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**Preliminary Assessment Report for
Grubbs/Kyle Training Center,
Smyrna/Rutherford County Regional Airport,
Installation 47340,
Smyrna, Tennessee**

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Acronyms

AASF	Army Aviation Support Facility
AEC	Army Environmental Center
ARM	armory
ARNG	Army National Guard
ATF	armory-type function
bgl	below ground level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	U.S. Department of Defense
DRMO	Defense Reutilization Marketing Organization
EPA	U.S. Environmental Protection Agency
ESO	environmentally significant operation
FISP	Facility Inventory and Stationing Plan
gpm	gallons per minute
IRP	Installation Restoration Program
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MID	Mixed Industrial Debris
NGB	National Guard Bureau
OMS	Organizational Maintenance Shop
PA	preliminary assessment
STP	Sewage Treatment Plant
TNARNG	Tennessee Army National Guard
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UST	underground storage tank

**Preliminary Assessment Report for
Grubbs/Kyle Training Center,
Smyrna/Rutherford County Regional Airport,
Installation 47340,
Smyrna, Tennessee**

Summary

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Tennessee Army National Guard (TNARNG) property near Smyrna, Tennessee. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Grubbs/Kyle Training Center property, the requirement of the Department of Defense Installation Restoration Program.

Grubbs/Kyle Training Center is an approximately 852-acre site located in Smyrna, Tennessee at the Smyrna/Rutherford County Regional Airport. Smyrna is located in the central portion of Tennessee in the county of Rutherford about 12 mi southeast of Nashville, which is the State capital. The cantonment area of Grubbs/Kyle Training Center, which consists of 55 buildings, is situated on approximately 70 acres, and 782 acres are used for field training. By agreement with the State, an additional 1,500 acres of adjacent publicly owned land are available to TNARNG for use during field exercises. The TNARNG Army Aviation Support Facility #1, which consists of a flight operations building, a control tower, hangars, and approximately 480,000 ft² of helipad, is central to operations at Grubbs/Kyle Training Center.

Grubbs/Kyle Training Center is one portion of the former Sewart Air Force Base; the greater portion of the property is now used as the Smyrna/Rutherford County Regional Airport. The TNARNG facilities included in this PA are (1) the Army Aviation Support Facility #1, (2) the Organizational Maintenance Shop #16, and (3) the former Sewage Treatment Plant Landfill and the adjacent (now dismantled) Sewage Treatment Plant. The environmentally significant operations associated with the property are (1) storage of hazardous materials and

hazardous waste, (2) storage and dispensing of fuel, (3) washing of vehicles and equipment, (4) release of untreated storm drainage, and (5) landfill disposal of hazardous waste.

The review of both historical and current practices at the property indicates that the Grubbs/Kyle Training Center property and the adjacent property pose a potential risk to human health and the environment. Of primary concern is the potential for hazardous waste, which is present on and near the TNARNG property as a result of past and current operations, to migrate beyond the property boundary to the J. Percy Priest Reservoir and Wildlife Management Area. The U.S. Army Corps of Engineers, Nashville District, initiated an evaluation of groundwater contamination at the former Sewart Air Force Base. The initial sampling performed as part of that investigation, which included surface soil, subsurface soil, and groundwater sampling on portions of the property currently used by TNARNG, confirmed soil and groundwater contamination. Additional expanded sampling that includes surface water and surface soil sampling along drainage pathways from the TNARNG property is warranted to determine the potential for migration of contaminants into areas where human health or the environment is threatened. Collection of biological samples of fish and water fowl in Stewart Creek at the perimeter of the Sewage Treatment Plant Landfill is recommended to determine whether bioaccumulation of contaminants measured at that location has occurred. Erosion of the STP Landfill surface has uncovered formerly buried debris. Installation of additional fencing is recommended to prevent unauthorized entry to this area.

1 Introduction

This document is a report of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Tennessee Army National Guard (TNARNG) property known as Grubbs/Kyle Training Center, located in Smyrna, Tennessee.

1.1 Authority for the Preliminary Assessment

The Army National Guard Bureau (NGB), Army Directorate, engaged Argonne to perform PAs of selected Army National Guard (ARNG) properties. These assessments are being done in a manner consistent with both the U.S. Department of Defense (DoD) Installation Restoration Program (IRP) and the U.S. Environmental Protection Agency's (EPA's) Potential Hazardous Waste Site Preliminary Assessment Guidance. Preliminary assessments of ARNG properties are conducted under the authority and direction of the IRP; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or, more commonly, Superfund); and the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499).

1.2 Objectives

This PA report is based on existing information from the TNARNG records that were made available to Argonne investigators and from other sources. Although this PA effort did not extend to the generation of new data, it nonetheless identifies areas where existing data are incomplete, unreliable, or ambiguous and recommends ways to address such shortcomings.

The objectives of the PA are to satisfy the requirements of the IRP and to

- Identify and characterize the environmentally significant operations (ESOs),
- Identify property areas or ESOs that may require a site investigation,
- Identify ESOs or areas of environmental contamination that may require immediate removal,
- Identify properties for which no further action is needed, and

- Provide information sufficient to prescore the site with the EPA's PA Scoresheets (September 1991).

1.3 Procedures

The PA began with a review of files located at TNARNG Headquarters in Nashville, Tennessee, on February 22, 1993. A site visit was conducted on February 23-24, 1993, to obtain additional information through direct observation and interviews with personnel familiar with the property and its operations. Other relevant information was obtained on February 22, 1993, from the U.S. Army Corps of Engineers (USACE) in Nashville, Tennessee, and on February 23, 1993, from the U.S. Geological Survey (USGS) Nashville Office and the State Department of Environment and Conservation.

1.4 Report Format

This PA report presents a summary and evaluation of the data relevant to the PA for this property. Section 2 describes the property and its surrounding environment and land uses. Section 3 identifies and characterizes the ESOs at the site. Section 4 discusses known and suspected releases to the environment, and Section 5 discusses potential human and environmental receptors for such releases. Section 6 summarizes the findings and conclusions, discusses the quality and reliability of the supporting information, identifies areas requiring further action, and (as appropriate) suggests how such actions can be accomplished. Section 7 lists pertinent materials reviewed. The Appendix gives interview information.

2 Property Characterization

2.1 General Property Information

Grubbs/Kyle Training Center is a major training site for National Guard units located in Tennessee, as well as a regional support center for the U.S. Army Reserve (TNARNG 1989). Six training areas provide facilities for individual and collective training in small arms live fire; tactical maneuver training for platoon, company, squadron, and battalion size elements; and integrated training for aviation, infantry, and armor units. The Tennessee Military Academy provides facilities to maintain military education requirements established by the Active Army and NGB. Figure 1 shows the general location of Grubbs/Kyle Training Center, and Table 1 lists pertinent information about the property.

The TNARNG Army Aviation Support Facility #1, which consists of a flight operations building, a control tower, hangars, and approximately 480,000 ft² of helipad, is central to operations at Grubbs/Kyle Training Center. Organizational Maintenance Shop #16 provides a motor pool and a maintenance and service center for vehicles assigned to the unit.

2.2 Description of Facilities

Grubbs/Kyle Training Center contains approximately 852 acres, of which 782 acres are available for field training exercises (TNARNG 1992d). Approximately 70 acres are used for the cantonment area, which consists of 55 buildings. By agreement with the State, an additional 1,500 acres of publicly owned land adjacent to the site are available for use during special field training exercises. Figure 2 identifies the existing boundary of Grubbs/Kyle Training Center and the adjacent property, and Figure 3 details the cantonment area.

2.2.1 Armory

Both a federally owned and a State-owned armory are located on-site. Seven buildings constructed between 1942 and 1960 house a federally owned armory licensed to the State of Tennessee (NGB 1984). Building 640 contains 27,290 ft², and Building 638 contains 24,369 ft². Five other buildings (536, 600, 549, 557, and 601) designated under the Facility

FIGURE 1 General Location of Grubbs/Kyle Training Center (Source: Adapted from USGS 1975, 1983a, 1983b, 1984)

TABLE 1 Identifying Information for Grubbs/Kyle Training Center

Installation address	Grubbs/Kyle Training Center Building 603 Smyrna, Tennessee 37167-2091
Geographic location	
Latitude	36° 01' N
Longitude	86° 31' W
Section	Not applicable in this geographic region
Township and range	Not applicable in this geographic region
FISP ^a installation number	47340
Commander	LTC Pete Peterson
Types of facilities	Armory Army Aviation Support Facility Army Aviation Training Site Organizational Maintenance Shop Tennessee Military Academy
License information	Federally owned, licensed to the state of Tennessee
Principal contact	Major Dan Fulkerson (615) 532-5006

^a Facility Inventory and Stationing Plan.

Inventory and Stationing Plan (FISP) as an armory (ARM) or an armory-type function (ATF) together contain 9,172 ft². The State armory is housed in eight buildings (NGB 1984). Building 510, which is State-owned and was constructed in 1984, contains 33,754 ft². Seven additional buildings (568, 569, 572, 306, 307, 308, and 309) constructed in 1942 as part of the former Sewart Air Force Base are leased by the State and together comprise a total of 37,372 ft².

2.2.2 Tennessee Military Academy

The Tennessee Military Academy houses the Officer Candidate School and provides facilities for training in leadership development and related courses; nuclear, biological, and chemical defense training; and Army training management (TNARNG 1989). Approximately 4,250 man-days of training per year are provided by the Tennessee Military Academy (Dennis

FIGURE 2 Grubbs/Kyle Training Center and Adjacent Property (Source: Adapted from TNARNG 1992d)

FIGURE 3 Grubbs/Kyle Training Center Cantonment Area (Source: TNARNG 1992c)

1993). Four buildings at Grubbs/Kyle Training Center are designated for training purposes (NGB 1984). Building 500 was constructed in 1959 and has 19,826 ft² of training space. Buildings 552, 606, and 607 were constructed in 1942 and together comprise 13,575 ft² of training space. Each of these buildings is federally owned and licensed to the State.

2.2.3 Housing

Housing, administrative, supply, and dining facilities dating from 1942 are available for approximately 800 troops at Grubbs/Kyle Training Center (TNARNG 1989). Housing includes 10 barracks currently designated for enlisted men, 3 barracks for women, and 1 bachelor officer quarters (NGB 1984). Two dining facilities, a swimming pool and other recreational areas, and a dispensary (without beds) are also available. Some facilities are federally owned and leased to the State; others are State owned.

2.2.4 Army Aviation Support Facility #1

Army Aviation Support Facility #1 (AASF #1), located in the southern portion of Grubbs/Kyle Training Center (Figure 3), provides facilities for maintenance of the 61 rotary and 1 fixed-wing aircraft assigned to the unit. Operations performed in and around the Building 681 shop (10,500 ft²), the Building 682/683 hanger (48,650 ft²), and the adjacent support buildings include general aircraft maintenance, aircraft washing, and aircraft fueling. Aircraft maintenance activities include fluid changes (i.e., oil, transmission fluid, and antifreeze); filter changes (i.e., gas, oil, air, and transmission filters); brake repair; lubrication, grease, and repair of axles and drive trains; engine repair and cleaning; body repair; welding; and minor spot painting (TNARNG 1992a).

The AASF #1 is a full-time facility manned by TNARNG personnel. Figure 4 depicts the Building 682/683 hanger and the adjacent support buildings. Minor quantities of hazardous materials, such as lubricating oils and solvents used for aircraft maintenance activities, are typically brought into the hangar work areas as required. The majority of these materials are stored in designated storage buildings or in storage areas adjacent to the work bays. Table 2 lists the hazardous materials typically present in the buildings that comprise AASF #1, as inventoried in the current Installation Spill Contingency Plan for the facility (TNARNG 1992a).

FIGURE 4 Vicinity of Army Aviation Support Facility #1 (Source: TNARNG 1992a)

TABLE 2 Army Aviation Support Facility #1 Workplace Chemical List

Trade Name/Nomenclature	Supply Number	Size/Type of Container	Number of Containers	Location
Electrical Repair Shop - Building 688				
Paint	Various	13-oz spray	12	Flammable storage cab.
Paint		1-gal metal	12	Flammable storage cab.
Denatured alcohol		1-qt metal	3	Flammable storage cab.
Freezing compound		12-oz spray	12	Flammable storage cab.
Brake fluid		1-gal plastic	1	Flammable storage cab.
Tin alloy solder		1-lb metal	10	Flammable storage cab.
Alloy solder flux				Flammable storage cab.
Ocean blue bowl		1-qt plastic	2	Janitor storage
Corrosion preventative compound				Shop area
Silicone				Shop area
Nickel Cadmium Battery Shop - Building 669				
Sulfuric acid		1-gal plastic		Battery shop
Maintenance Building - Building 682 (south)				
Waste hydraulic oil		55-gal drum	1	Storage shed
Waste turbine oil		55-gal drum	1	Storage shed
Waste solvent		55-gal drum	1	Storage shed
Waste oil		55-gal drum	1	Storage shed
Turbine engine cleaner		55-gal drum	1	Storage shed
Grease		tubes	48	Flammable storage cab.
Grease		1-lb metal	3	Flammable storage cab.
Hydraulic oil		5-gal metal	1	Flammable storage cab.
Hydraulic fluid		1-qt metal	25	Flammable storage cab.
Paint		12-oz spray	30	Flammable storage cab.
Corrosion preventative compound		12-oz metal	3	Flammable storage cab.
Paint	Various	1-gal metal	8	Flammable storage cab.
Sealing compound			12	Flammable storage cab.
CLP		1-gal plastic	1	Shop area
Curing cement		1-qt metal	1	Shop area
Layout dye		1-pt metal	5	Shop area
Break free		1-gal plastic	2	Shop area
Lube oil		8-oz metal	48	Shop area
Cleaner, GP		1-gal plastic	4	Shop area

TABLE 2 (Cont.)

Trade Name/Nomenclature	Supply Number	Size/Type of Container	Number of Containers	Location
Engine Shop				
Alodine				Shop area
Silicone sealant				Shop area
Two part glue				Shop area
Rubber solution				Shop area
Dexter hysol				Shop area
Polysulfide sealant				Shop area
Epoxy resin				Shop area
Zorb-all				Shop area
Citrikleen		5-gal metal	1	Shop area
Paint	Various	13-oz spray	20	Shop area
Maintenance Building - Building 682 (north)				
Dracon pesticide		1-gal metal	1	
Epoxy glue				
Paint		13-oz spray	18	
Sealing compound		1-pt metal	5	
Paint	Various	1-gal metal	4	
Lacquer thinner		1-gal metal	1	
Grease		1-lb metal	3	
Break free		1-gal plastic	1	
Hydraulic fluid		1-qt metal	12	
Lube oil		1-qt metal	12	
Waste hydraulic fluid		5-gal metal	1	
Aircraft soap		35-gal metal	1	
WTR grease		5-gal metal	1	
Detergent		1-gal plastic	1	Janitor closet
Building 681				
Engine cleaning compound				
Paint	Various	13-oz spray	12	
Aircraft soap		1-gal		
Hysol				
Break free				
Engine cleaner				
Lube oil		1-qt metal	24	
Hydraulic fluid		1-qt metal	4	
Grease		tubes	20	
Break free		1-gal plastic	1	
Waste turbine oil		5-gal metal	1	

TABLE 2 (Cont.)

Trade Name/Nomenclature	Supply Number	Size/Type of Container	Number of Containers	Location
Paint and Oil Storage Building - Building 684				
Paint	Various	13-oz spray	50	Paint storage
Corrosion preventative			20	Paint storage
Gas-cleaning comp.		5-gal metal	5	Paint storage
Paint	Various	1-gal metal	13	Paint storage
Citrikleen		55-gal drum	1	Oil storage
Turbine engine cleaner		55-gal metal	1	Oil storage
Turbine oil				Oil storage
Lacquer thinner		5-gal metal	2	Oil storage
Hydraulic fluid				Oil storage
LOTR aircraft grease				Oil storage
Grease				Oil storage
CPT cleaner				Oil storage
Lube oil				
Hydraulic fluid				Oil storage

Figure 5 shows the designated hazardous materials storage areas located at the southern end of the Building 682/683 hangar. An open-air shed with a concrete floor and no sidewalls is located outside the southern end of the building. This shed is currently used to store drummed waste fluids, although a recently delivered closed shed is to be used for such storage. Waste washwater is stored in a 6,000-gal UST located between Building 681 and the Building 682/683 hangar (Dennis 1993).

Building 684 is used primarily for storage of new oils and paints. A 6-in. concrete curb poured at the doorway to the oil storage area of the structure provides temporary containment (TNARNG 1992a). Building 669, the battery storage building, has concrete block walls and a concrete floor. Building 668 is used primarily for maintenance and development of electrical equipment that supports the activities in the hangar area. Little liquid or hazardous storage occurs within this building.

Aviation fuel (JP-4) is stored at this facility in three 10,000-gal underground storage tanks (USTs), which are identified as TN0750010. The single-wall tanks are 15 years old and are constructed of fiberglass. Hydrostatic testing performed in 1992 indicated no leakage (Dennis

FIGURE 5 Army Aviation Support Facility #1, Building 683, Hazardous Materials Storage Areas (Source: TNARNG 1992a)

1993). The USTs and the associated fuel dispensing island are located at Building 645, which is north of Building 681 (Figure 3). In addition to underground storage of fuel, two 2,400-gal tankers are assigned to AASF #1, one of which is typically loaded with JP-4 aviation fuel. Fuel is also stored in the fuel tank of each aircraft. Normal throughput of fuel at this facility is 15,000 gal/month of JP-4 (TNARNG 1992a). A throughput of 15,000 gal/month of diesel fuel at AASF #1, which was reported in the Spill Prevention Control and Countermeasure Plan for this facility, could not be verified at the time of this PA (TNARNG 1992a).

2.2.5 Organizational Maintenance Shop #16

Organizational Maintenance Shop #16 (OMS #16) provides facilities for maintenance of wheeled and tracked vehicles assigned to the unit. Operations performed in and around the Building 639 shop (9,673 ft²) include general vehicle maintenance, vehicle and equipment washing, and vehicle fueling. Vehicle maintenance activities include fluid changes (i.e., oil, transmission fluid, and antifreeze), filter changes (i.e., gas, oil, air, and transmission filters), brake repair, lubrication of the axles and drive trains, battery changes, tire repair and replacement, minor engine repair, minor transmission repair, electronic repair, minor welding, minor body repair, and minor spot painting (TNARNG 1992b).

Building 639, constructed in 1960, is located at the northern end of the Grubbs/Kyle Training Center cantonment area (Figure 3). Figure 6 depicts the vicinity of OMS #16, while Figure 7 provides a detailed view of Building 639. Hazardous materials, such as lubricating oils and solvents, are used for vehicle maintenance activities performed at OMS #16. Table 3 lists the hazardous materials required as part of OMS #16 operations, as inventoried in the current Installation Spill Contingency Plan for the facility (TNARNG 1992b). Small quantities of these materials are brought into the work bays as required. An oil storage room (for new product), a paint storage room, and a battery storage room are located within the OMS. Each room has a concrete floor and concrete masonry sidewalls (TNARNG 1992b).

A standard military-issue building with a concrete floor, located north of Building 639, is used for storage of hazardous waste fluids. As small quantities of waste fluids, such as used motor oil and transmission fluid, are generated in the work bays, they are transferred and accumulated in 55-gal drums inside the storage building. French drains are located along the walls to contain possible spills. The area adjacent to the storage building was formerly used to accumulate waste fluids and to store the drums prior to disposal.

FIGURE 6 Vicinity of Organizational Maintenance Shop #16 (Source: TNARNG 1992b)

FIGURE 7 Organizational Maintenance Shop #16, Building 639, Hazardous Materials Storage Areas (Source: TNARNG 1992b)

TABLE 3 Organizational Maintenance Shop #16 Workplace Chemical List

Trade Name/ Nomenclature	Supply Number	Size/Type of Container	Number of Containers	Location
Grease	9150-01-035-5393	5-gal metal	24	Oil storage
90W gear oil	9150-01-035-5393	5-gal metal	54	Oil storage
Xylene	6810-00-584-4070	5-gal metal	2	Oil storage
15W/40 oil	9150-01-178-4725	1-qt metal	100	Oil storage
Grease	9150-00-257-5358	tubes-plastic	50	Oil storage
Hydraulic fluid	9150-00-698-2382	1-qt metal	20	Oil storage
Paint	Various	13-oz spray	20	Oil storage
Paint	Various	1-gal metal	32	Paint storage
Varnish		1-gal metal	1	Paint storage
Canvas coating	8030-00-281-2346	1-gal metal	4	Paint storage
Icing inhibitor	6850-00-753-7415	5-gal metal	3	Paint storage
Alcohol	6810-00-543-7415	1-gal metal	1	Paint storage
Denatured alcohol	6810-00-205-6786	1-qt metal	20	Paint storage
Protective coating	9150-00-838-7789	1-qt metal	13	Paint storage
Paint	Various	1-qt metal	16	Paint storage
Carburetor cleaner		13-oz spray	2	Paint storage
Paint	Various	13-oz spray	45	Paint storage
Starter fluid	2910-01-128-9537	10.5-oz metal	10	Paint storage
Waste oil		35-gal drum	2	Shop area
15W/40 oil	9150-01-152-4119	55-gal drum	2	Shop area
Paint	Various	1-gal metal	13	Flammable storage cab.
Dope, thinner, and lacquer	8010-00-160-5788	5-gal metal	1	Flammable storage cab.
Brake fluid	9150-01-102-9455	1-gal plastic	5	Flammable storage cab.
Sulfuric acid	6810-00-249-9354	1-gal plastic	80	Battery room

Diesel fuel and unleaded gasoline are stored at this facility in two 5,000-gal USTs, which are identified as TN0750265. The single-wall tanks are 16 years old and are constructed of fiberglass. Hydrostatic testing performed in 1992 indicated no leakage (Dennis 1993). The USTs and the associated fuel dispensing island are located southeast of Building 639. Additional fuel is stored in the fuel tank of each vehicle. The fenced, gravel-covered motor pool is located south of Building 639. Normal throughput of fuel at this facility is 1,000 gal of diesel fuel and 300 gal of gasoline per month (TNARNG 1992b).

2.2.6 Training Range

Grubbs/Kyle Training Center is a major training site for National Guard units located in Tennessee, as well as a support center for the U.S. Army Reserve. Presently, 782 acres are

available for field training and, by agreement with the State, an additional 1,500 acres of adjacent lands are available for use during special training exercises. Weekend and annual infantry and aviation training is provided at this facility. Nonfiring maneuver areas are available for platoon and company-size exercises. Joint use areas are available for use by the civilian sector when such activities do not interfere with military training. The 25M pistol range and the M-60 and 25M rifle ranges have recently been upgraded with berms to safeguard against adverse affects to the surrounding community (TNARNG 1989). Plans are underway to upgrade a training lake for bridging operations for engineer units, as well as two quarry sites for training of engineer units.

2.3 Property History

In 1941, the Army Air Corps selected middle Tennessee as a location for one of its air bases. The site selected was near the small town of Smyrna, Tennessee. Construction of the air base began in March 1942, with the first troops arriving in June. In July 1942, the air base was formally opened as Smyrna Army Air Base. By January 1943, Smyrna Army Air Base had established seven school squadrons to provide both combat crew and flight training. Enlisted strength for the combat crew school rose from 540 in June 1942 to 4,800 in December 1942. Officer strength rose from 48 to 111 during the same period.

In March 1950, Smyrna Army Air Base was dedicated as Sewart Air Force Base in honor of Major Allen J. Sewart, Jr. Major Sewart, a resident of Murfreesboro and Nashville, Tennessee, was killed in aerial combat over the Soloman Islands in 1942. The DoD announced the phaseout of Sewart Air Force Base in early 1966, and from that point until July 1970 only required and immediate maintenance was performed at the site.

In July 1970, TNARNG acquired approximately 70 acres of the property, including approximately 38 buildings. Over a period of years the training area available to TNARNG has increased to approximately 1,700 acres.

In November 1984, the Smyrna Training Site was dedicated as Grubbs/Kyle Training Center in honor of Captain Douglas E. Grubbs and Major Sam M. Kyle. Captain Grubbs, a native of Nashville, Tennessee, was the supervisor of light aviation operations and maintenance for the National Guard when he was killed during a flight training mission on May 13, 1954. Major Kyle, a native of Lebanon, Tennessee, was killed in July 1984 when his National Guard helicopter crashed while he was participating in a search for prison escapees near Only, Tennessee.

2.4 Permitting Status

Grubbs/Kyle Training Center operates under a special industrial users permit issued by the town of Smyrna. Under this agreement, Grubbs/Kyle Training Center is required to submit a monthly report concerning the status of waste water flow discharged into the sewer system in Smyrna. Additionally, Grubbs/Kyle Training Center is required to report the frequency and method of grease removal from all grease traps (or oil-water separators) located within its sewer system (Morgan 1990).

2.5 Surrounding Environment and Land Use

2.5.1 Demographics and Land Use

Smyrna is located in the northwestern portion of Rutherford County approximately 12 mi southeast of the city of Nashville, which is the capital of Tennessee. Rutherford County is part of the Nashville Standard Metropolitan Statistical Area and exhibits an urbanizing growth pattern. Smyrna has a population of 13,647. LaVergne, with a population of 7,499, is located northwest of Smyrna approximately 2 mi west of the regional airport and the TNARNG facilities. Murfreesboro, which is the Rutherford County seat, is located approximately 7 mi southeast of Smyrna. It has a population of 44,922. The total population of Rutherford County is 118,570 (U.S. Bureau of the Census, as cited in Rand McNally 1992).

Grubbs/Kyle Training Center cantonment area is located in the northeastern portion of the Smyrna/Rutherford County Regional Airport, with the majority of the TNARNG property (the mostly undeveloped training areas) extending north and east of the airport boundary into the J. Percy Priest Reservoir and Wildlife Management Area (Figure 2). Smyrna is located south of the airport. Approximately 175 TNARNG personnel are assigned to Grubbs/Kyle Training Center during normal operations, although this number increases during annual training exercises. More than 300 civilian workers are estimated to be present at the airport and in the various aircraft or distribution businesses located at or in the vicinity of the airport. The worker population within a radius of 1 mi of the TNARNG property is approximately 500 persons. Smyrna is located south of the airport and LaVergne is located to the west (Figure 1). Approximately 50% of the Smyrna population (6,823 persons) lives within a radius of 1-2 mi south of the TNARNG property. Approximately 25% of the Smyrna population (3,412 persons) and 25% of the LaVergne population (1,875 persons) live within a radius of 2-3 mi south and west of the TNARNG

property. An additional 25% of the Smyrna population (3,412 persons) and 25% of the LaVergne population (1,875 persons) live within a radius of 3-4 mi south and west of the TNARNG property.

Smyrna and the surrounding area are rich in Civil War history. Smyrna is the birthplace of Sam Davis, one of the greatest heroes of the Civil War, who was tried and convicted as a spy at the age of 19 for refusing to divulge information concerning Confederate forces. In 1927, Congress established the National Military Park, located 6 mi from the Smyrna Air Base, to commemorate the Battle of Stones River. The Battle of Stones River, which is sometimes referred to as Murfreesboro, is considered one of the bloodiest in the Civil War. Losses on both sides were enormous. Casualties were estimated at 13,000 for the Union side and 12,000 for Confederate forces. A National Cemetery that contains the graves of almost 6,000 Union soldiers is located within this park (approximately 2,000 of which are unknown dead).

2.5.2 Climate

The climate of central Tennessee is classified as moderate continental, and the area escapes the extremes of temperature and precipitation characteristic of many interior continental areas (USACE 1987). Temperatures average near 60°F and rarely exceed 100°F in the summer or drop below 0°F in the winter. January is the coldest month, with an average temperature of approximately 41°F, and July is the hottest month, with an average temperature of 80°F. In central Tennessee, precipitation occurs approximately 120 days per year, with an annual average precipitation of 48 in. The summer months are characterized by long periods of drought intermittently broken by heavy thunderstorms. Heaviest rainfall occurs in winter and early spring. Snowfall, which seldom remains on the ground for more than a few days at a time, averages 8 in./year.

2.5.3 Surface Water and Physiography

The following sections describe the local and regional surface hydrology and physiography.

2.5.3.1 Physiography

Smyrna is located near the center of the Nashville Basin, or Central Basin, subdivision of the Interior Lowlands Plateau Physiographic Province. Figure 8 identifies the major physiographic provinces of Tennessee. The Central Basin is an oval-shaped surface depression approximately 120 mi across in the north-south direction and 60 mi across in the east-west direction. Land surface elevations in the Central Basin range from 450 ft to around 850 ft above mean sea level (MSL). Land surface elevations at Grubbs/Kyle Training Center and the adjacent airport property are generally in the 490-550 ft range (DoD 1960). The topography at the site is generally flat to gently undulating with a slope from west to east toward Stewart Creek.

2.5.3.2 Soils

The U.S Department of Agriculture (USDA) Soil Conservation Service has identified two principal soil types in the Grubbs/Kyle Training Center area: the Bradyville-Urban land complex and the Arrington silt loam (USDA 1977).

The Bradyville-Urban land complex consists of artificial fill material and disturbed soil. The Bradyville silt loam can be found in undisturbed areas. The Bradyville is a well-drained, deep soil that has formed in old alluvium or in mixed loess and alluvium, as well as in the underlying clayey residuum weathered from limestone.

The Arrington silt loam is a well-drained, loamy soil found on floodplains, along drainageways, and in shallow depressions. The soil is formed in recently deposited sediments washed from soils derived predominantly from limestone residuum.

2.5.3.3 Surface Hydrology

The region is drained by a network of streams that flow in a generally north-northwest direction into the J. Percy Priest Reservoir, which was formed by damming the Stones River (Figure 9). Downgradient of the dam, the Stones River empties into the Cumberland River. Stewart Creek and the East Fork, Middle Fork, and West Fork of the Stones River are the major streams draining the area. The Middle Fork joins the West Fork a few miles southwest of

FIGURE 8 Major Physiographic Provinces of Tennessee (Source: Adapted from Fenneman 1964)

FIGURE 9 Location of Regional Surface Waters (Source: USACE 1978)

Murfreesboro. The West Fork, in turn, joins the East Fork about 10 mi northwest of Murfreesboro. Stewart Creek flows into the Stones River a few miles downstream from the confluence of the East Fork and West Fork. Numerous smaller tributaries feed each of the four major streams. The largest tributaries are Overall Creek, Pucketts Creek, and Lytle Creek, which join the West Fork; and Cripple Creek and Bradley Creek, which join the East Fork.

Stewart Creek and the J. Percy Priest Reservoir are the only major surface water bodies within a 15-mi radius of Grubbs/Kyle Training Center that are likely to be affected by contamination at the site (TNARNG 1987). The Grubbs/Kyle Training Center is bisected by Stewart Creek, and virtually all surface drainage from the facility and the surrounding airport complex flows into Stewart Creek. Stewart Creek flows north-northwest into the J. Percy Priest Reservoir. The reservoir extends the full length of Stones River above the dam (22 mi) and approximately 10 mi and 6 mi up the East Fork and West Fork of the Stones River, respectively. Overland runoff is generally greatest during the wettest months of January through March, when flooding of portions of the TNARNG-licensed property — including the location of the Sewage Treatment Plant (STP) Landfill— is common. As shown in Figure 10, a portion of the TNARNG cantonment area is within the 100-year flood plain.

2.5.4 Groundwater and Hydrogeology

The following sections describe the local and regional geology and groundwater.

2.5.4.1 Regional Geology

The rocks of the Central Basin are almost entirely limestones of Ordovician age. The Central Basin is the result of the erosion of a low structural dome with a crest in southern Rutherford County. The dome represents the southern end of the Cincinnati Arch, which is an elongated area of upwarped rocks extending northward through Central Kentucky into Ohio and Indiana (Newcome 1958). During upwarping and doming the rocks at the crest of the dome were stretched, resulting in the formation of joints. The weakened carbonate rocks were readily subjected to solution and erosion, which formed the topographic basin that now occupies the top of the structural dome.

FIGURE 10 Stewart Creek Flood Line (100 year) in the Grubbs/Kyle Training Center Cantonment Area (Source: Adapted from TNARNG 1985)

Although jointing is a prominent feature of the Central Basin rocks, there is little evidence of differential movement along the joints. The formations lie in the same relative positions in which they were deposited. Minor folding of the rocks is not unusual, but it is of a local nature only.

2.5.4.2 Local Geology

Grubbs/Kyle Training Center is located predominantly within the outcrop area of the Ridley Formation, which is of Ordovician age, or about 450 million years old. The Ridley Formation is described as a brownish-gray to yellowish-brown, cryptocrystalline to very fine grain limestone. Some coarse grained beds are present. It has minor amounts of magnesium limestone and thin lenses of chert locally. The bedding is medium to thick with a 10-ft-thick shaley zone near the base. Total thickness of the formation is about 100 ft. The Lebanon Limestone occurs above the Ridley Formation on the higher ground to the west of the airfield. This medium-gray to medium-dark gray rock is similar in texture to the Ridley Formation, except that it is fossiliferous in places and contains more shale partings. The thickness varies from 50 to 110 ft, with some exceptions resulting from strong local dip. The depth to bedrock in the Grubbs/Kyle Training Center area is typically in the range of 5-20 ft (USACE 1992a).

2.5.4.3 Regional Groundwater

Groundwater in the Central Basin of Tennessee occurs chiefly in solution channels in limestones of Ordovician age. Wells in the Central Basin are of low yield, with few of them furnishing more than 20 gallons per minute (gpm) and many yielding less than 1 gpm. About 20% of the wells that are drilled fail to yield water (Newcome 1958).

The solution channels, where most of the groundwater occurs, form as downward infiltrating water that is rich in carbonic and organic acids, both of which are natural degradation products. The infiltrating water travels along joints and bedding planes in the limestone bedrock, while constantly dissolving the limestone. This process of dissolution over a long period of time results in the network of water-carrying subterranean channels that are common in limestone regions. The composition of the rocks greatly affects the rate of solution. Generally, the purer limestones are more easily dissolved. In most places in the Central Basin substantial solution has not progressed beyond a depth of 300 ft (Newcome 1958).

The Ridley limestone is the principal aquifer in the Smyrna area. It is the purest limestone in the Central Basin, with an average content of insoluble material of only 5% (Newcome 1958). The large area exposures and the chemical purity of the rock afford favorable conditions for the development of solution channels. Water from the Ridley limestone is usually potable, although a detectable odor of hydrogen sulfide occurs in more than 30% of the wells that yield water from the formation (Newcome 1958).

2.5.4.4 Local Groundwater

At Grubbs/Kyle Training Center, depth to groundwater ranges from only 2-3 ft near Stewart Creek to as much as 40 ft at higher elevations. During a recent U.S. Army Corps of Engineers investigation at the landfills adjacent to Stewart Creek, depth to groundwater in three of the wells installed ranged from 2.4 to 6.6 ft. The static water elevations in these three wells indicate that groundwater near the creek generally flows in a northerly direction toward the reservoir, roughly parallel to the axis of the creek. A fourth well installed during the investigation had a static water level at a depth of 26.3 ft, or an elevation of 473.46 — approximately 17 ft lower than the static groundwater elevation in the other three wells (USACE 1992a). This anomalous static water level elevation combined with the very low yield of the well suggests that the well does not intercept a solution channel and probably is not in direct hydraulic connection with the main aquifer. Consequently, data from that well were not used to evaluate the groundwater flow direction in the upper aquifer.

At least 72 registered wells occur within a 4-mi radius of Grubbs/Kyle Training Center (TDHE 1993). Figure 11 shows the locations of these wells. In addition to the 72 registered wells that had location coordinates, there were many registered wells for which only road locations were given. It is likely that many of those wells fall within the 4-mi radius. On the basis of current understanding of groundwater flow and surface runoff, only the wells at locations 1, 2, and 7 appear to be situated in areas where they could be influenced by contamination from Grubbs/Kyle Training Center. Other wells located upgradient of the Training Center are of less concern because of well depth. Table 4 provides information concerning ownership, location, depth, and use for each of the wells identified in Figure 11.

FIGURE 11 Water Wells within a Four-Mile Radius of Grubbs/Kyle Training Center

TABLE 4 Data for Water Wells within a Four-Mile Radius of Grubbs/Kyle Training Center

Location	Owners	Latitude	Longitude	Use	Depth (ft)
1 ^a	Waldron	36-01-55	86-31-36	Home	125
	Waldron	36-02-00	86-31-36	Home	185
	Waldron	36-01-58	86-31-43	Home	310
	Waldron	36-02-02	86-31-43	Home	165
	Waldron	36-02-07	86-31-48	Home	135
	Bowman	36-02-15	86-31-42	Home	165
	Brandon	36-01-41	86-31-16	Home	160
	Brandon	36-01-40	86-31-18	Home	165
	Hall	36-01-46	86-30-56	NL ^b	285
	Hall	36-01-57	86-31-55	Home	145
	Hall	36-01-57	86-31-40	Home	330
	Hill	36-01-56	86-32-07	NL	310
	Moore	36-01-48	86-31-47	Home	74
	Seals	36-01-52	86-31-39	Home	120
	Williams	36-01-55	86-31-46	NL	100
2	Sewart Air Force Base	36-00-22	86-31-45	Municipal	145
3	Mason	36-02-12	86-33-39	Home	244
4	Mason	36-02-31	86-33-35	Home	230
5	Mason	36-02-39	86-33-28	Home	155
6	Crawford	36-01-32	86-32-47	Home	300
7	Wade	36-02-52	86-31-35	Home	73
8 ^c	Ripnvanjwinkle	36-02-42	86-32-13	Industrial	930
	Spivey	36-02-42	86-32-13	Home	263
9	Crawford	36-02-13	86-34-12	NL	100
10	Butner	36-03-48	86-28-38	Home	115
11	Elliott	36-03-42	86-29-10	Home	165
12	Johnson	36-03-06	86-28-06	Home	65
13	Patterson	36-03-23	86-28-05	Home	200
14	McPeak	36-03-20	86-28-06	Home	200
15	McPeak	36-03-20	86-27-04	Home	145
16	Sanders	36-02-13	86-29-22	Commercial	100
17	Norris	36-02-05	86-27-53	Home	107
18	Savage	36-02-23	86-27-57	Home	115
19	Victory	36-03-04	86-27-03	Home	112
20	Potts	36-00-44	86-25-44	Home	885
21	Swain	36-01-05	86-27-07	Home	166
22 ^d	Martin	35-59-27	86-26-39	Home	137
	Talley	35-59-12	86-26-16	Home	207
	Wright	35-59-16	86-26-16	Home	750
	Wright	35-59-14	86-26-21	Home	110
	Wright	35-59-26	86-26-39	Home	90
	Wright	35-59-21	86-26-33	Municipal	225

TABLE 4 (Cont.)

Location	Owners	Latitude	Longitude	Use	Depth (ft)
23 ^e	Buchaman	35-57-43	86-28-06	NL	200
	Bullard	35-57-27	86-28-33	NL	NL
	Corely	35-57-31	86-28-53	Home	105
	Indian Spring	35-57-50	86-27-29	NL	NL
	Clemmons	35-57-19	86-28-17	NL	160
	Rooker	35-57-31	86-28-13	NL	NL
	King	35-57-35	86-28-10	Other	228
	Roberts	35-57-23	86-28-26	NL	NL
	Rooker	35-57-28	86-27-49	Farm	227
	Rooker	35-57-23	86-27-30	Farm	64
	Jones	35-57-24	86-27-54	Home	138
	Vogle	35-57-25	86-27-47	Farm	100
	Voss	35-57-28	86-28-18	Home	133
	Stewart	35-57-27	86-28-15	Farm	228
	Rooker	35-57-18	86-27-43	Farm	248
24	Church	35-18-16	86-29-36	Other	250
25	Rose	35-58-24	86-30-00	Home	275
26	Nissan	35-57-52	86-29-26	Other	80
27	Young	35-59-03	86-29-37	NL	99
28	Young	35-59-08	86-29-19	Municipal	200
29	NL	35-58-59	86-27-19	NL	NL
30	Nipper	35-58-19	86-26-12	Home	72
31	Wright	35-58-58	86-26-36	Industrial	76
32	Harris	35-58-27	86-33-32	NL	112
33	Kix	35-59-00	86-32-47	NL	60
34	Marpin	35-59-14	86-33-44	Municipal	70
35	Merret	35-58-38	86-33-24	Home	79
36	Potts	35-58-43	86-32-34	Home	147
37	Wade	35-59-04	86-32-50	Home	50
38	Well	35-58-45	86-32-27	NL	72

^a 15 wells in the vicinity of location 1.

^b NL = not listed.

^c 2 wells at location 8.

^d 6 wells in the vicinity of location 22.

^e 15 wells in the vicinity of location 23.

2.5.5 Sensitive Environments

The J. Percy Priest Reservoir and Wildlife Management Area, which encompasses an area of approximately 32,750 acres, is located adjacent to Grubbs/Kyle Training Center to the east, northeast, and north (USACE 1987). The primary purpose of the J. Percy Priest Reservoir is flood control, with the added benefits of hydroelectric power production and recreation. Since completion of the dam in September 1967, the reservoir has been operated as part of the system of lakes established in the comprehensive flood control plan for the Cumberland Basin and the Ohio River Basin. During the major flood control season from early December through March, space for flood control is provided up to an elevation of 504.5 ft. At this depth, the reservoir would cover an area of 22,720 acres (USACE 1987).

The dam and reservoir have an average annual energy production of approximately 70 million kilowatt hours, with a maximum megawatt capability of 35.8. Hydroelectric power generated at the reservoir is marketed through the Southeast Power Administration into Tennessee Valley Authority service areas.

In addition to flood control and energy production, a major feature of the J. Percy Priest Reservoir is the recreational opportunity that it provides, including fishing, swimming, camping, picnicking, and hiking. The Tennessee Wildlife Resources Agency is responsible for fisheries management in J. Percy Priest Lake. The reservoir supports a warm-water fishery, which is characterized by a midsummer surface temperature of approximately 80°F. In terms of fish productivity per unit area, the lake ranks as one of the most productive impoundments in Tennessee, with a 1984 harvest of 300,000 lb of fish. Surrounding the reservoir are 19,011 acres of publicly owned lands, of which approximately 15,208 acres are forested and 3,803 acres are open grassland as a result of past agricultural operations. Table 5 provides a list of native fish and wildlife species classified as Endangered or Threatened and protected by the Endangered Species Act of 1973 or by the Tennessee Wildlife Resources Commission (USACE 1987). Table 6 lists plants classified as Endangered, Threatened, or Species of Special Concern known to occur in the vicinity of the J. Percy Priest Reservoir and Wildlife Management Area (USACE 1987).

TABLE 5 Endangered and Threatened Native Animals of Tennessee

Species	Common Name	Status ^a
Fish		
<i>Acipenser fulvescens</i>	Lake sturgeon	ES
<i>Cyckleptus elongatus</i>	Blue sucker	TS
<i>Esox masquinongy ohioensis</i>	Ohio River muskellunge	A, ES ^b
<i>Ericymba bucatta</i>	Silverjaw minnow	TS
<i>Etheostoma acuticeps</i>	Sharphead darter	A
<i>E. boschungii</i>	Slackwater darter	TS, TF
<i>E. ditrema</i>	Coldwater darter	A, TS
<i>E. tippecanoe</i>	Tippecanoe darter	A
<i>E. trisella</i>	Trispot darter	A, TS
<i>E. tuscumbia</i>	Tuscumbia darter	A
<i>E. sp.</i>	Duck River darter	A
<i>E. (Catonotus) sp.</i>	Duskytail darter	TS
<i>E. sp. (cf. E. Maculatum)</i>	Coppercheek darter	TS
<i>Fundulus sp. (cf. F. albolineatus)</i>	Barren's topminnow	A, ES
<i>Hermitremia flammea</i>	Flame chub	A
<i>Hybopsis cahni</i>	Slender chub	A, TS, TF
<i>H. monacha</i>	Spotfin chub	A, ES, TF
<i>Noturus baileyi</i>	Smoky madtom	A, EF
<i>N. flayipinnis</i>	Yellowfin madtom	A, ES, TF
<i>N. munitus</i>	Frecklebelly madtom	A, TS
<i>N. sp. (cf. N. hildebrandi)</i>	Madtom	TS
<i>Percina burtoni</i>	Blotchside logperch	A
<i>P. macrocephala</i>	Longhead darter	TS
<i>P. sp.</i>	Narrowsaddle darter	A
<i>P. antesella</i>	Amber darter	TS, EF
<i>P. sp. (cf. P. caprodes)</i>	Reticulate longperch	TS
<i>P. tanasi</i>	Snail darter	ES, TF
Amphibians		
<i>Gyrinophilus palleucus</i>	Tennessee cave salamander	TS
Reptiles		
<i>Ptyuophid m. melanoleucus</i>	Northern pine snake	TS
<i>Sistrurus miliarius streckeri</i>	Western pigmy rattlesnake	TS
Birds		
<i>Aimophila aestivalis bachmanii</i>	Bachman's sparrow	ES
<i>Aquila chrysaetos</i>	Golden eagle	ES
<i>Accipiter cooperii</i>	Cooper's hawk	TS
<i>A. striatus</i>	Sharp-shinned hawk	TS
<i>Ammodramus savannarum</i>	Grasshopper sparrow	TS
<i>Circus cyaneus hudsonius</i>	Marsh hawk	TS
<i>Corvus corax</i>	Raven	ES
<i>Dendrocopos borealis</i>	Red-cockaded woodpecker	ES, EF
<i>Falco peregrinus anatum</i>	American peregrine falcon	ES, EF
<i>Haliaeetus leucocephalus leucocephalus</i>	Southern bald eagle	ES, EF
<i>Ictinia mississippiensis</i>	Mississippi kite	ES

TABLE 5 (Cont.)

Species	Common Name	Status ^a
Birds (Cont.)		
<i>Pandion haliaetus</i>	Osprey	ES
<i>Thryomanes bewickii</i>	Bewick's wren	TS
<i>Vermivora bachmanii</i>	Beckman's warbler	EF
Mammals		
<i>Felis concolor cougar</i>	Eastern cougar	EF
<i>Lutra canadensis</i>	River otter	TS
<i>Myotis grisescens</i>	Gray bat	ES, EF
<i>M. sodalis</i>	Indiana bat	ES, EF
<i>Plecotus townsendii virginianus</i>	Virginia big-eared bat	TF
Mussels		
<i>Auadrula sparsa</i>	Appalachian monkeyface pearly mussel	EF
<i>Conradilla caelata</i>	Birdwing pearly mussel	EF
<i>Quadrula intermedia</i>	Cumberland monkeyface pearly mussel	EF
<i>Dromus dromas</i>	Dromedary pearly mussel	EF
<i>Fusconaia cuneolus</i>	Finerayed pigtoe pearly mussel	EF
<i>Epioblasma torulosa gubernaculum</i>	Green blossom pearly mussel	EF
<i>Plethobasus cooperianus</i>	Orange footed pearly mussel	EF
<i>Toxolasma cylindrella</i>	Pale lilliput pearly mussel	EF
<i>Lampsilis orbiculata orbiculata</i>	Pink mucket pearly mussel	EF
<i>Pleurobema plenum</i>	Rough pigtoe pearly mussel	EF
<i>Fusconaia edgariana</i>	Shiny pigtoe pearly mussel	EF
<i>Epioblasma torulosa torulosa</i>	Tuberculed-blossom pearly mussel	EF
<i>E. trugidula</i>	Turgid-blossom pearly mussel	EF
<i>Plethobasus cicatricocus</i>	White warty-back pearly mussel	EF
<i>Epioblasma florentina</i>	Yellow-blossom pearly mussel	EF

^a EF = Endangered — protected by the Federal Endangered Species Act of 1973.

ES = Endangered — protected by the Tennessee Wildlife Resources Commission, Proc. No. 75-15.

TF = Threatened — listed in *Endangered and Threatened Wildlife and Plants*, 50 CFR 17.11 and 17.12, USFWS, 1982.

TS = Threatened — protected by the Tennessee Wildlife Resources Commission, Proc. No. 75-15.

A = Listed in Miller's "Threatened Freshwater Fish," in *Transactions of the American Fisheries Society*, Vol. 101, No. 2, 1972.

^b In Morgan, Cumberland, Fentress, and Scott counties.

TABLE 6 Plants Classified as Endangered, Threatened, or Species of Special Concern in the Vicinity of the J. Percy Priest Reservoir

Species	Common Name	Status ^a
<i>Astragalus tennesseensis</i>	Tennessee milk-vetch	TES
<i>Dalea foliosa</i>	Leafy prairie-clover	TES
<i>Onosmodium molle</i>	False gromwell	TSSC
<i>Talinum calcaricum</i>	Limestone fameflower	TTS
<i>Lobelia appendiculatum</i> var. <i>gattingeri</i>	Gattinger's lobelia	TTS
<i>Satureja glabella</i>	Savory	TSSC
<i>Phlox bifida</i> ssp. <i>stellaria</i>	Cleft phlox	TTS
<i>Leavenworthia stylosa</i>	Glade cress	TSSC
<i>Evolvulus pilosus</i>	Evolvulus	TES
<i>Psoralea subacaulis</i>	Scurf-pea	TSSC
<i>Echinacea tennesseensis</i>	Tennessee coneflower	FES

^a FES = Federally endangered species.

TES = Tennessee endangered species.

TTS = Tennessee threatened species.

TSSC = Tennessee species of special concern.

3 Environmentally Significant Operations

The five ESOs at Grubbs/Kyle Training Center identified by the PA team from Argonne are (1) storage of hazardous materials and hazardous waste, (2) storage and dispensing of fuel, (3) washing of vehicles and aircraft, (4) release of untreated storm drainage, and (5) landfill disposal of hazardous waste.

3.1 Hazardous Materials and Hazardous Waste Storage

Maintenance activities performed at OMS #16 and AASF #1 require the use of hazardous materials and the subsequent generation of hazardous waste. Hazardous materials and hazardous waste storage locations at both OMS #16 and AASF #1 have the potential for migration of contaminants if a release of the materials in storage were to occur. Figure 12 identifies potential contaminant migration pathways associated with OMS #16, and Figure 13 depicts the potential contaminant migration pathways of AASF #1.

3.1.1 Organizational Maintenance Shop #16

Currently, hazardous waste generated as part of OMS #16 operations, such as used oils and solvents, is accumulated and stored in 55-gal drums located in an enclosed storage shed north of Building 639. When sufficient volume has been accumulated, the hazardous waste is recycled by a private vendor or through the Defense Reutilization and Maintenance Office (DRMO). New (unused) product is stored in designated storage rooms within OMS. Prior to installation of the waste storage building, both new and used products, including oils, solvents, and batteries, were stored in the area north of Building 639. Releases may have occurred as a result of inadvertent spills during transfer of the material between containers or as a result of container leak or rupture.

3.1.2 Army Aviation Support Facility #1

Containment is not provided for hazardous waste stored in drums in the open shed area at the southeast corner of Building 683. An enclosed storage building has been purchased (and recently delivered) for the purpose of hazardous waste storage, but installation of the building is pending. New (unused) product is stored in designated storage areas within the AASF #1

FIGURE 12 Potential Contaminant Migration Pathways at Organizational Maintenance Shop #16 (Source: TNARNG 1992b)

FIGURE 13 Potential Contaminant Migration Pathways at Army Aviation Support Facility #1 (Source: TNARNG 1992a)

buildings. Spills that occur in these areas are contained while cleanup proceeds. However, if a release from one or more of the drums positioned in the open waste storage shed were to occur as a result of drum rupture or because of an inadvertent spill, the hazardous material would migrate away from the site.

3.2 Fuel Storage and Dispensing

Refueling operations occur at the TNARNG property at two designated fuel storage and dispensing locations and via mobile fuel tanker. In addition, fuel storage locations dating from Sewart Air Force Base operations are located on TNARNG property and on Smyrna Airport property adjacent to the TNARNG facility.

3.2.1 Organizational Maintenance Shop #16

Two 5,000-gal USTs, one containing gasoline and the other containing diesel fuel, are located at OMS #16. The 16-year-old steel tanks are located southeast of Building 639, as shown in Figure 12. In 1992, hydrostatic testing of the tanks confirmed integrity of the UST systems. The potential exists for contaminant migration through surface runoff following accidental spills during vehicle or UST refueling operations. In addition, releases of fuel or oil from vehicles parked in the gravel-covered, fenced motor-pool area south of OMS can be transported via surface runoff.

3.2.2 Army Aviation Support Facility #1

Three 10,000-gal USTs, each containing JP-4 aviation fuel, are located north of AASF #1. The 15-year-old fiberglass tanks are located at Building 645, identified in Figure 3. In 1992, hydrostatic testing of the tanks confirmed integrity of the UST systems. Of concern is the potential for contaminant migration as a result of surface runoff from inadvertent spills during aircraft or UST refueling operations.

3.2.3 Fuel Locations at Sewart Air Force Base

A vehicle fueling location dating from Sewart Air Force Base operations is situated near the AASF #1 aircraft fueling location at Building 645. The abandoned fuel pump is located north of Building 664, which covers an area of 468 ft² (Figure 3). The exact age, size, and construction of the abandoned UST(s) is unknown, although Building 664 was constructed in 1942 (NGB 1984).

One of the major fueling operations at the former Sewart Air Force Base is located approximately 2,000 ft south of the TNARNG cantonment area (DoD 1955). Twenty-eight 50,000-gal USTs and 11 24,000-gal USTs, which are approximately 40 years old, are located in this area (Figure 2). These fuel tanks, which were used for storage of JP-4 aviation fuel, are in the process of being removed (USACE 1992b).

Bulk storage of aviation fuel in aboveground storage tanks was located approximately 7,000 ft south-southwest of the TNARNG cantonment area (DoD 1955). According to TNARNG personnel, these former Sewart Air Force Base tanks were subsequently used by a private contractor for storage of waste fluids and have since been dismantled and removed. The approximate locations at these tanks are identified in Figure 2.

A motor gasoline system was located at 13th Avenue and E Street, approximately 3,500 ft southeast of the TNARNG cantonment area (Figure 2). Two 12,000-gal USTs and one 1,000-gal UST were used for gasoline storage. One 12,000-gal UST was used for storage of diesel fuel, and one 12,000-gal UST was used for storage of kerosene. Nearby, along 13th Avenue, four 12,000-gal USTs were used for storage of lubrication oil (DoD 1955).

3.3 Vehicle and Aircraft Wash Areas

Vehicle wash areas are available for use at OMS #16 and AASF #1.

3.3.1 Organizational Maintenance Shop #16

A grease rack located west of Building 639, as shown in Figure 12, is used to wash vehicles. Because of the location of the rack and the slope of the ground surface, not all of the

waste washwater enters the drain leading to the oil-water separator. Of concern is the migration of contaminants away from the OMS #16 wash area along the available drainage pathways.

3.3.2 Army Aviation Support Facility #1

The open asphalt-covered area north of Building 645 (the aircraft refueling station) is sometimes used for aircraft and vehicle washing (Figure 3) (Morgan 1990). More frequently, the aircrafts are washed inside the Building 682/683 hangar (Figure 13). Floor drains flow to a 6,000-gal underground holding tank located adjacent to Building 682. When the tank is full, water is pumped from the tank and poured into an outside drain. Primary treatment is provided for the waste water prior to entry into the Smyrna sanitary waste system. Minor quantities of the waste washwater may bypass the pretreatment basin as a result of surface runoff.

3.4 Discharge of Untreated Storm Drainage

The on-site drainage system, which was installed during construction of Sewart Air Force Base, primarily consists of open-flow ditches and limited storm-sewer lines (TNARNG 1989). Runoff from the cantonment area of the TNARNG property, as well as from most of the adjacent airport property, flows north and is discharged into Stewart Creek. The storm runoff is not treated and may contain hazardous chemicals as a result of surface spills.

Buildup of silt, filling in of ditches, burying of drain tiles, construction of crossing points without adequately sized culverts, installation of improperly located or designed catch basins, and improper location of asphalt curbing have significantly altered and impeded storm runoff (TNARNG 1989). The TNARNG Facilities Engineering Division has a full survey and study of the base under way to determine the necessary modifications.

Drainage from the field training areas is overland flow that drains into Stewart Creek to the northeast. Drainage of the training areas located west of the cantonment area travels by overland flow into minor tributaries of Stewart Creek.

3.5 Landfill Disposal of Hazardous Waste

A contamination evaluation at the former Sewart Air Force Base performed for the USACE in 1992 identified three landfill disposal areas on or near the TNARNG property (USACE 1992a). These areas are (1) the Sewage Treatment Plant (STP) Landfill, located on TNARNG property at the northeastern end of the former Sewart Air Force Base, approximately 1,000 ft southwest of the former Sewage Treatment plant; (2) the Mixed Industrial Debris (MID) Landfill, located on TNARNG property, approximately 2,400 ft south of the cantonment area; and (3) the Airport Landfill, located just outside the TNARNG property boundary, approximately 4,500 ft northwest of the cantonment area.

The STP Landfill, shown in Figure 2, is bordered on the north, west, and south by Stewart Creek and the J. Percy Priest Reservoir and on the east by a portion of the TNARNG training range. The approximate dimensions of the STP Landfill (based on aerial photographs) are 1,500 ft by 1,500 ft (USACE 1992a). The STP Landfill was used by DoD from the early 1950s until about 1968 when the area was flooded by the rising waters of the J. Percy Priest Reservoir. This landfill reportedly received all wastes generated by Sewart Air Force Base, including sludge from the sewage treatment plant. Presently, the STP Landfill is covered by weeds and small trees. Metal cans, glass, and other trash are scattered over the landfill. The STP Landfill is located within the floodplain of Stewart Creek, and erosion has exposed landfill debris, concrete rubble, and seep zones along the perimeter of the landfill stream bank.

No documentation exists regarding the type and volume of waste that may have been disposed of in the STP Landfill during its years of operation prior to construction of the J. Percy Priest Dam. However, with the rising waters of the reservoir, use of the Sewage Treatment Plant was terminated and the sludge beds (eight 25-ft by 60-ft sludge drying beds constructed of rough creosote-treated lumber with concrete curbs) were removed and disposed of in the STP Landfill (DoD 1956b). The depth of the sand and gravel in the lower wooden frame was approximately 12 in. The concrete curbs were approximately 12 in. high. Therefore, the volume of sludge, sand, and gravel that may have been disposed of in the STP Landfill ranges from approximately 12,000 ft³ to 24,000 ft³. No documentation is available regarding the quantity of underlying contaminated soil that was excavated and disposed of.

Soil and groundwater sampling performed at the STP Landfill for the 1992 USACE study verified the characterization of that location as an ESO. The sampling performed, including the installation of two monitoring wells, is discussed in the following section. Available records

indicated that use of both the MID Landfill and the Airport Landfill disposal areas was limited. Preliminary sampling performed for the USACE study provided no compelling evidence that either disposal location (Figure 2) represents a significant threat to human health or to the environment. For the purposes of this PA, the MID Landfill and the Airport Landfill are not considered to be ESOs.

4 Known and Suspected Releases

4.1 Releases to Groundwater

The following ESOs are known to have released or have had the potential to release hazardous chemicals to groundwater in the vicinity of Grubbs/Kyle Training Center.

4.1.1 Fuel Storage and Dispensing

Releases to groundwater from USTs currently in use at two TNARNG fuel dispensing locations are not suspected. Recent hydrostatic testing of the 15- to 16-year-old tanks has confirmed UST integrity. Asphalt at these fueling locations reduces the risk of groundwater contamination via infiltration of surface spills. Of concern for potential groundwater contamination are abandoned USTs located on and adjacent to TNARNG property and dating from Sewart Air Force Base operations. Because of the age of these tanks (i.e., approximately 40 years or more), the potential for leakage is high. The shallow groundwater is at risk as a result of subsurface leakage from USTs.

4.1.2 Sewage Treatment Plant Landfill

Initial environmental sampling has been performed at the STP Landfill as part of an evaluation of groundwater contamination at the former Sewart Air Force Base by the U.S. Army Corps of Engineers (USACE 1992a). Sampling included collection of surface soil, subsurface soil, and groundwater samples; sample locations are approximated in Figure 14. Groundwater samples were collected from two monitoring wells, one installed near the southern edge of the STP Landfill (SGW-7, as it was identified in the USACE study) and one installed near the northeastern edge (SGW-8 in the USACE study). Monitoring well SGW-7 was drilled to a depth of 14.7 ft below ground level (bgl). The overburden thickness was 6.0 ft, and the bedrock thickness was 8.7 ft. Water was encountered at 2.4 ft bgl. Monitoring well SGW-8 was drilled to 16.0 ft bgl. The overburden thickness was 12.5 ft, and the bedrock thickness was 3.5 ft. Water was encountered at 10 ft bgl. When bedrock was encountered, the well was redrilled, and water was encountered at approximately 6.5 ft bgl. Both monitoring wells were seated in bedrock with 10-ft

FIGURE 14 Approximate Locations of Soil and Groundwater Samples Collected at the STP Landfill (Source: Adapted from USACE 1992a)

screens. Elevated photoionization detector readings of 15 ppm to 20 ppm were encountered during drilling and installation of SGW-7. Elevated photoionization detector readings were not encountered during drilling and installation of SGW-8 (USACE 1992a).

Analytical results for groundwater samples collected at the site, provided in Table 7, indicate the presence of heavy metals, petroleum products and fuel constituents, solvents, coal tar derivatives, and plasticizers. Sludge from the closed Sewage Treatment Plant is reported to have been discarded at the STP Landfill and probably accounts for a portion of this contamination. The limited sampling performed to date would prohibit any conclusions regarding whether migration of contaminants from areas upgradient of the STP Landfill could have contributed to the contamination detected.

4.2 Releases to Surface Water

The following ESOs are known to have released or have the potential to release hazardous chemicals to surface water in the vicinity of Grubbs/Kyle Training Center.

4.2.1 Hazardous Materials and Hazardous Waste Storage

Hazardous materials and hazardous waste are stored in outdoor locations at both OMS #16 and AASF #1. In past years, before suitable enclosed storage areas were installed and recycling measures were implemented, higher volumes of hazardous materials than are currently present at the sites were stored in these outdoor locations. Surface staining at both locations provides evidence of past releases of oil-like fluids. Staining of the asphalt north of Building 639 is especially evident. Storm sewer drains present at both locations provide a migration pathway for the released contaminants to enter nearby surface waters.

4.2.2 Fuel Storage and Dispensing

The potential exists for surface release of fuel during vehicle and storage tank refueling operations. Runoff of the spilled fuel on asphalt-covered surfaces would be directed across the asphalt surface to drains entering the storm drainage system, which is discharged into Stewart Creek. Storm runoff over fuel-contaminated soil areas also flows to Stewart Creek.

TABLE 7 Analytical Results for Groundwater Samples from the STP Landfill

	Concentration in Sample (µg/L)		Tennessee Drinking Water MCL ^a
	SGW-7	SGW-8	
Total Metals			
Arsenic	10.7	22.1	50
Barium	1150	3140	2,000
Cadmium	69	78	5
Chromium	152	314	100
Iron	128,000	376,000	300
Lead	209	117	50
Manganese	10,400	11,700	50
Mercury	1.43	1.60	2
Selenium	<1.0	<1.0	50
Silver	10.0	15.0	100
Sodium	89,000	23,000	NA ^b
Dissolved Metals			
Arsenic	5.8	7.1	50
Barium	348	223	2,000
Cadmium	6.0	6.0	5
Chromium	<6.0	<6.0	100
Iron	9,600	28,500	300
Lead	<2.0	<2.0	50
Manganese	7,040	6,110	50
Mercury	<0.1	<0.1	2
Selenium	<1.0	<2.0	50
Silver	8.0	7.0	100
Sodium	81,800	24,100	NA
Volatile/Semivolatile Organics			
Bis-2(ethylhexyl)phthalate	17.7	ND	NA
Methylene Chloride	587	6.52	NA
Naphthalene	11.0	ND	NA
Toluene	237	ND ^c	5

^a MCL = maximum contaminant level.^b NA = MCL not available.^c ND = not detected above contract-required quantitation limit.

Source: USACE (1992a).

4.2.3 Vehicle and Aircraft Washing

Much of the waste washwater from the AASF #1 aircraft wash area north of Building 645 undergoes primary treatment through an oil-water separator before entering the sanitary sewer to the Smyrna Treatment Plant. A minor amount of the waste washwater may bypass the treatment basin as a result of natural surface drainage.

Drainage of waste washwater from the OMS #16 wash area (the grease rack located west of Building 639) is poorly contained. Although some of the flow is directed toward a surface drainage inlet leading to an oil-water separator (inoperative at the time of the PA), much of the waste washwater flow drains west onto a grassy slope leading to a creek bed (as evidenced by surface staining and stressed vegetation) or drains to the south over the asphalt surface toward inlets into the storm sewer system. The oil-water separator is currently plugged and inoperative (Dennis 1993). The records available for this PA do not confirm whether the outflow from the oil-water separator at OMS #16 leads to the Smyrna Sanitary Sewage Treatment System or to the nearby storm drainage system (TNARNG 1992c). A study of the Grubbs/Kyle Training Center's sanitary sewer network is currently underway (Dennis 1993).

4.2.4 Release of Untreated Storm Drainage

Most of the cantonment area of Grubbs/Kyle Training Center is asphalt covered. Surface runoff is directed into inlet drains of the storm sewer system, which was developed for the former Sewart Air Force Base. The outflow of the storm sewer system is located southwest of OMS #16, Building 639. Any releases of hazardous materials, such as oil and fuel, to the surface asphalt would be directed via storm drainage to this storm sewer discharge point. Discharge is into Stewart Creek, which flows into the J. Percy Priest Reservoir.

4.2.5 Sewage Treatment Plant Landfill

The STP Landfill is within the floodplain of Stewart Creek, and because of frequent flooding, substantial surface erosion of the landfill has occurred. Much formerly buried debris is now clearly visible. Soil sampling around the perimeter of the STP Landfill, performed as part of the evaluation of groundwater contamination by USACE in 1992, has confirmed the presence of organic and inorganic contamination. Soil samples, which were collected from eroded areas of the

landfill and at seepage points from the landfill as depicted in Figure 14, confirm the release of contaminated soils into nearby Stewart Creek. Analytical results for soil samples are provided in Table 8. Subsurface drainage of contaminants into the creek is probable.

4.3 Releases to Soil

The following ESOs are known to have released or have had the potential to release hazardous chemicals to the Grubbs/Kyle Training Center surface soils and subsurface soils.

4.3.1 Hazardous Materials and Hazardous Waste Storage at Organizational Maintenance Shop #16

Release of oils, grease, and similar contaminants to surface soils at OMS #16, Building 639, is indicated by the presence of surface staining and distressed vegetation north and northwest of the hazardous waste storage area. No major spill has been recorded at the storage location, and the surface contamination is probably the result of small, inadvertent releases occurring over time. The surface soil affected is estimated to cover an area of 10 ft by 20 ft to a depth of 1 ft.

4.3.2 Vehicle Washing at Organizational Maintenance Shop #16

Release of wastewater containing oils, grease, and similar contaminants to surface soils at OMS #16, Building 639, is indicated by the presence of surface staining and distressed vegetation west of the vehicle wash area. The surface soil affected is estimated to cover an area of 5 ft by 20 ft to a depth of 1 ft.

4.4 Releases to Air

Minor releases of contaminants to the air occur during vehicle and aircraft operation and maintenance activities. These releases occur during activities such as fueling, painting, sanding, and welding. Contaminants are also released via exhaust during operation of the aircraft and vehicles. Major releases of contaminants to the air, which would occur as a result of extensive painting operations of the vehicles and aircrafts assigned to the unit, were not identified.

TABLE 8 Analytical Results for Soil Samples from the STP Landfill

	Concentration in Sample							Range in Natural Soils
	SAFB-2 ^a	SAFB-3 ^b	SAFB-33 ^c	SAFB-4 ^d	SAFB-5 ^e	SAFB-6 ^f	SAFB-7 ^g	SAFB-8 ^h
Total Metals (mg/kg)								
Arsenic	4.3	8.9 ⁱ	6.2 ⁱ	2.3	3.8	7.2	6.4	8.9
Barium	100	143	139	86.5	104	116	99.8	196
Cadmium	ND ^j	4.3 ⁱ	6.2 ⁱ	ND	ND	5.6	ND	2.9
Chromium	12.6	26.0	26.3	8.0	10.5	8.2	ND	21.8
Lead	19.8	115 ⁱ	324 ⁱ	10.1	14.9	208	11.6	53.6
Mercury	ND	2.5	3.2	ND	0.05	ND	ND	0.33
Selenium	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	21.7	ND	ND	ND	ND	ND	ND
Volatile/Semivolatile Organics (µg/kg)								
BEHP ^k	<DL ^l	671 ⁱ	465 ⁱ	ND	<DL	9800	ND	2970
DPP ⁿ	380	<DL	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	403	<DL	ND	ND	ND	ND	ND
Pyrene	ND	593	<DL	ND	ND	ND	ND	ND
Acetone	ND	ND	ND	ND	ND	ND	ND	35.4
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	8.51
Toluene	ND	ND	ND	ND	ND	ND	ND	287
Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	14.4
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	55.6
Naphthalene	ND	ND	ND	ND	ND	ND	ND	1130
Methylnaphthalene	ND	ND	ND	ND	ND	ND	ND	510

Footnotes on next page.

TABLE 8 (Cont.)

- ^a Shallow soil sample collected on the north perimeter of STP Landfill, approximately 10 ft south of Stewart Creek.
- ^b Shallow soil sample collected on the northwest perimeter of STP Landfill, approximately 10 ft south of Stewart Creek.
- ^c Sample is blind duplicate of SAFB-3.
- ^d Shallow soil sample collected on the west perimeter of STP Landfill, approximately 10 ft east of Stewart Creek.
- ^e Shallow soil sample collected on the west-central perimeter of STP Landfill, approximately 15 ft north of Stewart Creek.
- ^f Shallow soil sample collected on the southwest perimeter of STP Landfill, approximately 10 ft north of Stewart Creek.
- ^g Shallow soil sample collected on the south perimeter of STP Landfill in a vertical bank, approximately 2 ft above ground level.
- ^h Subsurface soil sample collected at approximately 3-5 ft depth during drilling of monitoring well SGW-7.
- ⁱ Relative percent difference of field duplicate > 20%.
- ^j ND = not detected above instrument detection limit.
- ^k BEHP = bis-(2-ethylhexyl)phthalate.
- ^l DL = compound detected in the sample at a concentration less than the quantitation limit.
- ^m NA = not present in natural soils.
- ⁿ DPP = 5,6-dihydro-6-(2-pentenyl)-(Z)-2H-pyran-2-one.

Source: USACE (1992a).

4.5 Other Releases

Operation of vehicles and aircraft assigned to the unit will result in increased noise, as will firing of weapons during training exercises. The potential for fire and explosion exists as a result of an accident involving a vehicle or an aircraft assigned to the unit.

5 Human and Environmental Receptors

5.1 Groundwater

Groundwater is a source of potable water in the vicinity of Grubbs/Kyle Training Center, although the majority of the population receives potable water from surface water resources. Approximately 100 registered wells are located within a four-mile radius. Some of these are probably no longer used. To estimate the population potentially affected by groundwater contamination, all 100 wells are assumed to still be in operation, and four persons are assumed to obtain their drinking water from each well. The population served by drinking water wells within a four-mile radius of the Training Center is, therefore, estimated at 400.

Groundwater recharge is via precipitation. Rain falling on the land surface either runs off into surface streams, infiltrates the soil, or evaporates back into the atmosphere. The water that infiltrates the soil is either retained by the soil and subsequently returned to the atmosphere by the transpiration of plants or migrates downward under the force of gravity through the soil and weathered rock to recharge the groundwater system. The amount of water added to the groundwater system as recharge is approximately equal to the amount of water discharged as outflow, thus maintaining the base flow of surface streams.

5.2 Surface Water

Stewart Creek and the J. Percy Priest Reservoir are the primary recipients of contamination released at Grubbs/Kyle Training Center, either as a result of current or past operations of that facility and the Smyrna/Rutherford County Regional Airport or from operations at the former Sewart Air Force Base. Grubbs/Kyle Training Center is bisected by Stewart Creek, which then flows north into the J. Percy Priest Reservoir. Virtually all surface drainage from Grubbs/Kyle Training Center and the adjacent properties flows into Stewart Creek. Contaminants are likely to be transported into the creek via water draining across the ground surface. In addition, available data indicate that groundwater flow is in the direction of the J. Percy Priest Reservoir, or it perhaps flows locally to Stewart Creek. Available static groundwater table information shows a relationship between the reservoir pool level and the groundwater table, which indicates a likely hydrogeologic connection.

The J. Percy Priest Reservoir and Stewart Creek are used by many for boating, fishing, and swimming. In addition, the reservoir is also a source of potable water for Smyrna, where the pumping station is located approximately 7,000 ft east of the STP Landfill in the Stones River. Smyrna, which has the capacity to provide 8 million gal/day of water, supports a current consumption of 4 million gal/day. Eight storage tanks with a total storage capacity of approximately 4.9 million gal are located within Smyrna. Water for Grubbs/Kyle Training Center is supplied by Smyrna, and a storage tank with 500,000-gal capacity is located within Grubbs/Kyle Training Center (TNARNG 1989).

Data are not available to quantify the contaminant volume or concentration entering the creek and reservoir system from Grubbs/Kyle Training Center and the adjacent properties. While contaminants introduced to the creek and reservoir system will be diluted by the inflow of waters from locations away from the vicinity of Grubbs/Kyle Training Center and the adjacent property, each visitor or user of the creek and reservoir system is at potential risk.

5.3 Soil

Access to the Grubbs/Kyle Training Center cantonment area is restricted to TNARNG personnel and escorted visitors. Workers in areas of surface soil contamination within the cantonment area, such as at hazardous waste storage areas, are appropriately trained with regard to potential hazards.

Site security is limited at the STP Landfill, where surface soil contamination has been confirmed, and at the location of the former Sewage Treatment Plant. The STP Landfill is secured with an 8-ft-high fence and locking gates that block entrance to vehicles using the roadway into the landfill. However, individuals can access to the landfill and the former Sewage Treatment Plant location by walking along the bank of Stewart Creek or by boat. These hazardous waste sites are located within the wooded and accessible area of the J. Percy Priest Reservoir, and it is common to observe fishermen in boats trolling along the perimeter of the landfill. Because access by civilians is possible, the potential exists for exposure to hazardous materials via direct contact.

5.4 Air

Site personnel are exposed to minor releases of contamination to the air during regular vehicle operation and maintenance activities. Dust masks or filters are used when appropriate

(e.g., during welding, sanding, or painting) to reduce the level of exposure. Exposure of the off-site population to TNARNG-generated contamination via air is unlikely.

5.5 Other Receptors

Because of the surface water and groundwater migration pathways identified, it is likely that the contamination present at Grubbs/Kyle Training Center and the former Sewart Air Force Base, which has been confirmed in the recent groundwater evaluation by the U.S. Army Corps of Engineers, is migrating into the J. Percy Priest Reservoir and Wildlife Management Area. The extent of the impacts to animal and plant species in this area and to users of these recreational facilities is unknown at this time. The potential exists for contamination to affect federal- and State-protected species in the vicinity and to impact the surrounding population, which may consume contaminated fish. Fish kills in the J. Percy Priest Reservoir have been recorded in past years by the Tennessee Wildlife Resources Agency and the Department of Water Quality Control (USACE 1978). Some kills have been attributed to fuel spills and release of sewage into the J. Percy Priest Reservoir; however, no cause has been confirmed. The causes of other kills are not known (USACE 1978).

6 Preliminary Assessment Findings and Conclusions

6.1 Summary of Preliminary Assessment Findings

Grubbs/Kyle Training Center is located at the Smyrna/Rutherford County Regional Airport approximately 1 mi north of Smyrna, Tennessee, and 1 mi east of LaVergne, Tennessee. The approximately 852-acre facility, which is located in the northwestern portion of Rutherford County, is about 12 mi southeast of Nashville, Tennessee. Grubbs/Kyle Training Center is one portion of the former Sewart Air Force Base, and the greater portion of the property is now used as the Smyrna/Rutherford County Regional Airport and associated commercial properties. The TNARNG cantonment area consists of 55 buildings situated on approximately 70 acres, and an additional 782 acres are used for field training. By agreement with the State, an additional 1,500 acres of publicly owned land adjacent to the site are available to TNARNG for use during special field exercises. Central to the operations at Grubbs/Kyle Training Center is the TNARNG Army Aviation Support Facility #1, which consists of a flight operations building, a control tower, hangars, and approximately 480,000 ft² of helipad. The primary ESOs are (1) storage of hazardous materials and hazardous waste, (2) storage and dispensing of fuel, (3) washing of vehicles and aircraft, (4) release of untreated storm drainage, and (5) landfill disposal of hazardous waste.

The J. Percy Priest Reservoir and Wildlife Management Area, which covers 32,750 acres, is adjacent to Grubbs/Kyle Training Center to the east and north. The J. Percy Priest Dam was completed in 1967 and is used primarily to control flooding and to provide hydroelectric power. The reservoir system is also a widely used source for recreation (e.g., boating, swimming, fishing, and camping), as well as a source of domestic drinking water. The reservoir is the major hydrologic feature in the study area. The drainage area above the dam site covers 865 mi², or 94% of the Stones River Basin and approximately 1% of the Cumberland River watershed. Stewart Creek, with a drainage area of 60 mi², is one of the largest of the numerous small tributaries that feed into the Stones River. Static groundwater table information indicates that the reservoir pool level dictates the groundwater table. The regional groundwater gradient is probably toward the J. Percy Priest Reservoir or Stewart Creek (USACE 1992a).

A PA of Grubbs/Kyle Training Center was performed to determine the potential for hazardous constituents used as part of normal facility operations or present on-site as a result of past operations to migrate beyond the property boundary to areas of human or environmental

concern. Materials that are used and stored at the Training Center, as well as at the current regional airport and the former Sewart Air Force Base, include aviation fuel, diesel fuel, gasoline, oils, transmission fluids, antifreeze, and solvents. Underground fuel storage capacity (aviation fuel, diesel fuel, and gasoline) for Training Center operations is 25,000 gal. More than 1,700,000 gal of underground fuel storage capacity dating from operations at Sewart Air Force Base is located on property now leased to the TNARNG or adjacent to that property. The review of both historical and current practices at the property indicates that the Grubbs/Kyle Training Center property and the adjacent property pose a potential risk to human health and the environment. Of primary concern is the potential for hazardous waste, which is present on and near the TNARNG property as a result of past and current operations, to migrate beyond the property boundary to the J. Percy Priest Reservoir and Wildlife Management Area. Migration of contaminants via (1) surface water, (2) groundwater, (3) direct contact with contaminated soil and water, and (4) consumption of contaminated fish is suspected.

6.1.1 Surface Water

Stewart Creek traverses the Grubbs/Kyle Training Center property and appears to be a significant migration pathway for contaminants now present on-site as a result of past or current operations to enter the off-site environment. Three surface water transport mechanisms are evident:

1. As the recipient of the natural surface runoff from the TNARNG property and as a result of a 47% precipitation infiltration rate, surface spills of fuel, oil, untreated waste water, or other contaminated waste are transported into the adjacent reservoir system via Stewart Creek.
2. Stewart Creek is the discharge point for the storm drainage system installed at the site and the adjacent airport property. Releases of hazardous materials to the asphalt-covered areas of the airport complex enter inlet drains and are directed via the drainage system into Stewart Creek.

3. The rising floodwaters of the J. Percy Priest Reservoir and Stewart Creek inundate the former STP Landfill, which is located on property now licensed to TNARNG. The STP Landfill was used by DoD when the current airport property and TNARNG land operated as the Sewart Air Force Base. Substantial erosion of the STP Landfill is clearly evident, with debris and seepage from the landfill entering Stewart Creek.

6.1.2 Groundwater

Groundwater in the region is a source of domestic drinking water and, as such, is a potential contaminant migration pathway. In addition, a link between the reservoir water level and groundwater indicates that the groundwater gradient is toward the reservoir, although this is not clearly defined. An evaluation of groundwater contamination at the former Sewart Air Force Base, including a portion of the property now used by TNARNG, has been initiated by the U.S. Army Corps of Engineers (USACE 1992a). Groundwater contamination and related surface and subsurface soil contamination has been confirmed at the former STP Landfill (property now licensed to TNARNG). The extent of this contamination has yet to be determined, although initial sampling indicated contaminant concentrations above permissible levels.

The contribution to groundwater contamination, if any, that may have resulted from the underground storage of fuel at the former Sewart Air Force Base and at the current airport was not addressed in the initial groundwater evaluation by the U.S. Army Corps of Engineers. Removal of these tanks, which are more than 40 years old, is under way (USACE 1992b). The total underground storage volume available at the Sewart Air Force Base was more than 1.7 million gal (DoD 1955). Possible groundwater contamination via this source is applicable to this PA for the TNARNG property because of the potential for groundwater flow to traverse the TNARNG property. At least one abandoned UST and a fuel dispensing island dating from Sewart Air Force Base operations is located on property now licensed to TNARNG.

6.1.3 Direct Contact with Contaminated Soil or Water

The J. Percy Priest Reservoir and Wildlife Management Area is widely used for boating, swimming, picnicking, and other recreational activities. In 1986, approximately 8.4 million people visited this area (USACE 1987). Fishermen and boaters have been observed in Stewart Creek at the perimeter of the STP Landfill, where soil and groundwater contamination have been

verified (USACE 1992a). No data are available to evaluate the rate of transport of contaminants released near the Grubbs/Kyle Training Center property via surface or subsurface flow to recreational areas away from the facility.

6.1.4 Consumption of Contaminated Fish

The reservoir supports a warm-water fishery that ranks as one of the most productive in Tennessee, with a 1984 fish harvest of approximately 300,000 lb (USACE 1987). Fishermen and boaters have been observed in Stewart Creek near the area of the STP Landfill, where soil and groundwater contamination have been verified. No data are available to evaluate the possibility of bioaccumulation of contaminants by fish in the reservoir system.

6.1.5 Endangered and Threatened Species

The reservoir system is the habitat of numerous federal- and State-protected endangered and threatened animal and plant species. The impacts of the migration of contaminants from the TNARNG property to the water quality of the reservoir, the contaminant levels in fish, and the potential affect on endangered and threatened species has yet to be determined.

6.2 Recommendations for Further Action

The primary objective of the PA is to identify and evaluate ESOs that would result in either (1) immediate action, (2) site investigation, or (3) no further PA/IRP action. Generally, the available information indicates that Grubbs/Kyle Training Center and the adjacent property pose a potential threat to human health and the environment. The threat exists because surface and subsurface migration pathways could have the capability to transport contaminants that may be present on-site as a result of past and current operations into the 32,750-acre J. Percy Priest Reservoir and Wildlife Management Area. A site investigation is warranted to determine the extent of contamination present on-site and the risk to human and environmental health that would result from migration of this contamination.

Grubbs/Kyle Training Center is located in the northeast corner of the Smyrna/Rutherford County Regional Airport. From the 1940s to the 1970s, both properties were operated by DoD as Sewart Air Force Base. Substantial environmental contamination that dates from past DoD

operations is present on the property now licensed to TNARNG. Initial sampling performed by the U.S. Army Corps of Engineers, Nashville District, as part of an evaluation of groundwater contamination at the former Sewart Air Force Base has confirmed groundwater contamination, as well as surface and subsurface soil contamination, at certain locations. A contaminated area of primary concern is the STP Landfill, which is located on the TNARNG facility.

The migration of contaminants, both within the former DoD property as a whole and to off-site locations, was not addressed by the initial round of sampling. Of significant concern is subsurface contamination that may have resulted from underground fuel storage dating from DoD operations. Approximately 1.7 million gal of fuel were stored in USTs located approximately 2,000 ft south of the current TNARNG property (DoD 1955). One underground fuel storage location of unknown volume that was abandoned by DoD has been identified on the property now licensed to TNARNG. Bulk fuel storage in aboveground tanks was located approximately 5,000 ft south-southwest of the current TNARNG property.

The volume of hazardous chemicals that may have been released to the environment as a result of TNARNG operations does not appear to be substantial. The volume of hazardous materials used at TNARNG is relatively low. Recycling measures and administrative controls that have been in place during most years of TNARNG operation have limited the amount of waste generated. However, data regarding surface and subsurface hydrology evaluated as part of this PA indicate that both surface and subsurface flow from the majority of the former Sewart Air Force Base crosses the current TNARNG property.

A site investigation is recommended to determine the extent of contamination present at Grubbs/Kyle Training Center and the adjacent property. Development of a phased sampling plan is recommended to evaluate (1) migration of contaminants via surface drainage into Stewart Creek and their subsequent transport to the J. Percy Priest Reservoir, (2) migration of contaminants via subsurface flow and the potential for transport to the reservoir, and (3) bioaccumulation of contaminants by the fish and water fowl that inhabit the reservoir in the vicinity of Grubbs/Kyle Training Center. One objective of the sampling effort should be to obtain analytical data to determine whether certain suspected contaminated areas are in fact not contaminated. These areas could be uncontaminated either as a result of subsequent migration of the contaminants away from

the release site or because the quantity of contaminants released is not significant or has been diluted over time. Specific sampling locations may include:

1. Surface sediment and surface water samples collected at selected positions downgradient of the site-wide storm drainage system outfall discharging to Stewart Creek,
2. Surface soil samples collected at selected positions downgradient of the OMS #16 hazardous waste storage area north of Building 639 (i.e., along the slope descending to Stewart Creek),
3. Surface soil samples collected at the AASF #1 hazardous waste storage area (i.e., at the southeast corner of the Building 682/683 hanger),
4. Surface water and sediment samples collected at selected locations along the length of Stewart Creek as it traverses the TNARNG property,
5. Groundwater samples collected at locations downgradient of the former Sewart Air Force Base fuel storage positions,
6. Surface water and sediment samples collected at the perimeter of the STP Landfill and along the Stewart Creek downgradient of the STP Landfill, and
7. Biological samples of the fish and water fowl that inhabit Stewart Creek collected near the perimeter of the STP Landfill within TNARNG property.

Although the STP Landfill is fenced, it is accessible along Stewart Creek. Fishermen and boaters have been observed along the perimeter of the landfill, where surface and subsurface contamination has already been confirmed. Erosion of the landfill surface has uncovered formerly buried debris. Installation of additional fencing is recommended to prevent unauthorized entry to the area.

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Appendix:
Interview Information

Appendix:

Interview Information

Individuals Interviewed

Environmental Officer
Tennessee Army National Guard
Nashville, Tennessee

Real Estate Agent 3
Tennessee Army National Guard
Nashville, Tennessee

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END

**DATE
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10 / 18 / 93