APPENDIX A

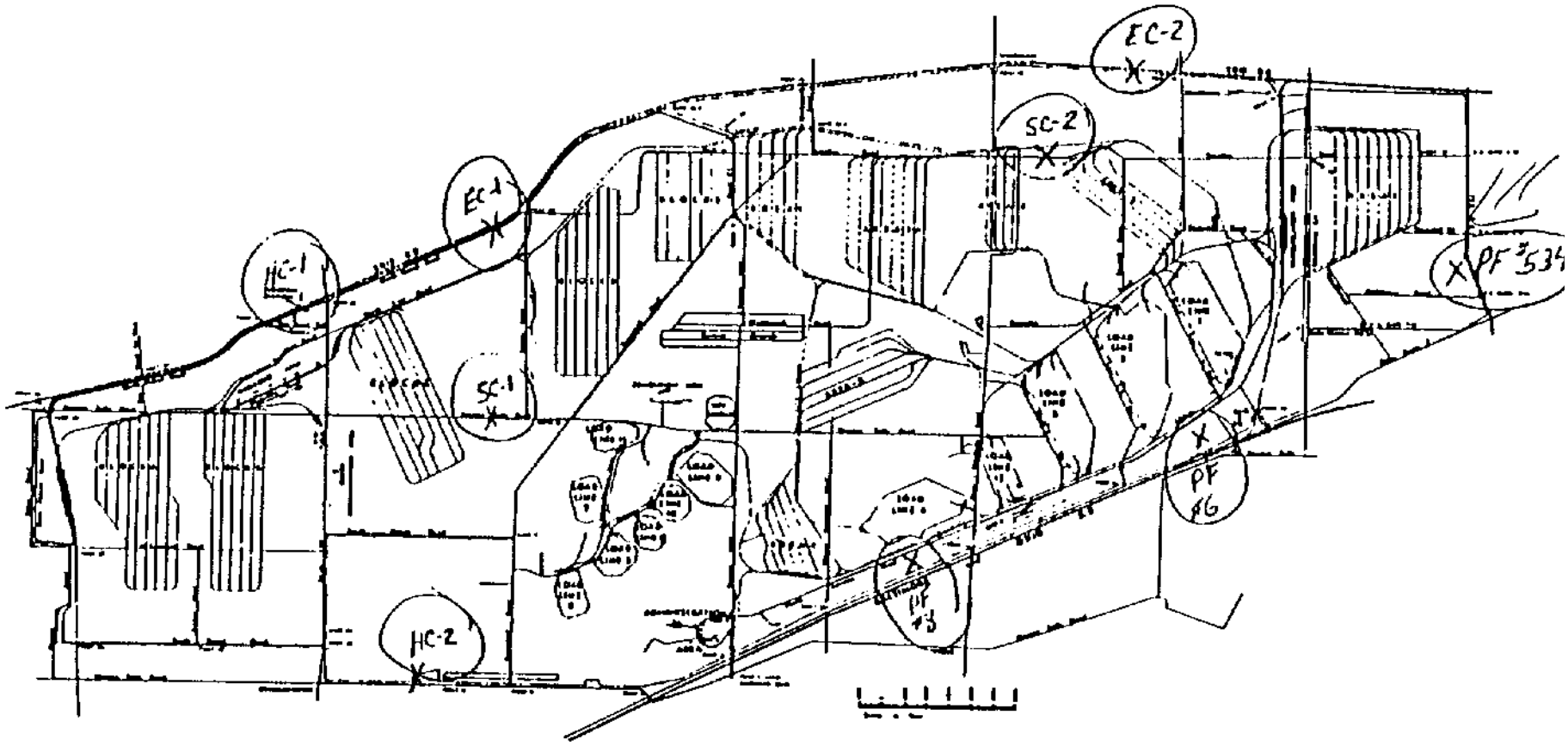
RESULTS OF PREVIOUS INVESTIGATIONS AT THE NACA TEST AREA

APPENDIX A-1

SELECTED PORTIONS FROM
PREVIOUS ENVIRONMENTAL INVESTIGATIONS
AT
NACA TEST AREA

WATER QUALITY SURVEILLANCE PROGRAM RESULTS
(1980 - 1992)

Location of surface water sampling Points



RAVENNA ARMY AMMUNITION PLANT

GENERAL AREA MAP

A-109

March 12, 1980

NACA Test Area
Demolition Area 1.

ERIE VIC

Re: Water Quality Surveillance Program

PARAMETER	SAMPLE STATION								
	EC-1	EC-2	SC-1	SC-2	HC-1	HC-2	PF #8	PF #6	PF #53
pH	Q	Q	Q	Q	Q	Q	Q	Q	Q
Temperature	Q	Q	Q	Q	Q	Q	Q	Q	Q
Specific Conductance	Q	Q	Q	Q	Q	Q	Q	Q	Q
Total Suspended Solids	Q	Q	Q	Q	Q	Q	Q	Q	Q
Biochemical Oxygen Demand -5 day	Q	Q	Q	Q	Q	Q	Q	Q	Q
Total Organic Carbon	S	S	S	S	S	S	S	S	S
Total Kjehldal Nitrogen	S	S	S	S	S	S	S	S	S
Nitrate	S	S	S	S	S	S	S	S	S
Nitrite	S	S	S	S	S	S	S	S	S
Phosphorous	S	S	S	S	S	S	S	S	S
Oil & Grease	Q	Q	Q	Q	Q	Q	Q	Q	Q
Dissolved Oxygen	Q	Q	Q	Q	Q	Q	Q	Q	Q
TNT		A		A		A	A	A	A
RDX		A		A		A	A	A	A
Copper	A	A	A	A	A	A	A	A	A
Chromium, Total (Hex & Tri)	A	A	A	A	A	A	A	A	A
Zinc	A	A	A	A	A	A	A	A	A
Lead	A	A	A	A	A	A	A	A	A
Fecal Coliform	Q	Q	Q	Q	Q	Q	Q	Q	Q

Q = Quarterly - 4/times a year (March, June, September & December)
S = Semi-Annually - 2 times a year (June (June & September
A = Annual - Once a year (September).

NOTE: (1) All samples will be taken as a grab sample unless otherwise notified at a future date.
(2) The Wastewater Treatment Plant Operator will be responsible for obtaining the Grab Samples.

Re: Water Quality Surveillance Program

PARAMETER	SAMPLE STATION								
	EC-1	EC-2	SC-1	SC-2	HC-1	HC-2	PF #8	PF #6	PF
pH	Q	Q	Q	Q	Q	Q	Q	Q	Q
Temperature	Q	Q	Q	Q	Q	Q	Q	Q	Q
Specific Conductance	Q	Q	Q	Q	Q	Q	Q	Q	Q
Total Suspended Solids	Q	Q	Q	Q	Q	Q	Q	Q	Q
Biochemical Oxygen Demand -5 day	Q	Q	Q	Q	Q	Q	Q	Q	Q
Total Organic Carbon	S	S	S	S	S	S	S	S	S
Total Kjehldal Nitrogen	S	S	S	S	S	S	S	S	S
Nitrate	S	S	S	S	S	S	S	S	S
Nitrite	S	S	S	S	S	S	S	S	S
Phosphorous	S	S	S	S	S	S	S	S	S
Oil & Grease	Q	Q	Q	Q	Q	Q	Q	Q	Q
Dissolved Oxygen	Q	Q	Q	Q	Q	Q	Q	Q	Q
TNT		A		A		A	A	A	A
RDX		A		A		A	A	A	A
Copper	A	A	A	A	A	A	A	A	A
Chromium, Total (Hex & Tri)	A	A	A	A	A	A	A	A	A
Zinc	A	A	A	A	A	A	A	A	A
Lead	A	A	A	A	A	A	A	A	A
Fecal Coliform	Q	Q	Q	Q	Q	Q	Q	Q	Q

Q = Quarterly - 4/times a year (March, June, September & December)
S = Semi-Annually - 2 times a year (June (June & September
A = Annual - Once a year (September).

NOTE: (1) All samples will be taken as a grab sample unless otherwise notified at a future date.
(2) The Wastewater Treatment Plant Operator will be responsible for obtaining the Grab Samples

RAVENNA ARMY AMMUNITION PLANT

WATER QUALITY SURVEILLANCE PROGRAM

Ravenna Arsenal, Inc.

March 12, 1980

SAMPLING STATIONS

A.	EAGLE CREEK	Influent	(North of Area #1 & Block E)
	" "	Effluent	(North of Area #3)
B.	SAND CREEK	Influent	(1/2 Mi. West of Slagle Rd.)
	" "	Effluent	(Smalley Road Bridge)
C.	HINCKLEY CREEK	Influent	(500 Ft. West of Post #32 - Rte. 80)
	" "	Effluent	(East of Post #24 - Charleston Perimeter R
D.	PARSHALL FLUME (Area #8)	Effluent	(Between Wayland-Wilcox and Parris Windham Rds on South Perimeter Fence Line Rd.)
E.	PARSHALL FLUME (Area #6)	Effluent	(South of Kelly's Pond and East of Post #2 on South Perimeter Fence Line Rd.)
F.	PARSHALL FLUME	Effluent	(Rte. #534)

Nomenclature:		Sampling Station:
EC-1	Influent	Eagle Creek
EC-2	Effluent	Eagle Creek
SC-1	Influent	Sand Creek
SC-2	Effluent	Sand Creek
HC-1	Influent	Hinckley Creek
HC-2	Effluent	Hinckley Creek
PF #8	Effluent	Parshall Flume - Area #8
PF #6	Effluent	Parshall Flume - Area #6
PF #534	Effluent	Parshall Flume - Rte. #534.

TMA
Thermo Analytical Inc.

TMA/ERG
7777 Exchange Street
Cleveland, OH 44125-3337

(216) 447-0790

Ravenna Arsenal
8451 State Route 5
Ravenna, Ohio 44266

Attn: Mr. Joe Mound

Samples Received: 9/04/87

Date: November 5, 1987

Project Number: V2466

Results reported in mg/l
except where noted.

TMA-Cleve Sample ID's 43454-43461

FINAL REPORT

Parameters	EC1	EC2	HC1	HC2	PF8	PF534	SC1	SC
pH (S.U.)	7.8	7.8	7.6	7.9	7.9	7.9	7.9	8.
Specific Conductivity (uhmos/cm)	500	430	590	390	430	460	470	46
Total Suspended Solids	12	13	10	15	12	8	9	8
Nitrate	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.
Nitrite	<0.010	<0.010	<0.010	0.016	0.014	0.012	0.015	0.
Total Phosphorus	0.062	0.054	0.15	0.064	0.054	0.040	0.044	0.
Oil & Grease	2	2	<1	5	1	4	9	1
Copper	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.
Total Chromium	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.
Hexavalent Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.
Trivalent Chromium	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.
Zinc	<0.010	<0.010	<0.010	<0.010	0.021	0.099	<0.010	<0.
Lead	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.
Fecal Coliform	90	500	880	130	340	81	160	7
Total Organic Carbon	5.7	3.5	4.6	4.9	6.6	1.8	5.9	4
Total Kjeldahl Nitrogen	0.44	0.65	0.96	0.52	0.70	0.60	0.60	0
~~TNT (ug/l)~~	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1
RDX (ug/l)	15	<1.5	45	4.8	<1.5	64	5.4	1

Approved by: Gunars Zikmanis
Gunars Zikmanis
Laboratory Manager

Ravenna Arsenal, Inc.
Ravenna, Ohio 44256

Attn: Mr. Al Custar

Samples Received: 8/04/83

Date: August 31, 1983

Project Number: 6511

Results reported in mg/l except where noted.

Parameter	EC-1 21,823	EC-2 21,824	HC-1 21,825	HC-2 21,826	PF-6 21,827	PF-8 21,828	PF-534 21,829	SC-1 21,830	SC-2 21,83
pH[1]	7.6	7.5	7.4	7.3	7.4	7.0	7.5	7.5	7.6
Conductivity[2]	<110	360	380	290	360	140	390	290	360
Total Suspended Solids	4	22	13	8	6	13	7	7	4
Biochemical Oxygen Demand	3	2	5	3	2	2	3	2	4
Total Organic Carbon	4	3	4	5	5	9	4	5	2
Total Kjeldahl Nitrogen	0.14	0.16	0.15	0.27	0.44	0.95	0.057	0.12	0.09
Nitrate	0.71	0.45	0.10	0.07	0.16	0.10	0.02	0.01	0.11
Nitrite	<0.010	<0.010	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	<0.01
Total Phosphorus	0.03	0.02	0.08	0.06	0.02	0.04	0.06	0.02	0.07
Oil & Grease	4	3	3	2	2	3	2	<1	2
Dissolved Oxygen	8.8	8.3	6.2	5.6	7.2	6.3	6.9	7.0	7.2
Copper	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.02
Chromium	<0.024	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.04
Hexavalent Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.01
Zinc	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.02
Lead	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05
Fecal Coliform	TNTC	320	TNTC	220	160	120	120	590	400
TNT	-----	ND-10	-----	ND-10	ND-10	ND-10	ND-10	-----	ND-1
RDX	-----	ND-10	-----	ND-10	ND-10	ND-10	ND-10	-----	ND-1

[1] pH is reported as S.U.

[2] Conductivity is reported as µhmos/cm

[3] Fecal Coliform is reported as /100 ml

[4] TNT and RDX are both reported as µg/l

ND-non-detectable. Detection limits are shown next to "ND" notations.

Certified by: _____

Art Czabaniuk
Laboratory Manager

ANALYTICAL REPORT

ENVIRONMENTAL RESEARCH GROUP, INC.

Project: V9367
Report Date: 10-30-85

Client I.D.: HC-2 *
ERG Sample No.: 09/137684
Matrix: NATURAL WATER

Parameter	Result	Units
INC	ND (0.02)	mg/L
H	7.6	S.U.

Client I.D.: PF-8
ERG Sample No.: 09/137685
Matrix: NATURAL WATER

Parameter	Result	Units
RGANIC CARBON, TOTAL	4	mg/L
AVERAGE OF DUPLICATE RUNS		
EXAVALENT CHROMIUM	~~0.07~~	mg/L
HROMIUM, TOTAL	0.03	mg/L
ECAL COLIFORM BACTERIA	4200	TC/.1L
PECIFIC CONDUCTANCE	500	umho/c
OPPER, TOTAL	<0.02	mg/L
IOCHEMICAL OXYGEN DEMAND	3	mg/L
EAD, TOTAL	ND (0.05)	mg/L
ITRATE NITROGEN	0.03	mg/L
ITRITE NITROGEN	ND (0.01)	mg/L
JELDAHL NITROGEN, TOTAL	0.46	mg/L
IL AND GREASE	<1	mg/L
XYGEN, DISSOLVED	7.2	mg/L
HOSPHORUS, TOTAL	0.35	mg/L
DX	ND (10)	ug/L
USPENDED SOLIDS	7	mg/L
EMPERATURE	60	degF
IME	11:09	AM

Comments: FLOW RATE IS LOW

NT	ND (10)	ug/L
INC	<0.02	mg/L
H	8.0	S.U.

Client I.D.: PF-534
ERG Sample No.: 09/137686
Matrix: NATURAL WATER

Parameter	Result	Units
RGANIC CARBON, TOTAL	ND (1)	mg/L
EXAVALENT CHROMIUM	~~0.11~~	mg/L
HROMIUM, TOTAL	<0.02	mg/L
ECAL COLIFORM BACTERIA	1400	TC/.1L
PECIFIC CONDUCTANCE	430	umho/c
OPPER, TOTAL	<0.02	mg/L
IOCHEMICAL OXYGEN DEMAND	<1	mg/L

Ravenna Arsenal
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 3/26/81

Date: March 31, 1981

Project Number: 4007

Results reported in mg/l except where noted.

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Result
13,102	EC-1	pH	6.2 S.
13,103	EC-2	"	7.1 S.
13,104	HC-1	"	6.6 S.
13,105	HC-2	"	6.6 S.
13,106	SC-1	"	7.0 S.
13,107	SC-2	"	7.0 S.
13,108	PF-534	"	6.9 S.
13,109	PF#6	"	6.7 S.
13,110	PF#8	"	7.0 S.
13,102	EC-1	Biochemical Oxygen Demand	5
13,103	EC-2	"	<1
13,104	HC-1	"	7
13,105	HC-2	"	<1
13,106	SC-1	"	<1
13,107	SC-2	"	<1
13,108	PF-534	"	<1
13,109	PF#6	"	<1
13,110	PF#8	"	5

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
13,102	EC-1	Dissolved Oxygen	10.3
13,103	EC-2	"	11.6
13,104	HC-1	"	10.7
13,105	HC-2	"	10.2
13,106	SC-1	"	12.7
13,107	SC-2	"	12.5
13,108	PF-534	"	9.8
13,109	PF#6	"	13.1
13,110	PF#8	"	12.1
13,102	EC-1	Fecal	<1.2
13,103	EC-2	"	31
13,104	HC-1	"	12
13,105	HC-2	"	4
13,106	SC-1	"	4
13,107	SC-2	"	<1.2
13,108	PF-534	"	13
13,109	PF#6	"	<1.2
13,110	PF#8	"	15

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
13,102	EC-1	Conductivity	230 µmho/
13,103	EC-2	"	220 µmho/
13,104	HC-1	"	170 µmho/
13,105	HC-2	"	145 µmho/
13,106	SC-1	"	175 µmho/
13,107	SC-2	"	190 µmho/
13,108	PF-534	"	130 µmho/
13,109	PF#6	"	195 µmho/
13,110	PF#8	"	225 µmho/
13,102	EC-1	Oil & Grease	1
13,103	EC-2	"	<1
13,104	HC-1	"	<1
13,105	HC-2	"	2
13,106	SC-1	"	1
13,107	SC-2	"	1
13,108	PF-534	"	1
13,109	PF#6	"	1
13,110	PF#8	"	1

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Result
13,102	EC-1	Suspended Solids	1
13,103	EC-2	"	3
13,104	HC-1	"	<1
13,105	HC-2	"	3
13,106	SC-1	"	1
13,107	SC-2	"	6
13,108	PF-534	"	5
13,109	PF#6	"	2
13,110	PF#8	"	4

cc: Tom Chanda
Jack Powell

Certified by: Art Czabaniuk
Art Czabaniuk
Laboratory Manager

Ravenna Arsenal
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 12/4/80

Date: December 31, 1980

Project Number: 3661

Results reported in mg/l except where noted.

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Temp.	Results
12,263	EC-1	pH	38°F	7.0 S.U.
12,164	EC-2	"	35°"	6.9 S.U.
12,165	HC-1	"	33°"	6.6 S.U.
12,166	HC-2	"	33°"	6.8 S.U.
12,167	SC-1	"	33°"	7.0 S.U.
12,168	SC-2	"	33°"	6.8 S.U.
12,169	PF-534	"	33°"	6.6 S.U.
12,170	PF-6	"	33°"	6.6 S.U.
12,171	PF-8	"	33°"	6.8 S.U.
12,163	EC-1	Conductivity		560 µmho/cm
12,164	EC-2	"		320 µmho/cm
12,165	HC-1	"		380 µmho/cm
12,166	HC-2	"		370 µmho/cm
12,167	SC-1	"		7400 µmho/c
12,168	SC-2	"		370 µmho/cm
12,169	PF-534	"		370 µmho/cm
12,170	PF-6	"		230 µmho/cm
12,171	PF-8	"		360 µmho/cm

Ravenna Arsenal
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 12/4/80

Date: December 31, 1980

Project Number: 3661

Results reported in mg/l except where noted.

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
12,163	EC-1	Suspended Solids	4
12,164	EC-2	"	4
12,165	HC-1	"	3
12,166	HC-2	"	4
12,167	SC-1	"	7
12,168	SC-2	"	4
12,169	PF-534	"	16
12,170	PF-6	"	7
12,171	PF-8	"	14
12,163	EC-1	Biochemical Oxygen Demand	<1
12,164	EC-2	"	<1
12,165	HC-1	"	<1
12,166	HC-2	"	<1
12,167	SC-1	"	<1
12,168	SC-2	"	<1
12,169	PF-534	"	<1
12,170	PF-6	"	<1
12,171	PF-8	"	<1

Ravenna Arsenal
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 12/4/80

Date: December 31, 198

Project Number: 3661

Results reported in mg
except where noted.

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
12,163	EC-1	Oil & Grease	1
12,164	EC-2	"	<1
12,165	HC-1	"	<1
12,166	HC-2	"	<1
12,167	SC-1	"	<1
12,168	SC-2	"	<1
12,169	PF-534	"	<1
12,170	PF-6	"	<1
12,171	PF-8	"	3
12,163	EC-1	Dissolved Oxygen	11.7
12,164	EC-2	"	11.8
12,165	HC-1	"	10.8
12,166	HC-2	"	11.9
12,167	SC-1	"	12.3
12,168	SC-2	"	12.0
12,169	PF-534	"	11.4
12,170	PF-6	"	11.8
12,171	PF-8	"	11.9

Ravenna Arsenal
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 12/4/80

Date: December 31, 1980

Project Number: 3661

Results reported in mg/l
except where noted.

ERG-Cleve Sample ID	Ravenna Sample ID
12,163	EC-1
12,164	EC-2
12,165	HC-1
12,166	HC-2
12,167	SC-1
12,168	SC-2
12,169	PF-534
12,170	PF-6
12,171	PF-8

Parameter		Results
Fecal	1120	120/100 ml
"	2000	200/100 ml
"	3600	360/100 ml
"	620	62/100 ml
"	620	62/100 ml
"	520	52/100 ml
"	500	50/100 ml
"	350	35/100 ml
"		TNTC*

*Too numerous to count.

Certified by: David L. Lanzgla
David L. Lanzgla
Laboratory Manager
Environmental Resear

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 30, 1980

Project Number: 3384

Results reported in mg/l
except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	pH	6.7 S.U.
11,303	EC-2	"	7.4 S.U.
11,304	SC-1	"	7.4 S.U.
11,305	SC-2	"	7.5 S.U.
11,306	HC-1	"	7.2 S.U.
11,307	HC-2	"	7.4 S.U.
11,308	PF-8	"	7.4 S.U.
11,309	PF-6	"	NR
11,310	PF-534	"	7.3 S.U.
11,302	EC-1	Conductivity	440 umho/c
11,303	EC-2	"	150 umho/c
11,304	SC-1	"	320 umho/c
11,305	SC-2	"	420 umho/c
11,306	HC-1	"	480 umho/c
11,307	HC-2	"	420 umho/c
11,308	PF-8	"	420 umho/c
11,309	PF-6	"	NR
11,310	PF-534	"	400 umho/c

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Suspended Solids	12
11,303	EC-2	"	3
11,304	SC-1	"	7
11,305	SC-2	"	4
11,306	HC-1	"	3
11,307	HC-2	"	19
11,308	PF-8	"	4
11,309	PF-6	"	NR
11,310	PF-534	"	4
11,302	EC-2	Biochemical Oxygen Demand	2
11,303	EC-2	"	<1
11,304	SC-1	"	2
11,305	SC-2	"	<1
11,306	HC-1	"	4
11,307	HC-2	"	2
11,308	PF-8	"	1
11,309	PF-6	"	NR
11,310	PF-534	"	2

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Total Organic Carbon	32
11,303	EC-2	"	11
11,304	SC-1	"	8
11,305	SC-2	"	22
11,306	HC-1	"	28
11,307	HC-2	"	12
11,308	PF-8	"	25
11,309	PF-6	"	NR
11,310	PF-534	"	6
11,302	EC-1	Total Kjeldahl Nitrogen	0.20
11,303	EC-2	"	<0.010
11,304	SC-1	"	<0.010
11,305	SC-2	"	0.15
11,306	HC-1	"	0.22
11,307	HC-2	"	0.091
11,308	PF-8	"	<0.010
11,309	PF-6	"	NR
11,310	PF-534	"	<0.010

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Nitrate	0.69
11,303	EC-2	"	0.11
11,304	SC-1	"	0.024
11,3-5	SC-2	"	0.029
11,306	HC-1	"	0.065
11,307	HC-2	"	0.19
11,308	PF-8	"	0.12
11,309	PF-6	"	NR
11,310	PF-534	"	0.040
11,302	EC-1	Nitrite	0.016
11,303	EC-2	"	<0.010
11,304	SC-1	"	<0.010
11,305	SC-2	"	<0.010
11,306	HC-1	"	0.015
11,307	HC-2	"	0.015
11,308	PF-8	"	0.012
11,309	PF-6	"	NR
11,310	PF-534	"	<0.010

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Total Phosphorus	<0.030
11,303	EC-2	"	0.072
11,304	SC-1	"	<0.030
11,305	SC-2	"	0.041
11,306	HC-1	"	0.14
11,307	HC-2	"	<0.030
11,308	PF-8	"	0.069
11,309	PF-6	"	NR
11,310	PF-534	"	<0.030
11,302	EC-1	Oil & Grease	<1
11,303	EC-2	"	<1
11,304	SC-1	"	<1
11,305	SC-2	"	<1
11,306	HC-1	"	<1
11,307	HC-2	"	<1
11,308	PF-8	"	<1
11,309	PF-6	"	NR
11,310	PF-534	"	<1

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Dissolved Oxygen	6.4
11,303	EC-2	"	7.0
11,304	SC-1	"	6.9
11,305	SC-2	"	7.5
11,306	HC-1	"	4.0
11,307	HC-2	"	6.0
11,308	PF-8	"	8.1
11,309	PF-6	"	NR
11,310	PF-534	"	6.8
11,302	EC-1	Copper	0.008
11,303	EC-2	"	0.039
11,304	SC-1	"	0.012
11,305	SC-2	"	0.025
11,306	HC-1	"	0.067
11,307	HC-2	"	0.011
11,308	PF-8	"	0.006
11,309	PF-6	"	NR
11,310	PF-534	"	0.025

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Chromium	<0.005
11,303	EC-2	"	<0.005
11,304	SC-1	"	<0.005
11,305	SC-2	"	<0.005
11,306	HC-1	"	<0.005
11,307	HC-2	"	<0.005
11,308	PF-8	"	<0.005
11,309	PF-6	"	NR
11,310	PF-534	"	<0.005
11,302	EC-1	Hexavalent Chromium	<0.010
11,303	EC-2	"	<0.010
11,304	SC-1	"	<0.010
11,305	SC-2	"	<0.010
11,306	HC-1	"	<0.010
11,307	HC-2	"	<0.010
11,308	PF-8	"	<0.010
11,309	PF-6	"	NR
11,310	PF-534	"	<0.010

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Zinc	0.044
11,303	EC-2	"	0.050
11,304	SC-1	"	0.023
11,305	SC-2	"	0.051
11,3-6	HC-1	"	0.066
11,307	HC-2	"	0.031
11,308	PF-8	"	0.034
11,309	PF-6	"	NR
11,310	PF-534	"	0.035
11,302	EC-1	Lead	<0.039
11,303	EC-2	"	<0.039
11,304	SC-1	"	<0.039
11,305	SC-2	"	<0.039
11,306	HC-1	"	<0.039
11,307	HC-2	"	<0.039
11,308	PF-8	"	<0.039
11,309	PF-6	"	NR
11,310	PF-534	"	<0.039

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 9/4/80

Date: September 29, 1980

Project Number: 3384

Results reported in mg/l
except where noted

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results
11,302	EC-1	Fecal Coliform	120/100 ml
11,303	EC-2	"	140/100 ml
11,304	SC-1	"	120/100 ml
11,305	SC-2	"	230/100 ml
11,306	HC-1	"	TNTC
11,307	HC-2	"	270/100 ml
11,308	PF-8	"	270/100 ml
11,309	PF-6	"	NR
11,310	PF-534	"	100/100 ml

NR-Not Received

Certified by: David L. Lanzola
David L. Lanzola
Laboratory Manager

ADDENDUM

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Date: November 6, 1980

Project Number: 3384

Attn: Al Custar

Samples Received: 9/4/80

ERG-Cleve Sample ID	Ravenna Sample ID	Parameter	Results	Detection Limit
11,303	EC-2	TNT	ND	0.04 ppb
11,305	SC-2	"	ND	0.04 ppb
11,307	HC-2	"	ND	0.04 ppb
11,308	PF-8	"	ND	0.04 ppb
11,309	PF-6	"	ND	0.04 ppb
11,310	PF-534	"	ND	0.04 ppb
11,303	EC-2	RDX	ND	12 ppb
11,305	SC-2	"	ND	12 ppb
11,307	HC-2	"	ND	12 ppb
11,308	PF-8	"	ND	12 ppb
11,309	PF-6	"	ND	12 ppb
11,310	PF-534	"	ND	12 ppb

Certified by: _____
David L. Lanzola
Laboratory Manager

Ravenna Arsenal,Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 6/12/80

Date: June 30,1980

Project Number: 3164

Results reported in mg/l
except where noted

ERG/Cleve Sample ID	Ravenna Sample ID	pH	Conductivity	Suspended Solids	Biochemical Oxygen Demand	TKN	Nitrate-N	Nitrite-N
10,740	EC-1	7.7 S.U.	410	10	3	.088	0.50	<0.010
10,741	EC-2	7.5 "	390	11	4	.044	0.29	<0.010
10,742	SC-1	7.1 "	340	7	2	1.1	0.19	0.017
10,743	SC-2	7.6 "	330	11	2	0.12	0.062	<0.010
10,744	HC-1	7.5 "	360	15	3	0.088	0.21	0.017
10,745	HC-2	7.5 "	310	16	6	0.41	0.40	<0.010
10,746	PF-8	7.5 "	370	10	5	0.73	0.18	<0.010
10,747	PF-6	7.4 "	260	28	3	0.36	0.14	<0.010
10,748	PF-534	7.3 "	340	5	2	0.42	0.055	<0.010

Ravenna Arsenal, Inc.
Ravenna, Ohio 44266

Attn: Al Custar

Samples Received: 6/12/80

Date: June 30, 1980

Project Number: 3164

Results reported in mg/l
except where noted

ERG/Cleve Sample ID	Ravenna Sample ID	Total Phosphorous	Oil and Grease	Dissolved Oxygen	Fecal Coliform	Temp (F°)	pH
10,740	EC-1	0.11	<1	9.3	110	56°	7.6
10,741	EC-2	0.21	<1	9.0	190	55°	7.6
10,742	SC-1	0.16	1	9.4	620	56°	7.8
10,743	SC-2	0.075	<1	9.6	310	56°	7.8
10,744	HC-1	0.16	<1	8.1	710	56°	7.3
10,745	HC-2	0.19	<1	7.9	260	56°	7.3
10,746	PF-8	0.19	<1	8.0	330	60°	7.3
10,747	PF-6	0.96	<1	9.3	270	60°	7.4
10,748	PF-534	0.35	1	8.0	680	58°	7.3

Certified by: David Lanzola

David L. Lanzola
Laboratory Manager

APPENDIX A-2

SELECTED PORTIONS FROM
PREVIOUS ENVIRONMENTAL INVESTIGATIONS
AT
NACA TEST AREA

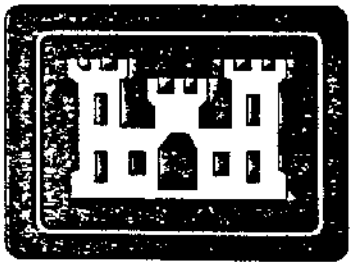
PRELIMINARY ASSESSMENT (1996)

PRELIMINARY ASSESSMENT

FOR

THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

PREPARED FOR



U.S. ARMY CORPS OF ENGINEERS NASHVILLE DISTRICT

CONTRACT No. DACA62-94-D-0029
Delivery Order 0009

February 1996

95-033MS/021596

4.2.5 RVAAP-36 (Pistol Range)

The Pistol Range, due north of RVAAP-05 (Winklepeck Burning Grounds) was used by the installation security force and occasionally other outside agencies for pistol qualification. The qualifier stood on the south side of the creek and shot over the creek at targets on the north side. The north bank, 150 to 200 feet from the edge of the creek, was the stopping point for the bullets.

4.2.6 RVAAP-37 (Pesticide Building S-4452)

This facility was used as the pest control shop from the early 1970s until 1993. Small quantities of pesticide were mixed inside the building and vehicle-mounted sprayers were filled and mixed along the western side of the building. This building is located to the southeast of the 1037 building (Headquarters).

4.2.7 RVAAP-38 (NACA Test Area)

The NACA was trying to develop explosion-proof fuel tanks for aircraft, or explosion-proof fuel. An airplane would land on an old clay runway and taxi to the east (the test facility). The planes were hooked up to a conveyor or catapult and rammed into a wall. The facility is due east of the RVAAP-03 (Demolitions Area #1).

APPENDIX A-3

SELECTED PORTIONS FROM
PREVIOUS ENVIRONMENTAL INVESTIGATIONS
AT
NACA TEST AREA

NACA INFORMATION PAPER (1997)

NACA

DRAFT

INFORMATION PAPER

AGOH-OT-RTLS

24 SEPTEMBER 1997

PURPOSE: TO DEFINE PREVIOUS USAGE OF NACA CRASH STRIP.

THE NACA CRASH STRIP IS LOCATED IN TRAINING AREA "G" AT THE RAVENNA TRAINING AND LOGISTICS SITE (RTLS), ON THE RAVENNA ARMY AMMUNITION PLANT (RVAAP). THE STRIP IS A CONCRETE AIRSTRIP APPROXIMATELY 1600' LONG, COMPRISED OF THREE PARALLEL CONCRETE STRIPS. THE TWO OUTBOARD CONCRETE STRIPS PROVIDED A SURFACE UPON WHICH THE AIRCRAFTS' MAIN LANDING WHEELS TRAVELLED. THE CENTER STRIP SUPPORTED A MONORAIL WHICH LOCKED-IN THE AIRCRAFTS' NOSE OR TAILWHEEL (SEE ATTACHMENT). THE STRIP WAS UTILIZED BY THE NATIONAL ADVISORY COMMITTEE ON AERONAUTICS (NACA) BETWEEN 1947 AND 1953 FOR CLASSIFIED TESTING.

DURING THIS PERIOD, FOUR CURTISS C-46 "COMMANDOES" AND THIRTEEN FAIRCHILD C-82 "PACKETS" (WAR WEARY TWIN-ENGINE CARGO AIRCRAFT FROM THE U.S. AIR FORCE) WERE UTILIZED FOR FULL-SCALE CRASH-FIRE STUDIES AT THE SITE (SEE ATTACHMENTS).

THE CRASH-FIRE TESTING CONDUCTED PERMITTED IDENTIFICATION OF THE MECHANISMS FOR CRASH FIRES, AND THE TRUE NATURE OF THE DISRUPTION SUFFERED BY AIRPLANES, RELATING SPECIFICALLY TO FUEL SPILLAGE, COMBUSTIBLE VAPOR DISTRIBUTION, GENERATION OF IGNITION SOURCES, FIRE INCIDENCE AND PROGRESSION, AND TEMPERATURES AND TOXIC GAS CONCENTRATION. THE CONDITIONS AT RVAAP PERMITTED FULLY-INSTRUMENTED AIRCRAFT TO BE PLACED (UNDER THEIR OWN POWER) IN CONTROLLED CRASHES INTO A FIXED CRASH BARRIER AT SPEEDS OF 80-105 MPH.

THE C-46 AIRCRAFT UTILIZED HAD A 108.1' WINGSPAN, AND A LENGTH OF 76.4'. THE CRASH WEIGHT WAS APPROXIMATELY 24,060 LBS., INCLUDING 7,090 LBS OF OCTANE GRADE 100/130 AVIATION FUEL OR LOW VOLATILITY FUEL. THE C-82 AIRCRAFT UTILIZED HAD A WINGSPAN OF 109.3' AND A LENGTH OF 86.6'. THE CRASH WEIGHT OF APPROXIMATELY 40,781 LBS. ALSO INCLUDED 7,090 LBS. OF OCTANE GRADE 100/130 AVIATION FUEL OR LOW VOLATILITY FUEL. THE AIRCRAFT NORMALLY TRAVELLED LESS THAN 400' AFTER STRIKING THE CRASH BARRIER.

COMBUSTIBLE LIQUIDS INVOLVED IN THIS CRASH-FIRE STUDY INCLUDED THE 100/130 OCTANE AVIATION FUEL, THE LOW VOLATILITY FUEL, LUBRICATING OIL, COOLANT COMPOUNDS, HYDRAULIC FLUID, ALCOHOL FOR DE-ICING SYSTEMS AND BRAKE FLUID. THE UNBURNED COMBUSTIBLE LIQUIDS WERE GENERALLY FOUND WITHIN A FAN-SHAPED AREA BEGINNING AT THE CRASH BARRIER, AND EXTENDING OUTWARD (EASTWARD) UP TO 400' (SEE ATTACHMENT). A SMALL DRAINAGE POND IS LOCATED AT THE SOUTH EDGE OF, AND SLIGHTLY DOWN-GRADIENT FROM THE FAN.

WHILE 17,850 GALLONS (120,530 LBS.) OF AVIATION FUEL WERE CONSUMED DURING THIS STUDY, EXACT AMOUNTS OF THE OTHER COMBUSTIBLE LIQUIDS EXPENDED (LISTED ABOVE) ARE UNAVAILABLE AND UNKNOWN. THEIR CONSUMPTION AND IMPACT WAS NOT CONSIDERED SIGNIFICANT TO THE CONDUCT OF THE STUDY.

AN UNDISCLOSED NUMBER OF THE AIRCRAFT WERE NEARLY TOTALLY CONSUMED DURING THE CRASH FIRES. OTHERS HOWEVER, WERE SIGNIFICANTLY DAMAGED, BUT NOT TOTALLY BURNED. OTHER THAN TELEMETRY AND INSTRUMENTATION REMOVED FOR SALVAGE OR REUSE, THE DAMAGED AND BURNED AIRFRAMES WERE BULLDOZED INTO AN AREA EAST OF THE END OF THE STRIP AND BURIED. A FEW REMNANTS OF THE BURIED

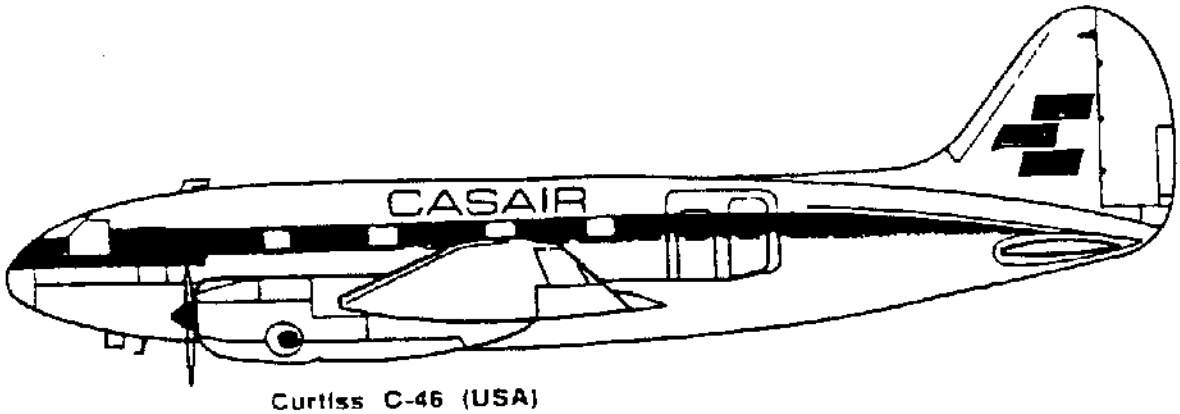
DRAFT

AIRFRAMES PROTRUDE FROM THE SOIL IN VARIOUS POINTS WITHIN THE TRAINING AREA, WHERE THEY HAD PREVIOUSLY BEEN BURIED. THESE AIRFRAME REMNANTS ARE FOUND OFF THE EXISTING ROADS AND TRAILS UTILIZED BY THE NACA AND SUBSEQUENT USERS.

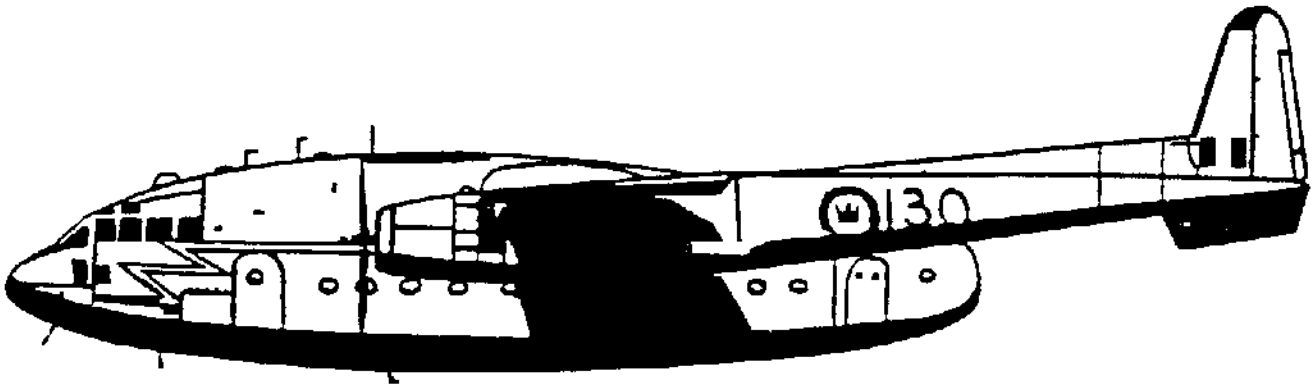
A LARGE PROPORTION OF THE COMBUSTIBLE LIQUIDS SPILLED ON THE GROUND SOAKED QUICKLY INTO THE UNFROZEN SOIL. THESE LIQUIDS RELEASED COMBUSTIBLE VAPORS INTO THE AIR WHICH BURNED LONG AFTER THE CRASH, UNTIL THE VAPORS EMANATING FROM THE SOIL HAD DIMINISHED TO A POINT WHERE THEY WOULD NO LONGER SUPPORT COMBUSTION.

THE OHIO ARMY NATIONAL GUARD HAS BEEN THE LICENSED USER OF TRAINING AREA "G" SINCE 1969. AN ARCHEOLOGICAL SURVEY OF TRAINING AREAS "D" THROUGH "G" WAS COMPLETED DURING 1997, BY MIDWEST ENVIRONMENTAL CONSULTANTS, INC. TRAINING AREA "G" HAS BEEN UTILIZED SINCE 1969 FOR DISMOUNTED TROOP TRAINING, BIVOUAC OF THE TROOPS IN TRAINING AND VEHICULAR PARKING. DURING THE SAME PERIOD, THE TRAINING AREA HAS ALSO BEEN UTILIZED AS AN HELICOPTER DAY AND NIGHT LANDING ZONE. FIRING OF BLANK AMMUNITION OF 7.62MM AND SMALLER IS PERMITTED WITHIN THE TRAINING AREA BETWEEN 1000 AND 2200 HOURS DAILY.

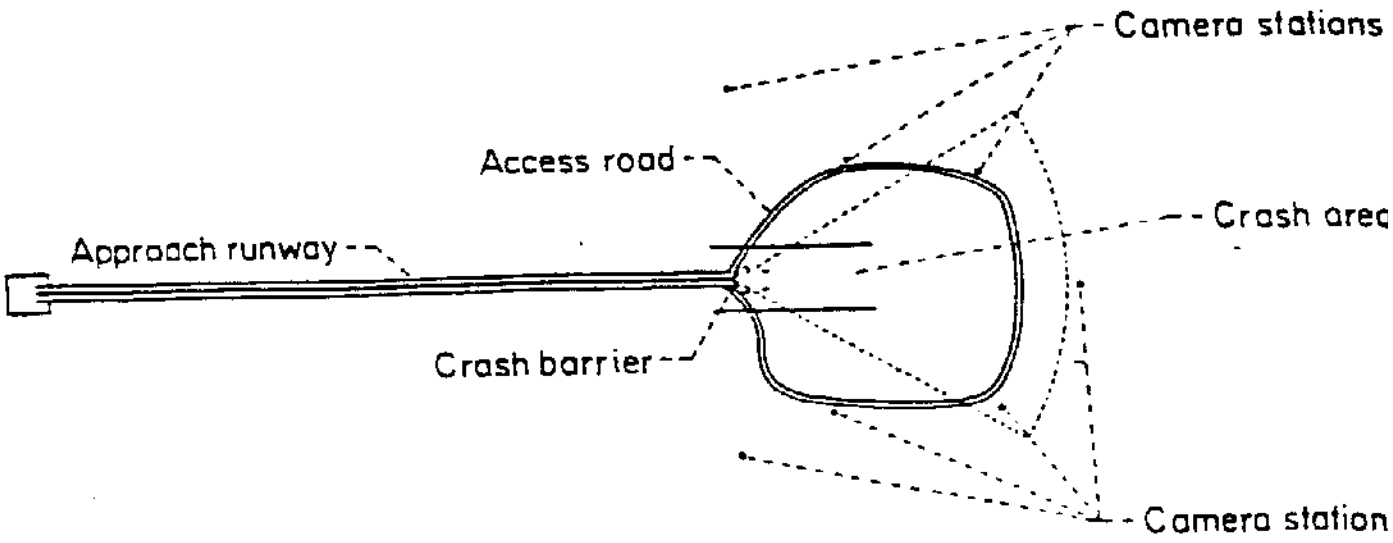
ADJUTANT GENERAL OF OHIO PAMPHLET (AGOH PAM) 210-1, DATED 9 AUG 97 ELABORATES ON THE USES OF AND RESTRICTIONS TO THE USE OF THIS TRAINING AREA. A PRINTED COPY OF THIS AGOH PAM IS PROVIDED TO, AND ITS CONTENTS ARE ALSO BRIEFED TO EACH INCOMING UNIT IN TRAINING, ACTIVE AND RESERVE COMPONENT, REGARDLESS OF BRANCH OR RECENT HISTORY OF PREVIOUS USE. THE AGOH PAM RESTRICTS VEHICULAR TRAFFIC AND PARKING TO THE CONCRETE RUNWAY AND ESTABLISHED TRAILS WITHIN THE TRAINING AREA. THE AGOH PAM ALSO PROHIBITS TROOPS FROM DIGGING INTO THE SOIL, DISCHARGING GRAY WATER (MESS OPERATION WASTE), DISPOSING OF TRASH OR GARBAGE WITHIN THE TRAINING AREA. THE AGOH PAM ALSO PROHIBITS LIVE-FIRE OF ANY WEAPON OR WEAPON SYSTEM, ALL PYROTECHNIC USAGE, AND FIRES OF ANY KIND. THE TROOPS ARE ALSO CAUTIONED VERBALLY NOT TO CONSUME OR INGEST THE SOIL OR GROUND WATER.



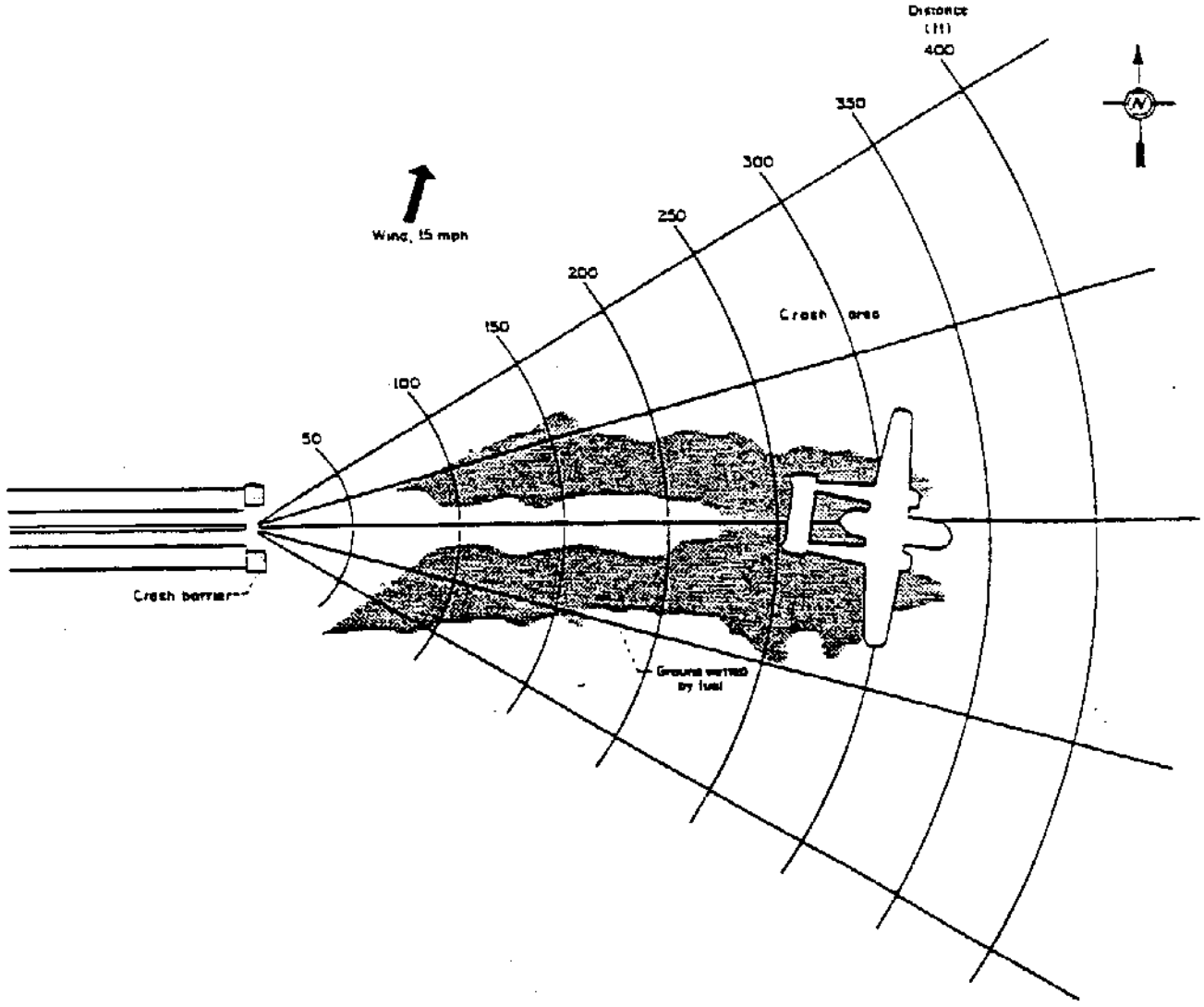
Curtiss C-46 (USA)

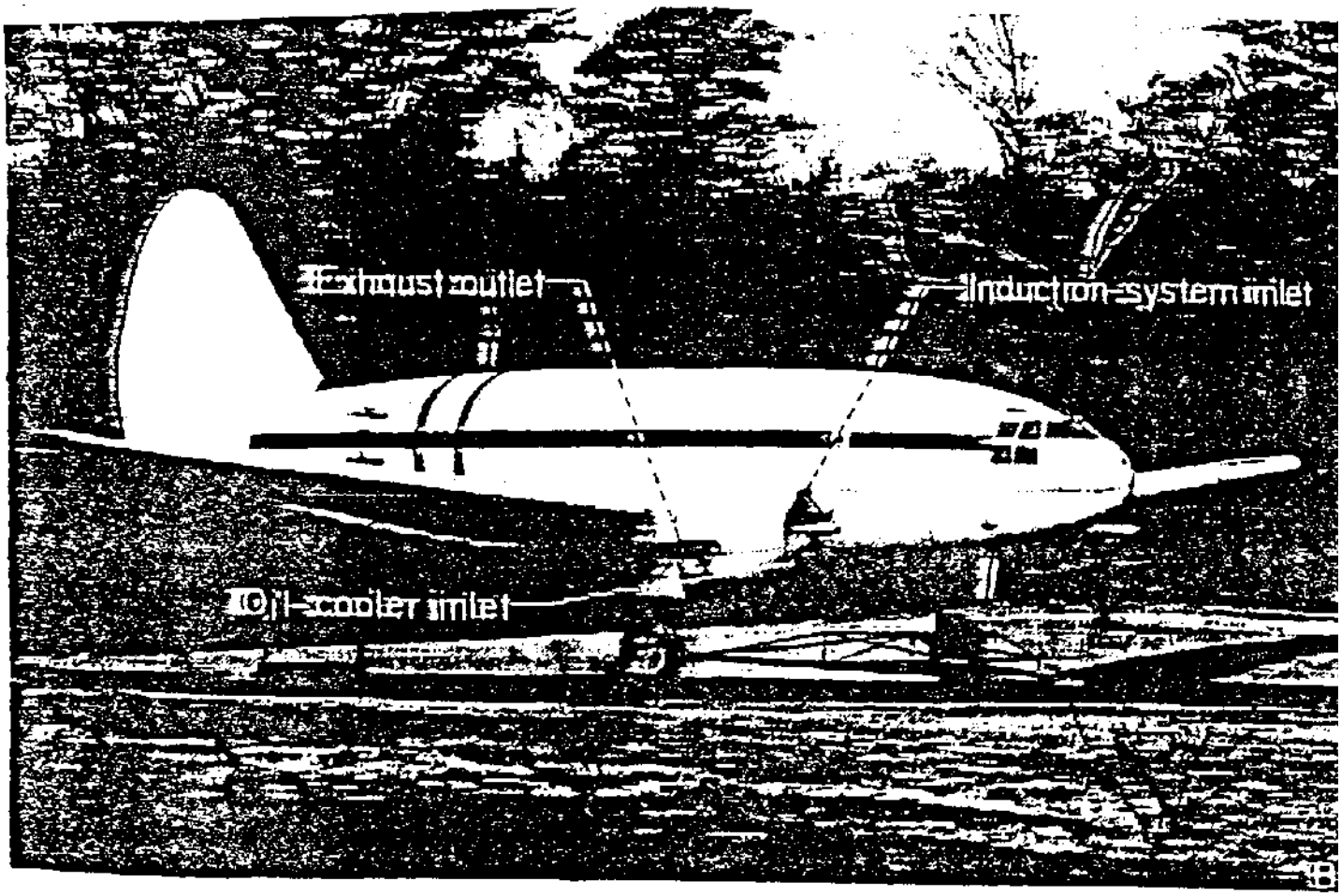


Fairchild C-119G Flying Boxcar (1946, USA)

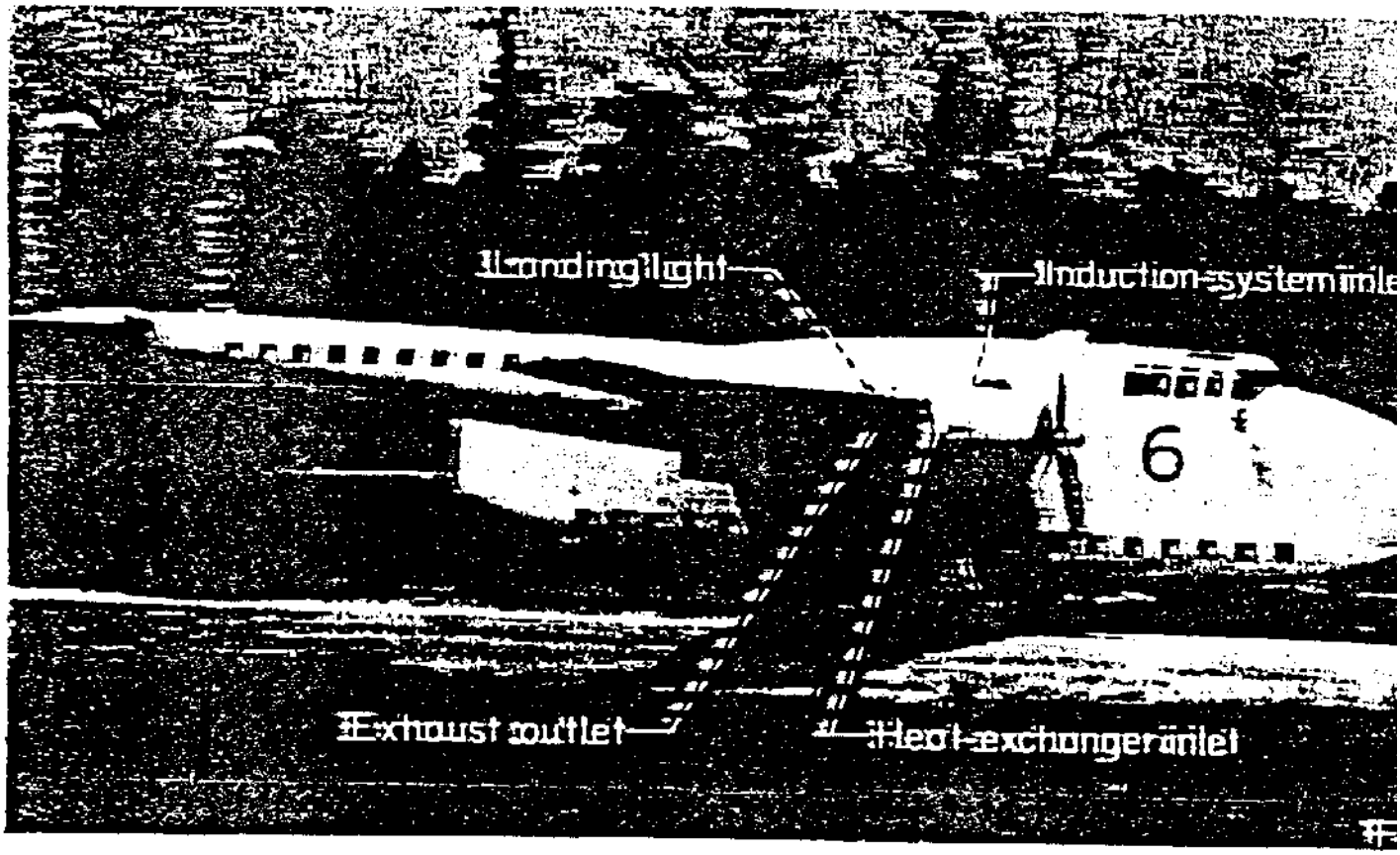


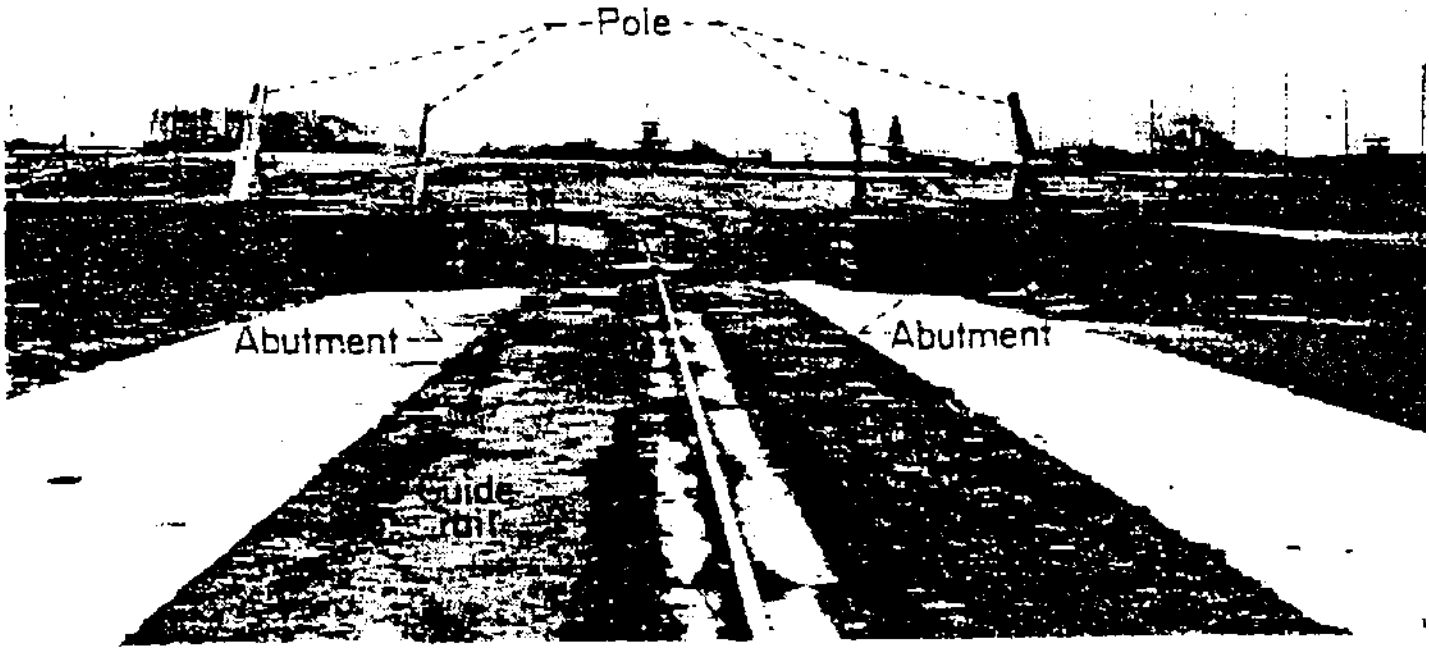
Schematic drawing of test site for aircraft crash-fir program.

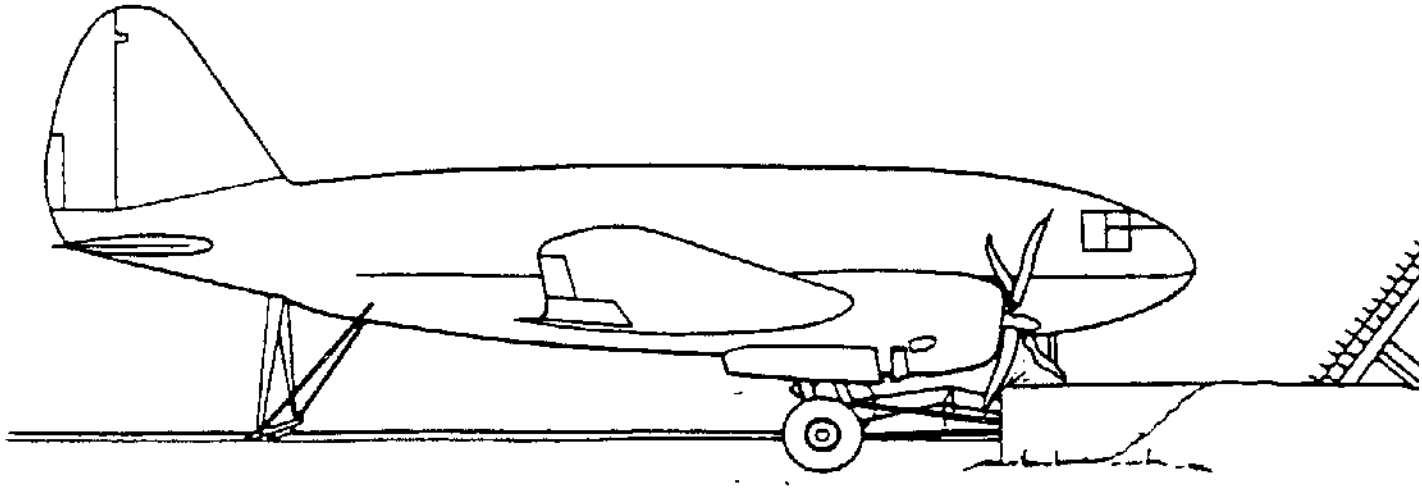




C–46 airplane used in aircraft crash-fire program.




Pole
Abutment
Abutment
Guide
rail



APPENDIX A-4

SELECTED PORTIONS FROM PREVIOUS ENVIRONMENTAL INVESTIGATIONS AT NACA TEST AREA

NACA ANNUAL REPORT (1953)

THIRTY-NINTH ANNUAL REPORT

OF THE

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1953

INCLUDING TECHNICAL REPORTS

NOS. 1111 to 1157

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1953

...oserved were provided by the burning of the fire-...guishing agent employed in the engine induction sys-...m. The agent in this case was bromochloromethane CH_2BrCl, known as CB. This material decomposes thermally at the temperatures of the engine exhaust-system metal, and some of the decomposition fragments released will burn in air. Photographs of this agent burning on the surface of a heated section of exhaust stack are shown in figure 39. In normal application during fire extinguishment, enough CB is employed to provide an inerting atmosphere around the decomposition products, and their ignition does not occur. In a crash, unfortunately, there can be no control of the quantity of extinguishing agent passing through the engine, because the displacement of the pistons meters the extinguishing agent throughput according to the engine rotational speed and the current throttle setting of the damaged engine, neither of which can be specified in a crash. Although high concentrations of CB were provided at the engine inlet of the crashed airplane, the quantity passed through the engine was small enough to allow a sufficient residence time for the CB in the high-temperature environment of the exhaust-disposal system to decompose thermally. Upon contact with the air at the tail-pipe exit, the decomposition products ignited to provide the series of exhaust flames shown in figure 12.

Halocarbons involving bromine and fluorine, in ...plete substitution of hydrogen is obtained, wou... satisfactory fire-extinguishing agents for engine inlet me... ing, because their decomposition products do not burn a... engine metal temperature. Compounds in this class includ... trifluorobromomethane $CBrF_3$ and difluorodibromomethan... CBr_2F_2, which have recently become available in restricte... quantities.

After the first crash in this series, the water-spray syste... was mounted to remain with the exhaust-disposal syste... should the engine be displaced, and carbon dioxide was er... ployed at the engine inlet because it does not decompo... appreciably at engine exhaust temperatures. In the next ... crashes, one ignition occurred by the movement of fi... through the hot-air duct to the exhaust-gas heat exchang... as was described in the discussion of liquid-fuel spilla... This result called attention to the need for more care... distribution of the water spray in the heat exchanger ... to the desirability of a safety gate in the hot-air duct. A... coming to rest, the other five unburned crashed airpla... carrying the inerting system appeared as shown in fig... 40. The only visible evidence of the presence ... the inerting system was the volume of water vapor issu... from the nacelle. On humid days, the condensed w... vapor persisted in the atmosphere long enough to have ... appearance shown in some of the photographs.

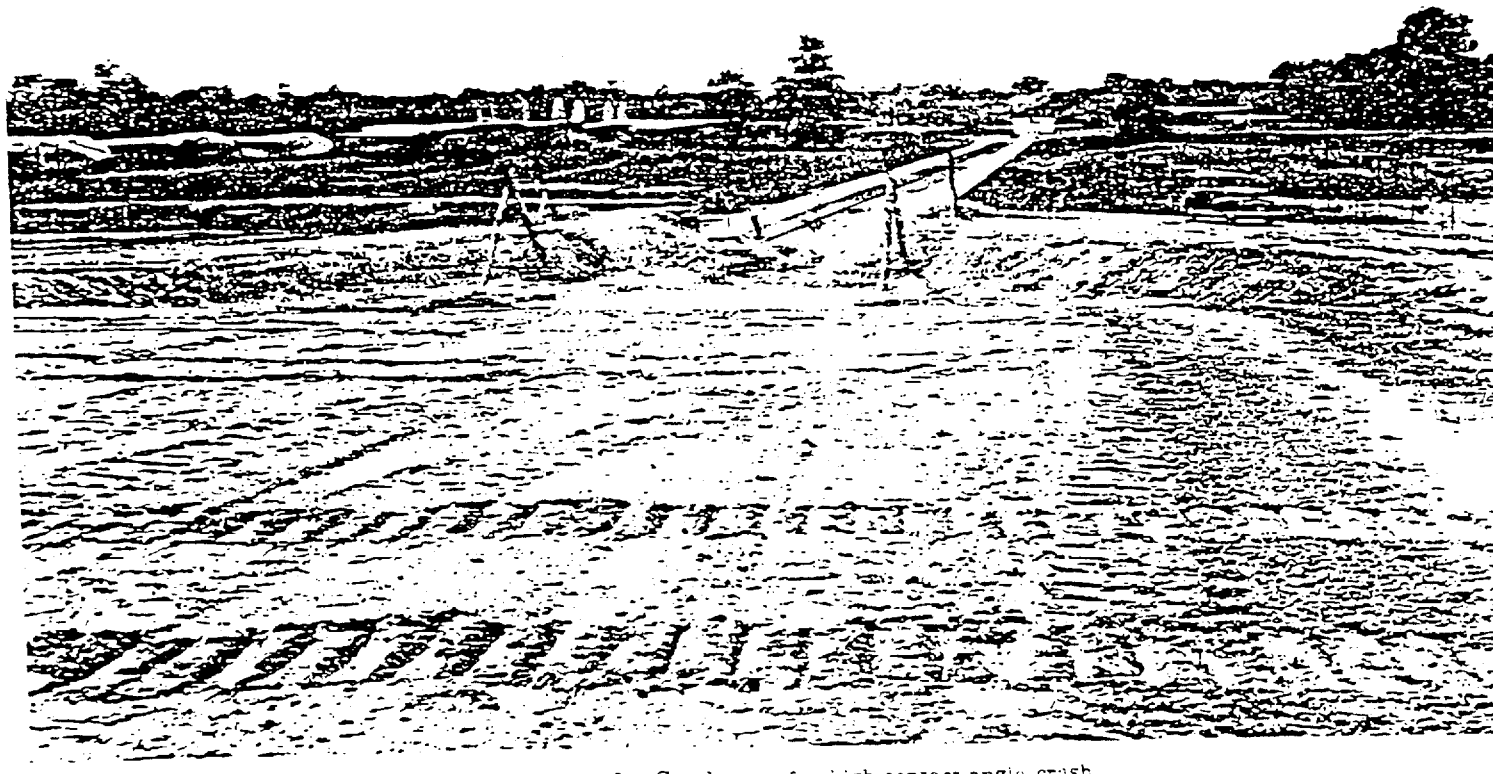
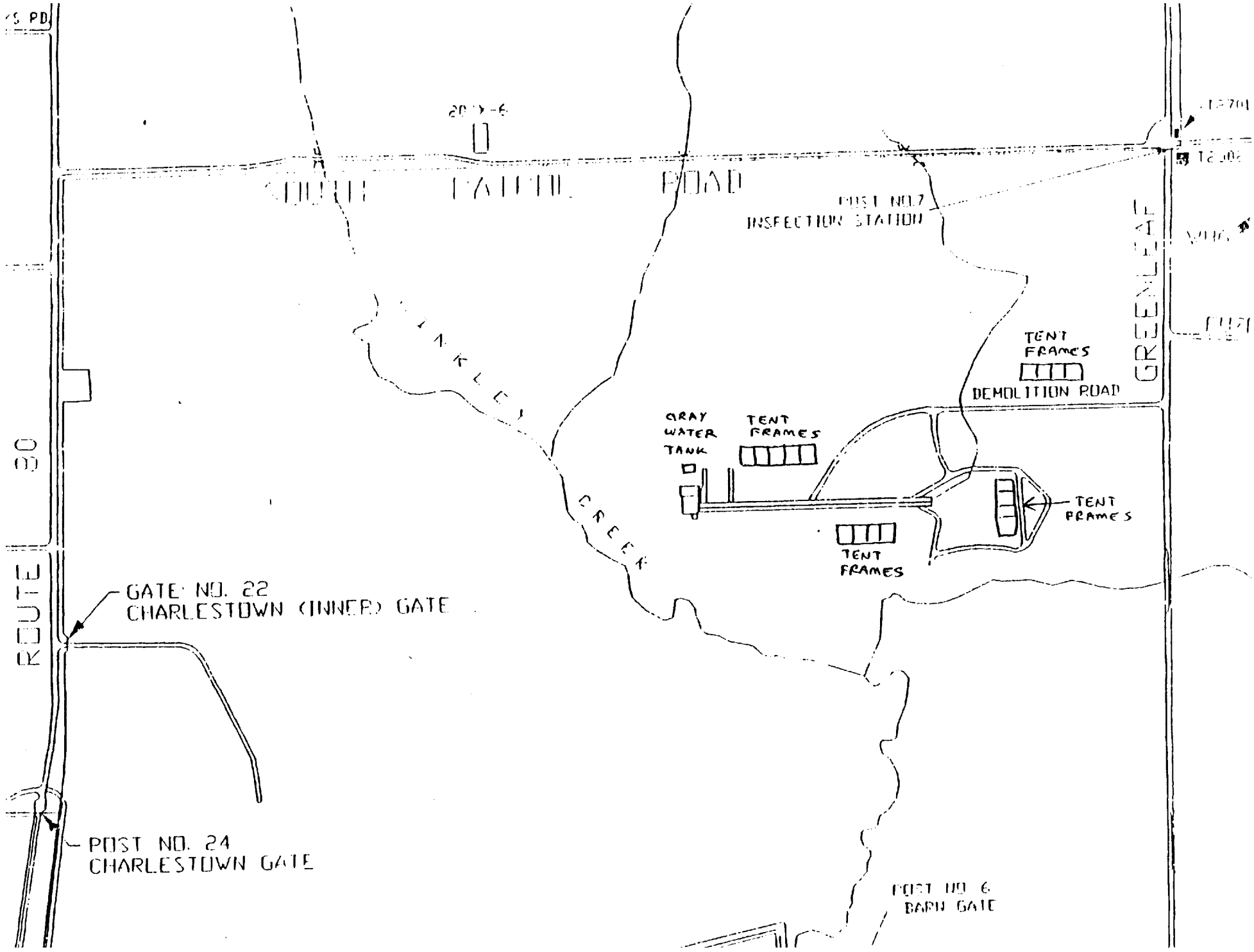


FIGURE 42.—Crash area for high-contact-angle crash.


POST NO.7
INSPECTION STATION
TENT FRAMES
DEMOLITION ROAD
GRAY WATER TANK
TENT FRAMES
TENT FRAMES
TENT FRAMES
GATE NO. 22
CHARLESTOWN (INNER) GATE
POST NO. 24
CHARLESTOWN GATE
POST NO. 6
BARN GATE

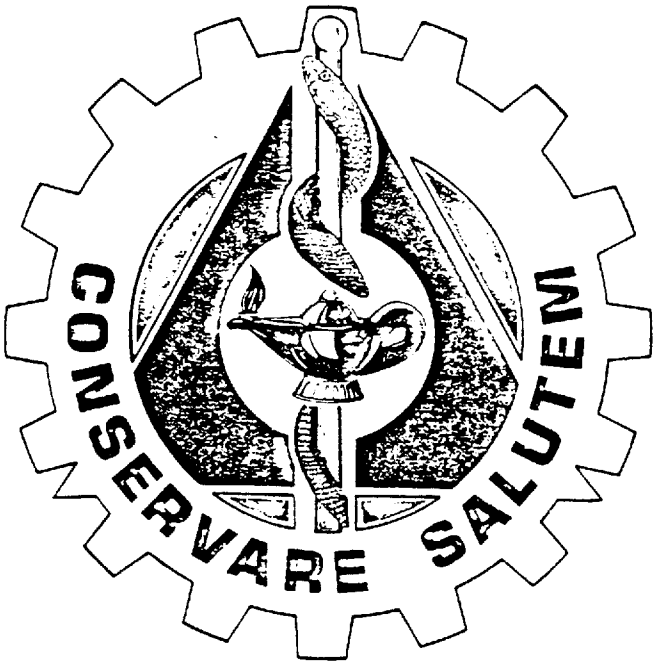
APPENDIX A-5

SELECTED PORTIONS FROM
PREVIOUS ENVIRONMENTAL INVESTIGATIONS
AT
NACA TEST AREA

RELATIVE RISK SITE EVALUATION (1996)

USACHPPM

U.S. Army Center for Health Promotio and Preventive Medicine



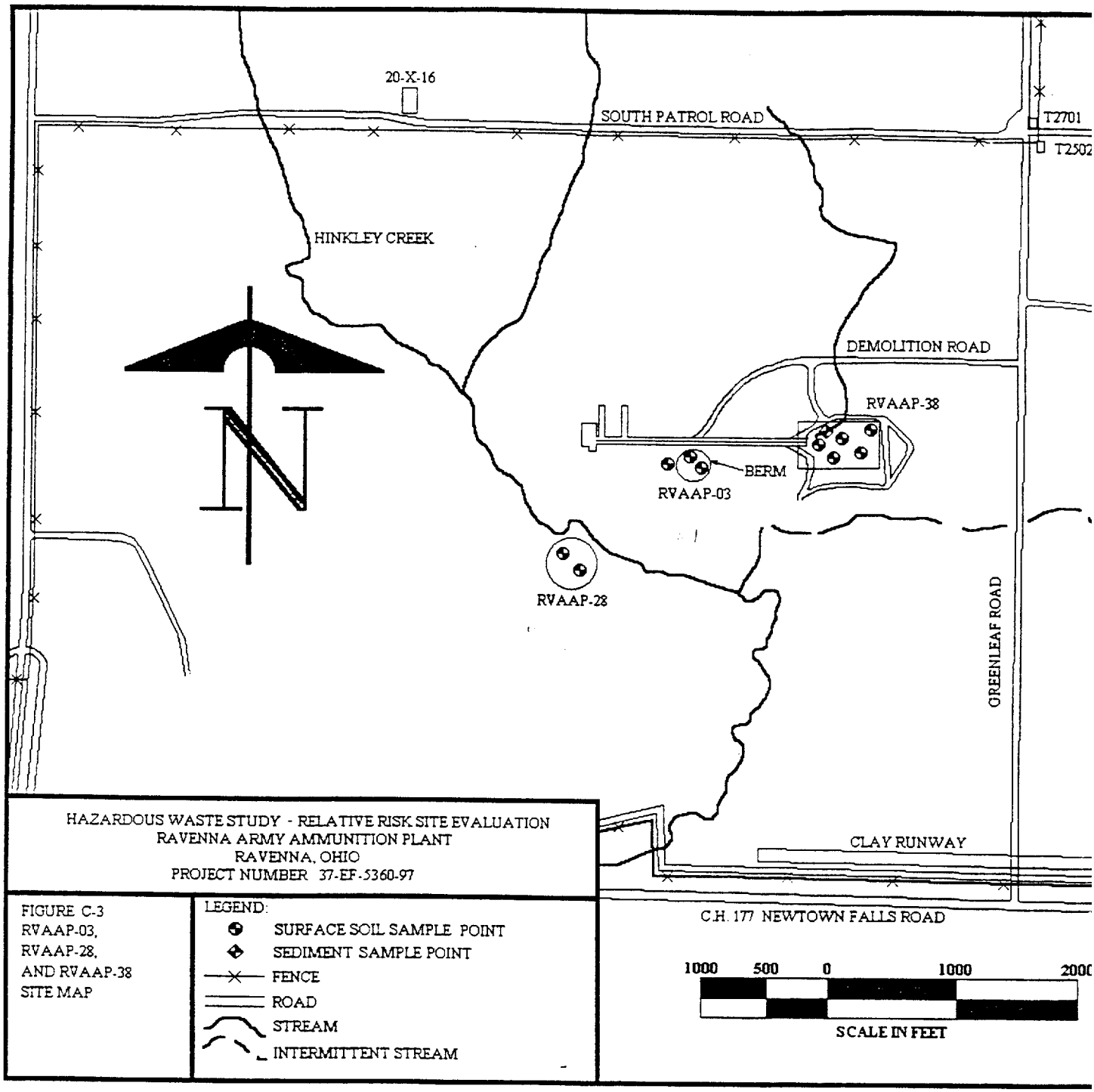
HAZARDOUS AND MEDICAL WASTE STUDY NO. 37-EF-5360-9
RELATIVE RISK SITE EVALUATION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
28 OCTOBER - 1 NOVEMBER 1996

VOLUME I

Readiness Thru Health

B-10

DESTRUCTION NOTICE


20-X-16
SOUTH PATROL ROAD
T2701
T2502
HINKLEY CREEK
DEMOLITION ROAD
RVAAP-38
BERM
RVAAP-03
RVAAP-28
GREENLEAF ROAD
CLAY RUNWAY
C.H. 177 NEWTOWN FALLS ROAD
1000 500 0 1000 2000
SCALE IN FEET
HAZARDOUS WASTE STUDY - RELATIVE RISK SITE EVALUATION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
PROJECT NUMBER 37-EF-5360-97
FIGURE C-3
RVAAP-03,
RVAAP-28,
AND RVAAP-38
SITE MAP
LEGEND:
SURFACE SOIL SAMPLE POINT
SEDIMENT SAMPLE POINT
FENCE
ROAD
STREAM
INTERMITTENT STREAM

1. **Site Name**: RVAAP-38, NACA Test Area.

2. **Site Summary**: This area was used as an aircraft test area. Airplanes with full fuel loads were rammed into an obstacle that sheared off the left side landing gear to intentionally cause crashes. These tests were to develop explosion-proof fuel tanks and/or fuels. The area was used during the 1950's. Five soil samples and one sediment sample were taken and analyzed for metals, semivolatile organic compounds, and volatile organic compounds (soil only for VOCs).

3. **Pathway Evaluation**:

a. **Ground Water**: *Not Evaluated.* There is no ground water associated with this site.

b. **Surface Water/Human Endpoint**: *Not Evaluated.* There is no surface water associated with this site.

c. **Sediment/Human Endpoint**: *Low.* Two compounds: 4-chloro-3-methyphenol at a concentration of 4 mg/kg and 2-methylnaphthalene at a concentration of 1.6 mg/kg were detected in the sediment sample, but are not in the *Primer* and are not included in calculating the CHF.

(1) **Contaminant Hazard Factor**: *0.63 = Minimal.*

Contaminant	Max Concentration (mg/kg)	Standard (mg/kg)	Ratio
arsenic	3.9	22	0.18
barium	67.6	5300	0.01
chromium	20.3	3000	0.01
copper	4.95	2800	0
zinc	44.2	23000	0
phenol	3.8	39000	0
2-chlorophenol	3.6	330	0.01
1,3-dichlorobenzene	2	2800	0
1,4-dichlorobenzene	1.9	740	0
n-nitroso-di-n-propylamine	2.3	6.3	0.37
1,2,4-trichlorobenzene	2.1	620	0
acenaphthene	2	360	0
2,4-dinitrotoluene	2.2	130	0.02
4-nitrophenol	3.9	4800	0
pentachlorophenol	4.4	250	0.02
pyrene	2.2	2000	0

(2) **Migration Pathway Factor**: *Potential.* There is no evidence that site contaminants are migrating. However, there are no physical barriers in place to prevent migration.

(3) **Receptor Pathway Factor**: *Potential.* This area is not used for production and is not populated with workers. However, access to the site is not restricted in any manner.

d. **Surface Water/Ecological Endpoint**: *Not Evaluated.* There is no surface water associated with this site. Furthermore, this site does not impact any critical habitat, as defined in the *Primer*.

e. **Sediment/Ecological Endpoint**: *Medium.*

(1) **Contaminant Hazard Factor**: *6.60 = Moderate.*

Contaminant	Max Concentration (mg/kg)	Standard (mg/kg)	Ratio
Arsenic	3.9	6	0.65
Chromium	20.3	26	0.78
Copper	4.95	16	0.31
Zinc	44.2	120	0.37
Pyrene	2.2	0.49	4.49

(2) **Migration Pathway Factor**: *Potential.* There is no evidence that site contaminants are migrating. However, there are no physical barriers in place to prevent migration.

(3) **Receptor Pathway Factor**: *Potential.* Sediment running off of this site could enter into Sand Creek, which is known habitat for State Endangered Species.

f. **Surface Soil**: *Medium.*

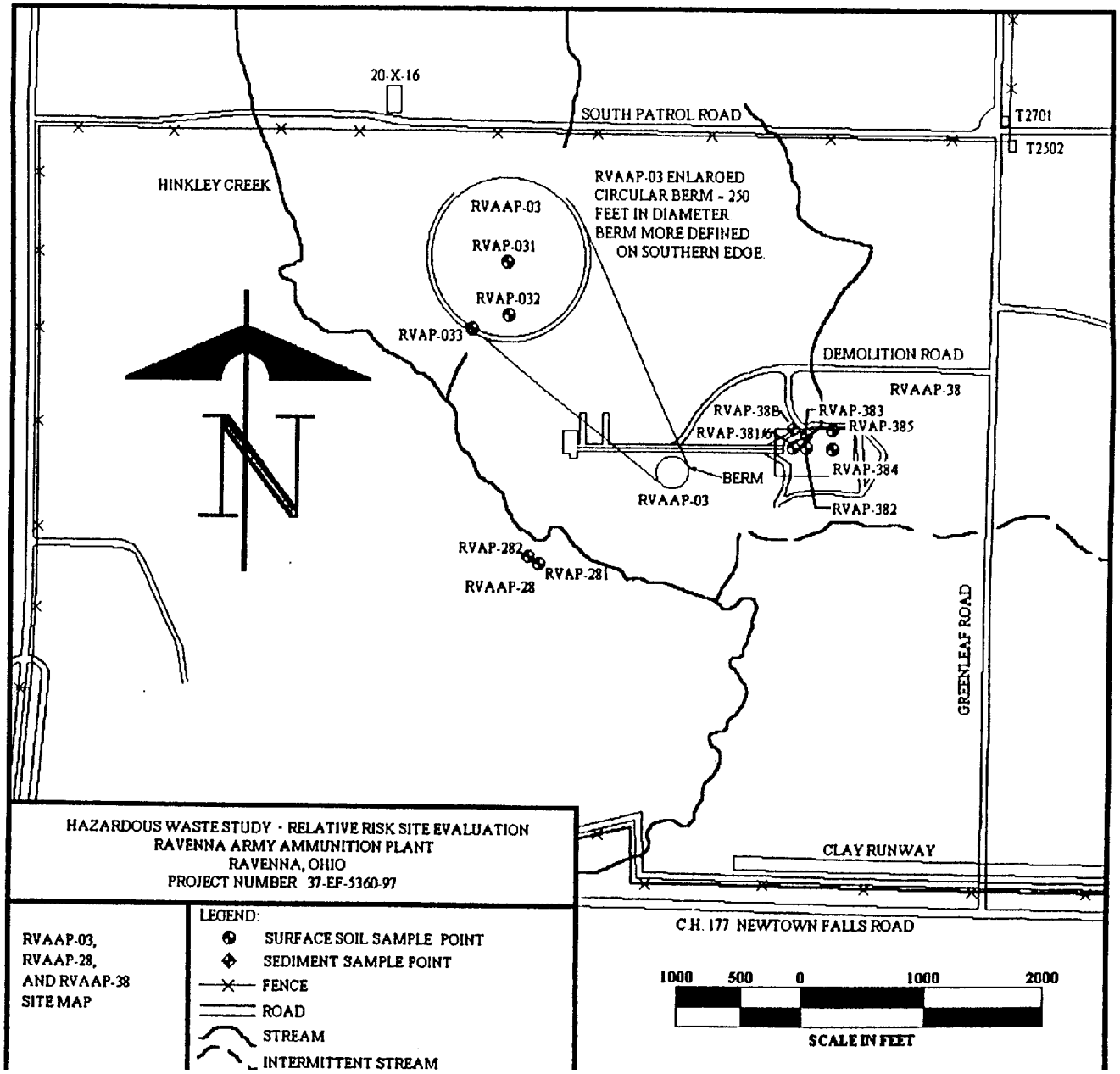
(1) **Contaminant Hazard Factor**: *3.20 = Moderate.*

Contaminant	Max Concentration (mg/kg)	Standard (mg/kg)	Ratio
Arsenic	12.7	22	0.58
Barium	179	5300	0.038
Cadmium	46	18	2.56
Chromium	48.3	3000	0.02
Copper	13.4	2800	0
Zinc	53	23000	0
Methylene Chloride	12	1100	0.01

(2) **Migration Pathway Factor**: *Potential.* There is no evidence that site contaminants are migrating. However, there are no physical barriers in place to prevent migration.

(3) **Receptor Pathway Factor**: *Potential.* This area is not used for production and is not populated with workers. However, access to the site is not restricted in any manner.

4. **Final Score.** Medium (2), three Media of Concern.


20-X-16
SOUTH PATROL ROAD
T2701
T2502
HINKLEY CREEK
RVAAP-03 ENLARGED CIRCULAR BERM ~ 250 FEET IN DIAMETER BERM MORE DEFINED ON SOUTHERN EDGE
RVAAP-03
RVAP-031
RVAP-032
RVAP-033
DEMOLITION ROAD
RVAAP-38
RVAP-38B
RVAP-383
RVAP-38106
RVAP-385
RVAP-384
BERM
RVAAP-03
RVAP-382
RVAP-282
RVAP-281
RVAAP-28
GREENLEAF ROAD
CLAY RUNWAY
C.H. 177 NEWTOWN FALLS ROAD
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RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
PROJECT NUMBER 37-EF-5360-97
RVAAP-03, RVAAP-28, AND RVAAP-38 SITE MAP
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1000 500 0 1000 2000
SCALE IN FEET

Summary of Detected Compounds (Cont)

NACA

Site Number		RVAAP-36					RVAAP-38						
Sample Type		Surface Soil				Sediment	Surface Soil						Sediment
Sample Number		361	362	363	364	36B	381	382	383	384	385	386	38B
Compound (soil/sediment mg/kg -surface/groundwater µg/L)	arsenic	11.3	16.6	17.4	11.7	8.03	8.82	12.7	11.6	10.0	9.94	10.5	3.9
	barium	80.9	72.9	48	64	56	162	179	142	115	50.5	105	67.6
	cadmium	-	-	-	-	-	46	-	-	-	-	-	-
	chromium	21.6	54.6	20.4	18.1	6.85	48.3	37.1	24.7	20	36.8	34.6	20.3
	copper	15.7	174	214	372	5.62	13.4	11.8	9.68	9.56	7.88	9.15	4.95
	lead	39	1682	2840	4309	-	-	-	-	-	-	-	-
	zinc	155	67.6	81.4	106	31.3	50.9	51.7	51.9	50.4	30.7	53	44.2
	methylene chloride	-	-	-	-	-	0.006	0.009	0.012	-	0.01	-	-
	phenol	-	-	-	-	-	-		-	-	-	-	3.8
	2-chlorphenol	-	-	-	-	-	-		-	-	-	-	3.6
	1,3-dichlorobenzene	-	-	-	-	-	-		-	-	-	-	2
	1,4-dichlorobenzene	-	-	-	-	-	-		-	-	-	-	1.9
	n-nitroso-di-n-propylamine	-	-	-	-	-	-		-	-	-	-	2.3
	1,2,4-trichlorobenzene	-	-	-	-	-	-		-	-	-	-	2.1
	4-chloro-3-methyphenol	-	-	-	-	-	-		-	-	-	-	4
	2-methylnaphthalene	-	-	-	-	-	-		-	-	-	-	1.6
	acenaphthene	-	-	-	-	-	-		-	-	-	-	2
	2,4-dinitrotoluene	-	-	-	-	-	-		-	-	-	-	2.2
	4-nitrophenol	-	-	-	-	-	-		-	-	-	-	3.9
	pentachlorophenol	-	-	-	-	-	-		-	-	-	-	4.4
	pyrene	-	-	-	-	-	-		-	-	-	-	2.2