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INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

216th Engineering Installation Squadron
and
234th Combat Communications Squadron

Hayward Air National Guard Station
California Air National Guard
Hayward, California

January 1991

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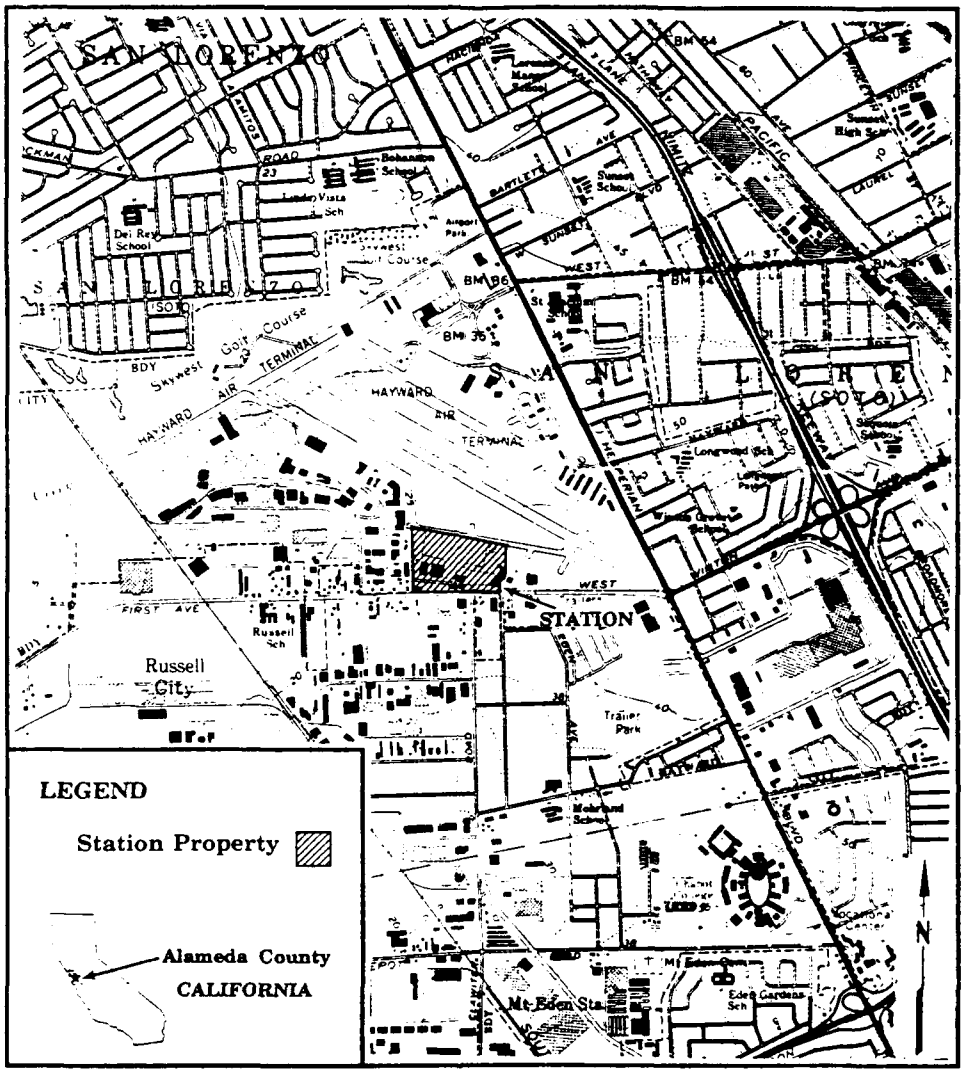

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Preliminary environmental investigation for the Hayward Air National Guard Station located in Hayward, California. The report reflects data collected by records review interviews, and site investigation. Three sites were identified as potentially contaminated and recommended for further investigation.

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

216th ENGINEERING INSTALLATION SQUADRON
234th COMBAT COMMUNICATIONS SQUADRON
HAYWARD AIR NATIONAL GUARD STATION
CALIFORNIA AIR NATIONAL GUARD
HAYWARD, CALIFORNIA

Prepared for

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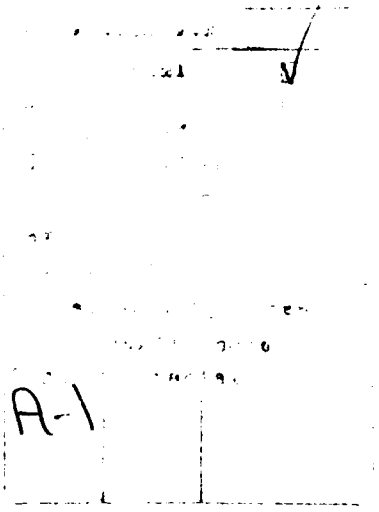

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ACRONYM LIST

AGE	Aerospace Ground Equipment
AVGAS	Aviation Gasoline
CCSQ	Combat Communications Squadron
CERCLA	Comprehensive Environmental Restoration, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EIS	Engineering Installation Squadron
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
HARM	Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Remedial Actions Program
IRP	Installation Restoration Program
JP-4	Jet Fuel
MAP	Municipal Airport
MOGAS	Automobile Gasoline
NDDB	Natural Diversity Data Base
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PCB	Polychlorinated Biphenyl
PL	Public Law
POC	Point of Contact
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
USAF	United States Air Force
USC	United States Code
UTA	Unit Training Assembly

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 216th Engineering Installation Squadron (EIS) and the 234th Combat Communications Squadron (CCSQ), Hayward Air National Guard Station [hereinafter referred to as the Station] located at Hayward, California. For the purpose of this document, the Station shall include the total area leased by the 216th EIS and the 234th CCSQ at Hayward, California.

The PA included the following activities:

- o an on-site visit, including interviews with a total of 17 persons familiar with Station operations, and field surveys by SciTek representatives during April 23 through May 4, 1990;
- o acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;
- o acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and
- o the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 216th EIS and the 234th CCSQ have used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1982.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenance and maintenance of aerospace ground equipment (AGE). The hazardous wastes disposed of through these operations include varying quantities of fuels, acids, paints, thinners, strippers, solvents, and oils.

The field surveys and interviews resulted in three sites being identified that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are three sites where a potential for contaminant presence exists. These are as follows:

Site No. 1 - FTA at City Fire Station (HAS - 84)

Site No. 2 - FTA at the Industrial Park (HAS - 84)

Site No. 3 - FTA at End of Runway (HAS - 75)

D. RECOMMENDATIONS

Further work under the IRP is recommended for the three identified sites to determine the presence or absence of contamination.

I. INTRODUCTION

A. Background

The 216th Engineering Installation Squadron (EIS) and the 234th Combat Communications Squadron (CCSQ), Hayward Air National Guard Station [hereinafter referred to as the Station] is located at Hayward, California. The 216th EIS and the 234th CCSQ have been active at their present location since 1982. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

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

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

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

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

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

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

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

- **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

  The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to

provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

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

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

2. **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.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an

installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in 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**

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

- **Immediate Action Alternatives**

At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, 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 IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Station property.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

- o an on-site visit and field surveys during the period April 23 through May 4, 1990;
- o acquisition of records and information on hazardous materials use and waste handling practices;
- o acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;
- o a review and analysis of all information obtained; and
- o preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Ray S. Clark, Civil/Environmental Engineer; Mr. P. J. McMullen, Geologist/Hydrogeologist; and Mr. Jack D. Wheat, Geologist. Ms. Carol Ann Beda of the NGB is Project Officer for this Station and participated in the overall assessment during the Station visit. Mr. Bob Combs of the Hazardous Waste Remedial Actions Program (HAZWRAP) also participated in the Station visit.

The point of contact (POC) at the Station was Captain Gideon (Detachment Commander).

D. Methodology

The PA began with a visit to the Station to identify all operations that may have utilized hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

A total of 17 current and past Station employees familiar with the various operating procedures were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 15 years and ranged from 1 to 28 years. Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal and state agencies. A listing of federal and state agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, three potential sites were identified to be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored and assigned a Hazard Assessment Score (HAS) using the Air Force Hazard Assessment Rating Methodology (HARM). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather, may indicate a lack of data. A description of HARM is presented in Appendix B.

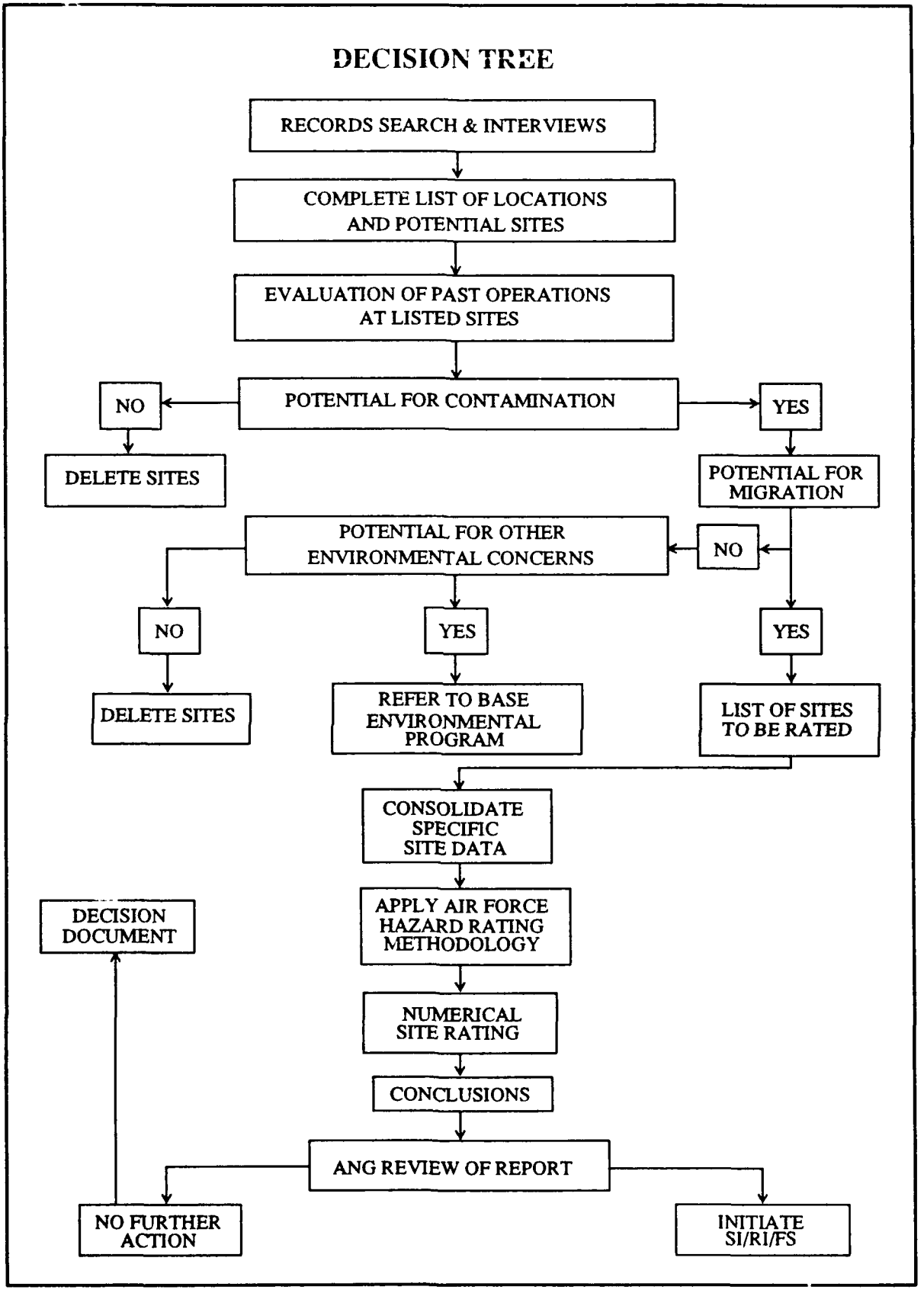


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

The Station is located approximately 14 miles south-southeast of Oakland and is adjacent to the Hayward Municipal Airport (MAP) within Alameda County, California. The major route to the Station is Interstate 880.

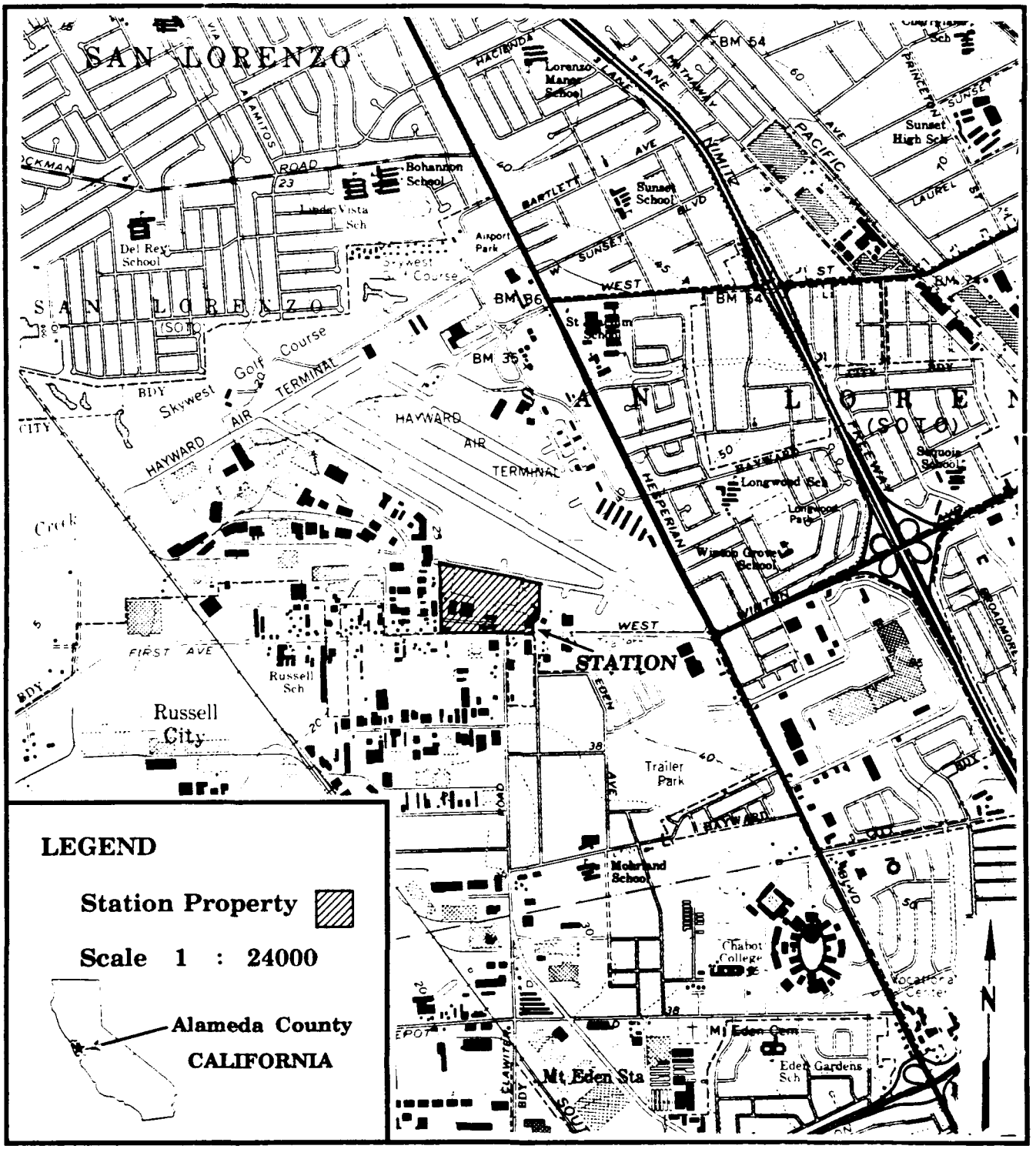
The Station occupies approximately 44 acres just north of West Winston Avenue and south of Hayward MAP. Figure II.1 illustrates the location and boundaries of the Station. On weekdays, the population at the Station is approximately 80 including the Marines. Unit Training Assembly (UTA) occurs one weekend per month. The Station population during this weekend is approximately 635 including the Marines. The Station is completely fenced with controlled access. The unimproved acreage is used to conduct training and for parking of equipment.

B. Organization and History

The 234th CCSQ and the 216th EIS have been at the Station since 1982. A Marine Corps Reserve Training Unit has been present at the Station since 1984. The Marines conduct radar operations, maintenance, and training at the Station. Waste oils, fuels, paints, thinners, and solvents are generated as a result of the operations at the Station. Wastes are collected and disposed of by a contractor. The 151st Air Force Band is also a tenant on the Station's property; however, the band uses the facilities at the Station strictly for practices. No hazardous materials are used or generated by the band.

Before 1946, the Station was occupied by the Army. Specific operations and waste disposal practices performed by the Army are not known. The 194th Fighter Interceptor Squadron was allotted to the Guard in 1946. Although the unit was equipped with North American F-51Ds and based at Hayward MAP, it was not organized for almost three years. It was federally recognized as the 194th Fighter Squadron on March 21, 1949. When the 194th Fighter Squadron began its conversion to jet aircraft in the fall of 1954, the unit was relocated to Fresno. Most of the 194th Fighter Squadron personnel did not transfer to Fresno which is 160 miles from Hayward, but remained at Hayward where the Air National Guard activated a new unit.

The newly organized unit was federally recognized on April 3, 1955, as the 129th Air Resupply Squadron. In 1962, the Squadron became part of the 129th Troop Carrier Group. The designation of the group and squadron was changed to Air Commando in 1975 and then to Special Operations. After another aircraft conversion, the Hayward units became the 129th Aerospace



SOURCE: USGS, Hayward Quad, N3737.5-W12200/7.5; San Leandro Quad, N3737.5-W12207.5, 1959 (photo revised 1980).

Figure II.1

Location Map of
the Hayward Air National Guard Station

Recovery & Rescue Squadron and the 129th Aerospace Recovery & Rescue Group. With the same designation and equipment, the 129th Northern California unit moved across the bay during the spring of 1980 to become based at Naval Air Station Moffett Field.

Activities that generated hazardous wastes included aircraft maintenance, vehicle maintenance, AGE maintenance, and non-destructive inspection testing. Waste materials included fuels, oils, thinners, paints, and solvents. However, specific waste disposal practices are not fully known. Until 1984, the majority of wastes was used for fire training exercises. Materials for fire training included oils, fuels, solvents, and paints. Wastes were sometimes disposed of by contractors; however, paint and other flammable materials were burned after their shelf life had expired. This continued until the late 1970s. Then, fire training was done using only JP-4 fuel. The other liquid wastes were disposed of by contractors.

The mission of the 234th and the 216th is to maintain an optimum capability to install, operate, and maintain mobile communication facilities providing interbase and intrabase communications in support of tactical air forces and state emergencies. This mission has basically remained the same through the years.

The unit's mission necessitates the use of potentially hazardous materials that require disposal. These hazardous materials include waste oils, fuels, solvents, paints, and thinners. Such materials are largely generated through vehicle maintenance and AGE shop operations. Washrack activity and the routine maintenance of vehicles, generators, and other equipment results in varying quantities of hazardous materials.

In recent years, hazardous wastes have typically been collected and disposed of either through a contractor or the Defense Reutilization and Marketing Office (DRMO). However, in the past, small amounts of hazardous materials have been spilled or released into the environment at the Station.

III. ENVIRONMENTAL SETTING

A. Meteorology

The following climatological data is taken from Climatic Atlas of the United States (U.S. Department of Commerce, National Climatic Center, Asheville, N.C., 1979) and Climatography of the United States, No. 81 - California (U.S. Department of Commerce, National Climatic Center, Asheville, N.C., 1982). Data from Oakland (4-6335), San Jose (4-7821) and Newark (4-6144) show that the Station is heavily influenced by the westerly winds off the Pacific Ocean. Average annual temperature during the 29 years from 1951 to 1980 was 58.6°F. The temperature ranged from a low of 49.0°F in January to a high of 67.0°F in September.

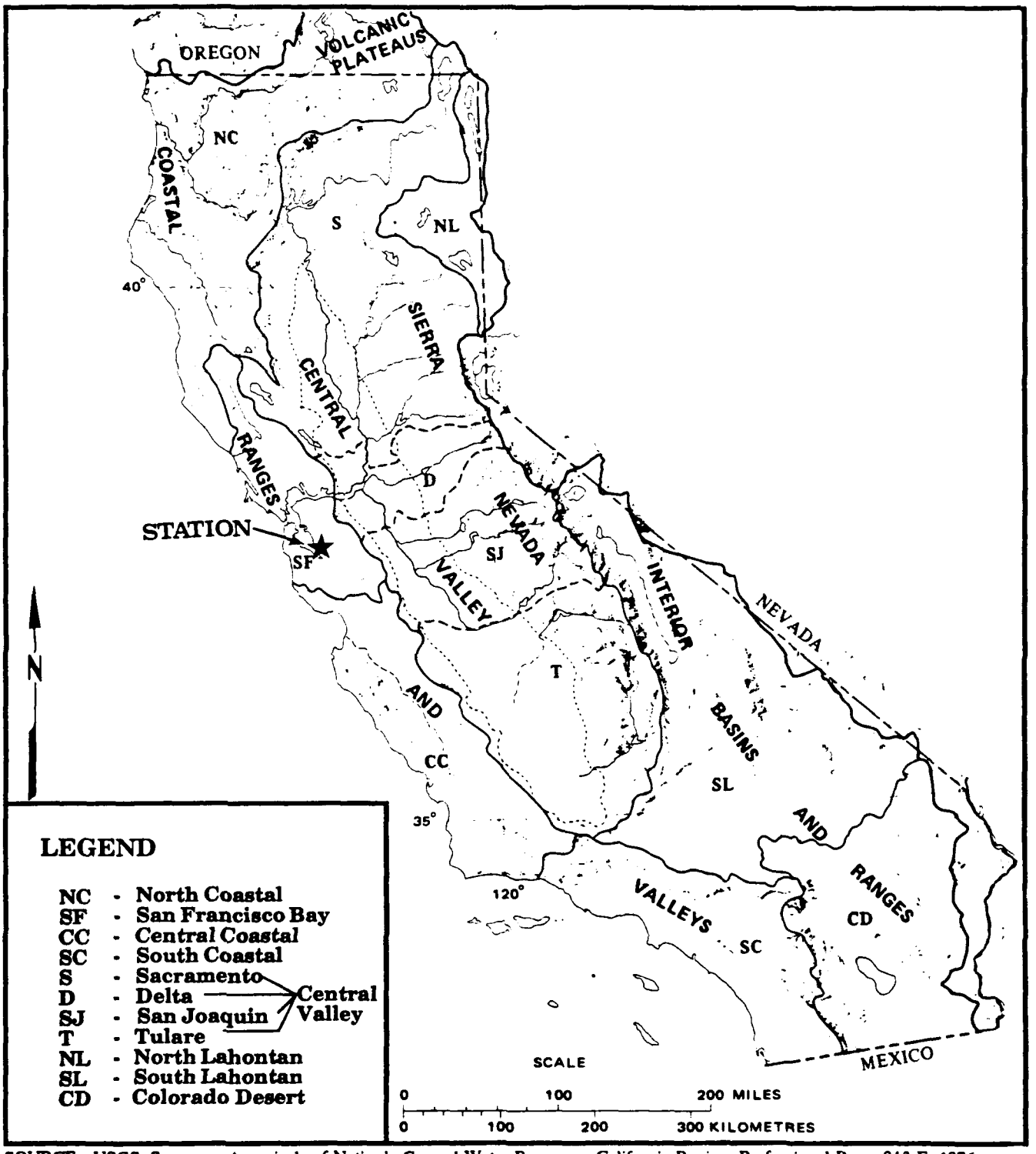
Rainfall amounts vary significantly on the eastern shore of San Francisco Bay where Hayward has an average annual precipitation of 18 inches. Mean annual lake evaporation is 42 inches. Net precipitation, which is the difference between mean annual lake evaporation and average annual precipitation, is -24 inches per year (47 FR 31224 July 16, 1982). Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 2.4 inches (47 FR 31235 July 16, 1982, Figure No.8).

B. Geology

The Station is located on the eastern shore of San Francisco Bay within the Coastal Ranges province of California, and elevation averages 35 feet above mean sea level with gentle slopes of less than 1 degree per mile towards the west (Figure III.1).

San Francisco Bay is a result of local subsidence of river valleys during the Pleistocene. Additionally, it should be noted that the major northern-most east-west cross valley fault of the Central Valley Province, the Stockton Fault, marks the confluence of the Sacramento and San Joaquin Rivers. The waters from this delta flow westward from Suisun Bay into the upper San Francisco Bay (San Pablo Bay) and represent a major fresh water source for the Bay (Figure III.2).

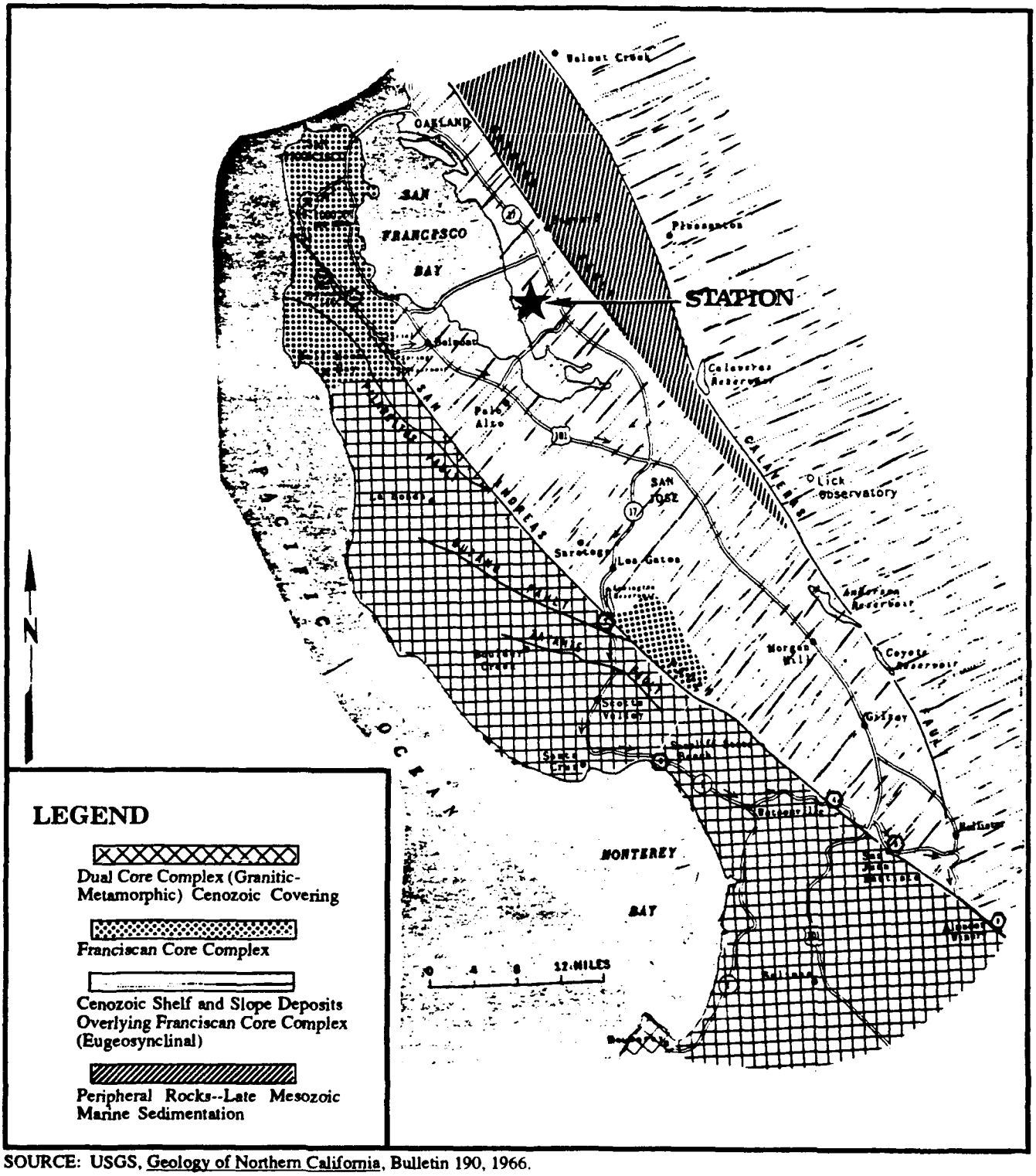
According to Page, 1966, the Coastal Ranges province is a series of north-northwest trending mountain ranges and intermountain valleys bounded on the west by the Pacific Ocean and on the east by the Central Valley (Great Valley). In the San Francisco area, the province is basically underlain by two depositionally unrelated, incompatible rock sequences: the eugeosynclinal Franciscan Formation sediments of Jurassic - Cretaceous age and an early Cretaceous and older sialic sequence. These two sequences appear side by side,



SOURCE: USGS, Summary Appraisals of Nation's Ground Water Resources-California Region, Professional Paper 813-E, 1976.

Figure III.1

Physiographic Map of California



SOURCE: USGS, Geology of Northern California, Bulletin 190, 1966.

Figure III.2

General Tectonic

Map of Northern California

separated only by the major transcurrent fault zones like the San Andreas (Figure III.2).

The Franciscan Formation is a heterogeneous sequence of marine sedimentary and volcanic rocks consisting predominately of massive bedded graywacke with interbedded dark shale and chert along with metamorphic schists. Juxtaposed to these marine and volcanic rocks are granitic and metamorphic sequences that are rich in silica and alumina and are commonly referred to as sial.

Structurally, the Station is situated on a large pie-shaped wedge that includes the Santa Clara Valley and is bounded on the west by the generally vertical plane of the San Andreas Fault zone and on the east by the Calaveras/Hayward zone (Brabb et al, 1966). These right lateral strike slip zones join approximately 40 miles south of the Station in the area east of San Jose (Figure III.2).

A thick blanket of late Cretaceous and Cenozoic clastic sedimentary rocks covers large portions of the province. In general, the Cenozoic deposits of late Pliocene and Pleistocene age are mainly nonmarine, unconsolidated gravels, sands, and silts of local derivation but with some interbedded clays and marls. In the area of the Station, these Quaternary sediments are undeformed and include local tidal flat deposits (Figures III.3, III.4).

The soil beneath the Station has been assigned to the Danville - Botella association and consists of nearly level to moderately sloping well-drained loams and silty clay loams formed on low terraces and alluvial fans. The deep, well-drained soils of the Danville sequence consist of a grayish brown and dark gray, slightly acid silty clay loam surface layer that is approximately 21 inches thick. The subsoil is grayish brown, slightly acid, silty clay and heavy silty clay loam that extends to a depth of 61 inches. The substratum is a grayish brown, neutral, silty clay loam and extends to a depth of 80 inches or more. Permeability is slow to very slow due to clay content in the subsoil (4.24×10^{-5}cm/sec to 1.41×10^{-4}cm/sec)

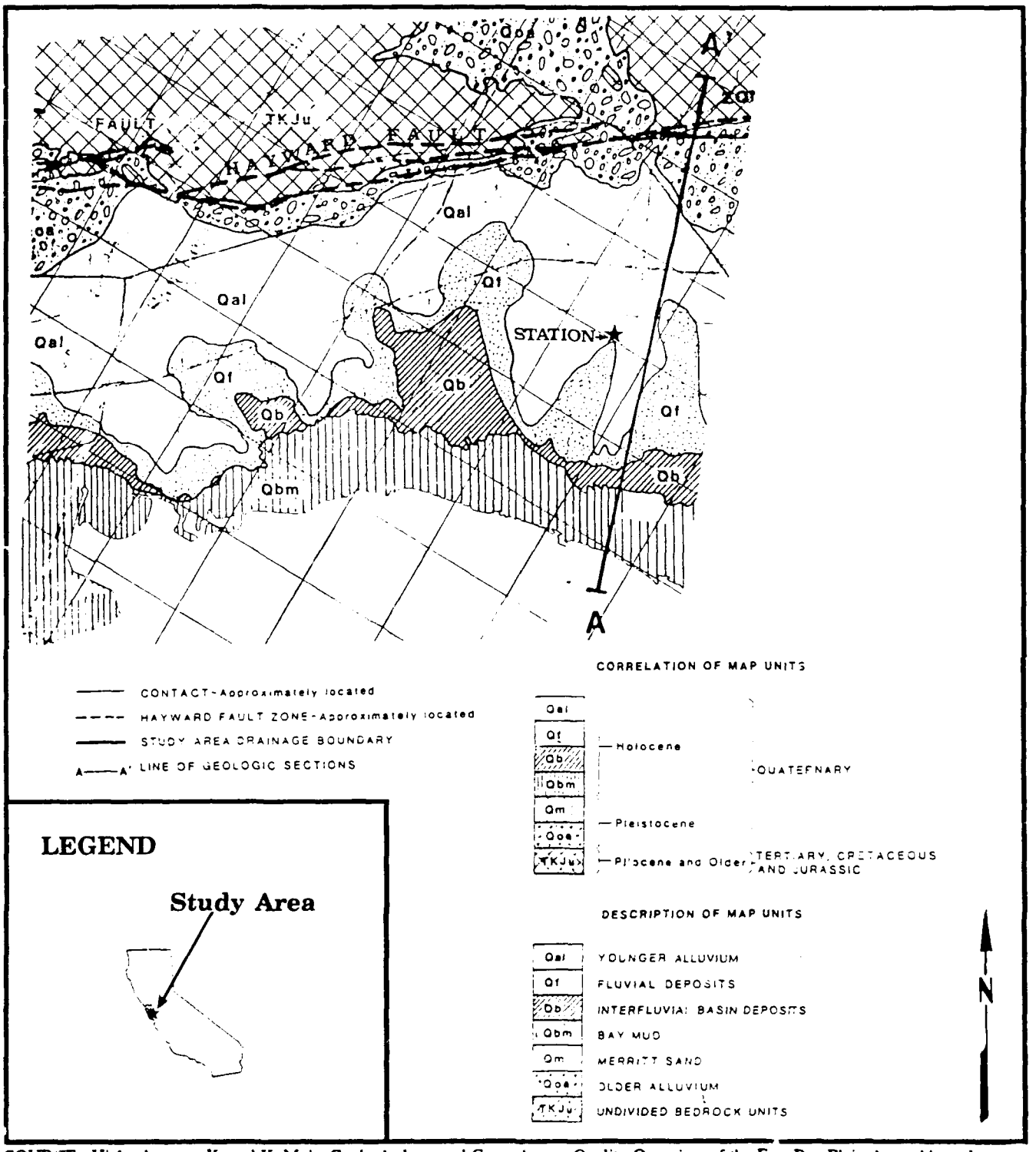
The major portion of the Hayward MAP is underlain by the Clear Lake - Omni soil sequence. This clay sequence is very deep, poorly drained soil formed in alluvium in basins. The surface layer is a very dark gray, neutral, and moderately alkaline clay to a depth of 37 inches. The subsoil is calcareous, dark gray to grayish-brown clay and silty clay to a depth of 60 inches. Permeability and runoff are slow (less than 4.24×10^{-5}cm/sec) with the water table varying from 48 to 60 inches below ground surface. The information pertaining to soils contained in the text was derived from the Soil Survey of Alameda County, California, Western Part (United States Department of Agriculture, Soil Conservation Service, March 1981).

Period	Epoch	Geologic unit	Thickness	General Character	Water-bearing Properties
Quaternary	Holocene	Younger alluvium (Qal)	Ranges from less than 10 feet to as much as 50 feet.	Unconsolidated, moderately sorted, sand and silt; coarse sand and gravel toward alluvial fan heads and in narrow canyons.	Moderately permeable. Most of deposit lies above zone of saturation, so yields small quantities of groundwater to wells.
		Fluvial deposits (Qf)	Generally less than 15 feet	Unconsolidated, moderately sorted, fine sand, silt, and clayey silt, with occasional thin beds of coarse sand. Well bedded.	Moderately permeable. A thin surficial deposit. Yields small quntities of groundwater to wells.
		Interfluvial basin deposits (Qb)	Generally less than 10 feet	Unconsolidated, plastic, moderately to poorly sorted silt and clay, rich in organic material.	Low permeability. Seasonally saturated. Yields small quantities of groundwater to wells.
		Bay mud (Qbm)	Ranges from less than 1 foot to as much as 120 feet beneath the bay	Unconsolidated, dark plastic clay and silty clay rich in organic material. Some lenses of silt and sand.	Low permeability. Water saturated; mostly with salt water. Yields a small quantity groundwater to wells.
	Pleistocene	Merritt Sand (Qm)	A maximum of about 65 feet	Loose, well-sorted, fine to medium grained sand; silty, clayey, with lenses of sandy clay and clay.	Permeable. *Permeability decreases* with depth as deposit becomes more consolidated. Yields small quantities of groundwater to wells.
		Older alluvium (Qoa)	A maximum of about 1100 feet	Layers of poorly consolidated to unconsolidated clay, silt, sand and gravel.	Permeable, but water-yielding ability varies throughout area. Yields large to small quantities of water to wells. The major groundwater reservoir in the East Bay Plain Area.
Tertiary, Cretaceous, and Jurassic	Pliocene and Older	Undivided bedrock units (TKbu)	Probably more than 10,000 feet	Mostly consolidated or highly compacted sandstone, shale, and chert; some volcanic rock, serpentine, and conglomerates.	Low permeability. Locally yields small quantities of water to wells from fractures, and the sandstone and conglomerate units.

SOURCE: Hickenbottom, K. and K. Muir, Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California, Report 205J.

Figure III.3

Generalized Stratigraphic Column of the Area



SOURCE: Hickenbottom, K. and K. Muir, Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California. Report 205J.

Figure III.4

Surficial Geologic Map of the Area

C. Hydrology

1. Surface Water

The Station is located in the Sulphur Creek/San Francisco Bay drainage basin. Through storm drains, the Station drainage flows northward to Sulphur Creek located along the northern boundary of the Hayward MAP and then flows westward into San Francisco Bay. The Station has been classified as being outside the 100-year flood plain (Figures III.5, III.6).

2. Groundwater

Figure III.4 demonstrated that the unconsolidated Quaternary deposits that collectively form the groundwater reservoirs of the East Bay Plain area all lie west of the Hayward Fault (Hickenbottom and Muir, 1990). The undivided peripheral bedrock sequence of Late Mesozoic age lies east of the Hayward Fault and forms the eastern boundary of the aquifer system. Figure III.7 is a diagrammatic section that represents this relationship as well as depicting the Quaternary Alluvium relationships. The Older Alluvium is considered to be the principal groundwater reservoir in the East Bay Plain area.

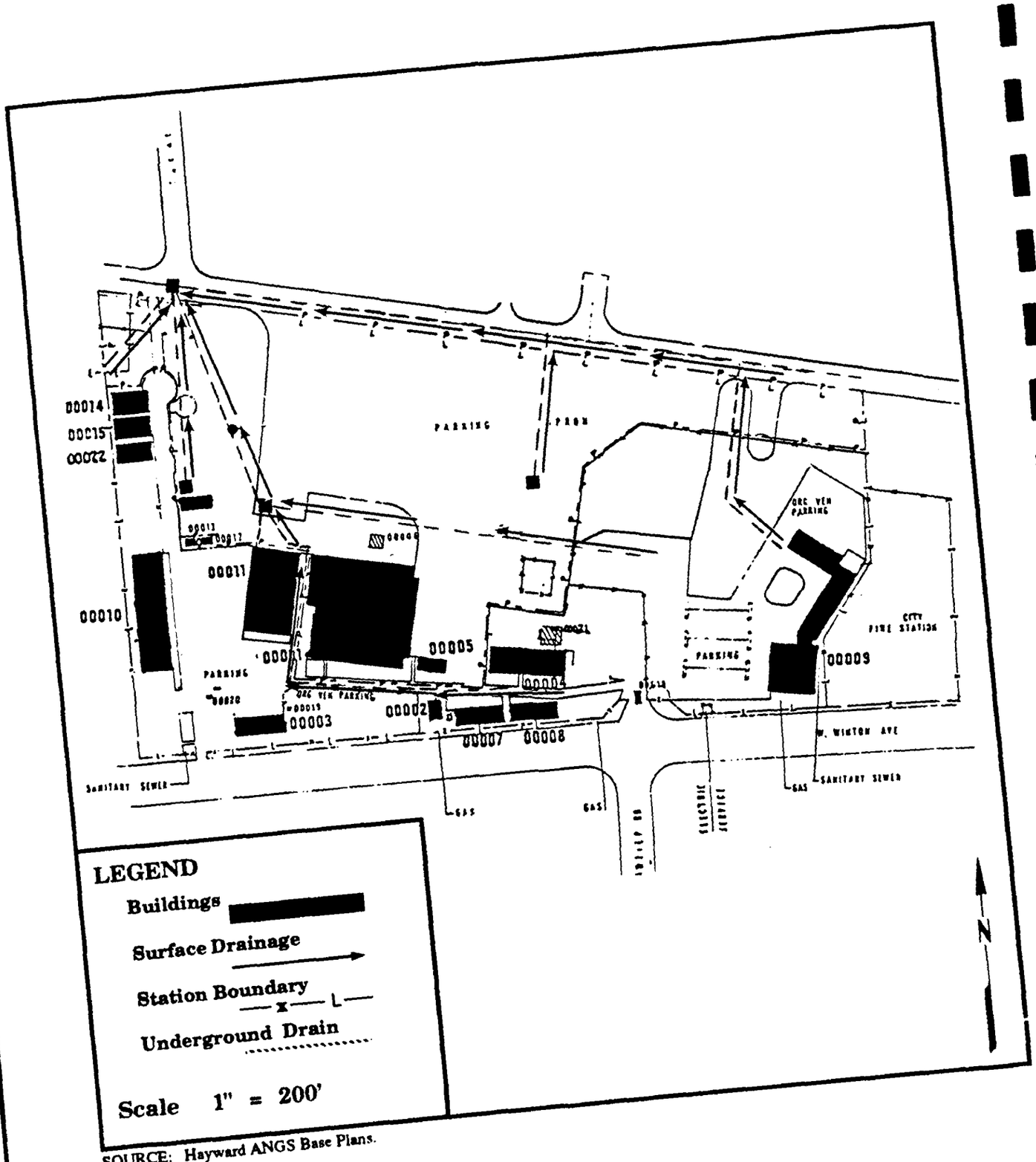
Water level altitudes mapped in the Spring of 1987 indicate a range of approximately 20 feet above mean sea level to -20 below mean sea level (Figure III.8). This is because some wells in the Older Alluvium have depths of less than 200 feet and others have depths greater than 200 feet. Groundwater movement is westerly towards San Francisco Bay (Hickenbottom and Muir, 1990).

Although subsidence due to groundwater withdrawal has become a serious problem south of Hayward MAP in the Upper Santa Clara Valley, it has not affected the Station because of more efficient water management practices on the east-side of San Francisco Bay.

D. Critical Habitats/Endangered or Threatened Species

According to records maintained by the California Department of Fish and Game, Natural Diversity Data Base (NDDB), no endangered or threatened species of flora and fauna have been identified within a 1-mile radius of the Station.

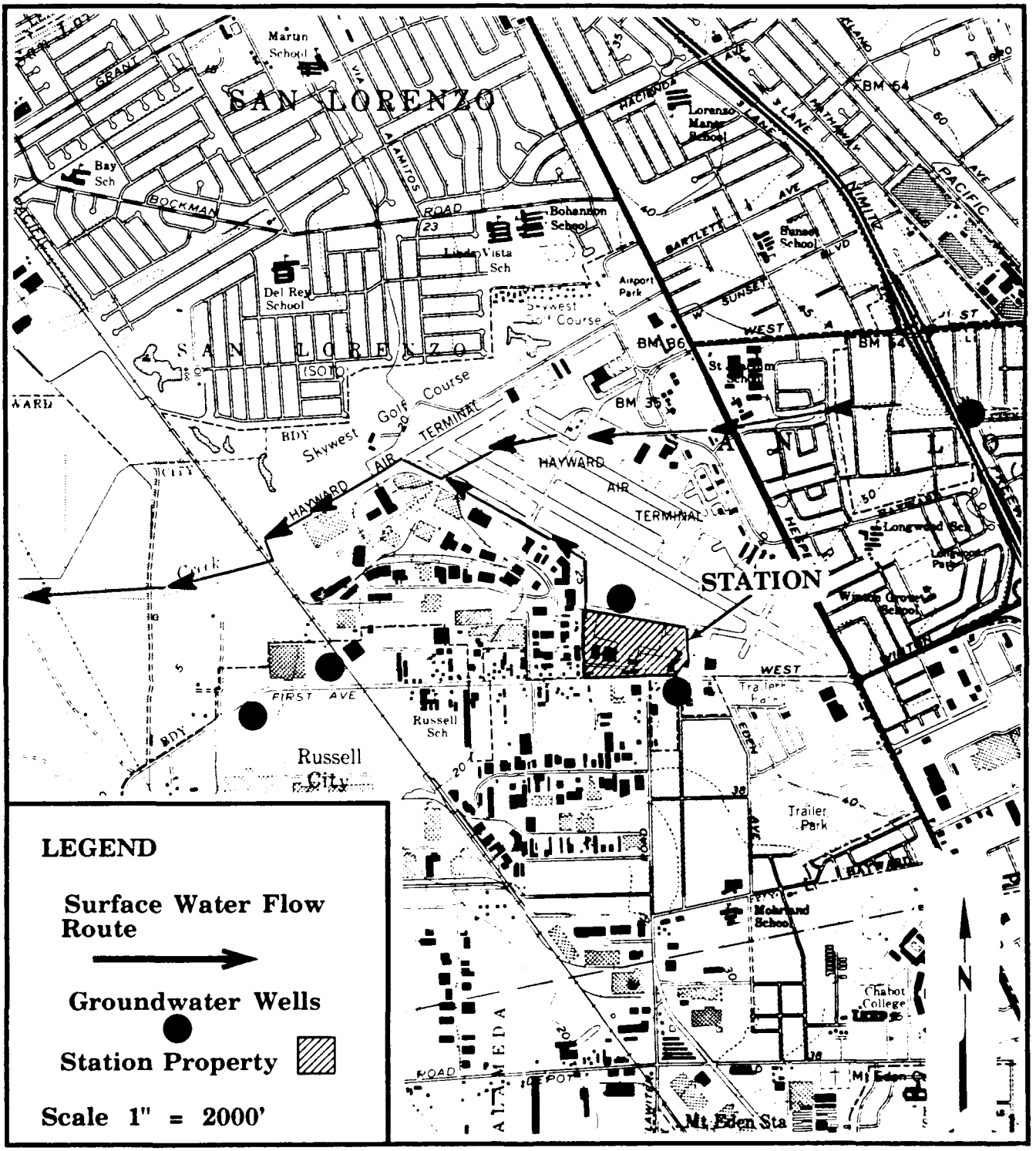
However, minor wetlands are present approximately one mile from the potential sites. Also, within a 1 1/2-mile radius of the Station, surface drainage empties into the marshes and mud flats on the eastern shore of San Francisco Bay via Sulphur Creek. The endangered or threatened specie in this area is:



SOURCE: Hayward ANGS Base Plans.

Figure III.5

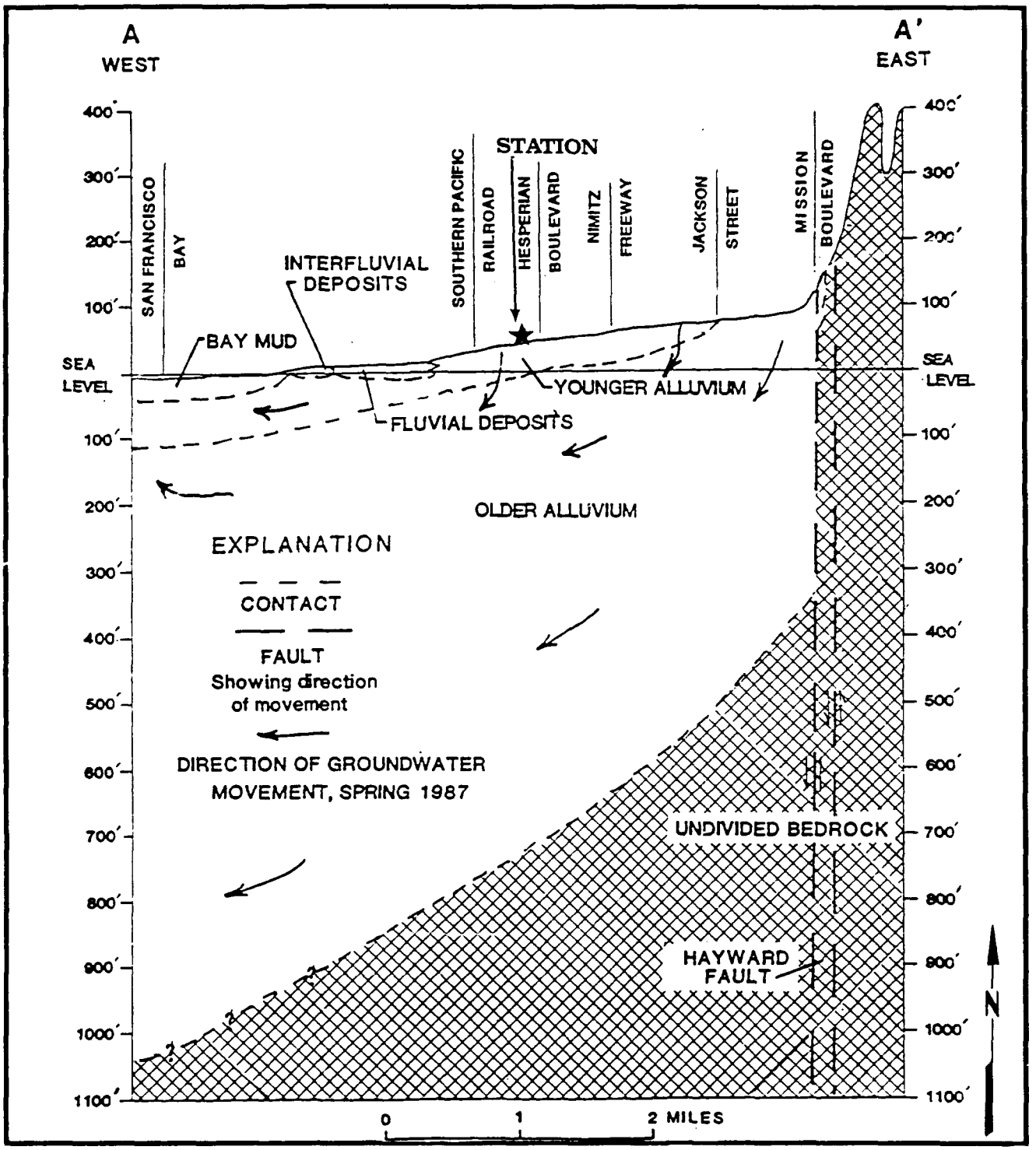
Drainage Map
of the Hayward Air National Guard Station



SOURCE: Hayward Quad N3737.5-W12200/7.5, 1959 (photo revised 1980); San Leandro Quad N3737.5-W12207.5, 1959 (photo revised 1980).

Figure III.6

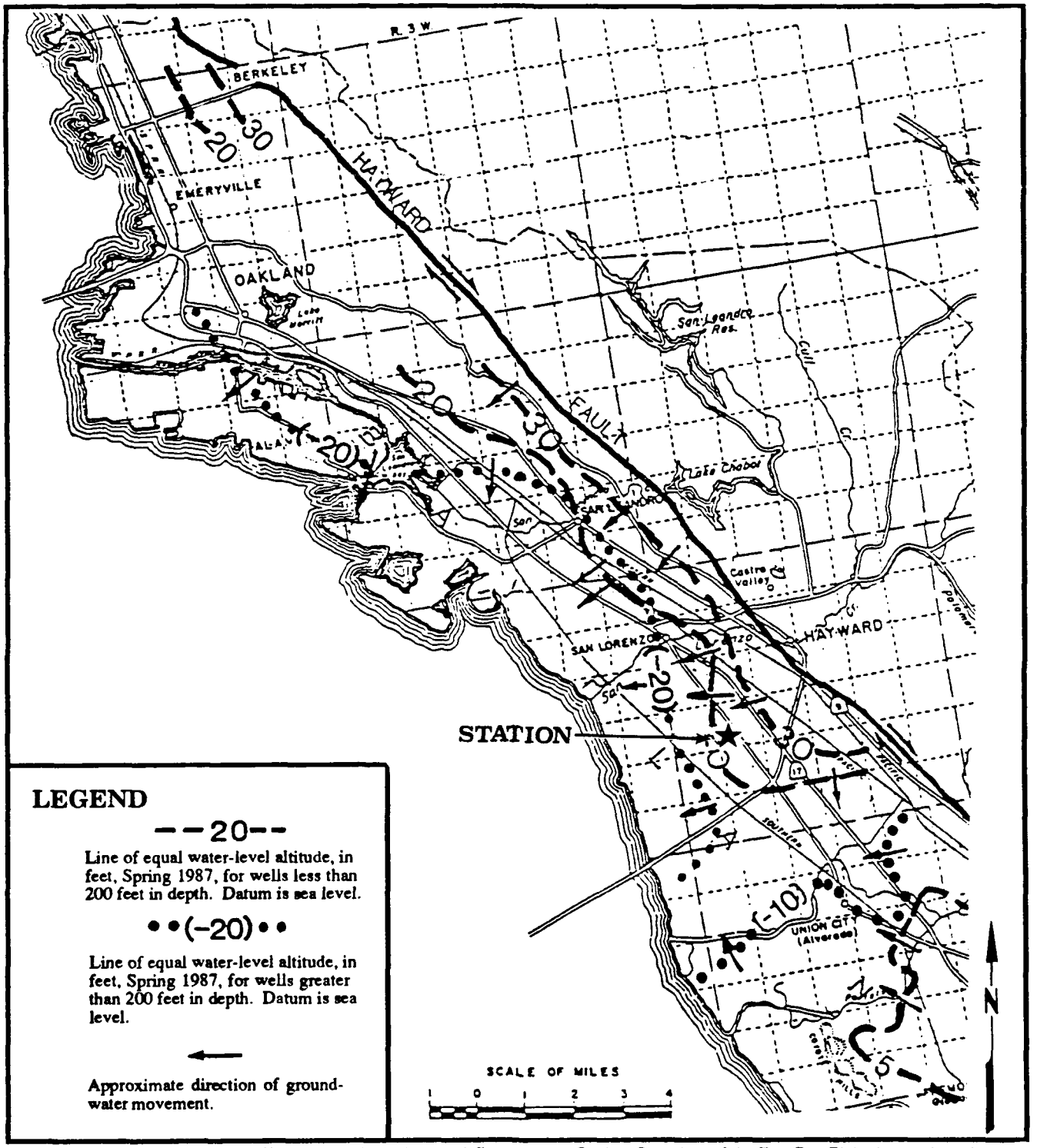
Surface Water Flow Route Map



SOURCE: Hickenbottom, K. and K. Muir, Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California, Report 205J.

Figure III.7

Stratigraphic Relations and Groundwater Movement Across the San Lorenzo Cone in California



SOURCE: Hickenbottom, K. and K. Muir, Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California, Report 205J.

Figure III.8

Composite Water Level Map

Showing Direction of Groundwater Movement

Fauna

Reithrodontomys raviventris (SAFLL66) - Salt Marsh Harvest Mouse

Note: The NDDB is a computerized inventory of information on the location and conditions of California's rare and threatened animals, plants and natural communities. A seven-character code is assigned to each listing. The first two letters include Element Class:

SA = Special Animal
SP = Special Plant
NC = Natural Communities

The remaining five characters give each specie or community a unique code for data management.

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, disposed of, and processed. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Station. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

Fresh product diesel fuel and MOGAS are stored in underground storage tanks at the Station. In addition, tank trucks and fuel trailers parked at the Station are used to store fuels. The 216th EIS and the 234th CCSQ generate hazardous wastes primarily through vehicle and AGE maintenance operations.

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

Seventeen persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. Three potentially contaminated sites were identified through the interviews. These site identifications were followed by visual field examinations of the sites. Each of these sites was rated by application of the United States Air Force (USAF) HARM, and since the potential for contaminant migration exists at these three potential sites, each is recommended for further investigation under the IRP program. Copies of completed HARM forms and an explanation of the factor rating criteria used for sites scoring are contained in Appendix C.

The potential exists for contaminant migration at each of the three rated sites. Contaminants that may have been released at these sites have the potential to be transported by groundwater and surface water. The seasonal high water table is approximately 15 feet below the ground surface at the Station. If the shallow groundwater becomes contaminated by hazardous wastes, then, under certain circumstances, the deeper aquifers may also be contaminated by groundwater migration. Released contaminants that are exposed on the ground surface have the potential to be transported by surface water migration into San Francisco Bay.

Locations for the three sites are provided on Figure IV.1. The following items are descriptions of the three potential sites identified at the Station:

Table IV.1

Hazardous Materials/Hazardous Wastes Disposal Summary: Hayward Air National Guard Station, Hayward, California.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1982	1984	1986	1988	1990
Vehicle Maintenance (Bldg. 3)	Engine Oil	200	CONTR			DRMO	
	Battery Acid	90	CONTR			DRMO	
	Ethylene Glycol	150	GRND			CONTR/DRMO	
	Hydraulic Oil	100	CONTR			DRMO	
	Transmission Fluid	100	CONTR			DRMO	
	Paint Thinner	15	CONTR			DRMO	
	Brake Fluid	40	CONTR			DRMO	
	Diesel Fuel	10	CONTR			DRMO	
	Safety Kleen	50	NIU		CONTR		
	Contact Cleaner	8 aerosol cans	PROC				
	PD-680	100	WASH		NLU		

KEY:

CONTR - Disposed of through a Contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
GRND - Material disposed on the ground.
NIU - Material not in use.
NLU - Material no longer used.
PROC - Material used in process (ie. evaporation).
SAN - Material disposed down drains leading to the sanitary sewer.
TRASH - Material disposed of in trash.
WASH - Disposed in drains at washrack during washing operations. Water at the washrack drains into an oil/water separator and then into the storm sewer.

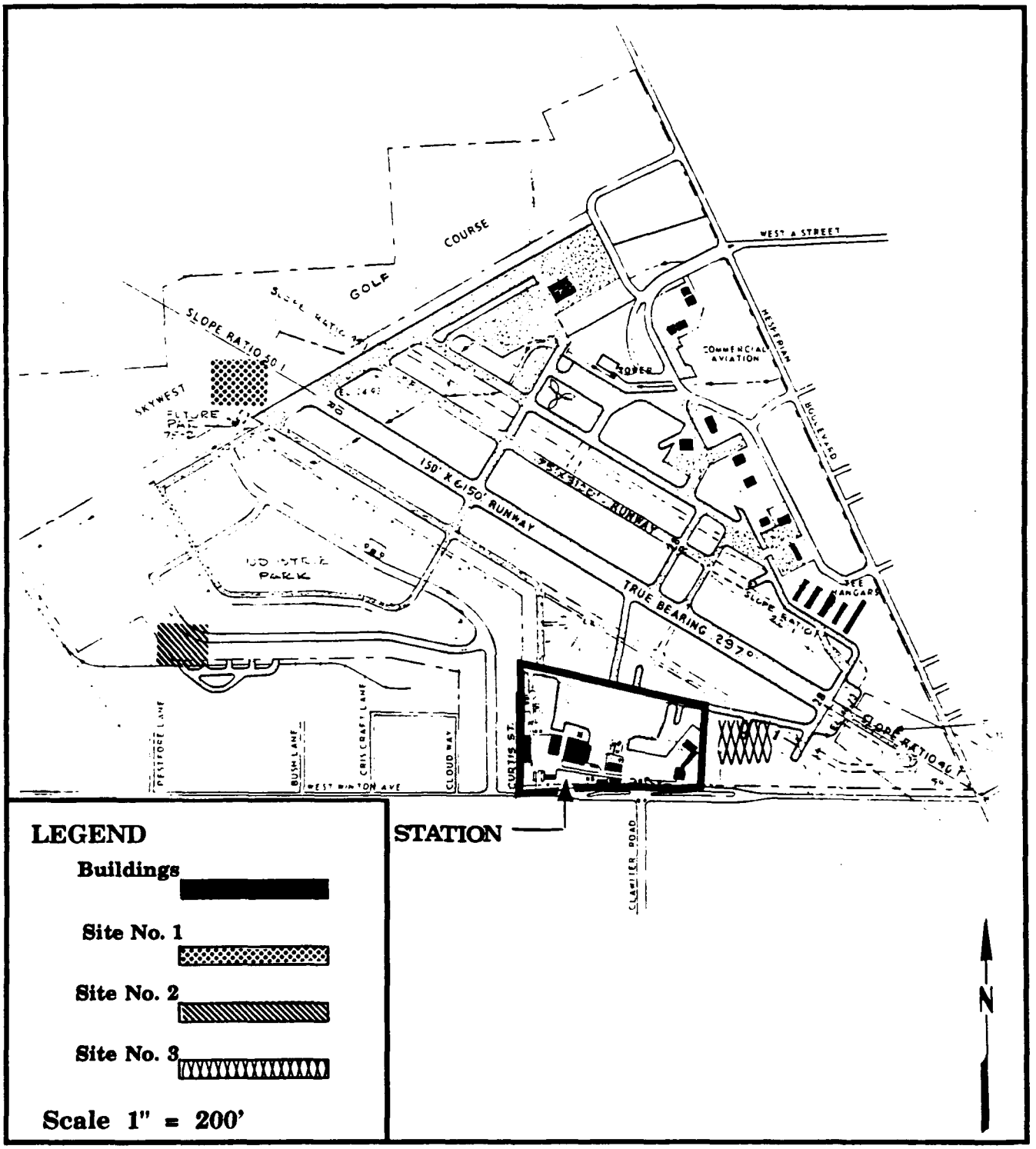
Table IV.1

Hazardous Materials/Hazardous Wastes Disposal Summary: Hayward Air National Guard Station, Hayward, California (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1982	1984	1986	1988	1990
Aerospace Ground Equipment (AGE) Maintenance (Bldg. 9)	Engine Oil	120	CONTR			DRMO	
	Strippers/Thinners	30	CONTR			DRMO	
	PD-680	100	WASH/CONTR/DRMO			NLU	
	Gasoline	10	CONTR			DRMO	
	Battery Acid	50	CONTR			DRMO	
	Cleaning Compound	100	WASH				
	MEK	3	PROC/TRASH			NLU	
	Safety Kleen	100	NIU			CONTR	
	Diesel Fuel	55	CONTR			DRMO	
	Enamel Paint	15	CONTR			DRMO	
	Hydraulic Oil	20	CONTR			DRMO	
	Ethylene Glycol	25	SAN			DRMO	

KEY:

CONTR - Disposed of through a Contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
GRND - Material disposed on the ground.
NIU - Material not in use.
NLU - Material no longer used.
PROC - Material used in process (ie. evaporation).
SAN - Material disposed down drains leading to the sanitary sewer.
TRASH - Material disposed of in trash.
WASH - Disposed in drains at washrack during washing operations. Water at the washrack drains into an oil/water separator and then into the storm sewer.



SOURCE: Hayward ANGS Base Plans, 1964.

Figure IV.1

Potential Sites in the Vicinity of the Hayward Air National Guard Station

Site No. 1 - FTA at City Fire Station (HAS - 84)

The original FTA was located at the City Fire Department's current location just west of the Station. The original site was approximately 100 feet in diameter and is now probably underneath asphalt or a building. This FTA was used from the middle to the late 1950s for a total of about 4 to 5 years. The original FTA consisted of a concrete pad surrounded by an earth berm. According to interviewees, a water base was poured on the area prior to pouring and igniting any fuel. Interviewees reported that this site was used at least quarterly and that 500-1000 gallons of flammable materials were used for each training exercise. Materials used for fires included AVGAS, waste oils, solvents, and paint. This FTA was solely used and controlled by the Air National Guard during its operation.

Estimating that 750 gallons of flammable materials were used for each training session and that these fire training exercises occurred at least four times a year for 5 years, a total of 15,000 gallons of liquids was poured and ignited. If 70 percent of this fuel actually burned, the remaining 30 percent (4500 gallons) may have contaminated the soil and groundwater at this site. Consequently, a HAS was calculated for this site.

Given the history of typical fire training areas, the frequency of use, and the materials involved, this potential site is given a large quantity (greater than 85 drums) rating and a high hazard rating according to HARM.

Site No. 2 - FTA at the Industrial Park (HAS - 84)

The FTA at the nearby industrial park just west of the Station was used from the early 1960s until the late 1970s. This FTA was solely used and controlled by the Air National Guard during its operation. It is thought to be presently covered by either a building or concrete/asphalt. This FTA was approximately 100 feet in diameter and was constructed of an unlined pit that was surrounded by an earth berm. Like the preceding FTA, a water base was poured on the soil prior to igniting any flammable materials.

Interviewees reported that this site was used for training purposes at least once per month and sometimes as often as five times per month. Each training session involved the use of 500-1000 gallons of liquid wastes. Materials used included JP-4, AVGAS, waste oils, solvents, and paints. In addition, one training session reportedly involved the use of 1200-2400 gallons of napalm.

Knowing the frequency of use and the materials involved, this potential site is given a large quantity rating and a high hazard rating for calculating the HAS.

Site No. 3 - FTA at End of Runway (HAS - 75)

The FTA at the end of the runway was used in the late 1970s and the early 1980s. This area was used by both the city and the Air National Guard. However, the Guard controlled the area and actually constructed the fire training area. This FTA is an unlined, soil covered pit that is completely surrounded by an earth berm. It is approximately 75 feet long and 60 feet wide and is divided into three equal areas that are separated by an earth berm. The site inspection revealed a burned aircraft that apparently had been used for fire training exercises. This aircraft was present in the center pit. In addition, two burned automobile bodies were located within 150 feet of the FTA. Closer examination revealed no noticeable oil stains on the soils in this FTA.

This FTA was used quarterly until the last six months of use, when it was used once per month for fire training. Interviewees reported that only JP-4 was used for burns at this site. Additionally, only 500 gallons of fuel were used for each training exercise. Like the other FTAs, a water base was poured upon the ground before the fuel was poured and ignited.

Given the frequency of use and the materials involved, this potential site would be given a moderate quantity rating and a high hazard rating for calculating the HAS.

C. Other Pertinent Facts

- Trash and non-hazardous solid wastes are disposed of by a contractor.
- The Station has three oil/water separators. Two of these are connected to the storm sewer. The oil/water separator for the 234th EIS is connected to the sanitary sewer.
- A monitoring well was installed along with a 5000-gallon fiberglass tank just west of Building 3. This well is sampled monthly by the Station and is visually inspected for the presence of petroleum products.
- A 5000-gallon unleaded gasoline tank was ruptured during an inventory check in 1986. This tank was immediately pumped dry and was abandoned. It is believed that only a small amount of fuel, if any, could have been released. This abandoned tank is in the vicinity of the monitoring well.
- Three 25,000-gallon JP-4 tanks were abandoned in 1982 when the 129th Tactical Fighter Group moved to Moffett Field. These tanks show no indication of leakage and are scheduled to be removed by the Air National Guard.

- The potable water supply and sanitary sewer service for the Station is provided by the city of Hayward. No water wells are present within the Station's boundaries.

- There are no polychlorinated biphenyl (PCB) transformers located at the Station.

- The Station is not required to have a National Pollutant Discharge Elimination System (NPDES) permit.

V. CONCLUSIONS

Information obtained through interviews with 17 present and past Station personnel, reviews of Station records, and field observations resulted in the identification of three potentially contaminated disposal and/or spill sites on Station property. The potential sites are as follows:

Site No. 1 - FTA at City Fire Station (HAS - 84)

Site No. 2 - FTA at the Industrial Park (HAS - 84)

Site No. 3 - FTA at End of Runway (HAS - 75)

Each of these sites exhibit the potential for contaminant migration through surface water, soil, and/or groundwater.

VI. RECOMMENDATIONS

The PA identified three potentially contaminated sites. As a result, additional investigation under the IRP is recommended for these sites to confirm the presence or absence of contamination.

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GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium or deposited by a stream or running water.

ALLUVIAL FAN - An outspread, gently sloping mass of alluvium deposited by a stream, especially in an arid or semiarid region where a stream issues from a narrow canyon onto a plain or valley floor.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUIFER - A water-bearing layer of rock that will yield water in a usable quantity to a well or spring.

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

ARGILLACEOUS - Like or containing clay.

ARKOSE - A feldspar rich sandstone, typically coarse-grained and pink or reddish, that is composed of angular to subangular grains that may be either poorly or moderately well-sorted, is usually derived from the rapid disintegration of granite or granitic rocks, and often closely resembles granite.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the consolidated (solid) rock that underlies soil or other unconsolidated superficial material. See HORIZON [soil] - *R layer*.

BERM - A ledge or space between the ditch and parapet in a fortification.

CLASTIC - Rock or sediments composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their place or origin source.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

COARSE-TEXTURED (light textured) SOIL - Sand or loamy sand.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

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

(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, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CONTEMPORANEOUS FAULT - See GROWTH FAULT.

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIABASE - An intrusive rock whose main components are labradorite and pyroxene and which is characterized by ophitic texture.

DIORITE - A group of igneous rocks composed of dark-colored amphibole (esp. hornblende) oligoclase, andesine, pyroxene, and small amounts of quartz; the intrusive equivalent of andesite.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are

shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well-drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured and mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water drains or moves.

DRAWDOWN - The reduction in head at a point caused by the withdrawal of water from an aquifer.

EMBAYMENT - A downwarped region of stratified rocks that extends into a region of other rocks.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the

Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

EUGEOSYNCLINAL - Like a geosyncline in which volcanism is associated with clastic sedimentation.

EUSALINE - Sodium chloride concentrations of 30 to 35 parts per thousand. Same as normal sea water.

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

FELDSPAR - Any of several crystalline minerals made up of Aluminum silicates with sodium, potassium, or calcium; most widespread of any mineral group and constitute 60% of the earth's crust; occur in all types of rock.

FELDSPATHIC - Like or as feldspar.

FINE-GRAINED - Said of a soil in which silt and/or clay predominate.

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GABBRO - A group of dark-colored, basic intrusive igneous rocks composed principally of basic plagioclase and clinopyroxene, with or without olivine and othoxypyrene; approximate intrusive equivalent of basalt.

GEOLOGIC TIME - See Figure Gl.1.

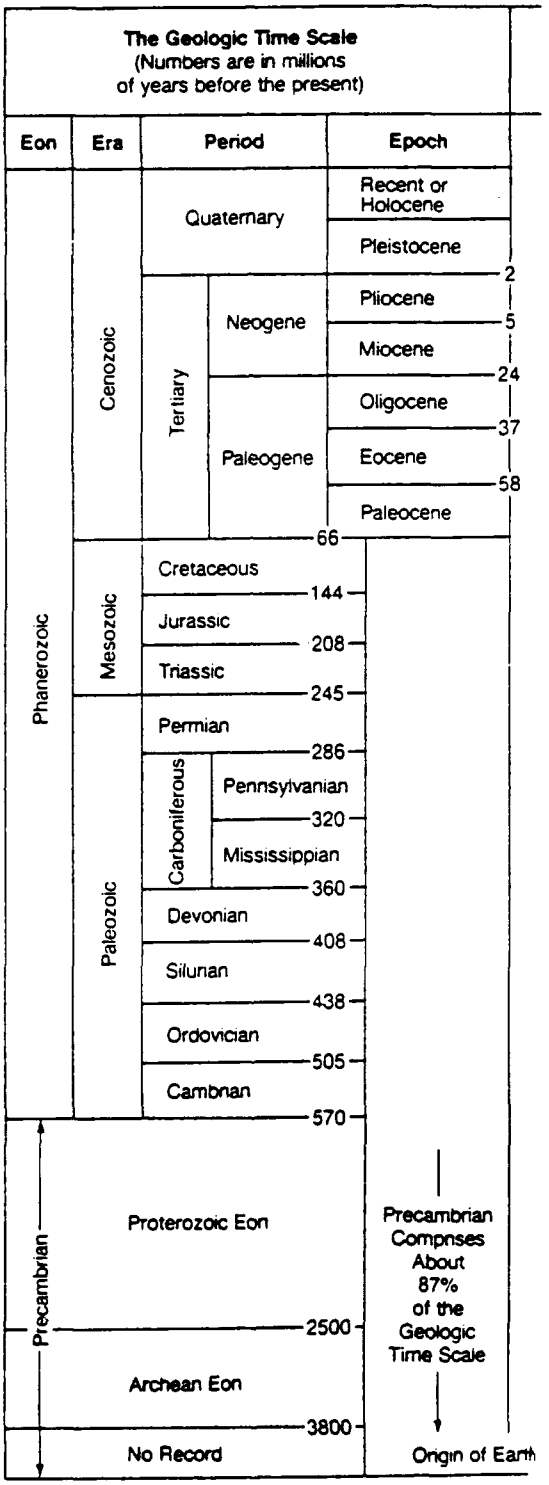

Figure Gl.1

The Geologic Time Scale

GNEISS - A coarse-grained, foliated rock produced by regional metamorphism; commonly feldspar- and quartz-rich.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase, and potassium feldspar with biotite, hornblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GRAYWACKE - A non-porous, dark-colored sandstone containing angular grains and fragments of other rocks; a fine-grained conglomerate resembling sandstone.

GROUNDWATER - Water in the saturated zone that is under a pressure equal to or greater than atmospheric pressure.

GROWTH FAULT - A fault in sedimentary rock that forms contemporaneously and continuously with deposition, so that the displacement (throw) increases with depth and the strata of the downthrown side are thicker than the correlative strata of the upthrown side.

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, December 11, 1981.)

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

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

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

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

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

HEAD - See TOTAL HEAD.

HERBICIDE - A weed killer.

HIGHLAND - A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; and mountainous region.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

HORIZON [soil] - A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon - An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon - The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon - A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon - The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic of blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon - The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties

typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer - Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

HORST - An elongate, relatively uplifted crustal unit or block that is bounded by faults on its long side.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

LOWLAND - A general term for low-lying land or an extensive region of low land, esp. near the coast and including the extended plains or country lying not far above tide level.

MEANDERBELT - The zone along a valley floor across which a meandering stream shifts its channel from time to time.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEAN SEA LEVEL - The average height of the surface of the sea for all stages of the tide over a 19-year period.

MESA - A table-land; a flat-topped mountain or plateau bounded on at least one side by a steep cliff.

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

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

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MONTMORILLONITE - A clay mineral of the smectite group comprising expanding-lattice clay minerals when wetted.

MONZONITE - Plutonic rock intermediate in composition between syenite and diorite, containing approximately equal amounts of alkali feldspar and plagioclase.

MOTTLED [soil] - a soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

NET PRECIPITATION - Precipitation minus evaporation.

ORTHOCLASE - See FELDSPAR.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

OVERTURNED - Said of a fold or the limb of a fold, that has tilted beyond the perpendicular. Sequence of strata thus appears reversed.

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stoddard solvent.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content (at least 75%).

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 - see SOIL PERMEABILITY.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The voids or openings in a rock. Porosity may be expressed quantitatively as the ratio of the volume of openings in a rock to the total volume of the rock.

POTENTIOMETRIC SURFACE - A surface that represents the total head in an aquifer; that is, it represents the height above a datum plane at which the water level stands in tightly cased wells that penetrate the aquifer.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline or crystalline masses. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

QUARTZITE [meta] - A granoblastic metamorphic rock consisting mainly of quartz and formed by recrystallization of sandstone or chert by either regional or thermal metamorphism.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SALINE [adj] - Salty; containing dissolved sodium chloride.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular fragments of sand, size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SATURATED ZONE - The subsurface zone in which all openings are full of water.

SCHIST - A medium- or coarse-grained, strongly foliated, crystalline rock; formed by dynamic metamorphism.

SEDIMENT - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SEDIMENTARY ROCK - A rock resulting in the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

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

SIALIC - Like the light, granitic rock material near the surface of the earth's crust, underlying the continents.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SOIL - The layer of material at the land surface that supports plant growth.

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

Terms describing permeability are:

Very Slow	-	less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	-	0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	-	0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	-	0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	-	2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	-	6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid - more than 20.00 inches per hour (more than 1.41 x 10^{-2} cm/sec)

(Reference: United States Department of Agriculture, Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests at pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - See STRUCTURE [soil].

SOLUM - The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum. See HORIZON [soil].

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

STRAND PLAIN - A prograded shore built seaward by waves and currents, and continuous for some distance along the coast.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRIKE - SLIP FAULT - A fault on which the movement is parallel to the fault's strike. See TRANSCURRENT FAULT.

STRUCTURE [soil] - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are - platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SUBSIDENCE - Sinking or downward settling of the earth's surface, not restricted in rate, magnitude, or area involved.

SUBSOIL - Technically, the B horizon; roughly, the part of the solum below plow depth.

SUBSOILING - Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

SUBSTRATUM - The part of the soil below the solum.

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

SYENITE - Plutonic rock containing orthoclase and microcline with small amounts of plagioclase feldspar.

SYNCLINORIUM - A composite synclinal structure of regional extent composed of lesser folds.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.

TERRIGENOUS DEPOSITS - Shallow marine sediment consisting of material eroded from the land surface.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or significant portion of its range.

TIME [geol] - See Figure Gl.1.

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

TOTAL HEAD - The height above a datum plane of a column of water. In a groundwater system, it is composed of elevation head, pressure head, and velocity head.

TRANSCURRENT FAULT - A large scale strike - slip fault in which the fault surface is steeply inclined.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

UNDULATING [geomorph] - (a) A landform having a wavy outline or form. (b) A rippling or scalloped land surface, having a wavy outline or appearance.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

WATER TABLE - The level in the saturated zone at which the pressure is equal to the atmospheric pressure.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater 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 - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) Alameda County Planning Commission
399 Elmhurst Street
Hayward, CA 94544
Sandy Rivera
(415) 670-5400

2) City of Hayward
Building Department
22300 Foot Hill Boulevard
Hayward, CA 94541

3) City of Hayward
Building Inspection Division
22300 Foot Hill Boulevard
Hayward, CA 94541
David Bellrose
(415) 581-2345
Rich Rohr
(415) 784-8675

4) City of Hayward Water Department
22300 East Foot Hill Road
Hayward, CA 94541
Jan Sparks
(415) 784-8650

5) County of Alameda
Public Works Agency
399 Elmlhurst Street
Hayward, CA 94544-1395
Jim Scanlin

6) Department of Water Resources
Central District
3251 South Street
Sacramento, CA 95816-70117
Howard L. Mann, Chief
Surface and Ground Water Data Section

7) Soil Conservation Service
1560 Catalina Street
Livermore, CA 94550
Lois Tillman
(415) 447-0749

OUTSIDE AGENCY CONTACT LIST (continued)

8) State of California
Department of Fish and Game
P.O Box 944290
Sacramento, CA 94244-2090
(916) 324-3812

9) State of California
Resources Agency
Department of Conservation
California Division of Mines and Geology
P.O. Box 2980
Sacramento, CA 95812
Karen Fleming
(916) 324-3812

10) State of California
Resources Agency
Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236-0001

11) Timely Discount Topos Inc.
9769 West 119th Drive, Suite 9
Broomfield, Colorado 80020
(303) 469-5022

12) United States Department of Agriculture
Alameda County Resource Conservation District
1560 Catalina Court
Livermore, CA 94550
(415) 447-0749

13) United States Department of Agriculture
Soil Conservation Service
Alameda County, CA
(707) 575-1748

14) United States Department of Agriculture
Soil Conservation Service
805 West Avenue J
Lancaster, CA 93534
Richard Campbell
(805) 945-2604

OUTSIDE AGENCY CONTACT LIST (continued)

15) United States Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Data and Information Service
National Climatic Center
Asheville, NC 28801
(704) 259-0871

16) United States Geological Survey
Books and Open File Reports Section
P.O. Box 25425 DFC, Building 810
Denver, CO 80225

17) United States Geological Survey
300 North Los Angeles Street
Los Angeles, CA 90012
Dianne Noserale
(213) 894-2850

18) United States Geological Survey
745 Middle Field Road
Mail Stop 532
Menlow Park, CA 94025

19) United States Geological Survey
Water Resources Division
California District
2800 Cottageway, Room W-2235
Sacramento, CA 95825
Jean F. Lucas
(916) 978-4668

Appendix B

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The DoD has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques at DoD facilities. One of the actions required under this program is to:

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

Accordingly, the USAF has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the PA phase of the IRP.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-up site investigations.

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

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the USAF's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD 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 worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors presented in this appendix. The site rating form and the rating factor guidelines are provided at the end of this appendix.

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

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor 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 solids are reduced.

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

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

HAZARD ASSESSMENT RATING FORM

NAME OF SITE

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site		4		12
B. Distance to nearest well		10		30
C. Land use-zoning within 1-mile radius		3		9
D. Distance to installation boundary		6		18
E. Critical environments within 1-mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Groundwater use of uppermost aquifer		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by groundwater supply within 3 miles of site		6		18
		Subtotals	_____	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

_____ x _____ = _____

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

_____ x _____ =

III. PATHWAYS

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

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

Subscore

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

1. Surface water migration

Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals	_____	108

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

2. Flooding		1		3

Subscore (100 x factor score/3)

3. Groundwater migration

Depth to groundwater		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to groundwater		8		24
		Subtotals	_____	114

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

C. Highest pathway score

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

Pathways subscore

IV. WASTE MANAGEMENT PRACTICES

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

Receptors
Waste Characteristics
Pathways

Total _____ divided by 3 = _____

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

_____ x _____ = [ ]

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	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 Factors	Rating Scale Levels			
	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

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

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

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

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

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

Confidence Level

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

Waste Hazard Rating

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

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

B Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

III. PATHWAYS CATEGORY

A. Evidence of Contamination

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

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

B-1 Potential for Surface Water Contamination

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

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

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

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-8-1, or III-8-3, then leave blank for calculation of factor score and maximum possible score.

Appendix C

Site Hazard Assessment Rating Forms and Factor Rating Criteria

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Site No. 1 - FTA at City Fire Station

LOCATION East of Hayward Air National Guard Station

DATE OF OPERATION OR OCCURRENCE Middle 1950s thru the late 1950s

OWNER/OPERATOR Hayward Air National Guard

COMMENTS/DESCRIPTION Waste fuels, oils, solvents, paints, etc., were periodically burned at this site.

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest 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	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	131	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 73

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 1.0 = 100

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

100 x 1.0 = 100

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

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	60	108

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

2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Depth to groundwater	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
		Subtotals	32	114

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

C. Highest pathway score

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	73
Waste Characteristics	100
Pathways	80

Total 253 divided by 3 = 84

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

84 x 1.0 = **84**

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Site No. 2 - FTA at the Industrial Park

LOCATION West of Hayward Air National Guard Station

DATE OF OPERATION OR OCCURRENCE Early 1960s thru the late 1970s

OWNER/OPERATOR Hayward Air National Guard

COMMENTS/DESCRIPTION Waste fuels, oils, solvents, paints, etc., were periodically burned at this site.

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest 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	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18

Subtotals 131 180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 73

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 1.0 = 100

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

100 x 1.0 = 100

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

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
Subtotals			60	108

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

2. Flooding

	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Depth to groundwater	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
Subtotals			32	114

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

C. Highest pathway score

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	73
Waste Characteristics	100
Pathways	80
Total 253 divided by 3 =	84

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

84 x 1.0 = **84**

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Site No. 3 - FTA at End of Runway

LOCATION West of Hayward Air National Guard Station

DATE OF OPERATION OR OCCURRENCE Late 1970s thru the early 1980s

OWNER/OPERATOR Hayward Air National Guard

COMMENTS/DESCRIPTION JP-4 was burned at this site during fire training exercises.

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest 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	2	10	20	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	131	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 73

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 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

Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	60	108

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

2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Depth to groundwater	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to groundwater	1	8	8	24
		Subtotals	32	114

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

C. Highest pathway score

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	73
Waste Characteristics	72
Pathways	80
Total 225	divided by 3 = 75

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

75 x 1.0 = **75**

Hayward Air National Guard Station
Hayward, California

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

The following is an explanation of the HARM factor rating criteria for each of the three potential sites.

I. Receptors

A. Population Within 1000 feet of Site.

Site Nos. 1, 2, and 3, Factor Rating 3.
The population within 1000 feet of all three potential sites is over 100. Site No. 1 is near the Station; and on UTA weekends, the station population exceeds 600 including the Marines. Site Nos. 2 and 3 are near an industrial park that employees more than 100 people.

B. Distance to Nearest Water Well.

Site Nos. 1, 2, and 3, Factor Rating 3.
There is a water well located just north of the Station near the runway. Site No. 1 is within 1000 feet of this well. There are several additional wells near the Station. Site Nos. 2 and 3 are within 1000 feet of one of these wells.

C. Land Use-Zoning (within 1-mile radius).

Site Nos. 1, 2, and 3, Factor Rating 3.
The area within a 1-mile radius of both sites is zoned commercial and residential.

D. Distance to Installation Boundary.

Site Nos. 1, 2, and 3, Factor Rating 3.
All three potential sites are located outside the Station's boundary.

E. Critical Environments (within 1-mile radius).

Site Nos. 1, 2, and 3, Factor Rating 2.
Minor wetlands are present approximately one mile from the potential sites. Also, there are endangered or threatened species which can be found just outside the 1-mile radius. These natural resources are susceptible to contamination.

F. Water Quality/Use Designation of Nearest Surface Water Body.

Site Nos. 1, 2, and 3, Factor Rating 1.
Sulphur Creek is primarily used for agricultural or industrial purposes; however, it empties into San Francisco Bay approximately one mile away.

G. Groundwater Use of Uppermost Aquifer.

Site Nos. 1, 2, and 3, Factor Rating 2.
The groundwater is used for drinking water; however, municipal water is available in Hayward.

H. Population Served by Surface Water Supplies Within 3 miles Downstream of Site.

Site Nos. 1, 2, and 3, Factor Rating 0.
The local population is supplied with water from aquifers.

I. Population Served by Aquifer Supplies Within 3 miles Downstream of Site.

Site Nos. 1, 2, and 3, Factor Rating 3.
Over 1000 persons within a 3-mile radius of each potential site are served by aquifer supplies.

II. Waste Characteristics

Site No. 1

A-1: Hazardous Waste Quantity - Factor Rating [illegible]arge).
A large quantity, greater than 85 drums, combined wastes is estimated to have been disposed of [illegible]ite.

A-2: Confidence Level - Factor Rating C (Confirmed).
Interviewees reported that wastes including fuels, oils, and paints were used for fire training exercises at this potential site.

A-3: Hazard Rating - Factor Rating H (High).
A high hazard rating was assigned because of the high toxicity of the fuels and solvents disposed of at this site.

Site No. 2

A-1: Hazardous Waste Quantity - Factor Rating L (Large).
A large quantity, greater than 85 drums, of combined wastes is estimated to have been disposed of at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Interviewees reported that wastes including fuels, oils, and paints were used for fire training exercises at this potential site.

A-3: Hazard Rating - Factor Rating H (High).
A high hazard rating was assigned because of the high toxicity of the fuels and solvents disposed of at this site.

Site No. 3

A-1: Hazardous Waste Quantity - Factor Rating M (Moderate).
A moderate quantity, 21 to 85 drums, of JP-4 is estimated to have been disposed of at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
Interviewees reported that wastes were used for fire training exercises at this potential site.

A-3: Hazard Rating - Factor Rating H (High).
A high hazard rating was assigned because of the high toxicity of the fuels and solvents disposed of at this site.

B. Persistence Multiplier for Point Rating.

Site Nos. 1 and 2 were assigned a persistence multiplier of 1.0, based on the potential presence of heavy metals from the use of waste paint for fire training. Site No. 3 was assigned a persistence multiplier of 0.9 based on the use of JP-4. This fuel corresponds to the HARM category of "Substituted and Other Ring Compounds."

C. Physical State Multiplier.

A physical state multiplier of 1.0 was applied to all three potential sites because the substances released were liquids.

III. Pathways Category

A. Evidence of Contamination.

Site Nos. 1, 2, and 3 were given a score of 80 (indirect evidence). Site No. 1 had no visible evidence of heavy oil-stained soil, and Site Nos. 2 and 3 were not accessible because buildings or parking areas have been constucted at these sites. Nevertheless, all of these sites were given a score of 80 because they are suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination.

- Distance to Nearest Surface Water: Factor Rating 3.
  Site Nos. 1, 2, and 3 are located within 500 feet of drainage ditches and storm sewers.

- Net Precipitation: Factor Rating 0.
  The average annual net precipitation at the Station is approximately -24 inches.

- Surface Erosion: Factor Rating 1.
  There is slight soil erosion at each site.

- Surface Permeability: Factor Rating 2.
  The soils at the three potential sites have approximately 30 to 50% clay and the rate of permeability ranges from 10^{-6} to 10^{-4} cm/sec.

- Rainfall Intensity Based on 1-year, 24-hour Rainfall: Factor Rating 2.
  The rainfall intensity at the Station is approximately 2.4 inches.

B-2 Potential for Flooding.

Factor Rating 0.
Site Nos. 1, 2, and 3 are located beyond the 100-year flood plain of local streams.

B-3 Potential for Groundwater Contamination.

- Depth to Groundwater: Factor Rating 2.
  The depth to groundwater at Site Nos. 1, 2, and 3 is approximately 15 feet.

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

- Soil Permeability: Factor Rating 1.
  The soils at the three potential sites have approximately 30 to 50% clay and the rate of permeability ranges from 10^{-6} to 10^{-4} cm/sec.

- Subsurface Flows: Factor Rating 0.
  The bottoms of Site Nos. 1, 2, and 3 are greater than 5 feet above high groundwater level.

- Direct Access to Groundwater: Factor Rating 1.

  Direct access to groundwater through faults, fractures, faulty well casings, subsidence, etc., is low risk for Site Nos. 1, 2, and 3.

IV. Waste Management Practices Factor

A multiplier of 1.0 was applied to Site Nos. 1, 2, and 3 because they have no form of containment. The exact locations of Site Nos. 2 and 3 are not known; therefore, it was assumed that there was no containment.