

INSTALLATION ASSESSMENT OF FORT DRUM, NEW YORK

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U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
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II. PAST AND CURRENT ACTIVITY REVIEW

A. Installation Operations

1. Industrial Operations

There are no manufacturing operations at FD. The industrial-type operations relate primarily to the maintenance of military vehicles and equipment required to support the training mission. The activities include washing of vehicles, tuning and cleaning engines, periodic maintenance (oil changes, lubrication, etc.) of vehicles, and repairs and overhaul of equipment. A small amount of equipment repainting is done. This equipment is sandblasted, not stripped, prior to painting. Lead-acid batteries are recharged and filled. These operations are performed in the New York and New Jersey National Guard Maintenance areas.

Other activities include the operation of heating boilers throughout the cantonment area, washing of garbage trucks and trash cans at the wash facility near the airport, and facilities type operations (electrical, plumbing, etc.).

2. Lessee Industrial Operations

There are no lessee industrial operations at FD.

3. Laboratory Operations

Laboratory operations include activities at the sewage treatment plant (STP, Bldg. 2166), water treatment plant (WTP, Bldg. S-2067) and various photographic laboratories (Training Aids Services Center; Bldg. T-1030, the Arts and Crafts Shop, Bldg. 5-2009; U.S. Army Health Center, Bldg. 2407).

STP and WTP laboratory operations are discussed under following section II.B. and II.C. of this report.

FD's principal photographic laboratory is located in Bldg. T-1030. Operations include development of both color and black and white film, 35mm up to 20.3x25.4 cm in size. Fixer solutions containing silver are accumulated in 55-gallon drums. The drums are taken to FD's Directorate of Industrial Operations and subsequently to the Defense Property Disposal Office (DPDO), Griffiss Air Force Base, Rome, N.Y., for disposal.

Photographic liquid wastes are also produced by X-ray activities at the U.S. Army Health Clinic (Bldg. T-2407). Their silver containing wastes are also saved for silver recovery.

Both activities have been in the silver recovery program for several years. No-silver bearing liquid wastes are discharged to the sanitary sewer.

The Arts and Crafts Section of the Morale Support Division has a small laboratory set up for black and white film processing. Because the

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level of activity is very low, the small quantities of liquid wastes generated are discharged to the sanitary sewer.

4. Materiel Proof and Surveillance Tests

Research, development, test and evaluation programs conducted at FD are:

- a. Snow removal equipment.
- b. Control of breeding locations for the black fly.
- c. DDT effects within the soil.
- d. Wind power for electrical generation.

Definitive information about the above RDT&E activities is not available.

5. Training Areas

U.S. Army Reserve components and the active Army as well as Marine, Air Force and Navy Units use the training facilities at FD for training. Approximately 75,000 individuals undergo training at the installation each year. A wide variety of training facilities are available for use by the tactical and logistical units requiring wheel, track, and helicopter transportation. General and specialized areas are also available for bivouac, river crossings, rock quarrying, parachute landing and air drop zones, tactical landing, and demolition. Weapon firings from small arms up to, and including, the largest artillery are conducted at various range complexes and areas. Duds are reported in the impact areas as a result of these operations.

The Nuclear, Biological and Chemical School (NBC) at FD conducts summer training courses to coincide with unit training periods. The class duration is one week with a maximum of 50 students for each class. Fig. 7 identifies the training areas. Table V lists the number and type of training facilities; Table VI indicates the acreage of each training area.

6. Toxic/Hazardous Materials--Handling and Storage

a. Industrial Chemicals

The industrial chemicals at FD are primarily those related to the maintenance operations. They include solvents, cleaners, paints, antifreeze, and POL materials. These materials, along with water treatment chemicals, bleaches, and similar chemicals, are stored in well maintained buildings near Warehouse road.

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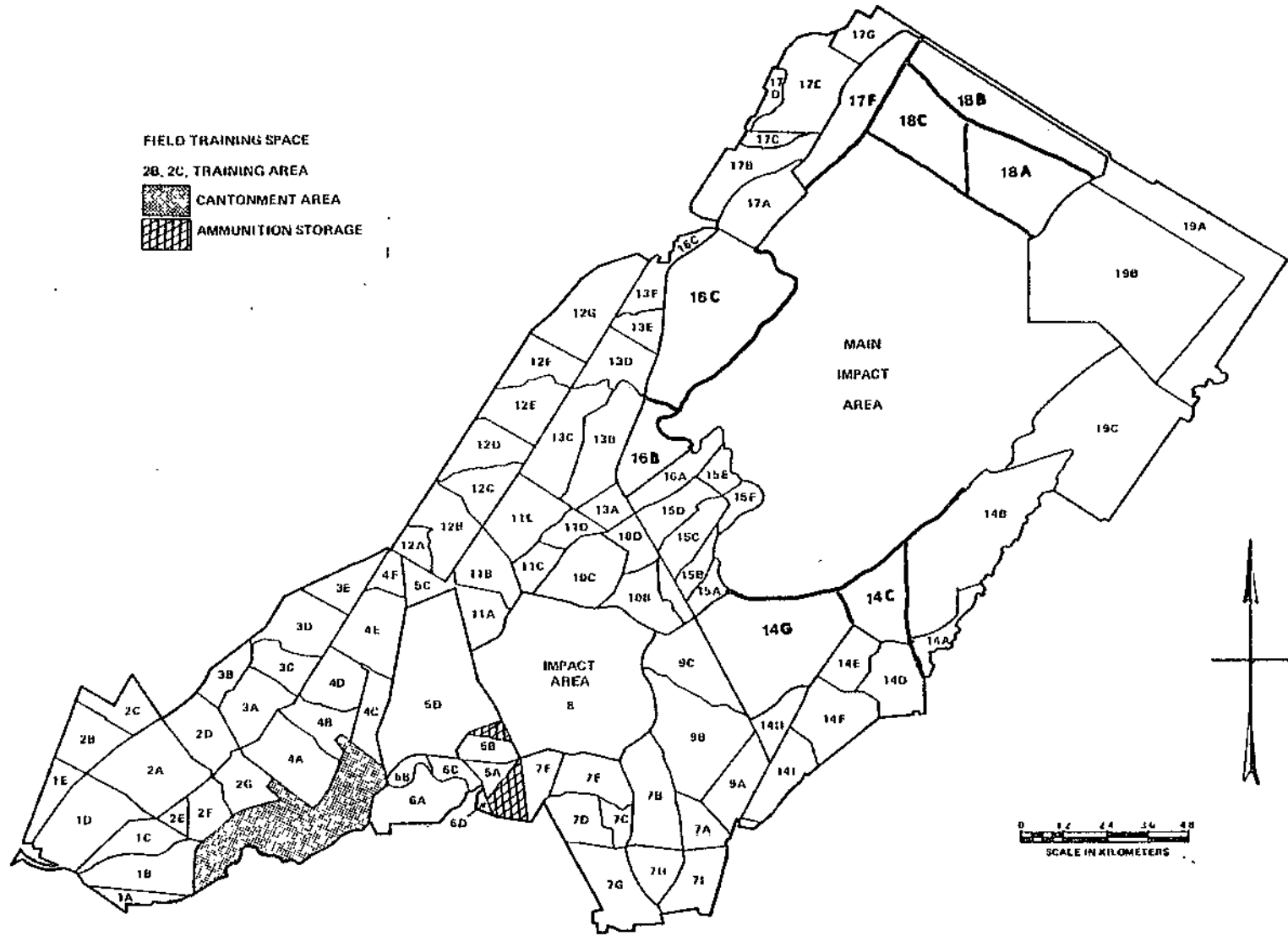


Figure 7. Training Areas

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TABLE V. FORT DRUM RANGES AND TRAINING AREAS

- 1 Helicopter Gunship Qualification Range
- 1 Air to Ground Gunnery Range (Fixed Wing)
- 1 Pistol Range
- 1 Known Distance Range 100, 200, 300 meter
- 2 10 and 25 Meter Machine Gun Ranges
- 1 Machine Gun Transition Range
- 1 Machine Gun Field Firing Range
- 1 Recoilless Rifle Range
- 1 Rocket Launcher Range/LAW Range
- 1 M79/M203 Grenade Launcher Range

- 10 Tank Firing Ranges:
 - 2 Tank Subcaliber Tables I, II, III
 - 1 Tank Table V/Dry TCQC Scout Vehicle
 - 4 Tank Table VI/2 Without Moving Targets
 - 2 Tank Table VII & VIIC & VIII
 - 1 Tank Table VIIC/Scout Squad Proficiency

- 6 Combat Ranges:
 - 2 Squad Attack Courses
 - 1 Platoon Attack Course
 - 1 Squad and Platoon Attack Course
 - 1 Combined Arms Course
 - 1 ARTEP Forces March/Live Fire Exercise

- 14 Engineer Training Sites:
 - M4T6 Float Bridge
 - Light Tactical Raft
 - Aluminum Foot Bridge
 - Deck Balk Fixed Bridge
 - Amphibious Landing Site
 - Debarcation Site
 - Bailey Bridge
 - Demolition Site
 - Field Fortifications
 - Mine Warfare
 - Timber Trestle Bridge
 - Rigging
 - Camouflage
 - Armored Vehicle-Launched Bridge (AVLG)

- 137 Surveyed Artillery/Mortar Firing Points
- 28 Ranges
- 11 OPs
- 19 Major Training Areas
- 97 Subdivided Training Areas
 - 1 Trainfire Complex
 - 1 Hand Thrown Grenade

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TABLE VI. TACTICAL TRAINING AREAS

<u>TRAINING AREA</u>	<u>ACREAGE</u>	<u>HECTARE</u>	<u>TRAINING AREA</u>	<u>ACREAGE</u>	<u>HECTARE</u>
1A	275	111	9A	644	261
1B	851	344	9B	1,669	675
1C	486	197	9C	987	399
1D	1,256	508	10A	235	95
1E	462	187	10B	572	232
2A	1,304	528	10C	934	378
2B	599	242	10D	379	153
2C	518	210	11A	479	194
2D	764	309	11B	589	238
2E	142	57	11C	325	132
2F	397	161	11D	284	115
2G	466	189	11E	843	341
3A	717	290	12A	244	99
3B	357	145	12B	775	314
3C	411	166	12C	572	232
3D	809	327	12D	650	263
3E	446	181	12E	771	312
4A	967	391	12F	589	238
4B	516	209	12G	574	232
4C	467	189	13A	309	125
4D	561	227	13B	1,149	465
4E	967	391	13C	983	398
5A	203	82	13D	759	307
5B	142	58	13E	337	136
5C	402	163	13F	163	66
5D	2,853	1,155	14A	321	130
6A	751	304	14B	3,329	1,347
6B	199	81	14C	1,068	432
6C	280	113	14D	790	320
6D	40	16	14E	536	217
7A	347	140	14F	923	374
7B	923	374	14G	2,732	1,106
7C	231	94	14H	244	99
7D	535	217	14I	597	242
7E	660	267	15A	244	99
7F	243	98	15B	284	115
7G	980	397	15C	516	209
7H	522	211	15D	528	214
7I	684	277	15E	276	112
8 (Impact Area)	4,720	1,910	15F	162	66
			16A	803	325
			16B	734	297
			16C	2,918	1,181
			17A	1,462	592
			17B	812	329
			17C	231	94
			17D	231	94
			17E	1,470	595
			17F	1,322	535
			17G	402	163
			18A	938	380
			18B	1,292	523
			18C	1,730	700
			19A	2,094	847
			19B	4,900	1,983
			19C	3,396	1,374
			Ammo Dump	540	219
			Cantonment Area and Airfield	2,330	943
			Main Impact Area	<u>22,500</u>	<u>9,106</u>
			TOTAL	107,265	43,410

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There is large-scale storage of fuels, including 42 underground storage tanks for gasoline, 48 for diesel fuel, and 449 for No. 2 fuel oil. The major portion of the gasoline and diesel fuel storage is along the area called gasoline alley (1).*

In addition, there are several 55-gallon drums and underground tanks for collecting waste POL materials. The waste POL in these containers is collected by a private contractor and recycled.

b. Chemical Agents

No records were found to indicate that lethal or incapacitating chemical agents had ever been used or stored at FD. There is an NBC school on the installation, but this is staffed only during the summer training period. As a result, no details of its operations could be obtained.

Signal smokes, pyrotechnics, and riot control agents (RCA) are used in training operations. These materials are stored at the ammunition storage area.

c. Biological Agents

A dissemination test of a cereal rust disease was conducted in August 1950. The disseminated material consisted of washed, fluffed, white turkey feathers infected with 10 percent by weight of the uredospores of Puccinia graminis avenae, Race 8, a parasitic fungus of oats. Three cluster bomblets of feathers were dropped from an airplane over sixteen 0.2 ha plots of oats (exact location onpost could not be determined). When the study was completed, all of the oat crops were destroyed. No effect was observed in the oat crops of surrounding farms.

No evidence was found to indicate any other use or storage of biological agents or simulants at FD.

d. Radiological Materials--Permits and Licenses

FD has no items that require the installation to have a Nuclear Regulatory Commission (NRC license or DA permit. There are small quantities of radioactive isotopes in test sources (Kr-85, Ra-226), calibrators (SR-90, Pu-239), and other sealed sources such as watches (H-3), compasses (H-3, Ra-226), and gunsights (Pm-147). These items are stored and controlled by the using organization. No records of disposal practices were found.

At the time of the team visit, there were no formal procedures for control, storage, and disposal of radioactive materials.

*Numbers in parentheses are keyed to Figure 8, Map Identifying Areas Relevant to the Survey.

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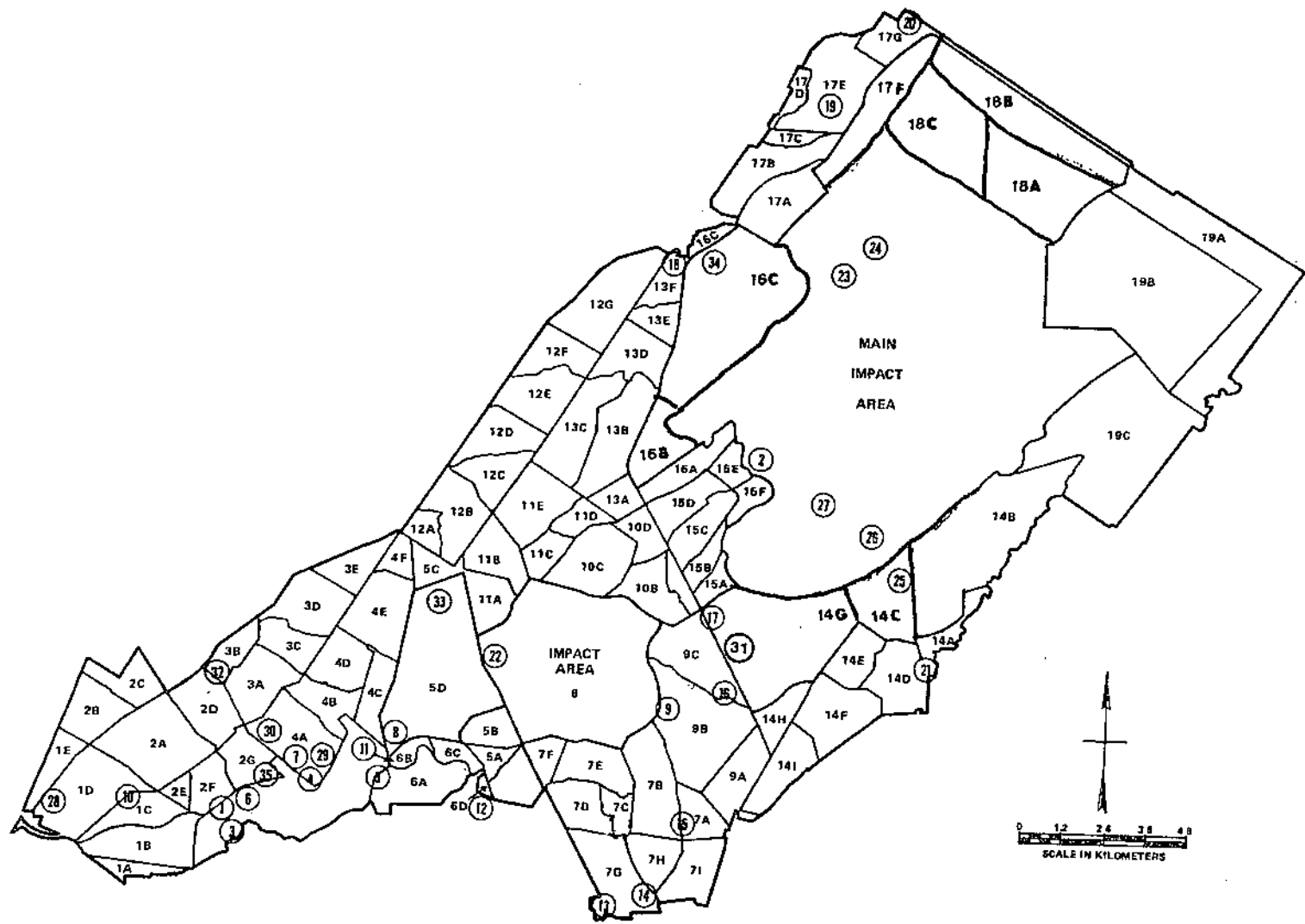


Figure 8. Map Identifying Areas Relevant to the Study

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FIGURE 8--LEGEND

1. Gasoline and Diesel Fuel Storage Area--1940's to present.
2. Defoliant Spray Test--Late 1960's.
3. STP-1941 to present.
4. New Wash Rack Facility--Under Construction.
5. Dumpster and Garbage Can Washout Facility--1940 to present.
6. Washrack Wastewater Holding Ponds--1979-1980.
7. Old Landfill--1940-1973.
8. Present Landfill.
9. Field Sanitary Landfill--1970-1974.
10. Old Landfill--1978-1980.
11. Landfill--1950 (Used 6 months).
12. Landfill (General Trash from Deferiet City)--unknown to present.
13. Surface Fill (from Carthage City)--unknown to present.
14. Landfill--unknown to present.
15. Field Dump--Early 1970's.
16. Field Dump--1974-1977.
17. Trench Dump--1975-1977.
18. Landfill--1975-1977.
19. Field Dump--1970.
20. Landfill from Somerville--1973.
21. Landfill--Unknown to present.
22. Demolition and Burning Ground--1978-present.
23. Large Cal. Ammo Destroyed by Detonation [90 millimeter (mm) - 105mm]--
1970 to present.
24. 2-500 lb bombs destroyed by Air Release (one time operation)--1972-1973.

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FIGURE 8--LEGEND (Continued)

25. Old Hosford Estate Swim Pool Used for Destruction of Old Ammo, Smoke Grenades, Fuel Oil, Smoke Pots, Small and Large Cal. Ammo--1967--1970.
26. Same Material Destroyed as Mentioned in 25 Above.
27. Explosive Ordnance Disposal (EOD) Operations (one time)--Smoke Pots, Broken Lots of Ammo, Flares--1960.
28. Demo Training Area.
29. Simulated "A" Bomb Test Area.
30. German and Japanese Landmine Field--WWII to present.
31. Demo Training Area.
32. Oil Sludge Burial.
33. Spring for Philadelphia Water Supply.
34. Spring for Antwerp Water Supply.
35. Oil Leaching from Unnamed Spring.

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However, draft documents of proposed procedures have been written, and will be submitted for approval after discussion with USAEHA during a radiation protection survey scheduled to start in the near future.

At present, tubes, radiacs, and dials containing small amounts of radioactive material are stored in Bldg. T-83 until disposal procedures are defined.

e. Pesticide/Herbicide/Fertilizer Usage

Pest control at FD involves the use of herbicides, insecticides, and rodenticides. The total quantities used in calendar year 1979 are listed in Table VII. These operations are covered under New York State permit No. 6-04493.

Three areas onpost are used for storage. Bldg. T-4002, with a concrete floor with floor drains that connect to the sanitary sewer, is used for both mixing and storage. Bldg. T-4011, an unheated wooden frame building with a wooden floor, is used for storage of additional materials, including ten 5-gallon (18.9 liter) metal cans of 2,4,5-T. Bldg. 4099 has a floor of railroad ballast rock and is used to store 34 drums of Naled and 6.8 kilograms (kg) of DDT.

A building is currently scheduled for renovation in order to properly store pesticides/herbicides temporarily until completion of a new facility targeted for FY 87.

DDT was used from the 1940's until the mid 1960's. The treated areas included the bivouac area, the Luray mansion locality, and some of the range firing points. In 1959-1960, the bivouac areas, the ranges in the southern half of Area 5D, and the roadsides of Route 26 and Pearl Street were sprayed with DDT. Until 1977, DDT was kept in open storage north of Bldg. 199 along First Street.

From 1969 to 1978, 2,4-D at 1.1 kg/ha was used to control vegetation along fences and 2,4,5-T at 2.2 kg/ha was used to control brush along Town Line Rd. and Russell Turnpike in the main impact area. In the late 1950's, a large quantity of herbicide (exact composition could not be determined) was sprayed from a helicopter over a site in the main impact area (2). In 1961, the Dow Chemical Company tested an experimental defoliant mixture along 2.4 km of Range Rd. (location could not be determined). No evidence of stress could be found during the ground or aerial tours. At present, Simazine is used for vegetation control.

According to interviewers, herbicide 2,4,5-T was used on the range impact areas during the 1950's thru the early 70's. The use was to improve the line of vision from observation points to target impact areas.

No records of fertilizer use onpost were found. Stabilized sludge from the sewage treatment plant is spread in the blown-sand areas in an attempt to encourage the growth of stabilizing vegetation.

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TABLE VII. PESTICIDES APPLIED IN CY 1979

<u>INSECTICIDE</u>	<u>AMOUNT OF CONCENTRATE</u>
Baygon 14% EC	4 Gal (15 liters)
Baygon 1% SLN	15 Gal (57 liters)
Diazinon 47.5% EC	3.73 Gal (14 liters)
Carbaryl 80% WP	206 Lbs (93 kg)
Lindane 1% DUS	33 Lbs (15 kg)
 <u>RODENTICIDE</u>	
Anticoagulant .025 BT	397 Lbs (180 kg)
 <u>HERBICIDE</u>	
Simazine 80% WP	371 Lbs (168 kg)

SOURCE: Fort Drum DFAE Files
1980 (DD Form 1532)

FORM 1532

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B. Disposal Operations

1. Liquid Waste Treatment

a. Sanitary Wastewater Treatment

FD's STP (3) was built in 1941 to provide primary treatment for domestic wastewater generated in the cantonment area. The original facilities included two parallel grit chambers, two comminutors, a Parshall flume, two primary clarification tanks having scum and sludge digestors, two sludge holding tanks and three sludge drying beds. The plant was upgraded in 1973 to provide secondary treatment. Added facilities were a 12,490 m³ per day (m³/day) wet well pumping station, 35.6 cm diameter main, two 2,081.8 m³/day contact stabilization and settling units, three 22.7 m³ per minute centrifugal blowers and a chlorine contact chamber. In 1974, the original primary treatment facilities were also upgraded through repair and renovation.

Design parameters for the secondary plant included average daily winter flow rate (681.3 m³/day), average daily summer flow rate (4,163.5 m³/day) and instantaneous peak flow rate (12,490.5 m³/day). The plant was designed to function as a contact stabilization plant during the high flow rates of summer and as an extended aeration plant during the low flow rates of winter (below 1,031 m³/day).

FD has an Environmental Protection Agency (EPA) permit (NPDES Permit No. NY 0026905; effective date: Aug 22, 1977, expiration date: Jun 30, 1981) that authorizes the discharge of STP effluent (Discharge 003) into the Black River. Parameters required to be monitored are total flow, biological oxygen demand (BOD), settleable solids, suspended solids (SS), phosphorus, temperature, and pH.

The STP has had a need for tertiary treatment for phosphorus removal since the NPDES permit was reissued in 1977. Plant personnel anticipate that this capability will be attained by Dec 1980.* The permit restricts concentration of phosphorus in STP effluent to 1 mg/liter. Since phosphorus monitoring began in 1977, phosphorus in the effluent has averaged 2.2 mg/liter.¹

The STP has also experienced difficulties in meeting discharge limits for BOD and SS since the NPDES permit became effective in 1974. Plant failures with respect to these parameters have been attributed in part to shock loading associated with the extreme variation in FD's population. A second factor is the high rate of groundwater/stormwater infiltration into the sewer system (estimated in 1970 to range between 757 and 1,892 m³/day depending on climatic conditions.² FD currently has projects underway to correct these deficiencies.*

*Work was completed in Jan 1981.

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Field operations involving troop training are capable of generating large volumes of sanitary wastewaters. No records are available at FD to indicate the amounts of wastewaters generated at latrines, shower points, laundry facilities water purification points, mess operations, and bakery activities. However, it has been estimated that during a summer peak usage week, 16,000 troops using 0.121 m^3 of water per day potentially could generate $1,892 \text{ m}^3$ of sanitary wastewater in the field each day.

Under a 1973 construction program, the old style pit latrines were replaced with latrine buildings equipped with water-tight, concrete holding tanks of approximately 8.5 m^3 capacity. Approximately six of the old style seepage pits remain; however, they are seldom used. Concrete tanks are pumped out regularly by a contractor who takes the wastes to a manhole near Bldg. T-2170 and discharges it into the sewer system. Latrine pits/trenches are dug for use only in remote areas or as demonstrations for construction and maintenance training. Rented portable latrines are usually employed in areas where permanent facilities are unavailable.

During the summer of AT80, five shower points (concrete pads with rock sumps) were constructed at various locations, thereby replacing the old inadequate slabs. The shower points obtain water from nearby streams. A total of six pads are now available. However, the troops generally shower in the cantonment area rather than at the permanent shower points. There is also a tendency to set up mobile shower units in the field rather than use the permanent ones. Showers are installed on raised wooden platforms equipped with rubber floors. Water is trucked in and the used water drains into staved rubber bladder holding tanks. Holding tanks are emptied by the trainees as needed and the wastewater is discharged into FD's sanitary sewer.

Mobile laundry facilities used in field operations discharge up to 1.9 m^3 per hour of wastewater into staved rubber holding tanks. Contaminants include synthetic detergents, bleaches, soaps, and clothing soil. Wastewater is taken from the holding tanks and disposed of in the sanitary sewer.

The mobile bakery is usually located in Area 4C. Wastewater, containing soap and bread ingredients, is collected in staved rubber holding tanks and discharged to the sanitary sewer as required.

Mobile water purification units take stream water and purify it only as an equipment training exercise. The purified water is not actually used for drinking. Wastewater is produced when the unit's diatomaceous earth filter is backwashed. Wastewater is held temporarily in an aboveground covered steel tank. It is subsequently pumped out and discharged to the sanitary sewer. Contaminants include diatomaceous earth particles, coagulants, inorganic silts, and organic slimes.

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Field mess operations generate some sanitary wastewater during food preparation and cleanup activities. Permanent facilities are not available for containment/treatment of field mess wastewater. It is usually dumped on the ground; occasionally, some goes into seepage pits.

b. Industrial Wastewater Treatment

Most of FD's industrial type wastewater is generated during the cleaning of wheeled and tracked vehicles at washrack facilities. There are numerous washracks located in the cantonment area, especially along Oneida Ave. (gasoline alley) and just east of Great Bend Rd. (1).

The installation obtained a New York State Pollution Discharge Elimination System Permit (SPDES NY 010 6798; effective date: Sept 1, 1979, expiration date June 30, 1981) to authorize discharges from 10 washracks to groundwaters via unlined percolation ponds or ditches. These discharges (identified as Outfalls #001 through #010) are associated with the following washracks: 1590A, 1590B, 1591, 1592, 1593, 1594, 2090, 2091, 2092, 2093, and the aircraft wash facility. The permit specifically forbids discharge of wastewater from these washracks to surface waters. Use of temporary liners in ponds/ditches to facilitate removal of oil from the wastewater via pickup by imbibitor beads has not been very successful. In addition to oil, the SPDES requires that effluent to groundwater be monitored for aluminum, arsenic, chloride, chromium, foaming agents, lead, grease, zinc, pH, and flow. An evaluation of monthly SPDES reports (June through September 1979) showed that discharge limits were exceeded for aluminum (18 times), arsenic (5 times), foaming agents (2 times), lead (18 times), oil and grease (9 times), and pH (1 time).

Construction of a centralized wheeled and tracked vehicle wash facility (4) is expected to be completed by the end of CY 80.* Wastewater will be collected in concrete vaults for solids removal. It will subsequently pass through an oil and grease separator and sand filter. All treated wastewater will be recycled so that the need for percolation ponds will be eliminated.

FD's current NPDES permit covers discharges of wastewater from tank washrack (discharge 001) and vehicle washrack (discharge 002) facilities into Pleasant Creek. Parameters required to be monitored under this permit include flow, BOD, SS, oil and grease and pH. Additionally, floating solids and visible foam are not allowed in these effluents. FD personnel no longer collect samples of washrack wastewater as it discharges to Pleasant Creek (NPDES discharges 001 and 002) and no monitoring data were available. These monitoring points will be closed out when the centralized vehicle wash facility becomes operational. However, until the new centralized wash facility proves large enough to handle the large number of vehicles, a few old washrack areas will be retained on standby status.

*Completed in Dec 80.

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Since the 1940's, only sediment traps (no seepage pits) were provided to treat wastewater from some washracks (1389, 1390, 1593, 1594, 1690, 1693, 1964, 1796, 2090.⁴ Oil and dissolved materials would have been discharged with the effluent. Tracked vehicle washracks 2091 and 2092 had sediment traps and also discharged a part of their effluents to seepage pits. No information was available on wastewater treatment at washracks 1199 and 1294.

Small volumes of other industrial type wastewaters (battery acid, boiler blowdown, antifreeze, paint water-screen, garbage can washwaters) are also generated.

Waste battery acid is disposed in the Battery Shop (Bldg. P44) by dumping it into a disposal sink that discharges directly into the sewer system. Since the mid 1960's, the New York National Guard (NYNG) has discharged its battery acid into lime pits near Bldg. 1826. During earlier NYNG operations, batteries were emptied directly onto the ground in the 1700 and 1800 areas. (This area has a sand covering over limerock.) Battery acid generated by the New Jersey National Guard was neutralized in a plastic drum. This drum was buried in the southwest corner of the 6000 area.

Boiler blowdown water is produced in one high pressure boiler located in Bldg. T-2063 (garbage can washout facility) and in numerous low pressure boilers. All boilers are treated with sodium hydroxide and sodium sulfite. The high pressure boiler also receives tannin. These chemicals are added to boilers to provide rust, corrosion and scale control. Boiler blowdown is variously disposed onto the boilerhouse floor for evaporation or subsequent discharge to the ground around the building or to floor drains that empty into the sanitary sewer.

Waste antifreeze has been discharged to the sanitary sewer via floor drains, and it has been added to waste oil in underground storage tanks.

A water curtain is used for air scrubbing in the paint spray booth (Bldg. 197). Paint is skimmed from the wastewater and sent to the sanitary landfill. The resulting wastewater is disposed in a rock sump outside the building.

Wastewater is generated at Bldg. T-2063 (5) during the cleaning of garbage cans and messhall air filters. It passes successively through a grease trap, septic tank and to one of two seepage pits. Dumpsters and garbage trucks are washed near Bldg. T-2063. Resulting wastewaters drain toward Black River; however, they are absorbed by the soil before reaching the river. By the end of FY 82, under the on-going APAP - Misc. Water Pollution Control Project, a septic tank with a series of interconnecting seepage tanks will be installed to preclude discharge to the Black River.

c. Holding Ponds

Four plastic lined holding ponds were constructed along Oneida Avenue in the washrack areas during 1979 and 1980. Vehicle washwater is held temporarily to permit oil and suspended solids removal before being discharged into adjacent percolation ponds for final disposal.

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d. Stormwater Drainage

FD's stormwater drainage system includes 67,907 linear feet (20,698 m) of vitreous tile, cast iron, vitreous clay, and reinforced concrete piping that vary from 15.2 to 121.9 cm in diameter. Stormwater is collected in various systems consisting of catch basins, manholes, paved or grassy open swales and ditches. Stormwater piping in the southern portion of the cantonment area discharges to the Black River. Other piping segments tend to discharge in a general northerly direction. Surface runoff from land near the Black River discharges to the river. Most surface runoff ends up in natural drainageways that flow northwest to the Indian River. This river drains approximately 82 percent of the installation. Stormwater runoff in the extreme northern portion of the reservation drains into several small streams which eventually discharge into the Oswegatchie River just above Gouverneur, N.Y.

There are no deliberate discharges of wastes into the stormwater drainage system. However, past discharges and spills of oil, particularly in the cantonment area, are potential sources of stormwater contamination. Landfill leachate especially from the old landfill (7), is also a potential stormwater contaminant.

2. Solid Waste Treatment

a. Sanitary Landfills

The present landfill (8) has been in operation since 1973. It is located in a level area of permeable sandy soil with very little vegetation. The trench method of landfilling is used. This landfill receives solid waste generated by messhalls, offices, barracks, maintenance shops, and the training units. It is operated under New York State Permit No. 1265.

The old landfill (7) was operated from 1940 to 1973. The site covers about 20 ha of permeable sandy soil and is divided into two cells by a deep ravine. The northern boundary of the landfill is a steep-sided ravine which has a perennial stream flowing in a westerly direction. The deep ravine dividing the landfill acts as a drainage path to the perennial stream. Discoloration of the banks of this stream has been reported.

According to persons interviewed, this landfill was used for the disposal of DDT, POL wastes, and unused ammunition, in addition to the types of refuse being put into the present landfill.

These two landfills were studied in April 1979 under a Corps of Engineers Army Pollution, Abatement Program (APAP) contract. This study showed that the depth to groundwater under the current landfill varied from 15.8 m to at least 19.8 m and that the direction of groundwater flow was probably trending westerly away from the Black River. Under the old landfill, the depth to groundwater varied from 2.7 m to 11.2 m and the flow was in a general northerly direction.

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Groundwater samples taken around the landfills were analyzed for fecal coliform bacteria, pH, specific conductance, zinc, hexavalent chromium, copper, iron, lead, chlorinated hydrocarbon pesticides, polychlorinated biphenyls (PCB), and volatile halogenated organic compounds. Samples from the current landfill violated the New York State groundwater quality standards for lead and iron. Samples from the old landfill contained excessive iron.

In 1973, a field sanitary landfill (9), located on Lake School Rd. just north of its intersection with Gormerly Rd., was closed because of water-filled trenches.

An open landfill operation (10) is located off Pearl Street Rd. Construction type debris and waste have been placed in this area since 1978. No contaminated material was reported to have been dumped in this area. Many other unauthorized landfills and dumps were observed by the team during the ground and aerial tours. It was reported that many of these dumps were a result of nearby civilian population intrusion and dumping. The post is an open post which is poorly fenced, not well posted, and easily accessible in the remote range and impact areas. The most significant dumps observed by the team are identified on Figure 8 as numbers (11) through (21).

Many of the range landfill areas contained packing crates, ammunition casings, and other military packing and shipping debris.

b. Contaminated Waste

The old sanitary landfill (7) was used for the disposal of all solid waste. This included POL-saturated solid waste (empty oil cans, oily rags, oil filters, etc.); empty containers from paints, solvents, and pesticides; and, according to some reports, excess ammunition and pesticides, including DDT.

At present, the active landfill (8) receives empty paint and solvent containers, empty pesticide cans that have been rinsed three times and crushed, and POL-saturated wastes.

Pathological wastes from the medical facility are disposed of in the incinerator in Bldg. 2415 under N.Y. State Permit No. 6-04462.

FD disposes of excess material through the DPDO at Griffiss Air Force Base, Rome, N.Y. Excess pesticides are disposed of in this manner. Waste POL is collected by private contractor and recycled. POL sludge from replaced fuel storage tanks along gasoline alley (1) was buried in a trench (32) near Evans Mills gate in the 1960's.

Nine transformers containing PCBs have been stored in Bldg. S-2005 since November 1979 awaiting disposal instructions. The floor is concrete and not bermed.

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3. Demolition and/or Burning Grounds

Ten demolition and/or burning grounds were located at FD. They are shown on Fig. 8 as numbers (22) through (31). Little migration of contaminants would be expected from these activities. Conventional ammunition and explosives (including smoke and incendiaries) were reportedly destroyed at these areas.

4. Demilitarization

The only demilitarization operations reported at FD was covered under demolition and burning grounds above. No supporting data could be found with reference to lethal or incapacitating chemical munitions.

C. Water Quality

1. Surface

The quality of FD's surface waters has been characterized in terms of known or potential contamination without reference to specific contaminants. Beaver Meadow, Buck, Deerlick, Hunter Matoon, and Shingle Creeks; Trout Brook; West Branch of Black Creek and Indian River were identified as having no known pollution. Drainage from the Main Impact Area may be introducing pollutants into Cold and Rockwell Creeks. There is a potential for agricultural pollution of Black Creek at its headwaters area. Black River (runs along the southern boundary) may receive municipal and industrial wastes upstream of FD when wastewater treatment plants fail. Bonaparte Creek is subject to potential contamination from residences around and recreational uses of Lake Bonaparte. Pleasant Creek has a high pollution potential due to contaminants (especially petroleum products) generated in the cantonment area.

All of the above streams are designated Class C streams for fishing and fish propagation.

Benton, Buck Creek Campsite, Dority, Indian and Quarry Ponds; Indian and Narrow Lakes are all characterized as having no known pollution. No information was available on the pollution susceptibility of Burnt and Marsh Ponds or Sawyer Creek.

Mud lake is susceptible to pollutants associated with residential and recreational activities at Lake Bonaparte.

St. James Lake pond is located northwest of the cantonment area. This pond is the only available facility for swimming onpost. It experienced fecal coliform pollution in the past that was attributed to the nearby bathhouse septic tank.⁹ Post personnel stated that, in the past, truck loads of brass from spent ammunition have been taken from the pond.

Spring No. 2 (33), located in Area 5D, serves as the public water supply for the Village of Philadelphia. The spring discharges 11,355 m³ of water per day. Philadelphia Reservoir, formed by damming Spring No. 2, is

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approximately 0.4 ha in size. In the past, samples of the water had a general bacterial count that ranged from 1 to 5,000 cells per ml. The reservoir is not fenced off and it is readily accessible to man and wild animals.

Three other springs located on Government property (34) supply the community of Antwerp with potable water. No problems with water quality were identified in the records.

2. Subsurface

FD's water requirements are satisfied by a well field having 12 drilled wells located around the perimeter of Wheeler-Sack Airfield on the east side of the cantonment area. (see Table VIII.³)

The well field has an estimated capacity of 15,900 m³/day. All water is pumped to the WTP (Bldg. S2067) located on Well Rd. where it is treated with chlorine, fluoride and sodium silicate. Treated water is stored in two 1,900 m³ elevated storage tanks (Bldgs. S2068, S2160) and a 2,850 m³ ground storage reservoir (Bldg. S1699). Potable water is monitored daily for chlorine and pH and monthly for coliform bacteria.

Three of the 12 water wells are drilled into sand and the others are drilled into rock. Water taken from sand deposits tends to be softer (low calcium bicarbonate type) than water from the other wells which tends to be higher in mineral content, especially magnesium sulfate.

In the summer of 1979, water samples were taken from each potable water well. Samples were also taken from Spring No. 2 (water supply for Philadelphia); a composite of waters from Springs 3, 4, and 5 (serves Antwerp) and West Creek at the installation boundary (receives water from Springs 1 and 9 and serves the town of Evans Mills). Analyses were made for pH, nitrate, chloride, total dissolved solids, specific conductance, fluoride, sulfate, total alkalinity, total hardness, arsenic, barium, cadmium, chromium, copper, lead, mercury, silver, zinc, calcium, sodium, iron, magnesium, manganese, and selenium. Analytical results indicated that these waters in general are of excellent quality.³ Water from Well No. 8 was found to be high in iron. Samples from West Creek and the components of Springs 3, 4, and 5 "apparently" (some doubt about sample preparation) were high in iron and manganese. High values indicate that concentrations of iron and manganese exceed concentration levels established under EPA's National Secondary Drinking Water Regulations. Parameters covered by these regulations are of concern primarily because of their adverse affects on aesthetic quality (appearance, color, odor, taste) rather than adverse affects on health, although they do constitute health hazards at very high concentrations.

It has been reported that for at least four years an unnamed spring(35) located approximately 152 m northwest of Petroleum Dispensing Area No. 1595 has been contaminated by oil seepage.³ Area No. 1595, located along Oneida Avenue, has several underground fuel storage tanks. In 1975, one of the tanks was determined to have a 2.5 cm diameter hole and it was

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TABLE VIII. FORT DRUM WELL DATA

Well Number	Bldg Number	Surface Elevation (feet above MSL)	Depth of Well (Feet)	Depth to Static Water Level July 1979 (Feet)
1	S2071	679	350	167
2	2072	613	111	11
3	2073	651	119	49
4	2074	685	93	42
5	2075	685	228	78
6	2076	684	119	42
7	T2080	673	107	34
8	2077	670	92	37
9	2078	650	190	60
10	2079	593	103	Artesian (flowing)
11	S2081	690	227	66
12	S2082	681	126	64

1 foot = 0.305 meters

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subsequently replaced. The drainageway from the spring is foul smelling and contaminated with petroleum products. The extent of oil contamination of the surrounding aquifer is not known. Discharge from the spring flows to St. James Pond, an onpost recreational area.

It has been reported that "a significant amount of leachate moves via the groundwater path to the toe of the slope north of the old landfill where it surfaces along a stream"⁵. This leachate has been described as orange-colored and odoriferous.

Several of the surveillance wells established at the old landfill (OL-1 through OL-5) and existing landfill (EL-1 through EL-3) were sampled in July 1979 and analyzed for pH, nitrate, chloride, total dissolved solids, specific conductance, fluoride, sulfate, total alkalinity, total hardness, arsenic, barium, cadmium chromium copper, lead, mercury, silver, zinc, calcium, sodium, iron, magnesium, manganese, and selenium. Surveillance wells OL-1, OL-2, OL-3, OL-5, EL-2, and EL-3 showed high iron and EL-2 showed elevated lead.⁶ These data have been questioned by AEHA due to sample handling deficiencies. (Metal samples were not filtered before acidification.) None of the shallow monitoring wells at either landfill is located in the known or projected down-gradient or site source direction of groundwater flow. Subsequent work by AEHA in 1979 using above surveillance wells showed that most of the wells have been dug too shallow and were dry. Of the wells that could be sampled (OL-2, OL-3, OL-4), OL-2, and OL-3 exceeded National Secondary Drinking Water Regulation limits for iron and manganese (0.3 and 0.05 mg/l, respectively).

It was reported that "Water from glacial-deposits aquifers is commonly objectionably high in iron and manganese content."

The contribution of naturally occurring iron and manganese to the quantities of these contaminants found in samples from wells OL-2 and OL-3 is unknown.

Another potential source of groundwater contamination is runoff from a large coal pile (4.5 to 7.3 million kg capacity) located in a coal yard near Bldg. T4010. Runoff accumulates in the southeastern end in a depression filled with large crushed stones and sinks into the ground. Parameters adversely affected by coal pile runoff include pH, sulfate, iron and dissolved solids. Analytical results from the assessment of coal pile runoff conducted June 1979, indicated that the NYS-DEC Effluent Standards and/or Limitations for groundwater standards were not contravened.

During 1973, a well approximately 12.8 m deep was dug by an Air Force radar detachment at FD. The well was constructed just south of Bldg. P2342 for use as a grounding well. The well was cased all the way to the limestone bedrock base. Approximately 227 kg of Epsom salt (magnesium sulfate heptahydrate) was added to the well during the summer of 1974 to improve

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conductivity. Analysis of the well water by AEHA (September and October 1974, August 1979) shows that the original high levels of magnesium, sulfate, hardness, dissolved solids and conductivity no longer exist. Present levels of well water constituents are not health hazards and do not pose a significant aquifer pollution threat.

3. NPDES Permits

FD has one National and one State of New York pollutant discharge elimination permit. They are discussed above under sanitary and industrial wastewater treatment.

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northerly direction and discharged onto the surface via a spring approximately 137 m north of the fuel tank. The tank has since been replaced.

10. Signal smokes, pyrotechnics and riot control agents are used in training operations. No records were found to indicate the use of lethal or incapacitating chemical agents at FD.

11. A dissemination test of a cereal rust disease on oats was conducted in August 1950. When the study was completed, all crops were destroyed. No effect on crops off the installation were reported from this activity. No evidence was found of any other use or storage of biological agents at FD.

12. FD has no radiological items that require the installation to have an NRC license or DA permit. No record of past rad disposal practices was found. Procedures for disposal of the tubes, radiacs and dials used in the training operations were being prepared at the time of the team's visit. Bldg. T-83 is used to store material until disposal procedures are defined.

13. Pesticides including DDT and 2,4,5-T have been used in the past. Pesticide storage buildings used do not meet present day requirements for storage of pesticides. Defoliant tests have reportedly been conducted at FD in the past. Exact range locations could not be found in FD documents.

14. Sanitary wastes at FD are treated at the post STP. The STP has experienced difficulties in meeting all discharge limits of the NPDES permit. Failures are attributed in part to shock loading associated with the extreme variation in FD population and the high rate of groundwater/stormwater infiltration into the sewer system. Projects are underway for correcting these deficiencies. During field operations, wastewaters are generated at latrines equipped with water tight concrete holding tanks. The tanks are pumped out regularly by contractor, who takes the wastes to a manhole near Bldg. T-2170 and discharges it into the sewer system.

15. The primary industrial wastewater generated at FD is from cleaning of wheeled and tracked vehicles at washracks. The NPDES permit authorized the use of unlined percolation ponds associated with the washracks. Temporary liners in ponds/ditches for removal of oil has not been successful. A new centralized wheeled and tracked vehicle washrack facility was being built at the time of the team's visit and should be operational before next summer's training exercises.

16. The records indicate that toxic waste discharges have occurred in the past into the storm drainage system. The most significant examples are: leachate from the old landfill area and oil spills in and around the cantonment area.

17. Several landfills were identified on FD. The present landfill has a New York State permit; however, it does not meet all of the EPA requirements. Attempts are being made to work with offpost communities to locate a suitable future site. The old landfill was operated from 1940-1973

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near a drainage path and perennial stream. Leachate has been reported flowing from this landfill. The landfill was reported to have been used for the disposal of pesticides (DDT), POL wastes, and unused ammunition. The depth to groundwater is reported to vary from 2.7 m to 11.2 m. This landfill has a large quantity of debris (old autos, ammo cases, and general junk) exposed on the surface. Other landfills and dumps were identified in the training range areas. Some are a result of field training operations while others appear to be a result of indiscriminate dumping by offpost private citizens. Many of these are surface dumps located in low lying areas and subject to possible leaching by surface and subsurface waters.

18. Excess materials are disposed of through the DPDO at Griffis AFB, Rome, N.Y. There are nine transformers containing PCBs stored in Bldg. S-2005 awaiting disposal instructions. The floor is concrete; however, it is not bermed. Future renovation of Bldg. S-2005 includes a berm at all door thresholds.

19. Water quality data at FD is primarily on the 12 water wells which supply potable water to FD. The quality is reported to be excellent with well No. 8 high in iron. Several springs and streams onpost are used as water supplies to nearby communities. Two communities (Philadelphia and Antwerp) outside the northwest boundary have agreements to obtain their potable water from springs which are located on FD while other communities obtain their drinking water from streams which have a portion of its watershed on FD. No problems were surfaced with respect to water quality of these springs; however, a spring located approximately 152 m northwest of Oneida Avenue was reported as contaminated with POL.³ Oil was observed seeping from this spring during the ground tour. It has been reported that the source was a result of leakage from underground fuel storage tanks along Oneida Avenue. The extent of oil contamination is not known and the flow from the spring is to St. James Pond (recreational area) and eventually to Pleasant Creek, which is a potable water supply for the community of Evans Mills. All old fuel tanks have been recently replaced. Leachate analysis of the old landfill indicated high contents of iron only. The unconfined aquifer has never been analysed to the extent to arrive at the conclusion of contamination.

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B. Conclusions

1. Available geological evidence and information on contaminant sources indicates a potential for migration of contaminants via streams and subsurface aquifers.

2. The most likely sources of contamination from a migration point of view are from storage of POL materials which includes residual from past leakage of underground tanks, past usage of pesticides, and landfills.

3. Based on the previously collected limited water quality data, primarily in the cantonment area, indications are that contaminants are migrating via the surface and initial groundwater.

4. Due to the past usage of pesticides in the Northeast Range Areas, there is a possibility that residual amounts of pesticides are present; however, a lack of sampling and analyses data precludes determining the impact of this situation on the environment.

5. ^{1,2} A potential hazard exists as a result of unrestricted access to impact areas.

6. Pesticides and PCB transformers are improperly stored.^{3,4,7}

7. There is a potential for underground leakage from POL storage tanks, due to the fact that the integrity of the tanks is not checked.^{5,6}

¹AR 385-30, Safety Color Code Markings and Signs, 19 Nov 71, Chapter 2.

²AR 385-63, Policies and Procedures, for Firing Ammunition for Training, Target Practice, and Combat, 22 Feb 78, Chapter 2.

³AR 200-1, Hazardous and Toxic Materials Management, Chapter 6.

⁴USAEHA Entomology Special Study No. 99-045-75/76: Criteria for Design of a Pest Control Shop, Pesticide Storage and Mixing Facility.

⁵CFR-Title 40-112, Oil Pollution Prevention.

⁶AR 200-1, Chapter 9, Oil and Hazardous Substances Spill Control and Contingency Plans.

⁷CFR-Title 40-761, Polychlorinated Biphenyls (PCB's) Manufacturing, Processing, Distribution, In Commerce, and Use Prohibitions.

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