II. CONTAMINATION ASSESSMENT

A. Mission and Tenant Activities

There have never been any significant industrial or manufacturing operations at Fort McClellan. Chemical and radiological contamination existing there are due primarily to training exercises conducted by the US Army Chemical Center and School during the period of 1951 to 1973. The implementation of chemical/biological toxic agent/radiological education and training programs led to the establishment of a number of training ranges both on the Main Post and on Pelham Range to supplement classroom training facilities. Individual ranges were used at different times for varying periods during the residence of the Chemical School.*

1. Main Post Contamination

a. Chemical Agents/Biological Simulants. There are approximately 546 buildings presently located on Fort McClellan; none is known to be contaminated with chemical agents or biological simulants. (The standard operating procedure was not to disseminate biological materials inside buildings.) In contrast, some of the training ranges are still thought to be contaminated due chiefly to the fact that the highly persistent chemical agents VX (nerve agent) and HD (blister agent) were included among the toxic agents/simulants used there (see Table II-1). Table II-2 provides additional information on field testing of biological simulants. A listing of toxic agents and simulants authorized for use in the School for training under individual lesson plans may be found in Table II-3. Chemical and biological materials used by the School were always decontaminated to the degree necessary to protect young, healthy adults against short-term exposure; however, it is not known whether the procedure provided sufficient protection against long-term exposure to the residue. Reactions between chemical agents and decontaminants produce by-products, some of which are not only toxic themselves but also persist for unknown periods of time. Baseline standards have not been established for the chemical agents and their by-product residues in soils.

Live biological agents were never used at Fort McClellan, only the biological simulants serratia marcescens (SM) and bacillus globigii (BG), nonpersistent and persistent (spore forming) agents, respectively, which were always disseminated outdoors. Both organisms were grown in the laboratory for use in training, and relatively small amounts were employed in individual exercises. It was believed that the disseminated biological materials that escaped decontamination procedures would be destroyed by natural processes over a period of time. Excess cultures of biological

*Solid Waste Special Study No. 99-056-73/76, Clearance of Toxic Agent Training Areas, page 2, Fort McClellan, AL, July 1973 - August 1975, USAEHA, APG, MD 21010.

TABLE II-1. TOXIC AGENT/SIMULANTS RANGE DATA

Range	Range Size, Acres	Probable Date Opened	Last Used	Agents Used	Site Physically Rearranged	Past CB Commission Sampling	Contents
T-38	6.0	1961	1972	HD,VX,GB	Yes	Yes	Storage yard
T-31	3.4	1957	1969	HD,GB	Yes	Yes	Unknown
24 Alpha	1.5	Unknown	1973	HD,GB*	Possibly, due to explosive demil operations	Yes	HD burn pits
T-6	7.3	Unknown	1973	HD	Yes	Yes	Burn pits
T-5	11.4	1961	1973	HD,VX,GB	Possibly site of old toxic HD storage area	Yes	Possibly past HD storage area
T-4	0.3	1965	1971	BG,SM,HD** VX**	Possibly site of old toxic HD storage area	Unknown	Possibly past HD storage area
Detection and Identification	1.1	Early 1950's	1973	HD, GB*	Yes	Yes	Burn pit
Old Toxic Training	484 sq feet	Early 1950's	Unknown	HD	Unknown	Unknown	Unknown

*Simulants and other chemical agents also used
**Assumed HD or VX
BG = Bacillus globigii
SM = Serratia Marcescens

TABLE II-2. FIELD TESTING OF BIOLOGICAL SIMULANTS*

Location	Testing Dates	Simulant(s) Used
Fort McClellan	1-30 July 1952	SM/BG
	15-28 September 1952	SM/BG
Morrisville Maneuver Area, Pelham Range	15 September 1953	BG
	21 September 1953	BG
Fort McClellan	March-June 1962	BG
	19 March-13 April 1962	BG
	June 1962	BG

*US Army Activities in the United States Biological Warfare Programs, 1942 - 1977, Volume 1, pages IV-E-2-1, -2, -4.

SM = Serratia Marcescens

BG = Bacillus globigii

Table II-3 . Toxic Agents/Simulants Authorized for Chemical/Biological Training+

1. Reaction Exercises

Lesson Plan No.	Agent(s) Authorized	Quantity
*OA210	VX	40 cc
	GB	40 cc
	HD	40 cc
	BZ	.2 lb
	BG1 (Simulant)	1/4 dispenser
OA290	CS1	1 lb
	BG1	1/4 dispenser
*OA300	VX	80 cc
	GB	80 cc
	HD	80 cc
	BG1 (Simulant)	1/4 dispenser
*OA330	VX	80 cc
	GB	80 cc
	HD	40 cc
	CS (M7A2 Grenade)	6 ea
	BZ (M6 Canister)	3 ea
	155 MM HD	1 ea
	105 MM GB	1 ea
	CS1	1 lb
*OA340	105MM GB	1 ea
	155MM HD	1 ea
	M6 BZ Canister	3 ea
	CG	20 lb
	CK	20 lb
	AC	20 lb
	CS	1 lb
	PWP	40 lb

+ Report of the Ad Hoc Advisory Committee for Review of Testing Safety at Edgewood Arsenal, Maryland, and Fort McClellan, Alabama, September 1969.

* When more than 25 ml of nerve and blister agents are used at a munitions site, it will be poured on more than one munition, so as not to exceed more than 25 ml per munition.

Table II-3. (continued)

Lesson Plan No.	Agent(s) Authorized	Quantity
OA390	CG 4.2" Mortar	1 ea
HE210	HD	4 oz
HE220	GB	25 cc
HE230	HD BG1 Simulant	4 oz 1/2 dispenser
HE280	BG1 VX Simulant**	1/2 dispenser 4 oz
HI070	HD	4 oz

** VX Simulant = DS2+Ethylene Glycol Monoethyl Ether (50/50 by volume).

2. Nerve Agents Effects Demonstration

Lesson Plan Number	Agent(s) Authorized*	Quantity
FB 330, 340, 350	VX	0.1 ml
FB 440, 450, 460	GB	0.2 ml
FB 480	GB	5 ml
OA 230	GB & VX	0.2 ml & 0.1 ml
ZD 600	GB	0.2 ml
QA 020	VX	0.1 ml

* Live rabbits were used for the VX exercises. They were subsequently sacrificed with chloroform, decontaminated with sodium hypochlorite and disposed of along with contaminated equipment.

A live goat was used for the GB demonstration, and a live pigeon was used to detect excess GB vapors during the exercise.

Table II-3. (continued)

3. Agents Authorized for Use in Disposal Exercises

Lesson Plan Numbers	Agent(s) Authorized	Quantity (Max)
OA340	GB (105MM)	1 ea or 4.5 kg
	HD (155MM)	1 ea or 4.5 kg
	CK	10 lb (5lb/hr)
	AC	10 lb (5lb/hr)
	BZ (M6)	3 ea (1 kg)
	CS (M7A2)	6 ea (1.8 kg)
	CG	10 lb (5lb/hr)
	VX	4.5 kg
	WP	25 lb
	PWP (5" Rocket)	1 ea
	FS	50 gal
	FM	50 gal
OA390	Bio (M143 Simulant)	1 ea
	PT1 (M74A1)	1 ea
	WP (3.5")	2 ea
	CG (4.2" Mortar)	1 ea or 3 kg
	GB (105MM)	1 ea or 4.5 kg
	AC	10 lb (5lb/hr)
	CK	10 lb (5lb/hr)

4. Mustard Individual Decontamination Exercise

Lesson Plan Numbers	Agent(s) Authorized	Quantity
FB 250, 0A050, PD 050, LL 060	HD	0.5 ml

5. Field Decontamination Exercise (Howitzer Hill)

Lesson Plan Numbers	Agents(s) Authorized	Quantity
HB261, ZD600	HD or HS*	160 cc

*HS, a simulant for HD, was used for temperatures below 55°F.

Table II-3. (continued)

6. Biological Field Sampling Exercise

Lesson Plan Numbers	Agent(s) Authorized	Quantity
EC232, 242, 243, 248, EC252	SM & BG	8 oz (SM) 4 oz (BG)
HE250, 280 ZB610, 050	BG	4 oz

7. Simulants for Chemical Agents & Identification

a. Vapor Simulants, for use in obtaining positive tests with detector tubes:

Agent	Simulant
G	O-chlorobenzaldehyde
H	Ethyl sulfate
CK	Cyanogen bromide
CX	Benzene sulfonyl chloride
AC	Acetonitrile
CG	4% phosgene in benzene
L	Hydrazine hydrate + ethylene glycol monoethyl ether (50/50 by volume)

b. Liquid Simulant, for use in obtaining positive test with detector ticket (enzyme ticket).

V	Concentrated hydrochloric acid

c. Liquid Simulant, for use in obtaining positive tests with detector paper and crayon.

G	Ethylene glycol monoethyl ether
V	DS-2 + ethylene glycol monoethyl ether (50/50 by volume)
H	Nitrobenzene + sulfuric acid + isopropyl alcohol (20/1/5 by volume).
HN	Nitrobenzene

Table II-3. (continued)

8. Mask Confidence Exercise

Lesson Plan Number	Agent(s) Authorized	Quantity
HA021, 040, 051, 060, 085	CS or CN	*
	CL	**
LL100	CS or CN	*
	CL	**
OA150	CS or CN	*
	CL	**
PD030	CS or CN	*
	CL	**
ZB600	CS or CN	*
	CL	**

* 5 capsules of CS or CN for the initial concentration and 1 capsule per 10 students to maintain concentration.

** A discharge from chlorine cylinder of 2 to 3 seconds per 45 cubic meters for the initial concentration and a 2 second discharge, every 30 minutes, to maintain proper concentration.

simulants produced in the laboratory were autoclaved. Both simulants are generally considered to be harmless, especially when used with prescribed safety precautions. However, large concentrations may cause infection if one is exposed to large doses or when body defenses are lowered by age, disease, antibiotics, or drug abuse.

Figure II-1 depicts approximate locations of ranges and other toxic training facilities; areas are not drawn to scale. Appendix H provides more exact data on location and size. Photographs of ranges T-38, T-31, 24 Alpha, T-6, T-5, T-4, Detection and Identification Area, and Old Toxic Training Area, are shown in Figures II-2 through II-9, respectively. With the exception of the photograph of Range T-6 which was taken by the Records Research Team, all other photographs were taken by personnel at Fort McClellan.*

Other potentially contaminated areas on the Main Post (see Figure II-1) include four areas that experienced mustard spills and Igloo 13 on Range T-31 which was used for the storage of all of the different agents and was the scene of numerous spills. The goat yards are shown because they provided living space for the goats used in the GB nerve agent demonstrations. (Pigeons were also used in these demonstrations, and rabbits were employed in the VX exercises.) One standard operating procedure required that dead experimental animals be decontaminated, bagged in plastic, and put in regular sanitary landfills.** The Standing Operating Procedure for Nerve Agent Effects Demonstration, 8 April 1969, states that dead animals will be incinerated at the hospital after being decontaminated.*** Some of the goats that lived may have been released on Pelham Range.

b. Radiological Contamination. Former radiological training and storage facilities on the Main Post (see Figure II-10) consist of the Radiological Laboratory (building 3182), Radiological Laboratory Vault (building 3180), Isotope and Scaler Laboratories (building 3181), Hot Cell (building 3192), Alpha Field (behind building 3165), Bromine Field (Radiological Decontamination Training), and Rattlesnake Gulch (now Iron Mountain) Facility (behind building 3192). The Chemical School operated these facilities (along with those on Pelham Range) under the following Atomic Energy Commission Licences:

*Letter, Task Force, AFFN-A, signed Joseph R. Tedeschi, LTC, CmlC, Commander, subject: Clearance of Toxic Training Areas, Fort McClellan, Alabama, dated 27 August 1973, to Mr. Edward L. Hewell, Jr., US Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

**David B. Cary, LTC, CmlC, Standing Operating Procedure for Delivery and Disposal of Chemical Agents and Waste Material, US Army Chemical School and Center, Fort McClellan, AL.

***Report of the Ad Hoc Advisory Committee for Review of Testing Safety at Edgewood Arsenal, MD, and Fort McClellan, AL, September 1969.

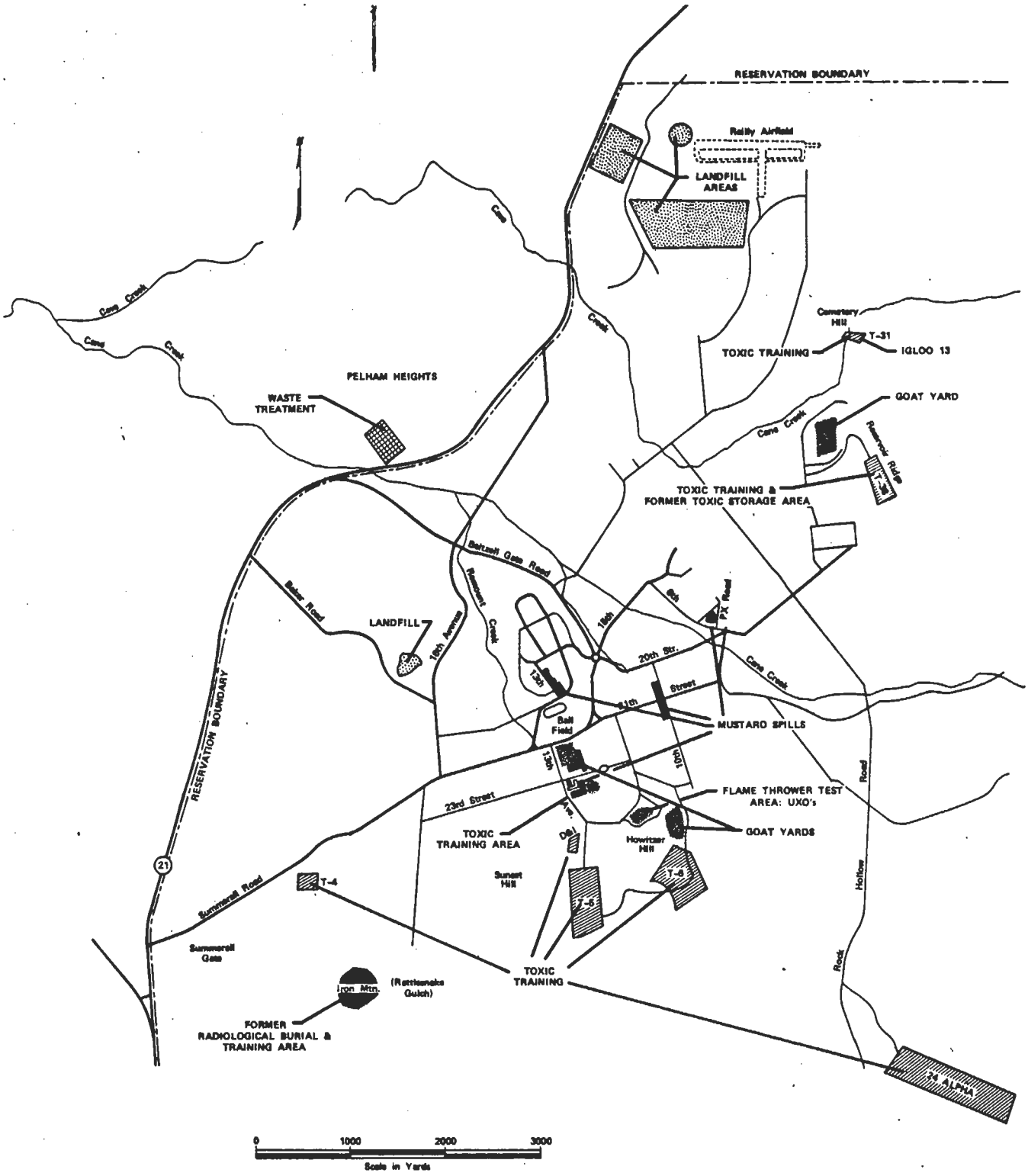

Figure II-1. Approximate Areas of Contamination: Main Installation

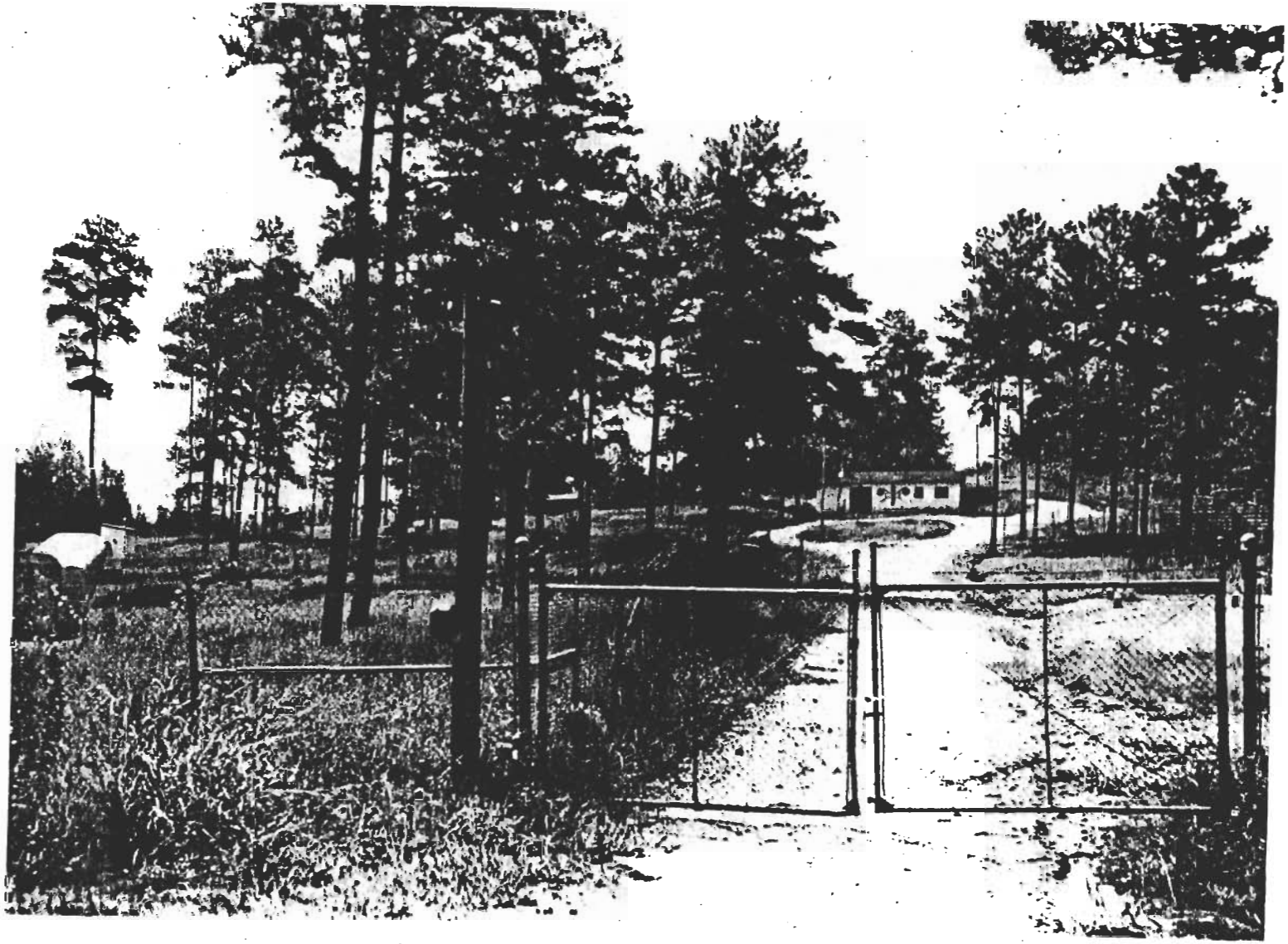

Figure II-2. Range T-38 — Technical Escort Reaction Area

1. Former storage area for toxic agents and munitions.
2. Training to handle accidents to chemical munitions during transport.

Figure II-3. Range T-31 — Technical Escort Reaction Area prior to the use of T-38. (1973)

Figure II-4. Range 24 Alpha – Bandholtz Range
EOD Disposal Area
(Boundary of two pits staked out in the center)

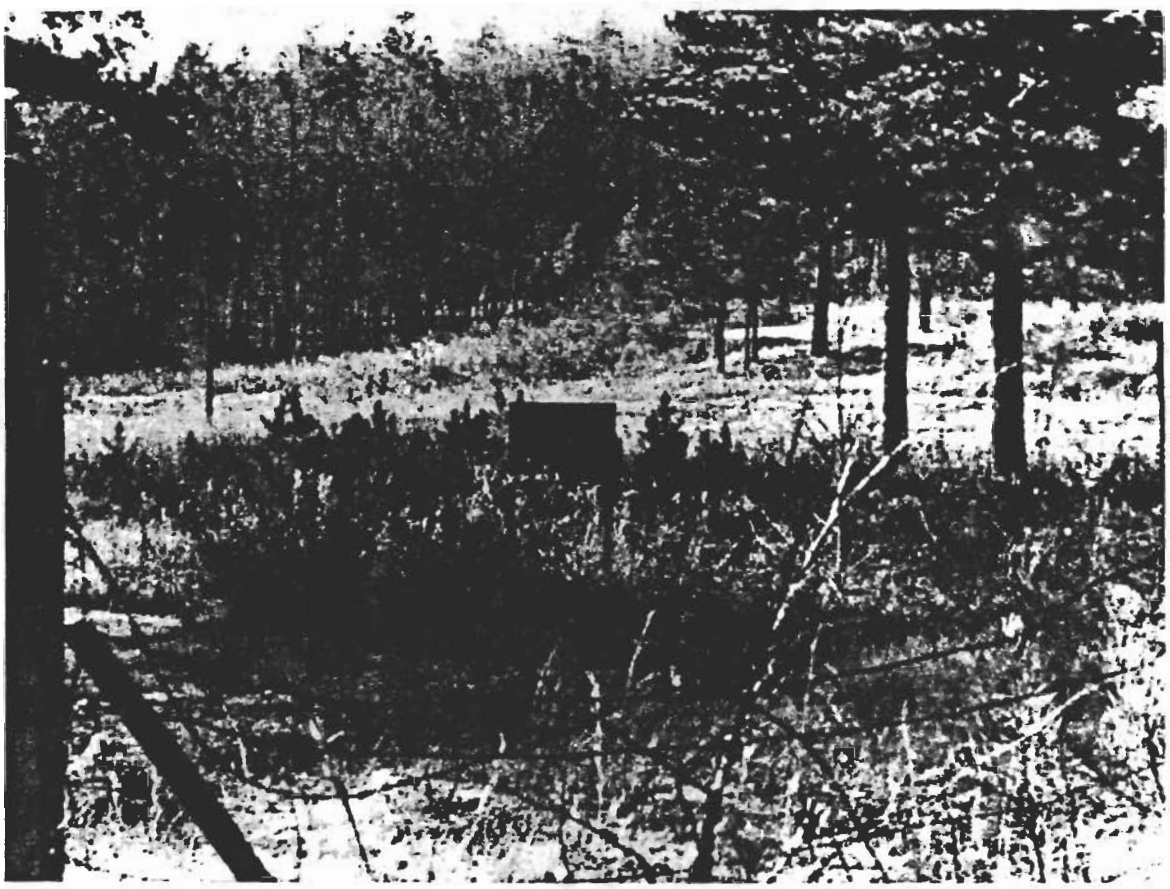

Figure II-5. Range T-6 — Naylor Field
Area for Decontamination of Chemical Agent (1977)

Figure II-6. Range T-5 — Washington EOD Reaction Area
VX Site (1973)

Figure II-7. Range T-4 – Possible old Toxic Storage Area and Biological Demonstration Area (1973)

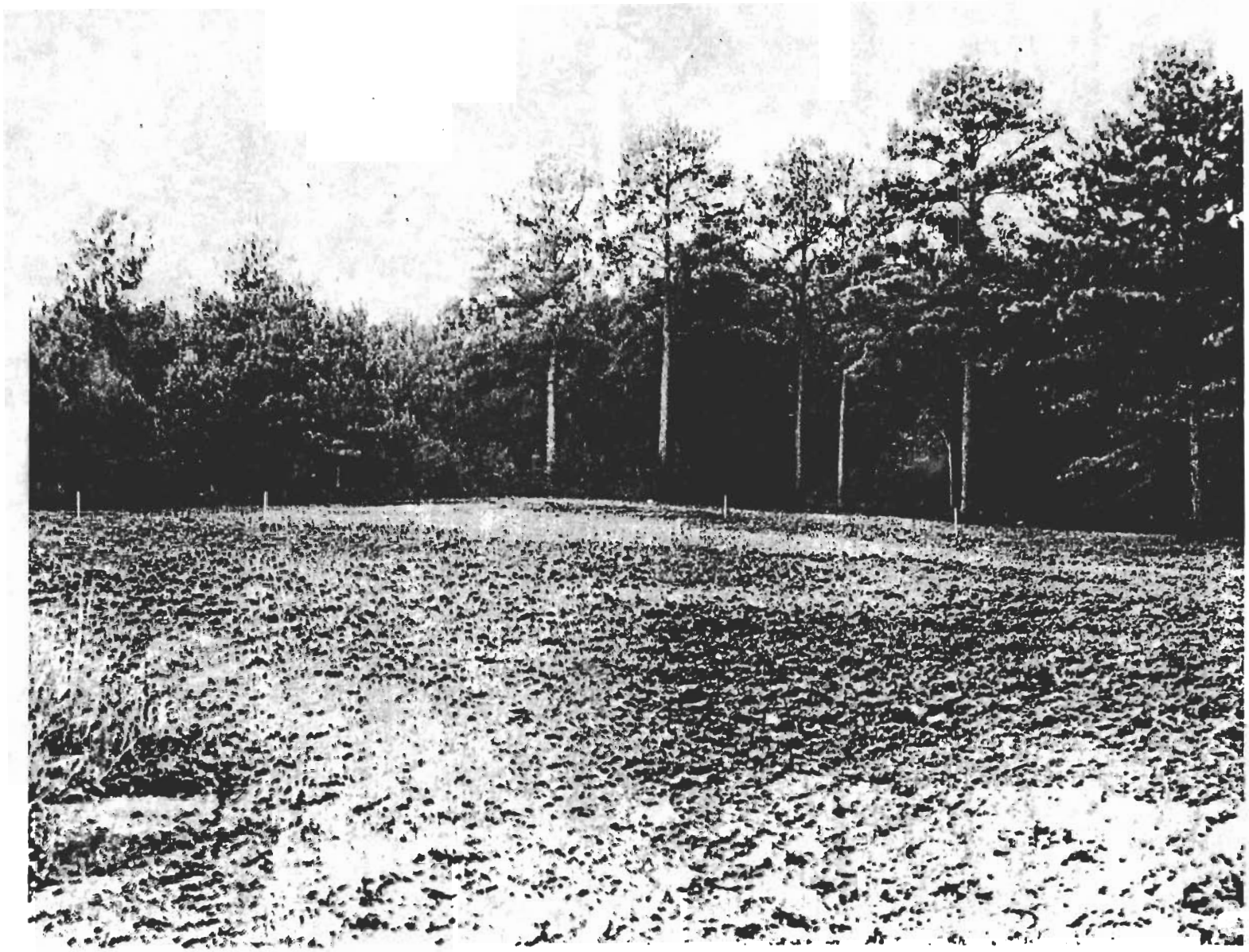

Figure II-8. Detection and Identification Area (D&I)
Detection and Identification of HD prior to 1972 (1973)

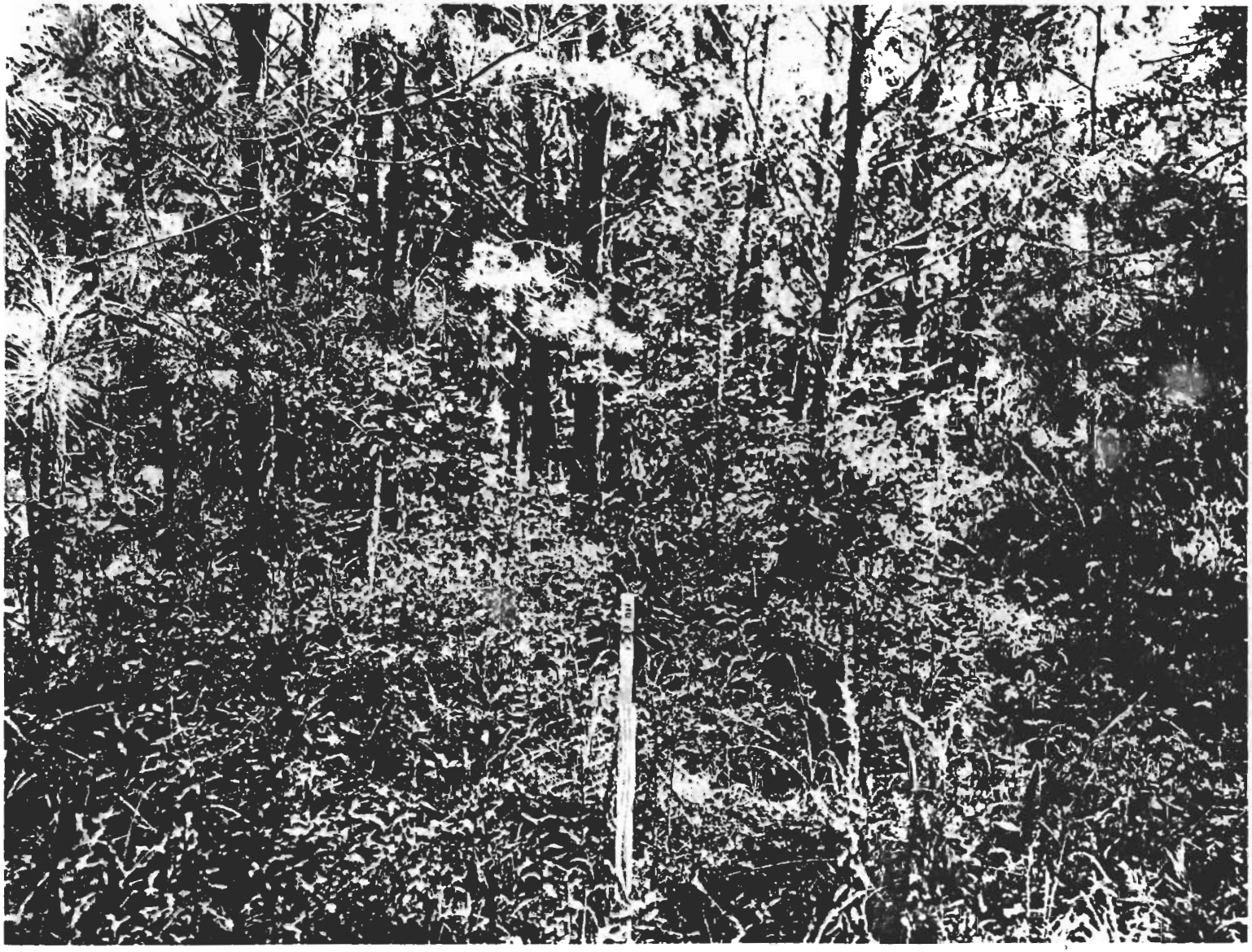

Figure II-9. Old Toxic Training Area – Located to the rear of the Reproduction Branch

Special Nuclear Material Licence Number SNM-344, By-product Material License Number 1-2861-1, and By-product Material License Number 1-2861-2. Table II-4 lists isotopes confirmed as having been used in the School. Radioactive isotopes used in the greatest quantities were cobalt (Co-60), bromine (Br-82), and uranium (U-233).

The use of Co-60 (half-life, 5.27 years) led to the existing contamination of buildings (especially the Hot Cell, building 3192) and storage tanks within the Radiological Facilities. Although Br-82 was used in fairly large quantities on the Bromine Field Pad during training in decontamination exercises, it did not cause residual contamination. This was due primarily to Br-82's short lifetime of radioactivity (half-life, 35.34 hours). Radioactive Br-82 waste was held in storage tanks until safe to dump into the sanitary sewer. The U-233 (half-life, 1.62×10^5 years) was used in the form of plates bolted to concrete blocks on Alpha Field (Nuclear Accident Training Facility). The removal of this material and subsequent decontamination procedures satisfactorily eliminated all U-233 radioactivity.

The area over which contamination probably is still spread is indicated by USAEHA Radiation Protection Evaluation No. 43-030-76, 19 September 1975 (Appendix E). During that survey, smear samples of soil and water were taken from various areas (approximate locations shown) within the confines of the Radiological Facilities (see Figure II-11); results of analyses are contained in Table II-5.

A new US Nuclear Regulatory Commission (NRC) (formerly Atomic Energy Commission) license (NRC License 01-02861-03), issued 26 July 1973, was obtained to cover radioactively contaminated facilities remaining on Fort McClellan after the Chemical School departed.

Iron Mountain (formerly Rattlesnake Gulch) is a former radioactive material training site and, at one time, was extensively contaminated with buried radioactive waste. All radioactive wastes were shipped from this site on Fort McClellan during decontamination prior to the close-out of the School and were disposed of under contracts held by Edgewood Arsenal.

2. Pelham Range Contamination

a. Chemical Agents/Biological Simulants. Contamination data pertaining to Pelham Ranges (I, J, K, and L) are summarized in Table II-6.

Here again, as on the Main Post, residual contamination is anticipated because of known or suspected use of HD or VX. The use of biological

Table II - 4. Radioactive Isotopes Used in Radiological Training

Element	Atomic Number	Isotope
Americium	95	Am-241
Antimony	51	Sb-122
Arsenic	33	As-76
Barium	56	Ba-133
Bismuth	83	Bi-210
Bromine	35	Br-82
Calcium	20	Ca-45
Carbon	6	C-14
Cerium	58	Ce-141
Cesium	55	Cs-137
Cobalt	27	Co-57, Co-60
Gold	79	Au-198
Hafnium	72	Hf-181
Lanthanum	57	La-140
Mancanese	25	Mn-54
Mercury	80	Hg-203
Niobium	41	Nb-95
Phosphorus	15	P-32
Plutonium	94	Pu-239
Protactinium	91	Pa-234
Phenium	75	Re-186
Rubidium	37	Rb-86
Ruthenium	44	Ru-106
Samarium	62	Sm-151, Sm-155
Scandium	21	Sc-46
Silver	47	Ag-110m, Ag-111
Sodium	11	Na-22
Strontium	38	Sr-89, Sr-90
Sulfur	16	S-35
Thallium	81	Tl-204
Uranium	92	U-233, U-238
Tungsten	74	W-185
Zinc	30	Zn-65
Rubidium-86-Uranium		Rb-86-U
Strontium-Yttrium 90		Sr-Y 90

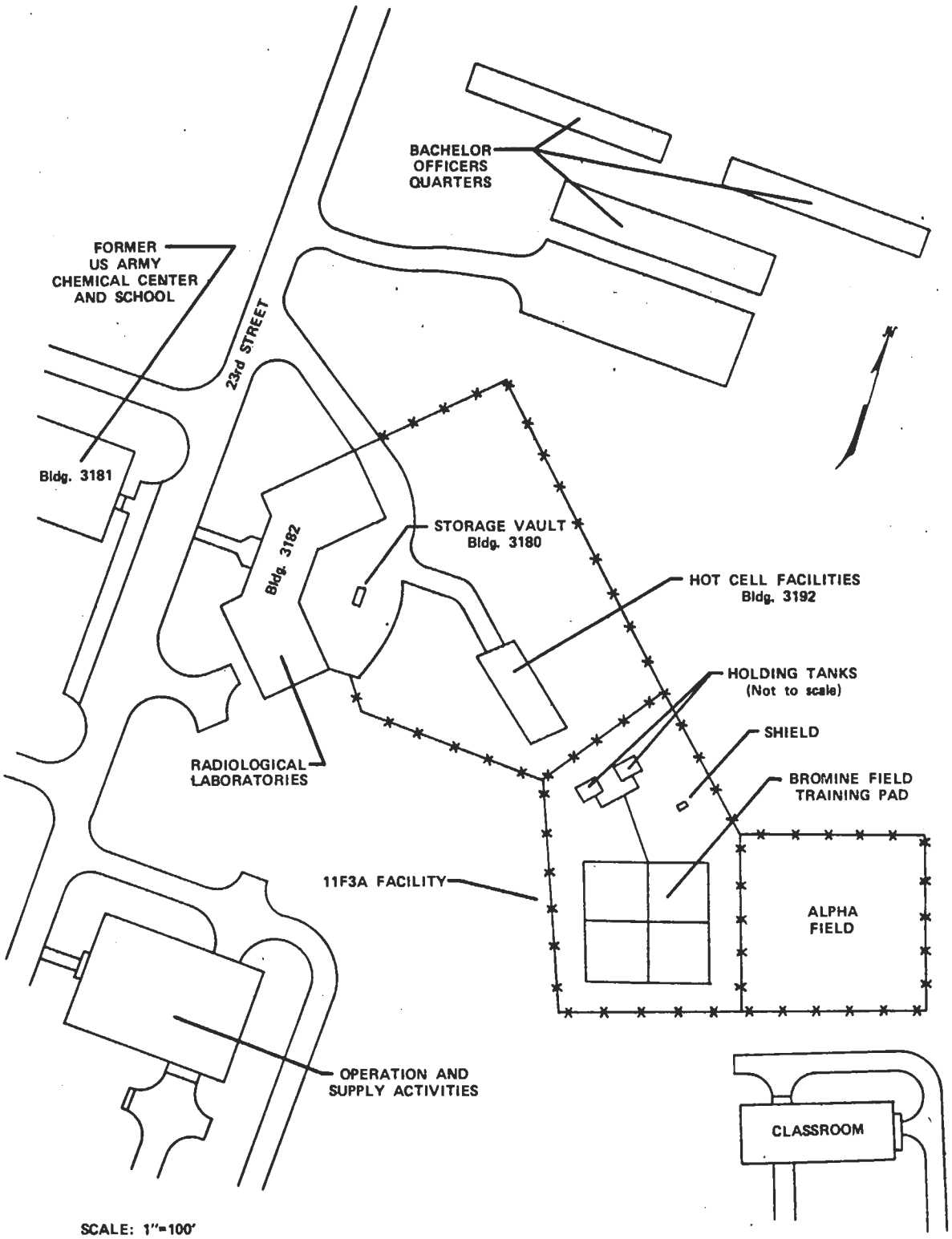

Figure II-10. Radiological Facilities and Training Fields of the Former US Army Chemical School

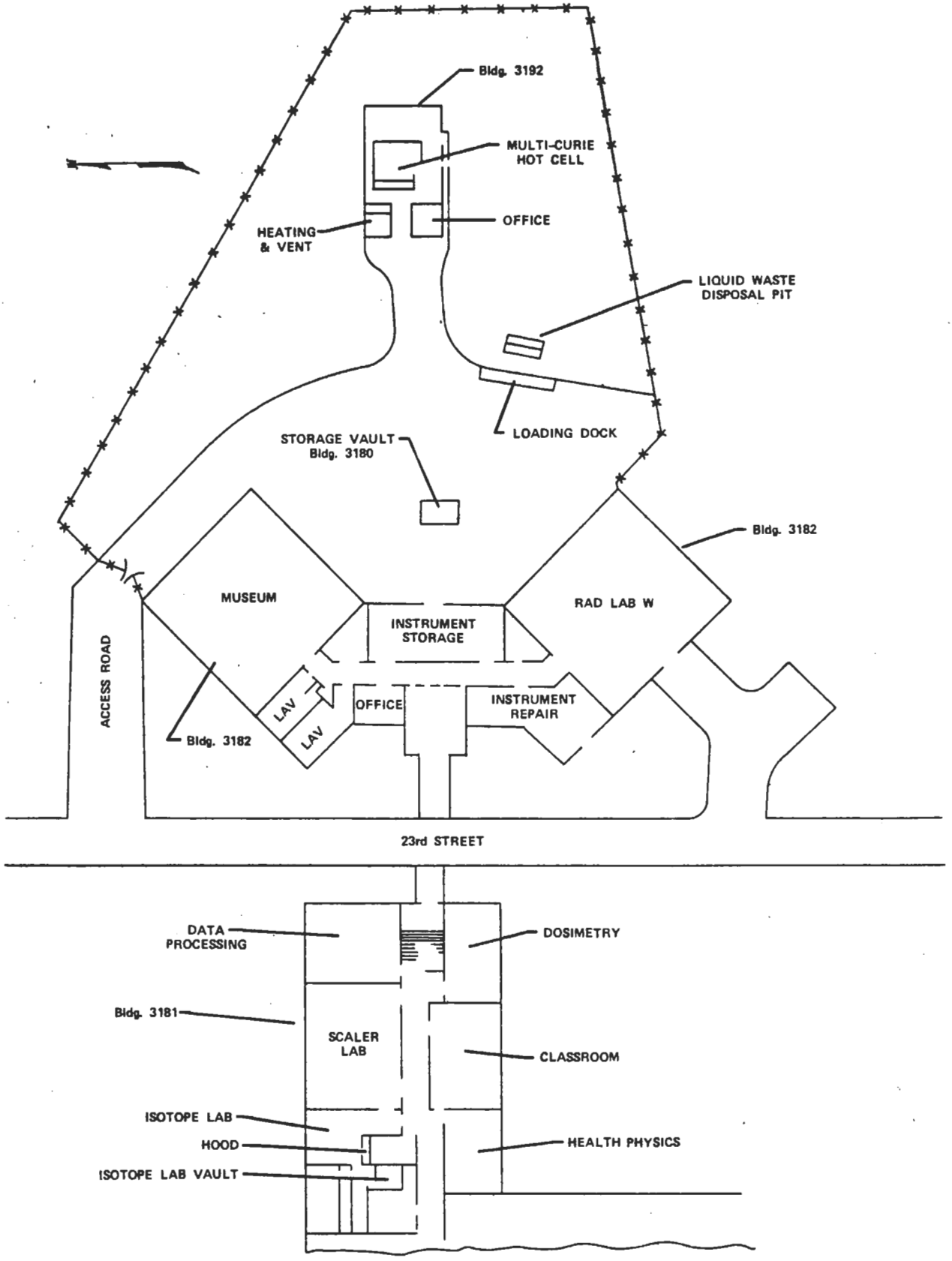

Figure II-11. Radiological Facilities: Former US Army Chemical Center and School

TABLE II-5. RADIOACTIVE CONTAMINATION WITHIN THE RADIOLOGICAL FACILITIES (1975)

1. Soil Samples (surface soil to a depth of 2 inches)

Sample ID	Location	Beta Activity (μCi/gm)
A	20 ft S of SW corner Bldg 3192	4.1×10^{-5}
B	15 ft W of SW corner Bldg 3192	1.8×10^{-4}
C	3 ft W of NW corner Bldg 3192	9.5×10^{-4}
D	3 ft E of concrete pad at S fence line	5.0×10^{-5}
E	Fence line at SE corner Bldg 3182	1.7×10^{-4}
F	3 ft E of S fence bend, near Bldg 3182	1.2×10^{-4}
G	3 ft E of concrete pad, near dock	6.4×10^{-5}
H	E of concrete pad, S of access road	4.5×10^{-5}
I	N of access road NE of Bldg 3182	1.4×10^{-5}

2. Surface Smears

Sample ID	Location	Beta Activity (μCi/100 cm^2)
1	Floor, center of Bldg 3180	1.0×10^{-5}
2	Hallway, Hot Cell Door, Bldg 3192	1.2×10^{-5}
3	Air System Inlet, Bldg 3192	5.9×10^{-5}
4	NE Pad Doorway, Bldg 3182	$<1.1 \times 10^{-6}$
5	SE Pad Doorway, Bldg 3182	$<1.1 \times 10^{-6}$
6	Intermediate Point, Between #4 and #5	1.8×10^{-6}

3. Analysis of Water in Holdup Tank, After 15 Minutes Recirculation

Sample ID	Beta Activity (μCi/ml)
Dissolved solids	4.1×10^{-6}
Suspended solids	9.9×10^{-6}
Total	1.4×10^{-5}

TABLE II-6. PELHAM RANGE TOXIC AGENT DATA

Range	Range Size, Acres	Probable Data Opened	Last Used	Agents Used	Site Physically Rearranged	Past CB Commission Sampling	Contents
Pelham I	0.5	Possibly 1963/1964	Possibly 1963/1964	HD*	Yes	Yes	Possible hot disposal pits
Pelham J	0.1	Unknown	1963	HD*	Unknown	Unknown	Possible HD soil burial pit
Pelham K	2.0	Unknown	Unknown	HD*	Unknown	Unknown	Unknown
Pelham L	0.5	Unknown	Unknown	HD*	Possibly large	Unknown	Possible site of chemical munitions burial in pond (WWII)

* Assumed HD or VX used.

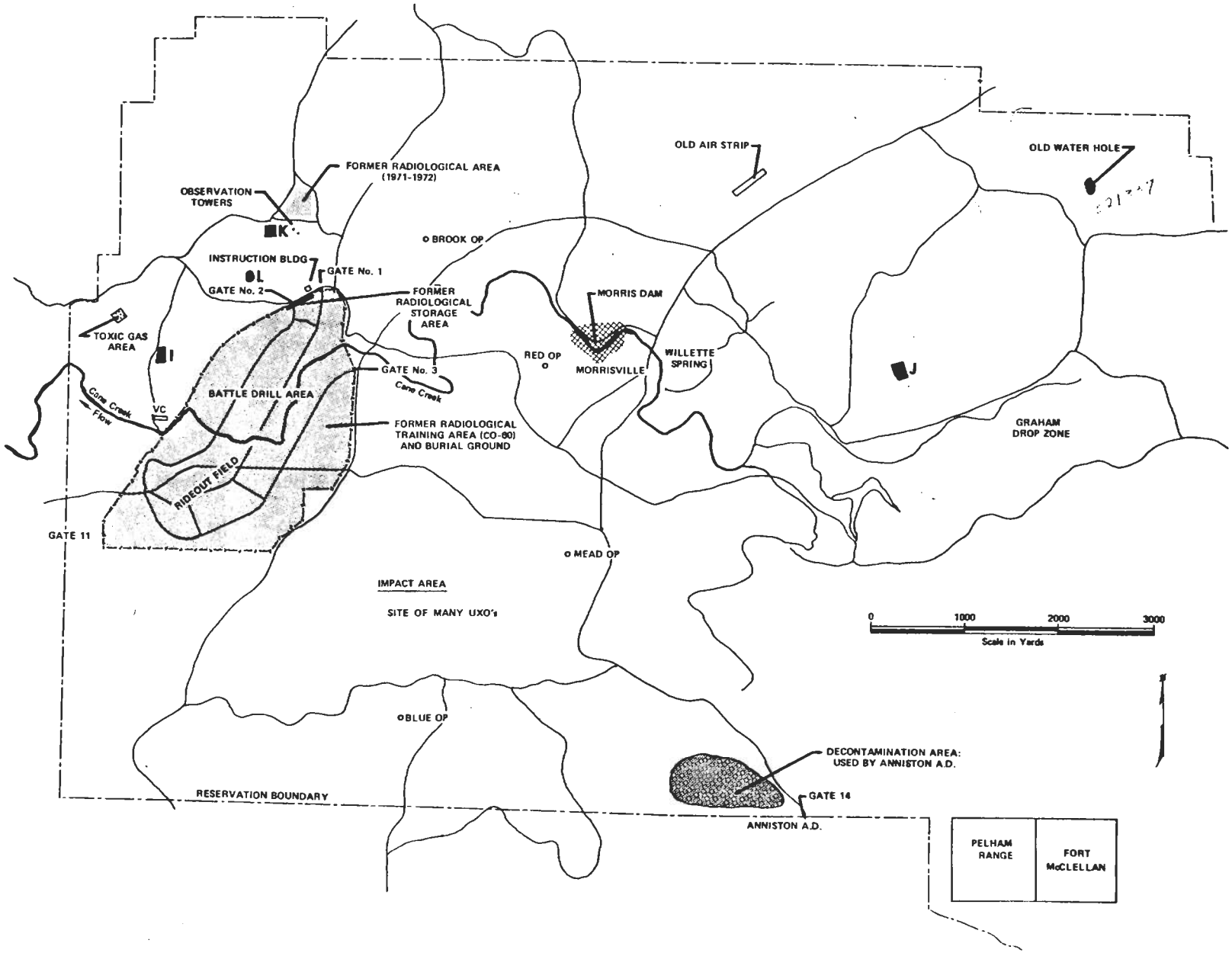

Figure II-12. Approximate Areas of Contamination: Pelham Range

simulants is not considered a contributing factor. Figure II-12 maps the approximate locations of these ranges; areas are not drawn to scale. More exact locations for the three sites I, J, and K may be found in Appendix H. Site L location data was not included in the reference. Figures II-13 and II-14 are 1973 photographs of Sites I and J, respectively; similar photographs were not available for Sites K and L.

Other areas on Pelham Range thought to be contaminated include a Toxic Gas Area northwest of Site I; Figure II-15 is a 1977 photograph taken in this area. The Team was unable to find an "Old Water Hole," said to be located in the vicinity of the northeast corner of Pelham, and thought to be a disposal site for just about everything, including live conventional and chemical ammunition, etc. A decontamination area on Pelham Range near Gate No. 14 is currently used by adjoining Anniston Army Depot. An old demilitarized mustard (H) round and decontamination material was found in the former Radiological Area north of Pelham K. The Pelham Impact Area contains numerous rounds of unexploded ordnance (UXO). An indication of current activity that could add to the number of UXO on other ranges is provided by Table II-7 which lists explosives and rounds of ammunition fired during the month 20 August through 18 September 1976.

b. Radiological Contamination on Pelham Range. Rideout Field was the former Chemical School's Radiological Survey Training Facility and burial site on Pelham Range (see Figure II-12). This facility consisted of Rideout Field; Rideout Hall, which housed an operating console for the Field; a classroom; and a helicopter landing pad (see Figure II-16). This facility was used from 2 June 1965 until 1 March 1972 to train students in the techniques of conducting ground and aerial radiological surveys. At one time, one thousand high-intensity radioactive cobalt-60 sources were mounted in the center of an inclosed area two miles long and one mile wide. The radiation emitted by the sources could be used to simulate the fallout pattern that might be produced by the detonation of a 0.5 kiloton nuclear weapon.* Upon closeout of the Chemical School, all of the radioactive sources containing Co-60 were removed from the facility. A backhoe was used to dig up buried wastes, and Rideout Field was subsequently certified clean by the AEC. However, in view of the random manner used to bury radioactive wastes, it is felt that there is a possibility that all of this material was not recovered.

B. Installation Land Use Factors

*Fact Sheet, US Army Chemical School's Rideout Field Radiological Survey Training Facility (inclosure to DF, Health Physics Division, Fort McClellan, ATSCM-H, subject: Disposal of Rideout Field, dated 18 March 1972).

Figure II-13. Pelham Site I — Toxic Agent Shell Taping: 1963 or 1964 (1973)

Figure II-14. Pelham Site J — Dirt from 1955 Mustard Spill on Fort McClellan buried here. (1973)

Figure II-15. Pelham Toxic Gas Area/1977

TABLE II-7. ROUNDS AND EXPLOSIVES FIRED AT FORT MCCLELLAN/MONTH.

Weapon	Location	Ammunition	Quantity
Explosive	P	1/4 lb	24 sticks
M72 LAW	P	66 mm Rocket	42
M72 LAW, with adapter	P	35 mm Rocket	1300
Explosive	P	Flex-x	1/4 lb, 2 ea
Explosive	P	TNT	1/4 lb, 2 ea
Explosive	P	M1 Dynamite	1 stick
Explosive	Q	M1 Dynamite	500 stick
4.2 Inch Mortar	P	4.2 Inch Round	92
81 mm Mortar	P	81 mm Round	93
Explosive	P	Dynamite	1 stick
155 mm Artillery Piece	P	155 mm Round	100
Explosive	P	C4	4 sticks
50 Caliber Machine Gun	P	50 Cal. Tracer	3,300
M16 Rifle	P	5.56 mm Ball	283,050
M60 Machine Gun	P	7.62 mm Ball	2,200
Explosive	M	C4	4 sticks
M203 Launcher	M	40 mm Projectile	803
M79 Launcher	M	40 mm Projectile	1543
M72 LAW	M	66 mm Rocket	18
M16 Rifle	M	5.56 mm Ball	750
.45 Caliber Pistol	M	.45 Cal Ball	263,181
.38 Caliber Pistol	M	.38 Cal Ball	38,678
M60 Machine Gun	M	7.62 mm Ball	76,300
12 Gauge Shotgun	M	12 Gauge Round	7,387

NOTE: P = Pelham Range; M = Main Post; Q = Quarry; LAW = Light Arm. Weapon

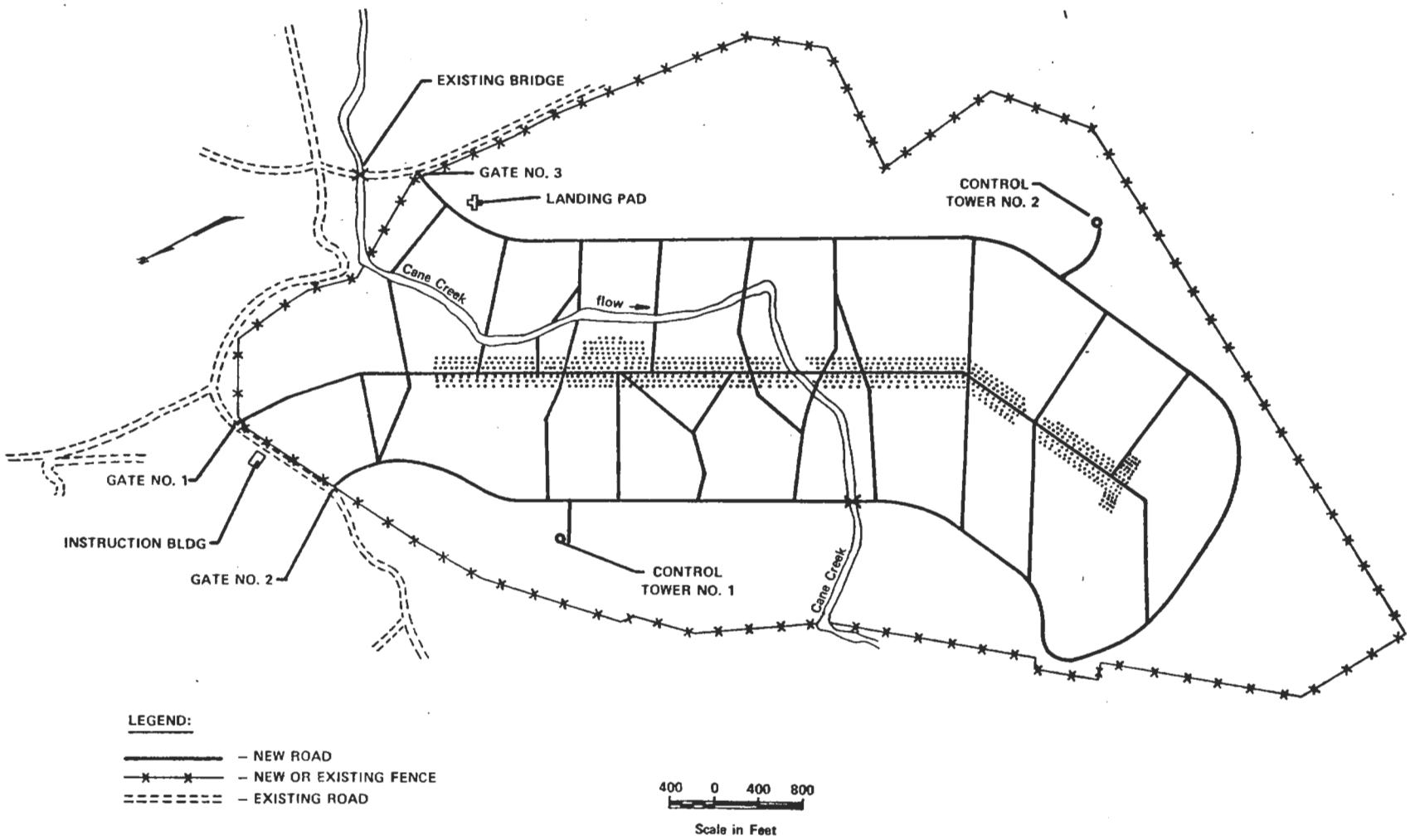

Figure II-16. Rideout Facility

1. Pesticide and Fertilizer Use

a. Pesticides currently used at Fort McClellan are EPA-registered. All pest controllers are currently certified and are required to be recertified every two years. Facilities for storing pesticides range from marginal to adequate, the major problem being the pre-positioning of safety equipment and adequate ventilation. The mixing of pesticides is conducted on a concrete apron which drains into the sanitary sewer. This practice is prohibited by Army regulations and is under correction. Pesticides used for land management are carried to the application areas as concentrates and mixed there. All surplus pesticides are expended in treatment areas or drained into spray and rinse tanks and used as normal diluent. Empty pesticide containers are triple-rinsed and buried in the sanitary landfill. Rinse water is also used as normal diluent. Fort McClellan maintains a stock of DDT which, by law, is restricted. It is properly secured and has been reported to the Defense Property Disposal Office for disposal.

b. Table II-8 is a list of pesticides used at Fort McClellan during the 3-year period from 1974 to 1976. Herbicides used for 1974 through 1976 is shown in Table II-9. Fertilizer used at Fort McClellan is shown in Table II-10.

2. Ecological Research Program

a. Management of the Red-cockaded Woodpecker Program. There has been an increasing concern on the part of private citizens to conserve particular non-game animal species. A visible result of this concern has been the formation of numerous incorporated and unincorporated private groups which, through public meetings and advertising campaigns, have sought to protect animals of special interest. Such activities have culminated in the passage of various state and federal laws. These, along with increasing attention within the office of the President, the Department of Defense, and the Department of the Army, have resulted in the development of a series of Executive Orders, Department of Defense Instructions, directives, memorandums, and Army Regulations regarding wildlife conservation.

Two laws, Public Law 86-797, Wildlife-Military Reservation Act; and Public Law 93-205, Endangered Species Act of 1973; have reinforced wildlife conservation efforts on Fort McClellan, Alabama, and directed the installation to its present state.

(1) To the extent compatible with the military mission, the natural resources management objectives are to:

TABLE II-8. PESTICIDES AND QUANITY USED AT FORT McCLELLAN
(1974 THROUGH 1976)

Material	Concentration	Quantity
Diazinon	0.50% (Water)	6,523 gallons
Baygon	1.10% (Water)	1,338 gallons
Malathion	95.00% (Kerosene)	166 gallons
Chlordane	1.00% (Water)	5,691 gallons
Pyrethrum	3.00% (Mineral Oil)	8 gallons
Baygon Bait	2.00% (Inert Ingredients)	32 pounds
Lindane Dust	1.00% (Talcum Powder)	46 pounds
Malathion	3.00% (Kerosene)	36 gallons
Dibrome (Naled)	0.80% (Diesel Oil)	2,558 gallons
*Mirex (Kepone)	0.15% (Inert Ingredients)	193 pounds
Anticoagulant (Rat Bait)	0.25% (Inert Ingredients)	775 pounds

* Used in 1974 and 1975 only.

TABLE II-9. HERBICIDES AND QUANTITY USED AT FORT McCLELLAN

Name	1974	1975	1976
Silvex	8,000 gallons		
24D	7,200 gallons	6,000 gallons	4,800 gallons
245T	1,800 gallons		10,000 gallons
OIN DMA	12,000 gallons		
Silvex		18,480 gallons	41,460 gallons
Pichloram (#160)		4,000 gallons	
Arsenicorg		8,000 gallons	6,400 gallons
OPH (Tordon 101)		20,300 gallons	
OINDMA		4,000 gallons	
OPN (FORE)			1,200 gallons

TABLE II-10. FERTILIZER USED AT FORT McCLELLAN

CY 1975

100 Ton (20,000 gallons) Liquid Nitrogen, 34%
25 Ton 27-9-18*
6 Ton 8-8-8
12 Ton 20-20-5 (Fish Ponds)

CY 1976

50 Ton (10,000 gallons) Liquid Nitrogen
22 Ton 27-9-18
3 Ton 8-8-8
5 Ton 30-10-0
8 Ton 20-20-5 (Fish Ponds)

CY 1977 Proposed Fertilizer Requirements

50 Ton (10,000 gallons) Liquid Nitrogen
35 Ton 27-9-18
15 Ton 19-19-19
8 Ton 20-20-5 (Fish Ponds)

---

*Numbers are the percentage of nitrogen, phosphorus and potassium in the fertilizer. For example, 27-9-18 means that the fertilizer contains 27% nitrogen, 9% phosphorus, and 18% potassium.

(a) Protect and conserve the watersheds and natural landscapes; the soil; the beneficial forest and timber growth; and the fish and wildlife as vital elements of an optimum natural resources program.

(b) Use and care for natural resources in the combination best serving the present and future needs of the United States.

(c) Provide for an optimum ecological allocation of land and water resources and for controlled public access to such resources.

(2) Within these broad objectives are various interrelated programs. One of these is the rare and endangered species habitat conservation effort. The program has been continuously evolving since its conception in 1968. Presently, the elements of the program are four-pronged in nature:

(a) Familiarization with the current listing of species which are threatened or endangered.

(b) An inventory of threatened wildlife species indigenous to or dependent on the habitat of the installation.

(c) Identification and protection of the wildlife habitat on the installation.

(d) The development of positive programs for the management which may include avoidance of the habitat of any endangered or threatened species.

b. Description of Habitat and Management Prescription.

(1) The preference of the red-cockaded woodpecker for open, old-growth, mixed southern pine forests is recognized in the literature. On Fort McClellan, these open stands rarely occur naturally; rather, they represent a pine forest modified by prescribed burning and harvesting.

Approximately 45 acres of mixed pine (Pinus palustris, Miller; Pinus taeda, Linneaus; and Pinus echinata, Miller) are managed as habitat or potential habitat for the red-cockaded woodpecker. The stand ranges from 10 to 90 square feet of basal area per acre with mixed age and size classes of pine within. The major soil series is a Jefferson gravelly fine sandy loam on a 2 to 6 percent slope. Other

soils included are Anniston and Allen gravelly loams on a 6 to 10 percent slopes.

(2) The following procedures of management are followed:

(a) Maintenance of an inventory of all nest sites identifying in detail the location of each.

(b) Development activities within 330 feet of any nest tree will be limited to management measures beneficial to maintaining the nesting site.

(c) A special buffer zone, 660 feet in radius, is established and marked on the ground around each nest site. A support area of 140 acres will be managed on approximately 80 year rotation.

(d) Timber cutting, timber stand improvement, prescribed burning, road construction, recreation construction and most other disturbing activities will not be allowed within buffer zone during December through August.

(e) Three to five old-growth trees will be reserved as roosting and potential nest trees within the buffer zone.

(f) The area is to be prescribed burned at 2 to 3 year intervals.

c. Present Nesting Activities. Though dead pine trees are left standing in the management area, it appears that the woodpecker's active nests are in live pine trees attacked by red-heart disease (Fomes pini sp). Nest trees are easily identifiable by the exuding gum about the nest cavities.

Three nest trees have been inventoried. Two of the trees appear to have active nests: two in one loblolly tree and one nest in a shortleaf. Apparently these nests are used year after year until the tree dies. The disease is evident in nearby trees, yet the small population clearly uses the same nest trees (see Figure II-17).

This tendency to nest in the same tree is a fortunate habit from a management point of view: (1) fewer trees are needed for reserve, (2) intrusion can be controlled, (3) populations of birds are localized thus avoidance and disturbance can be minimized, and (4) management costs are minimal when related to wide ranging species such as turkey (Meleagris gallopavo).

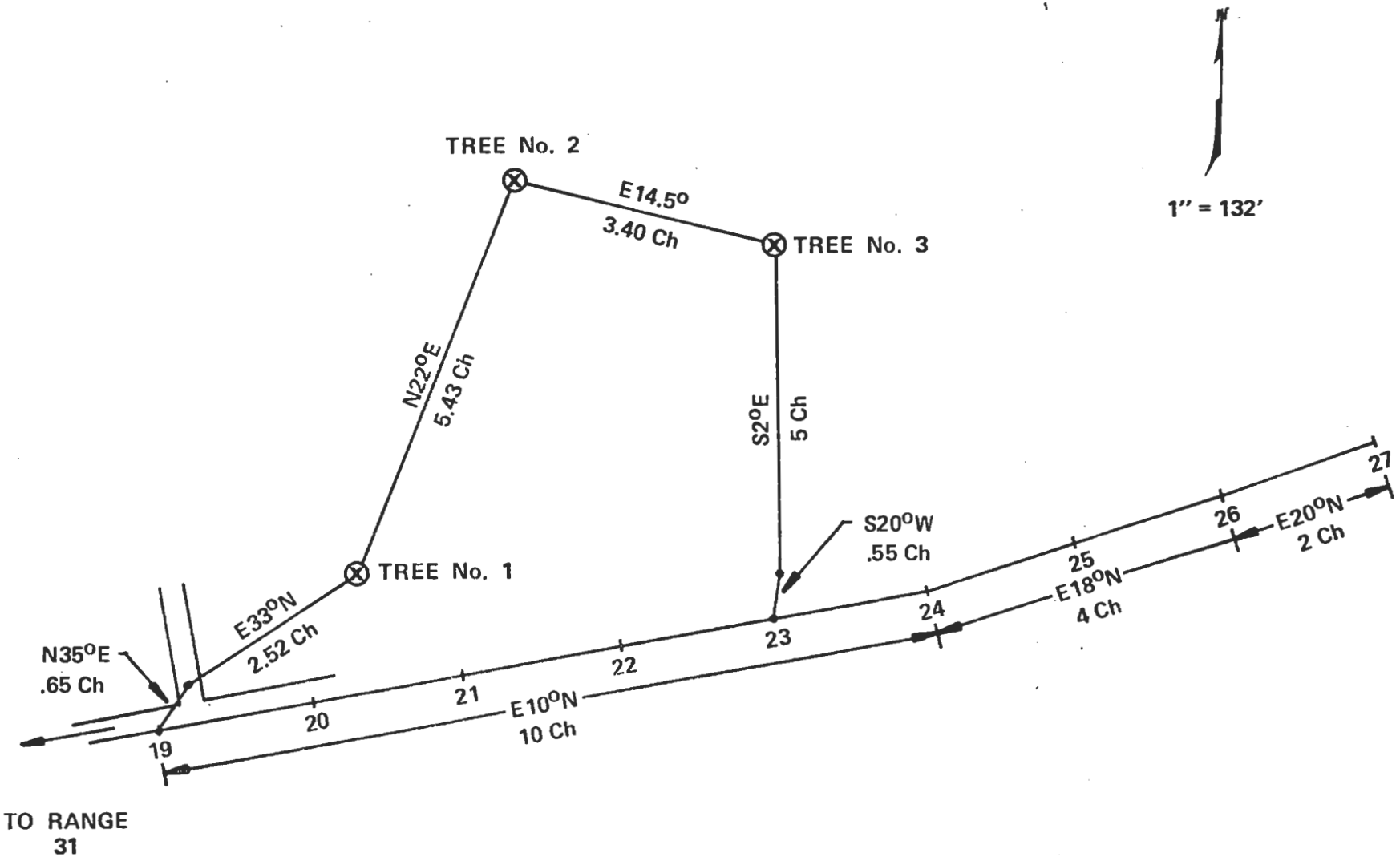

Figure II-17. Location of Nest Trees: Red Cockaded Woodpecker Protected Area

d. Post Management Activities. A standing operating procedure prior to and during the year of 1954 was to remove the infested and/or dying trees. The last real harvest was in 1954, thus, it can be assumed that some of the nesting trees were removed; it is also probable that some of the woodpeckers left the area.

In 1968, William Summerour, the installation wildlife biologist at that time and presently Professor at Jacksonville State, identified the area as red-cockaded woodpecker habitat and essentially made the aforementioned management recommendations.

The eastern quarter of the area was again harvested in 1974 leaving the present mix of pine. It is expected that the management unit will again be harvested in the early 1980's so as to reduce total basal area and maintain the present park-like nature of the timber stand.

A data summary sheet on the red-cockaded woodpecker is presented in Table II-11.

e. Other Programs. Nine purple martin houses with 24 units each have been erected in hopes of attracting these useful insect-eaters. However, if the use of DDT is not permanently stopped along with the present use of some "hard" or persistent insecticides, the birds may be killed by the pesticides.

Other ecological research programs are detailed in the Wildlife Management Plan (1966); Land Management Plan (1965); Coosa Valley Resource Conservation and Development Plan (1974); Woodland Management Plan (1973?); and in a brochure entitled "Conservation and Wildlife Activities, Fort McClellan, Alabama 1970."

C. Off Post Migration of Contaminants

1. Water Quality Data

Personnel from the US Army Environmental Hygiene Agency conducted studies at Fort McClellan in the spring of 1976 to assess the biological impact of industrial and domestic wastes on surface waters of both the Main Post and Pelham Range. Data were also collected on various chemical parameters to include: pH, acidity, alkalinity, dissolved oxygen, temperature, total organic carbon, and heavy metals (cadmium, chromium, copper, mercury, lead, zinc, and manganese).

The study concluded that the streams on Fort McClellan are in good biological condition. Elevated coliform bacteria concentrations, due to animal waste and an unchlorinated sewage discharge, contraindicate

TABLE II-11. DATA SUMMARY SHEET
RED COCKADED WOODPECKER HABITAT

Area: Protected Area or 10 acres

Management Unit or 140 acres

Nest Trees:

Species	DBH	Height	Number of Nest Holes	Present Condition of Tree
Longleaf	17.2	63	3	Tree died in 1976
Shortleaf	19.3	65	1	Excellent
Loblolly	17.6	63	2	Poor

Location of Nest Trees: From crossroads N1,178,264.8 E520,528.5

Tree #1: E43°N for 167.64 feet

From Tree #1:

Tree #2: N22°E for 358.38 feet

From Tree #2:

Tree #3: E14°S for 223.74 feet

Notes:

Scattered potential nest trees throughout area management unit should support colony indefinitely.

Seven birds seen in area June 1976.

No birds observed in October 1976 but droppings and recent working noted at Tree #2.

primary contact with Fort McClellan surface waters. There is a potential raw sewage leak on Remount Creek. Infiltration of rainwater into the sewage lines results in intermittent discharge of raw sewage and causes moderate degration of a section of Cane Creek. Implementation of current proposed projects will eliminate infiltration of runoff into the main sewage lines. The complete report is included in Appendix F.

Figure II-18 is a map of sampling point locations on the Main Post. In addition, AEHA sampled at three locations on Cane Creek at Pelham Range. These sampling points are numbered as follows: 12 (near the eastern edge of Pelham Range), 13 (near the center of the Range), and 14 (near the western edge). The findings on the main installation streams by AEHA is synopsized as follows:

a. Cave Creek, Main Post.

(1) Cave Creek, Stations 9, 10, and 11 (see Figure II-18), is in good biological condition. Diatom and macroinvertebrate diversity indices and species present are characteristic of water receiving moderate to little environmental stress. The diatom diversity indices for Stations 9, 10, and 11 are 4.1, 4.2, and 4.3 respectively and the macroinvertebrate diversity indices are 3.1, 3.5, and 3.5 respectively. The abundance of pollution sensitive organisms such as mayflies and damselflies also indicates good water quality.

(2) Cave Creek is a typical shallow southern stream with low flow. Fish populations are restricted to a limited number of families capable of surviving these conditions. Since many of these species require specific environmental conditions, care should be taken to prevent extensive stream modification. No large fish populations were noted during the survey period.

(3) Total coliform (TC) ranged from 95 to 104 col/100 ml on Cave Creek. The fecal coliform/fecal streptococcus ratio (FC/FS) at Stations 9, 10, and 11 were 0.1, 0.1, and 0.0 respectively and indicative of animal sources.

(4) Chemical analyses results for metals and other compounds were within limits acceptable to maintain aquatic life.

b. Cane Creek, Main Post.

(1) Cane Creek Stations 1, 2, 7, and 8 have diatom and macroinvertebrate diversity indices and significant organisms present which indicate that the overall water quality is fair, but some moderate impact is due to the discharges, particularly at Stations 1 and 2. The diatom diversity indices at Stations 1, 2, 7, and 8 are 3.8, 3.4, 4.0,

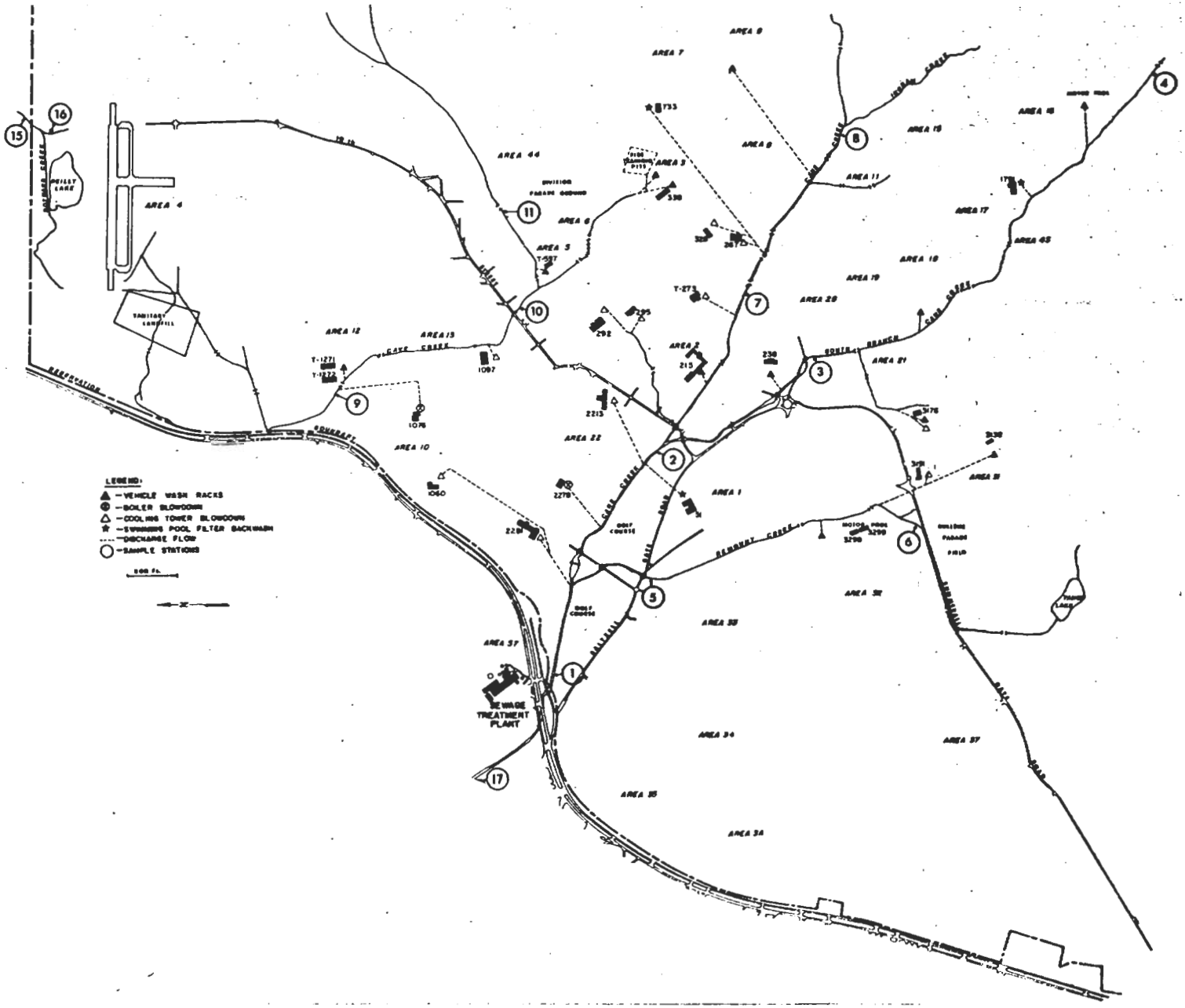

Figure II-18. Sampling Points and Discharge Locations

and 4.3 respectively. The macroinvertebrate diversity indices at Stations 1, 2, 7, and 8 are 2.3, 2.7, 3.9, and 3.1 respectively. Also, some dead, small bluegill sunfish were observed near Station 1 during the survey. Raw sewage is dumped at the lift station near Station 1 during periods of high flow. Heavy rainfall, with resultant infiltration into the sewer system, causes the flow to exceed the lift station pump capacity and the 4 million gallon per day (MGD) capacity of the sewage treatment plant (STP).

(2) There are no significant fish populations on the Main Post section of Cane Creek. A small population of bluegill sunfish was observed in the area of Station 2.

(3) The TC in the Main Post section of Cane Creek range from 90 to 735 col/100 ml. The FC/FS at Stations 1, 2, 7, and 8 are 0.8, 0.3, 0.2, and 0.0 respectively. This indicates that the source of most of the bacteria is animal. Possible sources include pasture and wildlife areas east of the Main Post that reach Cane Creek as runoff or stormwater.

(4) With the exceptions of increased total organic carbon and grease/oils at Station 1, the chemical analyses at Stations 1, 2, 7, and 8 are acceptable for normal aquatic life. Slightly elevated total organic carbon at Station 1 is due to intermittent dumping of raw sewage. The increased grease and oils are the result of upstream discharges into Cane Creek, Remount Creek, and the South Branch. These chemical factors along with a reduced benthic community diversity indicate moderate pollution impact at Station 1.

c. Cane Creek, Pelham Range.

(1) Macroinvertebrate and diatom diversity indices at Stations 12, 13, and 14 (on Pelham Range) indicate water of good quality. Only bacteriological studies were done at Station 17 since it is not on Government property. Diatom diversity indices at Stations 12, 13, and 14 are 4.1, 3.9, and 4.1 respectively. Macroinvertebrate diversity indices at Station 12 and 14 are 3.6 and 3.7 respectively. Since Cane Creek gains considerable volume before entering Pelham Range, the effect of the sewage discharge is limited. The presence of organisms associated with good water quality further indicates that the adequate treatment of sewage and dilution results in minimum biological impact on the Pelham Range section of Cane Creek.

(2) Since Cane Creek becomes a deep and fast flowing stream on Pelham Range, it harbors an excellent stream fishery. Fish collected during this study in the area of Station 13 are listed in

Table II-12. The species collected represent a wide range of environmental requirements and indicate that the habitat and condition for a stable and diverse fish population exists. Most sewage discharges produce unfavorable conditions for fish by reducing dissolved oxygen (DO). The presence of these fish supports the biological conclusions in the previous section.

(3) After Cane Creek leaves the Main Post and receives unchlorinated discharge from the 1.5 to 1.7 million gallon per day sewage treatment plant (MGD STP), the TC exceed 140,000 col/100 ml. The FC/FS at Stations 12, 13, 14, and 17 are 1.5, 0.2, 0.2, and 4 respectively. The FC/FS at Station 17, below the discharge, confirm human origin of the bacteria. The TC remain high as Cane Creek flows through Pelham Range but the FC/FS become characteristic of animal sources after Station 12. Children were observed playing near Station 17 (off US Property).

(4) With the exception of excessive grease and oils at Station 12, the chemical analyses are within the normal range outlined in Appendix G. The grease and oil are probably a result of some off post discharge and the STP discharge. The increase in stream volume from runoff and other sources results in a slightly elevated total organic carbon.

d. Dothard Creek, Main Post.

(1) Dothard Creek Stations 15 and 16 have diatom and macroinvertebrate diversity indices that indicate good water quality. The diatom diversity indices at Station 15 and 16 are both 4.1. The macroinvertebrate diversity indices at Station 15 and 16 are 3.3 and 3.6 respectively. The drainage from the landfill area has not caused a reduced diversity.

(2) TC ranged from 155 to 335 col/100 ml with FC/FS indicative of animal sources.

(3) The chemical analyses of metals and other compounds fall within the safe limits for aquatic life. No excessive levels of heavy metals were found.

2. Legal Claims

At the present time, there are no legal claims pending against Fort McClellan. Records retained by the Staff Judge Advocate (SJA) did not indicate any prior claims against Fort McClellan by personnel living in the vicinity of the installation. Mr. Paul Hughes, the Attorney Advisor General of SJA, confirmed that no legal actions were either pending or previously filed against the post.

TABLE II-12. FISH COLLECTED FROM CANE CREEK, PELHAM RANGE

Scientific Name	Common Name	Number Collected
Carpiodes sp	Carpsucker	6
Lepomis macrochirus	Bluegill	2
Hypentelium nigricans	Hogsucker	1
Moxostoma carinatum	Redhorse sucker	6
Esox niger	Chain pickeral	1
Ictalurus punctatus	Channel catfish	3
Dorosoma cepedianum	Gizzard shad	1