.D.
Area 40 ft. west from north Guard House			0	N.D.
Area 40 ft. west from north Guard House			0	N.D.
Steps leading to old Talbott Home			1,000	N.D.
Steps leading to old Talbott Home			1,200	N.D.
Steps leading to old Talbott Home			800	N.D.
Steps leading to old Talbott Home			400	N.D.
Steps leading to old Talbott Home			600	N.D.
Wooden walkway from Guard House to Garage			16,800	N.D.
Wooden walkway from Guard House to Garage			31,500	N.D.
Wooden walkway from Guard House to Garage			25,200	N.D.
Wooden walkway from Guard House to Garage			21,000	N.D.
Wooden walkway from Guard House to Garage			31,500	N.D.
Wooden walkway from Guard House to Garage			29,400	N.D.
Steps leading from Office to north Guard House			16,800	N.D.
Steps leading from Office to north Guard House			12,600	N.D.
Steps leading from Office to north Guard House			21,000	N.D.
Steps leading from Office to north Guard House			14,700	N.D.
Steps leading from Office to north Guard House			10,500	N.D.
Steps leading from Office to north Guard House			18,900	N.D.
Steps leading from Office to north Guard House			12,600	N.D.
Left wall ascending steps to north Guard House			1,600	N.D.
Left wall ascending steps to north Guard House			1,200	N.D.
Left wall ascending steps to north Guard House			800	N.D.
Left wall ascending steps to north Guard House			1,200	N.D.
Left wall ascending steps to north Guard House			1,400	N.D.
Left wall ascending steps to north Guard House			600	N.D.
Left wall ascending steps to north Guard House			400	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Right wall ascending steps to N. Guard House			1,000	N.D.
Right wall ascending steps to N. Guard House			800	N.D.
Right wall ascending steps to N. Guard House			1,200	N.D.
Right wall ascending steps to N. Guard House			1,400	N.D.
Right wall ascending steps to N. Guard House			400	N.D.
Right wall ascending steps to N. Guard House			1,000	N.D.
Driveway from N. Gate to Garage			600	N.D.
Driveway from N. Gate to Garage			800	N.D.
Driveway from N. Gate to Garage			0	N.D.
Driveway from N. Gate to Garage			0	N.D.
Driveway from N. Gate to Garage			200	N.D.
Wall by N. Fence (W. of Guard House)			2,200	N.D.
Wall by N. Fence (W. of Guard House)			1,800	N.D.
Wall by N. Fence (W. of Guard House)			1,000	N.D.
Wall by N. Fence (W. of Guard House)			600	N.D.
Wall by N. Fence (W. of Guard House)			400	N.D.
Wall by N. Fence (W. of Guard House)			1,000	N.D.
Wooden walkway on N. side of Auditorium	104,400		Removed	
Wooden walkway on N. side of Auditorium	92,800		Removed	
Wooden walkway on N. side of Auditorium	34,800		Removed	
Wooden walkway on N. side of Auditorium	116,000		Removed	
Wooden walkway on N. side of Auditorium	58,000		Removed	
Wooden walkway on N. side of Auditorium	34,800		Removed	
South wall by fence			1,000	N.D.
South wall by fence			800	N.D.
South wall 10 ft. from fence			600	N.D.
South wall 10 ft. from fence			800	N.D.
South wall 20 ft. from fence			1,000	N.D.
South wall 20 ft. from fence			600	N.D.
South wall 40 ft. from fence			600	N.D.
South wall 40 ft. from fence			600	N.D.
South wall 60 ft. from fence			400	N.D.
Steps leading down to Fish Pond south			400	N.D.
Steps leading down to Fish Pond south			0	N.D.
Steps leading down to Fish Pond south			0	N.D.
Steps leading down to Fish Pond south			200	N.D.
Steps leading down to Fish Pond south			0	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Right gate post by S. Gate			0	N.D.
Right gate post by S. Gate			0	N.D.
Right gate post by S. Gate			0	N.D.
Right gate post by S. Gate			0	N.D.
Left gate post by S. Gate			0	N.D.
Left gate post by S. Gate			0	N.D.
Left gate post by S. Gate			0	N.D.
Left gate post by S. Gate			0	N.D.
Dirt walk around W. side of Auditorium			21,600	N.D.
Dirt walk around W. side of Auditorium			5,400	N.D.
Dirt walk around W. side of Auditorium			10,800	N.D.
Dirt walk around W. side of Auditorium			3,240	N.D.
Dirt walk around W. side of Auditorium			6,480	N.D.
Dirt walk around W. side of Auditorium			3,240	N.D.
Dirt walk around W. side of Auditorium			10,800	N.D.
Area 10 ft. away from S. Loading Dock	116,000	400	Removed	
Area 10 ft. away from S. Loading Dock	125,000	1,600	Removed	
Area 10 ft. away from S. Loading Dock			30,000	N.D.
Area 10 ft. away from S. Loading Dock	200,000	2,800	Removed	
Area 10 ft. away from S. Loading Dock	200,000	2,400	Removed	
Area 10 ft. away from S. Loading Dock	250,000	2,800	Removed	
Area 10 ft. away from S. Loading Dock	116,000	1,200	Removed	
Area 10 ft. away from S. Loading Dock			33,000	N.D.
Area 10 ft. away from S. Loading Dock	55,000	600	Removed	
Area 20 ft. away from S. Loading Dock			21,600	N.D.
Area 20 ft. away from S. Loading Dock			10,800	N.D.
Area 20 ft. away from S. Loading Dock			21,600	N.D.
Area 20 ft. away from S. Loading Dock			8,640	N.D.
Area 20 ft. away from S. Loading Dock			9,720	N.D.
Area 20 ft. away from S. Loading Dock			6,480	N.D.
Area 20 ft. away from S. Loading Dock			17,280	N.D.
Area 20 ft. away from S. Loading Dock			27,020	N.D.
Area 20 ft. away from S. Loading Dock			21,600	N.D.
Area 20 ft. away from S. Loading Dock			10,800	N.D.
Area 20 ft. away from S. Loading Dock			21,600	N.D.
Area 20 ft. away from S. Loading Dock			8,640	N.D.
Area 20 ft. away from S. Loading Dock			9,720	N.D.
Area 20 ft. away from S. Loading Dock			6,480	N.D.
Area 20 ft. away from S. Loading Dock			17,280	N.D.
Area 20 ft. away from S. Loading Dock			27,020	N.D.
Area 20 ft. away from S. Loading Dock			26,100	N.D.
Area 20 ft. away from S. Loading Dock			30,260	N.D.
Area 20 ft. away from S. Loading Dock			15,020	N.D.
Area 20 ft. away from S. Loading Dock			7,560	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Area 30 ft. away from S. Loading Dock			5,400	N.D.
Area 30 ft. away from S. Loading Dock			3,240	N.D.
Area 30 ft. away from S. Loading Dock			17,280	N.D.
Area 30 ft. away from S. Loading Dock			7,560	N.D.
Area 30 ft. away from S. Loading Dock			10,800	N.D.
Area 30 ft. away from S. Loading Dock			12,860	N.D.
Area 30 ft. away from S. Loading Dock			13,940	N.D.
Area 30 ft. away from S. Loading Dock			7,560	N.D.
Area 30 ft. away from S. Loading Dock			6,480	N.D.
Area 40 ft. away from S. Loading Dock			7,560	N.D.
Area 40 ft. away from S. Loading Dock			4,320	N.D.
Area 40 ft. away from S. Loading Dock			3,240	N.D.
Area 40 ft. away from S. Loading Dock			5,400	N.D.
Area 40 ft. away from S. Loading Dock			32,420	N.D.
Area 40 ft. away from S. Loading Dock			36,740	N.D.
Area 40 ft. away from S. Loading Dock			10,800	N.D.
Area 40 ft. away from S. Loading Dock			8,640	N.D.
Area 40 ft. away from S. Loading Dock			9,720	N.D.
Area 50 ft. away from S. Loading Dock			7,560	N.D.
Area 50 ft. away from S. Loading Dock			10,800	N.D.
Area 50 ft. away from S. Loading Dock			6,480	N.D.
Area 50 ft. away from S. Loading Dock			8,640	N.D.
Area 50 ft. away from S. Loading Dock			7,560	N.D.
Area 50 ft. away from S. Loading Dock			6,480	N.D.
Area 50 ft. away from S. Loading Dock			5,400	N.D.
Area 50 ft. away from S. Loading Dock			4,320	N.D.
Concrete Slab East of Auditorium				
Northeast corner			10,800	N.D.
North center			8,640	N.D.
Northwest corner			9,720	N.D.
Center			11,780	N.D.
Center			21,600	N.D.
Center			27,020	N.D.
Southeast corner			35,660	N.D.
South center			55,000	N.D.
Southwest corner			21,600	N.D.
Walkway around east side of Auditorium			43,200	N.D.
Walkway around east side of Auditorium			36,740	N.D.
Walkway around east side of Auditorium			45,360	N.D.
Walkway around east side of Auditorium			47,520	N.D.
Walkway around east side of Auditorium			16,200	N.D.
Walkway around east side of Auditorium			13,940	N.D.
Walkway around east side of Auditorium			36,740	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Concrete steps on East side of Auditorium			16,200	N.D.
Concrete steps on East side of Auditorium			3,420	N.D.
Concrete steps on East side of Auditorium			23,760	N.D.
Concrete steps on East side of Auditorium			16,200	N.D.
Concrete steps on East side of Auditorium			15,020	N.D.
Concrete steps on East side of Auditorium			23,760	N.D.
East Driveway Macadam Surface	250,000	600	Removed	
East Driveway Macadam Surface	225,000	800	Removed	
East Driveway Macadam Surface	250,000	600	Removed	
East Driveway Macadam Surface	225,000	1,000	Removed	
East Driveway Macadam Surface	100,000	N.D.	Removed	
East Driveway Macadam Surface	80,000	N.D.	Removed	
East Driveway Macadam Surface	32,420	N.D.	Removed	
East Driveway Macadam Surface	24,840	N.D.	Removed	
East Driveway Macadam Surface	21,600	N.D.	Removed	
East Driveway Macadam Surface	80,000	N.D.	Removed	
East Driveway Macadam Surface	36,740	N.D.	Removed	
North Gate			1,000	N.D.
North Gate			600	N.D.
North Gate			400	N.D.
North Gate			0	N.D.
North Gate			0	N.D.
Fence toward Garage (from North Gate)			0	N.D.
Fence toward Garage (from North Gate)			0	N.D.
Fence toward Garage (from North Gate)			0	N.D.
Fence toward Garage (from North Gate)			0	N.D.
Fence toward Garage (from North Gate)			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
Fence West of North Guard House			0	N.D.
South Gate			8,000	N.D.
South Gate			400	N.D.
South Gate			7,000	N.D.
South Gate			600	N.D.
South Gate			800	N.D.
South Gate			1,000	N.D.

Location	Preliminary Readings Direct	Preliminary Readings Wipe	Final Readings Direct	Final Readings Wipe
Fence from South Gate to East Gate			0	N.D.
Fence from South Gate to East Gate			0	N.D.
Fence from South Gate to East Gate			0	N.D.
Fence from South Gate to East Gate			0	N.D.
Fence from South Gate to East Gate			0	N.D.
East Gate			400	N.D.
East Gate			600	N.D.
East Gate			300	N.D.
East Gate			500	N.D.
East Gate			0	N.D.
East Gate			200	N.D.

Ceiling Insulation

Four areas of 280 square feet each in different areas of the ceiling were surveyed on November 25, 1949. The following direct readings were obtained (in d./min./100 cm.^{2}):

Area Reading	1	2	3	4
	17,100	20,520	9,120	45,000
	14,820	60,000	5,700	20,520
	11,400	60,000	2,280	14,820
	9,120	0	6,840	30,000
	45,000	2,280	11,400	15,960
	10,260	2,280	7,980	5,700
	45,000	2,280	13,680	11,400
	45,000	2,280	10,260	30,000
	15,000	3,420	6,840	17,100
	4,800	3,420	4,940	13,680
		1,140	2,280	14,820
		1,140	6,840	12,540
		9,120	6,840	14,820
		12,540	7,980	30,000
		13,680	4,560	12,540
		9,120	5,700	6,840
		11,400	6,840	13,680
		19,380	11,400	18,240
				30,000

On two different occasions, sections of the insulation were taken down and surveyed. Insulation comes in two parts with paper backing on each section. In both cases wipe tests of all surfaces were not detectable or barely detectable. Wipe tests of paper on which insulation was laid gave no readings, which indicates at least that dusting is not excessive or likely to be a problem.

Twenty wipe tests made in Area 3 were not detectable or just barely detectable (less than one division on an alpha meter calibrated to read 240 d./min./division).

On the basis of this data, ceiling insulation was left for removal and disposal by the contractor.

TAB G

TAB G - AIR SAMPLES

AIR SAMPLES AT UNIT IV IN d./min./m.^{3}

	Number of Samples						
	0 to 1,000	1,000 to 3,000	3,000 to 10,000	10,000 to 25,000	25,000 to 50,000	*Over 50,000	TOTAL
June	72	31	14	4	4	4	129
July	61	33	6	9	1	0	110
August	8	14	2	0	0	0	24
September	25	61	27	17	2	3	135
October	5	34	65	45	24	19	192
November	9	44	51	32	13	5	154
December	20	52	60	29	12	4	177
January	14	15	9	0	0	0	38
TOTAL	214	284	234	136	56	35	959
Per Cent of Total	22.4	29.6	24.4	14.2	5.8	3.6	100.0

* These samples were mostly in the 50,000 to 100,000 range, with the maximum single sample being 700,000 d./min./m.^{3}

TAB H

TAB H - SUMMARY OF URINE SAMPLES

SUMMARY OF URINE SAMPLES AT UNIT IV IN c./min./50 ml.

	Number of Samples						
	0 to 2	3 to 5	6 to 8	9 to 11	*12 to 30	Contaminated Plus Insufficient	TOTAL
June	13	8	5	2	6	4	38
July	15	0	3	3	5	2	28
August	12	4	3	1	0	2	22
September	22	8	3	0	0	3	36
October	58	27	10	6	0	5	106
November	32	25	11	6	3	6	83
December	57	24	8	4	5	8	106
January	23	9	0	2	0	1	35
TOTAL	232	105	43	24	19	31	454
Per Cent of Total	51.1	23.1	9.5	5.3	4.2	6.8	100.0

* Three men only became "hot" during the work at Unit IV, with maximum count of 30 c./min./50 ml. This involved a total of 360 manhours out of approximately 18,000 manhours expended on the project.

REFERENCE 7

HISTORICAL RESUME OF MONSANTO'S OPERATION OF THE DAYTON PROJECT SITES - UNITS I, II, III, IV, V AND OTHERS - WASTE DISPOSAL 1943-1980

Summary of the Dayton Project

In the summer of 1942, the United States Army organized the Manhattan Engineering District to developan atomic bomb. This tremendous undertaking became known as the Manhattan Project.

In 1943, Charles Allen Thomas, Director of Monsanto Chemical Company's (Chemical has since been deleted) Central Research Department in Dayton, Ohio, was called to Washington, D.C. for a conference with top government officials. The Manhattan Project involved many unique problems. The solution to some of the problems required an experienced team of industrial chemists. Dr. Thomas, on behalf of Monsanto, accepted responsibility for the chemistry and metallurgy of radioactive polonium-210 and the Dayton Project was launched. Visible quantities of polonium-210 had never before been produced. Significant quantities of this extremely rare isotope were required as an essential "trigger" for the atomic weapon.

Monsanto began its organization for the super secret program and initiated the recruitment program at its Central Research facilities on Nicholas Road in Dayton, Ohio. This site became known as Unit I in the Dayton Project.

Within a short period of time, it became apparent that larger facilities would be required to produce the needed polonium. An old unused building (1879) known as the Bonebreak Theological Seminary rented and located at 160 West First Street, Dayton, Ohio, was hastily renovated. It was occupied in October, 1943. This facility became known as Unit III.

Again, the Dayton Project soon outgrew its accommodations. In February, 1944, the Army Corps of Engineers rented the Runnymede Playhouse located in Oakwood, Ohio at the southern boundary of Dayton, and turned it over to Monsanto. The Runnymede facility was a relatively large private recreational building constructed in 1927 by the Talbott family for their own activities. This facility became known as Unit IV.

In 1946, further expansion became inevitable. Several floors were therefore leased in a large old warehouse in downtown Dayton at Third and Sears Streets. The location became known simply as "the warehouse". Operations were limited to only trace quantities of polonium from the analysis of environmental monitoring samples, bioassay samples from the project personnel and preliminary biological studies on the effect of polonium on laboratory animals.

In 1946, it was evident that a permanent facility was needed for polonium work and to consolidate the work being done at the various locations. Several sites were considered in several locations throughout the country. The Dayton area was selected because of the good supply of skilled labor, adequate water, gas, power, transportation and close proximity to Monsanto's Central Research Department. The location chosen was a 180-acre site at the southern edge of

the city of Miamisburg, approximately 12 miles south of Dayton. Mound Laboratory was built and named for a large Indian mound overlooking the Great Miami River. The new multi-million dollar facility was commissioned in 1948. It was initially referred to as Unit V until the other units were decommissioned. In 1978, Mound Laboratory was renamed Mound Facility.

A standby facility, a processing duplicate of the Mound Laboratory T Building was constructed at Marion, Ohio in the same time frame as Mound Laboratory. Radioactive material was never introduced to this facility, however, since a need for added or alternate capability never developed. Process equipment was later dismantled and the site/building turned over to the General Services Administration for other possible uses. This facility was referred to as the Marion, Ohio facility or Marion.

During the early years of the Dayton Project, Monsanto also operated, independently, a facility for the production of rocket propellant. This operation was designated Unit II. Explosives handled included amonium picrate and amonium nitrate. No radioactive materials were handled at this location. The site is located about one-fourth mile east off State Route 741 adjacent to the present St. Henry Catholic Church property. Access to the site can be gained via Betty Lane which is the first street south of the St. Henry property. The old bunkers are still evident. Monsanto phased out this operation around the Fall of 1945.

Site Designations and Locations

Unit I - Monsanto Central Research Department facilities, 1515 Nicholas Road, Dayton, Ohio.

Unit II - Monsanto Rocket Propellant work off Betty Lane; site adjacent to present St. Henry Chruch site on Ohio 741; north of Dayton Mall.

Unit III - Bonebrake Theological Seminary, 1601 West First Street, Dayton, Ohio.

Unit IV - Runnymede Playhouse at Dixon Avenue and Runnymede Road in Oakwood, Ohio.

Unit V - Mound Laboratory, Miamisburg, Ohio.

Warehouse - Old warehouse at Third Street and Sears Street, Dayton, Ohio.

Marion - Duplicate production facility located in Marion, Ohio.

Waste Disposal Practices

Unit I - In the Dayton Project, polonium was not produced at Unit I. The process was set up initially at Units III and IV and later, in 1948, at Mound Laboratory (Unit V).

In subsequent years, various research projects were undertaken that did involve radioisotopes. All such work was done with AEC and subsequently, NRC licenses. These projects involved relatively small quantities of various isotopes such as carbon 14 and tritium. Some sealed sources in curie quantities were used. Trace quantities were discharged to the domestic sewer but controlled rigidly according to terms of the licenses and the provisions of 10 CFR Part 20. Some small quantities of carbon-14 in waste were incinerated on two occasions - again this was controlled in accordance with 10 CFR Part 20. Radioactive material was not buried on site. Solid waste was packaged in compliance with the stringent U.S. Department of Transportation regulations for radioactive materials and disposed of by the Nuclear Engineering Corporation at their Maxie Flats burial grounds according to their license from the State of Kentucky. NECO took possession of and responsibility for all packaged nuclear waste at the Unit I site.

Concerning other toxic materials, in the early years of operations at Unit I, spent acids were disposed of in onsite acid pits and allowed to neutralize in the soil. For example, 5-gallon containers of Hcl were emptied into an "acid pit" every few days.

Unit II - Scrap explosives were combusted onsite. No fuel wastes, refuse or other waste materials were ever buried onsite. Radioactive materials were not handled so there was no nuclear disposal to be considered.

Unit III - All radioactive waste generated was packaged in strong, tight containers according to U.S. DOT regulations and shipped on government vehicles to Oak Ridge National Laboratory for onsite burial. No materials were buried onsite at Unit III or sent to city landfills or other disposals. Disposal was rigidly controlled. The principal isotope involved was polonium-210 which has a physical half-life of 138 days. All of the polonium disposed of at Oak Ridge in those days has long since degraded by nuclear decay to stable lead-206.

All operations ceased at Unit III in 1948. The facilities and site were completely decontaminated and turned over to the Dayton Board of Education, the site owner. The main building has since been torn down. The small auxillary concrete block structures still remained in 1974 and were being used by a group of local trade unions for training purposes. Ownership of the site at that time was not determined. (Reference letter dated August 12, 1974, R. K. Flitcraft to R. L. Wainwright, DAO, AEC, titled "Radiological Condition Surveys of Real Property). The referenced letter included several attached original reports concerning the site decontamination, final surveys and decommissioning. (H. E. Meyer has copies of these reports on file.)

Unit IV - All radioactive waste was handled the same as at Unit III. It was packaged and shipped by government vehicles to Oak Ridge for land burial. The principal isotope was polonium-210. Burials were not made onsite or in the local area. All operations at Unit IV ceased and transferred to Mound Laboratory late in 1948. By spring 1950, all Unit IV structures, services and utilities were removed to a depth of 7 feet, packaged and shipped to

Oak Ridge for burial. Clean fill dirt replaced the excavated soil and the site was completely landscaped to blend with the surrounding well-kept, upper-class suburban Oakwood neighborhood. The property was returned to the Talbott family estate. To the best of people's knowledge in 1974 the estate was sold to three businessmen including a Dr. Madden, M.D., now deceased. We assumed at that time in 1974 that his interest had been turned over to his wife. Dr. Madden's daughter, Mrs. Richard W. Taylor, still resides at 111 Katherine Terrace which is across the street from the old Talbott estate. The letter, Flitcraft to Wainwright, and reports referenced in the discussion of Unit III above also apply to Unit IV.

Unit V - This designation was applied to Mound Laboratory during the construction period and early period of operation. In later years it fell into disuse since Units II, III and IV no longer existed. The handling and disposal of radioactive and other toxic materials at Mound are covered in a multitude of documents pertaining to Mound operations. Therefore, this information is not covered in this brief historical review.

Warehouse - Operations were limited to trace quantities of polonium-210 from the analysis of environmental monitoring samples, bioassay samples from the project personnel and preliminary biological studies on the effect of polonium on laboratory animals. These activities were carried out at the warehouse rather than at Units III or IV because a very low background of polonium was necessary to prevent contamination of the samples being processed. To the best of current available knowledge, samples, waste materials and plated copper disc from the polonium analyses were discarded into the general Warehouse wastes since the amount and concentration of polonium was so small. The Warehouse operation was also transferred to Mound Laboratory in 1948-1949. Equipment was moved to Mound, the area scrubbed down and returned to the building manager for renting to other clients. The environmental and bioassay work was set up in the I Building at Mound. The animal studies were set up in the B Building at Mound.

Marion - The facility at Marion, Ohio never became operational and no radioactive materials were ever introduced to the facility. By the mid-1950's, all process equipment, supplies, instrumentation, etc. were brought to Mound. The facility was turned over to the GSA for other possible government use or sale.

Conclusion

Monsanto has not conducted or concluded any of its nuclear waste operations at any of its facilities, past or present, in such manner that it may cause any future corporate embarrassment or hazard to the public. Nuclear waste has been handled and disposed of according to the stringent regulations imposed by the MED and its successor agencies as well as the DOT. There are no past or present secret burial sites or Love Canal "time bombs" waiting to be touched off by the persistent and snooping efforts of any person or group rightfully dedicated to the protection of the environment and public health.

Past and current history of Monsanto waste disposal operations at Mound Facility and the overall environmental impact are a matter of public record.

H. E. Meyer

H. E. Meyer

12-20-79

HEM:bp

REFERENCE 8

See Nuclfing-
H.E.M
Cuccow UNITS III
IV

November 9, 1973

Mr. R. L. Wainwright, Area Manager
U. S. Atomic Energy Commission
P. O. Box 66
Miamisburg, Ohio 45342

Dear Mr. Wainwright:

Decontamination and Decommissioning of AEC Facilities
(Additional Information on Contaminated Ex-AEC Owned
or Leased Facilities)

This letter is in response to the TWX, Mr. H. C. Donnelly to Mr. R. K. Flitcraft, requesting additional information on contaminated Ex-AEC owned or leased facilities that have already been turned over to other uses. Our evaluation indicates that only two AEC facilities operated by Monsanto fall within the criteria given in the TWX. These were and are still referred to as Unit III and Unit IV. Units III and IV, located in Dayton, Ohio, were operational from approximately 1944 to 1949 and both of these facilities were used in processing Po-210. Following termination of Po-210 processing at these locations, Unit III was decontaminated and returned to the Dayton Board of Education in 1950. Also, Unit IV was decontaminated and dismantled, the excavation filled with top soil and the site returned to the original owner (the Talbott family) in late 1950.

In the case of Unit III, the levels of contamination remaining when it was returned to the Dayton Board of Education were: (a) no detectable removable alpha contamination, and (b) maximum of 5,000 d/m per 100 cm^2 fixed alpha contamination. Considering the short half-life of Po-210, approximately 138 days, within three years the quantity of Po-210 remaining would have been reduced to 0.4 percent of the original amount; and to date (approximately 60 half-lives later) the quantity of Po-210 remaining would be so minute (10^{-19} of the original quantity) that it could be classed as non-existent and assuredly non-detectable by any means.

Unit IV was decontaminated, dismantled, and the contaminated materials disposed of at Mound Laboratory. When Unit IV was returned to the original owner, the land had no detectable contamination.

The specific information requested in the TWX is shown in Table I.

TABLE I
Specific Information Requested
in TWX, dated October 31, 1973

AEC Requested Information	Information
(1) A list identifying all past cleanup efforts resulting in transfer or release of real property for conditional or unconditional use.	(a) Unit III (b) Unit IV
(2) A brief summary of cleanup action where possible for each item identified in (1) above and including the following points where available. (A) Cleanup criteria used.	(a) Unit III - decontamination of facilities to: (a) no detectable removable alpha contamination, and (b) less than 5,000 d/m per 100 cm^2 fixed alpha contamination. (b) Unit IV - decontaminated to: (a) no detectable removable alpha contamination, and (b) less than 50,000 d/m per 100 cm^2 fixed alpha contamination - facilities totally dismantled and disposed of at Mound Laboratory to allow final decay. (c) In both cases, the grounds had no detectable contamination when released.

AEC Requested Information		Information	
(B)	Current Radiological Condition of property transferred.	(a)	Unit III and Unit IV site - no detectable contamination.
(C)	Who property transferred to.	(a)	Unit III - Dayton Board of Education
		(b)	Unit IV site - Talbott family estate.
(D)	Persons and/or organizations most knowledgeable about cleanup and disposal action.	(a)	G. Mahfouz, Mound Lab. J. M. Garner, Mound Lab. J. E. Bradley, Mound Lab.
(E)	Available documentation, memo, etc.	(a)	"Report No. 1 of Steering Committee of Units III and IV" - Completion Report for Disposal of Unit III, 1601 West First Street, Dayton, Ohio, F. L. Halbach, October 31, 1949, SRD Document MLM-393.
		(b)	"Report No. 3 of Steering Committee for Disposal of Units III and IV" - Completion Report for Disposal of Unit IV, Runnymeade Road and Dixon Avenue, Dayton, Ohio, F. L. Halbach, April 17, 1950, SRD Document MLM-461.

AEC Requested Information	Information
(F) State whether cleanup could be considered adequate, under present standards. If not, what should be done. What would be feasible to do, what are budgeting implications, etc.	(a) Yes, the cleanup is considered adequate - no additional action is required.

If there are any questions or if further information is required, please let us know.

Very truly yours,
Original signed
by
Donald R. Storey
Donald R. Storey
Director, Administration

Wolfe:aw

cc: Mr. R. L. Wainwright (2)

bc: J. E. Bradley
R. K. Flitcraft
R. A. Wolfe
D. A. Edling
D. E. Crook

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ZEN/R O MCCLELLAN LOVELACE FOUNDATION ALB NM THRU D K NOWLIN ALB ALO
INFO BY/USAEC MAJ GEN FRANK A DAVY HQ
AE
BT

xc: D. E. Crook
~~D. R. Storey~~
please prepare reply.
RKF/JEB

xc: J. L. Ricks
W. T. Cave

xc: ~~cirl to~~
J. E. Bradley
E. A. Rembold

PAGE 2 AN1 ADMU3365 UNCLAS/N ON W D
UNCLAS/N ON W D
REFERENCE MEMORANDUM DONNELLY/ATTACHED LIST, DECONTAMINATION AND DECOMMISSIONING OF AEC FACILITIES, DATED SEPTEMBER 14, 1973. WE HAVE BEEN REQUESTED TO PROVIDE ADDITIONAL INFORMATION ON CONTAMINATED EX-AEC OWNED OR LEASED FACILITIES THAT HAVE ALREADY BEEN TURNED OVER TO OTHER USES AND FOR WHICH YOU ARE NO LONGER RESPONSIBLE.
WE THEREFORE NEED BY NOVEMBER 12, 1973 THE FOLLOWING INFORMATION:
1. A LIST IDENTIFYING ALL PAST CLEANUP EFFORTS RESULTING IN TRANSFER OR RELEASE OF REAL PROPERTY FOR CONDITIONAL OR UNCONDITIONAL USE.
2. A BRIEF SUMMARY OF THE CLEANUP ACTION WHERE POSSIBLE FOR EACH ITEM IDENTIFIED IN 1. ABOVE AND INCLUDING THE FOLLOWING POINTS WHERE AVAILABLE:
   A. CLEANUP CRITERIA USED
   B. CURRENT RADIOLOGICAL CONDITION OF PROPERTY TRANSFERRED
   C. WHO PROPERTY TRANSFERRED TO.
   D. PERSONS AND/OR ORGANIZATIONS MOST KNOWLEDGEABLE ABOUT CLEANUP AND DISPOSAL ACTION.
   E. AVAILABLE DOCUMENTATION, REPORT, MEMO, ETC., SUBMIT COPY OF REPORT OR CITE REFERENCE.
   F. STATE WHETHER CLEANUP COULD BE CONSIDERED ADEQUATE, UNDER PRESENT STANDARDS. IF NOT, WHAT SHOULD BE DONE, WHAT WOULD BE FEASIBLE TO DO, WHAT ARE BUDGETING IMPLICATIONS, ETC?

PAGE 3 AN1 ADMU 3365 UNCLAS/N ON W D
MASON AND HANGER WILL ALSO BE RESPONSIBLE FOR PROVIDING THE ABOVE INFORMATION ON DECOMMISSIONED FACILITIES AT MEDINA AND CLARKSVILLE. PPP: DFL (503-73)
BT