INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

Nevada Air National Guard
152nd Tactical Reconnaissance Group (TRG)
Reno Cannon International Airport
Reno, Nevada

HAZWRAP SUPPORT CONTRACTOR OFFICE
Oak Ridge, Tennessee 37831
Operated by MARTIN MARIETTA ENERGY SYSTEMS, INC.
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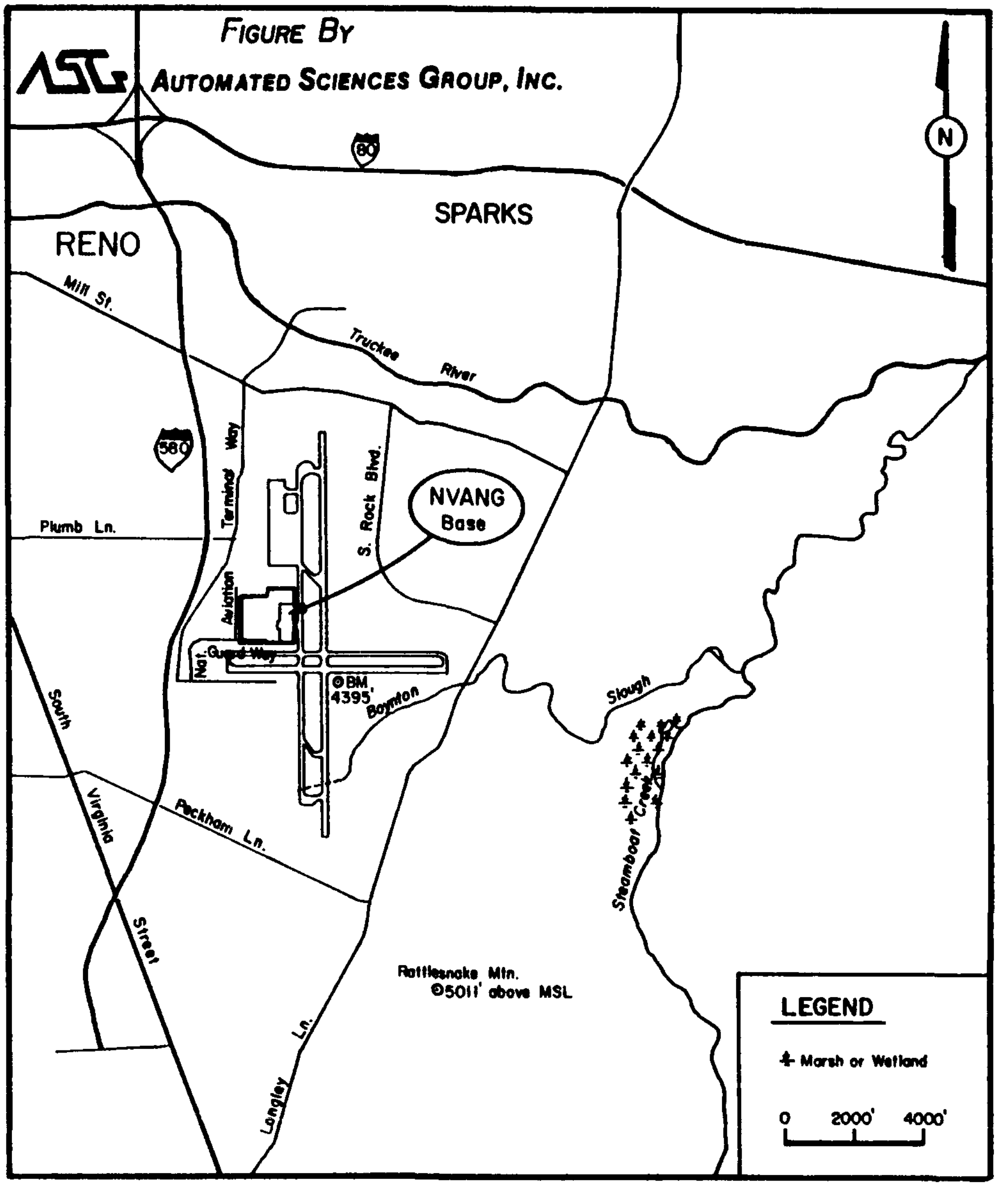

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Preliminary Assessment for suspected hazardous waste sites at the Reno Cannon International Airport on property leased by the Nevada Air National Guard. The Study was conducted under the Air National Guard Bureau's Installation Restoration Program.

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FOR THE

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152ND TACTICAL RECONNAISSANCE GROUP (TRG)
RENO CANNON INTERNATIONAL AIRPORT
RENO, NEVADA

JANUARY 1989

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WASHINGTON, D.C. 20310

PREPARED BY:
HAZWRAP SUPPORT CONTRACTOR OFFICE
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EXECUTIVE SUMMARY

A. INTRODUCTION

The Automated Sciences Group, Inc. (ASG) was retained by the HAZWRAP Support Contractor (SCO) in May 1988 to conduct the Preliminary Assessment (PA) phase of the Installation Restoration Program (IRP) of the 152nd Tactical Reconnaissance Group (TRG), Nevada Air National Guard (NVANG), located at the Reno Cannon International Airport, Reno, Nevada (hereinafter referred to as the Base), under contract No. DE-AC05-87OR21642. The PA included the following:

- o An on-site visit that included interviews with 19 past and present Base employees conducted by ASG personnel during 6-10 June 1988.
- o The acquisition and analysis of pertinent information and records on industrial chemical usage and past 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.
- o The identification and assessment of sites on the Base that may have been contaminated with hazardous materials/hazardous wastes (HM/HW).

B. MAJOR FINDINGS

The major operations of the Base that have used and disposed of hazardous materials/hazardous wastes include aircraft maintenance; aerospace ground equipment (AGE) maintenance; ground vehicle maintenance; petroleum, oil, and lubricant (POL) management and distribution; and air weapons control. The operations involve such activities as corrosion control, nondestructive inspection (NDI), fuel cell maintenance, engine maintenance, hydraulics, structural repair, and wheel and tire maintenance. Waste oils, recovered fuels, paint wastes, spent cleaners, acids, strippers, and solvents are generated and disposed of by these activities.

Interviews with 19 past and present Base personnel, analysis of pertinent information and records, and a field survey resulted in the identification of 7 potentially contaminated disposal and/or spill sites at the Base. These sites are potentially contaminated with hazardous materials/hazardous wastes resulting from Air National Guard (ANG) operations. A Hazard Assessment Score (HAS) utilizing the U.S. Air Force Hazard Assessment Rating Methodology (HARM) was assigned to all of the potential sites for contamination. These sites are identified on Site Location Maps on pp IV-7, IV-9, and IV-11 as follows:

- o Site No. 1 - Fire Training Area No. 1
- o Site No. 2 - Fire Training Area No. 2
- o Site No. 3 - Fire Training Area No. 3
- o Site No. 4 - Fire Training Area No. 4
- o Site No. 5 - Fire Training Area No. 5
- o Site No. 6 - Fire Training Area No. 6
- o Site No. 7 - POL Storage Area

C. CONCLUSIONS

Sites 1 through 7 were identified as potentially contaminated with hazardous materials/hazardous wastes and are considered to have the potential for contaminant migration.

Site No. 1 - Fire Training Area No. 1 (HAS-62)

This off-base Site, 600 feet east of Runway 34L and 400 feet north of the Old Engine Run-Up Pad, was a flat, earthen area. The NVANG was the sole operator of this Site from 1952 to 1956 and from 1960 to 1965. Between 1956 and 1960, Fire Training Area No. 2 was used for training exercises. This area was always under the jurisdictional control of the Airport Authority. Training was done on a quarterly basis with three to four burns per exercise.

Site No. 2 - Fire Training Area No. 2 (HAS-62)

This on-base Site, east of Building 1 and under parking area A2 of the present Aircraft Parking Apron, was a flat, earthen, unlined area used by the Base from 1956 to 1960. This area was used in conjunction with Fire Training Area No. 1. The Base was the sole operator of this Site. Training was done on an "as needed" basis with an estimated ten burns per year.

Site No. 3 - Fire Training Area No. 3 (HAS-65)

This off-base Site, 200 feet northwest of the North Gate of the Base and under the present Airport Authority Parking Lot, was used by the Base from 1964 to 1971 when this area was within the Base's leased boundaries. This area was transferred to the Washoe County Airport Authority in 1985. The Base was the sole operator of this flat, earthen, unlined area. Training was generally done on a quarterly basis with three to four burns per exercise. Several aircraft were used in fire fighter training near this area.

Site No. 4 - Fire Training Area No. 4 (HAS-53)

This on-base Site, south of Building 88 and under the present Training Field, was used by the Base for fire training from 1970 to 1973. This flat, earthen, unlined area was used by the Base which was the sole operator of the Site. An estimated one to two burns were conducted yearly at this Site. This FTA was used in conjunction with FTA No. 5.

Site No. 5 - Fire Training Area No. 5 (HAS-59)

This on-base Site, located between the northwest corner of Building 76 and the southeast corner of the Airport Authority Parking Lot, was used by the Base from 1970 to 1977 in conjunction with FTA No. 4. The Base was the sole operator of this Site. Training was conducted on an "as needed" basis with an estimated eight to ten burns per year in this flat, earthen, unlined area. A mock-up model of an aircraft was used as a training aid at this Site.

Site No. 6 - Fire Training Area No. 6 (HAS-74)

This earthen, unlined, off-base Site, located in the southeast quadrant of the Reno Cannon International Airport, was utilized by the Base from 1975 until September 1985. This fire training area was approximately 75 feet in diameter. The Base was the sole operator of this Site from 1975 until 1980. From 1980 until September 1985, joint fire-training exercises were conducted with the Airport Authority which had always had jurisdictional control of this area. The Base supplied all of the necessary flammables for the exercises. Fire-training exercises for the Base and the Airport Authority are now conducted at the University of Nevada's approved Fire Protection Academy, Stead Airport, Reno, Nevada. Training was generally done on a quarterly basis with two days of training per quarter from 1975 to 1984. From 1984 to September 1985, training was done on a semi-annual basis with four training days per year.

Site No. 7 - POL Storage Facility (HAS-64)

Aviation fuel for the Base is supplied by four 25,000-gallon underground storage tanks. These tanks have been in the ground for over 30 years. The interior of the tanks are inspected on a periodic basis, but they are not hydraulically static tested. The area around the POL area has been frequently exposed to numerous fuel spills. These spills were usually flushed into the soil/graveled areas surrounding the fuel stand area.

D. RECOMMENDATIONS

Sites No. 1 through 7 are recommended for further investigation in the IRP Program.

I. INTRODUCTION

A. BACKGROUND

The 152nd Tactical Reconnaissance Group (TRG), Nevada Air National Guard (ANG), is located at the Reno Cannon International Airport, East half, Section 19, Township 19N, Range 20E, Washoe County, Nevada. The airport is a county-owned facility located within the city limits of Reno, Nevada, and has been used by the Base since 1948. Over the years the types of military aircraft based and serviced there has varied and included both piston and turbine powered aircraft. Past operations involved the use and disposal of hazardous materials/hazardous wastes. Because of the disposal of the resultant wastes, the National Guard Bureau (NGB) has implemented its Installation Restoration Program (IRP).

The Department of Defense (DoD) Installation Restoration Program (IRP) is a comprehensive program designed to:

- identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on DoD installations, and

- control hazards to human health, welfare, and the environment that may have resulted from these past practices.

The operational activities of the IRP are currently defined and described as follows:

Preliminary Assessment (PA) - A Records Search is conducted that is designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, welfare, or the environment.

Site Inspection/Remedial Investigation/Feasibility Study (SI/RI/FS) - The SI consists of field activities designed to confirm the presence or absence of contamination at the sites identified as a result of the PA. The RI consists of field activities designed to quantify the types and extent of contamination present, including migration pathways.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests are required that may necessitate the installation of monitoring wells or the collection and analyses of water, soil, and/or sediment samples. Careful documentation and quality control procedures, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendment and Reauthorization Act (CERCLA/SARA) guidelines, ensure the validity of the data. Hydrogeologic studies are conducted to determine the underlying strata, ground-water flow rates, and direction of contamination migration. The findings from these studies result in the selection of one or more of the following options:

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

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

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

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

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

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

B. PURPOSE

The purpose of this PA phase of the Installation Restoration Program (IRP) is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on the Base. The potential for the migration of contaminants is evaluated by visiting the Base, reviewing existing environmental information, analyzing Base records concerning the use and generation of potentially hazardous materials and/or wastes, and conducting interviews with past and present Base personnel who are familiar with past material management activities. Relevant information collected and analyzed as a part of the Records Search included the history of the Base, with special emphasis on the history of the shop operations and their past materials and/or waste management procedures; the local geologic, hydrologic, and meteorologic conditions that may affect migration of contaminants; local land use, public utilities, and zoning requirements that affect the potential for exposure to contaminants; and the ecological settings (e.g., environmentally sensitive habitats or evidence of environmental stress).

C. SCOPE

The scope of this PA is limited to the identification of potential hazardous materials/hazardous wastes disposal and/or spill sites on the Base or on property for which the Air National Guard was the sole user, and includes:

- o an on-site visit;
- o the acquisition of pertinent information and records on past materials use and waste 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, state of Nevada, and local agencies;

- a review and analysis of all information obtained;
- the identification of possible contaminant sources, migration pathways, and receptors of said contaminants; and
- the preparation of a report.

The on-site visit and interviews with past and present Nevada ANG personnel were conducted during the period 6-10 June 1988. The ASG effort was conducted by the following individuals:

- Mr. David R. Styers, Chemist/Civil Engineer/Health Physicist;
- Mr. William Condra, Environmental Engineer; and
- Mr. T. Ward Dilworth, Geologist/Civil Engineer.

Resumes are included as Appendix A.

Individuals who assisted in the PA include:

- Mr. Basit Ghori, Project Officer, ANGSC/DER;
- SMSgt James L. Craig, ANGSC/SG;
- MAJ Everett Foster, NGB-PA;
- CPT William Strandell, Base Civil Engineer, NVANG;
- 2LT Craig L. Wesner, Assistant Base Civil Engineer, NVANG;
- MSgt Michael G. Halan, 152 TAC Clinic/SGPB, NVANG; and
- Other selected members of the NVANG.

The Point of Contact at the Base was 2LT Craig L. Wesner, Assistant Base Civil Engineer.

D. METHODOLOGY

A flow chart of the IRP Preliminary Assessment methodology is presented in Figure 1. This PA methodology, to the greatest extent possible, ensures a comprehensive collection and review of pertinent site-specific information

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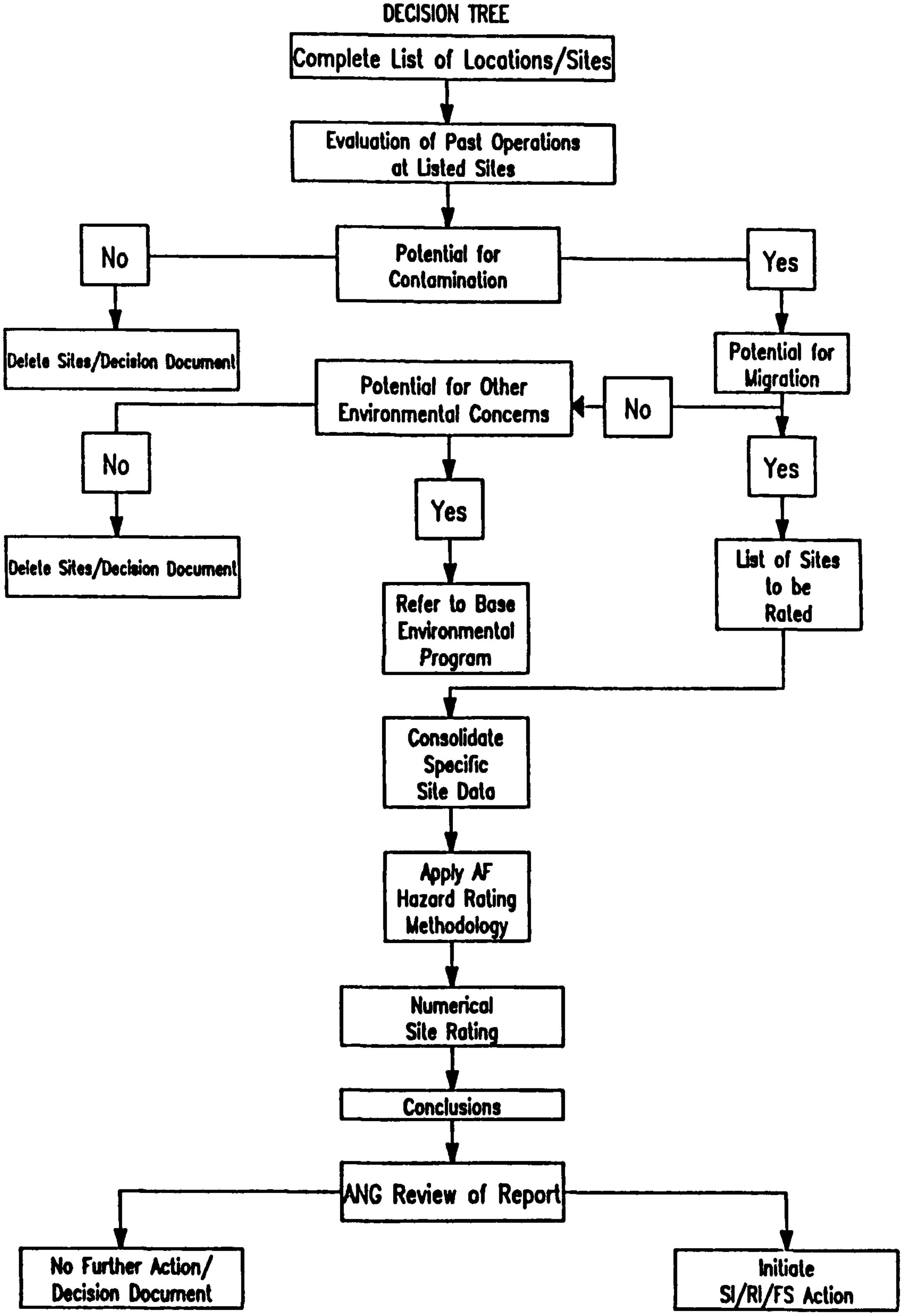
Figure 1
Methodology Flow Chart



and is utilized in the identification and assessment of potential waste spill/disposal sites.

The PA began with a site visit to the Base to identify all shop operations or activities on the Base that may have used potentially hazardous materials or generated potentially hazardous wastes. Next, an evaluation of past and present material and/or waste handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of these past practices was facilitated by extensive interviews with 19 past and present ANG personnel familiar with the various operating procedures at the Base. These interviews were also utilized to define the areas on the Base where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released to the environment.

Historical records contained in the Base files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined, a list of past waste spill/disposal sites on the Base was compiled for further 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 geologic, hydrologic, meteorologic, developmental (land use and zoning), and environmental data for the area of study were also obtained from appropriate federal, state, and local agencies identified in Appendix B. This information was gathered for use in the determination of possible receptors and migration pathways. Following a detailed analysis of all the information obtained, seven sites were identified as potentially contaminated with hazardous materials/hazardous wastes resulting from Base operations. The potential for contaminant migration exists at all sites. Where sufficient information was available, sites were numerically scored by using the Air Force Hazard Assessment Rating Methodology (HARM). A description of HARM is presented in Appendix C. Copies of completed Hazardous Assessment Rating Forms are found in Appendix D. Appendix E is a list of storage tanks located within the NVANG leased boundaries. Appendix F is a list of soil boring data pertinent to the NVANG at the Reno Cannon International Airport.

II. INSTALLATION DESCRIPTION

A. LOCATION

The 152nd Tactical Reconnaissance Group (TRG) is located at the Reno Cannon International Airport, approximately 5 miles southeast of downtown Reno, Nevada (See Figure 2 for the site location and Figure 3 for the immediate area). The Base occupies approximately 60 acres in the southern portion of the northwest quadrant of the airport complex and employs 1136 military personnel which includes 287 full-time employees. Figure 4 displays the Air National Guard property at the Reno Cannon International Airport.

B. ORGANIZATION AND HISTORY

On 12 April 1948, the Nevada Air National Guard was initially established as the 192nd Fighter Squadron. This designation was changed to the 192nd Fighter Bomber Squadron on 9 April 1951. In June 1955, the unit was redesignated as the 192nd Fighter Interceptor Squadron and maintained this designation until 19 April 1958 when the unit was renamed as the 152nd Fighter Group. In February 1961, the 152nd Fighter Group was redesignated as the 152nd Tactical Reconnaissance Group which is its present designation.

When the Nevada ANG was initially established, it was equipped with P-51 aircraft and was located at the Stead Army Air Base, Reno, Nevada. In 1953 the Nevada ANG leased 29 acres of land at Hubbard Field (Reno Cannon International Airport) from the city of Reno, Nevada. Base operations were moved from Stead to its present location in 1954. F-86A aircraft were assigned to the 192nd in 1956 and flown until 1961 when the squadron converted to the RB-57. In 1965 the Base converted from RB-57 to RF-101 aircraft that were flown until 1975 when the Nevada ANG converted to RF-4Cs which are presently being operated at the Base.

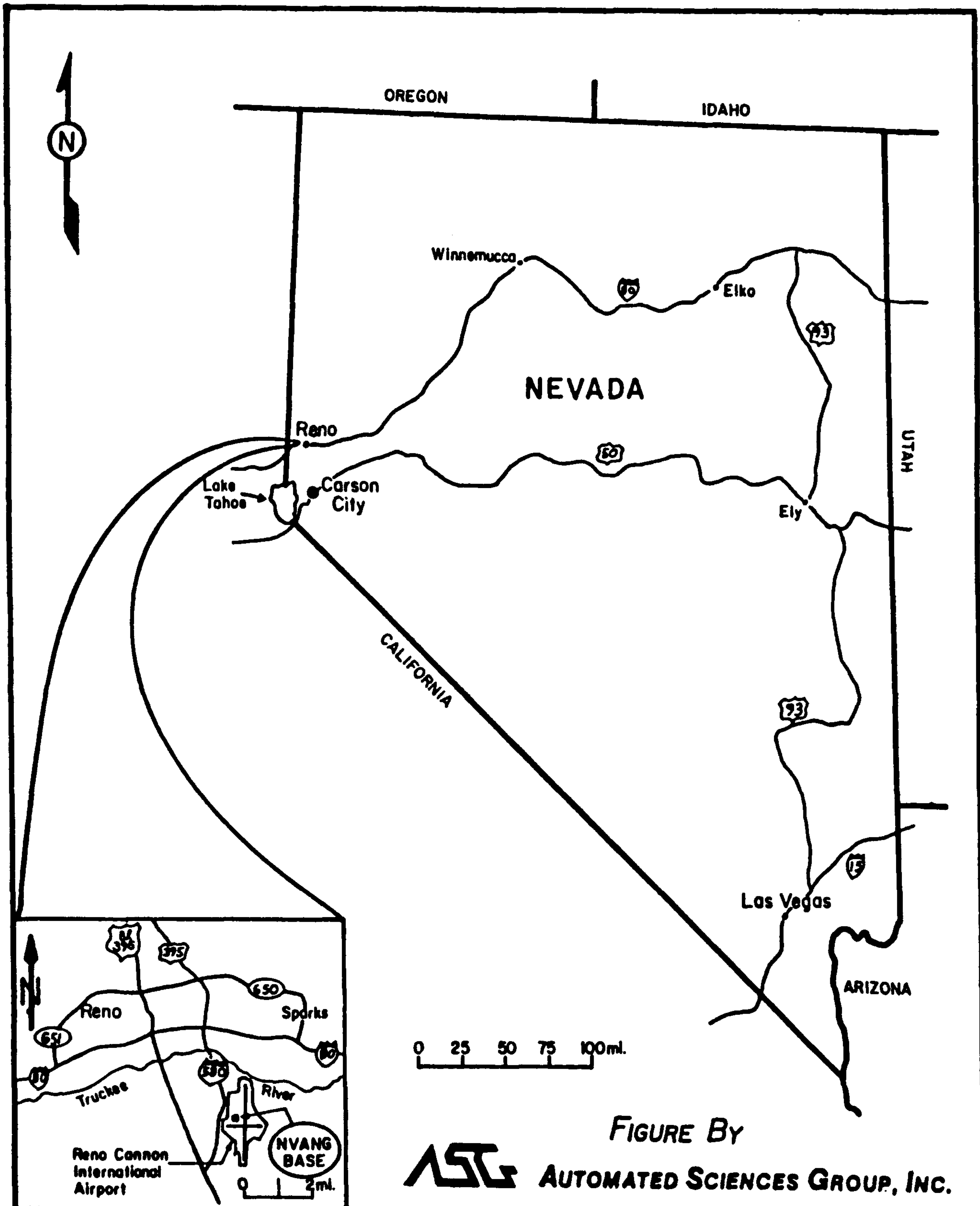


Figure 2. Site Location Map of Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada (1988).

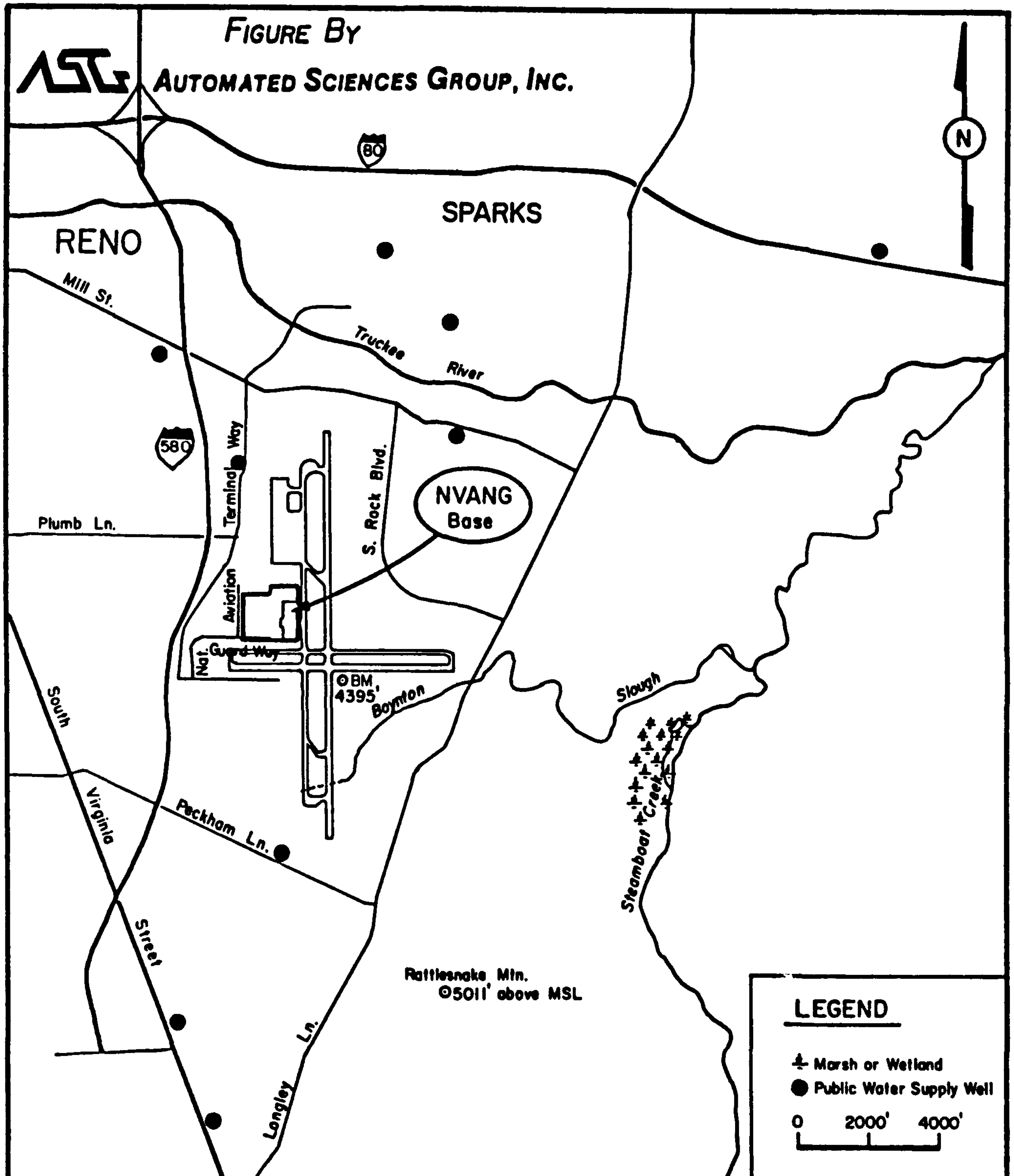


Figure 3. NVANG Base, 152nd TRG, and Immediate Surrounding Area, Reno Cannon International Airport, Reno, Nevada(1988).

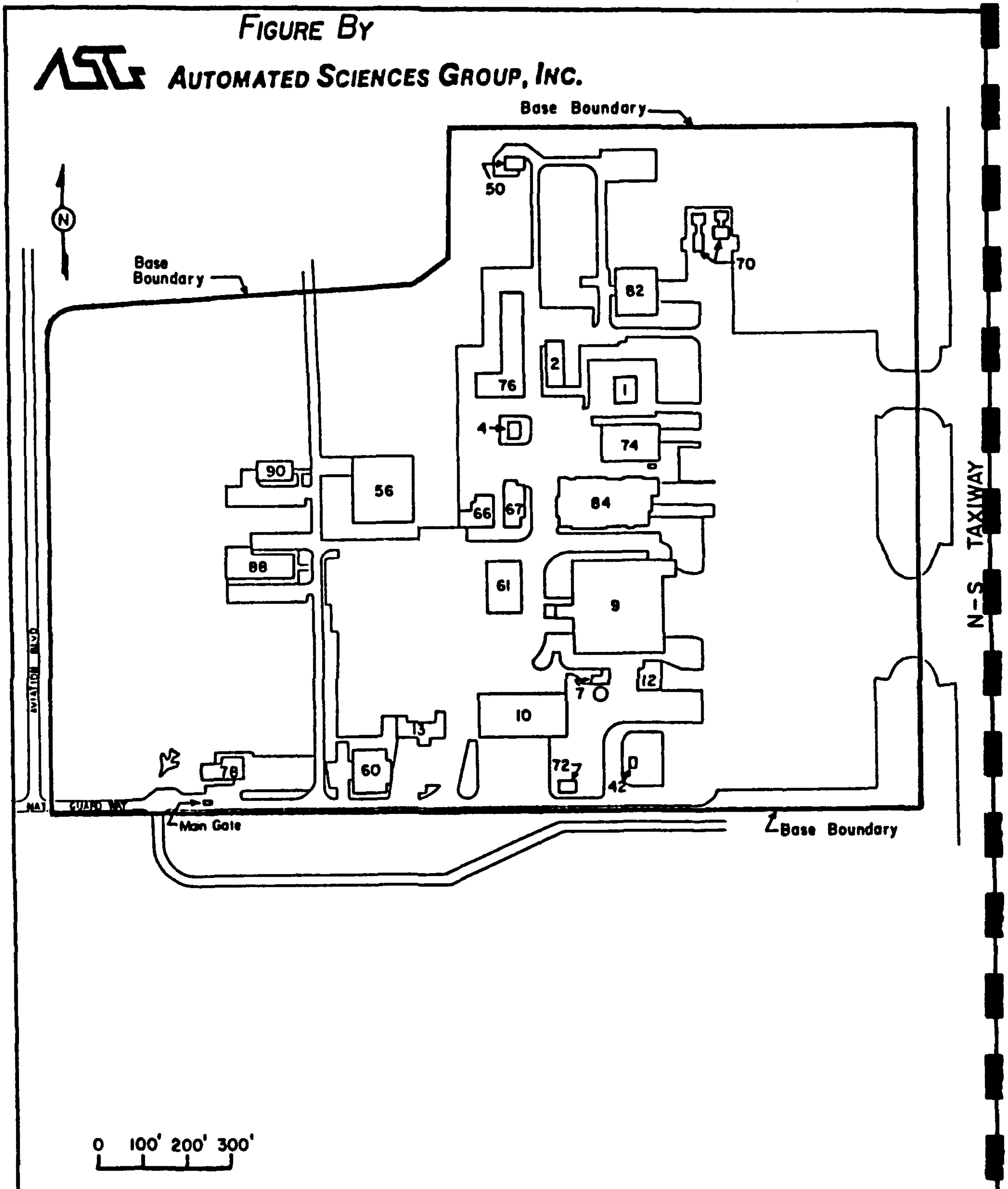


Figure 4. Base Boundary Map for the 152nd TRG, Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada (1988).

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

The annual mean temperature for Reno, Nevada is recorded as 49.9°F with the maximum monthly average of 91.3°F occurring in July and the minimum monthly average low of 18.9°F occurring in December. The average daily temperature change is 35°F with a maximum daily temperature change of 43.5°F occurring in July and August.

Annual precipitation amounts vary greatly in the area around Reno. For example, the annual precipitation for Glenbrook, located 35 miles south southwest of Reno on the eastern shore of Lake Tahoe, is 18.1 inches; for Reno, it is recorded as 7.49 inches at the Reno Cannon International Airport; and for Carson City, located 10 miles east of Glenbrook and 30 miles south of Reno, it is 10.79 inches. Both Reno and Carson City are located in a valley east of the Carson Range which borders the eastern edge of Lake Tahoe. The mountains of the Carson Range mark the eastern boundary of the Sierra Nevada Range. The abrupt decline of the precipitation gradient from Lake Tahoe to the valley is most likely related to both the topographic gradient between the lake and the valley as well as to any lake effect precipitation.

As mentioned above, the average annual precipitation for Reno, Nevada is 7.49 inches. The recording station, the National Oceanic and Atmospheric Administration (NOAA) station No. 26-6779, is located near the Base on airport property. According to the Water Atlas of the United States (1973), Plate 12, the average annual evaporation from open water surfaces is 43 inches. Using the method outlined in the Federal Register (47 FR 31224, 16 July 1982), the annual net precipitation for the Base is -35.51 inches. Rainfall intensity based on the 1-year, 24-hour rainfall (47 FR 31235, 16 July 1982, Figure 8) is 1.5 inches.

B. GEOLOGY*

1. General Geology of Truckee Meadows

The Nevada Air National Guard Base is located at the Reno Cannon International Airport in Reno, Nevada. Truckee Meadows is the name given to the north trending basin located in northwestern Nevada in which Reno and the adjoining city of Sparks are situated. This basin is bounded on the east by the Virginia Range and on the west by the Carson Range which is a spur of the eastern edge of the Sierra Nevada. Truckee Meadows is located in the physiographic province known as the Intermontane Division, more specifically in the Basin and Range area just east of the Sierra Nevada Range. These ranges are fault block mountains of igneous origin and are both bordered by normal faults with the Truckee Meadows being a graben or structural depression between them.

These two ranges are composed primarily of granitic rocks that have intruded a diverse assemblage of metavolcanic and metasedimentary rocks. These rocks were then covered to a large extent, particularly in the Virginia Range, by thick sequences of Tertiary volcanic-flow rock. The foothill belts of these ranges are made up of complexly faulted, steeply dipping stream and lacustrine (lake) deposits which include diatomite, shale, siltstone, conglomerate, and tuff breccia. Overlying these deposits in places is a heterogeneous mix of floodplain and pediment gravel with intercalated clay lenses. The composition of the underlying tertiary volcanic-flow rock ranges from basalt to rhyolite; however, andesitic flows are predominant. Some large areas of hydrothermally-altered volcanic rocks occur on the slopes surrounding Truckee Meadows.

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* The majority of the remainder of Section III was derived from The Nevada Bureau of Mines and Geology Report 25. Other references will be noted where they were used.

Valley fill-deposits range in age from Miocene to Quaternary. The oldest deposits consist of unconsolidated to consolidated beds of diatomite, sandstone, and conglomerate of Miocene to late Pliocene age that outcrop along the margins of the basin primarily along the western border and upstream along the Truckee River. There are three major types of Quaternary deposits:

1) gravel deposits of the Truckee River,
2) alluvial fan deposits around the margins of the Truckee Meadows, and
3) reworked older deposits and relatively fine-grained clastic material deposited throughout the central part of Truckee Meadows.

The lithologies of these deposits range from clays and silts to very coarse gravels. Channel shifts of the Truckee River are generally responsible for the more permeable gravel deposits. The presence of these gravels along the general course of the Truckee River explains the trend in the Meadows that permeability tends to decrease as one moves away from the present river course. Table 1 illustrates the stratigraphic relationships of the major geologic deposits in the area.

Some areas of geothermal occurrence can be found in Truckee Meadows. Two major concentrations of such activity can be found in the Steamboat Springs and Moana areas and are probably due to a postulated-cooling intrusive body at depth that may be connected to ground-water resources through fault systems at these sites. The presence of geothermal activity has a profound effect on water chemistry through hydrothermal alteration of volcanic rocks around and under Truckee Meadows.

2. Geology Specific to the NVANG Base at Reno Cannon International Airport, Reno, Nevada

The average Base elevation is 4400 feet above mean sea level (MSL). Although topographic relief is substantial in the surrounding mountain ranges, the area of Truckee Meadows around the Base is mostly flat but gently sloping towards the west.

Table 1

Stratigraphic Relationships, Lithologic and Hydrologic Descriptions of Major Geologic Deposits and Rock Units In and Around Reno, Nevada

AGE	DEPOSIT/FORMATION	LITHOLOGIC AND HYDROLOGIC DESCRIPTIONS
QUATERNARY	Floodplain & Lake Deposits (Qfl); Alluvial Bajada Deposits (Qa)	Qfl--Thin sheet (up to 23 ft thick) of medium-to thin-bedded clayey silt and sand. Contains discontinuous layers of silt and peat. Low water well yield. Forms an upper aquitard. Qa--Poorly sorted thin sheet-like aprons of clayey to silty gravelly sand, poorly bedded to unbedded. Hydrologically similar to Qfl.
	Tahoe Outwash (Qto)	Glacial outwash stream deposits of volcanic and granitic composition. Boulder to cobble gravel, sandy gravel, and gravelly sand. High well yield relative to other area deposits.
	Donner Lake Outwash (Qdo)	Deposits similar to Qto except weathered to depths of 4 feet or more. High well yield relative to other area deposits.
TERTIARY	Sandstone of Hunter Creek (Th)	Pale brown to gray brown and greenish brown predominantly bedded interlayered siltstone, silty sandstone, and sandy conglomerate. Some areas are white to yellowish white diatomite and diatomaceous sandstone. Low well yield.
	Kate Peak Formation (Tk)	Gray, porphyritic, hornblende-biotite andesite flow containing phenocrysts of plagioclase, biotite, and hornblende. Sometimes occurs as an intrusive rock. Virtually no intergranular permeability. Yields moderate amounts of water from wells that intersect fracture zones.
	Alta Formation (Ta)	Dark brown pyroxene andesite flows, flow breccia, and laharic breccia. Commonly altered to tan rock composed of quartz, sericite, and clay minerals. Hydrothermally altered to gray green rock containing chlorite, calcite, albite, epidote, and clay minerals. Virtually no intergranular permeability. Fractured zones may yield small amounts of water.

Sources: Cohen & Loeltz (1964), Bonham and Bingler (1973), and Bonham and Rogers (1983). The abbreviations of the deposits and rock units are shown in parenthesis after the name of each unit. These abbreviations follow the labeling convention used by Bonham & Bingler (1973) and Bonham and Rogers (1983).

The geologic maps of the Reno and Mt. Rose NE quadrangles show that the Base lies on a Quaternary deposit termed "floodplain and lake deposits". The general description for this deposit is as follows:

> "Interbedded gray to pale grayish-yellow silt and fine sand; contains thin lenses of peat; fluvial and lacustrine deposits up to 7m (23 ft.) thick. Little or no soil development (entisols)"[1].

The southern portion of the airfield is underlain by deposits known as "Alluvial Bajada deposits" which are described as:

> "Thin sheet-like aprons of fine- to medium-grained clayey sand and intercalated muddy, medium pebble gravel; deposits of low gradient streams that reworked older gravelly outwash and alluvial fan deposits; weakly weathered and largely undissected. Little or no soil development (entisols)".[2]

Table 2 represents a well log that is a composite of two well logs of wells upgradient (assumed) from the Base. The locations for these wells are shown on Figure 5.

C. SOILS

The soils of the Base are represented by two general soil types. Figure 5, Soils Map for the NVANG Base, illustrates the locations of these soil types. The following soil descriptions were derived from Soil Survey of Washoe County, Nevada, South Part (August 1983) and reflect the general characteristics of the soil types found on the Base. All of these characteristics may not apply to the Base itself:

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[1] H.F. Bonham, Jr. and D.K. Rogers, (geologic map) Mt. Rose NE Quadrangle: Nevada Bureau of Mines and Geology, Environmental Series, Map 4Bg, Reno Folio, (1983).

[2] Ibid.

Table 2. Generalized Well Log[a] Showing Typical Stratigraphy Underneath NVANG Base

Lithology	Thickness (ft)	Depth from surface to bottom of layer (ft)
Sandy Clay	18	18
Sand[b]	8	26
Clay	8	34
Sand[b]	9	43
Clay	16	59
Sand and Gravel[c]	8	67

[a] This table is a composite of two well logs for wells located within 3000 feet south of the NVANG Base. These well logs were obtained from the state of Nevada's Division of Water Resources in Carson City, Nevada.

[b] Water-bearing formation.

[c] Chief water-bearing formation encountered.

First water was encountered at a depth of about 8 feet from the surface in June and August of 1962.

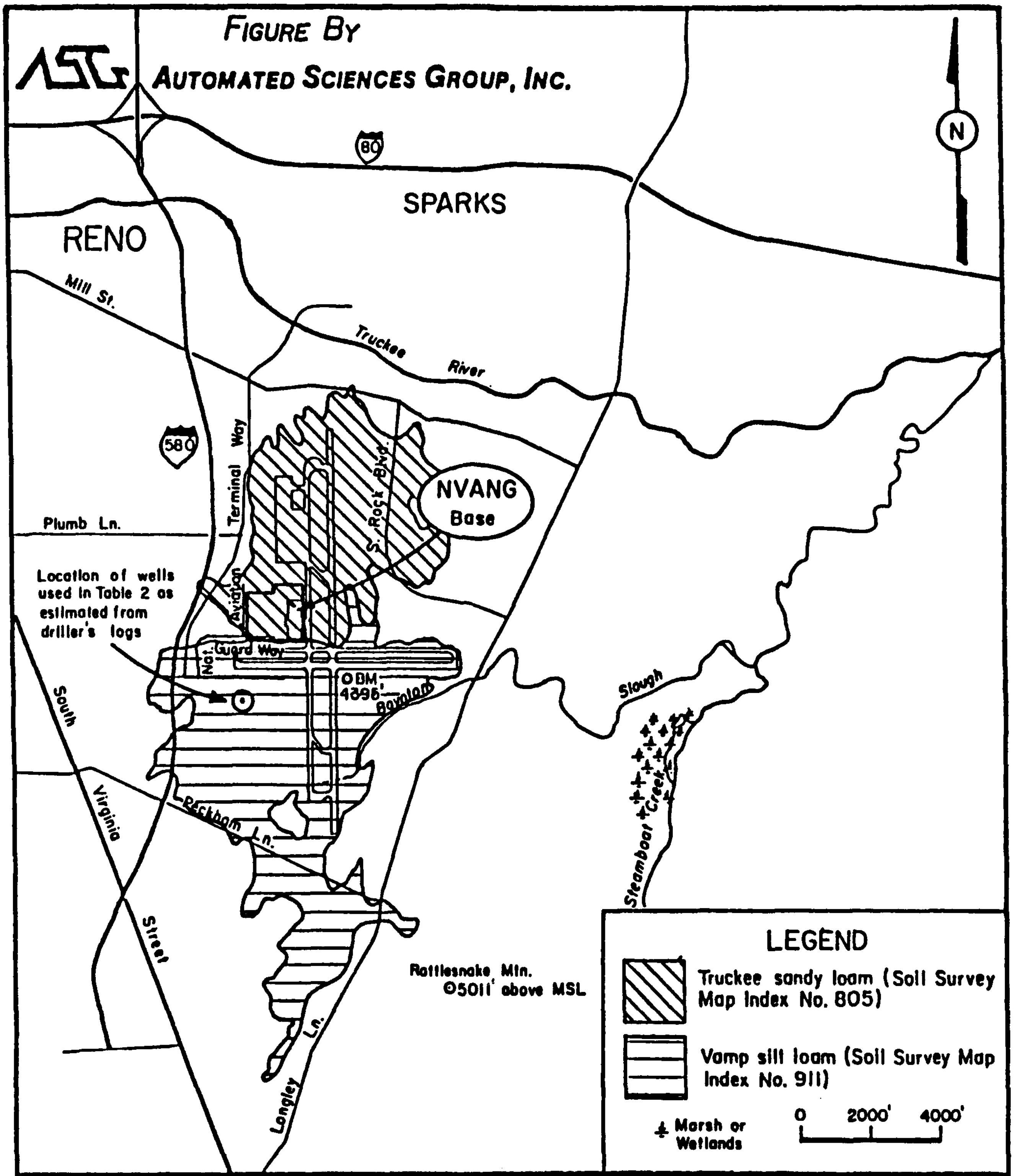

Figure 5. Soils Map for the NVANG Base, 152nd TRG, Reno, Nevada (Showing Locations of Wells Used in Table 2) (1988).

Truckee sandy loam, gravelly substratum (Soil Survey Map Index No. 805)

- This very deep, somewhat poorly drained soil is on flood plains. Drainage has been altered. This soil formed in alluvium derived from mixed rock sources. Slopes can be from 0 to 2 percent. This soil occurs in the Reno-Sparks area at elevations of 4400 to 4800 feet.

- Typically, the surface layer is gray sandy loam about 12 inches thick. The upper 18 inches of the underlying material is gray, stratified sandy loam through silty clay loam. The lower part, to a depth of 60 inches, is pale brown, stratified gravelly sand through very gravelly sandy loam. Depth to gravelly material ranges from 30 to 40 inches.

- Permeability of the Truckee soil is moderately slow in the upper part of the underlying material and rapid in the lower part. Permeability values are illustrated in Table 3 (page III-18). Available water erosion is slight. This soil is subject to flooding during storms of prolonged high intensity although this has not been a problem on the Base itself. Channeling and deposition are common along streambanks. The soil is moderately saline- and alkali-affected. The risk of corrosion is high for uncoated steel and concrete structures. This unit is used for urban development.

- This soil is subject to seasonal flooding that can be controlled only by major flood-control structures that have been installed around the Base in the form of deepened drainage ditches. These ditches provide adequate drainage so that flooding has not been a problem on the Base itself. The main limitations to use of this unit as septic tank absorption fields are the moderately slow permeability in the upper part of the soil stratum and the rapid permeability in the lower part. The limitation imposed by moderately slow permeability can be overcome by increasing the size of the absorption field. The leach lines should not be placed in the rapidly permeable layer. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

- The main limitation to use of this soil as sites for roads is the susceptibility of the soil to frost heaving. Roads should be provided with drainage. Suitable material should be added to provide an adequate wearing surface. This soil is not assigned a capability classification.

Vamp silt loam, strongly saline-alkali (Soil Survey Map Index No. 911)

- This moderately deep, somewhat poorly drained soil is on flood plains and terraces. It formed in alluvium derived from mixed rock sources. This soil occurs at elevations from 4400 to 4600 feet above sea level in the Reno-Sparks area. The average frost-free period is 100 to 110 days.

- Typically, the surface layer is grayish-brown silt loam about 3 inches thick. Below this is a layer of light grayish-brown and pale-brown, stratified fine sandy loam and loam about 33 inches thick. The next layer is a white, strongly-cemented hardpan about 6 inches thick. The next layer to a depth of 60 inches is yellowish-brown and light olive-gray, stratified loam, sandy loam, and loamy sand. Depth to the hardpan ranges from 20 to 40 inches.

- Permeability of this Vamp soil is moderate. Permeability values are shown in Table 3 (page III-18). Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 40 inches in spring and early summer. This soil is subject to flooding during storms of prolonged high intensity although this has not been a problem on the Base itself. Channeling and deposition are common along streambanks. The soil is strongly saline and alkaline affected. The risk of corrosion is high for uncoated steel and concrete structures.

- This unit is used for urban development.

- This soil is subject to seasonal flooding that can be controlled only by major flood control structures. This has not been a problem at the Base because of the drainage ditches around the airfield that adequately control flooding. The main limitations to use of the unit as septic tank absorption fields are the hardpan and the high water table. This soil is suited to septic tank absorption fields only if the water table is lowered by drainage. In drained areas, the suitability of the soil for septic-tank absorption fields can be improved by ripping the hardpan. If the density of housing is too high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage.

- The main limitation to use of this unit as sites for roads is the susceptibility of this soil to frost heaving. Drainage should be provided. Suitable material should be added to provide an adequate wearing surface.

Appendix F contains some soil-boring and test-pit information from the Base itself. These boring logs are included to enhance site specific soil data.

D. HYDROLOGY

A discussion of the hydrology at the Base is necessary in order to provide a framework for the possible pathways along which contaminants could travel.

This subject is divided into two parts, surface water and ground water. This information is intended to be an aid in conceptualizing a pathways model to be used in the determination of possible waste migration.

Another purpose for considering the Base hydrology is to assist in the determination of the possible reception of any contamination that could migrate along existing pathways.

1. Surface Water

Flood data for the Base were derived from the Flood Insurance Rate Map (FIRM) of Washoe County. This map was generated by the National Flood Insurance Program and was obtained from the Washoe County Department of Comprehensive Planning in Reno, Nevada. It indicates that the Base does not lie in a floodplain associated with a 100-year flood.

The Truckee River, the major drainage feature for the Truckee Meadows, generally flows from west to east through the meadows. It passes north of the airport, approximately 1.5 miles from the Base at its closest point. Steamboat Creek, the major tributary to the Truckee River within the meadows, enters the meadows from the south through Pleasant Valley. This stream generally flows northward to the Truckee River. Most other streams in this area flow briefly and maintain significant flows only during the spring snowmelt.

The surface water hydrology immediately around the Base is characterized by both open and covered channel drainage ditches. Diversion dams on the Truckee River feed irrigation ditches that pass by the Base to the east of the airfield. Figure 6 illustrates the surface water drainage in the vicinity of the Base.

Drainage ditches are located along all four sides of the Base and transport drainage generally towards the east, across the airfield, and into Boynton Slough that feeds into Steamboat Creek and then on into the Truckee River. The drainage pathways on the Base are shown in Figure 7, Surface Water Drainage of NVANG Installation.

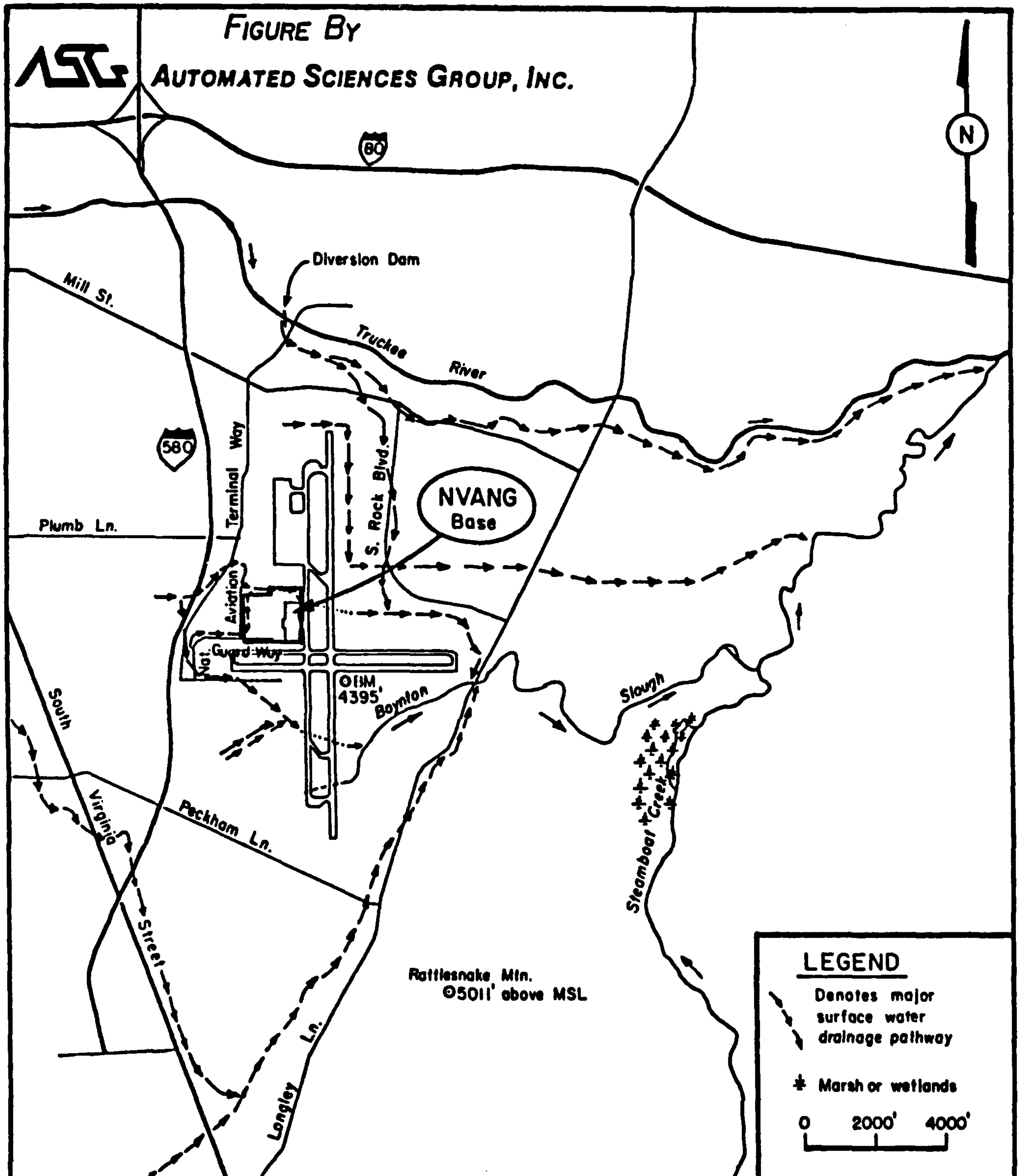

Figure 6. Surface Water Drainage in the Vicinity of the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

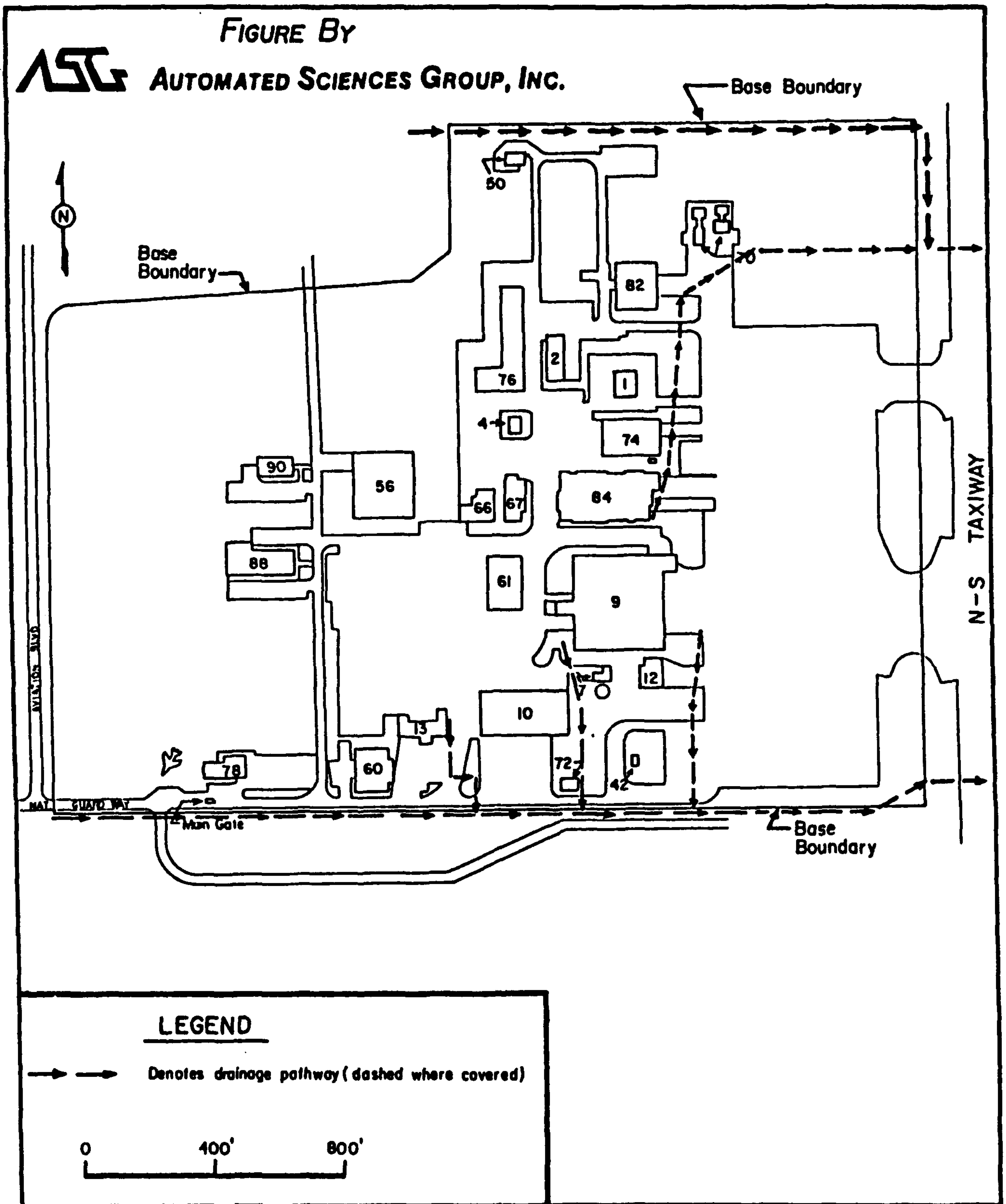

Figure 7. Surface Water Drainage of the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

According to Westpac-Sierra Water in Reno, 85% of the water supplies in the Reno-Sparks area are taken from the Truckee River. The remaining 15 percent, 12,000 acre-feet per year, are supplied by several wells in the Truckee Meadows.

2. Ground Water

Most of the economically recoverable ground water in the Truckee Meadows occurs under both artesian and water-table conditions. Generally speaking, artesian conditions develop when impermeable deposits overlie saturated deposits and when the pressure at the top of the aquifer is greater than atmospheric. A water-table condition would be one in which the saturated zone of the aquifer is not confined by impermeable strata and the water at the top of this saturated zone is under atmospheric pressure.

Due to the intertonguing nature of the valley-fill deposits, depths to water-bearing strata vary extensively. Some wells, located approximately 2000 to 3000 feet south of the Base, tap a zone of water-bearing deposits about 50 to 70 feet below ground surface. However, it is common for wells located several yards apart to find economically useful producing aquifers at different depths. This becomes more common near the Truckee River where channel shifts have left discontinuous and sinuous gravel deposits. Table 1 (p. III-4) describes the water-bearing properties of the deposits and formations that underlie the Base.

The basic ground-water flow gradients in the Truckee Meadows can be seen in Figure 8. The general movement of ground water in the vicinity of the Base is indicated in Figure 8 by arrows. According to some of the interviewees from the Base, the water table was higher in the past, resulting in swampy areas on and around the airfield. Today, most of the swampy area, approximately two miles east-southeast of the Base, is confined to the area near the confluence of the Boynton Slough and Steamboat Creek. Apparently, the airfield was part of an area of discharge for ground water moving through the Truckee Meadows, but lowering of the local water table has restricted the areas of discharge. This lowering of the water table is

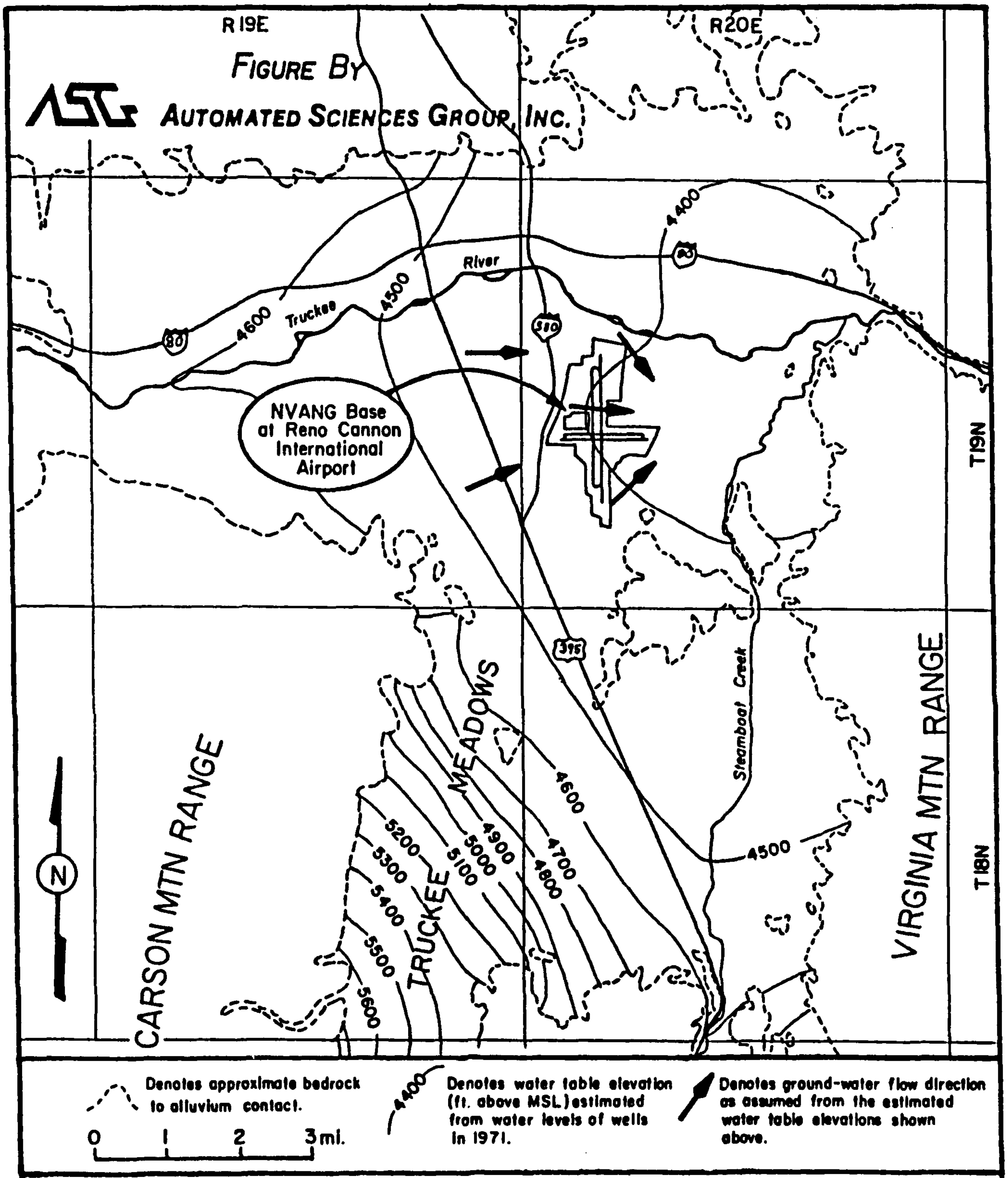

Figure 8. Estimated Water Table in the Truckee Meadows (1988).

most likely due to the deepening of the drainage ditches on and around the airfield. Another contributing factor is the changing land use.

The major source of water for crop irrigation purposes has been and still is the Truckee River that has been equipped with diversion dams. These diversion dams supply an elaborate system of irrigation ditches that traverse the meadows. Most of the recharge to the ground water of the meadows is due to infiltration from irrigation practices (~70%) while lesser amounts can be attributed to infiltration of streamflow and underflow from tributary valleys (~30%)[3].

As urbanization increases in Truckee Meadows, the use of crop irrigation decreases. If the major portion of ground-water recharge is due to crop irrigation practices, then a decrease in crop irrigation will decrease the rate of recharge and cause a lowering of the water table. This phenomenon has been observed in the areas around the airport over the last 15 years.

As seen in Figure 8, the general ground-water flow direction for the Base is to the east, towards the airport. In December 1959, the total ground-water discharge into drainage ditches, drains, and sloughs east of the airport facilities was reported to be approximately 6500 acre-feet per year (9 cfs) with an additional 2200 acre-feet per year (3 cfs) discharged to drains in the area immediately north of the airfield. So a total of 8700 acre-feet per year (12 cfs) of ground-water discharge through drains and sloughs existed in the area of the airport.[4] Although more recent actual values for discharges were not available, the State Engineer's office in Carson City estimates the present annual ground-water recharge to Truckee Meadows at 20,000 to 25,000 acre-feet.

Most of the water supply in the Reno-Sparks area is diverted from the Truckee River; however, 17 wells are utilized to supplement the supply.

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[3] P. Cohen and O.J. Loeltz "Evaluation of Hydrogeology and Hydrogeochemistry of Truckee Meadows Area," Washoe County, Nevada: U.S. Geological Survey Water Supply Paper 1779-S, p. S20 (1964).

[4] Ibid, p. S25.

Westpac-Sierra Water in Reno reports that these wells account for 10,000 to 13,000 acre-feet of ground-water discharge per year. These wells can pump up to 1500 gallons per minute with drawdowns ranging from 40 to 100 feet. Recovery is quick. The location of the wells closest to the airfield are shown in Figure 3 (p.II-3). The depths at which these wells are screened range from 274 feet to greater than 800 feet below the surface.

Ground-water quality from these wells is recorded by the Washoe County Health Department. The items monitored include volatile organic chemicals (VOCs), pesticides, polychlorinated biphenyls, carbamate pesticides, triazine and other herbicides, and pentachlorophenol. A review of the sampling results from six of the closest of these wells for 1987 reveals no significant concentrations of any of the sampled-for constituents. Almost all of the results were below the detectable limit. The frequency of sampling events was twice per year up through 1987 but will be increased to four times in 1988. The 1987 sampling results for six of the wells closest to the Base were reviewed. These results showed no significant concentrations of any of the constituents mentioned above.

E. BACKGROUND LEVELS

This section provides some information on common constituents found in the soil, surface water, and ground water on and around the Base. Because soil and water are precious commodities, especially in western climates, there were several sources of information available.

The soil survey for the southern part of Washoe County provides data on some physical and chemical properties of soils. The data determined to be pertinent to on-base soils is presented in Table 3, Physical and Chemical Properties of Soils Occurring on the NVANG Base in Reno, Nevada.

Analyses of surface water and thermal and non-thermal ground water have been performed for the Truckee Meadows area. Because of the vast difference in chemical content between thermal and non-thermal ground water in the meadows, and because the ground water around the Base is non-thermal, only the non-thermal data will be presented. Table 4 presents this data.

Table 3. Physical and Chemical Properties of Soils Occurring on the NVANG Base in Reno, Nevada[a]

Soil name (and SCS[b] Soil Survey map symbol)	Depth (in.)	Clay (%)	Permeability (in./hr)	Available water capacity (in./in.)	Soil reaction (pH)	Salinity (Mmhos/cm)	Shrink-swell potential
Truckee (805)	0-12	5-12	2.0-6.0	0.10-0.12	7.4-9.0	8-16	Low
	12-30	18-25	0.2-0.6	0.13-0.16	7.4-9.0	4-16	Moderate
	30-60	3-10	6.0-20.0	0.08-0.10	7.4-8.4	2-4	Low
Vamp (911)	0-3	12-18	0.6-2.0	0.13-0.16	>7.8	>16	Low
	3-36	12-18	0.6-2.0	0.13-0.16	>7.8	4-8	Low
	36-42						
	42-60	10-18	0.6-6.0	0.08-0.16	>7.8	2-8	Low

[a] Source: Baumer, O.W. Soil Survey of Washoe County, Nevada, South Part, United States Department of Agriculture, Soil Conservation Survey, 1983, Table 14.

[b] SCS = Soil Conservation Service.

Table 4. Some Basic Chemical Constituents of Local Surface and Ground Water Near the NVANG Base at Reno Cannon International Airport.

(Concentrations in parts per million except when noted otherwise.)

Parameter	Average Quality of Surface Water from Truckee River[b]	Average quality of non-thermal ground water in Truckee Meadows[a]		
		Avg. value	Range	Avg. ionic Ratio%
Temp (°C)	12.5	14.8	9.4-19.4	-
Silica (SiO_2)	24.5	51.0	15.0-101	-
Aluminum (Al)	0.70	-	-	-
Iron (Fe)	0.96	-	-	-
Calcium (Ca)	13.3	48.0	7.4-354	40.0
Magnesium (Mg)	4.9	17.0	3.0-137	24.0
Sodium (Na)	14.8	51.0	6.0-400	34.0
Potassium (K)	3.2	6.0	1.0-39.0	2.0
Bicarbonate (HCO_3)	73.5	180.0	68.0-435	66.0
Sulfate (SO_4)	14.9	111.0	2.4-1680	25.0
Chloride (Cl)	7.5	23.0	1.4-315	9.0
Fluoride (F)	0.2	-	-	-
Nitrate (NO_3)	1.8	-	-	-
Boron (B)	0.23	-	-	-
TDS[c]	120.5	482.0	117-3278	-
Hardness (as $CaCo_3$)	53.0	-	-	-
SEC (umhos/cm @ 25°C)[d]	179.0	609.0	236-3780	-
pH	7.0	7.7	7.0-8.8	-

a Bateman and Sheibach, p.13., 1975.

b These data are averages of two USGS sampling events that occurred on 4-17-59. One was taken near where the Truckee River enters the Truckee Meadows area and the other was taken where the river leaves the meadows. Cohen and Loeltz (1964), pp. 34-35 and 38-39.

c TDS = Total Dissolved Solids

d SEC = Specific Electrical Conductance

F. CRITICAL ENVIRONMENTS/ENDANGERED OR THREATENED SPECIES

According to the Nevada National Heritage Program (NNHP) in Carson City, Nevada, there are no records of sensitive habitats or species within 1 mile of the Base. One note of interest given by this organization (NNHP) is that the Truckee River furnishes habitat for the threatened Lahontan cutthroat trout and the endangered Cui-ui. Although the Truckee River only passes within 1.3 miles north of the Base boundary, the proximity of the river should be noted.

There are no major wetlands within a mile of the Base. There is a 65-acre swampy area located 2 miles east-southeast of the Base near the confluence of Steamboat Creek and Boynton Slough. Since this area is upstream from Boynton Slough, the drainage from the Base that enters Steamboat Creek by way of Boynton Slough should not influence it.

IV. SITE EVALUATION

A. ACTIVITY REVIEW

A review of Base records and interviews with past and present Base employees resulted in the identification of specific operations within each activity in which the majority of the chemicals are handled and hazardous materials/hazardous wastes are generated. Table 5 summarizes the major operations associated with each activity, provides estimates of the quantities of waste generated by these operations, and describes the past and present disposal methods for these wastes. The quantities listed for a particular shop may have been combined with another shop as indicated (e.g., AGE). The waste disposal practices are assumed to be the same. Records were not available to describe past waste disposal methods in the 1950s to 1980s. Listed methods of disposal for this time period are an estimate based on interview information. In some areas, more than one method of disposal may have been used. If an operation is not listed in Table 5, then that operation has been determined on a best-estimate basis to produce negligible quantities of wastes ultimately requiring disposal.

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

Interviews with 19 past and present Base personnel who had an average of 24 years tenure at the Base and subsequent site inspections resulted in the identification of 7 potential hazardous materials/hazardous waste disposal/spill sites. Sites 1 through 7 were scored by using HARM (Appendix C) and were recommended for further evaluation. Figures 9 through 11 illustrate the locations of the potential sites. Copies of the completed Hazardous Assessment Rating Forms are found in Appendix D. Also, included in Appendix D is a summary and explanation of the factor rating criteria used to score the sites. Table 6 summarizes the Hazard Assessment Score (HAS) for each of the scored sites.

Table 5. Hazardous Materials/Hazardous Waste Disposal Summary: 152nd TRG, Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	ESTIMATED WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1948 — 1980	1980 — 1988
Aircraft Maintenance	9	PD-680	1900	Offsite/FTA	DRMO
	61	Battery Acid	77	Neutr/San	Neutr/San
		Turbine Oil	115	Offsite/FTA/Grnd	Sply
		7808 Oil	(AGE)**	Offsite/FTA/Grnd	Sply
		Hydraulic Oil	75	Offsite/FTA/Grnd	Sply
		Engine Oil	3960	Offsite/FTA/Grnd	DRMO
		JP-4	(Liquid Fuels)**	Offsite/FTA/Grnd	DRMO
Aerospace Ground Equipment Maintenance	2	Engine Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		Hydraulic Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
		Turbine Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		Motor Oil	(Vehicle Maintenance)**	Offsite/FTA/Grnd	DRMO
		Battery Acid	(Aircraft Maintenance)**	Neutr/San	Neutr/San
		7808 Oil	12	Offsite/FTA/Grnd	Sply
		Trichloroethylene	40	Offsite/FTA	DRMO
		Trichloroethane	(Aircraft Maintenance)**	Offsite/FTA/Grnd	DRMO
Vehicle Maintenance (Motor Pool)	13	Engine Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
		Battery Acid	(Aircraft Maintenance)**	Neutr/San	Neutr/San
		JP-4	(Liquid Fuels)**	Offsite/FTA/Grnd	DRMO
		Hydraulic Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		Transmission Fluid	75	Offsite/FTA	DRMO
		Motor Oil	12	Offsite/FTA/Grnd	DRMO
		Brake Fluid	7	Offsite/FTA	DRMO
Fuels Management (Liquid Fuels)	6	JP-4	~1000	Offsite/FTA/Grnd	DRMO
		Battery Acid	(Aircraft Maintenance)**	Neutr/San	Neutr/San
		7808 Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply

Table 5 (continued). Hazardous Materials/Hazardous Waste Disposal Summary: 152nd TRG, Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	ESTIMATED WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1948–1980	1988
Non-Destructive Inspection (NDI)	76	Developer	128 kits	San	San
		Trichloroethylene	(AGE)**	Offsite/FTA	DRMO
		PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
Weapons Maintenance (Munitions Storage)	1	Trichloroethylene	(AGE)	Offsite/FTA	DRMO
		PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
Corrosion Control and Paint Shops	2				
	9	PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
	11				
	13				
	61	Trichloroethylene	(AGE)**	Offsite/FTA	DRMO
	72	Hydraulic Fluid	2	Offsite/FTA/Grnd	Sply
	82	Lacquer	3	Offsite/FTA	DRMO
Entomology	5	Motor Oil	(Vehicle Maintenance)**	Offsite/FTA/Grnd	DRMO
		Engine Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		Battery Acid	(Aircraft Maintenance)**	Neutr/San	Neutr/San
Hangar Spaces	9	JP-4	(Fuel Management)**	Offsite/FTA/Grnd	DRMO
	82	Trichloroethylene	(AGE)**	Offsite/FTA	DRMO
		PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
Machine Shop Plumbing Shop Electric Shop	56	Metal Cutting Oils	5 cans	Proc/San	Proc/San

Table 5 (continued). Hazardous Materials/Hazardous Waste Disposal Summary: 152nd TRG, Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada

SHOP NAME	LOCATION (Bldg No.)	WASTE MATERIAL	ESTIMATED WASTE QUANTITY* Gallons/Year	METHODS OF TREATMENT, STORAGE, AND/OR DISPOSAL 1948 — 1980	1980 — 1988
Battery Shop	2	Battery Acid	(Aircraft Maintenance)**	Neutr/San	Neutr/San
Photo Lab	74	Developer	(NDI Lab)**	San	San
		Fixer	(NDI Lab)**	San	DRMO
		Trichloroethylene	(AGE)**	Offsite/FTA	DRMO
Flight Simulator	76	PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
		Hydraulic Fluid	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
Propulsion Shop	61	PD-680	(Aircraft Maintenance)**	Offsite/FTA	DRMO
	70	Carbon Cleaner	2 cans		
		7808 Oil	(AGE)**	Offsite/FTA/Grnd	Sply
		Hydraulic Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply
		Engine Oil	(Aircraft Maintenance)**	Offsite/FTA/Grnd	Sply

Key:
- Neutr/San - Neutralized and disposed of through sanitary sewer.
- Offsite - Offsite disposal by unpaid contractor.
- FTA - Fire Training Activities.
- DRMO - Disposed of by Defense Reutilization and Marketing Office.
- Grnd - Disposed of on ground.
- Sply - Turned into base supply for recovery/recycle by independent contractor.
- San - Disposed of in drains leading to sanitary sewer.

* This quantity may or may not reflect past practices.
** The quantities listed for the shop have been combined with another shop as indicated.

Table 6. Site Hazard Assessment Scores (as derived from HARM): 152nd TRG, Nevada Air National Guard, Reno Cannon International Airport, Reno, Nevada

Site No.	Site Description	Receptor	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	Fire Training Area No. 1	52	90	43	1.0	62
2	Fire Training Area No. 2	57	72	56	1.0	62
3	Fire Training Area No. 3	57	90	49	1.0	65
4	Fire Training Area No. 4	57	54	49	1.0	53
5	Fire Training Area No. 5	57	72	49	1.0	59
6	Fire Training Area No. 6	52	90	80	1.0	74
7	POL Storage Facility	57	90	63	1.0	70

The migration pathway of primary concern is the ground-water route, and the most likely potential human receptors are owners of residential wells near the Base. The nearest of these wells is approximately 2000 feet south-southwest of the Base.

Site No. 1: Fire Training Area No. 1 (HAS-62)

The NVANG conducted off-base fire training exercises in an area estimated to be 600-feet east of Runway 34L and 400-feet north of the Old Engine Run-Up Pad (Figure 9) on land that the Base has never owned or leased. This area has always been under the jurisdictional control of the Washoe County Airport Authority (Reno Cannon International Airport). The Base was the sole operator of this training Site.

The training area was a flat, unlined, open earthen area, slightly bermed, with a general depth of 6 to 10 inches to contain the flammable liquids used during training. This area was used by the Base from 1952 to 1956 and from 1960 to 1965. Between 1956 and 1960, Fire Training Area No. 2 was used. This area was primarily used as a rubble dump until 1956 with the fire-training exercises occurring near, but not on or in the dump area.

Interview information revealed that spent solvents, waste oils, "slop wastes", and other flammables in addition to JP-4 fuel were burned in this area during the training exercises. Before the flammables were applied to the FTA, a water base was applied prior to each burn.

Training was generally done on a quarterly basis with three to four burns per exercise. On the basis of 2 fire training days every 3 months, using 150 gallons of flammable liquids per exercise twice a day, it is estimated

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* The 70% value is an often used average when specific climatic data are not available.

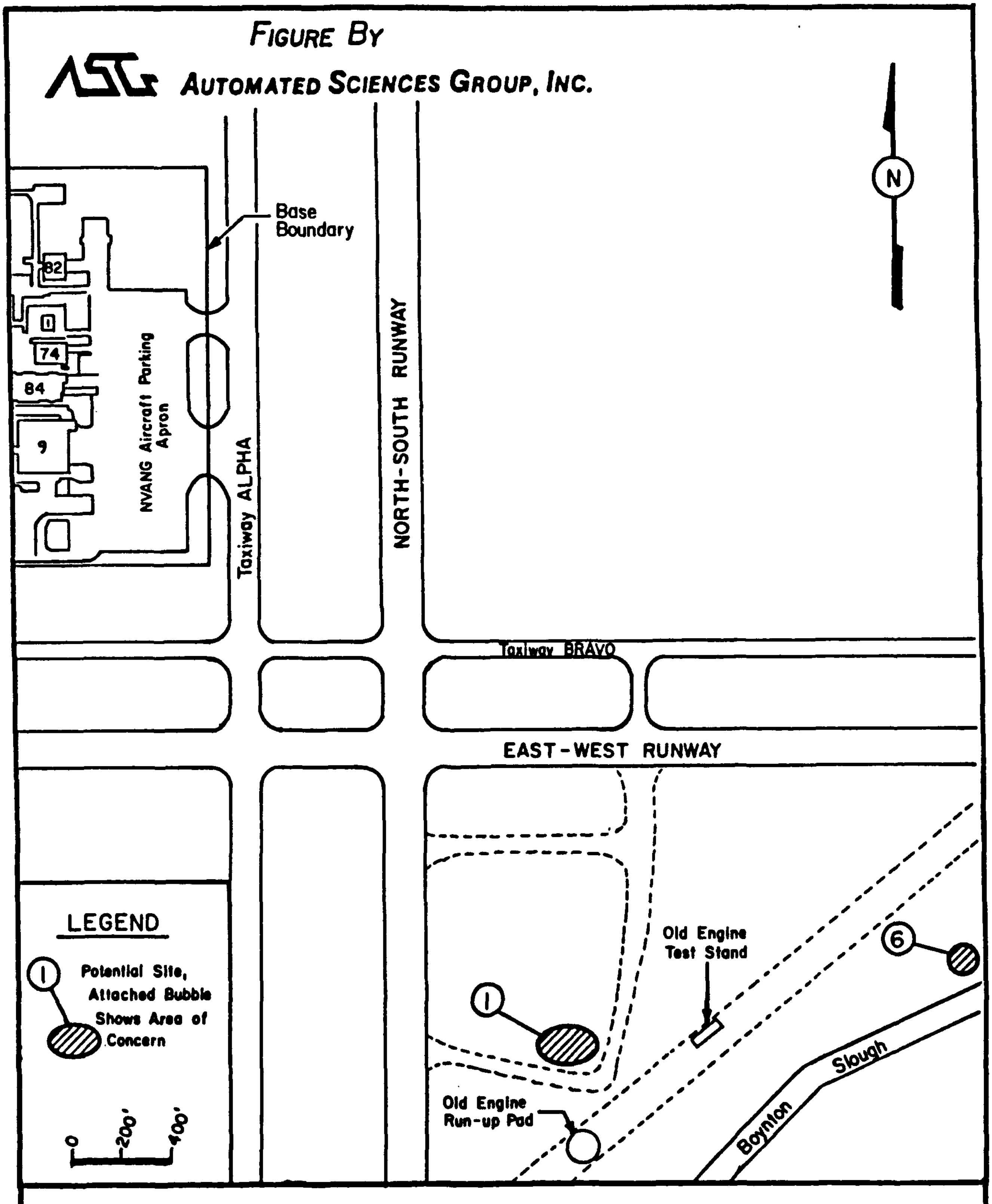

Figure 9. Locations of Off-base Potential Sites at the Nevada Air National Guard Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

that 2400 gallons of flammable liquids per year were used. Assuming that up to 70%* of the flammables released at the FTA were destroyed, an estimated 720 gallons per year remained either to evaporate or to percolate into the ground. A potential total of 6500 gallons may have infiltrated into the ground during the 9-year period that this FTA was in use.

Site No. 2: Fire Training Area No. 2 (HAS-62)

This fire training area was located on-base in an area east of Building 1 and under parking area A2 of the present Aircraft Parking Apron. Figure 10 shows the location of this former training area. This Site was an unlined, open earthen area, slightly bermed, with a general depth of 12 to 18 inches to contain the flammable liquids used during training. The Base was the sole operator of this fire training area.

Interview information revealed that spent solvents, waste oils, "slop wastes", and other flammables in addition to JP-4 fuel were burned during the training exercises in this area. Before the flammables were applied to the FTA, a water base was applied prior to each burn.

Training was generally done on an "as needed" basis with an estimated 10 burns per year using 150 gallons of flammable liquids per burn. On this basis, it is estimated that 1500 gallons of flammable liquids per year were used. Assuming that up to 70%* of the flammables released at the FTA were destroyed, an estimated 450 gallons per year remained either to evaporate or to percolate into the ground. A potential total of 1800 gallons may have infiltrated into the ground during the 4-year period that this FTA was in use.

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* See note at bottom of page IV-6.

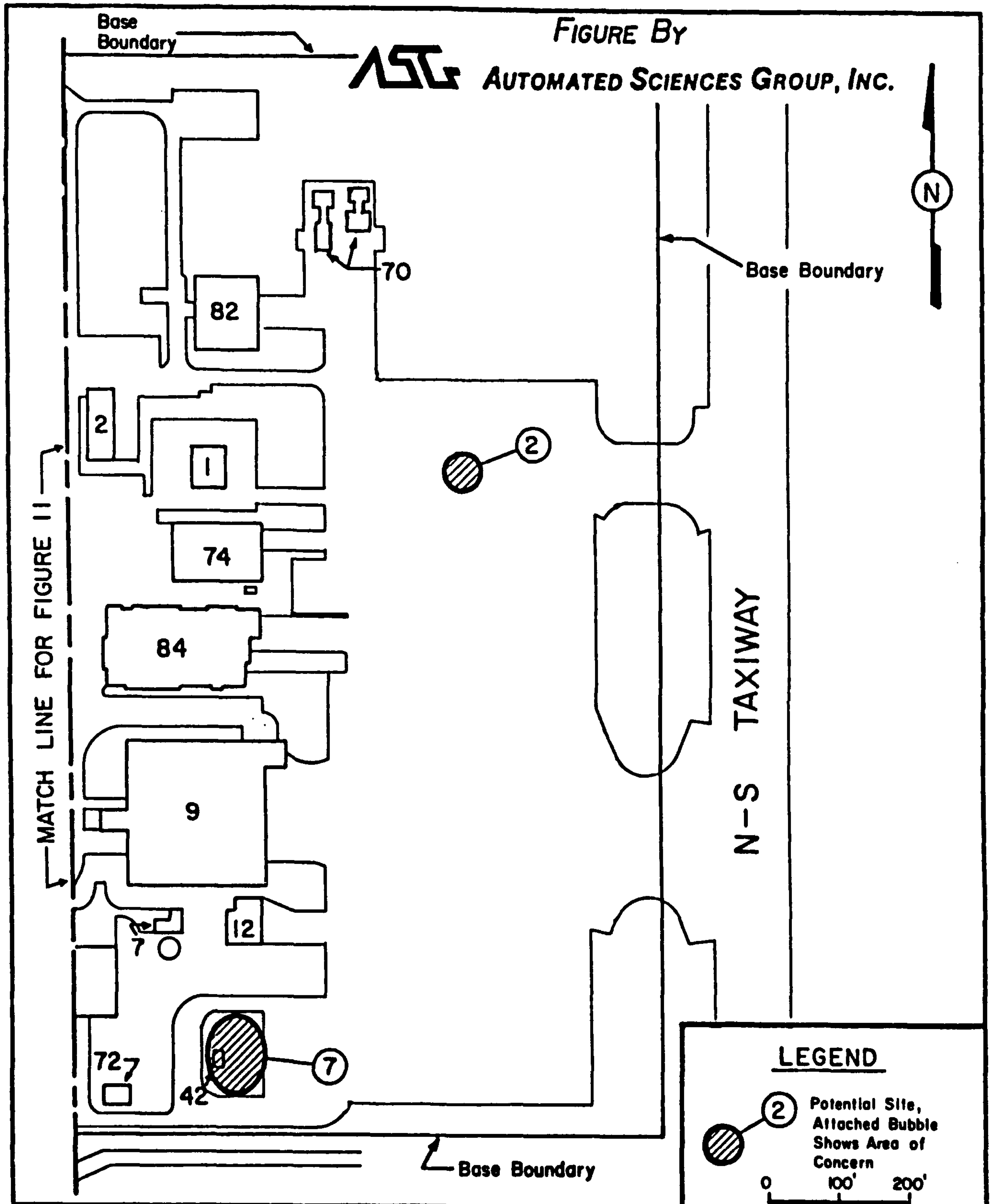

Figure 10. Locations of Potential Sites on East Half of the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

Site No. 3: Fire Training Area No. 3 (HAS-65)

This fire training Site was located in an area estimated to be 200-feet northwest of the North Gate of the Base and under the present Airport Authority Parking Lot (Figure 11). During the 1964 to 1971 time frame that the Base used this area, it was included within the leased boundaries of the Base. In 1985 this area was transferred to the Washoe County Airport Authority. Thus, the area is now off Base property and is under the jurisdictional control of the Airport Authority. The Base was the sole operator of this area.

This Site was a flat, open earthen area, slightly bermed, with a general depth of 12 inches to contain the flammable liquids used during training. Two aircraft and/or mockup models were used as training aids in this area.

Interview information revealed that spent solvents, waste oils, "slop wastes", and other flammables in addition to JP-4 fuel were burned during the training exercises in this area. Before the flammables were applied to the FTA, a water base was applied prior to each burn. On one occasion in 1971, no water base was used which resulted in a very poor burn.

Training was generally done on a quarterly basis with multiple burns per exercise. On the basis of 2 fire training days per quarter, using 150 gallons of flammable liquids per exercise, 2 times per day, it is estimated that 2400 gallons of flammable liquids per year were used. Assuming that up to 70%* of the flammables released at this FTA were destroyed, an estimated 720 gallons per year remained either to evaporate or to percolate into the ground. One fire training exercise in 1971 involved 2500 gallons of JP-4 fuel with no water base. It was estimated by the Base Fire Chief that 2000 gallons of this fuel percolated into the ground and was not burned. A potential total of 6300 gallons may have infiltrated into the ground during the 6 years this FTA was in use.

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* See note at bottom of page IV-6.

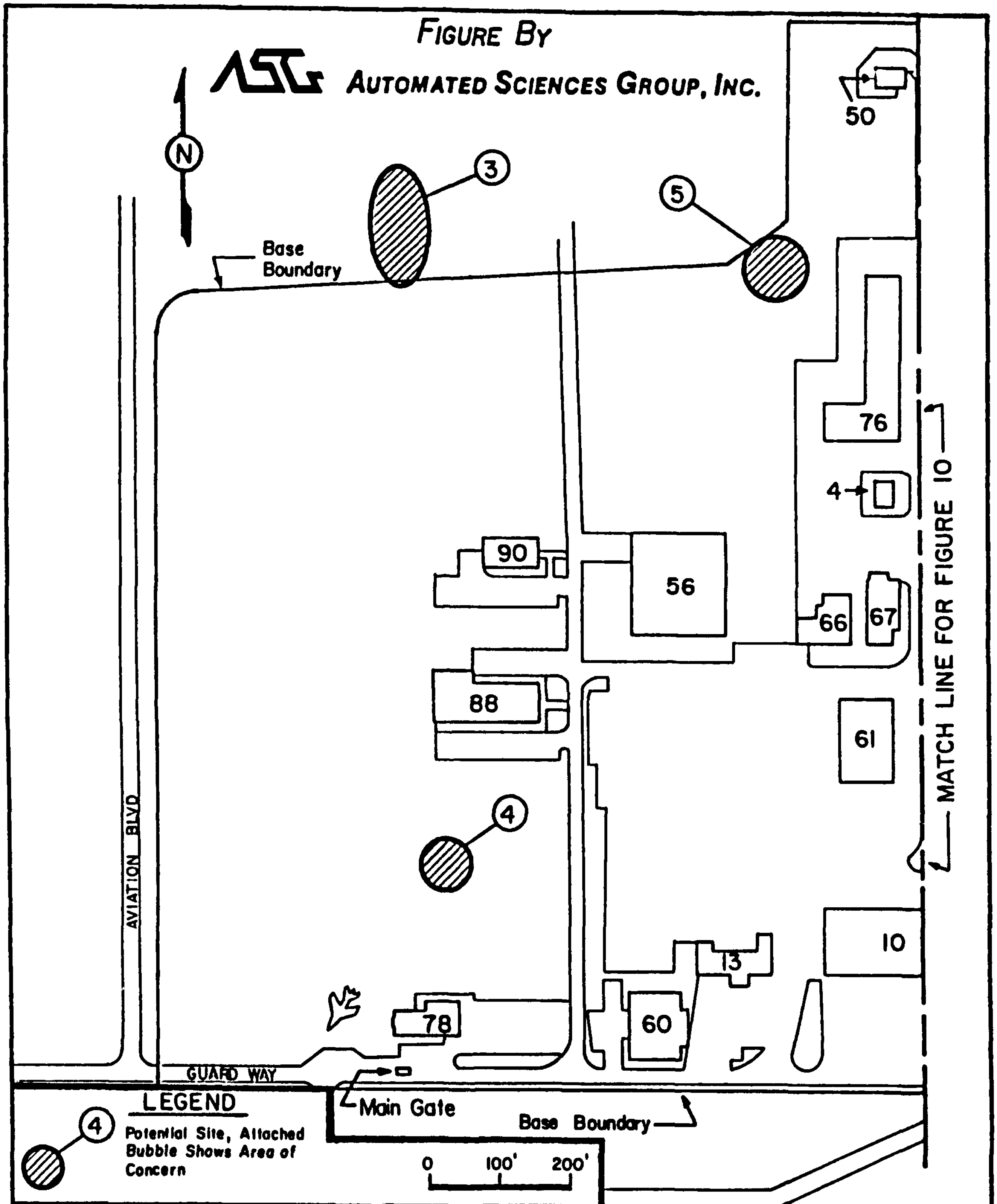

Figure 11. Locations of Potential Sites on West Half of the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

Site No. 4: Fire Training Area No. 4 (HAS-53)

This on-base Site, south of Building 88 and under the present Training Field, was used for fire training exercises from 1970 to 1973. Figure 11 shows the location of this Site. This training area was a flat, open earthen, slightly bermed area that was operated solely by the Base.

Interview information revealed that spent solvents, waste oils, "slop wastes", and other flammables in addition to JP-4 fuel were burned during the training exercises in this area. Before the flammables were applied to the FTA, a water base was applied prior to each burn.

Training was generally done on an "as needed" basis with an estimated one to two burns per year. This FTA was used in conjunction with the FTA of Site No. 5. An estimated 150 gallons of flammable liquids per burn were used. On the basis of 2 burns per year, it is estimated that 300 gallons of flammable liquids per year were used. Assuming that up to 70%* of the flammables released at the FTA were destroyed, 90 gallons per year remained either to evaporate or to percolate into the ground. A potential total of 270 gallons may have infiltrated into the ground during the 3-year period that this FTA was in use.

Site No. 5: Fire Training Area No. 5 (HAS-59)

This on-base fire training area was located between the northwest corner of Building 76 and the southeast corner of the Airport Authority Parking Lot (See Figure 11). This area was used solely by the Base. This FTA was in use from 1970 to 1977. During this time frame, several fire training exercises per year were conducted in conjunction with the FTA of Site No. 4 as described above. This Site was an unlined, open earthen, slightly depressed, bermed area. A mock-up model of an aircraft was used as a training aid at this Site.

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* See note at bottom of page IV-6.

Interview information revealed that spent solvents, waste oils, "slop wastes", and other flammables in addition to JP-4 fuel were burned during joint exercises in this area with the Base supplying the flammable liquids. Before the flammables were applied to the FTA, a water base was applied prior to each burn.

Training was generally done on an "as needed" basis with an estimated eight to ten burns per year. An estimated 150 gallons of flammable liquids per burn were used. Using 10 burns per year, it is estimated that 1500 gallons of flammable liquids per year were used. Assuming that up to 70%* of the flammables released at the FTA were destroyed, 450 gallons per year remained either to evaporate or to percolate into the ground. A potential total of 3200 gallons may have infiltrated into the ground during the 7-year period that this FTA was in use.

Site No. 6: Fire Training Area No. 6 (HAS-74)

The NVANG's last fire training Site was located in the southeast quadrant of the Reno Cannon International Airport and was estimated to be 2200 feet east of Runway 34L and 800 feet south of Runway 25 (Figure 9, page IV-7). This off-base Site was utilized by the Base from 1975 to September 1985 although the Base has never owned or leased this land. This area has always been under the jurisdictional control of the Washoe County Airport Authority. The Base was the sole operator of this Site from 1975 to 1980. From 1980 until September 1985, joint fire-training exercises were conducted with the Airport Authority. The Base supplied all of the necessary flammables for all fire training. This training area has not been used since September 1985. In 1985 the Base and the Airport Authority began utilizing the University of Nevada's approved Fire Protection Academy at Stead Airport, north of Reno, Nevada, for all live fire-training exercises.

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* See note at bottom of page IV-6.

The training area was estimated to be 75 feet in diameter and was an unlined, open earthen area, slightly bermed, with a general depth of 12 to 18 inches to contain the flammable liquids used during training.

Interview information revealed that mostly JP-4 fuel was burned in this area although a "one time only" burn of 2000 gallons of toluene was used at this FTA. Before the flammables were applied to the FTA, a water base was applied prior to each burn.

Training was generally done on a quarterly basis with two days of training per quarter from 1975 to 1984. From 1984 until September 1985, training was done on a semi-annual basis with four training days per year. According to interview information, an estimated 500 gallons of flammable liquids per day for eight training days per year were used from 1975 until 1980. Between 1980 and 1985, the number of burns per year doubled, thereby doubling the amount of flammable liquids used each year. From 1984 until September 1985, an estimated 2500 gallons of flammable liquids were burned each year. An estimated 57,000 gallons of flammable liquids have been used for fire training exercises at this FTA over a 10-year time period. If it is assumed that up to 70%* of the flammable liquids released at this FTA were destroyed, an estimated 17,000 gallons may have remained to infiltrate into the ground during the ten years this FTA was in use.

Site No. 7: POL Storage Facility (HAS-64)

Aviation fuel for the flightline operations at the Base are supplied by four 25,000-gallon underground storage tanks located near Building 42 (see Figure 10, page IV-9). These JP-4 tanks have been in the ground for over 30 years (Appendix E). Periodic visual inspections have been made to ascertain the general condition of these tanks. The last inspection was conducted in April 1986 and revealed that there was medium rusting with light pitting on the interior surfaces of all the tanks. These tanks have never been hydraulically static tested for leaks.

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* See note at bottom of page IV-6.

Interview information revealed that there have been numerous small fuel spills on and around the refueling stand area of Buildings 42. Most of the spills occurred during the 1973 to 1985 time period when the fuel trucks were top-loading vehicles. This area as been flooded with up to 1000 gallons of fuel on several occasions. A fuel spill of up to 300 gallons also occurred in June 1986 when a bottom-loading shutoff valve on a refueling unit failed to close. Several spills of up to 100 gallons have occurred during defueling of the fuel trucks. Up until the early 1980s, most of these spills were usually flushed into the soil/graveled areas surrounding the refueling stand.

C. OTHER PERTINENT INFORMATION

During the course of the Base visit and records search, additional areas were visited. These areas include such areas as the "Wash Rack" area, the oil/water separator that is between Buildings 74 and 84, the perimeter of the aircraft parking apron, the bowser storage area, the old engine test stand area, and the old run-up pad area. These areas were considered as possible sites; however, they were eliminated as sites either because there was no evidence of contamination or the quantities of waste material were too insignificant to warrant justifying these areas as sites.

Additional information indicated that there are no active water wells on Base. Drinking water supplies are provided by publicly-owned facilities. Also, sanitary sewage is connected to publicly-owned treatment works.

There are no landfills, past or present, or radioactive burial sites, or sludge burial sites on Base.

There are no active water wells on Base.

There have never been any known leaks of oils containing PCBs on the Base.

There has not been extensive use or storage of herbicides/pesticides on the Base. Application of these materials is done by state of Nevada employees.

There are 23 Underground Storage Tanks on the NVANG property for which the Base is responsible (Appendix E). None of these tanks are known to have leaked.

With the exception of the Oil/Water Separator located between Building 74 and 84, all Oil/Water Separators appear to be functioning correctly. The oil-free portion of all separators go to the sanitary sewer system.

The nearest residential water well is estimated to be 2000 feet south-southwest of the Base. There are other such wells slightly more than 0.5-miles southeast of the Base.

V. CONCLUSIONS

- Information obtained through interviews with 19 past and present Base personnel, review of Base records, and field observations has resulted in the identification of 7 potential disposal/spill/storage sites on the Base. There is a potential for contaminant migration at all Sites.

- The overall ground-water and geologic environment makes underlying aquifers susceptible to contamination from surface sources. Geologic characteristics at the Base contributing to this susceptibility include the presence of moderately permeable soil and a shallow depth to ground water. The water table is generally within 10 feet of the surface. The presence of drainage ditches around the airfield and the fact that most area wells are screened in water-bearing layers other than the uppermost water-table aquifer are both positive factors that enhance the protection of local ground-water resources. However, it should not be assumed that these positive factors can be counted on to prevent contamination of these resources.

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* Note: All ground-water flow gradients referred to in this report are assumed from regional flow, topographic, and geologic information. Actual site specific gradients beneath the Base are not yet known.

VI. RECOMMENDATIONS

Based on the investigation documented in this PA and the HARM scores the seven sites received, it is recommended that further IRP investigation be implemented.

GLOSSARY OF TERMS*

ALLUVIUM - A general term for unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta or as a cone or fan at the base of a mountain slope. These deposits are often deposited during a flood event and range from clays to gravels.

ANDESITE - A dark colored fine grained extrusive rock that, when porphyritic, contains phenocrysts of zoned andesine and one or more of the mafic minerals such as biotite, hornblende or pyroxene.

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

AQUITARD - A confining bed (deposit) that retards but does not prevent the flow of water to or from an adjacent aquifer.

BASALT - A general term for dark colored mafic igneous rocks that are commonly extrusive but locally intrusive (e.g., as dikes), composed chiefly of calcic plagioclase and clinopyroxene. Basalt is the fine-grained equivalent of gabbro.

BRECCIA - A coarse-grained clastic rock, composed of angular broken rock fragments held togethor by a mineral cement or in a fine grained matrix.

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* Source for most of the glossary definitions was Robert L. Bates & Julia A. Jackson, Editors, Glossary of Geology, Second Edition, American Geolgical Institute, Falls Church, VA, 1980.

CLASTIC - Pertaining to rock or sediments primarily composed of broken fragments derived from pre-existing rocks or minerals that have been transported a considerable distance from their place of origin.

COBBLE - A rock fragment larger than a pebble and smaller than a boulder.

CONGLOMERATE - A course-grained clastic sedimentary rock composed of rounded/subangular rock fragments larger than 2 millimeters in diameter set in a matrix of fine grained silt or sand.

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 the following,

(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).

CRETACEOUS - Of or relating to the period of geologic time that occurred after the Jurassic Period, generally thought to be about 130 million years ago.

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

DIATOMITE (DIATOMACEOUS) - A soft friable siliceous sedimentary rock consisting mainly of opaline frustules (siliceous shells) of the diatom which is a unicellular aquatic plant related to algae. Some of these deposits were formed in lake beds although most are of marine origin.

DISCHARGE - The release of any waste stream, or any constituent thereof, to the environment that is not recovered.

DOWNGRADIENT - A direction that is topographically or hydraulically down slope; the direction in which ground water flows.

DRAWDOWN - The lowering of the water level in a well as it is pumped.

ENTISOL - A soil order (U.S. Dept. of Agriculture soil taxonomy) characterized by dominance of mineral soil materials and absence of distinct soil horizons.

EPHEMERAL STREAM - A stream or reach of a stream that flows briefly only in direct response to precipitation in the immediate locality and whose channel is at all times above the water table.

EXTRUSIVE - Said of an igneous rock that has been erupted onto the surface of the Earth and includes lava flows and pyroclastic material such as volcanic ash.

FAULT BLOCK - A crustal unit formed by block faulting bounded by faults either completely or in part. Normal faulting is common. The term "normal fault" is used when the hanging wall appears to have moved downward relative to the footwall and the angle of the fault is usually 45-90°.

FORMATION - The fundamental formal unit of classification according to lithology and stratification.

FRACTURE ZONE - Also called a fault zone and may be a zone hundreds or thousands of feet wide consisting of numerous interlacing small faults and fractures or it may consist of a confused zone of breccia or gouged rocks.

FROST HEAVING - The uneven upward movement, and general distortion of surface soils and structures such as pavements due to subsurface freezing of water and growth of ice masses.

GABBRO - A dark colored igneous rock formed at great depth.

GEOTHERMAL - Pertaining to the heat of the interior of the earth.

GLACIAL OUTWASH - Stratified detritus (chiefly sand and gravel) removed or "washed out" from a glacier by meltwater streams and deposited beyond the end moraine of a glacier.

GRABEN - An elongate, relatively depressed crustal unit or block that is bounded by faults along its long sides.

GRANITIC - Pertaining to or composed of granite. Granite is a plutonic rock in which quartz constitutes 10 to 50 percent. Feldspars and plagioclase make up the other large portion while mafic minerals such as biotite and hornblende constitute less than 10 percent.

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, physical, chemical, or infectious characteristics may

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

(b.) pose a substantial threat or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HYDROTHERMAL - Of or pertaining to hot water and the actions or products of hot water such as alteration of rocks or minerals by their reaction with hydrothermal water or a mineral deposit precipitated from such a hydrothermal solution.

IGNEOUS - Rock material of molten origin.

INTERCALATED - Said of layered material that is interbedded as thin beds within thick beds of another type of material. An example would be thin beds of shale interbedded within a massive bed of sandstone.

INTERGRANULAR PERMEABILITY - Permeability that occurs due to spaces between the grains of a rock or deposit.

INTRUSIVE - Of or pertaining to igneous intrusion that is the process of emplacement of magma in pre-existing rock.

LACUSTRINE - Pertaining to, produced by, or formed in a lake environment.

LAHARIC - Said of a deposit that was formed as a result of a mudflow composed chiefly of volcaniclastic materials on the flank of a volcano.

LITHOLOGY - The physical character of a rock (e.g., particle size, color, mineral content, primary structures, thickness, weathering characteristics, and other physical properties).

METASEDIMENTARY - A sedimentary material/rock that shows evidence of having been exposed to metamorphism.

METAVOLCANIC - Volcanic material/rock that shows evidence of having been exposed to metamorphism.

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

MIOCENE - An epoch of the upper Tertiary period after the Oligocene and before the Pliocene.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated enviornment, such as a bog or fan.

PEDIMENT - A broad gently sloping erosion surface typically developed by subaerial agents (including running water) in an arid or semiarid region. Located at the base of an abrupt and receding mountain front and underlain by bedrock which is often partially covered by a thin discontinuous veneer of alluvium derived from the upland masses.

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.

PHENOCRYST - A relatively large conspicuous crystal in a porphyritic rock.

PLIOCENE - An epoch of the tertiary period, after the Miocene and before the Pleistocene.

PLUTONIC - Pertaining to igneous rocks formed at great depth.

PORPHYRITIC - Said of the texture of an igneous rock in which larger crystals (phenocrysts) are set in a finer-grained groundmass which may be crystalline or glassy or both.

QUATERNARY - The second period of the Cenozoic era following the Tertiary; also, the corresponding system of rocks.

RECOVERY - As a well is pumped the water level in the well is depressed. When the pumpage stops the water level returns back to its original position over time, i.e., it "recovers".

RHYOLITE - A group of extrusive igneous rocks (lava), typically porphyritic and commonly exhibiting flow texture, with phenocrysts of quartz and alkali feldspar in a glassy to cryptocrystalline groundmass. Rhyolite is the extrusive equivalent of granite.

SHALE - A fine-grained detrital sedimentary rock formed by the consolidation of clay, silt, or mud.

SILTSTONE - An indurated silt having the texture and composition of shale but lacking its fine lamination.

STRATIGRAPHIC (CLASSIFICATION) - The arbitrary but systematic arrangement, zonation, or partitioning of the sequence of rock strata in a region with regard to the many different characters, properties, or attributes that the strata may possess.

STRATUM - A section of a formation that consists throughout of approximately the same kind of material. Also a layer (of sediment) that was spread out horizontally with older layers below and younger layers above.

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

TERTIARY - The first period of the Cenozoic era (after the Cretaceous of the Mesozoic era and before the Quaternary).

TUFF BRECCIA - A pyroclastic rock consisting of more or less equal amounts of ash, lapilli, and larger fragments.

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

VOLCANIC - Pertaining to the activities, structures, or rock types of a volcano. Some common minerals found in volcanic rocks are quartz, pyroxene, plagioclase, albite, biotite, calcite, chlorite, epidote, hornblende, and sericite.

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

WETLANDS - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - Areas designated under Federal or State laws as wilderness areas to be managed for their aesthetic or natural value.

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APPENDIX A

RESUMES OF SEARCH TEAM MEMBERS

DAVID R. STYERS, P.E. - HEALTH PHYSICIST

PROFESSIONAL CAPABILITIES

Twelve years experience in program management that includes test planning, system design, training and management, research and development, and quality assurance/quality control. Expertise in radiation health physics that includes field surveys, safety reviews, hazard assessments, compliance reviews, and gamma spectroscopy (radiological chemical analyses). Conduct site surveys and records searches for Installation Restoration Program (IRP) for various Air National Guard bases. Efforts include risk assessment, site prioritization, and remedial action recommendations.

EDUCATION

M.S., Health Physics, Georgia Institute of Technology, Atlanta, 1985
Certified Professional Engineer in Civil Engineering
B.S., Education (Major, Chemistry, Minor, Physics), Slippery Rock College, Slippery Rock, PA, 1964

PROFESSIONAL EXPERIENCE

1987-Present Automated Sciences Group, Inc.
Health Physicist. Manage Tumulus Chemical and Nuclear Waste Disposal Task for ASG, including monitoring activities at Demonstration Site, SWSA-6. Prepare task implementation plans, maintain master schedule, and interface with clients at Oak Ridge National Laboratory. Active participation as a team member in Hazardous Waste Environmental Audits, Waste Minimization, and USAF Installation Restoration Program Projects.

1985-1987 Oak Ridge Associated Universities
Health Physics Team Leader. Directed on-site radiation survey teams throughout the United States; provided radiation safety assistance. Conducted complex radiological assays of samples; analyzed and interpreted data; prepared comprehensive reports of results. Reviewed safety procedures and engineering plans for decontamination of nuclear facilities and environmental impact documents. Conducted hazard assessments of radionuclides. Inspected operations and facilities for compliance with regulations.

1978-1985 Pennsylvania Department of Environmental Resources
Chemist. Performed qualitative and quantitative radioassay analyses by gamma spectroscopy techniques. Prepared and disposed of radioactive standards and samples in compliance with NRC regulations. Established quality control charts for radiation analyzers. Participated in quality assurance program of EPA's Environmental Surveillance Monitoring Laboratory; achieved 98% accuracy.

1974-1978 Pennsylvania Department of Transportation
Chemist. Supervised air monitoring section of Chemical Laboratory. Evaluated and selected test site locations for air monitoring projects; trained staff in proper use of equipment. Scheduled laboratory and field testing. Designed mobile air monitoring vans. Prepared reports on air monitoring testing and research.

1968-1974 Pennsylvania Department of Transportation
Chemist. Supervised and performed qualitative and quantitative chemical monitoring activities.

1965-1968 Fairview Township Schools
Teacher. College preparatory Chemistry and Physics.

MEMBERSHIPS

American Nuclear Society
Health Physics Society

CLEARANCE

DOE-Q

AUTOMATED SCIENCES GROUP, INC.

WILLIAM L. CONDRA - SENIOR ENVIRONMENTAL ENGINEER

PROFESSIONAL SUMMARY

Over 23 years of experience in hazardous waste management involving sampling, coordinating resources, and managing the clean-up of hazardous chemical spills; hazardous waste minimization projects for various Naval facilities as mandated by DOD's Naval Energy and Environmental Support Activity (NEESA) and DOE's Hazardous Waste Remedial Actions Program (HAZWRAP); and site surveys and record searches for the Installation Restoration Program (IRP) for Air National Guard bases. Primary capabilities include extensive personnel and program management, scientific, engineering, and economic analyses of hazardous environments, industrial process analyses, performance of preliminary assessments, and environmental sampling and analytical protocol, including chain of custody.

EDUCATION

M.S., Industrial Technologies/Environmental and Safety Studies, Middle Tennessee State University, 1985
B.S., Chemistry, Middle Tennessee State University, 1961
Certified Hazardous Materials Manager, 1986
Certified Hazardous Materials Technician, 1986
Certified Practices and Procedures for Asbestos Control, 1986
Registered Professional Environmentalist, 1976

PROFESSIONAL EXPERIENCE

1988-Present Automated Sciences Group, Inc.
Senior Environmental Engineer, Hazardous Waste Minimization for Robins Air Force Base. Managerial responsibilities involve coordination, project review, and manpower/cost requirements determination. Environmental responsibilities include conducting Hazardous Waste Minimization Surveys at U.S. Air Force bases, investigations, audits, operational analyses, and hazardous waste sampling, in addition to conducting preliminary assessments at Air National Guard bases. Conduct installation records reviews; prepare environmental reports; maintain liaison with support contractors and client; provide coordination with state and federal agencies; and advise the client and ASG on compliance with EPA, DOT, and OSHA regulations.

1987-1988 The EC Corporation, Knoxville
Project Manager/Senior Environmental Engineer. Managed contractual projects for optimizing hazardous waste generation and facility retrofitting for Hard Chrome Plating operations at Naval facilities. Supervised engineers and provided coordination with Naval facility representatives to ensure completion of contract Statement of Work requirements for Naval Energy and Environmental Support Activity (NEESA).

1981-1987 Arnold Engineering Development Center (AECD), Tullahoma
Environmental Specialist. Responsible for interpreting and ensuring compliance of AEDC's environmental program with applicable state, federal (EPA, OSHA, DOT), and Air Force regulations. Activities included supervising, coordinating, consulting, statistical monitoring, inspecting, sampling, and reporting environmental accomplishments and discrepancies to proper Air Force and associated contractor personnel. Served as a specialist in the chemistry of toxic and hazardous waste. Investigated oil and hazardous chemical spill releases and managed the disposal of hazardous waste chemicals. Initiated cost savings of $80,000 to U.S. Air Force.

1974-1981 State of Tennessee, Bradley County Health Department
Environmentalist II/Chemist II. Supervised, promoted, and inspected projects for compliance with Tennessee environmental regulations. Managed startup of an analytical laboratory for monitoring water quality in public school system including potable water and domestic sewage.

1965-1974 Beaunit Fibers, Inc., Etowah, TN
Senior Chemical Control Engineer/Chemical Laboratory Area Supervisor. Responsible for improving Nylon 6/6 polymerization process performance and yield through process modifications involving polymerization rate studies and lubricant formulation changes. Implemented startup of a manageable quality control program resulting in an annual savings of $900,000. Coordinated customer complaints with manufacturing process engineers for corrective actions. Supervised and managed startup of an analytical laboratory and additive preparation area with an annual budget of $1M.

1961-1965 B.F. Goodrich Chemical Company, Calvert City, KY
Chemist. Supervised laboratory technicians; developed procedures for gas chromatography and wet chemistry techniques. Implemented quality control testing for incoming raw materials and finished products.

AFFILIATIONS

Institute of Hazardous Materials Management
Institute for Environmental Career Advancement
Tennessee Department of Health and Environment

CITIZENSHIP

U.S.

CLEARANCE

DOD - Secret (Inactive)

T. WARD DILWORTH - ENGINEER

PROFESSIONAL CAPABILITIES

Combined background in Geology and Civil Engineering with emphasis on the geotechnical and environmental difficulties encountered in soil, rock, ground water, and similar hydrologic situations. Experience in preparation of proposals and technical reports and laboratory and field testing of soils and concrete. Assist in the conduct of site surveys and records searches for Installation Restoration Program (IRP) for various Air National Guard bases. Efforts include data compilation, risk assessment, site idetification, and site prioritization.

EDUCATION

B.A., Geology, University of Tennessee, 1984
B.S., Civil Engineering, University of Tennessee, 1987
Engineer In Training (E.I.T) Certification, State of Tennessee, 1987

PROFESSIONAL EXPERIENCE

1987 - Present Automated Sciences Group, Inc.
Engineer. Involved in Martin Marietta's site characterization investigations for the low-level waste disposal demonstration project. Duties encompass part of the ground-water characterization for the project and include monitoring ground-water levels on three sites, recording well details as they are finished, and transfer of collected data.

Also involved in development of ground-water computer modeling program. Assisted in survey of certain buildings at ORGDP to obtain information used to place those buildings in safe storage. Engaged in studies involving underground waste storage tanks, and assigned to five Preliminary Assessment projects for the Installation Restoration Program (IRP) for the Air National Guard Bureau (ANGB).

1986 - 1987 Law Engineering
Engineering Aide, Laboratory and Field Technician. Assisted senior engineering staff in preparation of technical reports and proposals. Checked field reports, prepared engineering drawings, and provided input on geologic considerations included in reports and proposals. Conducted laboratory and field tests on soil (in situ density, proctor test, freeze/thaw and wet/dry cycles on soil-cement samples, water content, and collecting bag samples) and concrete (compression testing of cylinders, making concrete cylinders, making grout cubes, slump testing, air content, density/unit weight). Assisted drilling crew in auger drilling operations and laying out borehole locations.

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

CONTACT LIST FOR LOCAL, STATE, AND NATIONAL AGENCIES

Soil Conservation Service
1281 Terminal Way, Suite 204
Reno, NV 89502
(702) 784-5408
Information Obtained: Soil Survey of Washoe County, South Part.

Washoe County Department of Comprehensive Planning
450 Sinclair
Reno, NV 89502
(702) 785-2350
Information Obtained: Zoning Maps, Flood Zone Maps.

Washoe County Health Department
1001 East 9th Street
Reno, NV 89502
(702) 328-2400
Information Obtained: Locations of some water supply wells, sampling and pumping data on same wells.

Nevada Bureau of Mines and Geology (Publications Office)
Mackay School of Mines
University of Nevada
Reno, NV 89507
(702) 784-6691
Information Obtained: Geologic maps, hydrologic maps, several geologic and hydrogeologic reports.

U.S. Geological Survey, Water Resources Division
705 North Plaza Room 224
Carson City, NV 89701
(702) 882-1388
Information Obtained: Basic hydrologic and geologic information on Nevada.

State of Nevada Division of Water Resources
201 South Fall Street, Room 211
Carson City, NV 89710
Information Obtained: Well locations, well logs.

National Climatic Data Center
Federal Building
Asheville, NC 28801
(704) 259-0682
Information Obtained: Climate/Meteorological Information.

Westpac - Sierra Water
P.O. Box 30028
Reno, NV 89520
(702) 689-4727 (Rick Moser)

Information Obtained: Quantities for water usage in the Reno-Sparks area.

Nevada Natural Heritage Program
201 South Fall Street
Carson City, NV 89710
(702) 885-4370

Information Obtained: Locations of potential areas of concern such as critical habitats, sensitive environments, and wetlands.

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

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

> 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), using information gathered during the Preliminary Assessment of its Installation Restoration Program (IRP), has sought to establish a system of priorities for taking actions at identified sites.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites suspected of contamination from hazardous substances. This model will assist the Air National Guard (ANG) 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 (i.e., hazardous wastes are 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 other hazardous waste site ranking models, the USAF 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 Preliminary Assessment portion 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 by using the appropriate ranking factors according to the method presented in the flow chart (see Figure 1). 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 specific sites: 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 1000 feet of the site and the distance between the site and the Base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within three miles of the site. The uses of the surrounding area are determined by the zoning within a one mile radius. Determination of whether or not critical environments exist within a one 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: receptor 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 ground-water migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned; and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no contaminant are not reduced. Scores for sites with limited 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 factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

	Rating Scale Levels				
Rating Factors	0	1	2	3	Multiplier
A. Population within 1,000 ft	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 mile	1 to 3 mile	3,001 ft to 1 mile	0 to 3,000 ft	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered species; threatened species; presence of recharge area; major wetlands	10

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Scale Levels

Rating Factors	0	1	2	3	Multiplier
F. Water quality / use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

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

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

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

S = Suspected confidence level

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

A-3 Hazard Rating

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

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

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

II. WASTE CHARACTERISTICS - Continued

Waste Characteristics Matrix

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

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

Confidence Level

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

Waste Hazard Rating

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

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

B. Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, 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 0	1	2	3	Multiplier
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	8
Net Precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (or number of Thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

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

B-3 Potential for Ground-Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

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

APPENDIX D

HAZARDOUS ASSESSMENT RATING FORM

Name of Site Site No. 1, Fire Training Area #1 - 152nd TRG, NV ANG

Location 600 Feet East of Runway 34L, 400 Feet North of Old Engine Run-Up Pad

Date of Operation or Occurrence 1952-1956/1960-1965

Owner/Operator Airport/Guard

Comments/Description Off Base

Site Rated By Automated Sciences Group, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft of site	1	4	4	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

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) H

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

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

Site (Cont.) No. 1

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	46	108

Subscore (100 x factor score subtotal/maximum score subtotal) 43

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	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 43

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	90
Pathways	43
Total 185 divided by 3 =	62
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

62 x 1.0 = 62

HAZARDOUS ASSESSMENT RATING FORM

Name of Site Site No. 2, Fire Training Area #2, 152nd TRG, NV ANG

Location A2 of Parking Apron

Date of Operation or Occurrence 1956-1960

Owner/Operator Airport/Guard

Comments/Description On Base

Site Rated By Automated Sciences Group, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

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) H

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

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	32	108

Subscore (100 x factor score subtotal/maximum score subtotal) 30

2. Flooding

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to groundwater	0	8	0	24
		Subtotals	64	114

Subscore (100 x factor score subtotal/maximum score subtotal) 56

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

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	72
Pathways	56
Total 185 divided by 3 =	62
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

62 x 1.0 = 62

HAZARDOUS ASSESSMENT RATING FORM

Name of Site Site No. 3, Fire Training Area #3, 152nd TRG, NV ANG

Location Airport Authority Parking Lot, 200 Feet Northwest of North Gate

Date of Operation or Occurrence 1964-1971

Owner/Operator Airport/Guard

Comments/Description Off Base

Site Rated By Automated Sciences Group, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
Subtotals			102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

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) H

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

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	32	108

Subscore (100 x factor score subtotal/maximum score subtotal) 30

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	24
		Subtotals	56	114

Subscore (100 x factor score subtotal/maximum score subtotal) 49

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

Pathways Subscore 49

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	90
Pathways	49
Total 196 divided by 3 =	65
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

65 x 1.0 = 65

HAZARDOUS ASSESSMENT RATING FORM

Name of Site Site No. 4, Fire Training Area #4, 152nd TRG, NV ANG
Location Training Field, South of Building 88
Date of Operation or Occurrence 1970-1973
Owner/Operator Airport/Guard
Comments/Description On Base
Site Rated By Automated Sciences Group, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 ft of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

60 x 0.9 = 54

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	32	108

Subscore (100 x factor score subtotal/maximum score subtotal) 30

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	24
		Subtotals	56	114

Subscore (100 x factor score subtotal/maximum score subtotal) 49

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

Pathways Subscore 49

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	54
Pathways	49
Total 160 divided by 3 =	53
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

53 x 1.0 = 53

HAZARDOUS ASSESSMENT RATING FORM

ame of Site Site No. 5, Fire Training Area #5, 152nd TRG, NV ANG
ocation Southeast Corner of Parking Lot, North Gate
ate of Operation or Occurrence 1970-1977
wner/Operator Airport/Guard
omments/Description On Base
ite Rated By Automated Sciences Group, Inc.

. RECEPTORS

ating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
. Population within 1,000 ft of site	3	4	12	12
. Distance to nearest water well	3	10	30	30
. Land use/zoning within 1 mile radius	3	3	9	9
. Distance to installation boundary	3	6	18	18
. Critical environments within 1 mile radius of site	0	10	0	30
. Water quality of nearest surface water body	0	6	0	18
. Groundwater use of uppermost aquifer	1	9	9	27
. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

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

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

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	32	108

Subscore (100 x factor score subtotal/maximum score subtotal) 30

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to groundwater	0	8	0	24
		Subtotals	40	114

Subscore (100 x factor score subtotal/maximum score subtotal) 49

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

Pathways Subscore 49

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	72
Pathways	49

Total 178 divided by 3 = 59
Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

59 x 1.0 = 59

HAZARDOUS ASSESSMENT RATING FORM

ame of Site Site No. 6, Fire Training Area #6, 152nd TRG, NV ANG

ocation Southwest quadrant of Cannon International Airport

ate of Operation or Occurrence 1975-1985

wner/Operator Airport/Guard

omments/Description Off Base

ite Rated By Automated Sciences Group, Inc.

. RECEPTORS

ating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
. Population within 1,000 ft of site	1	4	4	12
. Distance to nearest water well	3	10	30	30
. Land use/zoning within 1 mile radius	3	3	9	9
. Distance to installation boundary	3	6	18	18
. Critical environments within 1 mile radius of site	0	10	0	30
. Water quality of nearest surface water body	0	6	0	18
. Groundwater use of uppermost aquifer	1	9	9	27
. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

I. 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) H

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

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

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

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

Subscore 80

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
Subtotals			46	108

Subscore (100 x factor score subtotal/maximum score subtotal) 43

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	0	8	0	24
Subtotals			40	114

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

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	90
Pathways	80
Total 222 divided by 3 =	74
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score 74 x 1.0 = 74

HAZARDOUS ASSESSMENT RATING FORM

ame of Site Site No. 7, POL Storage Facility, 152nd TRG, NV ANG
ocation Building #6
ate of Operation or Occurrence 1948 - Present
wner/Operator Airport/Guard
omments/Description On Base
ite Rated By Automated Sciences Group, Inc.

. RECEPTORS

ating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
. Population within 1,000 ft of site	3	4	12	12
. Distance to nearest water well	3	10	30	30
. Land use/zoning within 1 mile radius	3	3	9	9
. Distance to installation boundary	3	6	18	18
. Critical enironments within 1 mile radius of site	0	10	0	30
. Water quality of nearest surface water body	0	6	0	18
. Groundwater use of uppermost aquifer	1	9	9	27
. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
. Population served by groundwater supply within 3 miles of site	3	6	18	18
Subtotals			102	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 57

I. 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) H

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

B. Apply persistence factor

Factor Subscore A x Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

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

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

Subscore 0

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

1. Surface Water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	32	108

Subscore (100 x factor score subtotal/maximum score subtotal) 30

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

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	3	8	24	24
Net precipitation	0	6	0	18
Soil permeability	3	8	24	24
Subsurface flows	3	8	24	24
Direct access to groundwater	0	8	0	24
		Subtotals	72	114

Subscore (100 x factor score subtotal/maximum score subtotal) 63

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

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	90
Pathways	63
Total 210 divided by 3 =	70
	Gross Total Score

B. Apply factor for waste contaminant from waste management practices
Gross Total Score x Waste Management Practices Factor = Final Score

70 x 1.0 = 70

Nevada Air National Guard
152nd Tactical Reconnaissance Group
Reno Cannon International Airport
Reno, Nevada
USAF Hazard Assessment Rating Methodology
Rating Factor Criteria

The following is a summary and explanation of the rating factor criteria used to score the Base sites under HARM. The majority of the factors in the receptors and pathway categories are the same for each of the rated sites and are therefore stated only once. In those instances where a rating factor varies according to a specific site, the factor is addressed separately for each of the respective sites.

I. RECEPTORS

A. Population Within 1000 Feet Of Site. Factor Rating 3 for Sites No. 2-5. Including the Base population, there are greater than 100 persons within 1000 feet of each rated site. For Sites 1 and 6, there are estimated to be 1-25 people within 1000 feet of these sites, thus resulting in a Factor Rating 1 for these sites.

B. Distance To Nearest Well. Factor Rating 3. According to well records for Washoe County, there is a private domestic well within 3000 feet of each site.

C. Land Use/Zoning (Within One Mile Radius). Factor Rating 3. Although a majority of the land use is commercial/industrial, there are several parcels of land designated as residential.

D. Distance To Installation Boundary. Factor Rating 3. All the rated sites are within 1000 feet of the Base boundaries.

E. Critical Environments (Within One Mile Radius Of Site). Factor Rating 0. No critical environments exist within a one mile radius of any of the sites.

F. Water Quality/Use Designation of Nearest Surface Water Body. Factor Rating 0. The nearest surface water bodies in the vicinity of the Base are irrigation and/or drainage ditches. These are utilized for agricultural use only.

G. Ground-water Use of Uppermost Aquifer. Factor Rating 1. The uppermost aquifer is used primarily for commercial, industrial, or irrigation purposes.

H. Population Served By Surface Water Supplies Within 3 Miles Downstream of The Site. Factor Rating 1. Surface waters within 3 miles downstream of the Base are used as drinking water sources by an estimated 1 to 50 people.

I. Population Served By Aquifer Supplies Within 3 Miles Of The Site. Factor Rating 3. Although the local municipality supplies most of the drinking water in the vicinity of the Base, there is evidence to indicate that a population greater than 1000 are being served by ground water from domestic wells.

II. WASTE CHARACTERISTICS

Site No.1:

- A-1: Hazardous Waste Quantity - Factor Rating L. It was estimated that up to 6500-gallons of waste may have percolated into the ground over the 9-year time period that this site was in use.

- A-2: Confidence Level - Factor Rating C. This is based on the knowledge of the known types of materials used at this site.

- o A-3: Hazard Rating - Factor Rating H. The hazard rating at this site is based on JP-4 toxicity. JP-4 has a Sax toxicity of 3 which corresponds to a HARM hazard rating of 3.

Site No. 2:

- o A-1: Hazardous Waste Quantity - Factor Rating M. It was estimated that up to 1800-gallons may have percolated into the ground over the 4-year time period that this site was in use.

- o A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- o A-3: Hazardous Rating - Factor Rating H. See Site No. 1, Section A-3.

Site No. 3:

- o A-1: Hazardous Waste Quantity - Factor Rating L. It was estimated that up to 6300-gallons may have percolated into the ground over the 6-year time period that this site was in use.

- o A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- o A-3: Hazard Rating - Factor Rating H. See Site No. 1, Section A-3.

Site No. 4:

- o A-1: Hazardous Waste Quantity - Factor Rating S. It was estimated that up to 270-gallons of waste may have percolated into the ground at this site over the 3-year time period that this site was in use.

- A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- A-3: Hazardous Rating - Factor Rating H. See Site No. 1, Section A-3.

Site No. 5:

- A-1: Hazardous Waste Quantity - Factor Rating M. It is estimated that up to 3200-gallons of waste may have percolated into the ground at this site over the 7-year time period that it was in use.

- A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- A-3: Hazardous Rating - Factor Rating H. See Site 1, Section A-3.

Site No. 6:

- A-1: Hazardous Waste Quality - Factor Rating L. The quantity of waste estimated to have infiltrated into the ground at this site was approximately 17,000-gallons over the 10 year time period that this site was in use.

- A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- A-3: Hazard Rating - Factor Rating H. See Site No. 1, Section A-3.

Site No. 7:

- A-1: Hazardous Waste Quantity - Factor Rating L. The quantity of contaminants present at this site is not accurately known, but it should be above the 85 drum lower limit for the large quantity category.

- A-2: Confidence Level - Factor Rating C. See Site No. 1, Section A-2.

- A-3: Hazard Rating - Factor Rating H. See Site 1, Section A-3.

For All HARM Rated Sites:

B. Persistence Multiplier - Factor Rating 0.9. JP-4 falls within the category of substituted and other ring compounds.

C. Physical State Multiplier - Factor Rating 1.0. The materials released at each site were in a liquid state.

III. PATHWAYS CATEGORY

A. Evidence of Contamination.

Sites No. 1-5, 7, and 8: Factor Rating 0 - No Evidence. There is no direct or indirect evidence that contaminants are migrating from these sites.

Site No. 6: Factor Rating 80 - Indirect Evidence. There was visible evidence of ground staining at this site.

B-1 Potential for Surface Water Contamination

- Distances to Nearest Surface Water (includes Drainage Ditches and Storm Sewers): Factor Rating 3. Each of the identified sites on the Base are within 500 feet of surface water.

- Net Precipitation: Factor Rating 0. Net precipitation at this Base is less than -10 inches per year.

- Soil Erosion:

  Sites No. 1, 6, and 7: Factor Rating 1. There were no visible signs of significant erosion at these sites.

  For Sites No. 2-5, and 8: Factor Rating 0. Four of the FTA's (Sites No. 2-5) have been partially graded so the surface of contaminated material, if it exists, would be covered by graded fill. Site No. 8 showed no signs whatsoever of erosion.

- Surface Permeability: Factor Rating 0 for Sites No. 2-5, 7, and 8. All of these sites are located in soils which generally have 5 to 12% clay content. Factor Rating 1 for Sites No. 1 and 6. These two sites are located in soils which typically have 12 to 18% clay content.

- Rainfall Intensity Based On 1-Year, 24-Hour Rainfall: Factor Rating 1. The 1-year, 24-hour rainfall value is 1.5 inches.

B-2 Potential for Flooding: Factor Rating 0. According to the Flood Insurance Rate Map (FIRM) for the National Flood Insurance Program, the Base does not lie within a 100-year floodplain.

B-3 Potential for ground-water Contaminations.

- Depth to ground water: Factor Rating 3. Base records and past excavations on the Base indicate a shallow water table of less than 10 feet in most places under the Base.

- Net Precipitation: Factor Rating 0. See B-1.

- Soil Permeability:

  Sites No. 2-5, 7, and 8: Factor Rating 0. The average clay content is less than 10%.

  Sites No. 1 and 6: Factor Rating 2. The average clay content is around 15 to 18%.

- Subsurface Flows:

  Site No. 6: Factor Rating 0. This site is approximately five or more feet above the high ground-water level.

  Sites No. 1, 3-5, and 7: Factor Rating 1. These sites may occasionally become submerged.

  Site No. 2: Factor Rating 2. This site is located beneath the north end of the parking apron and may be deep enough so that the bottom of this site may become submerged quite frequently.

Site No. 8: Factor Rating 3. Since this site exists several feet down from the ground surface, it is most likely located bel w the mean water table which is generally three to eight feet down.

o Direct Access To Groundwater: Factor Rating 0. There is no evidence of direct access to ground water at any of the sites.

IV. WASTE MANAGEMENT PRACTICES CATEGORY

Waste Management Factor Multiplier: 1.0. There are no forms of contaminant containment at the HARM scored sites.

APPENDIX E

UNDERGROUND STORAGE TANK SURVEY

UNDERGROUND STORAGE TANK SURVEY

This appendix is a general survey of the underground storage tanks on the NVANG Base at the Reno Cannon International Airport. The following table lists these tanks, their location, size, age, contents, and building or facility served. The accompanying listing from the NVANG also addresses type of construction, protection, date taken out of service (if abandoned), and record of leaks.

Table 7. Underground Storage Tank Listing for NVANG, Reno, Nevada*

Tank No.	Building No.	Capacity (gallons)	Years in ground	Contents	Facility served
2	2	1500	35	#2 htg. oil	AGE
4	4	285	9	#2 htg. oil	Chapel
9-1	9	6000	1	#2 htg. oil	Aircraft Hanger
9-2	9	6000	1	#2 htg. oil	Aircraft Hanger
13-1	13	5000	13	Diesel	Vehicle Maint. Shop
13-2	13	5000	31	Gasoline	Vehicle Maint. Shop
13-3	13	5000	31	Gasoline	Vehicle Maint. Shop
13-4	13	250	13	Used Oil	Vehicle Maint. Shop
13-5	13	1000	13	Used Oil	Vehicle Maint. Shop
42-1	42	25,000	31	JP-4	Aviation Fuel Dispensing
42-2	42	25,000	31	JP-4	Aviation Fuel Dispensing
42-3	42	25,000	31	JP-4	Aviation Fuel Dispensing
42-4	42	25,000	31	JP-4	Aviation Fuel Dispensing
56	56	3000	20	#2 htg. oil	Support Services
72	72	1000	11	#2 htg. oil	POL Shop
76	76	3000	10	#2 htg. oil	Avionics
82-1	82	400	11	Detergent	Fuel Cell Maint. Hanger
82-2	82	3000	10	#2 htg. oil	Fuel Cell Maint. Hanger
82-3	82	1000	11	Used oil	Fuel Cell Maint. Hanger
82-4	82	350	11	Used oil	Fuel Cell Maint. Hanger
82-5	82	250	11	Used oil	Fuel Cell Maint. Hanger
84	84	4000	9	#2 htg. oil	Squadron Operations
90	90	1000	3	#2 htg. oil	Info. Systems Flight

* All storage tanks are currently in active use.

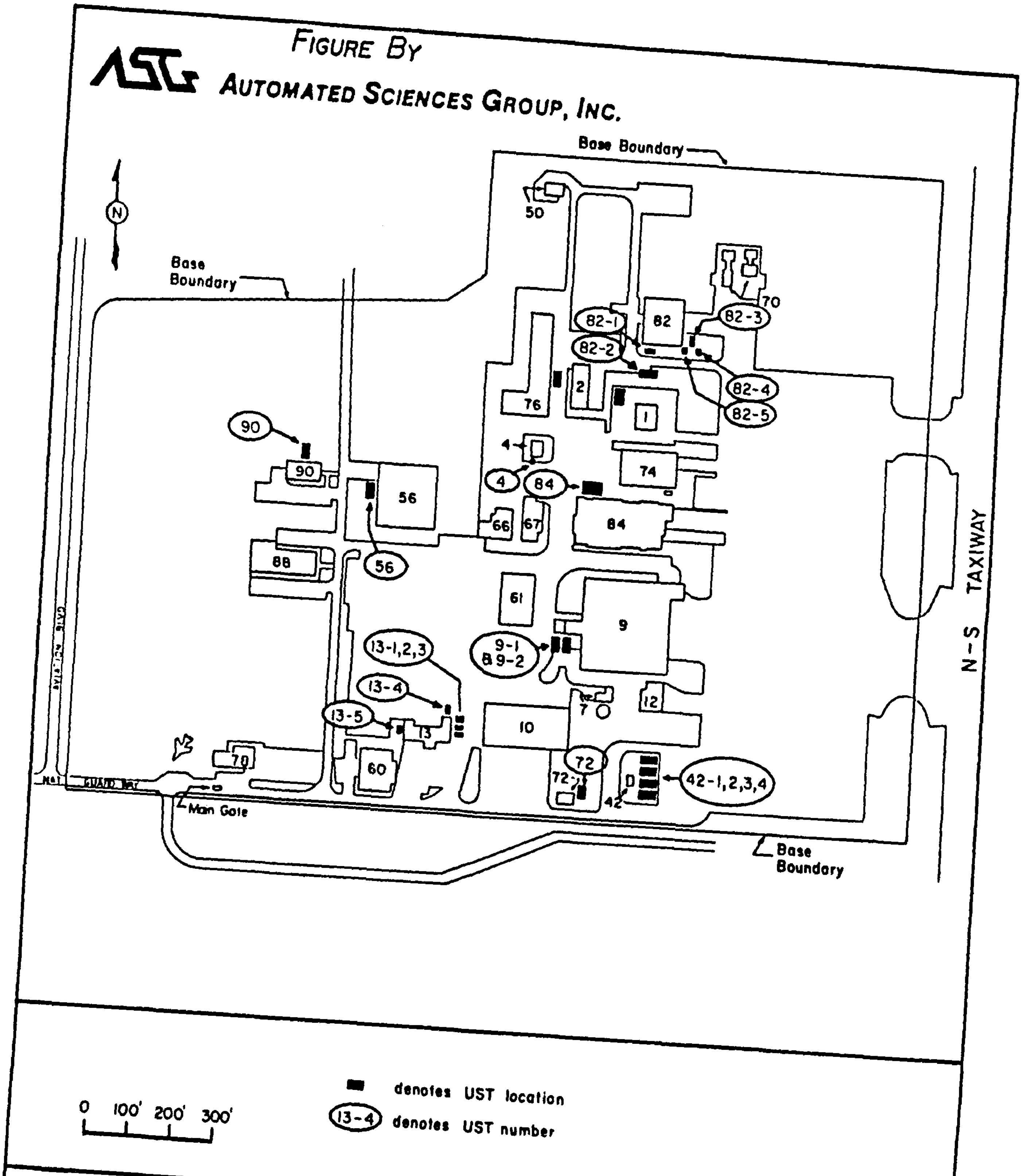

Figure 12. Location Map for Underground Storage Tanks at the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

APPENDIX F

BASE SPECIFIC SOIL DATA

Base Specific Soil Data for the NVANG Base,
152nd TRG, Reno Cannon International Airport,
Reno, Nevada

Several subsurface investigations have been performed at the Base over its history. The records of these investigations are kept at the Base in the Civil Engineering files. The following data were summarized from some of the above-mentioned records. Soil borings and test pits were drilled/dug for these investigations and those deemed pertinent to this report are presented here. Locations of these soil investigations are shown in Figure 13.

- Boring AP-4 (Source: U.S. Army Corps of Engineers, ANG Facility Site Plan and Building Layout, Logs of Borings ANG Area, Tolenco Engineers Inc., 1954).

  Surface elevation: 4400.27 feet above mean sea level (MSL)
  Depth to water: first water at 4.0 feet, equalized at 1.7 feet
  Date of investigation: Spring, 1954

  Depth from surface (ft):

From	To	Description of material encountered
0.0	0.5	Gray silty clay
0.5	1.7	Brown gray clayey silt
1.7	2.2	Brown organic clay
2.2	3.4	Green gray sandy clay
3.4	3.8	Green and gray gravel-clay sand
3.8	5.7	Dark gray medium sand
5.7	6.3	Dark gray gravelly sand
6.3	8.5	Dark gray medium sand
8.5	9.7	Dark gray gravelly sand
9.7	10.0	Brown fine to coarse sand

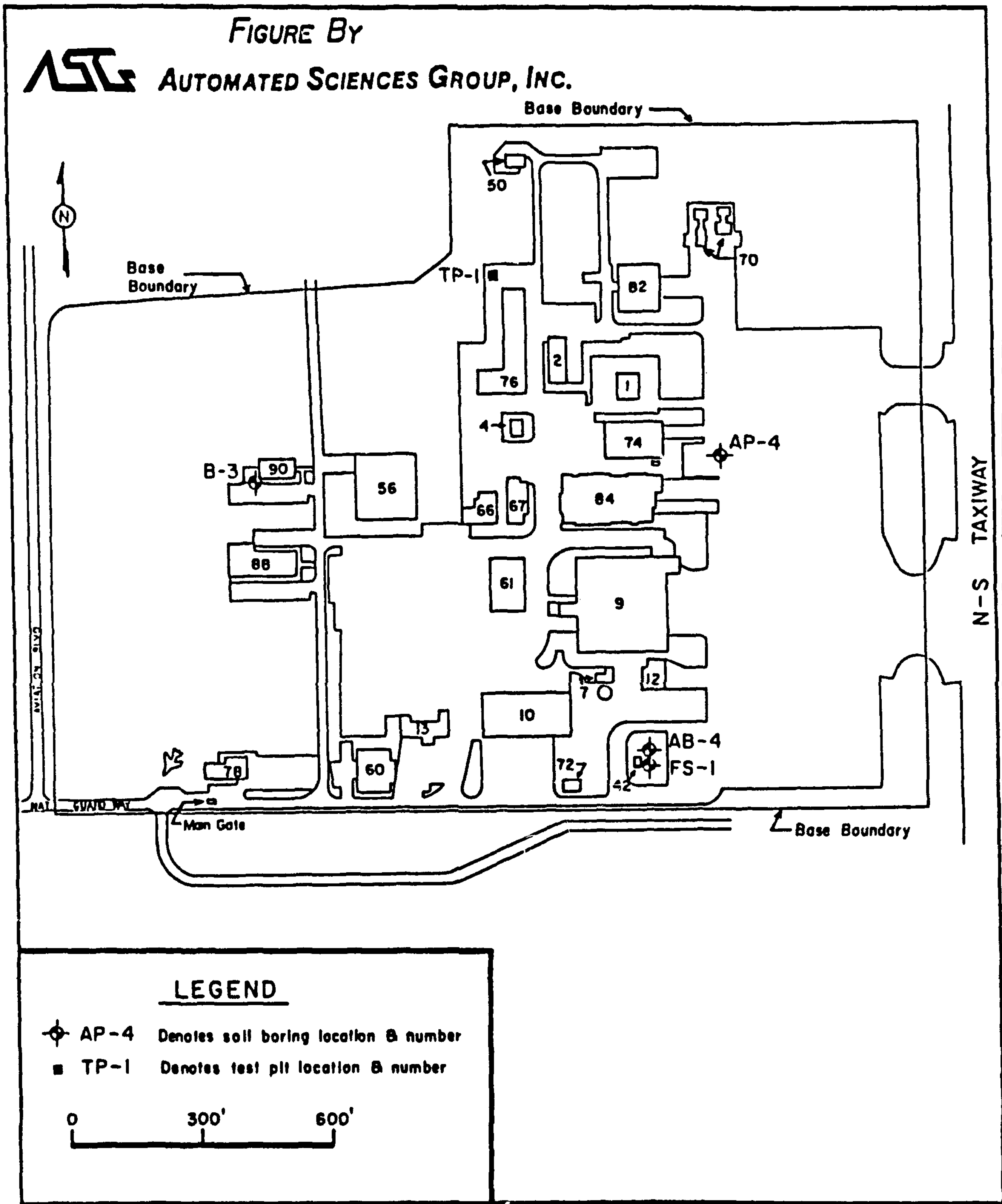

Figure 13. Locations of Some Soil Borings and Test Pits on the NVANG Base, 152nd TRG, Reno Cannon International Airport, Reno, Nevada (1988).

- Boring FS-1 (Source: U.S. Army Corps of Engineers, ANG Facility Site Plan and Building Layout, Logs of Borings ANG Area, Tolenco Engineers Inc., 1954).

  Surface elevation: 4399.44 feet above MSL
  Depth to water: first water at 5.5 feet
  Date of investigation: Spring, 1954

  Depth from surface (ft):

From	To	Description of material encountered
0.0	2.7	Light brown organic silty clay
2.7	3.0	Brown organic clay
3.0	3.9	Brown organic clay hard pan
3.9	5.0	Brown gray organic sandy clay
5.0	5.5	Brown organic clayey sand
5.5	7.2	Gray and green clayey sand
7.2	7.3	Brown silty clay
7.3	8.4	Green clayey sand
8.4	8.7	Brown silty fine sand
8.7	9.5	Green silty fine sand
9.5	9.8	Brown gray and green silty fine sand
9.8	11.2	Brown coarse sand

- Boring AB-4 (Source: U.S. Army Corps of Engineers, ANG Facility Site Plan and Building Layout, Logs of Borings ANG Area, Tolenco Engineers Inc., 1954).

  Surface elevation: 4399.44 feet above MSL
  Depth to water: first water at 9.0 feet, equalized at 0.5 feet
  Date of investigation: Spring, 1954

  Depth from surface (ft):

From	To	Description of material encountered
0.0	0.5	Gray silt
0.5	2.5	Gray organic clay

- Boring AB-4 (Continued)

Depth from surface (ft):

From	To	Description of material encountered
2.5	3.8	Brown organic clay
3.8	5.0	Brown and gray clay
5.0	5.6	Brown and gray organic clayey sand
5.6	6.0	Brown gray and green clayey sand
6.0	7.2	Green gray silty sand
7.2	8.0	Green clayey sand
8.0	10.5	Brown fine sand
10.5	11.0	Brown gray sand
11.0	12.0	Gray gravelly sand
12.0	16.0	Gray sandy gravel (gravel caved in hole back to 13 feet)

- Boring B-3 (Source: NVANG, 152 TAG, Geotechnical Investigation of the Telecommunications Center, Pezonella Associates, 1981)

Surface elevation: Unknown
Depth to water: 6.3 feet on 1-9-81
Date of investigation: 1-9-81

Depth from surface (ft):

From	To	Description of material encountered
0.0	5.0	Brown sandy silt (classified as ML*) medium stiff, moist. Blows/ft = 27
5.0	7.2	Mottled orange-brown silty sand (SM*) medium dense, wet (water content = 19.5%) Dry density = 109 pound per cubic foot. Percent passing No. 200 sieve = 27
7.2	10.0	Gray-black sand (SP*) medium dense, saturated

* Using the Unified Soil Classification System

o Test Pit TP-1 (Source: NVANG, 152 TAG, <u>Soils Geotechnical Engineering Report for the ECM Addition to the Avionics/NDI Facility</u>, Earth Sciences Consultant Assoc., 1981).

Surface elevation:
Depth to water: 7.8 feet on 4-27-81
Date of investigation: 4-27-81

Depth from surface (ft):

From	To	Description of material encountered
0.0	1.0	Fill-gravelly clayey sand slightly compact gray with asphalt/concrete debris and organics
1.0	1.2	Peat
1.2	4.5	Clay-stiff, gray
4.5	4.9	Sandy clay-stiff, gray, mottled
4.9	5.7	Gravelly sand-slightly compact, gray brown slightly clayey, mottled
5.7	6.5	Clayey fine sand-loose gray mottled
6.5	7.0	Fine gravelly sand-compact, gray brown, mottled
7.0	8.0	Clayey fine sand-compact, gray brown
8.0	9.0	Gravelly sand-compact, brown, with some small cobbles