PRELIMINARY ASSESSMENT

(1)

MISSOURI AIR NATIONAL GUARD
LAMBERT-ST. LOUIS IAP
ST. LOUIS, MISSOURI
FEBRUARY 1989

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
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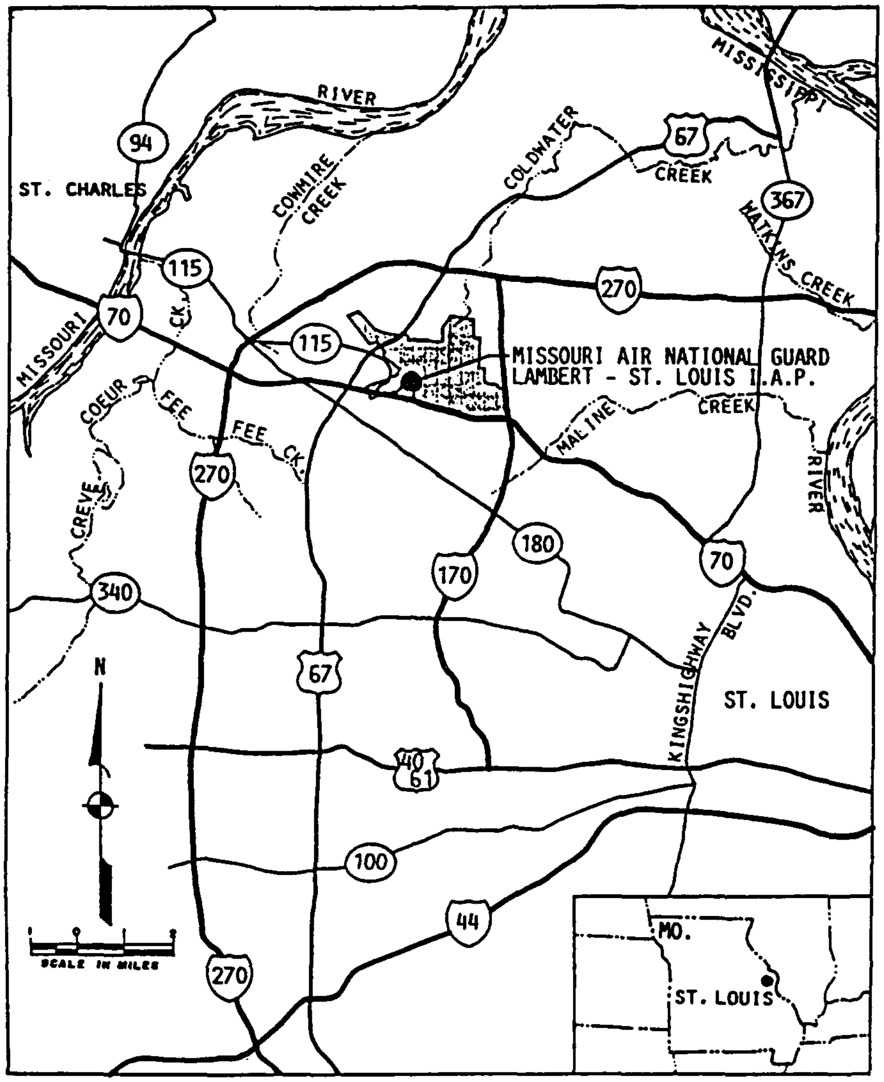

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Preliminary Assessment of suspected hazardous waste sites at the Missouri Air National Guard located at the Lambert-St. Louis International Airport. The study was conducted under the Air National Guard's Testoration Program.

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INSTALLATION RESTORATION PROGRAM
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February 1989

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20331-6008

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EXECUTIVE SUMMARY

A. INTRODUCTION

PEER Consultants, P.C., was retained by the Hazardous Waste Remedial Actions Program (HAZWRAP) Support Contractor office in June 1988 to conduct an Installation Restoration Program (IRP) Preliminary Assessment of the 131st Tactical Fighter Wing, Missouri Air National Guard, Lambert-St.Louis IAP, St. Louis, Missouri, under Contract No. DE-AC05-870R21705. The Preliminary Assessment includes:

- an on-site visit, including interviews with 13 Air National Guard Base (Base) employees conducted by PEER personnel on August 8 through August 12, 1988;
- the acquisition and analysis of pertinent information and records on past hazardous materials use and past hazardous wastes generation and disposal at the Base;
- the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent federal, state, and local agencies; and
- the identification of potential sites on the Base which may be contaminated with hazardous materials/hazardous wastes.

B. MAJOR FINDINGS

Lambert-St. Louis IAP, Missouri Air National Guard Base used and disposed of hazardous materials/hazardous waste during operations which include aircraft maintenance, ground vehicle maintenance, aerospace ground equipment, fire department training, and petroleum, oil, and lubricant (POL) management and distribution. The operations involve such activities as corrosion control, nondestructive inspection, fuel cell maintenance, and engine maintenance.

Varying quantities of waste oils, recovered fuels, spent cleaners, strippers, and solvents were generated and disposed of by these activities.

Interviews with 13 past and present Base personnel, analysis of pertinent information and records, and a field survey resulted in the identification of no disposal/spill/storage sites on the Base.

C. CONCLUSIONS

No potential hazardous material/hazardous waste disposal and/or spill sites were identified.

D. RECOMMENDATIONS

No further action is required.

I. INTRODUCTION

A. BACKGROUND

The 131st Tactical Fighter Wing, Missouri Air National Guard, is located at Lambert-St. Louis IAP, St. Louis, Missouri (hereinafter referred to as the Base). Over the years the types of military aircraft based and serviced there have varied. Because of the use of hazardous materials and disposal of hazardous wastes, the Department of Defense (DoD) has implemented its Installation Restoration Program (IRP).

THE INSTALLATION RESTORATION PROGRAM

The DoD IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on DoD installations, and
- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA, Public Law 96-510) commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 on December 11, 1981, which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the U.S. Environmental Protection Agency (USEPA) Superfund programs were essentially the same, differences in the definition of program phases and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all the provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan (NCP) (40 CFR 300), listing on the National Priorities List (NPL), and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the USEPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program (DERP). This was accomplished by adding Chapter 160, Sections 2701-2707, to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the USEPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

Preliminary Assessment (PA)

The PA consists of a records search and interviews with present and past Base employees to identify and evaluate past disposal and/or spill sites which might pose a potential and/or actual hazard to public health, welfare, or the environment.

Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS)

The SI consists of confirmation and/or quantification of contamination at the sites identified as a result of the PA. The RI consists of field activities designed to further quantify the types and extent of contamination present, including migration pathways.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests are required, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples. Careful documentation and quality control procedures, in accordance with CERCLA/SARA guidelines, ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

- o No further action - Investigations do not indicate harmful levels of contamination and do not pose a significant threat to human health or the environment. The site does not warrant further IRP action and a decision document will be prepared to close out the site.

- o Long-term monitoring - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect possible future problems.

- o Feasibility Study - Investigations confirm the presence of contamination that may pose a threat to human health and/or the environment, and some form of remedial action is indicated. The FS is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action by the Base with concurrence by state and/or federal regulatory agencies.

Remedial Design/Remedial Action (RD/RA)

The RD involves formulation and approval of the engineering designs required to implement the selected remedial action. RA is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in site biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the RAs have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

Research and Development (R&D)

R&D activities are not always applicable for an IRP site, but may be necessary if there is a requirement for additional R&D of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

Immediate Action Alternatives

At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate actions, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. PURPOSE

The purpose of the PA is to identify and evaluate potential sites associated with past hazardous waste handling procedures, disposal sites, and spill sites on the Base and to assess the potential for the migration of hazardous contaminants. PEER Consultants, P.C., visited the Base, reviewed existing environmental information, analyzed the Base records concerning the use and generation of hazardous materials/hazardous wastes, and conducted interviews with Base personnel who were familiar with past hazardous materials management activities. Relevant information collected and analyzed as a part of the PA included the history of the Base, with special emphasis on the history of the shop operations and their past hazardous materials/hazardous wastes management procedures; the local geologic, hydrologic, and meteorologic conditions that may affect migration of potential contaminants; local land use, public utilities, and zoning requirements that affect the potentiality for exposure to contaminants, and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. SCOPE

The scope of this PA is limited to the property situated within the boundaries of the Base and property which is, or has been, controlled by the Base and included the following:

- an on-site visit;

- the acquisition of pertinent information and records on hazardous materials use and past hazardous wastes generation and disposal practices at the Base in order to establish the source and characteristics of hazardous wastes or spills;

- the acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat and utility data from various federal, state, and local agencies in order to establish potential pathways and receptors of hazardous wastes or spills;

- a review and analysis of all information obtained; and

- the preparation of a report, to include recommendations for further actions.

The on-site visit, interviews with Base personnel, and meetings with local agency personnel were conducted on August 8 through August 12, 1988. The PEER PA team consisted of the following individuals (resumes are included as Appendix A):

- Mr. Tom Webb, Senior Project Manager
- Mr. George Nelson, Bioenvironmental Engineer
- Ms. Joni Oliver, Civil/Environmental Engineer
- Mr. Keith Owens, Hydrogeologist

Individuals from the Base who assisted in the PA included Major Roy Van Hee and Lane Endicot, 131 TFW/DE. Also assisting were Lorie Baker of HAZWRAP and Project Officers Greg Krisanda and Carol Ann Beda, Headquarters Air National Guard Support Center (ANGSC).

D. METHODOLOGY

A flowchart of the PA methodology is presented in Figure I-A. This PA methodology ensures, to the greatest extent possible, a comprehensive collection and review of pertinent site-specific information, and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The PA began with a site visit to the Base to identify all shop operations or activities that may have used hazardous materials or generated hazardous

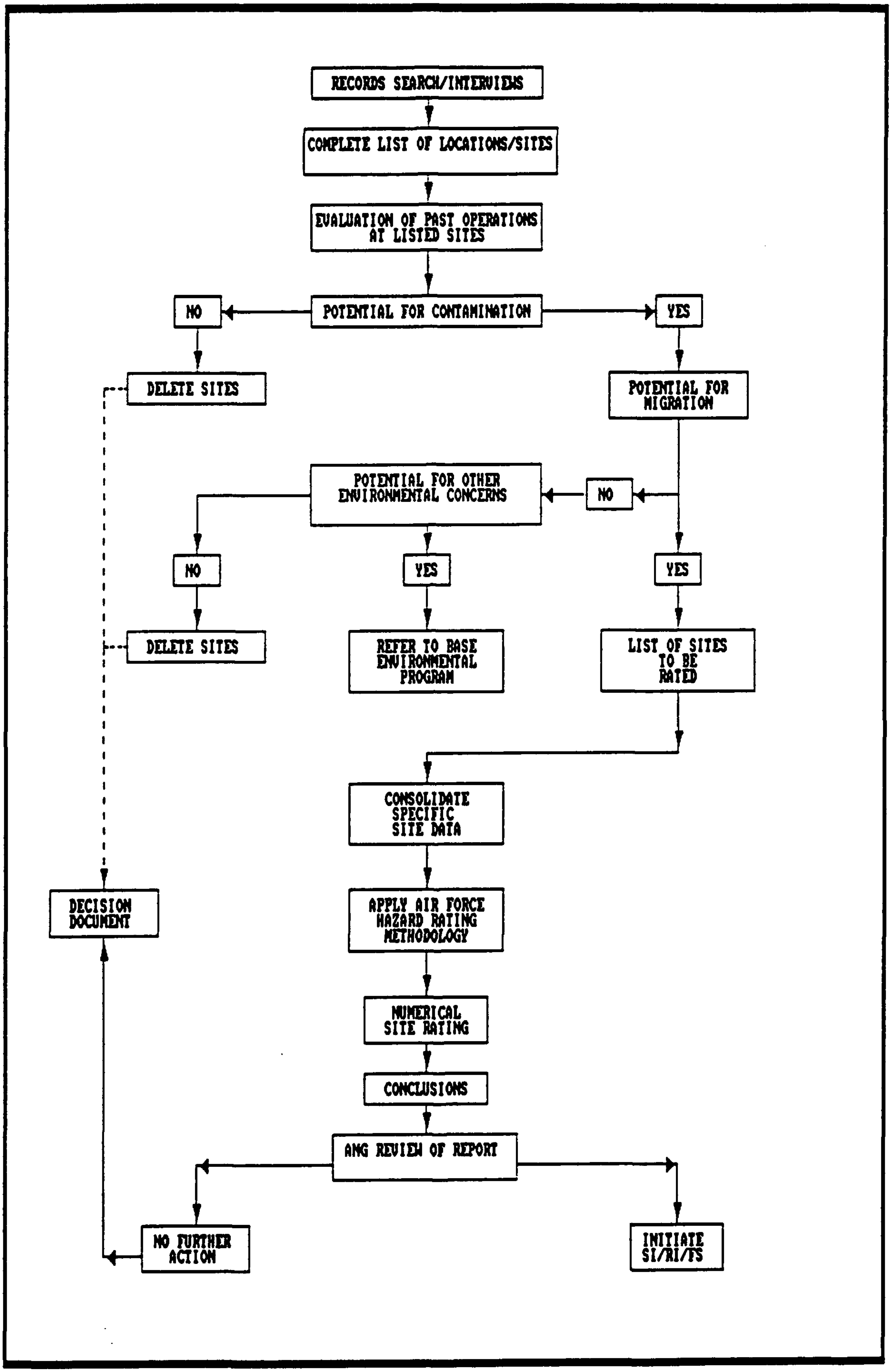

Figure I-A Preliminary Assessment Methodology Flowchart wastes. Next, an evaluation of past and present hazardous materials/hazardous wastes handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past hazardous materials/hazardous wastes handling practices was facilitated by extensive interviews with 13 Base employees having an average tenure of 25.5 years. These interviews were also used to define the areas on the Base where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment in order to establish the source and characteristics of hazardous wastes or spills.

Historical records contained in the Base files were collected and reviewed to supplement the information obtained from interviews. Using this information, a list of potential waste spill/disposal/storage sites on the Base was identified for further evaluation. A general survey tour of the potential sites, the Base, and the surrounding area was conducted to determine the presence of visible contamination and to help the PEER survey team assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells in order to establish potential pathways for migration.

Detailed geologic, hydrologic, meteorologic, developmental (land use and zoning), and environmental data for the area of study were also obtained from appropriate federal, state, and local agencies as identified in Appendix B for the purpose of establishing potential receptors of hazardous wastes or spills.

Using the process shown in Figure I-A, a decision was then made, based on all the above information, regarding the potential for hazardous materials contamination and migration to receptors. Although no potential existed for contamination, migration, or reception, if potential for contamination had been identified, the potential for migration of the contaminant would have been assessed based on site-specific conditions. If there had been potential for contaminant migration, the site would have been evaluated using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix C.

II. INSTALLATION DESCRIPTION

A. LOCATION

The Base is located at the St. Louis International Airport, St. Louis, Missouri. The Base occupies 50 acres of land located at Township 46N, Range 6E, Section 5. The north 23 acres of the Base is leased from the city of St. Louis and is under its jurisdiction. The south 27 acres of the Base is federal property located in St. Louis County. The Base employs 1,587 military personnel and 342 technicians. Figure II-A shows the location and boundaries of the Base.

B. ORGANIZATION AND HISTORY

The Missouri Air National Guard's primary mission is the same as that of the U.S. Air Force, which is to defend the U.S. against any would-be aggressor. The fighter mission of the Missouri Air National Guard is served through the 131st Tactical Fighter Wing and the 131st Tactical Fighter Group, both based at St. Louis. The basic flying unit is the 110th Tactical Fighter Squadron, a present-day descendant of the 35th Division, Aviation Section, later to become the 110th Observation Squadron.

The 35th Division, Aviation Section, Missouri National Guard, was formally organized on June 23, 1923. The first headquarters for the unit were located in a filling station on Manchester Avenue. After several moves, in 1926 the unit was notified that its federal recognition would be withdrawn unless it found suitable headquarters space. In the spring of 1927, the unit headquarters were moved to the Missouri National Guard facilities on South Grand.

The first flying equipment was a Curtiss OX JN-4 "Jenny," which was purchased by the officers of the squadron. During the next few years, the JN-4s were replaced by the TW-3, PT-1, O-11, and O-2H aircraft, and the unit assumed a mission of observation and reconnaissance. The Douglas O-38E aircraft was received in 1933, and replaced in 1938 by the North American O-47A, an all-metal mid-wing observation aircraft.

FIGURE II-A

BASE LOCATION MAP

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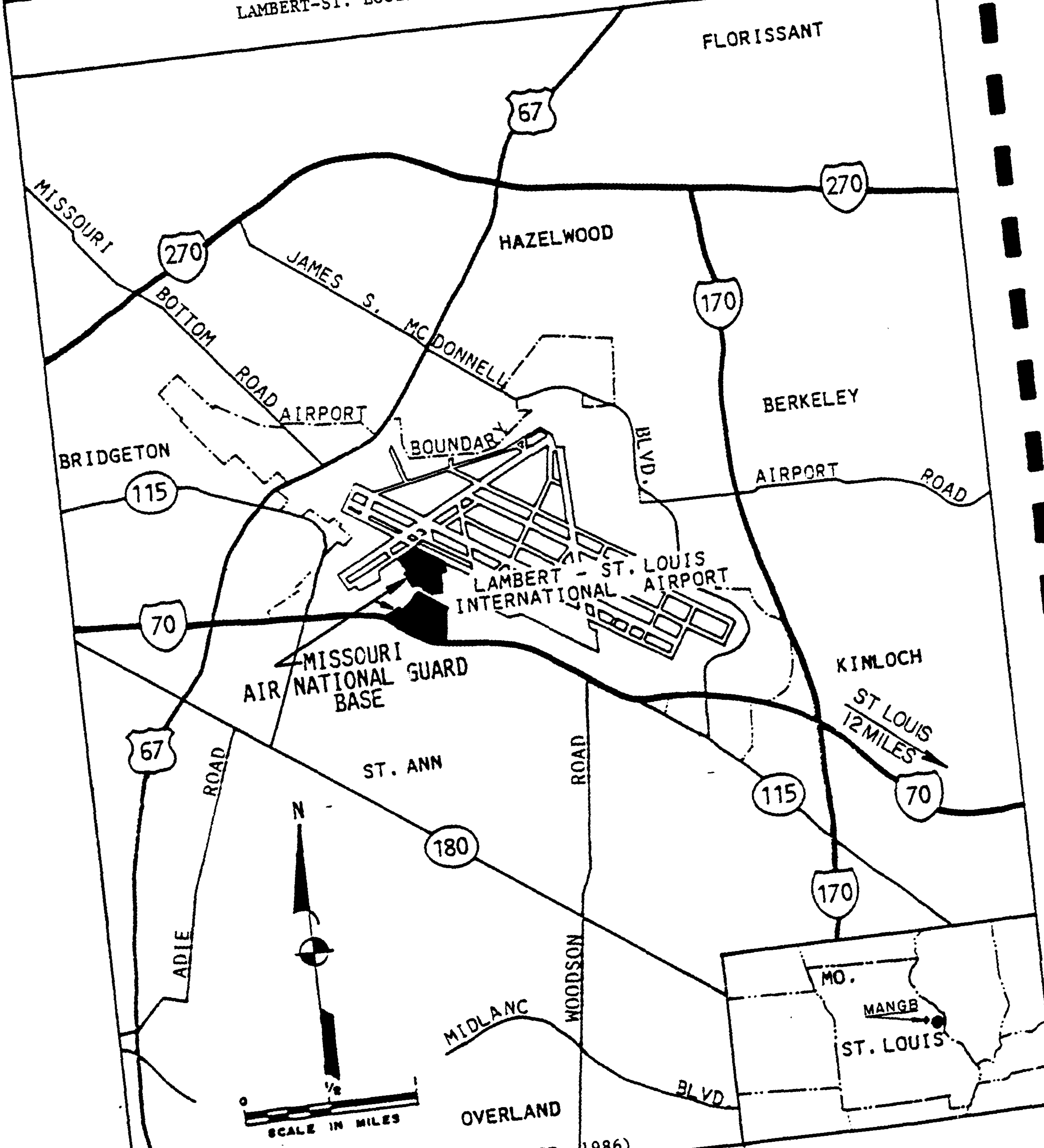

(SOURCE: MISSOURI AIR NATIONAL GUARD, 1986)

The unit entered into active service at the start of World War II. In the early stages of the war, the unit was equipped with P-39 and P-40 fighter aircraft. The unit distinguished itself in sinking an enormous tonnage of Japanese shipping and received the Presidential Unit Citation. Later in the war, the 110th converted to the P-51 "Mustang." In the early summer of 1946, plans were formulated to organize the Air National Guard.

The 110th Observation Squadron, Missouri National Guard, was one of the units federalized on December 23, 1940. Federal recognition was granted to the 57th Fighter Wing and the 110th Fighter Squadron in September 1946. The 57th Fighter Wing was redesignated the 71st Fighter Wing in 1947 and finally the 131st Composite Wing on November 1, 1950.

On March 1, 1951, as a result of the Korean Conflict, the wing was recalled to active federal service for 21 months. Shortly after the unit's return, it was re-equipped with the B-26 Light Bomber.

The 110th received its first jet aircraft in the spring of 1957. In 1957 when the Base began transitioning to jet aircraft, the primary fuel was changed from AVGAS to jet fuel, but maintenance operations involving potentially hazardous materials/hazardous waste were not significantly increased because the new aircraft were of similiar size and number. The unit flew F-80 and T-33 aircraft until June, then transitioned to the F-84 "Thunderstreak" jet fighter. On December 15, 1957, the last B-26 left Lambert Field and the conversion to the new mission and aircraft was complete. A high degree of operational readiness was maintained with annual summer encampments at Volk Field, Wisconsin. In the last quarter of 1959, the 110th Tactical Fighter Squadron was rated as the outstanding F-84F jet aircraft unit in the United States.

As a result of the Berlin Crisis, the 110th Tactical Fighter Squadron was recalled to active service at Toul-Rosieres Air Base, France, from October 1961 to August 1962. After returning to St. Louis, the unit received the North American F-100 "Super Sabre" jet fighter in late 1962. In early 1963 the unit received the North American F-100C "Super Sabre" fighter. Its standard of excellence and operational readiness was maintained for 16 years with the F-100.

In the autumn of 1978, the 110th received the McDonnell Douglas F-4C "Phantom II" and continued to fly it until December 1985, when the unit converted to the later model F-4E, its current operational aircraft.

There have been no significant events or changes of organization between 1985 and the present time (Table II-A).

TABLE II-A

Summary of Organizational Structure and Historical Events Affecting Missouri ANG

June 1923	Missouri ANG was formally organized.
1924	Arrival of Curtiss JN-4 or "Jenny" Aircraft. The unit's first summer encampments were held in 1924 and 1925.
1925	Arrival of the TW-3 aircraft.
1927	Arrival of two PT-1 aircraft.
1928	Arrival of two O-11 aircraft.
1929	Arrival of the O-2H aircraft. The O-11 aircraft was transferred out.
1933	Arrival of the Douglas O-38E aircraft.
1938	Arrival of the North American O-47A. The O-38E aircraft was transferred out.
December 1940	110th Observation Squadron, Missouri National Guard, was federally recognized.
1944	The unit was equipped with the P-39 and P-40 aircraft and converted to F-51 "Mustang" fighters.
September 1946	Federal recognition was granted to the 57th Fighter Wing and the 110th Fighter Squadron.
1947	The 57th Fighter Wing was redesignated the 71st Fighter Wing.
November 1950	The 71st Fighter Wing was redesignated the 131st Composite Wing.
March 1951	The unit was recalled to active federal service.
1952	The unit was re-equipped with the B-26 Light Bomber aircraft.
1957	The unit received its first jet aircraft, the F-84 "Thunder-streak" jet fighter. The F-80 and T-33 were used until June, then transitioned out. The B-26 was also transferred out.
October 1961	The 110th Tactical Fighter Squadron was recalled to active service at Toul-Rosieres Air Force Base, France.
September 1962	Arrival of the North American F-100 "Super Sabre" jet fighter.

Table II-A (Continued)

Summary of Organizational Structure and Historical Events Affecting Missouri ANG

August 1963	Arrival of the later model North American F-100C "Super Sabre" fighter.
1978	Arrival of the F-4C "Phantom II."
December 1985	F-4C "Phantom II" was transferred out and a later model arrived, the F-4E aircraft.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

The climate that is prevalent over East-Central Missouri, which includes the city of St. Louis and the Base, is a somewhat modified continental climate. In general, the summers are moderately long and hot while winters are short and brisk. Table III-A gives a statistical picture of the climate of the Base.

TABLE III-A

CLIMATIC DATA FOR ST. LOUIS, MISSOURI

SOURCE: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (1987)

<u>Temperature (in Degrees Fahrenheit)</u>	
Average Winter Temperature	39°
Average Summer Temperature	76°
Mean Annual Temperature	56°
Coldest Month	January
Warmest Month	July
Absolute Maximum Temperature	107° in August 1984
Absolute Minimum Temperature	-18° in January 1985
Average Frost-Free Period	300 days
<u>Precipitation (in inches)</u>	
Mean Annual Precipitation	38.38"
Wettest Month	4" in June
Driest Month	2" in January
Mean Annual Relative Humidity	65%
Highest Precipitation in One Month	10.71" in July 1981
Lowest Precipitation in One Month	Trace in September 1979
Rainfall Intensity (24 hours)	3.17"

The information above is based on data collected between 1958 and 1987. Annual net precipation averages 2.38 inches. The evaporation rate, based on Federal Register 47 FR 31224, July 16, 1982, is 36 inches per year.

B. GEOLOGY

1. Geomorphology

St. Louis County, St. Louis, Missouri, is situated within two Physiographic Provinces (Figure III-A). The northeastern two-thirds of St. Louis County lie within the Dissected Till Plains section of the Central Lowlands Region. The remainder of the county lies within the Salem Plateau of the Ozarks, which is a part of the Interior Highlands. The Base itself is within the Dissected Till Plains. The topography of this Province is gently undulating, with altitudes ranging from 500 to 700 feet. The morainal topography seen over much of the adjacent glaciated areas is noticeably lacking here. This particular area was glaciated twice during the Pleistocene Era, but the till deposits are thin and dissected. At the Base, changes in topography due to construction are minimal. Airport elevation ranges from 540 to 550 feet.

2. Stratigraphy

The stratigraphic sequence consists primarily of limestone and dolomite that were deposited mostly in shallow epicontinental seas. Rocks range in age from Precambrian to Holocene. A composite stratigraphic section showing these rocks and their water-bearing properties is given in Table III-B. The Precambrian rocks, the Lamotte Sandstone, and the lower part of the Bonneterre Formation are the only units that do not crop out in the area; however, they are present in the subsurface. Breaks in the stratigraphic record, such as unconformities, are shown by wavy lines on the column.

Alluvium underlying the floodplains and terraces of the Mississippi, Missouri, and Meramec rivers extends over 277 square miles in the tri-county area. The thickness of the alluvium is variable because of irregularities in the bedrock surface upon which it was deposited. The maximum known thickness of alluvium (150 feet) is located in the Columbia Bottoms near the mouth of the Missouri River. The alluvium is composed of clay, silt, sand, and gravel.

PHYSIOGRAPHIC PROVINCES	FIGURE III-A

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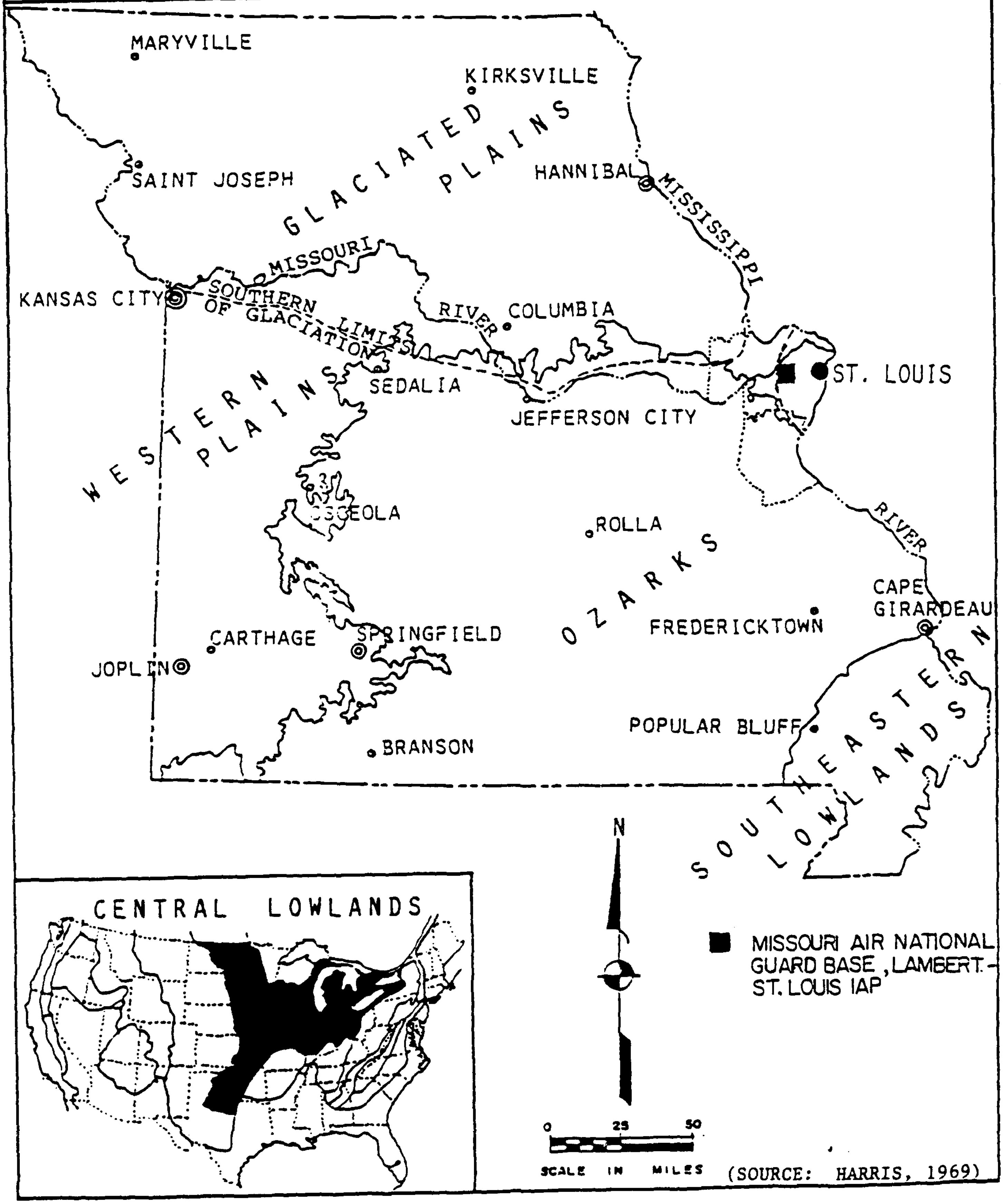

(SOURCE: HARRIS, 1969)

STRATIGRAPHIC CHART FOR LAMBERT-ST. LOUIS IAP	TABLE III-B

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System	Series	Group	Formation	Aquifer group	Thickness (feet)	Dominant lithology	Water-bearing character
Quaternary	Holocene		Alluvium		0-150	Sand, gravel, silt, and clay.	Some wells yield more than 2,000 gpm.
	Pleistocene		Loess		0-110	Silt	
			Glacial till		0-55	Pebbly clay and silt.	Essentially not water yielding
Pennsylvanian	Missourian	Pleasanton	Undifferentiated		0-75	Shales, siltstones, "dirty" sandstones, coal beds and thin limestone beds.	Generally yields very small quantities of water to wells. Yields range from 0-10 gpm.
		Marmaton	Undifferentiated		0-90		
	Desmoinesian	Cherokee	Undifferentiated		0-200		
	Atokan		Undifferentiated				
Mississippian	Meramecian		Ste. Genevieve Formation		0-160	Argillaceous to arenaceous limestone.	
			St. Louis Limestone		0-130		
			Salem Formation		0-180		
			Warsaw Formation		0-110		
	Osagean		Burlington-Keokuk Limestone	1	0-240	Cherty limestone	
			Fern Glen Formation		0-105	Red limestone and shale.	Yields small to moderate quantities of water to wells. Yields range from 5 to 50 gpm. Higher yields are reported for this interval locally.
	Kinderhookian	Chouteau	Undifferentiated		0-122	Limestone, dolomitic limestone, shale, and siltstone.	
Devonian	Upper	Sulphur Springs	Bushberg Sandstone		0-60	Limestone and sandstone.	
			Glen Park Limestone				
			Grassy Creek Shale		0-50	Fissile, carbonaceous shale.	
Silurian			Undifferentiated		0-200	Cherty limestone.	
Ordovician			Maquoketa Shale		0-163	Silty, calcareous or dolomitic shale.	Probably constitutes a confining influence on water movement.
	Cincinnatian		Cape Limestone		0-5	Argillaceous limestone.	
	Champlainian		Kimmswick Formation		0-145	Massive limestone	
			Decorah Formation		0-50	Shale with interbedded limestone.	Yields small to moderate quantities of water to wells. Yields range from 3 to 50 gpm. Decorah Formation probably acts as a confining bed locally.
			Plattin Formation	2	0-240	Finely crystalline limestone.	
			Rock Levee Formation		[illegible]	Dolomite and limestone, some shale.	
			Joachim Dolomite		0-135	Primarily argillaceous dolomite.	
			St. Peter Sandstone		0-160	Silty sandstone, cherty limestone grading upward into quartzose sandstone.	Yields moderate quantities of water to wells. Yields range from 10-140 gpm.
			Everton Formation	3	0-130		
	Canadian		Powell Dolomite		0-150	Sandy and cherty dolomites and sandstone.	Yields small to large quantities of water to wells. Yields range from 10 to 300 gpm. Upper part of aquifer group yields only small amounts of water to wells.
			Cotter Dolomite		0-320		
			Jefferson City Dolomite	4	0-225		
			Roubidoux Formation		0-177		
			Gasconade Dolomite Gunter Sandstone Member		0-230		
Cambrian	Upper		Eminence Dolomite		0-172	Cherty dolomites, siltstones, sandstone, and shale.	Yields moderate to large quantities of water to wells. Yields range from 10 to 400 gpm.
			Potosi Dolomite		0-325		
		Elvins	Derby-Doerun Dolomite	5	0-165		
			Davis Formation		0-150		
			Bonneterre Formation		245-385		
			Lamotte Sandstone		235+		
Precambrian						Igneous and metamorphic rocks.	Does not yield water to wells in this area.

(SOURCE: HARRIS, 1969)

In general, the alluvium becomes coarser grained with depth. Figure III-B shows the geology of the general area, and Figures III-C and III-D are cross-sections of St. Charles and St. Louis counties.

3. Structure

Figure III-E shows the major structural features in the St. Louis, St. Charles, and Jefferson County area, with the approximate location of the Base indicated. Note that the Base is situated near the southwest flank of the Florissant Dome. The Florissant Dome will influence the direction of migration of potential contaminants. The structures shown on Figure III-E are superimposed on a regional dip of from 60 to 80 feet per mile to the northeast.

There is no known significant faulting in St. Louis County or on the Base; however, lack of surface exposures of reliable marker beds limits mapping of possible surface faults. There are two faults in Jefferson County, as shown on Figure III-E. The presence of faulting would be a controlling factor in groundwater movement. Synclinal and anticlinal features are noticeable south and southwest of the Florissant Dome.

C. SOILS

The soils present at the Base are represented by one Series as defined by the U.S. Department of Agriculture Soil Conservation Service (Figure III-F). The Urban Land Series covers the entire Base. To the north and east of the Base lies the Nevin-Urban Land Series, and to the south lies the Urban Land-Harvester Series. The Base was originally covered by both the Nevin and Harvester Series, but has been mostly replaced by random fill material. The nature of the soils, such as permeability and water capacity, can have an impact on the migration of potential contaminants.

Soil boring logs provided indicate that the Base is covered with fill material to a depth of 4 to 6 feet. The fill material appears to consist of mostly clayey material.

GEOLOGIC MAP OF MISSOURI

FIGURE III-B

MISSOURI AIR NATIONAL GUARD

LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI

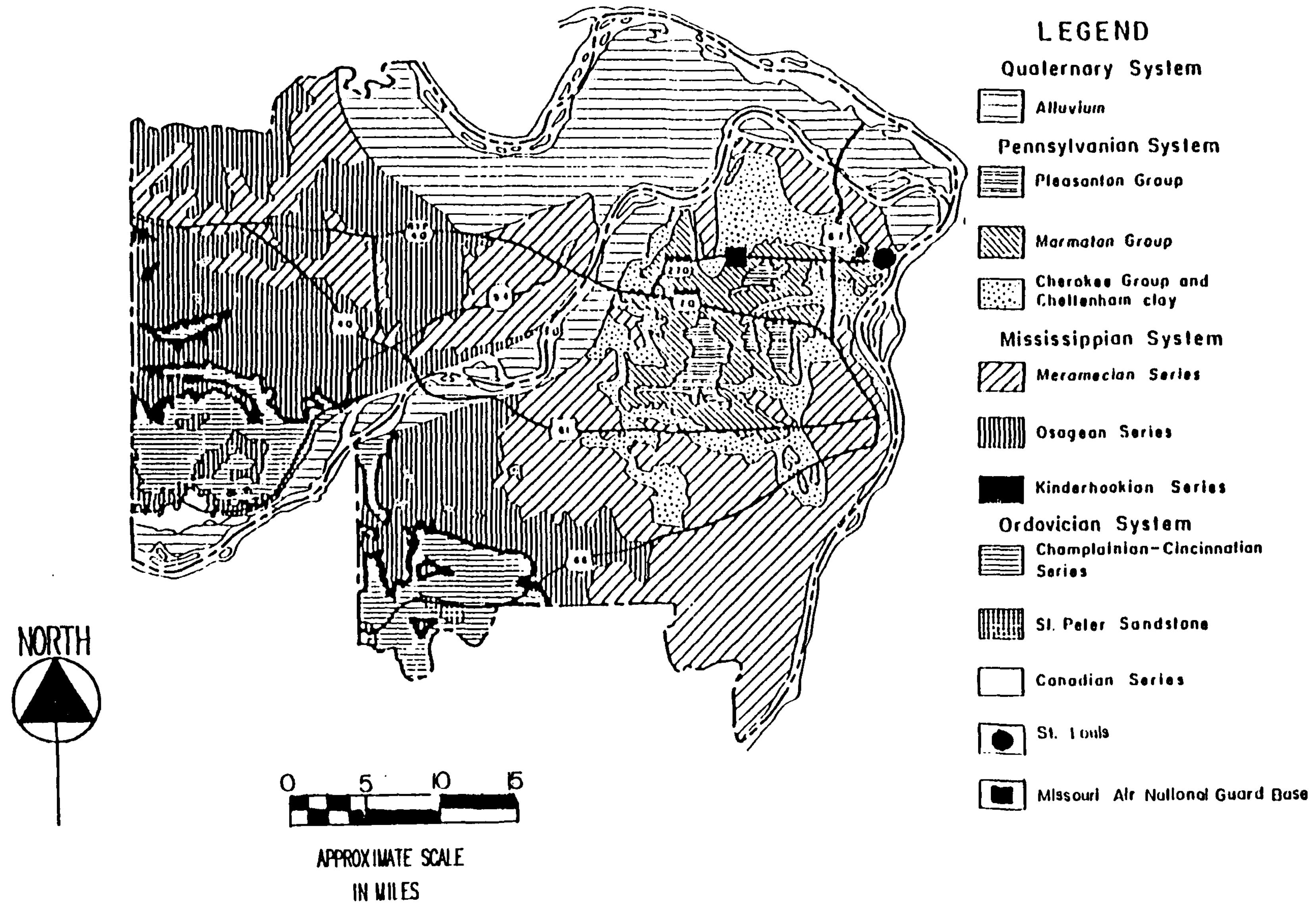


FIGURE III-C

EAST-WEST CROSS-SECTION
ST. LOUIS - ST. CHARLES COUNTIES, MISSOURI

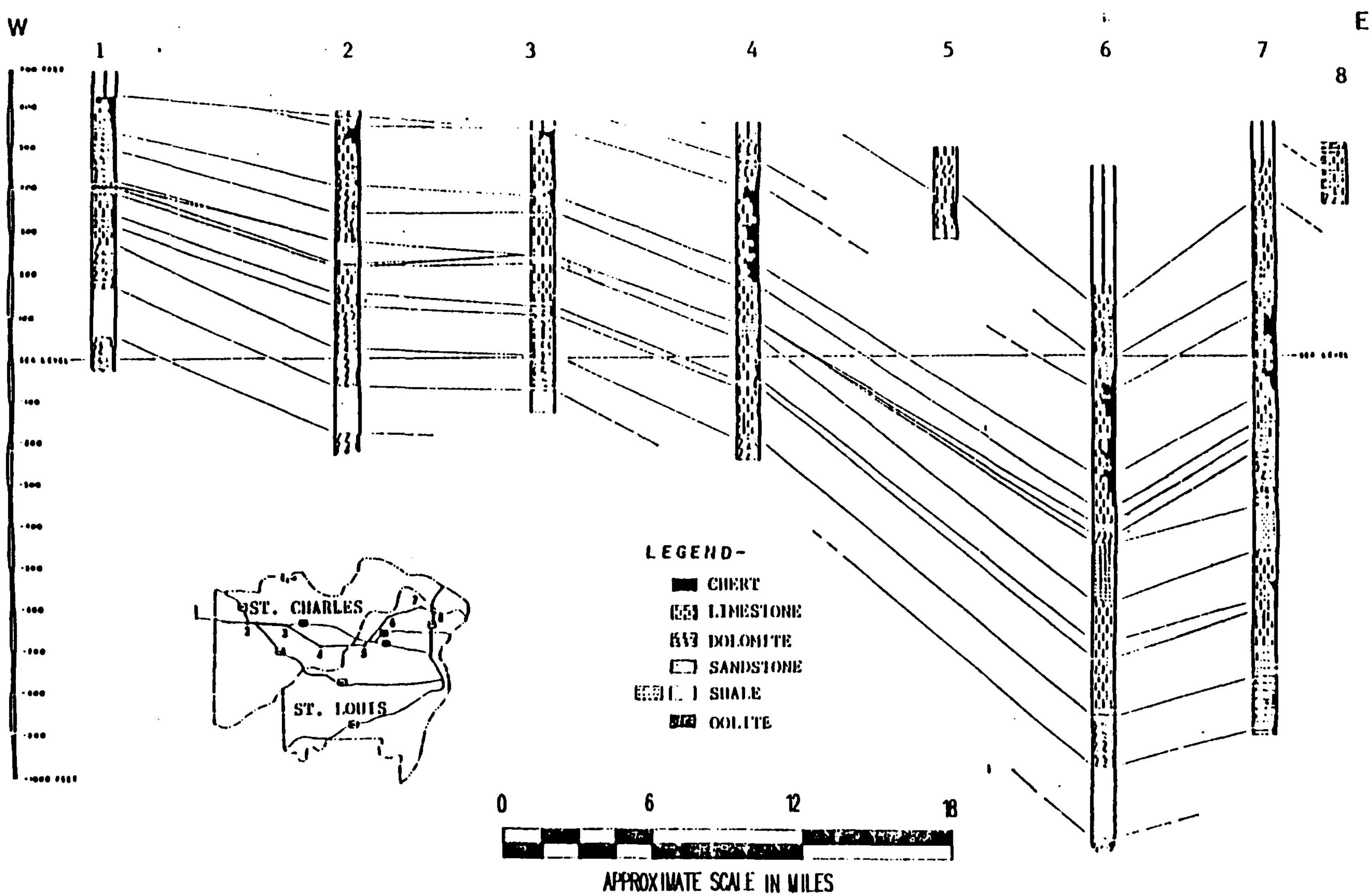
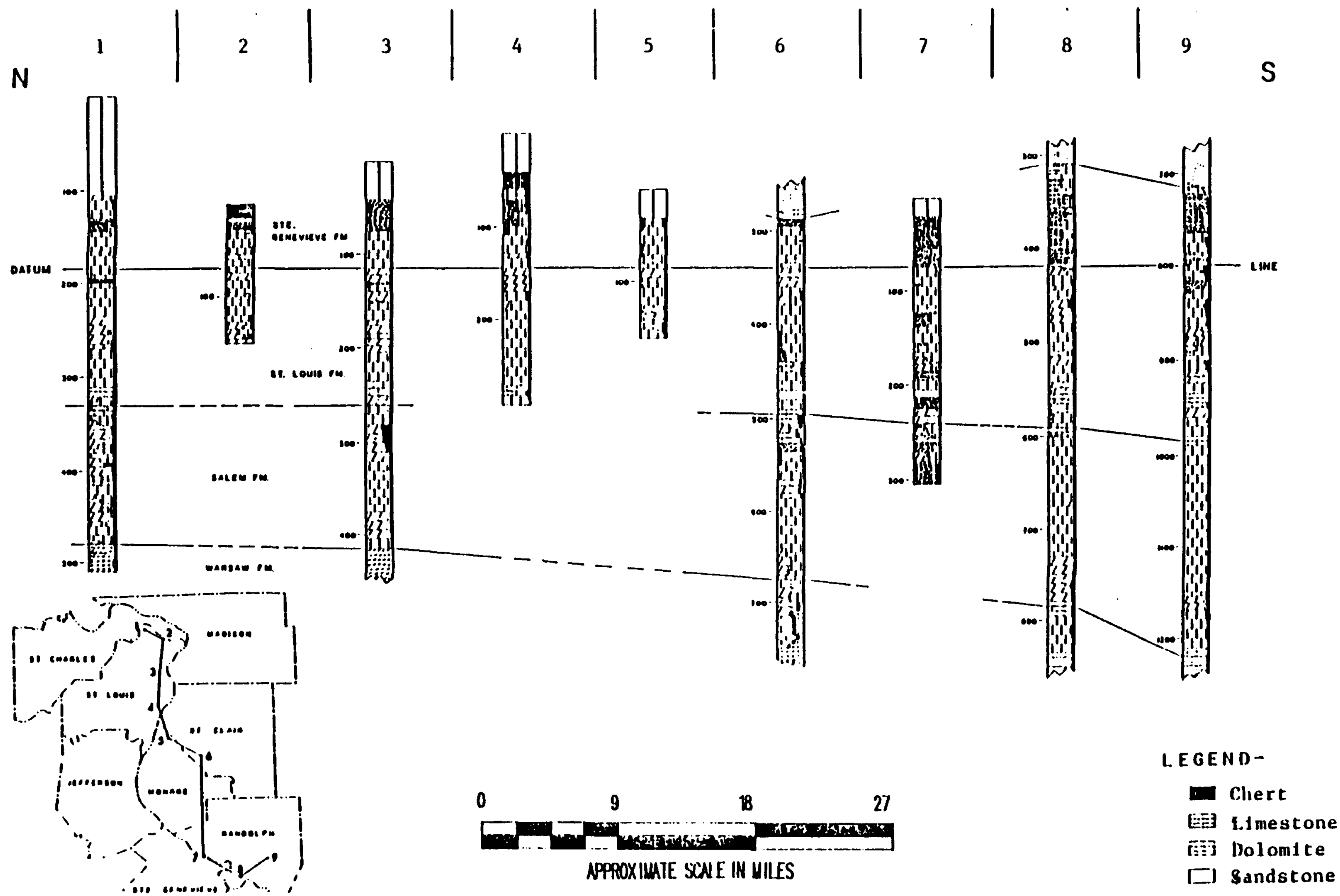


FIGURE III-D

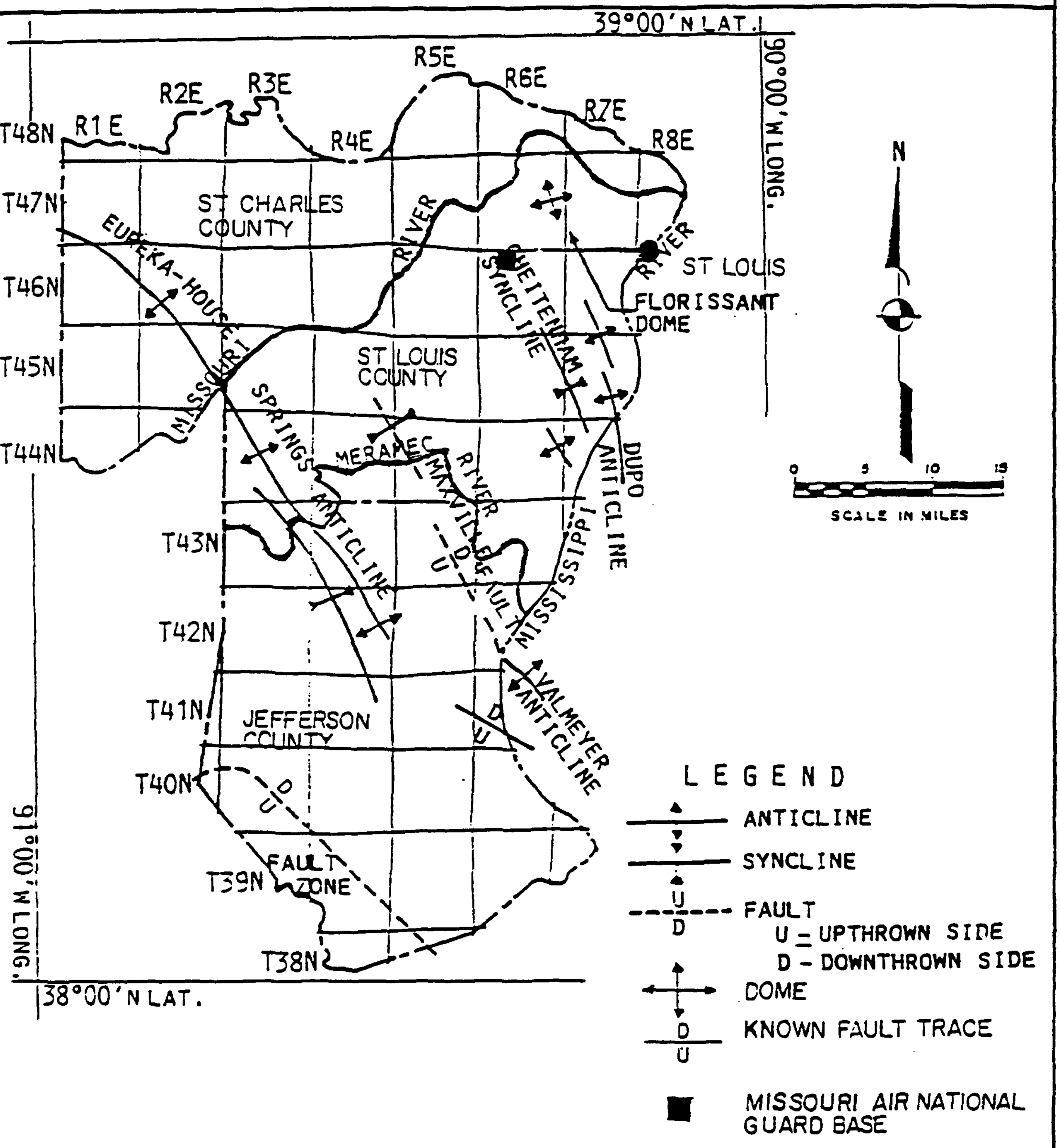
NORTH-SOUTH CROSS-SECTION
ST. LOUIS - RANDOLPH COUNTIES, MISSOURI



STRUCTURAL FEATURES OF WEST - CENTRAL MISSOURI

FIGURE III-E

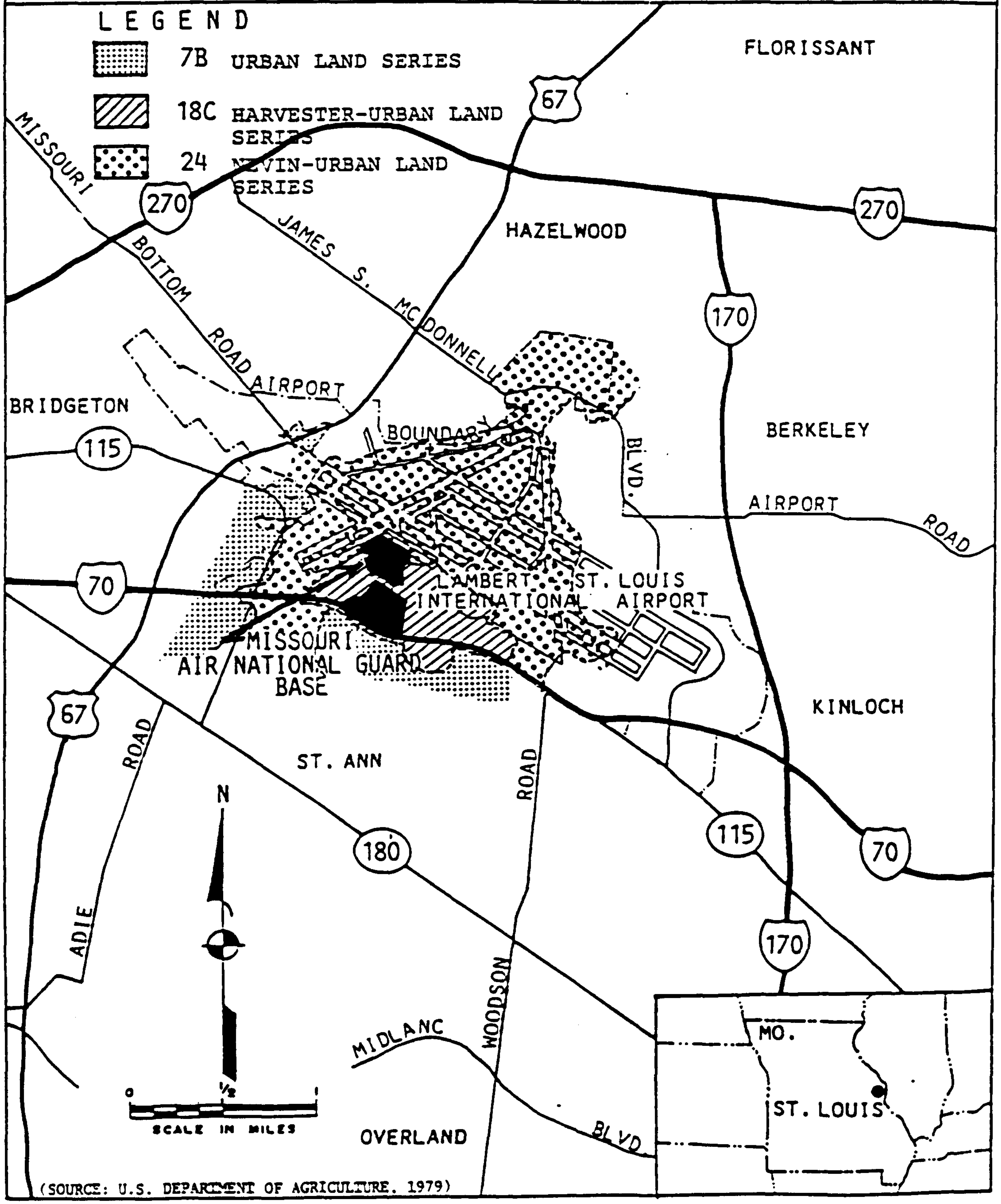
MISSOURI AIR NATIONAL GUARD
LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI



(SOURCE: McCRACKEN AND McCRACKEN, 1965)

SOILS MAP | FIGURE III-F

MISSOURI AIR NATIONAL GUARD
LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI



(SOURCE: U.S. DEPARTMENT OF AGRICULTURE, 1979)

The Urban Lands Series consists of areas of 0 to 5 percent slopes, of which more than 85 percent of the surface is covered by impervious materials (i.e., buildings, pavements, etc.).

The Urban-Harvester Series, a silt loam with 2 to 9 percent slopes, is a deep, moderately drained, nearly level soil. It formed in silty alluvium. The Urban Land and Harvester soils were so intermingled or in such an intricate pattern that to separate them in mapping was not practical. The surface layer of the Urban-Harvester Silt Loam is generally 0 to 4 inches and has a dark grayish brown color. The subsoil consists of a sequence as follows: (1) 4 to 18 inches - yellowish brown silt loam; (2) 18 to 37 inches - mixed yellowish brown, grayish brown, and strong brown silt loam and silty clay loam; (3) 37 to 44 inches - dark yellowish brown silty clay loam; and (4) 44 to 60 inches - dark yellowish brown silt clay loam.

The Urban-Harvester silt loam consists of 65 percent Urban Lands and 30 percent Harvester Series. Permeability is moderate at 0.2 to 2.0 inches per hour, and the water capacity is moderate at 0.10 to 0.24 inches per inch of depth. This soil series is of medium acidity to neutral pH throughout. Surface runoff is rapid, and therefore poses a potential erosion hazard. The water table is seasonal at a depth in excess of 6 feet from late fall to early spring. Flooding is not a problem. The shrink-swell potential is moderate.

The Nevin-Urban series, a silt loam with 0 to 2 percent slopes, is a deep, somewhat poorly drained, nearly level soil in upland basins. It formed in silty alluvium. The surface layer of the Nevin-Urban silt loam is generally 0 to 11 inches and has a very dark gray color. The subsoil consists of a sequence as follows: (1) 11 to 19 inches - very dark gray to gray silt loam; (2) 19 to 24 inches - dark gray silt loam; (3) 24 to 36 inches - very dark grayish brown silty clay loam; (4) 36 to 45 inches - mottled brownish yellow, yellowish brown, and light brownish gray silty clay loam; and (5) 45 to 60 inches - light grayish brown silty clay loam.

The permeability of the Nevin-Urban silt loam is moderate at 0.6 to 2.0 inches per hour, and the water capacity is moderate at 0.18 to 0.23 inches per inch of depth. The soil series is of medium acidity to neutral pH throughout. Surface runoff is slow and therefore poses little erosional hazard. The water table is seasonal and apparent at a depth of 2 to 4 feet in the winter and early spring. Flooding is not a problem. The shrink-swell potential is moderate.

D. WATER RESOURCES

1. General

Large quantities of fresh water are found underlying St. Louis County, including the area occupied by the Base. The principal water-bearing units are the Post Maquoketa Group, the Kimmswick-Joachim Group, the St. Peter-Everton Group, the Powell-Gasconade Group, and the Eminence-Lamote Group. Table III-B is a chart displaying these formations and several parameters regarding them.

Water quality of the major aquifers is generally good for most uses. Some aquifers have the capability of producing over 400 gallons per minute in wells of proper construction. Other aquifers yield 50 gallons per minute or less. Transmissivity values range from 100 to 300 gallons per day per foot.

The Missouri River is approximately 5 miles northwest of the Base. Large quantities of surface water are available from this source. Additional surface sources of water include the Mississippi River, approximately 18 miles east of the Base, and the Meramec River, approximately 24 miles south of the Base.

All runoff from the land surface in the area eventually reaches the Mississippi or Missouri rivers through a network of tributary streams. The floodplains of each of these two rivers are up to 11 miles wide and are bordered by loess-covered uplands. The Base does not lie within the 100-year floodplain.

The lowest stream flows normally occur on most of the streams during late spring and early fall. The highest stream flows generally occur in winter and early spring. Flooding can occur along many of the floodplains associated with the streams.

2. Surface Water

The amount and distribution of precipitation and the size of the drainage basin principally control the flow of streams in Missouri. The shape of the drainage basin, geology, topography, vegetative cover, and impoundments are other significant factors affecting flow. The tri-county area, including St. Louis, receives 97 percent of its potable water from the Missouri, Mississippi, and Meramer rivers. None of these water supplies are within 3 miles of the Base. Eighty-five percent of the surface water used is from the Mississippi River. The water of these rivers is generally of good quality and suitable for most uses. The water is a moderately mineralized, calcium-bicarbonate type with significant amounts of magnesium and sulfate in the form of dissolved solids. The Base receives its water supply from the St. Louis County Water Company. The drainage from the Base empties into Coldwater Creek (Figure III-G), which ultimately discharges into the Missouri River, flowing generally north, then east. The Base lies within the Missouri River drainage basin.

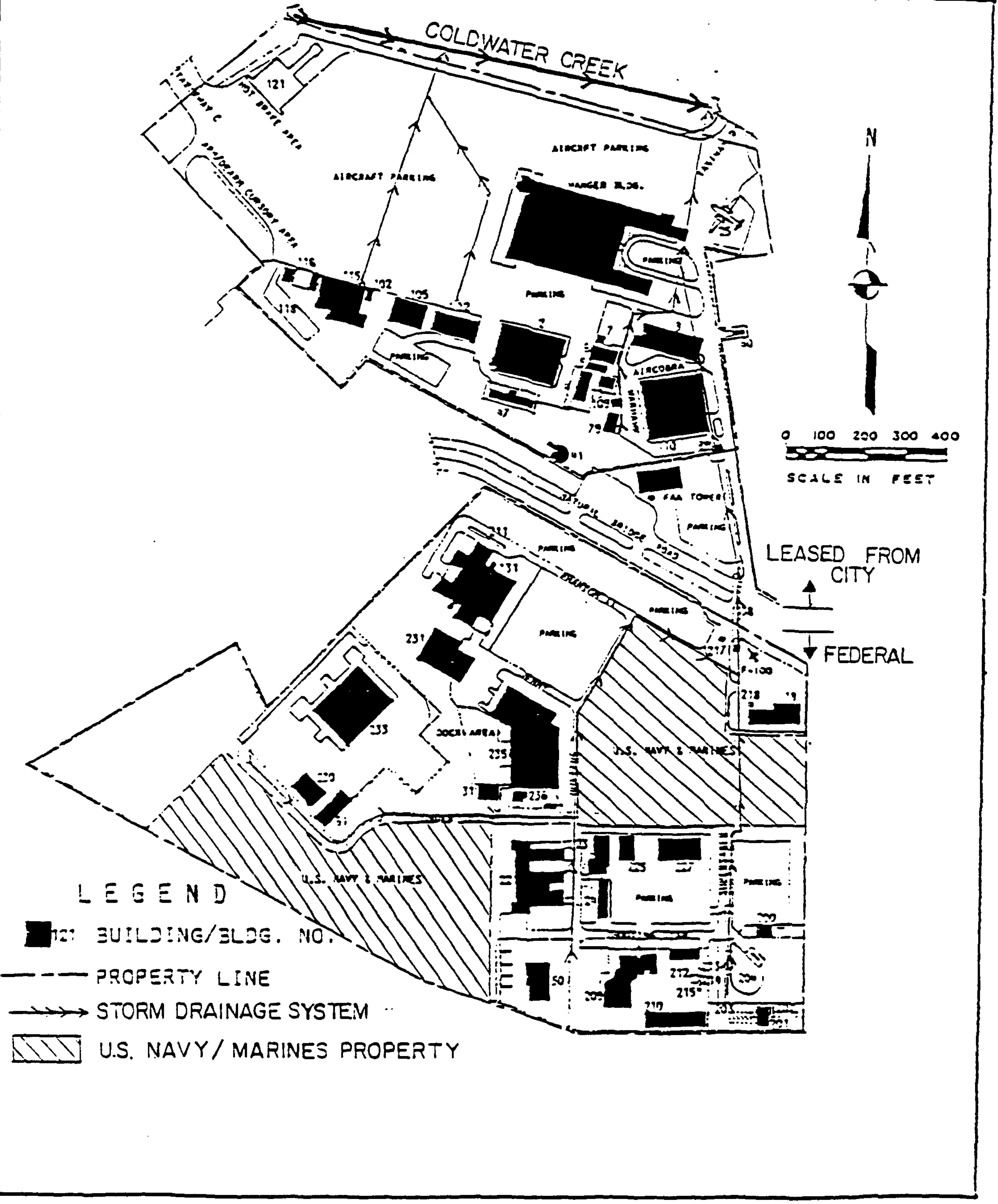
3. Groundwater

The Base is underlain by one primary aquifer that is capable of supplying water to wells (Figure III-H). No wells are located within the perimeter of the Base. That aquifer is the Post Maquoketa Group, including the Bushbery Sandstone and the Glen Park Limestone. Yields from these wells range from 5 to 50 gallons per minute (Miller et al., 1974), with some higher yields reported locally. The lower limit of this aquifer is confined by the Maquoketa Shale. Very few wells are used by the general population within 3 miles of the Base due to the availability of the Missouri and Mississippi rivers as a source of potable water.

BASE SURFACE RUNOFF/DRAINAGE SYSTEM

FIGURE III-G

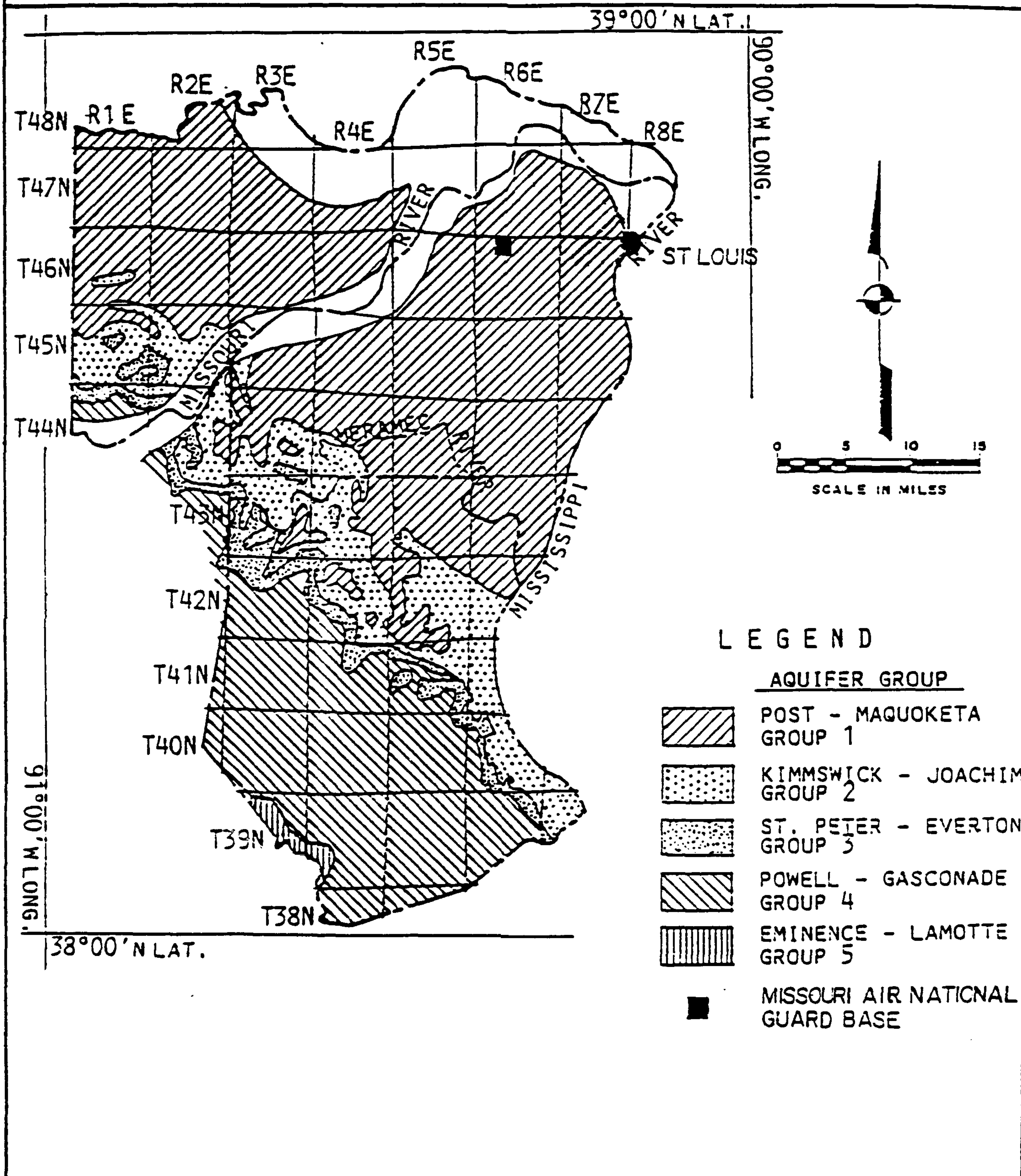
MISSOURI AIR NATIONAL GUARD
LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI



CONFIGURATION OF AQUIFERS OF WEST - CENTRAL MISSOURI

FIGURE III-H

MISSOURI AIR NATIONAL GUARD
LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI



(SOURCE: HARRIS, 1969)

Hydraulic gradient in this region is 8.3 ft/mile to the east and northeast into the Illinois Basin. Specific capacities of aquifers in the St. Louis County area are not as favorable as in western St. Charles and Jefferson counties. Wells in St. Louis County generally yield 50 gpm or less in shallow aquifers, with saline water yielded in the deeper aquifers.

Recharge from precipitation to the East St. Louis Alluvial area, adjacent to the study area, has been estimated to be 65 million gallons per day for 175 square miles (Schight, 1965). Data were not available to determine induced infiltration rates of streams in the study area.

Any of the aquifers mentioned above and described in Table III-B are capable of supplying water to domestic wells, but the city of St. Louis and the St. Louis Air National Guard Base receive their water supply from the Missouri, Mississippi, and Meramec rivers.

E. CRITICAL ENVIRONMENTS

Land use zoning within a 1-mile radius of the Base is mainly residential with some light industrial. The St. Louis International Airport is within 1 mile, as is an aircraft manufacturing firm (McDonnell Douglas).

The common barn owl, a state-endangered species, is known to live within a 1-mile radius of the Base; however, according to the Director of the Department of Conservation, St. Louis, Missouri, this is not a designated critical habitat. There are no critical environments within a 1-mile radius of the Base, and there are no wetlands or wilderness areas within a 3-mile radius of the Base. No species on the Federal Threatened/Endangered Species List are known to be in the area.

IV. SITE EVALUATION

A. ACTIVITY REVIEW

A review of the Base records and interviews with 13 Base employees resulted in the identification of specific operations within each activity in which most industrial chemicals are handled and hazardous wastes are generated. Until 1980 when the DRMO office opened on Base, there was no comprehensive procedure to dispose of hazardous wastes. The fuels and oils were sometimes given to local farmers who used them for dust control on roads and weed control along fence lines. Contaminated fuels were often burned in an off-base Fire Training Area. Other hazardous wastes such as battery acid, solvents, paint strippers, etc., were usually sent to the city-owned landfill. Table IV-A summarizes the major operations associated with each activity, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. If an operation is not listed in Table IV-A, then that operation has been determined on a best-estimate basis to produce negligible (less than 5 gallons per year) quantities of wastes requiring ultimate disposal. For example, an activity may use small volumes of methyl ethyl ketone. Such quantities commonly evaporate during use, and, therefore, do not present a disposal problem. Conversely, if a particular volatile compound is listed, then the quantity shown represents an estimate of the amount actually disposed of according to the method shown.

B. DISPOSAL/SPILL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

As a result of interviews and on-site investigations, no potential hazardous material/hazardous waste disposal and/or spill sites were identified. The method of hazard assessment is given in Appendix C.

Table IV-A. Inventory of Hazardous Materials/Hazardous Waste By Shops:
LAMBERT ST. LOUIS AIR NATIONAL GUARD BASE
DATE: AUGUST 18, 1988

Shop	Building No. (Past & Present)	Hazardous Materials/ Hazardous Waste	Estimated Quantities (Gal/Year)	Method of Treatment/Storage/Disposal* 1940 ... '80 ... '88
Aircraft Maint. Flightline Maint. 131 CAMS	1	PD-680 (Solvent)	20	------>FTA------DRMO------
		JP-4 Jet Fuel	150	------>FTA------DRMO------
AEROSPACE GRND Equipment Maint. (AGE) Powered Age CAMS 131	8	Hydraulic Oil	120	------>FTA------DRMO------
		PD-680	110	------>FTA------DRMO------
		Turbine Oil	192	------>FTA------DRMO------
		Motor Oil	234	------>FTA------DRMO------
		Battery Acid	24	--------NEUTR SAN--------
		Lubrication Oil	8	------>FTA------DRMO------
		Transmission Fluid	144	------------DRMO------
		Antifreeze Ethylene Glycol	240	----------SAN----------
Vehicle Maint. (Motor Pool) 131 RMS 239 CCS	209	PD-680	300	------>FTA------DRMO------
		Battery Acid/Casings	48	------NEUTR SAN------DRMO------
		Ethylene Oil	120	------>NA------SAN------
		Transmission Fluid	60	------>FTA------DRMO------
		Motor Oil	288	------>FTA------DRMO------
		Paint Thinner/ Paint Mixture	12	------>LF------DRMO------
Fuels Management 131 RMS, Fuels Mgt 131 CES, Liq. Fuel		Tank Cleaning Sludge	100 every four years	------>LF------DRMO------
Non-Destructive Inspection (NDI) 131 CAMS	110	Penetrant	55	------>LF------DRMO------
		Emulsifier	55	------>LF------DRMO------
		Developer	100	------>LF------SAN------
		Fixer	100	------>LF------SAN/SIL REC------
		Developer/ Cleaner	20	-------SAN------------
		Fixer Cleaner	12	------------SAN------
Weapons Maint. Munitions Stor. Gun Services Weapons Loading Weapon Release		PD-680	280	------>FTA------DRMO------
Corrosion Control 131 CAMS	115	Paint Strippers	23	------>LF------SAN------
		Waste Paint, Thinner, Trichloroethane	27	------>LF------DRMO------

Table IV-A (Continued) Inventory of Hazardous Materials/Hazardous Waste By Shops:
LAMBERT ST. LOUIS AIR NATIONAL GUARD BASE
DATE: AUGUST 18, 1988

Shop	Building No. (Past & Present)	Hazardous Materials/ Hazardous Waste	Estimated Quantities (Gal/Year)	Method of Treatment/Storage/Disposal* 1940 — '80 — '88
Hangar Spaces Inspection Dock 131 CAMS	Hanger 1	JP-4	50	------------------>FTA----------------DRMO----------------
		PD-680	48	------------------>FTA----------------DRMO----------------
Machine Shop 131 CAMS	2	Metal Cutting Oil	15	------------------>LF----------------DRMO----------------
Plumbing Shop 131 CAMS	22	Cutting Oil	6	------------------>LF----------------DRMO----------------
Electric Shop 131 CAMS 131 CES	22	Battery Acid	4	---------------------NEUTR SAN----------------------------
		Antifreeze	5	---------------------------SAN----------------------------
Medical X-ray 131 MRS		Developer	72	---------------------------SAN----------------------------
		Fixer	63	---------------------------SAN/SIL REC---------------------
Propulsion Shop 131 CAMS	2	PD-680	80	------------------>FTA----------------DRMO----------------
		7808 Oil	200	------------------>NA----------------DRMO----------------
		Hydraulic Oil	50	------------------>LF----------------DRMO----------------
		Mixed Waste Oil, Fluid, JP-4	150	------------------>FTA----------------DRMO----------------

* KEY:

DRMO	Disposed of through the Defense Reutilization and Marketing Office
FTA	Fire Training Area (Off Base)
LF	Landfill (Off Base)
NA	Not Available
NEUTR SAN	Neutralized and disposed of through sanitary sewer
SAN	Sanitary Sewer
SIL REC	Silver Recovery

C. OTHER PERTINENT FACTS

In the past, the Base had two sanitary sewage plants. One plant was located where the parking ramp is now located. This plant was about 8 feet above the terrain and was completely removed when the present ramp was installed. The other sewage plant, located on land given back to the city, has been subsequently removed by the city. Associated sewers are now connected to the city sewer system.

Another area of interest is the underground storage tank that was used for fuel for the steam plant. This tank and another tank about 30 feet away were used by the Base to dispose of waste products, especially solvents and degreasers. One tank was taken out and all personnel interviewed agreed that the soil left in the bottom of the hole was not discolored and did not show any sign of leakage. The remaining empty tank is scheduled to be removed in 1990.

The Base has implemented a spill prevention plan in order to avoid major spills from entering Coldwater Creek. In addition, McDonnell Douglas has developed a comprehensive monitoring program along the creek.

No signs of environmental stress regarding wildlife or vegetation were evident at the creek during the site investigation or upon examining aerial photographs of the area.

In 1974 the Base changed the fire training area (FTA) from Scott AFB to the city-owned FTA that the IAP uses. The Base uses the FTA five or six times per year and uses 400 to 500 gallons of JP-4 each time. There is no FTA on Base.

Sanitary sewage is connected to publicly owned treatment works.

There are no landfills, radioactive burial sites, or sludge burial sites.

There are no water wells on the Base.

There have never been any known leaks of PCB-contaminated oils.

There has not been extensive use or storage of pesticides on the Base.

Appendix D shows the locations of the underground storage tanks with inventories, and locations of oil/water separators.

Table D-1 gives the tank parameters. Tank 7 is used as a "slop" tank for contaminated fuels. There is no evidence of leakage from this tank. Tanks 8 through 13 are oil/water separators.

Tanks 1 through 6 are leak tested every 6 months and have never shown evidence of leakage.

V. CONCLUSIONS

Information obtained through interviews with Base personnel, review of Base records, field observations, and communication with outside agencies has resulted in the identification of no potentially contaminated sites either on the Base property or off the Base property, which have been under the exclusive control of the Air National Guard.

VI. RECOMMENDATIONS

Based on the investigation documented in this PA, it is recommended that no further IRP action be taken.

GLOSSARY OF TERMS

ALLUVIUM - A general term for all detrital deposits resulting from the operations of modern rivers; thus including the sediments laid down in river beds, floodplains, lakes, fans at the foot of mountain slopes, and estuaries.

ANTICLINE - A fold in rock strata that is convex upward or had such an attitude at some stage of development.

AQUIFER - A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs.

COLLUVIUM - A general term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

1. any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

2. any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

3. any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

4. any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

5. any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

6. any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The native environment of an animal or plant which, due either to the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions in response to environmental changes such as may be induced by chemical contaminants.

DETRITAL - Said of minerals occurring in sedimentary rocks which were derived from pre-existing rocks.

DIESEL FUEL - A hazardous fuel oil composed of aliphatic, olefinic, and aromatic hydrocarbons. Fuel oils are combustible or flammable. They are moderately persistent and mobile in surface soils and even more so in deep soils and groundwater. Ingestion or inhalation of fuel oil is harmful. Diesel fuels are not priority pollutants. The DOT has designated fuel oil as a hazardous material.

DOWNGRADIENT - A direction that is hydraulically downslope, i.e., the direction in which groundwater flows.

ENDANGERED SPECIES - Wildlife species that are designated as endangered by the U.S. Fish and Wildlife Service.

ESCARPMENT - A cliff or steep slope of some extent, generally separating two level or gently sloping areas, produced by erosion or faulting.

ETHYLENE GLYCOL - A colorless dihydroxy alcohol used as an antifreeze. It is highly mobile in the soil/groundwater system. It is not highly persistent. Ethylene glycol is not a priority pollutant. It does present a health hazard if ingested or inhaled. The European Economic Community (EEC) classifies ethylene glycol as a harmful substance.

FAULT - A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

FLORA - Plants or plant life, especially of a period or region.

GASOLINE - A fuel for internal combustion engines consisting essentially of volatile flammable liquid hydrocarbons derived from crude petroleum. Gasoline is relatively mobile and moderately persistent in most soil systems. Persistence in deep soils and groundwater may be higher. Downward migration of gasoline represents a potential threat to underlying groundwater. Inhalation and ingestion exposures are capable of causing death. Gasoline is not a priority pollutant. The DOT has designated gasoline as a hazardous material.

GEOMORPHOLOGY - That branch of both physiography and geology which deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of land forms.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the U.S. Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may

1. cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

2. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HYDRAULIC CONDUCTIVITY - The rate of flow of water in gallons per day through a cross section of one square foot under a unit hydraulic gradient, at the prevailing temperature (gpd/ft^2). In the SI system, the units are $m^3/day/m^2$ or m/day.

HYDRAULIC FLUID - A low-viscosity fluid used in operating a hydraulic mechanism. Most hydraulic fluids consist primarily of a blend of various hydrocarbons. Most are highly immobile and persistent in the soil/groundwater system due to volatilization and aerobic biodegradation. Ingestion of hydraulic fluid presents a gastrointestinal health hazard. Hydraulic fluid is not a priority pollutant. Several federal agencies have classified hydraulic fluid as a hazardous material/hazardous waste.

HYDRAULIC GRADIENT - The rate of change in total head per unit of distance of flow in a given direction.

JP-4 (JET FUEL) - Jet engine test fuel made up of 35 percent light petroleum distillates and 65 percent gasoline distillates. JP-4 hydrocarbons are relatively mobile and nonpersistent in most soil systems. Persistence in deeper soils and groundwater may be higher. Aspiration of the liquid into the lungs is a severe short-term health hazard. Long-term effects on other organs are noted. JP-4 is not a priority pollutant. The DOT has designated all aviation fuel as a hazardous material.

LITHOLOGY - The physical character of a rock.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MOTOR OIL AND GREASE (LUBRICANTS) - A material used to diminish friction between the moving surfaces of machine parts. Highly immobile in the soil/groundwater system due to low water solubilities and high soil sorption. Volatilization and aerobic biodegradation rates are slow; therefore, oils and grease are persistent in the subsurface. Motor oil and grease are not priority pollutants. The EPA has classified used oil as a hazardous waste.

PD-680 (STODDARD SOLVENT) - A petroleum naphtha product with a comparatively narrow boiling range; used mostly for degreasing and as a general cleaning solvent. Stoddard solvent hydrocarbons are relatively mobile and moderately persistent in most soil systems. Persistence in deep soils and groundwater may be higher. Short-term exposure causes irritation of eyes, nose, and throat. Kidney damage results from long-term exposure. Stoddard solvent is not a priority pollutant. The DOT has designated petroleum naphtha as a hazardous material.

PERCHED WATER TABLE - Water table above an impermeable bed underlain by unsaturated rocks of sufficient permeability to allow movement of groundwater.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POROSITY - The percentage of the bulk volume of a rock or soil that is occupied by interstices, whether isolated or connected.

POTENTIOMETRIC SURFACE - Surface to which water in an aquifer would rise by hydrostatic pressure.

STRATIGRAPHY - A branch of geology concerned with the form, arrangement, geographic distribution, classification, and mutual relationships of rock strata, especially sedimentary.

STRIKE - The course or bearing of the outcrop of an inclined bed or structure on a level surface. It is perpendicular to the direction of the dip.

SULFURIC ACID - A toxic, corrosive, strongly acid, colorless, odorless liquid that is miscible with water and dissolves most metals. Widely used as a battery acid and as a laboratory reagent. Sulfuric acid is not a priority pollutant.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SYNCLINE - A fold in rocks in which the strata dip inward from both sides toward the axis.

TERTIARY - A geological period lasting from 65 to 2.5 million years ago.

THREATENED SPECIES - Wildlife species who are designated as "threatened" by the U.S. Fish and Wildlife Service.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

TRANSMISSIVITY - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.

UNCONFORMITY - A surface of erosion or nondeposition that separates younger strata from older rocks.

WATER TABLE - The upper surface of a zone of saturation.

WETLANDS - An area subject to permanent or prolonged inundation or saturation that exhibits plant communities adapted to this environment.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

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21. Schicht, R. J., 1965, Groundwater Development in East St. Louis Area, Illinois, Illinois Water Survey, Rept. Inv. 51.

22. St. Louis County Water Company, Average Analysis of Finished Water.

23. Thornbury, William D., 1965, Regional Geomorphology of the United States, John Wiley and Sons.

APPENDIX A

RESUMES OF SEARCH TEAM MEMBERS

THOMAS S. WEBB

EDUCATION	B.S. Civil Engineering, University of Wyoming, 1966 B.A. History, Biology, University of Wyoming, 1964
CERTIFICATIONS	Certified Safety Executive - 1987 Certified Safety Manager - 1987 Certified Safety Specialist (Industrial Hygiene) - 1987 Certified Industrial Hygiene, Comprehensive Practice (Not Current) - 1975

PROFESSIONAL EXPERIENCE

1/1988-Present PEER CONSULTANTS, P. C.
Oak Ridge, TN
Oak Ridge Regional Manager

Oak Ridge Regional Manager for all PEER activities and program manager of all PEER tasks performed under contracts with DOE and Bechtel National, Inc. Currently providing technical assistance and support to Hazardous Waste Remedial Action programs at both DOE and DoD facilities, DOE Nuclear and Chemical Waste Programs, and Permanent Waste Storage Programs. The above work includes:

Support of regulatory and policy analysis;
Program research and scientific analysis;
Legislative and regulatory tracking;
Quality assurance and control (QA/QC);
Hydrogeological monitoring support;
Review of recently proposed federal regulations regarding hazardous waste management and groundwater protection;
Environmental analyses, health and safety analyses, community relations planning and other tasks related to remedial action planning.

1987-1/1988 **Project Manager**

Senior Project Manager for the following tasks: the New Boston AFS RI/FS and Robins AFB and Newark AFB Spill Prevention and Response Plans. Technical review and engineering support to DOE on Tinker AFB storm drainage system evaluation and Dover AFB, cadmium reduction in the industrial waste stream. Preliminary assessments for 13 Air National Guard Bases.

1966-1987 U. S. AIR FORCE

1984-1987 Directed the activities of the Occupational & Environmental Health Laboratory in providing consultation, technical guidance, and on-site assistance in industrial hygiene, air and water pollution, entomology, health physics, and bioenvironmental engineering at all Air Force bases in the Pacific area including Hawaii, Japan, Korea, Guam, and the Philippines. As director, developed the plans for establishing an asbestos identification and counting capability to support Air Force bases in the Pacific. Had responsibility for managing the administration and budgeting of operating funds for the organization, procurement of equipment and supplies, day-to-day supervision of laboratory personnel, and conducting selected field studies. Personnel directly supervised included chemists, engineers, medical entomologist, and specialized technicians in each functional area.

1979-1984 As Chief, Bioenvironmental Engineer, Headquarters US Air Force, directed the Bioenvironmental Engineering/Occupational Health programs for all Air National Guard facilities in the United States and its territories. Established policy and guidance by writing and revising Air National Guard regulations and by supplementing Air Force publications. From 1981 to 1984 conducted initial hazardous waste site investigations at Volk Field Wisconsin ANG field training site, Suffolk County ANGB, N.Y., Burlington ANGB, NH, and Lincoln ANGB, NE. Supervised all field activities in drilling, placement, and development of monitoring wells used to determine the extent of the plume and quantity of the contaminants under investigation. Personally determined the number of wells required, their location, and both the soil and ground water sampling strategy including analytes. Collected soil and ground water samples, packaged, and shipped them to OEHL for analysis, and interpreted results. Investigations at the above sites resulted in the placement of over seventy-five monitoring wells and the collection of hundreds of soil and ground water samples. Budgeted for and technically directed the Phase IIA Installation Restoration Program at five other ANG bases including Otis ANGB, MA, Buckley ANGB, CO and McEntire ANGB, SC. Was the only full time certified industrial hygienist in the command and personally conducted IH surveys including asbestos identification and evaluation; also assisted in developing plans and specifications for managing or removing asbestos in Air National Guard facilities. Represented the National Guard Bureau (NGB) Surgeon on the Agency Environmental Protection Committee and the NGBs on the DoD Safety and

Occupational Health Policy Council. Served on DoD subcommittees and provided testimony to Congressional committees in area of expertise.

1977-1979 Directed the Bioenvironmental Engineering/Environmental Health program for Clark AB, John Hay AB, and Wallace AS. Evaluated community and work environments and recommended controls to keep occupational and environmental stresses within acceptable limits. Established and conducted the environmental monitoring program for Clark AB.

1974-1977 As the Command Bioenvironmental Engineer, Headquarters AF Reserve, developed occupational health and environmental protection plans, policy, and programs for all AF reserve bases. Also developed and taught a two week training course for all AF Reserve bioenvironmental engineering technicians.

1972-1974 As Chief, Bioenvironmental Engineering, Robins AFB, Georgia, conducted an industrial hygiene program for 18,000 civilian and 5,000 military workers. Performed industrial hygiene evaluations of aircraft operations, paint stripping, industrial radiography, microwave radiation, laser and other industrial facilities.

1966-1972 Has also served as Chief, Bioenvironmental Engineering, Hill AFB, Utah; DaNang AB, Vietnam; and Wright-Patterson AFB, Ohio.

As the bioenvironmental engineer at the above bases, conducted numerous noise surveys for determining noise levels to which base personnel were exposed. Is also thoroughly familiar with land use planning with respect to aircraft noise having conducted such evaluations for both Hill and Robins AFB. These latter evaluations generated Ldn contours for then current aircraft operations, as well as projected contours for future aircraft conversions and modifications.

As the Bioenvironmental Engineer at five Air Force bases over a period of twelve years, collected, prepared, and interpreted results from base water samples submitted for bacteriological and chemical content analysis. As Commander of Operating Location AD USAF Occupational and Environmental Health Laboratory, directly supervised analytical personnel who performed analysis of lead and other metals in water and was directly responsible for appropriate analytical procedures and accuracy of data. In addition, provided consultative services concerning health and environmental effects to bases experiencing abnormally high levels of metals in drinking water. At Wright-Patterson AFB, assisted in all environmental protection evaluations and conducted stack gas monitoring of all coal-fired heating plants on base. At Hill AFB, was one of the principal authors of the Air Force's first Environmental Impact Statements (1970-71).

PUBLICATIONS:

"Exposure to Radio Frequency Radiation from an Aircraft Radar Unit," Aviation, Space, and Environmental Medicine, November 1980

"For a Breath of Clean Air", AF Aerospace Safety Magazine, March 1975

"Baseline Industrial Shop Surveys," AF Medical Service Digest, April 1973

"Knee Problems Observed in Weapons Loading Personnel," AF Medical Service Digest, March 1970

"Lasers - A New Problem for Bioenvironmental Engineers," AF Medical Service Digest, March 1969

"Use of Iodine as a Swimming Pool Disinfectant," AF Medical Service Digest, July 1967

GEORGE E. NELSON

EDUCATION

M.S., Public Health, Industrial Hygiene, University of Michigan, 1970
B.S., General (Civil and Mechanical) Engineering, University of Wyoming, 1966

PROFESSIONAL EXPERIENCE

1988-Present — PEER CONSULTANTS, P.C.
Oak Ridge, TN
Environmental Engineer

Review Quality Assurance/Quality Control plans for investigating potentially hazardous sites. Review facility assessment and facility investigation plans for compliance with state and federal regulations and procedures.

1980-1988 — Retired, studying computer science.

1958-1980 — U.S. Air Force

As **Hospital Commander** at Arnold Engineering and Development Center, in addition to administering the medical facility, was the contract manager of the environmental health contract. Developed the criteria for a 200-foot weather tower to be used in the air pollution control program. Liaisoned with Tennessee state air and water officials and determined sampling and analytical procedures.

As **Chief of Environmental Health** for the Manned Space Program, determined that the environment aboard Sky-Lab was safe for astronauts after Sky-Lab had been damaged during liftoff. Determined procedures for analysis of the environment aboard the Apollo-Soyuz mission. Determined safety procedures for long-range laser photography and attenuation of high-intensity lasers due to humidity and/or particles in the air.

Determined procedures for the safe handling of radioactive materials including thermonuclear generators. As **Team Chief**, determined sampling sites and procedures for collection and analyses of radioactivity during manned and unmanned launches.

Established techniques for operating the wastewater ocean dump that is used to neutralize wastes from metal plating shops, rocket engine cleaning operations, etc. Collected and analyzed samples from both drinking water and wastewater plants on Air Force and NASA sites throughout the Atlantic Ocean, Africa, and the Indian Ocean. Initiated the OSHA procedures on the Eastern Test Range.

Developed sampling and analytical procedures for a "foam in place" packaging operation. Wrote much of the Disaster Preparedness Plan for the Air Force hospital and two civilian hospitals. Wrote much of the Spill Prevention and Response Manual. Was the coordinator during a massive fish kill near Cape Canaveral. Performed research in using Xylene in a hospital laboratory. Performed industrial hygiene evaluations of rocket and aircraft operations, painting and paint stripping, airborne radioactive sampling program, laser, and other industrial facilities.

Extensive experience working with contractors and state air and water pollution control authorities. Integration of electronic circuits with monitoring and analytical equipment.

As **Bioenvironmental Engineer** at an Occupational and Environmental Health Laboratory, assisted base engineers with problems that they could not solve. Developed the tools, techniques, and sampling procedures used in stack sampling. Wrote the manual and conducted classes for engineers to sample heating plant and incinerator stacks. Developed the procedure used to record sound to allow subsequent playback for accurate analysis. Helped the Chinese (Taiwanese) Army develop a wastewater program. Performed stack sampling of an incinerator used to melt aircraft. Evaluated incinerators submitted by companies to be used at remote sites. Conducted a survey of radar sites and sampled for oil in air problems.

Conducted a program to determine the amount of asbestos in the environment of an elementary school. Monitored the workers who cleaned up the asbestos problem. Provided technical assistance regarding groundwater contamination from underground fuel storage tanks. Reviewed environmental impact statements presented in-house and contract programs.

Assisted chemists in designing techniques of sampling for analysis by gas chromatography, x-ray diffraction, and wet chemistry methods of both air and water pollution problems. Designed methods of determining air pollutants using optics rather than traditional chemical methods. Taught electronics and instrument flying procedures as a technician working on flight simulators. Contributed to using computers in the flight simulator field.

JONI S. OLIVER

EDUCATION B.S. Civil Engineering, University of Tennessee, 1985

MEMBERSHIP American Society of Civil Engineers

CERTIFICATION Certified as an Asbestos Abatement Supervisor, 1988

PROFESSIONAL EXPERIENCE

3/1988-Present

PEER CONSULTANTS, P.C.
Oak Ridge, TN
Civil Engineer

Prepared preliminary assessment reports for the Air National Guard under the U.S. Air Force Installation Restoration Program (IRP) which involves identifying past spill or disposal sites posing a potential and/or actual hazard to public health and environment. Conducted field surveys to assess what impact past hazardous waste disposal practices have had on the environment. Review and assist in preparation of the Asbestos Management and Operation Plans for Keesler AFB, Mississippi, and Tinker AFB, Oklahoma. Surveyed local schools for potential asbestos-containing building materials. Reviewed proposed RI/FS investigative program for an IRP site at Kelly AFB, Texas. For the Department of Energy, reviews Notices of Intent (NOI) to remove asbestos for regulatory compliance, writes letters to the regulators as needed to forward the NOI to the appropriate state regulator. Determines control measures and prepares cost estimates for asbestos abatement activities. Prepared RCRA Part B permit applications for Oak Ridge National Laboratory covering a wide variety of materials being treated. The materials included organics, inorganics, and compressed gasses. Reviewed the Final Safety Analysis Report (FSAR) for the E-Wing Chip Processing Facility at the Y-12 Plant. The review of the report included site location and structural components. The structural components reviewed were principal design criteria, structural and mechanical safety criteria, wind loadings, flood design, seismic design, and structural specifications.

1987-1988

EBASCO SERVICES INCORPORATED
Watts Bar Nuclear Plant Site
Spring City, TN
Associate Engineer

Involved in the support design group for the Tennessee Valley Authority's Watts Bar Unit 1 Reanalysis Project. Experience in Civil Engineering Branch performing extensive calculations (static, dynamic, and thermal). Resolved design discrepancies of conduit and instrumentation systems. Worked on Conditions Adverse to Quality Reports (CAQR). Responsible for the logging in-out of civil tasks. Sent out transmittals for civil outputs. Responsible for weekly progress reports. Oversaw corrective actions during construction at plant site. Interfaced with client on regular basis.

1986-1987

IMPELL CORPORATION
Knoxville, TN
Civil Engineer

Involved in the support design group for the Tennessee Valley Authority's Watts Bar Unit 1 Reanalysis Project. Qualified nuclear safety related pipe supports which comply with TVA design criteria AISC and ASME Section III code requirements. Familiar with both computer and hand analysis in the design of support structures. Computer analysis programs used included; GTSTRUDL, CDC's BASEPLATE II, and TVA's CONAN and DOLUG. Familiar with phases of structural design including sizing preengineered components, structural steel and connection design. Evaluated baseplate and concrete anchorage design. Qualified existing designs at Sequoyah Nuclear Station.

1984-1985

LAMAR DUNN & ASSOCIATES
Knoxville, TN
Engineering Aide (part-time)

Assisted in the planning, design, and construction phases of the water distribution system for the City of Jonesborough, TN.

KEITH E. OWENS

EDUCATION B.S., Geology, Austin Peay State University, 1986

MEMBERSHIP Association of Groundwater Scientists and Engineers
East Tennessee Geological Society

PROFESSIONAL EXPERIENCE

5/1988-Present PEER CONSULTANTS, P.C.
Oak Ridge, TN
Geologist

Prepare preliminary assessment reports for the Air National Guard under the U. S. Air Force Installation Restoration Program (IRP) which involves identifying past spill or disposal sites posing a potential and/or actual hazard to public health and environment. Reviewed proposed Remedial Investigation/Feasibility Study (RI/FS) investigative program for an IRP site at Bangor ANGB, Maine. Prepared project procedurals for the Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) RI/FS program. Assisted in the preparation of RCRA Part B applications. Conducted on-site inspections of Yeager ANGB, West Virginia; St. Louis ANGB, Missouri; and Youngstown Test Annex, New York.

1987-1988 ATEC ASSOCIATES, INC.
Nashville, TN
Senior Technician

Monitor well installation at service stations in Memphis, TN. Duties included logging, purging, and sampling wells for hydrocarbons. Core logging and environmental site assessments for various projects. Conducted compaction tests for Aviation Fuel Storage Facility for the Metro Nashville Airport Expansion project. Conducted environmental site assessments for Radnor Homes (Developer). Conducted caisson inspections for Tennessee Technological University's new library. Supervised field technicians and laboratory tests. Interfaced with clients on a daily basis. Assisted Construction Materials Division Manager with weekly reports.

1986-1987 MID-TENN EXPLOSIVES
Nashville, TN
Explosives Handler

Assisted in shot preparation and loading at Vulcan Materials (Quarry). Delivered explosives to selected clients.

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

1. Urban Information Center
   University of Missouri
   St. Louis, Missouri 63121-4499

2. National Oceanic and Atmospheric Administration
   National Climatic Data Center
   Federal Building
   Asheville, North Carolina 28801-2696

3. United States Department of Agriculture
   Soil Conversation Service
   234 Old Meramec Station Road
   Manchester, Missouri 63021

4. Director of Department of Conservation
   P.O. Box 180
   Jefferson City, Missouri 65102

5. Missouri Department of Natural Resources
   Division of Water Resources
   P.O. Box 250
   Rolla, Missouri 65401

6. Missouri Department of Natural Resources
   Division of Geology and Land Survey
   P.O. Box 250
   Rolla, Missouri 65401

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

Appendix C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the U.S. Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Preliminary Assessment (PA) phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the PA portion (Phase I) of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flowchart (Figure I-A of this report).

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contaminant migration, and (4) any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated uses of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed.

The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no contaminant are not reduced. Scores for sites with limited contaminant can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
	S	C	H
60	M	C	M
	L	S	M
	L	C	L
50	M	S	H
	S	C	M
	S	S	H
	M	S	M
40	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical state	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10^{-2} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay (>10^{-6} cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay (>10^{-6} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay (<10^{-2} cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8

III. PATHWAYS CATEGORY - (Continued)

Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft. of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Groundwater use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by groundwater supply within 3 miles of site		6		

Subtotals ______ ______

Receptors subscore (100 x factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

__________ x __________ = __________

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

__________ x __________ = __________

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to groundwater		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathwa ubscore

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

______ x ______ = ______

APPENDIX D

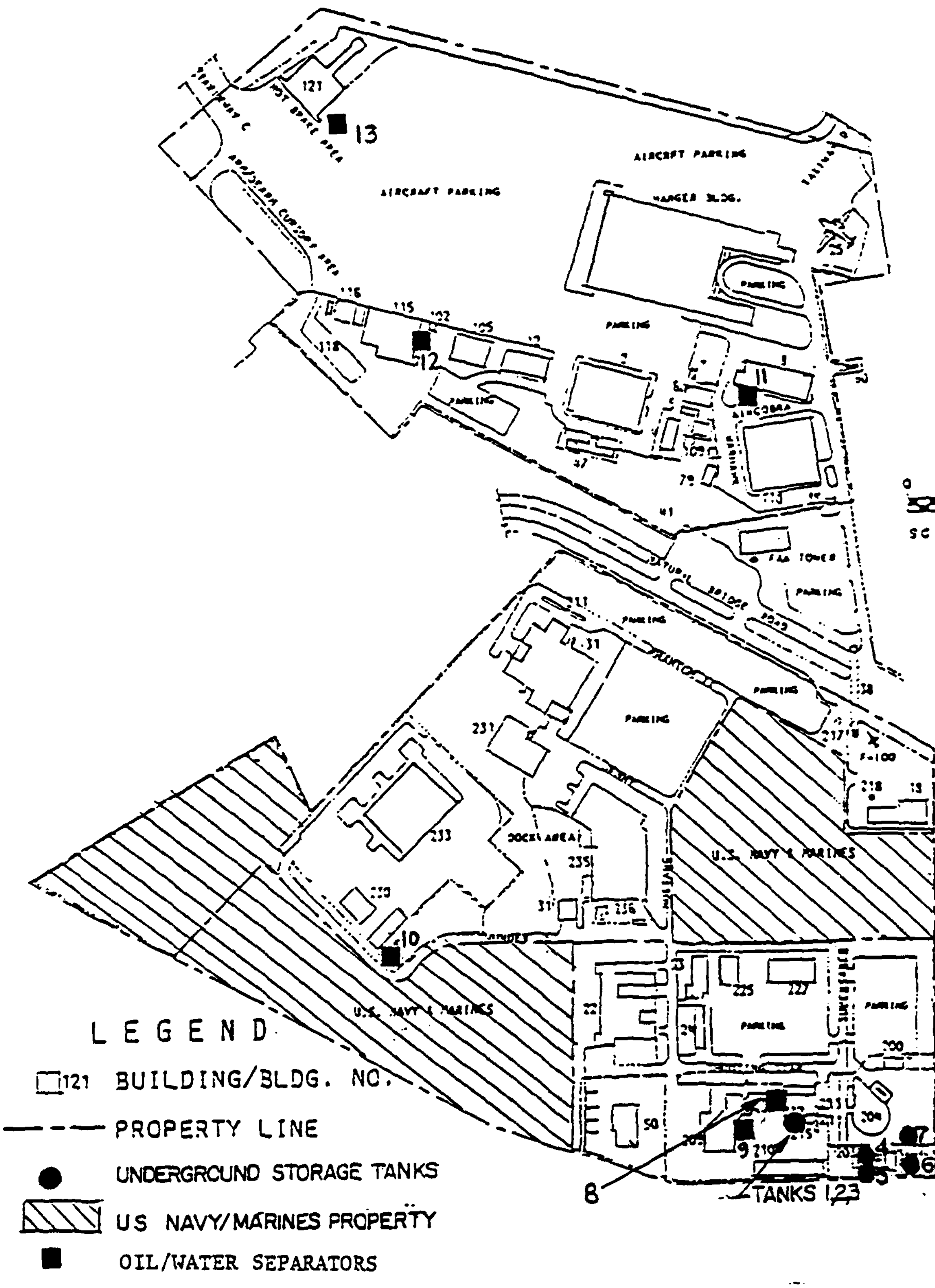
LOCATION OF UNDERGROUND STORAGE TANKS

WITH INVENTORIES

LOCATION OF UNDERGROUND STORAGE TANKS AND OIL/WATER SEPARATORS | APPENDIX D

MISSOURI AIR NATIONAL GUARD

LAMBERT-ST. LOUIS IAP, ST. LOUIS, MISSOURI



(SOURCE: MISSOURI AIR NATIONAL GUARD 1986)

TABLE D-1

LIST OF UNDERGROUND STORAGE TANKS AND OIL/WATER SEPARATORS

LAMBERT - ST. LOUIS IAP, ST. LOUIS, MISSOURI

Tank I.D. No.	Tank Location	Capacity (Gallons)	Contents	Material of Construction	Cathodic Protection
1	Vehicle Maintenance	5,000	Diesel	Fiberglass	None
2	Vehicle Maintenance	2,000	Unleaded Gasoline	Fiberglass	None
3	Vehicle Maintenance	2,000	Mogas	Fiberglass	D.C.* Magnesium Anode
4	POL Operations	50,000	JP-4 Jet Fuel	Steel	D.C. Magnesium Anode
5	POL Operations	50,000	JP-4 Jet Fuel	Steel	D.C. Magnesium Anode
6	POL Operations	50,000	JP-4 Jet Fuel	Steel	D.C. Magnesium Anode
7	POL Operations	2,000	Waste Fuels (Slop)	Steel	D.C. Magnesium Anode
8	Vehicle Maintenance	250	Waste Oil	Steel	None
9	Vehicle Maintenance	250	Waste Oil	Steel	None
10	Supply (Bldg 61)	250	Waste Oil	Concrete	None
11	Aircraft Maintenance	250	Waste Oil	Steel	None
12	Aircraft Maintenance	250	Waste Oil	Steel	None
13	Aircraft Maintenance	250	Waste Oil	Steel	None

NOTES:

*D.C. = Direct Current