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INSTALLATION RESTORATION PROGRAM

Preliminary Assessment Records Search

155th Tactical Reconnaissance Group (TAC)
Nebraska Air National Guard
Lincoln Municipal Airport
Lincoln, Nebraska



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Hazardous Materials Technical Center
October 1987

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT - RECORDS SEARCH FOR

155th TACTICAL RECONNAISSANCE GROUP
NEBRASKA AIR NATIONAL GUARD
LINCOLN MUNICIPAL AIRPORT
LINCOLN, NEBRASKA

November 1987

Prepared for

National Guard Bureau
Washington, DC 20310

Prepared by

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Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Hazardous Materials Technical Center (HMTc) was retained in May 1986 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) - Records Search for the 155th Tactical Reconnaissance Group (TRG), Nebraska Air National Guard, Lincoln Municipal Airport, Lincoln, Nebraska (hereinafter referred to as the Base) under Contract No. DLA-900-82-C-4426 (Records Search). The Records Search included:

- o an onsite visit including interviews with 19 Base personnel conducted by HMTc personnel on 21-23 May 1986;
- o the acquisition and analysis of pertinent information and records on hazardous materials use and hazardous waste generation and disposal at the Base;
- o the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal, State, and local agencies; and
- o the identification of sites on the Base that may be potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

*hazardous and
wastes,
environmental data*

B. MAJOR FINDINGS

The major operations of the 155th TRG that have used and disposed of HM/HW include aircraft maintenance; ground vehicle maintenance; and petroleum, oil, and lubricant (POL) management and distribution. The operations involve such activities as corrosion control, fuel cell maintenance, and engine maintenance. Varying quantities of waste oils, recovered fuels, and solvents were generated and disposed of by these activities.

Interviews with 19 Base personnel and a field survey resulted in the identification of nine disposal and/or spill sites at the Base which existed prior to January 1984 or, in the case of leaking tanks, prior to February 1986. Of the nine sites, six are potentially contaminated with HM/HW.

- Site No. 1 - POL Storage Area;
- Site No. 2 - Old Oak Creek Channel;
- Site No. 3 - Former Tank Cleaning Area;
- Site No. 4 - South Rock Road;
- Site No. 5 - Army National Guard Oil Storage Area; and
- Site No. 6 - Hydraulic Fluid Spill Area

At Site No. 1, an IRP Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) conducted by Roy F. Weston, Inc., has confirmed POL contamination. Recovery operations have collected about 300 gallons of the product, predominantly JP-4 fuel. At Site Nos. 5 and 6, there was evidence of discolored spills and/or vegetative stress.

C. CONCLUSIONS

Six of the identified potentially contaminated hazardous waste sites have been further evaluated and given a Hazard Assessment Score (HAS) utilizing Hazard Assessment Rating Methodology (HARM):

Site No. 1 - POL Storage Area (HAS-51)

There have been three major and several small JP-4 fuel spills in this area. Between 1956-1966, approximately 10,000 gallons of fuel were lost at the POL Storage Area. A small hole was discovered in one of the storage tanks in December 1982. A follow-up SI/RI/FS report by Roy F. Weston, Inc., completed in March 1983, confirmed JP-4 contamination and recovery wells were constructed with limited success. In 1984, a storage tank was overfilled, resulting in the release of approximately 1,000 gallons of JP-4.

Site No. 2 - Old Oak Creek Channel (HAS-63)

Old Oak Creek Channel is a semi-stagnant body of water created when the extension of the runway at Lincoln Airport required Oak Creek to be rechanneled around the airport. Old Oak Creek Channel is the abandoned channel of Oak Creek. Spillage of PD-680, paint remover and JP-4 of approximately 80 gallons per year from the aircraft maintenance hanger are washed into this

channel. In addition, the aircraft apron area drains to this channel. Motor oils, JP-4, hydraulic oils and solvents spilled on the apron, drain to a makeshift oil/water separator, which often overflows and discharges into the Old Oak Creek Channel.

Site No. 3 - Former Tank Cleaning Area (HAS-51)

For years, this area was used to drain fuel from tank trucks and mobile storage tanks (20 to 200 gallons/vehicle) during cleaning. Accidental spills of up to 4,000 gallons of fuel also occurred in this area when full tank trucks were mistakenly drained. This area was also used, in the past, as a hazardous waste storage area.

Site No. 4 - South Rock Road (HAS-51)

This site is located along the east end of Old Oak Creek Channel. From 1958 until 1972, waste oils, solvents, and diesel fuel were used to control dust on this road. It is estimated that approximately 350 gallons/year of chemicals were disposed of in this manner.

Site No. 5 - Army National Guard Oil Storage Area (HAS-30)

The Army Guard unit stores waste oil at this site in an above-ground 400-gallon storage tank. This tank has overflowed on several occasions. Oil contamination has been observed underneath the crushed rock ground cover surrounding the tank.

Site No. 6 - Hydraulic Fluid Spill Area (HAS-34)

Leakage from hydraulic fluid units stored at this site has been observed. The total quantity of spillage at this site is unknown; however, environmental stress is evident in a grassy area adjacent to the asphalt lot where the units are stored.

D. RECOMMENDATIONS

Because of the potential for contamination migration, initial investigative stages of the IRP SI/RI/FS are recommended for six sites that are potentially contaminated with HM/HW from past operations. The primary purposes of subsequent investigations are:

- o To determine whether pollutants are or are not present at each of the six sites; and
- o To determine whether groundwater at each site has been contaminated. If it has, to give quantification with respect to contaminant concentrations, the boundary of the contaminant plume, the rate of contaminant migration, and its direction.

I. INTRODUCTION

A. Background

The 155th Tactical Reconnaissance Group (TRG) is located at the Nebraska Air National Guard, Lincoln Municipal Airport, Lincoln, Nebraska (hereinafter referred to as the Base). The Lincoln Municipal Airport, formerly known as Lincoln Air Force Base, is approximately 5 miles northwest of the Nebraska State Capital of Lincoln. The Base has been active since 1945, and over the years the types of military aircraft based and serviced there have varied. Both past and present operations have involved the use and disposal of materials and wastes that subsequently have been categorized as hazardous. Consequently, the Air National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

Preliminary Assessment (PA) - identifying past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.

Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - acquiring data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment; preparing a Remedial Action Plan (RAP); and, if directed by the National Guard Bureau, preparing designs and specifications.

Research Development, and Demonstration (RD & D) - Technology Base Development (if needed) - developing new technology for accomplishment of remediation.

Remedial Design/Remedial Action (RD & RA) - Implementation of Site Remedial Action.

B. Purpose

The purpose of this IRP PA - Records Search (hereinafter referred to as Re-

cords Search) is to identify and evaluate suspected problems associated with past hazardous waste handling procedures, disposal sites, and spill sites on the Base. The Hazardous Materials Technical Center (HMTc) visited the Base, reviewed existing environmental information, analyzed the Base records concerning the use and generation of hazardous materials/hazardous wastes (HM/HW), conducted interviews with past and present Base personnel who are familiar with past HM/HW management activities, and made a physical inspection of the suspected sites. Relevant information collected and analyzed as a part of the Records Search includes the Base history, with special emphasis on the history of the shop operations and their past HM/HW management procedures; the local geological, hydrological, and meteorological conditions that may affect migration of contaminants; local land use, public utilities, and zoning requirements that could 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 Records Search is limited to the Base and includes:

- o An onsite visit;
- o The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the Base;
- o The acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat, and utility data from various Federal, Nebraska State, and local agencies;
- o A review and analysis of all information obtained; and
- o The preparation of a report to include recommendations for further actions.

The onsite visit, interviews with past and present personnel, and meetings with Federal, State, and local agency personnel were conducted during the period 21-23 May 1986. The HMTc Preliminary Assessment effort consisted of the following individuals (Resumes are included as Appendix A):

- o Ms. Jody C. Mooney, Environmental Scientist
- o Mr. Robert J. Paquette, Environmental Scientist
- o Ms. Kathryn A. Gladden, Chemical Engineer

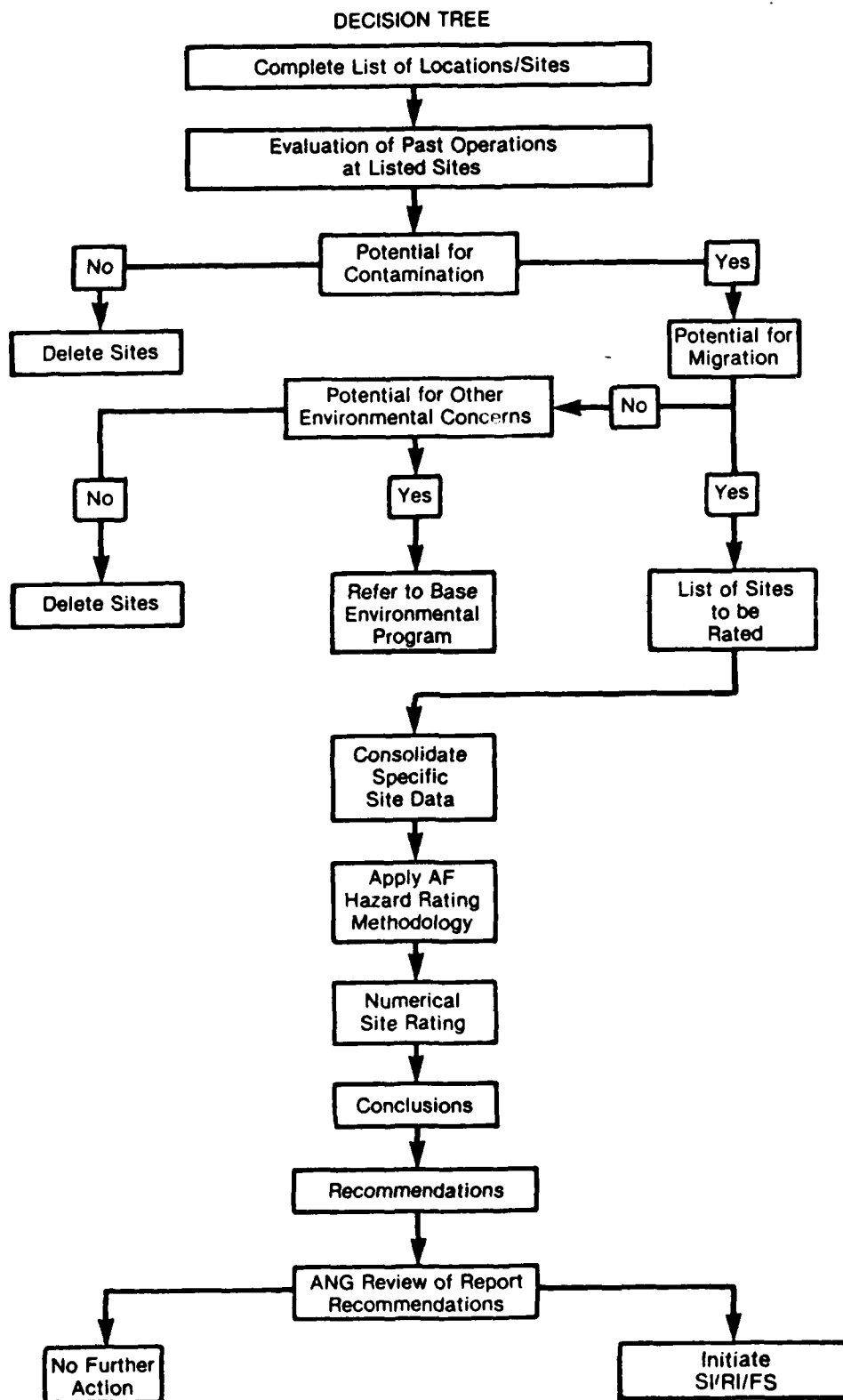
Individuals from the Air National Guard Bureau who assisted in the Records Search include Mr. Arthur R. Lee, Environmental Engineer, ANGSC/DEV, and selected members of the 155th TRG. The Point of Contact at the Base was Lt. Col. Kenneth G. King, Base Civil Engineer.

D. Methodology

A flow chart of the Records Search Methodology is presented in Figure 1. This Records Search Methodology ensures a comprehensive collection and review of pertinent site-specific information, and is utilized in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Records Search began with a site visit to the Base to identify all shop operations or activities on the Base that may have used hazardous material or generated hazardous waste. Next, an evaluation of past and present HM/HW handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices was facilitated by extensive interviews with 19 past and present employees familiar with the various operating procedures at the Base where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

Appendix B lists the interviewee's principle areas of knowledge and their years of experience with the Base. Historic records contained in the Base files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the Base were identified for evaluation. A general survey tour of the identified spill/disposal sites, the Base, and the surrounding area was conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention was given



to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geological, hydrological, meteorological, development (land use and zoning), and environmental data for the area of study was also obtained from appropriate Federal, State and local agencies as identified in Appendix C. Following a detailed analysis of all the information obtained, it was determined that six of the nine identified sites were potentially contaminated with HM/HW and the potential for contaminant migration existed. Sites were numerically scored utilizing the Air Force Hazard Assessment Rating Methodology (HARM). Recommendations for follow-up investigations on the six potentially contaminated sites were developed.

II. INSTALLATION DESCRIPTION

A. Location

The 155th TRG is located at the Lincoln Municipal Airport, Lincoln, Nebraska, approximately 5 miles northwest of the Nebraska State Capital, Lincoln, Nebraska. Access to the Base from the city is via Cornhusker Highway and Municipal Airport Road. The Base is served by Interstate 80, which has an exit 1 mile from the Base.

The Base, which is situated 1,167 feet above sea level, is comprised of approximately 171.21 acres designated as Air National Guard (ANG) property. The runways and taxiways are used jointly with the Lincoln Municipal Airport. Figure 2 shows the Base property studied for this Records Search.

B. Organization and History

The history of the tactical unit of the Nebraska ANG began with the activation of the 401st Fighter Squadron at Westover Field, Massachusetts, on 1 July 1943. Following World War II, the 401st Fighter Squadron was assigned to the Lincoln Air Force Base. On 26 July 1946, the 401st Fighter Squadron was redesignated as the 173rd Fighter Interceptor Squadron (FIS), Nebraska Air National Guard.

In 1948, Nebraska was one of the first five states to receive the F-80C jet aircraft which were assigned to the 173rd FIS. During the Korean War, however, these aircraft were relinquished to the Air Defense Command.

The entire Nebraska ANG was mobilized on 1 April 1951, and enlisted into active service at Lincoln, serving during the Korean conflict as an echelon of the 132nd Fighter-Bomber Wing at Dow AFB, Bangor, Maine. Following the Korean War, the Nebraska unit returned to Nebraska ANG and was discharged from actual service on 1 January 1953, after completing 21 months of service. Throughout its tour of active duty, the unit used the F-51s.

Figure 2.

11-2

On 1 July 1960, authority was received from the National Guard Bureau to reorganize the 173rd FIS into the 155th Fighter Group (FG). The new unit consisted of Headquarters, 155th Fighter Interceptor Group, 155th Consolidated Aircraft Maintenance Squadron, 155th Material Squadron, and 155th USAF Dispensary. The 155th FG was part of the 132nd Air Defense Wing, headquartered at Des Moines, Iowa.

In 1964, the 155th FG was placed under the Command of the Tactical Air Command (TAC), redesignated as the 155th Tactical Reconnaissance Group (TRG), re-equipped with RF-84F aircraft, and given a mission of photo-reconnaissance. The 155th TRG is assigned to the 12th Air Force, 835th Air Division, 127th Tactical Reconnaissance Wing of the TAC.

III. ENVIRONMENTAL SETTING

A. Meteorology

Precipitation in Lancaster County, Nebraska, averages 27.77 inches annually. By calculating net precipitation according to the method outlined in the Federal Register (Vol. 47, No. 137, July 16, 1982, p. 31224, para. 3.2) a net precipitation value of minus 16.23 inches per year is obtained. Rainfall intensity, based on 1-year, 24-hour rainfall, is 2.5 inches (Federal Register, Vol. 47, No. 137, July 16, 1982, p. 31235, Figure 8).

B. Geology

The Base is located in Lancaster County in the southeastern part of Nebraska. The Base is approximately 5 miles northwest of the Nebraska State Capital, Lincoln, Nebraska.

Lancaster County is near the eastern edge of the Great Plains area. The bedrock in Lancaster County is Pennsylvania and Permian age limestone with interbedded shale and shaley limestone and interbedded shale and sandstone of the Dakota Group of Cretaceous age.

Unconsolidated sediment of Quaternary age overlies the bedrock in the county. The light gray silts of the Fullerton Formation, late Nebraskan in age, crop out at numerous sites west and north of Lincoln. Glacial till of Kansan age is at the surface in western, northern, and central Lancaster County.

Soils at the installation are dominantly of the Crete-Sharpsburg and Kennebec association. These soils formed on loess and colluvium deposits of the Quaternary age associated with glacial activities in the area.

This complex consists of urban land and deep, nearly level, moderately well-drained Crete and Sharpsburg Soils on stream terraces and moderately well-drained Kennebec Soils on bottom lands. The areas are bisected by perennial streams and are occasionally flooded.

Sharpsburg and Kennebec have soil typically of a silty clay to silty clay loam having a moderate infiltration rate when thoroughly wet. This consists chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. Sharpsburg has a moderate rate of water transmission.

Bedrock typically occurs greater than 5 feet for Sharpsburg and Kennebec. Seasonal high water table occurs at depths between 4 to 6 feet for Kennebec and greater than 6 feet for Sharpsburg. The permeability rates for Sharpsburg and Kennebec range from 2.41×10^{-4} to 1.41×10^{-3} cm/sec.

The Crete Soil has typically a silty clay to silty clay loam, having a very slow infiltration rate (high runoff potential) when thoroughly wet. Crete consists chiefly of clays that have a high shrink-swell potential, permanent high water table, claypan or clay layer at or near the surface, and is shallow over nearly impervious material. Bedrock occurs greater than 5 feet for Crete. Seasonal high water table occurs at depths greater than 5 feet. The permeability rates for Crete range from 4.23×10^{-5} to 1.41×10^{-3} cm/sec.

C. Hydrology

Surface Water

The Base is within the boundaries of the floodplain associated with 100-year frequency floods. Drainage is poorly developed in the areas surrounding the Base. Surface waters from the base eventually find their way into Oak Creek and eventually Salt Creek via small runs and branches, drainage ditches, and eventually small tributaries. Surface water flow direction is generally northeast, towards Oak Creek.

Groundwater

Limestone of Pennsylvania and Permian age, sandstone of the Dakota Group of Cretaceous age, and unconsolidated sediments of Quaternary age, are believed to vary from slightly less than 100 feet to a maximum of about 140 feet in the Oak Creek valley portion of the installation. Within the unconsolidated sediments, the groundwater aquifer depth varies from 12 to 40 feet in various locations around the Base and generally flows in an easterly direction.

The sandstone layers of the Dakota Group are moderately permeable, and those layers that are saturated generally yield water for wells. However, in some parts of the county, the water in the Dakota rocks is too salty for most uses. The Dakota Formation is absent southeast of a line passing through Sprague and Walton and beneath the part of Salt Creek Valley northeast of Lincoln.

Unconsolidated sediments of Quaternary Age consist of fill and other glacial deposits, wind-deposited silt, and stream alluvium. The alluvium is the only significant source of water. It underlies the terraces and bottom lands in the larger valleys and fills some ancient buried valleys. Where the alluvium consists largely of sand or sandy gravel, as in the lower Salt Creek Valley, water can be obtained in sufficient amount for irrigation. The sand lenses and pockets of sand and gravelly sand in the glacial deposits are a source of small quantities of water, for domestic use and stock. Well quality ranges from hard but good water to very hard water where the content of sulfate and iron commonly exceeds acceptable limits for use.

Since 1933, the city of Lincoln has been supplied principally by water from the well field near Ashland, in the Platte River Basin. The quality of groundwater and surface water in parts of the Platte River Basin is affected by the Dakota Group, which characteristically yields water that contains large amounts of dissolved solids - principally sodium and chloride.

Most of the water for domestic, industrial, and irrigation use is from sands and gravels of Pleistocene age of variable thickness and extent. In the southern half of the Platte River Basin, the deposits are not capable of yielding the large quantities of water required for the city of Lincoln; therefore, Lincoln has developed its water supplies in the Pleistocene age deposit east of Ashland.

IV. SITE EVALUATION

A. Activity Review

A review of Base records and interviews with past and present Base personnel resulted in the identification of specific operations within each activity in which the majority of industrial chemicals are handled and hazardous waste are generated. Table 1 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 routes for the wastes. If an operation is not listed in Table 1, then that operation has been determined on a best-estimate basis to produce negligible quantities of wastes requiring disposal. For example, extremely small volumes of methyl ethyl ketone commonly evaporate after use, and therefore do not present a disposal problem. Conversely, if a particular volatile compound is listed, then the quantity represents an estimate of the amount actually disposed of according to the method shown.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with 19 Base personnel (Appendix B) and subsequent site inspections resulted in the identification of nine waste disposal/spill sites. Of these nine sites, it was determined that six of the sites are potentially contaminated with HM/HW with a potential for migration. Therefore, they should be further evaluated. Six of these sites were scored using HARM (Appendix D). One of these sites (Site No. 1 - POL Storage Area) has been investigated in the Phase II, Problem Confirmation [sic] and Quantification Presurvey Report, Leaking Jet Fuel Storage Tanks, performed by Roy F. Weston, Inc. (WESTON). Figure 3 illustrates the locations of the scored/unscored sites. Copies of the completed Hazardous Assessment Rating Forms are found in Appendix E. Table 2 summarizes the Hazard Assessment Scores (HAS) for each of the scored sites.

Table 1. Hazardous Waste Disposal Summary: Nebraska ANG, Lincoln Municipal Airport,
Lincoln, Nebraska

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY Gallons/Year	METHODS OF TREATMENT, STORAGE & DISPOSAL			
				1946	1954	1971	1980 Present
Army National Guard Organizational Maintenance	640	Hydraulic Oil	10			CNTR	
		Compressor Oil	2			CNTR	
		Engine Oil 15W40	400			CNTR	
		Transmission Oil	25			CNTR	
		Brake Fluid	10			CNTR	
		Cleaning Solvent	100			USP&FO	
		Thinner	5			USP&FO	
155 Consolidated	600	Anti Freeze	5			USP&FO	
		Compound, cleaning	12			CNTR	DRMO
		Lacquer Thinner	6	RS		CNTR	DRMO
OMS #3, 67th Support Battalion	624	Ename!, Thinner	1.5	RS		CNTR	DRMO
		Fire Resistant	10			USP&FO	CNTR
		Brake Fluid					
		Alcohol	20			USP&FO	CNTR
		Solvent, Dry Cleaning	300			USP&FO	CNTR
		Thinner, Paint	10			USP&FO	CNTR
		Toluene, Technical	10			USP&FO	CNTR
155th Motor Pool	625	PD-680	10				
		Engine Oils	300	RS		CNTR	RECYCLE
		Paint and Paint	50			1-CNTR	DRMO
		Thinners					
		Battery Acid	0			NEUTRALIZED	CNTR-DRMO

Key

Waste Quantities Gallons/Year
CNTR: Disposed of by contractor
FTA: Fire Training Area
DRMO: Defense Reutilization and Marketing Office

Recycle: DRMO for recycling
USP&FO: United States Property & Fiscal Office
RS: Road Spray

Table 1. Hazardous Waste Disposal Summary: Nebraska ANG, Lincoln Municipal Airport,
Lincoln, Nebraska (Continued)

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY Gallons/Year	METHODS OF TREATMENT, STORAGE & DISPOSAL		
				1946	1954	1971 1980 Present
Fuel Farm	670 668	JP-4	3,500		FIA	
Army Aviation Support Facility	624	Lubricating Oil	135	USP&FO/CNTR		
		Hydraulic Fluid	15	USP&FO/CNTR		
		Fire-Resistant Alcohol	10	USP/FO/CNTR		
		Methyl-Ethyl-Ketone	100	USP/FO/CNTR		
		Naphtha Aliphatic	3	USP&FO/CNTR		
155 Civil Engineering	600	Solvent, Dry Cleaning	210	USP/FR/CNTR		
	605	Thinner, Paint	10	USP/FO/CNTR		
	608	Toluene, Technical	10	USP/FO/CNTR		
		Contaminated JP-4	200	—FIA		
		30 WT Oil	27	RS	CNTR	DRMO
OMS #3, 67th Support Battalion		Diesel	12	RS	CNTR	DRMO
		Battery Acid	1	CNTR		DRMO
	624	Lubricating	1,280	USP&FO		

Key

Waste Quantities Gallons/Year
CNTR: Disposed of by contractor
FTA: Fire Training Area
DRMO: Defense Reutilization and Marketing Office

Recycle: DRMO for recycling
USP&FO: United States Property & Fiscal Office
RS: Road Spray

Source: Base Records

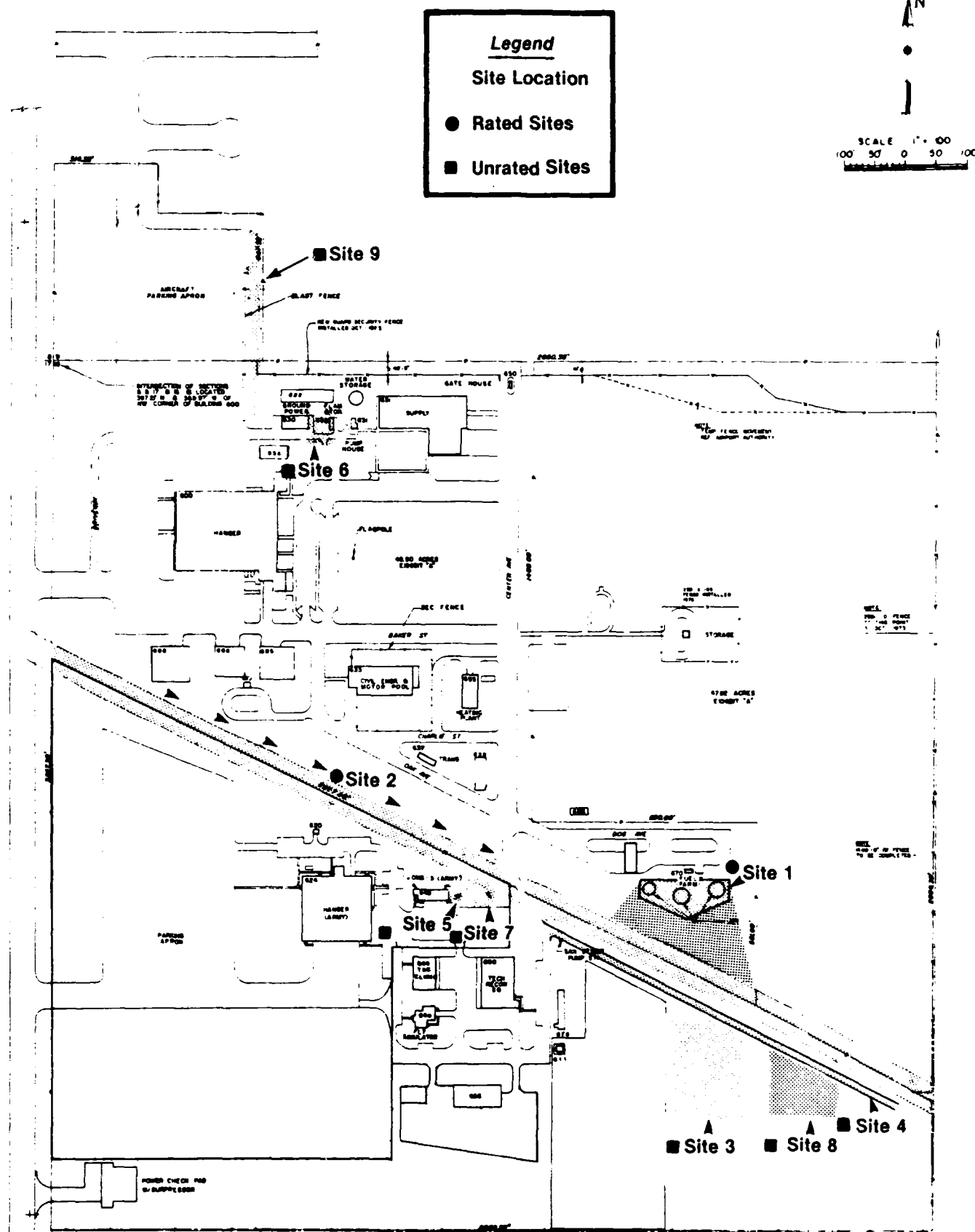


Table 2. Site Hazard Assessment Scores (as derived from HARM): Nebraska
ANG, Lincoln Municipal Airport, Lincoln, Nebraska

Site Priority	Site No.	Site Description	Receptor	Waste Characteristics	Path- way	Waste Management Practices	Overall Score
1	2	Old Oak Creek Channel	30	80	80	1.0	63
2	1	POL Storage Area	30	80	42	1.0	51
3	3	Former Tank Cleaning Area	30	80	42	1.0	51
4	4	South Rock Road	30	80	42	1.0	51
5	6	Hydraulic Fluid Spill Area	21	40	42	1.0	34
6	5	Army National Guard Oil Storage Area	27	20	30	1.0	30

Site No. 1 - POL Storage Area (HAS-51)

This area is located at the southeast end of the Base off Dog Ave (see Figure 3a). Three major JP-4 spills have occurred at this area.

During the period 1956-66, there was an estimated loss of 10,000 gallons of fuel in the POL Storage Area. Some of the fuel was recovered but no reliable estimate is available.

A pin-size hole was discovered in Tank F-1 at the POL Storage Area in December 1982. There is no estimate of how long the hole went unnoticed or how much fuel was lost. It is believed that a substantial amount of fuel was lost. The Base has stored only JP-4 jet aircraft fuel in the 100,000-gallon tank since it took over the facility from the Department of Navy in 1959. Seventeen test holes around the storage tank indicate the fuel has remained in the immediate area of the tank. A SI/RI/FS report concerning this incident was completed by Roy F. Weston, Inc., in March 1983. See Appendix F for logs of soil test borings and analytical results at the POL Storage Area. Six wells were constructed to recover the fuel. Recovery operations occurred each year from 1983 through 1986; from Spring until Fall. The total amount of fuel recovered was approximately 250 to 300 gallons. Analysis by Occupational Environmental Health Laboratory (OEHL) indicated that the recovered product was predominantly JP-4 with small amounts of AVGAS.

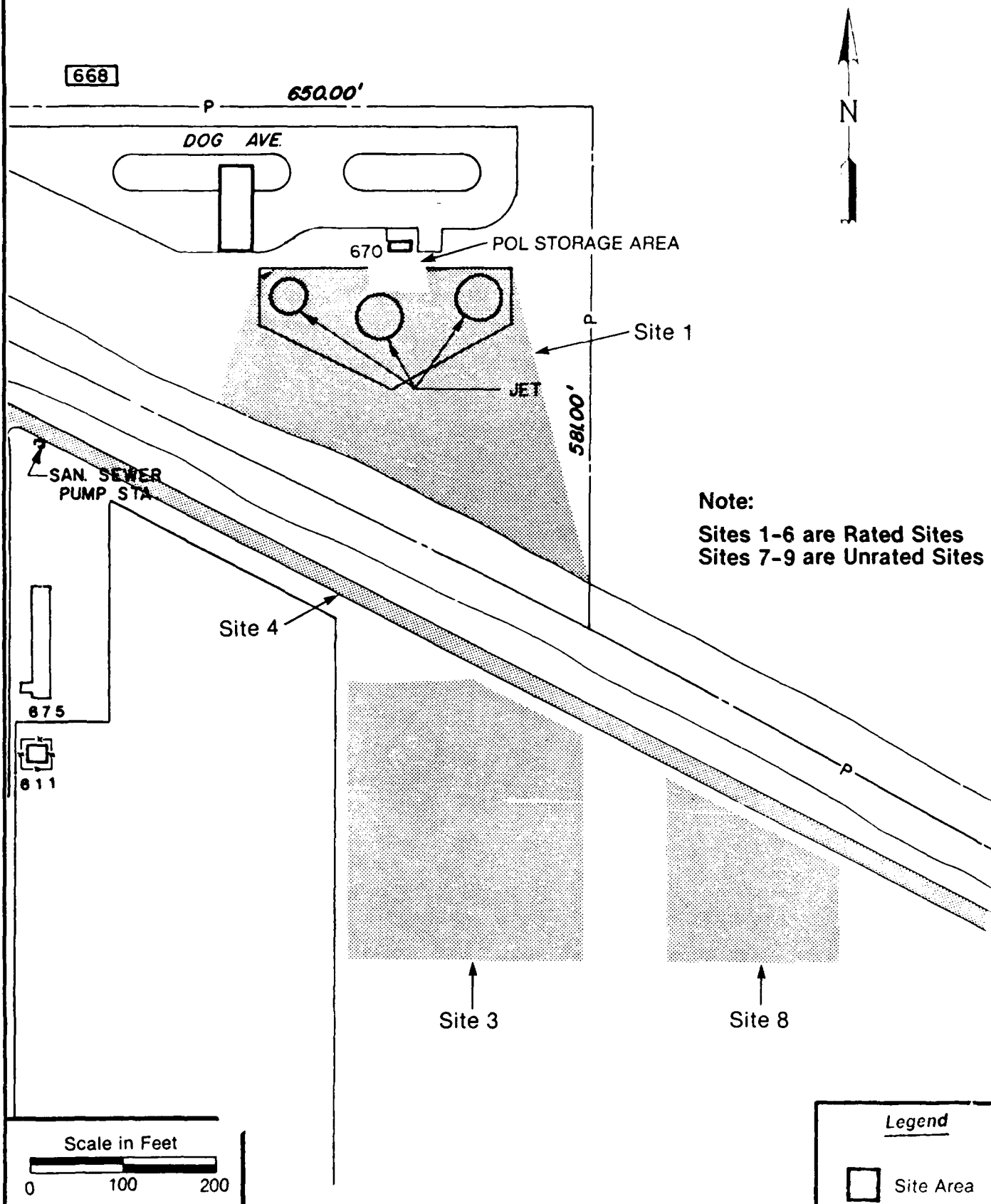
In 1984, there was an overflow of JP-4, which seeped into Old Oak Creek Channel, from the POL Storage Area. The spill was estimated at 1,000 gallons. Much of the fuel was recovered using absorbent materials; however, the exact quantity recovered is not known.

Several small spills have also occurred at this site. Because of the large volume of JP-4 lost, as confirmed by WESTON, a HAS was determined for this site and it was determined that immediate SI/RI/FS actions would be initiated.

HMTC

Figure 3a
Locations of Sites 1, 3, 4, and 8 at Nebraska ANG,
Lincoln Municipal Airport, Lincoln, Nebraska.

Source: Base Records



Site No. 2 - Old Oak Creek Channel (HAS-63)

As a part of the runway construction at the municipal airport, Oak Creek was rechanneled to the south end of the extended runway and as such, relocated off of Base property (see Figure 3c). The abandoned channel of Oak Creek is still on Base property. This abandoned channel today is known as Old Oak Creek Channel, which is a semi-stagnant body of water. Through a combination of spills, industrial discharges, or dumping, it is probable that Old Oak Creek Channel has received a substantial quantity of contaminants over the years. Water only flows from Old Oak Creek Channel during periods of precipitation. Consequently, small industrial discharges do not always flow directly off of the Base, but would more likely tend to accumulate in areas proximate to actual points of discharge.

The two Base activities which contribute to the contamination potential at the Old Oak Creek Channel site are:

a) The entire aircraft apron drains directly into Old Creek Channel. Approximately half of the aircraft apron drains into a storm drain area, which discharges directly into the end of Old Oak Creek Channel. A makeshift oil/water separator is situated at the discharge point into the creek, but does not fulfill its intended purpose and often overflows. The remainder of the apron area drains directly into Old Oak Creek Channel via a separate storm sewer. There is no estimate of total fuel that has drained into the creek. Over the years, materials spilled into the drain have included motor oils, JP-4, hydraulic oils, and various solvents. These spills have usually occurred during aircraft maintenance and cleanings.

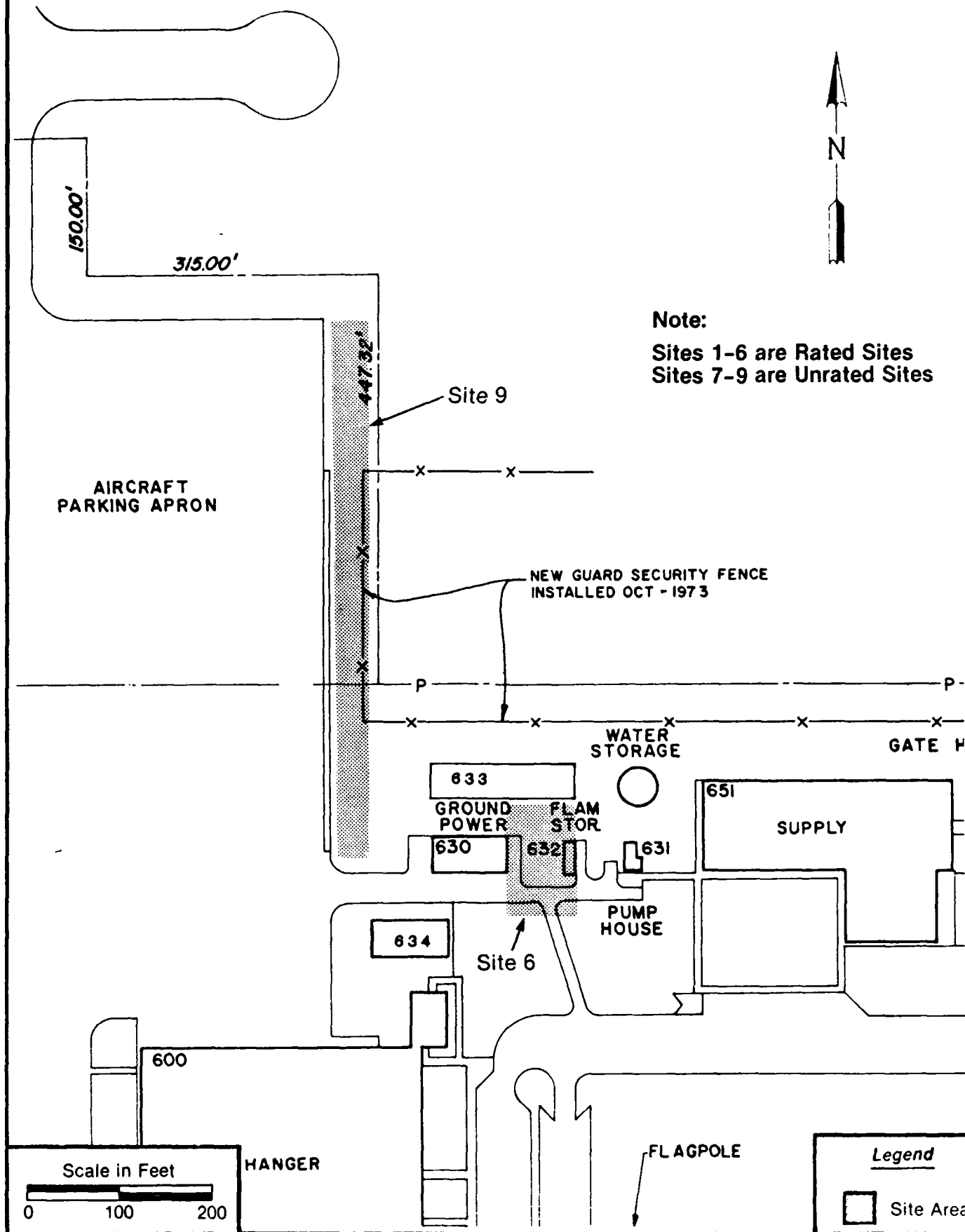
b) Building 600, the aircraft maintenance hangar, has also produced various wastes that have been released into this end of Old Oak Creek Channel. Building 600 has no oil/water separator; whatever materials that spilled in the past were usually washed down into floor drains that lead directly into the creek. Total spillage of PD-680, paint remover, and JP-4 is estimated at 60 to 100 gallons a year.

HMTC

Figure 3b

Locations of Sites 6 and 9 at Nebraska ANG, Lincoln Municipal Airport, Lincoln, Nebraska.

Source: Base Records



Note:

Sites 1-6 are Rated Sites
Sites 7-9 are Unrated Sites

The aircraft maintenance hangar discharge is the basis for determining a HAS for this site. Further stages of the IRP should also attempt to quantify the contamination potential from the aircraft apron.

Site No. 3 - Former Tank Cleaning Area (HAS-51)

This site is south of the POL Storage Area and adjacent to Old Oak Creek Channel (see Figure 3a). For many years, tank trucks and mobile storage tanks were delivered to this area for cleaning. It has been estimated that 20 to 200 gallons of waste material may have been disposed of per tank cleaned. Thus, various amounts of waste JP-4, fuel oil, and possibly cleaning solvents residuals were dumped in this area. Total amounts of waste and the exact number of years of this operation are unknown. Interviewee's also stated that on at least one occasion, in excess of 4,000 gallons of JP-4 was accidentally disposed of in this area when a full tank truck was unloaded by mistake.

The site was also used to store hazardous wastes. There were actually two sites in this area where hazardous waste was stored over the years, from the 1970s until the Defense Reutilization and Marketing Office (DRMO) began accepting the waste. Although there were no reports of major waste spills, interviewees reported observing many leaking and or toppled drums over the years. Wastes stored here included waste oils, solvents, acids, thinners, and hydraulic fluids.

As a result of the large amount of waste known to have been disposed of at this site, a HAS was developed and further IRP analysis should be performed.

Site No. 4 - South Rock Road (HAS-51)

This site is located along the east end of Old Oak Creek Channel (see Figure 3a). From 1958 until 1972, waste oils, thinner, and diesel fuel were used to control dust on this road. As a result of the Records Search process, it is

estimated that at least 350 gallons/year of waste oils, thinners, and diesel fuel from ANG shops were disposed of in this manner. Because of the number of years the road spraying practice occurred, a HAS was developed and further IRP analysis is warranted.

Site No. 5 - Army National Guard Oil Storage Area (HAS-30)

The site is located west of Center Ave. and adjacent to Building 640 (see Figure 3c). The Army Guard unit stores waste oil here in an aboveground 400-gallon storage tank. The tank is emptied by a local contractor on an "as needed" basis. However, many spills occurred during tank filling as well as many overflows. The tank sits adjacent to a parking lot surrounded by crushed white rock used to cover the parking surface. When the rock under the tank is moved, oil contamination is observed. Due to the observed contamination at this site, a HAS was developed and further IRP analysis should be performed.

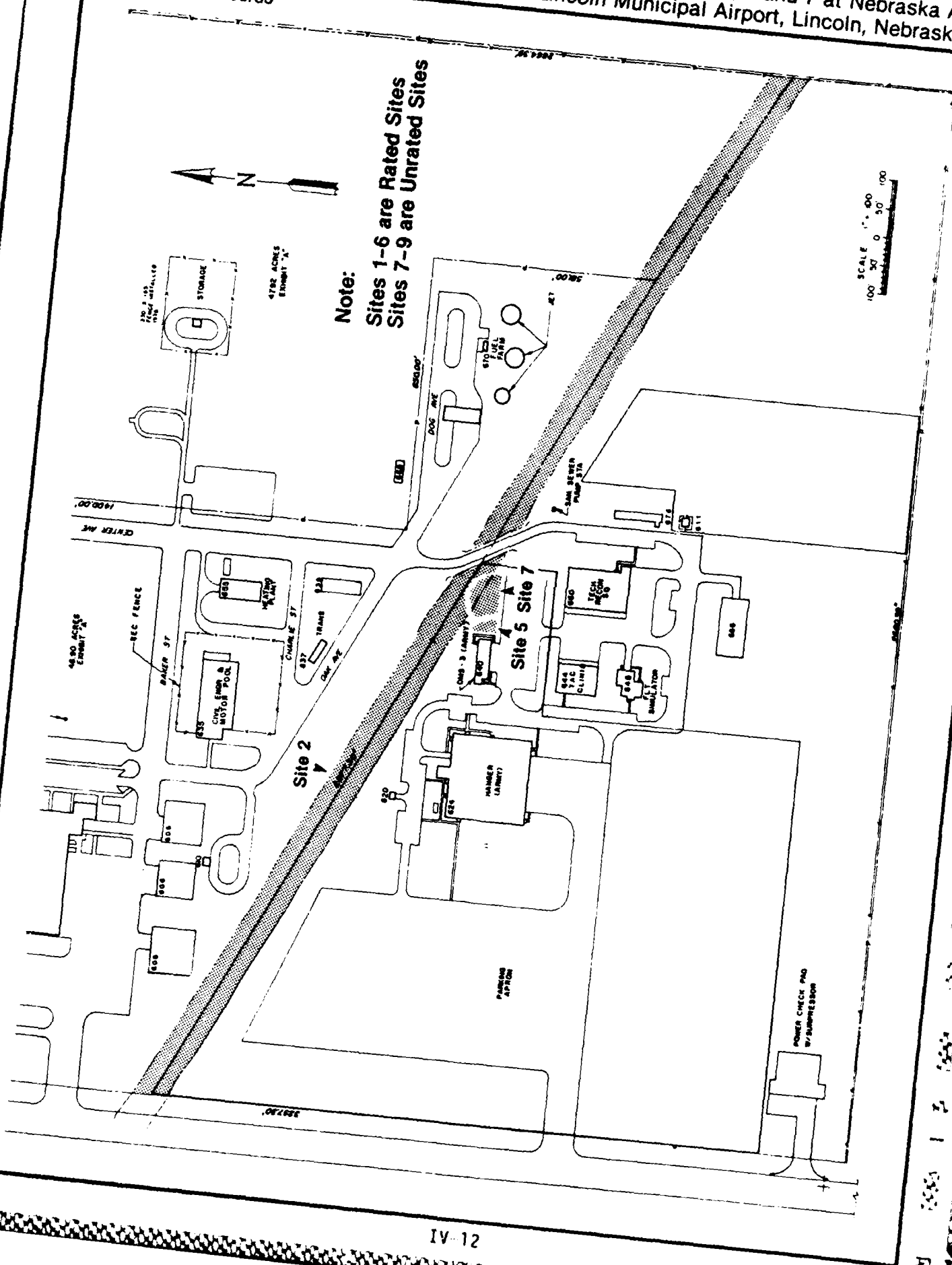
Site No. 6 - Hydraulic Fluid Spill Area (HAS-34)

This site, adjacent to Building 632, is used to store the hydraulic fluid units while they are not in use (see Figure 3b). Stored on an asphalt lot, the units often leaked hydraulic oil from loose fittings. The units have been stored here for years. The total amount of spillage is unknown, but environmental stress is evident in a grassy area adjacent to the asphalt lot where the units are stored. Due to the obvious contamination and visible environmental stress at this site, a HAS was developed and further IRP analysis should be performed.

Site No. 7 - Army National Guard Fence, North of Building 640 (Unrated)

This area is located adjacent to Old Oak Creek Channel, along the interior and exterior side of the Base's fence, the parking area of Building 648, and the north side of Building 640 (see Figure 3c). There is evidence of environmental stress, but according to Army National Guard personnel the stress is caused by a sterilant used twice a year to control the weeds along the fence. Army National Guard personnel stated that no hazardous waste has been dumped in

Figure 3c
Locations of Sites 2, 5 and 7 at Nebraska ANG,
Lincoln Municipal Airport, Lincoln, Nebraska.



this area. Based on this finding, it was decided that a HAS or further IRP analysis was not necessary for this site.

Site No. 8 - Former Hazardous Waste Storage Area (Unrated)

The south area of the Base and Building 666 was used temporarily for storing 55-gallon drums of hazardous waste on pallets over a 10-year period (see Figure 3a). There were no reports of significant waste spillage at this site and no signs of vegetative stress. Therefore, this site does not require a HAS or further investigation.

Site No. 9 - F-86 Crash (Unrated)

This area is located adjacent to and upgradient of ANG property, on the west side of the main runway, where in 1960, an ANG F-86 taxied into the blast fence dropping two 300 gallon fuel tanks which ruptured (see Figure 3b). The spilled fuel did not burn. The fuel which did not evaporate as it flowed across the runway onto the ANG property was estimated to be minimal; and there are no signs of vegetative stress. This site does not warrant a HAS or further investigation.

C. Critical Habitats/Endangered or Threatened Species

Discussions with personnel from the Nebraska Department of Natural Resources disclosed that there are no indigenous, endangered, or threatened species within a 1-mile radius of the Base.

V. CONCLUSIONS

- o Information obtained through interviews with 19 Base personnel, review of installation records, and field observations have resulted in the identification of nine disposal/spill sites on the Base which existed prior to January 1984 or, in the case of leaking tanks, prior to February 1986. Six of the nine sites are potentially contaminated with HM/HW and further IRP analysis should be performed.
- o Six of the nine sites, Sites Nos. 1, 2, 3, 4, 5, and 6 have been scored using the Air Force HARM. Two of the sites, Sites Nos. 5 and 6, exhibit visual evidence of contamination.
- o As a result of the shallow aquifer system and moderately permeable (1.4×10^{-3} cm/sec) soils, the overall groundwater environment at the Base is susceptible to contamination from surface contaminants.
- o Site No. 1 has been previously investigated in a Groundwater Contamination Study performed by Weston. However, further IRP analyses will be required to determine the extent of contamination.

VI. RECOMMENDATIONS

There is potential for contaminant migration at the Base; therefore, initial stages of the IRP SI/RI/FS are recommended.

The six potentially contaminated hazardous waste sites at the Base involve POL products. Site Nos. 2, 3, and 4 are also potentially contaminated with various solvents, detergents and strippers.

The purpose of the following site-specific recommendations made in this report is to confirm or refute the presence of contamination at each of the sites. If contamination is confirmed at a site, additional SI/RI/FS efforts will be required to fully characterize the extent of any soil and/or groundwater contamination.

Site No. 1 - POL Storage Area

This site has previously been investigated by Roy F. Weston, Inc. (WESTON) in March 1983. Nineteen test holes and six recovery wells were installed as a part of this SI/RI/FS effort. Existing wells installed for this study should be resampled.

Site No. 2 - Old Oak Creek Channel

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 3 - Former Tank Cleaning Area

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 4 - South Rock Road

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 5 - Army National Guard Oil Storage Area

Soil contamination at this site has been confirmed. Subsequent IRP analysis should be performed to determine the extent of soil contamination and to determine if groundwater contamination exists.

Site No. 6 - Hydraulic Fluid Spill Area

Soil contamination at this site has been confirmed. Subsequent IRP analysis should be performed to determine the extent of soil contamination and to determine if groundwater contamination exists.

GLOSSARY OF TERMS

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

CONTAMINANT - As defined by Section 101(f)(33) of 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:

- (a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,
- (b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,
- (c) 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),
- (d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,
- (e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and
- (f) 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, liquified 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 to environmental changes such as may be induced by chemical contaminants.

DISCHARGE - The process involved in the draining or seepage of water out of a groundwater aquifer.

DOWNGRAIENT - A direction that is topographically or hydraulically down sloped; the direction in which groundwater flows.

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 United States 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).

HAS - Hazard Assessment Score - The score developed by utilizing the Hazardous Assessment Rating Methodology (HARM).

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:

- a. Cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness; or
- b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

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

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.

PIEZOMETRIC SURFACE - The surface to which the water from a given aquifer will rise under its full head. As used in this report, it refers to the water table.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.2×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.23×10^{-5} to 1.4×10^{-4} cm/sec)
Moderately Slow	- 0.2 to 0.6 inches per hour (1.4×10^{-4} cm/sec)
Moderate	- 0.6 to 2.0 inches per hour (4.2×10^{-4} to 1.4×10^{-3} cm/sec)
Moderately Rapid	- 2.0 to 6.0 inches per hour (1.4×10^{-3} to 4.2×10^{-3} cm/sec)
Rapid	- 6.0 to 20 inches per hour (4.2×10^{-3} to 1.4×10^{-2} cm/sec)
Very Rapid	- more than 20 inches per hour (more than 1.4×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Survey)

STRATA - Distinguishable horizontal layers separated vertically from other layers.

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

UPGRADIENT - A direction that is topographically or hydraulically up slope.

WATER TABLE - The upper limit of the portion of the ground wholly saturated with water.

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2. Federal Register (47 FR 31224), July 16, 1982.
3. Federal Register (47 FR 31235), July 16, 1982.
4. Flood Insurance Rate Map Index, Lancaster County, Nebraska, Federal Emergency Management Agency, March 1986.
5. Phase II, Problem Confirmation [sic] and Quantification Presurvey Report, Leaking Jet Fuel Storage Tanks, March 1983, WESTON.
6. State of Nebraska, Nebraska Department of Environmental Control, Analytical Results for Air Guard Fuel Storage Tank Leak, March 1983.

Appendix A
Resumes of Preliminary Assessment
Team Members

ROBERT J. PAQUETTE

EDUCATION

B.S., environmental science, University of New Hampshire, 1973

EXPERIENCE

Extensive experience in hazardous waste receiving, handling, storage, and property accounting. Designed a system of labeling hazardous material/waste for proper storage. Developed Part B Application Information for many hazardous waste facilities. Conducted training sessions in hazardous materials/waste including receiving/warehousing, storage compatibility and personal safety. Performed atmospheric sampling for all major pollutants, computer modeling research projects and surveillance of possible regional air pollution sources.

EMPLOYMENT

Dynamac Corporation (1984-present): Environmental Scientist

Presently working on Installation Restoration Program for Air National Guard. Also, wrote State-of-the-Art Procedures for Defense Supply C points concerning compatibility, Packing, Packaging, Spill Response, and Recoupage of hazardous materials and waste.

Defense Reutilization and Marketing Region, Defense Depot Ogden (1981-1984):
Environmental Protection Specialist

Provided daily property disposal guidance to DPDOs concerning receiving, handling, storage and property accounting of HM/HW; provided technical advice on the handling and disposal of HM/HW to field personnel at DPDOs in region. Interpreted State and Federal regulations for superiors and the DPDOs, and acted as liaison between field personnel and State/Federal environmentalists. Assisted in rewriting DOD environmental regulations. Trained DPDO personnel in all aspects of HM/HW procedures as part of their increasingly involved environmental mission; wrote Emergency Response and Spill Contingency Plans. Developed Part B applications for HW facilities. Conducted environmental audits at DPDOs and other D.O.D. facilities.

State of New Hampshire, Bureau of Solid Waste Management (1979-1981):
Environmental Specialist

Responsible for all work activities dealing with uncontrolled hazardous waste sites. Working knowledge of safety equipment, personal protection equipment, safety plans, and monitoring, sampling and analytical procedures relating to hazardous waste. Daily contact with industry and the general public discussing current New Hampshire and Federal hazardous waste regulations. Assisted in developing regulations and interpreting existing regulations. Conducted research regarding proper disposal of hazardous waste materials; determining if certain materials are considered hazardous. Conducted inspections of industry to insure compliance with the Federal hazardous waste regulations (RCRA). Daily interaction with the U.S. Environmental Protection Agency.

State of New Hampshire, Air Resource Agency (1978-1979): Environmental Specialist

Assisted in conducting the research for and the development of the State Implementation Plan for New Hampshire; conducted computer modeling research projects and was partly responsible for Atmospheric Dispersion Modeling of Meteorology for the State of New Hampshire which included written and verbal reports. Knowledge of N.E.S.H.A.P. and N.H. Air Resource Regulations.

State of New Hampshire, Air Resource Agency (1974-1978): Air Pollution Technician

Responsible for atmospheric sampling for all major pollutants; site determination and development maintenance of air pollution monitors; air pollution monitoring and meteorology; chart data reduction; written reports; surveillance of all possible air pollution sources in district; inspections of most industries in district; constant public contact with county and city officials as well as the general populace; complaint investigations; occasional dissertations to private and public organizations.

JODY C. MOONEY

EDUCATION

B.S., chemistry, University of Maryland, 1975

EXPERIENCE

Eleven years of experience in hazardous waste and environmental science fields. Experience includes research in organic chemistry (polythiol-ene) and management for a treatment/storage/disposal (TSD) facility. As an associate chemist, performed analysis of inorganic and organic parameters of wastewater samples. Has extensive knowledge of state and federal DOT, RCRA and TSCA regulations on hazardous waste.

EMPLOYMENT

Dynamac Corporation (1986-present): Staff Scientist

Responsibilities include site surveys and records searches for the Phase I portion of the Installation Restoration Program for the Air National Guard. Efforts include risk assessment, site prioritization and remedial action recommendations. Participated in the evaluation of a wastewater treatment plant.

Transviron Incorporated (1984-1985): Environmental Scientist

Prepared proposals for various remedial investigations and feasibility studies (including NUS subcontract award) and supervised field activities relating to investigations and cleanups. Also responsible for hazardous waste management programs set up for commercial clients.

Atlantic Coast Environmental, Inc. (1983-1984): Director of Chemical Services

Planned, directed, and controlled the activities of two operation managers and one technical supervisor for a TSD facility. Supervised facility laboratory operation and assisted clients in chemical disposal problems. Chemical advisor to emergency coordinator of chemical spills.

Browning-Ferris Industries, Inc. (1982-1983): Chemist

Responsible for assuring that the facility (Quarantine Road) operated in compliance with state, local, and federal regulations. Managed the East Coast Regional Environmental Laboratory. Developed field procedures for groundwater monitoring program. Responsible for sampling analysis, treatment, and bringing six lagoons into compliance for discharge with NPDES permit.

Hittman Associates, Inc. (1980-1982): Associate Chemist

Performed analysis of inorganic and organic parameters of wastewater samples. Organized supplies and sample shipment for Exxon Donor Solvent Program. As project scientist, conducted a wastewater study at Bush River, Maryland. Laboratory representative on the safety committee.

Alcolac, Inc. (1979-1980): Quality Control Laboratory Technician

W.R. Grace, Inc., Washington Research Center (1975-1978): Research Technician (Organic)

PROFESSIONAL AFFILIATIONS

The American Society for Testing and Materials -- D-34 Committee on Waste Disposal
The American Chemical Society -- Maryland Local Section

KATHRYN A. GLADDEN

EDUCATION

B.S., chemical engineering (minor in biological sciences), University of Washington, 1978

SECURITY CLEARANCE

Secret DOD clearance

EXPERIENCE

Seven years of experience in hazardous waste consulting and plant process engineering. Experience includes development of engineering alternatives for reduction of in-plant effluents and preparation of RCRA background listing documents for the plastics industry.

EMPLOYMENT

Dynamac Corporation (1985-present): Staff Engineer

Performs studies on the feasibility of solvent recycling, including the evaluation of several alternatives. Studies to date have included 15 sites. For each site, prepared reports describing present practice for solvent use and disposal, and conducted economic analyses of options.

Conducted preliminary site investigations and ranking of hazardous waste sites for the U.S. Federal Bureau of Prisons. Prepared reports detailing site investigation findings and recommendations for Phase II monitoring and sampling.

Preparing statement of work for a Phase IV-A remedial action plan for the Air Force's Installation Restoration Program.

Conducted analysis of public comments on Advanced Notice of Public Rulemaking to establish National Primary Drinking Water Regulations for radionuclide contaminants.

Peer Consultants (1984-1985): Staff Engineer

Developed background documents for listing of RCRA hazardous wastes.

Engineering Science (1983-1984): Staff Engineer

Conducted regulatory policy review and technology assessment of transportation and decontamination procedures for acutely hazardous wastes. Project engineer for development of a cost analysis methodology for the U.S. Army Toxic and Hazardous Materials Agency Installation Restoration Program.

Weyerhaeuser Company (1978-1983): Chemical Engineer

Conducted plant environmental audits to develop in-plant effluent load balances; developed capital alternatives and improved operating procedures for in-plant effluent reduction; developed and implemented recommendations for plant energy conservation and process optimization programs; investigated industrial hygiene impacts of wood pyrolysis air emissions, and performed pilot trials for wood gasification and pyrolysis technology development.

PROFESSIONAL AFFILIATIONS

Tau Beta Pi Engineering Honorary
Society of Women Engineers

Appendix B

Interviewee Information

INTERVIEWEE INFORMATION

Interviewee Number	Primary Duty Assignment	Years Associated with Lincoln ANG
1	Supply Fuels	24
2	Supply Fuels	7
3	Fuels Maintenance	10
4	Fuels Maintenance	20
5	Motor Vehicle Maintenance	20
6	Motor Vehicle Maintenance	12
7	Aircraft Field Maintenance	32
8	Jet Engine Shop	14
9	AGE Equipment	25
10	Aircraft Organizational Maintenance	16
11	Aircraft Maintenance, Hazardous Waste Coordination	20
12	NCOIC, Fuel Cell Repair	15
13	Base Civil Engineering	22
14	Base Fire Department	15
15	Base Facilities	20
16	Civil Engineering Records	20
17	Resource Management	12
18	Automotive Worker	15
19	General Mechanic	22

Appendix C
Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1. National Oceanic and Atmospheric Administration
6001 Executive Boulevard
Rockville, Maryland 20853
2. Nebraska Department of Natural Resources
301 Centennial Mall, South
Lincoln, Nebraska 68509
3. United States Geological Survey
12201 Sunrise Valley Drive
Reston, Virginia 22092

Appendix D
USAF Hazard Assessment
Rating Methodology

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 United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search 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 Records Search 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 flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

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

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and 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 1,000 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 containment are not reduced. Scores for sites with limited containment 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 factory to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 4

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 feet 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. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		

Subtotals

Receptors subcore (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 Subcore A (from 20 to 100 based on factor score matrix)

B. Apply persistence factor

Factor Subcore A X Persistence Factor = Subcore B

_____ X _____ = _____

C. Apply physical state multiplier

Subcore B X Physical State Multiplier = Waste Characteristics Subcore

_____ 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 subcore of 100 points for direct evidence or 30 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 ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
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		1		
Subscore (100 X factor score/3)				_____
3. Ground water migration				
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		3		
Direct access to ground water		3		
Subtotals _____				_____
Subscore (100 X factor score subtotal/maximum score subtotal)				_____
C. Highest pathway subscore.				
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

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels			Multiplier
	0	1	2	
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	3,001 feet to 1 mile	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	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	6
G. Ground water use of uppermost aquifer	Not used, other sources readily available	Commercial, Industrial, or Irrigation, very limited other water sources	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	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	6

11. 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
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels

Sax's Level 3

Flash point less than 80°F

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

Waste Characterization Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	1	C	H
80	1	C	H
70	1	S	H
60	5	C	H
	1	S	H
50	1	C	L
	1	S	H
	5	C	H
	5	S	H
40	1	S	H
	1	C	L
	5	S	L
30	1	C	L
	5	S	L
20	5	S	L

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

no confirmed confidence levels (C) can be added.

o Confirmed confidence levels cannot be added with

Waste Hazard Rating

Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCH + SCH = LCH 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.

11. Persistence Multiplier for Point Rating

<u>Multiply Point Rating</u> <u>Persistence Criteria</u>	<u>From Part A by the Following</u>
ketals, polycyclic compounds, and halogenated hydrocarbons	1.0
substituted and other ring compounds	0.9
straight chain hydrocarbons	0.8
easily biodegradable compounds	0.4
<u>cal State Multiplier</u>	
Physical State	
	Multiply Point Total From Parts A and B by the Following

iii. Physical State Multiplier

Normalized thickness (\$t/t_0\$)	Liquid (\$\sigma_{max}/\sigma_{0.2}\$)	Solid (\$\sigma_{max}/\sigma_{0.2}\$)	Solid with hole (\$\sigma_{max}/\sigma_{0.2}\$)
0.0	1.00	1.00	1.00
0.2	0.90	0.85	0.80
0.4	0.80	0.75	0.70
0.6	0.75	0.65	0.60
0.8	0.70	0.60	0.55
1.0	0.65	0.55	0.50

111. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, 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	Rating Scale Levels			Multiplier
	0	1	2	3
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches
Surface erosion	None	Slight	Moderate	Severe
Surface permeability	0% to 15% clay (>10 ⁻² cm/sec)	15% to 30% clay (10 ⁻² to 10 ⁻⁶ cm/sec)	30% to 50% clay (10 ⁻⁶ to 10 ⁻⁶ cm/sec)	Greater than 50% clay (>10 ⁻⁶ cm/sec)
Rainfall intensity based on 1-year 24 hour rainfall (Thunderstorm)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-15 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100

B. 2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually
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B. 3 Potential for Ground Water Contamination

Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches
Soil permeability	Greater than 50% clay (>10 ⁻⁶ cm/sec)	10% 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)

b-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels			Multiplier
	0	1	2	

Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	0
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Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	0
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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 subcores.

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.

CNR127

Appendix E
Site Hazardous Assessment
Rating Forms

155th Tactical Reconnaissance Group
Nebraska Air National Guard
Lincoln Municipal Airport
Lincoln, Nebraska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS

Population within 1,000 feet of site:

All sites 0

Distance to nearest well:

Site Nos. 1, 2, 3, 4, and 5 0 to 3,000 feet
Site No. 6 3,001 feet to 1 mile

Land use/zoning within 1 mile radius:

All sites Commercial/Industrial

Distance to installation boundary:

Site Nos. 1, 2, 3 and 4 1,001 feet to 1 mile
Site Nos. 5 and 6 Greater than 2 miles

Critical environments within 1 mile
radius of site:

All sites Not a critical environ-
ment

Water quality of nearest surface water
body:

All sites Agricultural or indus-
trial use

Groundwater use of upper aquifer:

All sites Not used; other sources
readily available

Population served by surface water supply
within 3 miles downstream of site:

All sites 0

155th Tactical Reconnaissance Group
Nebraska Air National Guard
Lincoln Municipal Airport
Lincoln, Nebraska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria (Continued)

1. RECEPTORS (Continued)

Population served by groundwater supply
within 3 miles of site:

All sites 0

2. WASTE CHARACTERISTICS

Quantity:

Site Nos. 1, 2, 3, and 4	Large
Site No. 5	Small
Site No. 6	Medium

Confidence Level:

Site Nos. 1, 2, 3, 4, and 6	Confirmed
Site No. 5	Suspected

Hazard Rating:

Site Nos. 1, 2, 3, and 4	Medium
Site Nos. 5 and 6	Low

Persistence:

All sites:	Metals, polycyclic compounds, and halogenated hydrocarbons.
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Physical State:

All sites	Liquid
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155th Tactical Reconnaissance Group
Nebraska Air National Guard
Lincoln Municipal Airport
Lincoln, Nebraska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria (Continued)

3. PATHWAYS

Surface Water Migration

Distance to nearest surface water:

Site Nos. 1, 2, 3, and 4	0 to 500 feet
Site Nos. 5 and 6	501 to 2,000 feet

Net precipitation:

All sites	Less than 10 inches/year
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Surface erosion:

Site No. 1	None
Site Nos. 2, 3, 4, 5, and 6	Slight

Surface permeability:

All sites	10^{-2} to 10^{-4} cm/sec
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Rainfall intensity:

All sites	<1.0 inch
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Flooding:

All sites:	In 100-year floodplain
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Groundwater Migration

Depth to groundwater:

Site Nos. 1, 3, 4, 5, and 6	11 to 50 feet
Site No. 2	0 to 10 feet

Net precipitation:

All sites	Less than 10 inches/year
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Soil permeability:

All sites	10^{-4} to 10^{-6} cm/sec
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155th Tactical Reconnaissance Group
Nebraska Air National Guard
Lincoln Municipal Airport
Lincoln, Nebraska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria (Continued)

3. PATHWAYS (Continued)

Groundwater Migration (Continued)

Subsurface flows:

Site Nos. 1, 3, 4, 5, and 6

Bottom of site occasion-
ally submerged

Site No. 2

Bottom of site frequent-
ly submerged

Direct access to groundwater:

Site Nos. 1, 3, 4, 5, and 6

Low risk

Site No. 2

Moderate

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #1 POL Storage Area

LOCATION Dog Ave.

DATE OF OPERATION OR OCCURRENCE 1965-66, 1982

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, Nebraska

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
Subtotals			<u>54</u>	<u>180</u>
Receptors subscore (100 X factor score subtotal/maximum score subtotal)				<u><u>30</u></u>

II. WASTE CHARACTERISTICS

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

- Waste quantity (S = small, M = medium, L = large)
- Confidence level (C - confirmed, S - suspected)
- Hazard rating (H - high, M - medium, L - low)

LCM

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

80

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

$$\underline{80} \times \underline{1.0} = \underline{80}$$

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{80} \times \underline{1.0} = \underline{80}$$

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

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

1. Surface water migration

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	6
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24

Subtotals 30 108

Subscore (100 X factor score subtotal/maximum score subtotal) 28

2. Flooding	1	1	1	3
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Subscore (100 X factor score/3) 33

3. Ground water migration

Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24

Subtotals 48 114

Subscore (100 X factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

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

Pathways Subscore 42

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	30
Waste Characteristics	80
Pathways	42

Total 152 divided by 3 = 51

Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #2 Old Oak Creek Channel

LOCATION From ANG apron to south of POL area; Fuel Farm

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, Nebraska

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
Subtotals			<u>54</u>	<u>180</u>
Receptors subscore (100 X factor score subtotal/maximum score subtotal)				<u><u>30</u></u>

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)

L

2. Confidence level (C - confirmed, S - suspected)

C

3. Hazard rating (H - high, M - medium, L - low)

M

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

80

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

$$\underline{80} \times \underline{1.0} = \underline{80}$$

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{80} \times \underline{1.0} = \underline{80}$$

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 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
				Subscore <u>0</u>
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24
			Subtotals	<u>38</u> <u>108</u>
Subscore (100 X factor score subtotal/maximum score subtotal)				<u>35</u>
2. Flooding				
	1	1	1	3
Subscore (100 X factor score/3)				<u>33</u>
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
			Subtotals	<u>72</u> <u>114</u>
Subscore (100 X factor score subtotal/maximum score subtotal)				<u>63</u>
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				80
Pathways Subscore				<u><u>80</u></u>

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	<u>30</u>
Waste Characteristics	<u>80</u>
Pathways	<u>80</u>
Total <u>190</u> divided by 3 =	<u>63</u>
Gross Total Score	

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

63 x 1.0 = 63

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #3 Former Tank Cleaning Area

LOCATION Currently the baseball field area

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, Nebraska

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18

Subtotals 54 180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 30

11. 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) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

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

$$\underline{80} \times \underline{1.0} = \underline{80}$$

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{80} \times \underline{1.0} = \underline{80}$$

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 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				

Subscore 0

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

1. Surface water migration

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24

Subtotals 38 108

Subscore (100 X factor score subtotal/maximum score subtotal) 35

2. Flooding	1	1	1	3
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Subscore (100 X factor score/3) 33

3. Ground water migration

Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24

Subtotals 48 114

Subscore (100 X factor score subtotal/maximum score subtotal) 42

C. Highest pathway subscore.

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

Pathways Subscore 42

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	<u>30</u>
Waste Characteristics	<u>80</u>
Pathways	<u>42</u>

Total 152 divided by 3 = 51

Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #4 South Rock Road

LOCATION Access road along Oak Creek (south of POL Storage area)

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, NB

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18

Subtotals 54 180Receptors subscore (100 X factor score subtotal/maximum score subtotal) 30

11. 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) L2. Confidence level (C = confirmed, S = suspected) C3. Hazard rating (H = high, M = medium, L = low) MFactor Subscore A (from 20 to 100 based on factor score matrix) 80

- B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

80 X 1.0 = 80

- C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 X 1.0 = 80

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 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
				Subscore <u>0</u>
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24
			Subtotals	38 108
Subscore (100 X factor score subtotal/maximum score subtotal)				35
2. Flooding				
	1	1	1	3
Subscore (100 X factor score/3)				33
3. Ground water migration				
Depth to ground water	2	8	16	14
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
			Subtotals	48 114
Subscore (100 X factor score subtotal/maximum score subtotal)				42
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				42

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	30
Waste Characteristics	80
Pathways	42
Total <u>152</u> divided by 3 =	51
Gross Total Score	

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #5 Army National Guard Oil Storage Area

LOCATION East of Building 640

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, Nebraska

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
Subtotals			<u>48</u>	<u>180</u>
Receptors subscore (100 X factor score subtotal/maximum score subtotal)				<u><u>27</u></u>

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) S
2. Confidence level (C - confirmed, S - suspected) S
3. Hazard rating (H - high, M - medium, L - low) L

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

20

- B. Apply persistence factor
- Factor Subscore A X Persistence Factor = Subscore B

$$\underline{20} \times \underline{1.0} = \underline{20}$$

- C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{20} \times \underline{1.0} = \underline{20}$$

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 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
Subscore				0
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24
Subtotals				30 108
Subscore (100 X factor score subtotal/maximum score subtotal)				28
2. Flooding				
	1	1	1	3
Subscore (100 X factor score/3)				33
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals				48 114
Subscore (100 X factor score subtotal/maximum score subtotal)				42
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				42

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	27
Waste Characteristics	20
Pathways	42
Total	89

divided by 3 = 30

Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

30 x 1.0 = 30

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE Site #6 Hydraulic Fluid Spill Area

LOCATION South of Building 632

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR Lincoln Municipal Airport (Air National Guard Base) Lincoln, Nebraska

COMMENTS/DESCRIPTION _____

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
Subtotals			38	180
Receptors subscore (100 X factor score subtotal/maximum score subtotal)				21

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) M

2. Confidence level (C - confirmed, S - suspected) C

3. Hazard rating (H - high, M - medium, L - low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor

Factor Subscore A X Persistence Factor = Subscore B

$$\underline{40} \times \underline{1.0} = \underline{40}$$

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

$$\underline{40} \times \underline{1.0} = \underline{40}$$

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 30 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
				Subscore <u>0</u>
B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	0	18
Surface permeability	1	6	6	18
Rainfall intensity	0	8	0	24
Subtotals			30	108
Subscore (100 X factor score subtotal/maximum score subtotal)				28
2. Flooding				
	1	1	1	3
Subscore (100 X factor score/3)				33
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
Subtotals			48	114
Subscore (100 X factor score subtotal/maximum score subtotal)				42
C. Highest pathway subscore.				
Enter the highest subscore value from A, B-1, B-2 or B-3 above.				
Pathways Subscore				42

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	21
Waste Characteristics	40
Pathways	42
Total <u>103</u> divided by 3 =	34
Gross Total Score	

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

34 x 1.0 = 34

Appendix F
Logs of Soil Test Borings and Analytical
Results: POL Storage Area



NEBRASKA TESTING LABORATORIES, INC.

PHONE (402) 331-4453 4453 SOUTH 67TH ST (P.O. BOX 6075 ELMWOOD STATION)

February 18, 1983

Omaha, Nebraska 68106-0075

Dan E. McCarthy
President

George C. Phelps
Vice President

Don W. Lieberknecht, P.E.
Vice President

Division Directors

Altai Rahman, Ph.D. P.E.
Engineering

Donald F. Stevens
Industrial

Wayne L. Gilsdorf
Scientific

Captain Allen Malone
Nebraska Air National Guard
Lincoln MAP
Lincoln, NE 68524

RE: Soil Borings and Groundwater Monitoring Well Installation to determine extent of aviation fuel contamination of soil surrounding Tank No. 1 at Nebraska Air National Guard Fuel Storage Depot, Lincoln, Nebraska. NTL Job No. 444-82; Contract No. DAPA2533-M2214.

Dear Captain Malone:

Enclosed are typed copies of the boring logs for the test holes and wells that were drilled in and around the fuel storage depot at the Nebraska Air National Guard Base in Lincoln, Nebraska on January 31 and February 1, 10 and 11, 1983. These logs have been renumbered to coincide with the test hole designations used on the boring location plan provided us on February 14, 1983, i.e., DH-1 was changed to 0201, DH-2 to 0202, etc.

Also included are three (3) generalized subsurface profiles that indicate the results of the work performed. Shown on the profiles are the location and designation of samples obtained along with the associated Standard Penetration Test (SPT) blow count, and the field classification of the materials encountered by the Unified Soil Classification System. A table detailing the classification symbols and the related soil types is also included. The profiles also indicate the depths where groundwater was encountered and where it stabilized after drilling and also the relative concentrations of fuel in the samples based on smell.

The upper sediments are all of alluvial origin although it appears that some of these materials have been reworked and placed as fill on the site and during construction of the sewer lines around the perimeter of the fuel depot. These materials generally were moderately to highly plastic and are believed to have relatively low permeabilities. However, isolated zones of low plasticity silts and clay were observed within these sediments.

Underlying the alluvial sediments are light colored, sandy materials believed to be associated with glacial outwash deposits. These materials varied considerably from very silty fine grained sands to clean or gravelly well graded sands. Some low plasticity silts and clays were also observed.



Captain Allen Malone
Nebraska Air National Guard
February 18, 1983
Page Two

From the results of our borings it appears that the groundwater in this area is under considerable head given the extreme and rapid rise in the groundwater level when the higher permeability sands and silts are penetrated.

Based on the information obtained from this and previous investigations it appears that the aviation fuels have contaminated a large area within a 100 foot radius surrounding the tank but that the contamination decreases significantly in the northeast quadrant and possibly the southeast. No contamination (other than surficial) was observed in wells that were installed at distances greater than 100 feet from the tank in the north, northeast, and southeast directions. It appears that the greatest contamination beyond the 100 foot radius has occurred predominately in a westerly and southwesterly direction.

We trust that this fulfills your requirements at this time. If you have any questions or we may be of further service please contact this office.

Sincerely,

NEBRASKA TESTING LABORATORIES, INC.

William F. Willis

William F. Willis
Geologist

WFW:edw

Enclosures: As noted

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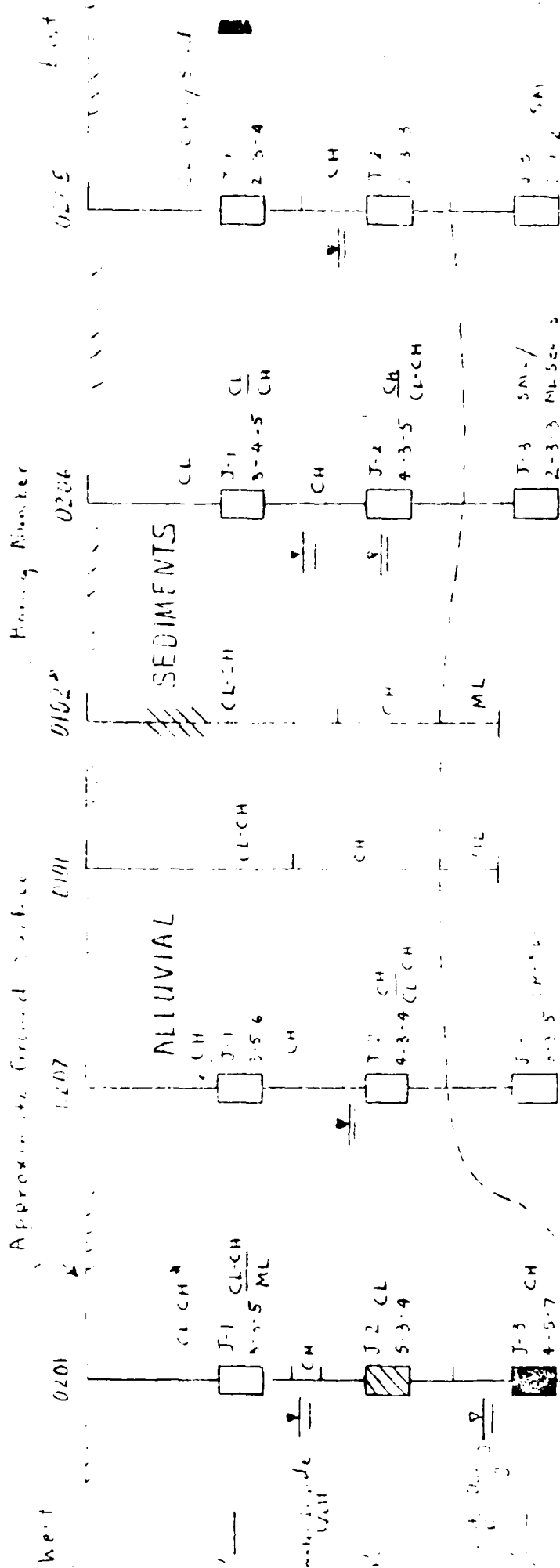
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MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve •				
FINE-GRAINED SOILS 50% or more passes No. 200 sieve •	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand mixtures
			GC	Clayey gravels, gravel-sand mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravel-sands, little or no fines
			SP	Poorly graded sands and gravel-sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-clay mixtures
			SC	Clayey sands, sand-clay mixtures
SILTS AND CLAYS Liquid limit 50% or less	SILTS AND CLAYS Liquid limit greater than 50%	ML	Inorganic silts, very fine sandy, rock flour, silt or clayey fine sand	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
		EH	Inorganic silts, fine grained, and silty clays of low plasticity	
		CH	Inorganic clays of high plasticity	
		CH	Inorganic clays of high plasticity	
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Unified Soil Classification Chart, ASTM D-2487

FUEL STORAGE TANK NEBRASKA AIR NATIONAL GUARD LINCOLN, NEBRASKA



SANDY SEDIMENTS OF PROBABLE GLACIAL ORIGIN

Scales: Horizontal: None
Vertical: 1"=5'

LEGEND

J-1 Sampled Interval w/ Sample Number: SPT Blow Count: No Fuel Encountered

Fuel Concentration: Weak

Fuel Concentration: Intermediate to High

Line of Weak Fuel Concentration - Unsampled

* Classification Symbols ML, CL, CH, etc. are field classes

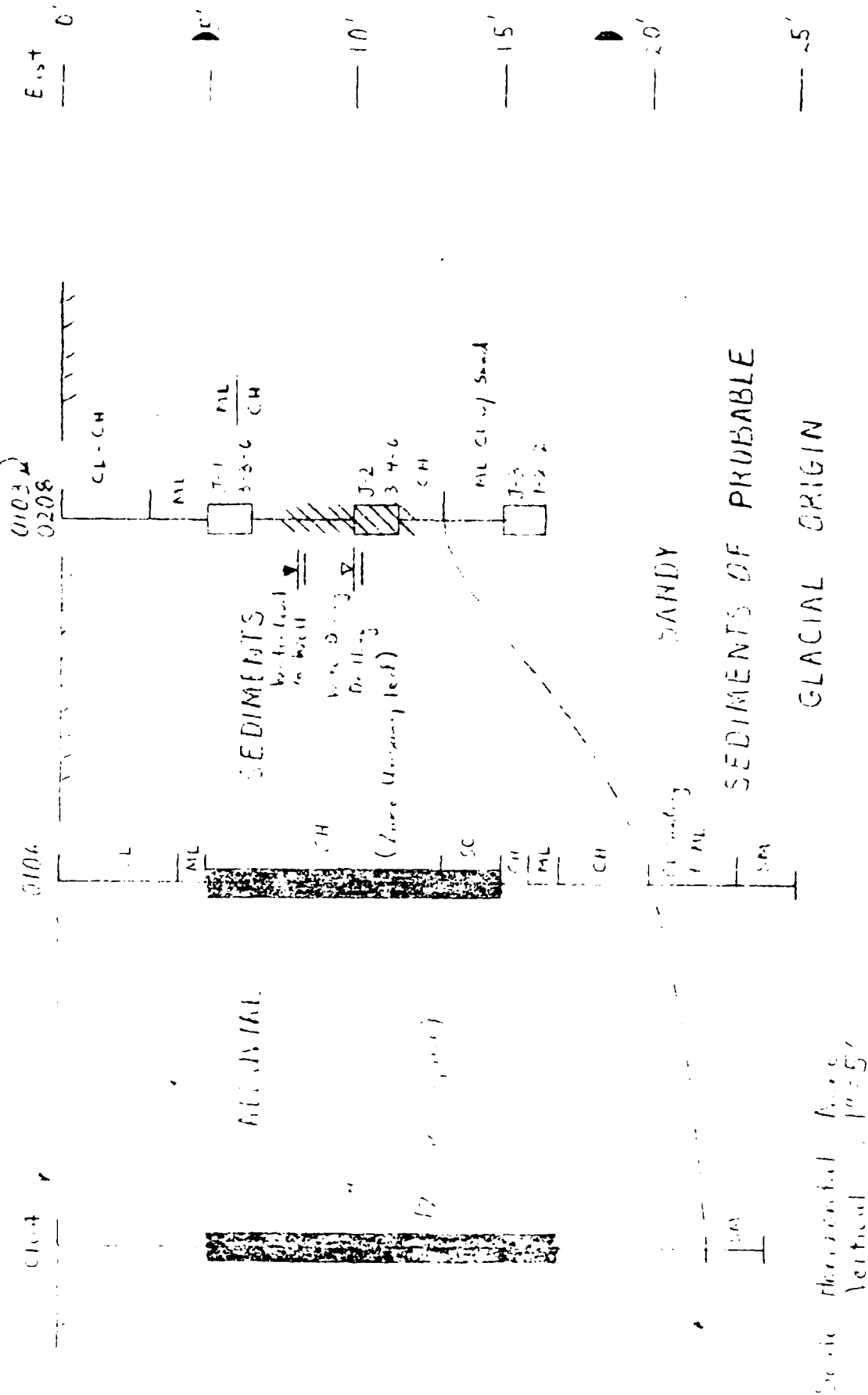
of the Hydrogeologic Survey System

SECTION OF DITCH PROFILE: AREA WITHIN 100 FT RADIUS OF TANK NO. 1

PLATE TOP OF DITCH NEBRASKA AIR NATIONAL GUARD LINCOLN, NEBRASKA

Approximate Ground Surface

Boring Number



NEBRASKA TESTING LABORATORIES OMAHA, NEBRASKA

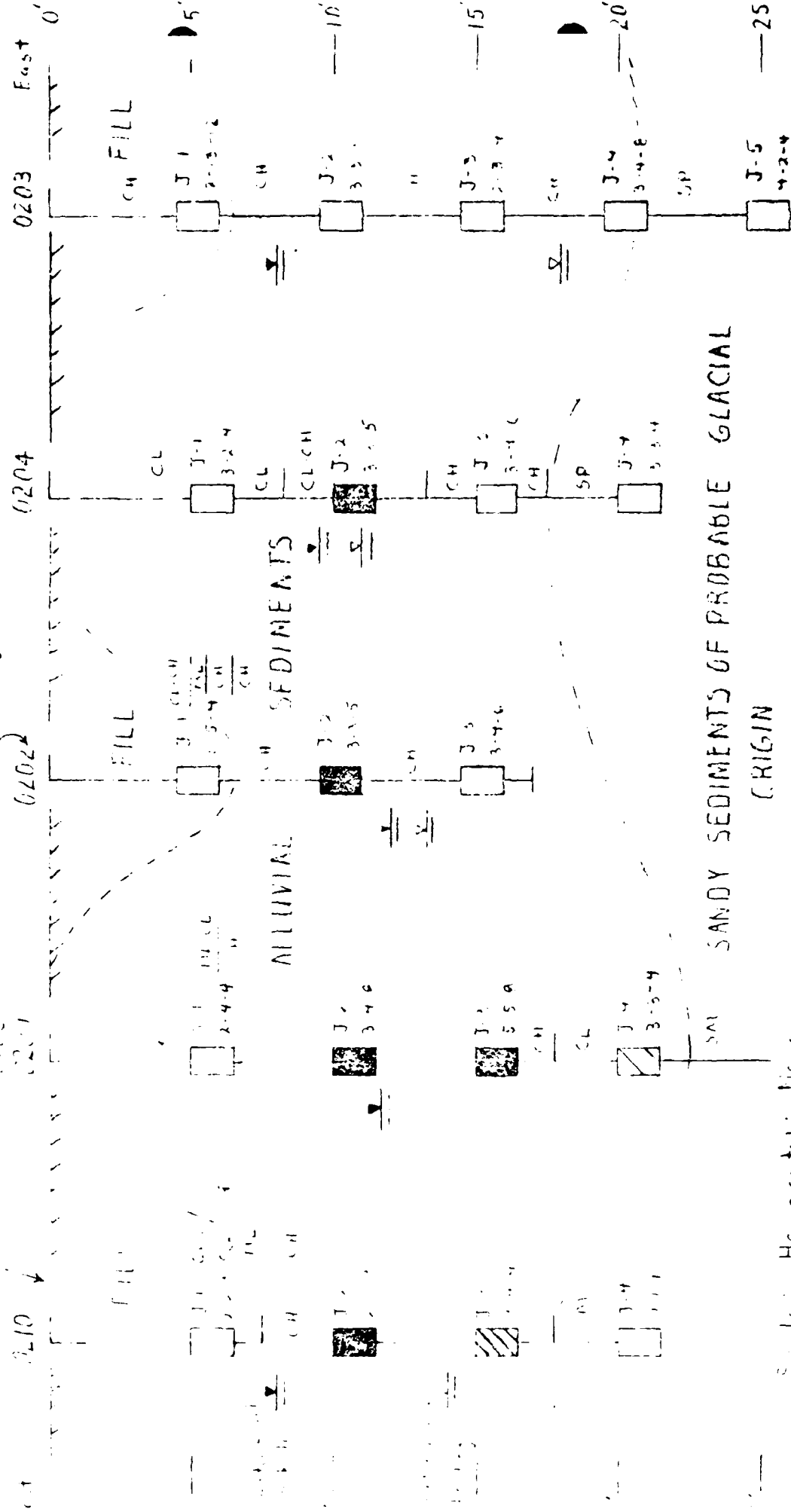
NEI 101 1144-82 January-February 1983

Sheet 2 of 3

FUEL STORAGE DEPOT NEBRASKA AIR NATIONAL GUARD LINCOLN, NEBRASKA

2777
(Henry King)

107



Horizontal: 11.5
Vertical: 10.5

PREPARED BY: NEBRASKA TESTING LABORATORIES

США, НЕБРАСКА

[illegible]

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA**PROJECT and LOCATION**ROBE BORINGS TO DETERMINE
EXTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BAS
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0101	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (d) January 31, 1982
LOCATION OF HOLE		DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 14.0 Feet
ELEV	6" Diameter	BIT TYPE Clay	SURFACE MATERIAL Concrete	DRILLER B. Willis
DATUM	TYPE AND SIZE OF SAMPLERS None		GWL DEPTH AND TIME OF READING None Encountered	INSPECTOR B. Willis

FIELD DATA**LABORATORY DATA**

DEPTH IN FT. or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH PSI	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5			Mottled Yellow Brown To Medium Gray	Moist	Silty Clay (CL-CH)	Stiff	Alluvial Soils Moderate to High Plasticity				
			Dark Gray	Moist	Silty Clay (CH)	Stiff	Organic Odor No Fuel Odor				
10			Light to Medium Gray Brown w/ Green tint	Moist	Silty Clay (CL-CH)	Stiff	Moderate to High Plasticity No Fuel Odor				
15			Light Gray Brown	Very Moist to saturated	Sandy Silt (SM)	Soft	Glacial Sediments Low Plasticity No Fuel Odor				
							Bottom of Hole at 14.0 Feet				

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKAPROJECT and LOCATION
ROBE BORINGS TO DETERMINE
EXTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO 444-82	BORING NO 0102	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (6) January 31, 1983
LOCATION OF HOLE		DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 14.0 Feet
ELEV		AUGER SIZE 6" Diameter	BIT TYPE Clay	SURFACE MATERIAL Grass
DATUM		TYPE AND SIZE OF SAMPLERS None	GWL DEPTH AND TIME OF READING None Encountered	DRILLER B. Willis
				HELPER R. Haynes
				INSPECTOR B. Willis

FIELD DATA**LABORATORY DATA**

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Dark Brown	Moist To Very Moist	Silty Clay (CL)		Alluvial Soils, Possibly Fill, Low to Moderate Plasticity				
5			Mottled Gray Brown	Moist	Silty Clay (CL-CH)	Stiff	Low to Moderate Fuel Odor from 2-4' Moderate to High Plasticity No Fuel Odor Beyond 4'				
10			Dark Brown Medium Gray		Fat Clay (CH)		Highly Plastic No Fuel Odor				
15			Gray Brown	Very Moist to Sat- urated	Sandy Silt (ML)	Soft	Glacial Sands - Very Fine Grained Sandy Silt, Low Plasticity No Fuel Odor				
							Bottom of Hole at 14.0 Feet				

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION

QBE BORINGS TO DETERMINE
EXTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0103	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (d) January 31, 1983
LOCATION OF HOLE		DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 14.5 Feet
ELEV.	AUGER SIZE 6" Diameter	BIT TYPE Clay	SURFACE MATERIAL Grass	DRILLER B. Willis
DATUM	TYPE AND SIZE OF SAMPLERS None		GWL DEPTH AND TIME OF READING None Encountered	INSPECTOR B. Willis

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Gray Brown	Moist	Silty Clay (CL-CH)	Stiff	Alluvial Soils Moderately Plastic				
5			Dark Gray	Very Moist	Clayey Silt (ML) Fat Clay (CH)	Medium Stiff to Stiff	Low Plasticity Highly Plastic Faint Fuel Odor From ≈ 7.5' to 11.5'				
10			Medium Gray								
15			Gray Brown	Very Moist	Sand to Clayey Silt (MD)	Soft	Glacial Sediments, Low plasticity, Fine Sand No Fuel Odor				
					Bottom of Hole at 14.5 Feet						

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKAPROJECT and LOCATION
HOLE BORINGS TO DETERMINE
CONTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO 444-82	BORING NO 0104	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (4) January 31, 1983
LOCATION OF HOLE	DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 24.0 Feet	
ELEV	AUGER SIZE 6" Diameter	BIT TYPE Clay	SURFACE MATERIAL Grass	DRILLER B. Willis
DATUM	TYPE AND SIZE OF SAMPLERS None	GWL DEPTH AND TIME OF READING GWL Not Obtained	INSPECTOR B. Willis	
FIELD DATA				LABORATORY DATA
DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE
(1)	(2)	(3)	(4)	(5)
			Dark Brown	Moist
				Silty Clay (CL-CH)
				Atterberg Plasticity
				Moderately Plastic
5			Dark Gray	Moist
				Fat Clay (CH)
				Atterberg Plasticity
				Highly Plastic
				Moderate to Strong
				Fuel
				Odor at 5' to $\approx$ 17'
10			Medium Gray With Brown Tint	
				Highly Plastic
15			Dark Gray Brown	
20			Medium Gray	
25			Gray Brown to Yellow Brown	Saturated
				Silty Sand
				Glacial Sands, Silty Fine to Medium Sand, Possibly Slight Fuel Odor
				Bottom of Hole at 24.0 Feet

NEBRASKA AIR NATIONAL GUARD

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORING

NEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION
ROBE BORINGS TO DETERMINE
EXTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO 0105	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (s) January 31, 1983
LOCATION OF HOLE		DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 29.0 Feet
ELEV		AUGER SIZE 6" Diameter	BIT TYPE Clay	SURFACE MATERIAL Grass
DATUM		TYPE AND SIZE OF SAMPLERS None	GWL DEPTH AND TIME OF READING GWL Not Obtained	DRILLER B. Willis
				HELPER R. Haynes
				INSPECTOR B. Willis

FIELD DATA

LABORATORY DATA

[illegible]

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKAPROJECT and LOCATION
ROBE BORINGS TO DETERMINE
EXTENT OF FUEL CONTAMINATION
IN AREA AROUND FUEL TANK NO. 1
NEBRASKA AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0106	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (s) February 1, 1983
LOCATION OF HOLE		DRILLING METHOD Continuous Flight Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 25.0 Feet
ELEV		AUGER SIZE 6" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass
DATUM		TYPE AND SIZE OF SAMPLERS None	GWL DEPTH AND TIME OF READING GWL Not Obtained	DRILLER B. Willis
				HELPER R. Haynes
				INSPECTOR B. Willis

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH PSI	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Mottled Gray And Brown	Moist	Silty Clay (CL)		Alluvial Sediments Moderately Plastic				
5			Dark Gray	Moist	Clayey Fat Clay (CH)		Low Plasticity Starting to Get Moderate to Strong Fuel Odor at $\approx$ 5' Highly Plastic				
10			Dark Gray Brown								
			Green Gray		Fat Clay (CH)		Highly Plastic Strong Fuel Odor				
15					Clayey Sand (CL)						
			Medium Gray	Very Moist To Satur- ated	Fat Clay (CH)		No to Weak Fuel Odor at $\approx$ 17', Brought Raw Fuel Up With Augers On Top of Water, Green Color				
20			Light Gray Brown	Satur- ated	Silty Clay Grading to Silty Sand (CL-ML)		Glacial Sediments No Detectable Fuel Odor Silty Sand, Fine to Medium Grained				
25											
							Bottom of Hole at 25.0 Feet				

Client:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORING

PROJECT and LOCATION

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

Owner:

NEBRASKA AIR NATIONAL GUARD

NEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

JOB NO. 444-82		BORING NO. 0201		DRILL RIG Acker AD II			AMOUNT OF CUT OR FILL		DATE (s) February 10, 1983		
LOCATION OF HOLE				DRILLING METHOD Hollow Stem Auger			TOPOGRAPHY AND DRAINAGE Flat - Fair		TOTAL DEPTH 21.0 Feet		
				AUGER SIZE 7" Diameter		BIT TYPE Finger	SURFACE MATERIAL Grass		DRILLER D. Kahler		HELPER R. Haynes
ELEV.				TYPE AND SIZE OF SAMPLERS 2" Split Spoon			GWL DEPTH AND TIME OF READING 11' 7" @ End of Drilling Inside Hollow Stem Augers		INSPECTOR B. Willis		
DATUM							7' 25" @ End of Drilling Inside Well				
FIELD DATA								LABORATORY DATA			
DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF.	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	8	Dark Gray Brown	Moist	Silty Clay (CL-CH)	Stiff	Alluvial Soils				
				Moist	Clayey Silt (ML)	Medium	Moderate to High Plasticity				
	J-2	7	Green Gray	Moist	Fat Clay (CH)	Stiff	Organic Odor				
				Moist	Silty Clay (CL)	Stiff	Low Plasticity				
10	J-3	12	Dark Gray Brown	Very Moist	Silty Clay (CL)	Stiff	Slight Fuel Odor				
					Saturated	Clay (CH)	Stiff	Low to Moderately Plastic			
15	J-4	6	Light Brown	Saturated	Silty Sand (SM)	Loose	Fuel Odor, Slick on Water, Water @ ≈ 13.5				
							Highly Plastic, Root Holes, No Fuel Odor In Soil				
20							Glacial Sands				
							Silty Fine Sand With Sandy Silt Zones, No Fuel Odor or Slick				
							Bottom of Hole at 21.0 Feet				

NEBRASKA AIR NATIONAL GUARD

NEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION
INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0202	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (d) February 10, 1983	
LOCATION OF HOLE		DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 17.0 Feet	
		AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D.Kahler
ELEV	TYPE AND SIZE OF SAMPLERS 2" Split Spoon		GWL DEPTH AND TIME OF READING 12.0' @ End of Drilling Inside Well	INSPECTOR B. Willis	
DATUM					

LABORATORY DATA

[illegible]

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0203	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (8) February 10, 1983
LOCATION OF HOLE	DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 26.0 Feet	
ELEV.	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D. Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWL DEPTH AND TIME OF READING 8.0' End of Drilling Inside Well	INSPECTOR B. Willis	HELPER R. Haynes

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	25	Dark Brown	Damp	Fat Clay (CH)	Very Stiff	Fill Highly Plastic No Fuel Odor				
10	J-2	3	Gray Brown	Moist	Fat Clay (CH)	Stiff	Alluvial Soils No Fuel Odor Becomes More Silty With Depth, Root Holes, Iron Stains				
15	J-3	7	Dark Gray Brown	Very Moist			No Fuel Odor Traces of Fine Sand Moderate to High Plasticity Root Holes Water @ $\approx$ 18' During Drilling				
20	J-4	12	Blue Gray				Highly Plastic, No Fuel Odor, Traces of Silt				
25	J-5	6	Yellow Brown	Satur- ated	Sand (SP)	Medium Dense	Fine to Medium Grained Sand Water @ $\approx$ 14' after Sampling @ 25', No Fuel Odor. Fine to Coarse Sand With Gravel, Some Silt				
							Bottom of Hole at 26.0 Feet				

Screen Length 6' - 8"

Screen Set @ 22.67'

Gravel Packed to $\approx$ 10'

Riser Pipe Stick-up 2'

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORING

NEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO 0204	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (d) February 10, 1983
LOCATION OF HOLE	DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 21.5 Feet	
ELEV.	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D. Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWL DEPTH AND TIME OF READING 9.5' End of Drilling Inside Well	INSPECTOR B. Willis	HELPER R. Haynes

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DE- DENSITY pcf	UNCONFINED COMPRESSIVE STRENGTH tsf	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	6	Dark Gray Brown	Moist	Silty Clay (CL)	Medium Stiff	Alluvial Soils				
							Moderately Plastic, Root Holes and Hairs, No Fuel Odor.				Screen Length - 6-8"
10	J-2	8	Medium Green Gray		Silty Clay (CL-CH)	Medium Stiff To Stiff	Moderate Fuel Odor Moderate to High Plasticity, Root Holes, Iron Stains				Screen Set @ $\approx 19.75'$
											Gravel Packed to 3'
15	J-3	10	Dark Green Gray	Very Moist	Fat Clay (CH)	Stiff	Highly Plastic, Root Holes, Traces of Very Fine Sand No Fuel Odor.				Riser Stick-up - 1.75'
20	J-4	7	Yellow Brown	Satur- ated	Sand (SP)	Loose	Water @ $\approx 11'$ After Sampling J-3, No Fuel Odor, Fine to Medium Grained Sand, Traces of Silt				
25							Bottom of Hole at 21.5 Feet				

Client:	NEBRASKA AIR NATIONAL GUARD	SUMMARY OF BORING	PROJECT and LOCATION	INSTALLATION OF GROUNDWATER MONITORING WELLS AT LINCOLN AIR NATIONAL GUARD BASE LINCOLN, NEBRASKA
Owner:	NEBRASKA AIR NATIONAL GUARD		NEBRASKA TESTING LABORATORIES OMAHA, NEBRASKA	

JOB NO. 444-82	BORING NO. 0205	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (a) February 11, 1983
LOCATION OF HOLE	DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 16.0 Feet	
ELEV	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D.Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWL DEPTH AND TIME OF READING 8.5' @ End Of Drilling Inside Well	INSPECTOR B. Willis	HELPER R.Haynes

FIELD DATA								LABORATORY DATA			
DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	7	Dark Gray Brown	Moist	Sandy Silty Clay (CL)	Medium Stiff To Stiff	Alluvial Soils Some Fine to Medium Grained Sand Moderate Plasticity, No Fuel Odor				Screen 6' - 8" Long Screen Set @ 14.9' Gravel Packed to 2.0' Riser Stick-up 1.5'
10	J-2	6	Medium Gray Brown	Moist To Very Moist	Fat Clay (CH)	Medium Stiff	No Fuel Odor. Highly Plastic, Iron Stains, Root Holes, Carbon				
15	J-3	3	Light Brown	Satur- ated	Silty Sand (SM)	Loose	Glacial Sands Apparently Silty Fine Sand				
20							Bottom of Hole at 16.0 Feet				
25											

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
AIR NATIONAL GUARD BASE
LINCOLN, NEBRASKA

JOB NO. 444-82		BORING NO. 0206		DRILL RIG Acker AD II		AMOUNT OF CUT OR FILL		DATE (d) February 11, 1983			
LOCATION OF HOLE				DRILLING METHOD Hollow Stem Auger		TOPOGRAPHY AND DRAINAGE Flat - Fair		TOTAL DEPTH 16.0 Feet			
ELEV		AUGER SIZE 7" Diameter		BIT TYPE Finger		SURFACE MATERIAL Grass		DRILLER D. Kahler			
DATUM		TYPE AND SIZE OF SAMPLERS 2" Split Spoon		GWL DEPTH AND TIME OF READING Water at 10' during Drilling, 7.3' at End of Drilling, Inside Well		INSPECTOR B. Willis		HELPER R. Haynes			
FIELD DATA								LABORATORY DATA			
DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	9	Dark Gray	Moist	Silty Clay (CL)	Stiff	Alluvial Soils				
							Moderately Plastic, Root Holes, No Fuel Odor. Highly Plastic				Well Screen 6' - 8" Long
			Dark Gray Brown	Very Moist	Fat Clay (CH)		No Fuel Odor. Root Holes, Iron Stains, Highly Plastic				Screen Set @ $\approx 14.9'$
10	J-2	8			Silty Clay (CL-CH)		Traces of Sand.				Gravel Packed to $\approx 1'$
			Light Brown	Saturated	Inter-bedded Silty Sand & Silt (ML-SM)	Loose	Galcial Sands. Inter-bedded Fine Grained Silty Sands And Sandy Silts				Riser Stick-up 1.5'
15	J-3	6									
20							Bottom of Hole at 16.0 Feet				

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

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OMAHA, NEBRASKAPROJECT and LOCATION
INSTALLATION OF GROUNDWATER
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JOB NO. 444-82	BORING NO. 0207	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (M) February 11, 1983
LOCATION OF HOLE	DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 16.0 Feet	
ELEV.	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D. Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWL DEPTH AND TIME OF READING 8.9' in Well @ End of Drilling	INSPECTOR B. Willis	HELPER R. Haynes

FIELD DATA**LABORATORY DATA**

DEPTH IN FT. or ELEV.	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF.	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF. DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	11	Dark Gray Brown	Moist	Silty Clay (CH)	Stiff	Alluvial Soils, No Fuel Odor. Highly Plastic, Root Holes, Iron Stains				
10	J-2	7	Medium Gray Brown				No Fuel Odor. Highly Plastic, Root Holes				
15	J-3	8	Dark Brown	Very Moist	Silty Clay (CI-CH)	Medium Stiff to Stiff	Moderately Plastic				
			Yellow Brown	Satur- ated	Sand (SP-SW)	Loose	Glacial Sands Traces of Silt And Gravel, Clean Fine to Coarse Sand				
20							Bottom of Hole at 16.0 Feet				

NEBRASKA AIR NATIONAL GUARD

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OMAHA, NEBRASKA

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
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JOB NO. 444-82	BORING NO. 0208	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (N) February 11, 1983
LOCATION OF HOLE		DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 16.5 Feet
		AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass
ELEV.			DRILLER D. Kahler	HELPER R. Haynes
DATUM		TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWL DEPTH AND TIME OF READING 8.1' in Well @ End of Drilling. Water @ 10'	INSPECTOR B. Willis

in Hollow Stem Auger

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5			Dark Brown	Very Moist	Clayey Silt (ML)	Medium Stiff	Alluvial Soils				
	J-1	9					Low Plasticity, No Fuel Odor.	Screen Length - 6' - 8'			
					Fat Clay (CH)	Stiff	High Plasticity, Root Holes	Screen Set @ $\approx 14.8'$			
			Medium Gray Brown With Green Tint	Moist To Very Moist			Weak Fuel Odor to $\approx 11.5'$ Where It Disappears. Highly Plastic, Iron Stains, Root Holes	Gravel Packed to 1'			
10	J-2	10					Glacial Sediments.	Riser Stick-up 1.9'			
15	J-3	4	Yellow Brown	Saturated	Silty Clay (CL)	Soft	No Fuel Odor. Low Plasticity, Traces of Sand				
20					Bottom of Hole at 16.5 Feet						

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
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INSTALLATION OF GROUNDWATER
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JOB NO. 444-82	BORING NO. 0209	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (6) February 11, 1983
LOCATION OF HOLE		DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 21.5 Feet
ELEV.	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass	DRILLER D. Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon		GWL DEPTH AND TIME OF READING 11.7' in Well @ End of Drilling	HELPER R. Haynes
			INSPECTOR B. Willis	

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	8	Black	Very Moist	Silty Clay With Clayey Silt (ML-CL)	Medium Stiff	Alluvial Soils				
				Moist	Fat Clay (CH)	Stiff	No Fuel Odor. Low Plasticity, Organic				Screen Length 6' - 8"
10	J-2	12	Green Gray				High Plasticity Root Hairs, Root Holes Water @ $\approx$ 9' During Drilling, High Plasticity, Root Holes, Iron Stains.				Screen Set @ $\approx$ 19.6'
15	J-3	13	Dark Gray				Strong Fuel Odor, Fuel Sheen on Sampler, High Plasticity Strong Fuel Odor				Gravel Packed to 1.0'
20	J-4	7	Medium Gray Brown	Saturated	Silty Clay (CL)	Soft to Medium Stiff	Low Plasticity, Very Faint Fuel Odor If Present.				Riser Stick-up - 3.0'
							Bottom of Hole at 21.5 Feet				

Client:

NEBRASKA AIR NATIONAL GUARD

Owner:

NEBRASKA AIR NATIONAL GUARD

SUMMARY OF BORINGNEBRASKA TESTING LABORATORIES
OMAHA, NEBRASKA

PROJECT and LOCATION

INSTALLATION OF GROUNDWATER
MONITORING WELLS AT LINCOLN
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LINCOLN, NEBRASKA

JOB NO. 444-82	BORING NO. 0210	DRILL RIG Acker AD II	AMOUNT OF CUT OR FILL	DATE (d) February 11, 1983
LOCATION OF HOLE		DRILLING METHOD Hollow Stem Auger	TOPOGRAPHY AND DRAINAGE Flat - Fair	TOTAL DEPTH 21.5 Feet
ELEV.	AUGER SIZE 7" Diameter	BIT TYPE Finger	SURFACE MATERIAL Grass and Gravel	DRILLER D. Kahler
DATUM	TYPE AND SIZE OF SAMPLERS 2" Split Spoon	GWI, DEPTH AND TIME OF READING 8.0' @ End of Drilling Inside Well		INSPECTOR B. Willis

FIELD DATA

LABORATORY DATA

DEPTH IN FT or ELEV	SAMPLE DATA	SPT BL/FT	COLOR	MOISTURE	TEXTURAL CLASSIF	CONSISTENCY or DENSITY	GEOLOGICAL DESCRIPTION and OTHER REMARKS	MOISTURE IN %	DRY DENSITY PCF	UNCONFINED COMPRESSIVE STRENGTH TSF	CLASSIF. DATA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
5	J-1	5	Mottled Gray Brown	Moist To Very Moist	Silty Clay With Seams Of Clayey Silt (CL-ML)	Medium Stiff	Fill Low Plasticity, Organic Odor, No Fuel Odor.				
10	J-2	6	Green Gray	Moist To Very Moist	Fat Clay (CH)	Medium Stiff	Alluvial Soils Moderate to High Plasticity, Moderate to Strong Fuel Odor, Root Holes, Iron Stains				
15	J-3	8	Dark Brown	Satur- ated		Stiff	Water During Drilling @ $\approx 14'$ Highly Plastic, Fuel Odor, Very Faint				
20	J-4	2	Light Gray Brown	Satur- ated	Silty Sand (SM)	Loose	Glacial Sand (?) Silty Fine Sand				
					Bottom of Hole at 21.5 Feet						



STATE OF NEBRASKA

ROBERT KERREY • GOVERNOR • GEORGE LUDWIG • ACTING DIRECTOR

March 29, 1983

Capt. Alan L. Malone
Assistant Base Civil Engineer
Nebraska Air National Guard
Lincoln, Nebraska 68524

Dear Capt. Malone:

As per your request I am forwarding copies of the reports for my February 22, March 2, March 3 and March 21, 1983 sampling investigations. Included in these reports are the analysis results and any conclusions I drew from them.

The following information was requested in my February 22, 1983 letter to Major King but has not been received. Therefore, I am again requesting that you forward the following to the Department:

1. A copy of your cleanup and disposal plans, for our review, prior to their initiation. This should include a detailed explanation of all activities the Air Guard will undertake to remove the fuel from the ground water and how they will monitor to be certain cleanup is being accomplished. Treatment and disposal methods should also be addressed in this plan; and,
2. All of the analytical results for both the soil and water samples the Air Guard has collected.

If you have any questions concerning this letter, please feel free to contact me.

Sincerely,

W. Clark Smith
Water & Waste Management Specialist
Surveillance & Analysis Section
Water & Waste Management Division

WCS/tsk
enclosures

copy to: Larry Cole, Lincoln Fire Prevention Bureau

MARCH 3, 1983
(listed in order of collection)

SAMPLE #	WELL #	DESCRIPTION	PETROLEUM HYDROCARBON	BOD, TOC, FECAL
ANG211	0211	New well, west end of facility approx. 40' east of street No odor.	*0.0	17.3, 50.5, 10B
ANG203	0203	Existing well, see map. No odor.	*0.0	
ANG204	0204	Existing well. Slight odor.	1.1	
ANG215	0215	New well south of tanks. Visible fuel layer.	**2,005,900.	160, 72.7, 10 K
ANG214	0214	New well ~~100' west of tanks~~ 100' west of tanks Fuel odor.	44.3	
ANG220	NA	QA sample rinse water.	0.0	
ANG106	0106	Existing well, Fuel layer.	3,380.600.	

- * - The presence of fuel was found, however, it was below the measurement capabilities of the instrument.
- ** - Sample contained JP4.
- K - Value known to be less than value given.
- B - Results based upon colony counts outside the acceptable range.
- + - BOD & TOC values in mg/l and Fecal values in colonies/100 ml.

CONCLUSIONS:

The sampling conducted on March 2, 1983 indicates the fuel has not reached Oak Creek. The film on the surface, which the fire people thought was oil, was probably decaying algae as originally suspected by me.

The sampling conducted on March 3, 1983, did not provide conclusive evidence that the sanitary sewer is leaking. The higher values for BOD and TOC in well #0215 could have been caused by the fuel contamination rather than sewage. This well had similar Fecal Coliform values as in the clean well (#0211) however, the fuel could have interfered with this test too.

March 18, 1983

Because of the possible interference by the fuel, I feel another sample should be collected from a well with similar fuel contamination. From our data, well #0106 has fuel concentrations similar to well #0215 and would be the most likely well to get background information from. This background sample will be collected on Monday, March 21, 1983.

/tsk

Memorandum

DATE: March 28, 1983
TO: Spill File
FROM: Clark Smith/IS
RE: Air Guard Fuel Leak

On March 21, 1983, I sampled four (4) additional wells for fuel contamination and one (1) well for background data of fuel contaminated ground water. The wells I sampled were #0205, 0206, 0207, 0213 and 0106. The first four wells listed were sampled for fuel contamination

The results of this analysis indicated there was no fuel contamination in the four wells. Well #0106 had similar values for BOD and TOC to those obtained from well #0215 on March 2, 1983. This indicates the seals in the sanitary sewer are still intact and not leaking. Further documentation of this is the fact the Air Guard has not found any explosive levels in the sewer during their monitoring.

/tsk

Summary of Water Quality
Analytical Results for
 Lincoln Municipal Airport ANG
 Lincoln, Nebraska

WELL No.	Petroleum Hydrocarbon Mg/L	B.O.D. Mg/L	C.O.D. Mg/L
106	73,900 3,380,600	----- -----	----- -----
201	70.8	-----	-----
202	466.5	-----	-----
204	1.1	-----	-----
210	50.9	-----	-----
211	--	17.3	50.5
214	44.3	-----	-----
215	2,005,900	160	72.7

Memorandum

DATE: February 23, 1983
TO: Spill File
FROM: Clark Smith *CSS*
RE: Air Guard Fuel Storage Tank Leak

On February 22, 1983, I sampled 5 wells at the ANG spill site. The wells I sampled were #1203, #0106, #0201, #0202 and #0210. Capt. Malone informed me these wells had not been sampled for several days. These wells were sampled using their bailer. This bailer was washed with soapy water then rinsed with xylene and then rinsed with distilled water between each sample.

Well #0106 and #0201 both had visible signs of contamination in them. I could not detect visually if the contamination in the other samples was from the fuel or the xylene used to rinse the bailer.

Because the xylene could influence the sample results, I requested the lab run an independent check on xylene. They are going to treat some glassware in the same manner the bailer was treated and run an oil and grease on it. If this causes contamination, the results will probably be biased on the high side.

The results for the above sampling are as follows:

<u>Well #</u>	<u>Oil as Petroleum mg/l</u>
1203	21.8
0106	73,900.0
0201	70.8
0202	466.5
0210	50.9

As far as our lab could determine the xylene didn't cause an increase in the concentrations. All samples were analyzed using the I.R. method.

From the analysis, Said thought the contamination was from a diesel fuel type petroleum product rather than gasoline. We agreed that during the next analysis we would collect a sample of JP4 jet fuel to compare to the product found in well #1203.

/tsk

Memorandum

DATE: March 18, 1983
TO: Spill File
FROM: Clark Smith *WCS*
RE: Air Guard Fuel Storage Tank Leak

On March 2, 1983, I went to the ANG base to collect well samples. When I arrived Larry Cole, Chief Chapp, Frank Costa and LaVern Reinhart were on-scene. They reported to me the fuel had reached the Creek in two locations. From my initial inspection of those areas I felt the film on the water was from decaying algae and reported this to them. Since they were concerned this may be fuel I decided to collect three samples.

While I was collecting the above samples Larry Cole went to inform Major King of our activities. When he returned he informed me the wells had been sampled that morning. Because of their recent sampling I decided to postpone my sampling until the next day.

Before I left Major King arrived on-scene. He explained their consultant would be in the next day. The consultant was going to review all of the data obtained so far and write up a clean-up plan. The Air Guard will be responsible for hiring a contractor to implement the clean-up plan. The consultant will monitor the progress of the clean-up and make any alterations needed. He also informed me we could sample anytime we want to without checking in but they wanted a summary of all the sampling we do.

On March 3, 1983, I returned to the Air Guard to sample. At this time, I collected 7 well samples and one J4 sample. The well locations and concentrations are listed out later in this report. Because it is suspected that the sanitary sewer is leaking I also sampled for BOD, TOC and Fecal Coliform at two wells. These results are also listed later in this report.

To collect these samples I used a brass Kemmerer water sampler. To prevent cross contamination the sampler was scrubbed with soap and water between each station. The sampler was then rinsed several times with clean water. To assure this cleaning was adequate, I half filled the sampler with clean water, vigorously shook the sampler and placed the water in a clean glass jar for analysis. This QA work was done between sampling well #0214 and well #0106.

The March 2 & 3, 1983 sampling is summarized below. A description of each sample is included.

MARCH 2, 1983

SAMPLE NO.	WELL NO.	DESCRIPTION	PETROLEUM
ANG001	NA	Oak Creek, South of Well #0202	0
ANG002	NA	Oak Creek, Approx. 5 feet downstream of sample #ANG001	0
ANG003	NA	Oak Creek, south of well #0203	0