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INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION, MOFFETT FIELD, SUNNYVALE, CALIFORNIA

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NAVAL ENERGY AND ENVIRONMENTAL
SUPPORT ACTIVITY
Port Hueneme, California 93043

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Initial Assessment Study

Naval Air Station, Moffett Field, California

UIC N00296

Prepared by the Naval Energy and Environmental

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FOREWORD

The Department of the developed Navy Assessment and Control of Installation Pollutants (NACIP) Program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations. The NACIP Program is part of the Department of Defense Installation Restoration Program, and is similar to the Environmental Protection Agency's "Superfund" Program authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

In the first phase of the NACIP Program, a team of scientists and engineers conducts an Initial Assessment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or to the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and an on-site survey of the activity. This report documents the findings of an IAS at the Naval Air Station (NAS), Moffett Field, Sunnyvale, California, including Naval Auxiliary Landing Field (NALF), Crows Landing, California.

A total of 13 sites, 9 at NAS Moffett Field and 4 at NALF Crows Landing, were identified. Further confirmation studies under the NACIP Program are recommended for seven sites at NAS Moffett Field. No further work under the NACIP Program is recommended at NALF Crows Landing. Western Division of the Naval Facilities Engineering Command (WESTNAVFACENGCOM) will assist NAS Moffett Field in implementing the recommendations.

Questions regarding this report should be referred to Naval Energy and Environmental Support Activity 112N at AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351. Questions concerning confirmation work or other follow-on efforts should be referred to WESTNAVFACENGCOM 114 at AUTOVON 859-7494, FTS 448-7494, or commercial (415) 877-7494.

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EXECUTIVE SUMMARY

This report presents the results of the Initial Assessment Study (IAS) conducted at the Naval Air Station (NAS) Moffett Field, Sunnyvale, California, including Naval Auxiliary Landing Field (NALF), Crows Landing, California. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or to the environment.

NAS Moffett Field was established in 1933. The station is built on Bay muds and alluvial fan deposits in the southwest part of San Francisco Bay. Due to the permeability of shallow ground water aquifers, there is some potential for off-site contaminant migration through both surface and ground water. Ground water contamination south of the station due to improper off-station storage and off-station use of hazardous materials has been documented. This contamination has migrated onto NAS Moffett Field. Ground water and soil contamination has also been documented north and east of Hangar 3.

NALF Crows Landing was established in 1942 and comissioned in 1943. The station is built on alluvial fan deposits in the San Joaquin Valley of the Great Valley in Central California. Due to the depth and use of ground water aquifers, little potential exists for off-base migration through ground water. However, off-base migration is likely when soluble contaminants enter the surface water. Should ground-water contamination occur, the water affected would be potable and irrigation supplies on base.

Based on information from historical records, aerial photographs, surface surveys, and personal interviews, a total of 13 sites, 9 at NAS Moffett Field, and 4 at NALF Crows Landing, were identified as having potentially received hazardous wastes. Each site was assessed with regard to contamination characteristics, migration pathways, and pollutant receptors.

The study concludes that eight of the sites at NAS Moffett Field pose a sufficient threat to human health or to the environment to warrant a confirmation study under the Naval Assessment and Control of Installation Pollutants program. The eight sites are

Site 1 Runway Landfill
Site 3 Marriage Road Ditch
Site 4 Former Industrial Wastewater Holding Ponds
Site 5 Fuel Farm French Drains
Site 6 Runway Apron
Site 7 Hangars 2 and 3
Site 8 Waste Oil Transfer Area
Site 9 Old Fuel Farm

The recommended confirmation studies for these sites will determine the presence and determine the areal extent of contamination. All 13 sites should be documented on station development maps to ensure that proper safety precautions are taken before any of the sites are disturbed or altered.

ACKNOWLEDGEMENT

The IAS team of the Naval Energy and Environmental Support Activity expresses its appreciation for guidance and assistance throughout this study provided by personnel of Western Division, Naval Facilities Engineering Command. Naval Air Station Moffett Field; Naval Auxiliary Landing Field Crows Landing; and the Ordnance Explosive Safety Office. In particular, the IAS team acknowledges contributions by the following people:

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CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to increasing national concern regarding these problems, Congress directed the Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 1980.

1.1.1 DOD Program. Department of Defense (DOD) efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. DOD defined the program as the Installation Restoration Program in 1980, and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP), in three phases. Phase one, the Initial Assessment Study (IAS), identifies potential threats to human health or to the environment caused by past hazardous substance storage, handling, or disposal practices at naval activities. Phase two, the Confirmation Study, analyzes contaminants present at sites of concern and determines their migration paths. Phase three, Remedial Action, provides the required corrective measures to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations initiated the NACIP Program in OPNAVNOTE 6240 of 11 September 1980, superceded by OPNAVINST 5090.1 of 26 May 1983. The Naval Facilities Engineering Command (NAVFACENGCOM) manages the program within the existing structure of the Naval Environmental Protection Support Service (NEPSS). Thus, the Naval Energy and Environmental Support Activity (NAVENENVSA) conducts the program's phase one Initial Assessment Studies in coordination with NAVFACENGCOM Engineering Field Divisions (EFDs). Activities are selected for an Initial Assessment Study by the Chief of Naval Operations (CNO), based on recommendations by NAVFACENGCOM, the regional EFDs, and NAVENENVSA. Naval Air Station (NAS) Moffett Field was specifically approved for an Initial Assessment Study by COMNAVFACENGCOM letter 1121B/PAP of 26 July 1983.

1.3 SCOPE

1.3.1 Past Operations. The NACIP Program focuses attention on past hazardous substance storage, use, and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and federal regulations and, therefore, are not included in the scope of the NACIP Program. The Initial Assessment Study report addresses operational non-hazardous disposal and storage areas only if they were hazardous waste disposal or storage areas in the past. Current operations are investigated solely to infer what types and quantities of chemicals were used, and what disposal methods were practiced in the past.

1.3.2 Results. An Initial Assessment Study recommends, if necessary, mitigating actions to be performed by the activity or EFD, or sampling and monitoring (confirmation studies) to be administered by the EFD under the NACIP Program. Based on these recommendations, NAVFACENGCOM schedules confirmation studies for those sites determined by scientific and engineering judgment to be potential hazards to human health or to the environment.

1.4 INITIAL ASSESSMENT STUDY

1.4.1 Records Searches. The Initial Assessment Study begins with records searches at various government agencies, including EFDs, national and regional archives and records centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's mission, industrial processes, waste disposal records, and known environmental contamination. Typical examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix B lists the agencies contacted during this study.

1.4.2 On-site Survey. After the records searches, the study team conducts an on-site survey to complete documentation of past operations and disposal practices and to identify potentially contaminated areas. With the assistance of an activity point of contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The on-site survey for NAS Moffett Field was conducted from 8 through 12 August 1983; information in this report is current as of those dates.

Information obtained from interviews is verified by data from other sources before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 Confirmation Study Ranking System. With information collected during the study, team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS), developed at NAVENENVSA, is used to systematically evaluate the relative severity of potential problems. As the first step, a flowchart based on type of waste, type of containment, and hydrogeology eliminates innocuous sites from further consideration. If the flowchart indicates a site has potential contamination, a rating model is applied. The rating model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the wastes, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 Site Ranking. After rating a site, engineering judgment is applied to determine the need for a confirmation study or a mitigating action. CSRS scores are used to develop a priority list for scheduling projects at sites recommended for further work. For a more detailed description, refer to NAVENENVSA Confirmation Study Ranking System (NEESA 20.2-042).

1.4.5 Confirmation Study Criteria. A confirmation study is recommended for sites at which (1) sufficient evidence exists to indicate the presence of contamination and (2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. The EFD conducts the confirmation study in two phases--verification and characterization. In the verification phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the Initial Assessment Study, are present in concentrations considered to be hazardous. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the confirmation study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings and conclusions from the Initial Assessment Study are presented in chapter 2. Recommendations are presented in chapter 3. Chapter 4 describes general activity information, history, physical features, and biology. Chapters 5 through 8 trace the use of chemicals and hazardous materials, from storage and transfer, through manufacturing and operations, to waste processing and disposal. The remaining chapters provide detailed documentation to support the findings and conclusions in chapters 2 and 3. Figure 1-1 shows the location of the NAS Moffett Field, Sunnyvale, California, and NALF, Crows Landing, California.

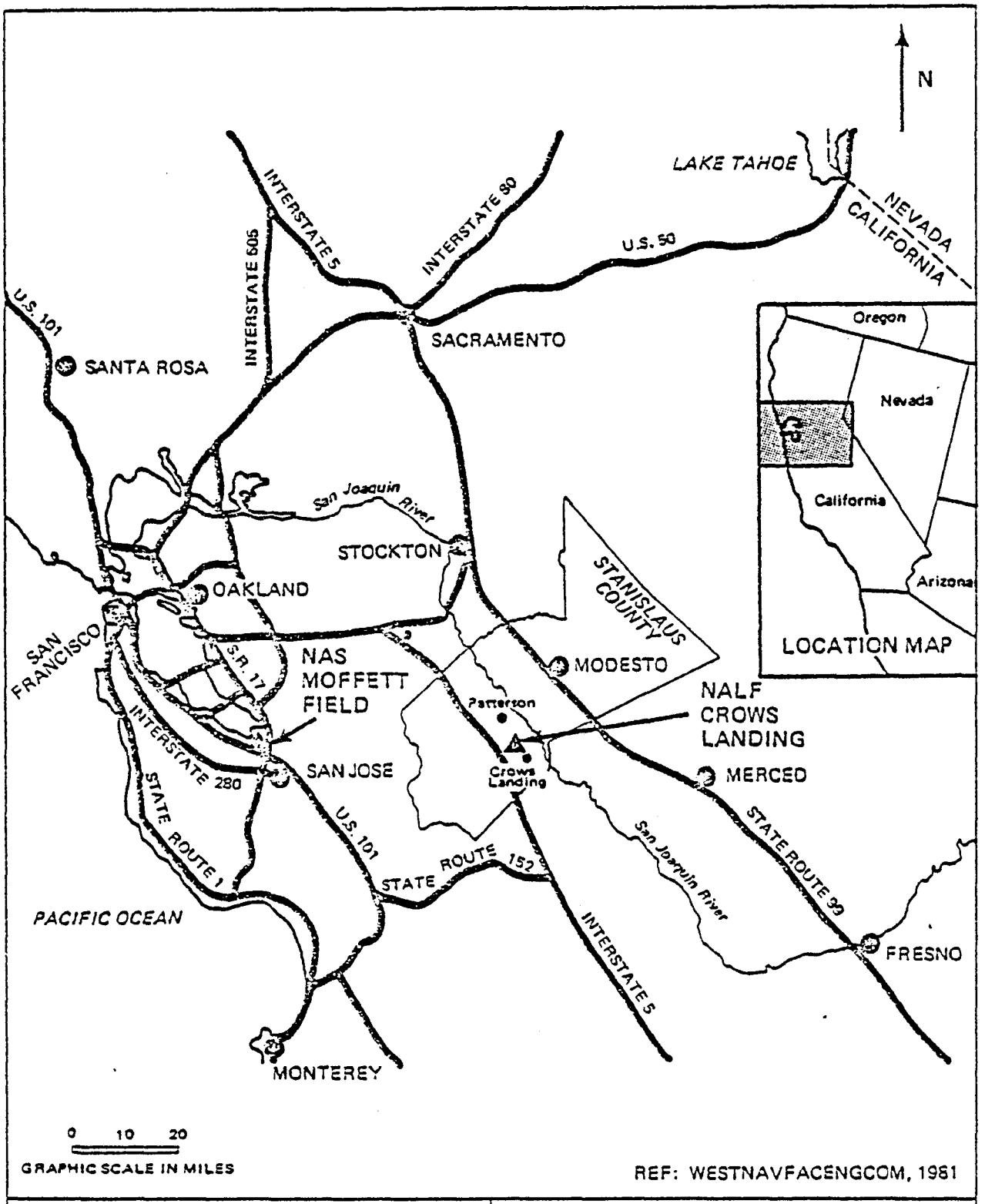

FIGURE 1-1
Location of NAS Moffett Field and NALF Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1. INTRODUCTION. This chapter summarizes the significant findings and conclusions developed by the Initial Assessment Study (IAS) team for Naval Air Station (NAS) Moffett Field, Sunnyvale, California and Naval Auxiliary Landing Field (NALF), Crows Landing, California. Nine sites at NAS Moffett Field and four sites at NALF Crows Landing were identified where hazardous materials were potentially disposed or spilled. These sites are shown on Figure 2-1 for NAS Moffett Field and Figure 2-2 for NALF Crows Landing. Based on reviews of available information, the judgment of the IAS team is that eight sites at NAS Moffett Field pose a potential threat to human health or to the environment and warrant a confirmation study. Recommendations for confirmation studies and precautionary actions are made in Chapter 3.

Section 2.2 is a summary of the migration potential of contaminants from disposal and spill areas. Migration potential is related to the characteristics of the disposal sites, to the physical and chemical properties of the waste, to the soils, and to the ground water system in the vicinity of the site. Section 2.3 is a discussion of sites recommended for confirmation studies at NAS Moffett Field. Section 2.4 is a discussion of the sites not recommended for confirmation studies. For each site, the evidence is summarized supporting or refuting the presence of a potential threat to human health or to the environment. More detailed site discussions are presented in Chapter 8.

2.2 POTENTIAL FOR CONTAMINANT MIGRATION. Contaminant migration can occur in surface water through streams and ditches or in ground water. Ground water can discharge to surface water bodies such as streams, ditches, lakes, and bays.

The potential for contaminant migration in ground water is related to the physical properties of the aquifer, the chemical properties of the contaminant, and the hydraulic gradient. Migration potential is examined here in terms of a conservative chemical constituent traveling with the ground water. The velocity is calculated from Darcy's law which equates velocity to hydraulic conductivity, hydraulic gradient, and porosity of the aquifer material. The velocities determined here are a maximum average velocity for water and do not take into account dispersion, dilution, attenuation, chemical reaction, or biological degradation of contaminants.

2.2.1 <u>NAS Moffett Field</u>. Contaminants at NAS Moffett Field can migrate both by surface water and by ground water. The most likely pathways of surface water migration are from runoff and through storm sewers that discharge to Marriage Road Ditch. Water in Marriage Road Ditch is pumped to Guadalupe Slough which flows into San Francisco Bay. Some runoff discharges directly to the salt evaporators adjacent to the north part of NAS Moffett Field. The salt evaporators are used to concentrate sea water in the production of salt.

Ground water at NAS Moffett Field flows generally northward toward San Francisco Bay and Guadalupe Slough. The aquifers of concern are shallow, unconfined and semi-confined sand and gravel lenses less than 50 feet deep.

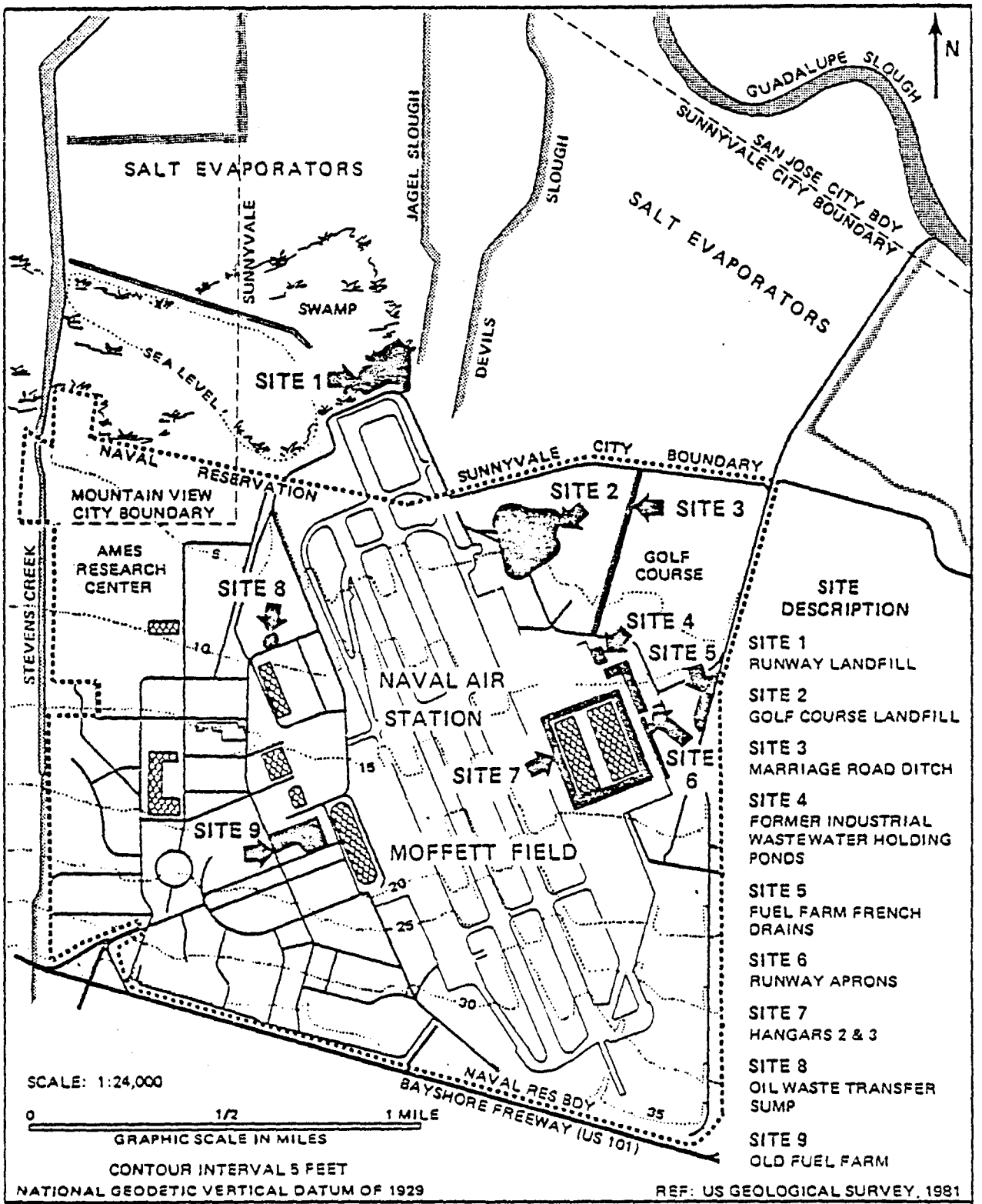

FIGURE 2-1
WASTE DISPOSAL SITES
NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

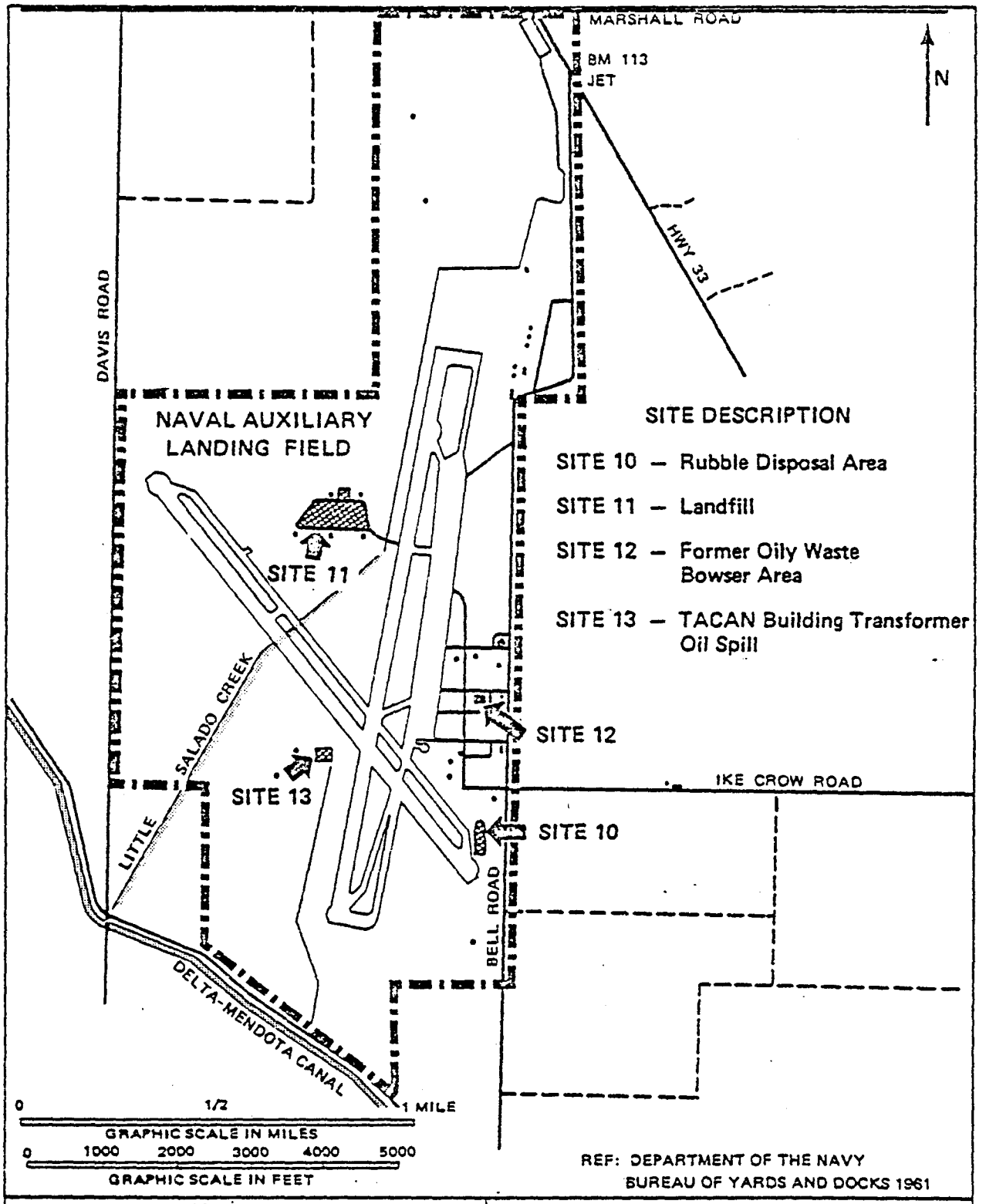

FIGURE 2-2
WASTE DISPOSAL SITES
NALF Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

Surface soils are very thick and slowly permeable. The deeper, confined aquifer, which is pumped for irrigation water on the station, will probably not be affected by contaminant migration because it is separated from overlying aquifers by a thick clay layer. Contaminants in the deeper, confined aquifer would have to move upgradient for a considerable distance to affect the pumped well. Maximum average ground water velocity in the shallow aquifers is probably about 100 feet per year. Chlorinated hydrocarbon-compound contamination of the shallow aquifers north and east of Hangar 3 has been documented (EMCON, 1983). Also, ground water contamination by chlorinated hydrocarbon compounds from off-station has been documented on the south side of NAS Moffett Field.

2.2.2. NALF Crows Landing. Contaminants at NALF Crows Landing can migrate by both surface water and ground water. The most likely pathway for surface water migration is runoff to storm ditches that drain to Little Salado Creek and to the sedimentation pond. This pond drains to a ditch that drains to the San Joaquin River.

Ground water at NALF Crows Landing flows generally northeast, however extensive pumpage for potable water and for irrigation water may cause ground-water-flow changes locally. Shallow aquifers, which may not be areally extensive, consist of sand and gravel lenses in clay in alluvial fans. Surface soils are several feet thick and slowly permeable. Most wells in the vicinity of NALF Crows Landing are at least 200 feet deep, and the producing layers are confined by clay deposits. An areally extensive, thick, impermeable clay layer (the Corocoran Clay) underlies the NALF Crows Landing area at a depth of about 250 to 300 feet. Several wells in the vicinity of NALF Crows Landing produce water from the aquifer below the Corocoran Clay. Most wells produce water from the aquifer above the Corocoran Clay. Some wells produce water from both aquifers. Maximum average ground water velocity in the aquifers may be as great as 1,700 feet per year.

Because NALF Crows Landing pumps large amounts of ground water for potable water and irrigation, contaminant migration from the station is unlikely. Contaminants present would first appear in station wells. The potable water supply is analyzed every three years for chemicals in accordance with the Safe Drinking Water Act. No contamination problems have been reported at NALF Crows Landing (Appendix C).

2.3 CONFIRMATION STUDY SITES. The following seven sites are recommended for confirmation studies under the Naval Assessment and Control of Installation Pollutants (NACIP) program.

2.3.1 Site 1, Runway Landfill, NAS Moffett Field. Site 1 is the landfill located at the northeast end of the runway and was operated from the early 1960's to 1978. This landfill was designed to hold refuse, debris, and scrap equipment; however, various shops at NAS Moffett Field used the landfill to dispose of hazardous materials. The aircraft squadrons disposed of hazardous waste, including trichloroethylene (TCE), toluene, methyl ethyl ketone (MEK),

paint, solvents, lacquer, and oil. The fuel farm sent about one pickup truck load of used fuel filters per year to this site. The Public Works paint shop disposed of paint and thinners of this site. Each year, the electrical shop disposed of a few dozen filters and some sawdust contaminated with transformer oils possibly containing PCB. Assuming the squadrons disposed of five to ten percent of their liquid waste at the landfill, as much as 75,000 to 150,000 gallons of hazardous waste were disposed of at Site 1.

This site borders directly on the Leslie Salt Company in the San Francisco Bay wetlands. Both surface drainage and ground water flow could move contaminants off NAS Moffett Field into the wetlands and salt evaporators.

2.3.1.1 Conclusion. Because of the amount of hazardous waste disposed of at Site 1, the proximity of the site to non-Navy property, and the migration potential of the contaminants to non-Navy property, Site 1 poses a potential threat to the environment. Therefore, Site 1 is recommended for a confirmation study.

2.3.2 Site No. 3, Marriage Road Ditch NAS Moffett Field. Site 3, Marriage Road Ditch, begins at the intersection of Marriage Road and Macon Road and is graded so that water flows toward the dike at the northern boundary of the station. Water in the ditch is pumped into Guadalupe Slough. The storm drains in and around hangars 1, 2, and 3 flowed to Marriage Road Ditch. Hazardous waste was disposed of in storm drains from the 1940's to the 1970's. An estimated 150,000 to 720,000 gallons of mixed hazardous waste containing waste oils, solvents, fuels, detergents, paints, paint strippers, and hydraulic fluids were disposed of in storm drains that flowed to Marriage Road Ditch. The wastes might have seeped into the soils beneath Marriage Road Ditch.

2.3.2.1 Conclusion. Because of the quantity and variety of hazardous wastes disposed of in Marriage Road Ditch and migration potential of these wastes in shallow ground water, Site 3 poses a potential threat to human health and to the environment. Therefore, a confirmation study is recommended for Site 3.

2.3.3 Site 4, Former Industrial Wastewater Holding Ponds, NAS Moffett Field. The former industrial wastewater holding ponds were located north east of Hangar 3 from 1968 to 1978. These ponds were unlined and received about 15 million gallons of wastewater from aircraft washing, ground support equipment maintenance, and hangars 2 and 3. The wastewater was held in the ponds, treated, and discharged to the sanitary sewers. As much as 35,000 gallons of hazardous waste may have been discharged to the ponds directly and in wastewater. The hazardous waste included toluene, MEK, dry cleaning solvent, paint sludge, freon 113, TCE, trichloroethane, carbon remover, paint stripper, ethylene glycol, fuel, and oil. The industrial wastewater treatment ponds have been moved to an adjacent area to the east and some of the area has been paved.

The ponds were probably deep enough to recharge or intercept the shallow ground water aquifer in the area. Water in this aquifer may enter Marriage Road Ditch and be pumped into Guadalupe Slough which flows into San Francisco Bay.

2.3.3.1 Conclusions. Because of the quantity of hazardous waste discharged to Site 4 and the proximity to the shallow aquifer, this site poses a potential threat to human health and to the environment. Therefore, a confirmation study is recommended for Site 4.

2.3.4 Site 5, Fuel Farm French Drains, NAS Moffett Field. The Fuel Division used a system of underground french drains at the main fuel facilities for approximately 15 years, from the early 1950's to the mid 1960's. Water and fuel were pumped into the french drains during routine tank drainage. The exact location of the drains and the quantities of fuel placed in the french drains are unknown, although two vertical open pipes were found during the on-site survey. A calculation based on the thickness of fuel layer observed in a well at the storage facility shows that as much as 28,000 gallons of fuel could be present on the ground water at this site.

The site is within 100 feet of the station boundary; and thus, fuel could migrate on ground water off station.

2.3.4.1 Conclusion. Because the site is close to the station boundary and because of the quantity of fuel that may be present, Site 5 poses a potential threat to the environment. Therefore, a confirmation study is recommended for Site 5.

2.3.5 Site 6, Runway Apron, NAS Moffett Field. Site 6 is the area surrounding the runway apron north and east of Hangar 3. The apron was enlarged in late 1979, covering an area formerly used for disposal. Waste from aircraft maintenance, which included solvents, oils, fuels, paints, and paint strippers, was disposed of at this site from 1940's to 1970's. The volume of hazardous waste disposed at this site has been estimated to range from 120,000 to 600,000 gallons. The chlorinated solvents included within the waste disposed of at this site pose the greatest potential environmental problems.

2.3.5.1 Conclusions. Because of the volume and types of waste disposed of at Site 6, this site poses a potential threat to human health or to the environment. Therefore, a confirmation study is recommended for Site 6.

2.3.6 Site 7, Hangars 2 and 3, NAS Moffett Field. Site 7 is the area surrounding hangars 2 and 3 on the eastern side of the runways. Construction of hangars 2 and 3 was completed in 1942. The deck drains in and around hangars 2 and 3 flowed to Marriage Road Ditch, Site 3, from the early 1940's to 1978. Unpaved areas at each corner of hangars 2 and 3 were used to dispose of liquid waste including paints, paint strippers, oils, solvents, fuels, and hydraulic fluids. An estimated 120,000 to 600,000 gallons of hazardous waste may have been disposed of around the hangars at Site 7. An Aircraft Intermediate Maintenance Department (AIMD) power plant shop was formerly located at the north east corner of Hangar 3. The shop disposed of chlorinated solvents, including trichloroethylene (TCE), down deck drains and on unpaved areas around Hangar 3. Chlorinated solvents such as TCE and other compounds have been detected in ground water samples from monitoring wells the north and east of Hangar 3. Results of ground water sample analyses are shown in Appendix E.

2.3.6.1 Conclusion. Because of the quantity and type of hazardous waste disposed of around the hangar, and because TCE and other chlorinated solvents have been detected in ground water at Site 7, this site poses a potential threat to human health or to the environment. Therefore, a confirmation study is recommended to characterize and identify the extent of contamination at Site 7.

2.3.7 Site 8, Waste Oil Transfer Area, NAS Moffett Field. Site 8 is located near Building 127 where the Off Site Branch of the Defense Property Disposal Office, Alameda, maintained a 5,000-gallon waste oil tank. The tank was used by the shops and squadrons for disposal of waste oil from the 1940's until 1981. The tank was fed from a sump located next to the road, where trucks discharged waste oil. Reportedly, the Public Works electrical shop used the tank for disposal of about 100 gallons per year of transformer oils contaminated with water. The transformer oil could have contained PCB. Also, the transportation shops may have placed as much as 200 gallons per year of solvents into the tank. Oil was spilled onto the ground around the sump during oil transfer.

The sump was located immediately next to the salvage yard, at the head of a drainage ditch. A grab sample of a small, discolored area of soil at this location showed a PCB concentration of 7.8 ppm. A potential for human contact with PCB-contaminated material exists at Site 8.

2.3.7.1 Conclusions. The PCB concentration in the soil this site exceeds state standards and may pose a potential threat to human health. Therefore, a confirmation study is recommended to determine the extent of PCB contamination at Site 8.

2.3.8 Site 9, Old Fuel Farm, NAS Moffett Field. Site 9 is the old fuel farm and old NEX gas station located in the area of Building 12. The old NEX gas station is Building 31. The old fuel farm was used from the 1940's until 1964. AvGas was stored in six underground 10,000 gallon steel tanks in an unpaved area that is now the parking lot of Building 12. MoGas was stored in two underground 5,000 gallon steel tanks near Building 31. Tanks were filled until fuel flowed from the vent onto the ground. Fuel samples were also disposed of to the ground. An estimated 60,000 gallons of AvGas containing about 1,000 pounds of tetraethyllead was disposed of over the life of the fuel farm. In the mid 1960's, two of the AvGas tanks began leaking. These tanks were not repaired. In 1964, the old fuel farm was abandoned and the tanks were filled with water. Reportedly, fuel odor occurs occassionally in the area.

2.3.8.1 Conclusions. Because of the quantity of tetraethyl lead and gasoline disposed in the area of the old fuel farm, Site 9 poses a potential threat to human health or to the environment. Therefore, a confirmation study is recommended for Site 9.

2.4 SITES NOT RECOMMENDED FOR CONFIRMATION STUDY

2.4.1 Site 2, Golf Course Landfill, NAS Moffett Field. Site 2 is a landfill located in the western part of the golf course. The golf course landfill operated from the 1940's to the early 1960's. Little information is available on the specific quantities of wastes were disposed of at this site, or on the exact location of the landfill. However, all organizations on the station had access to this landfill, and some might have disposed of hazardous waste there. Reportedly, this site was used by the same shops and to the same degree as the more recent runway landfill, Site 1. A burn pit in the golf course area was used for disposal of out dated flares and cartridge-activated devices (CADs) until 1971. The golf course was constructed by filling the area, using soil from off base.

Ground water levels in the area of the golf course are below sea level. Migration of contaminants to San Francisco Bay is unlikely.

2.4.1.1 Conclusions. Because of the age of the landfill, chemical degradation, and ground water movement to San Francisco Bay is unlikely, Site 2 does not pose a threat to human health or to the environment. Therefore, a confirmation study is not recommended for Site 2. However, if significant contamination is found at Site 1 which received similar types and quantities of waste, then a confirmation study for Site 2 should be considered.

2.4.2 Site 10, Rubble Disposal Area, NALF Crows Landing. Site 10 is located at the southeast end of northwest-southeast runway and was used for rubble disposal from 1952 to 1953. Rubble included scrap lumber, dry wall, metal, ash, wire, and pipe from building construction and demolition. No hazardous waste was reported to have been disposed of at Site 10.

2.4.2.1 Conclusion. Because no hazardous material was disposed of at Site 10, this site does not pose a threat to human health or to the environment. Therefore, a confirmation study is not recommended for Site 10.

2.4.3 Site 11, Landfill, NALF Crows Landing. Site 11 is located west of the main runway in the bunker area of NALF Crows Landing. The site was used from the 1960's to the early 1980's as a landfill. Refuse was disposed of in pits, burned, and covered. Also, about 300 pounds of scrap from the cleanup of practice bombing ranges was burned in a separate pit and covered. No hazardous waste was reported to have been disposed of with the refuse.

2.4.3.1 Conclusion. Because no hazardous waste was disposed of in the landfill and because the small amount of ordnance material in the practice bombs mostly burned, Site 11 does not pose a threat to human health or to the environment. Therefore, a confirmation study is not recommended for Site 11.

2.4.4 Site 12, Former Oily Waste Bowser Area, NALF Crows Landing. Site 12 is the ground area by the transportation shop (Building 138) where the oily waste bowser was located. Waste oil, transmission fluid, and solvents were disposed of in the bowser at the site. Some spillage occured and oil has stained the soil in the area. Contents of the bowser were always burned during fire fighting training.

2.4.4.1 Conclusion. Because only small amounts of solvent spilled during disposal, Site 12 does not pose a threat to human health or to the environment. Therefore, Site 12 is not recommended for a confirmation study.

2.4.5 Site 13, TACAN Building Transformer Oil Spill, NALF Crows Landing. Site 13 is the transformer pad east of the TACAN building, Building 143. In 1962, a transformer caught fire and spilled oil onto the unbermed pad. It is unknown whether the transformer contained PCB oil. Since the fire, the pad has been enlarged and some soil has been removed. A composite soil sample from around the new pad had a PCB concentration of less than 4.0 parts per million.

2.4.5.1 Conclusion. Because the concentration of PCB in the soil was less than 4.0 parts per million and the pad has been enlarged, Site 13 does not pose a threat to human health or to the environment. Therefore, a confirmation study is not recommended for Site 13.

CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. This chapter presents the recommended actions for the 12 potentially contaminated sites at NAS Moffett Field and NALF Crows Landing, California. Seven of the 12 sites pose a potential threat to human health or to the environment, and are recommended for confirmation studies.

A two-step Confirmation Study Ranking System (CSRS) is used to systematically evaluate the relative severity of potential problems at each site. The results of the CSRS and the recommended actions at each site are presented in Table 3-1. All sites should be marked on station development maps, reported to WESTNAVFACENGCOM Planning Facilities and Real Estate Department, and reported to NAS Moffett Field Public Works Branch, so that proper precautions can be taken during new construction at the sites.

3.2 CONFIRMATION STUDY RECOMMENDATIONS.

3.2.1 Site 1, Runway Landfill, NAS Moffett Field.

Ground-water-monitoring wells: Install three wells (shown in Figure 3-1) and use existing monitoring wells by Hangar 3 for background samples.

Type of samples: Ground water

Number of samples: 12, one sample from each well, quarterly for one year.

Test parameters: Water level, pH, specific conductance, TOC, and TOX. Run EPA methods 624 and 625 if TOX is detected.

Remarks: Ground-water-monitoring wells should be screened throughout the thickness of the shallow aquifer.

3.2.2 Site 3, Marriage Road Ditch, NAS Moffett Field.

Ground-water-monitoring wells: Install two wells in the ditch. Locations of monitoring wells are shown in Figure 3-2.

Type of samples: Ground water and soil.

Number of samples: Ground water, eight; one sample from each well quarterly for one year.

Soil, six; three soil core samples at depths of two, four, and eight feet from each well during installation.

Test parameters: Ground water; water level, pH, specific conductance, TOC, and TOX. Soil; pH, TOC, TOX. Run EPA methods 624 and 625 if TOX is detected.

Remarks: Ground-water-monitoring wells should be screened throughout the thickness of the shallow aquifer and sealed so that water in the ditch does not flow down the well bore.

TABLE

Summary of Confirmation Study Site Recommendations, NAS Moffett Field, California

Site Number	Site Name	CSRS (a) Score	Number of Wells	Number and Type of Samples	Frequency of Sampling	Parameters Analyzed (b)
49-1	Runway Landfill	8	3	12 Ground water	Quarterly for one year	Water level, pH, specific conductance, TOC, TOX. Run EPA methods 624 and 625 if TOX is detected.
49-3	Marriage Road Ditch	9	2	8 Ground water 6 Soil cores	Quarterly for one year Once	Water level, pH, specific conductance, TOC, TOX. Run EPA methods 624 and 625 if TOX is detected.
49-4	Former Industrial Wastewater Holding Ponds	10	1(c)	24 Ground water(d)	Quarterly for one year	Water level, pH, specific conductance TOC, TOX, phenols, MBAS. Run EPA methods 624 and 625 if TOX is detected.
49-5	Fuel Farm French Drains	5	4	16 Ground water	Quarterly for one year	First sample: Water level, pH, specific conductance TOC, TOX, oil and grease, and fuel thickness. Remaining samples: water level, fuel thickness.
49-6	Runway Apron	9	None(e)	4 Ground water(d)		Water level, pH, specific conductance TOC, TOX, phenols, MBAS. Run EPA methods 624 and 625 if TOX is detected.
49-7	Hangars 2 and 3	26	2(f)	32 Ground water	Quarterly for one year	Water level, pH, specific conductance TOC, TOX, phenols. Run EPA methods 624 and 625 if TOX is detected.
49-8	Waste Oil Transfer Area	8	None	9 Soil samples	Once	PCB.
49-9	Old Fuel Farm	6	None	21 Soils samples	Once	Lead, PAH

(a) CSRS is Confirmation Study Ranking System.
(b) Abbreviations: TOC--Total Organic Carbon.
TOX--Total Organic Halides.
MBAS--Methylene Blue Active Substances.
PCB--Polychlorinated biphenyl compounds.
PAH--Polyaromatic hydrocarbon compounds.
(c) Also use existing monitoring wells MW-7, MW-8, MW-10, MW-11, and MW-14.
(d) Combine results from samples from Sites 4 and 6.
(e) Also use existing monitoring wells MW-6, MW-7, MW-8, and MW-14.
(f) Also use existing monitoring wells MW-1, MW-3, MW-4, MW-5, and MW-20A.

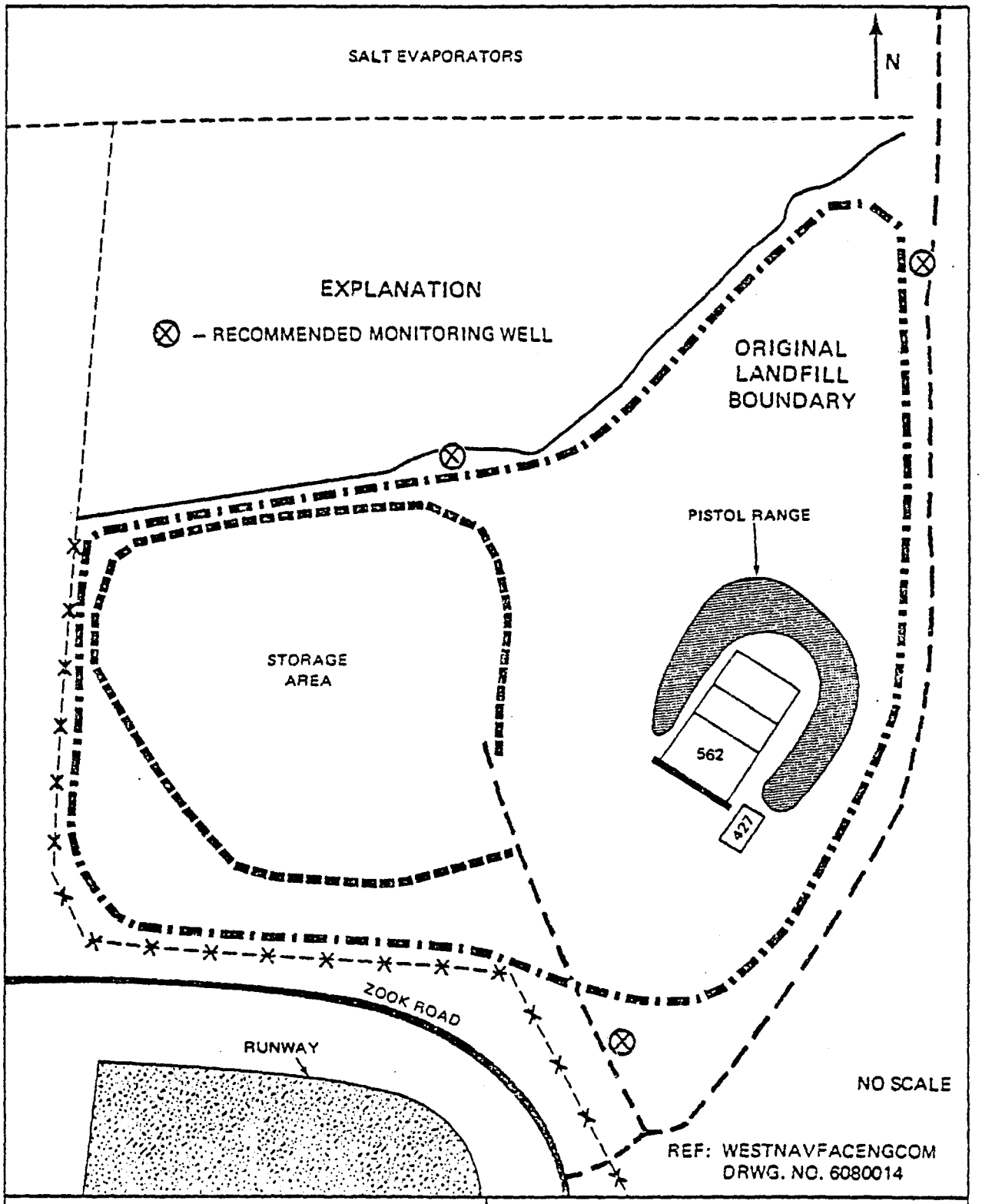

FIGURE 3-1
Location of Recommended Monitoring Wells for Site 1, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

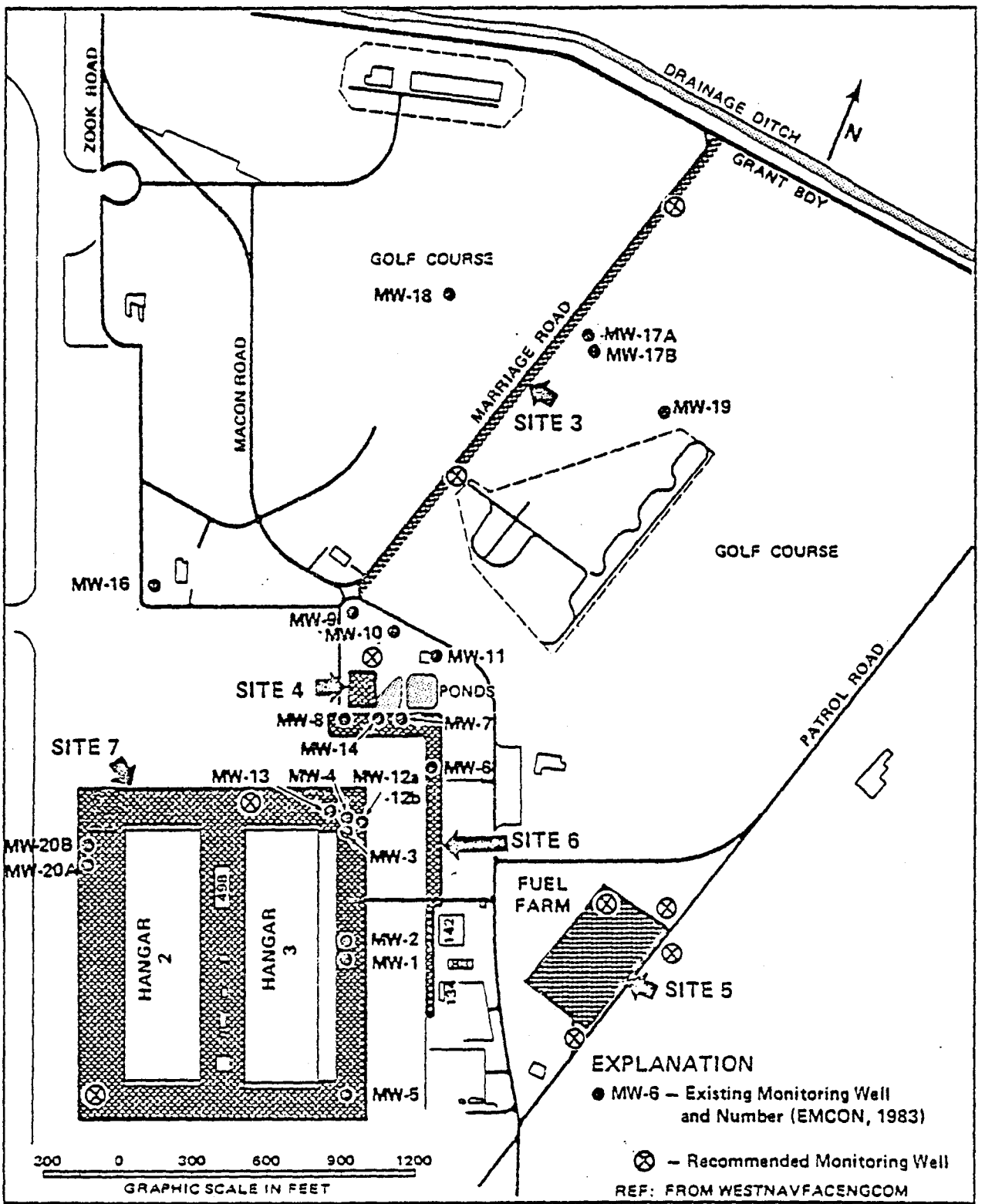

FIGURE 3-2
Locations of Recommended Monitoring Wells for Sites 3, 4, 5, 6 and 7, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

3.2.3 Site 4, Former Industrial Wastewater Holding Ponds, NAS Moffett Field.

Ground water monitoring wells: Install one new well (shown in Figure 3-2).

Types of samples: Ground water.

Number of samples: 24, one sample from each well (see remarks), quarterly for one year.

Test parameters: Water level, pH, specific conductance, TOC, TOX, phenols, methylene blue active substances (MBAS). Run EPA methods 624 and 625 if TOX is detected.

Remarks: Ground-water-monitoring well should be screened throughout the thickness of the shallow aquifer. Also, use existing monitoring wells MW-7, MW-8, MW-10, MW-11, and MW-14 for water quality samples. Results of water quality analyses from Site 6 should also be used in evaluating Site 4.

3.2.4 Site 5, Fuel Farm French Drains, NAS Moffett Field.

Ground-water-monitoring wells: Install four wells, one upgradient, and three downgradient (shown in Figure 3-2).

Types of samples: Ground water.

Number of samples: 16, one sample from each well quarterly for one year.

Test parameters. First sampling: water level, fuel thickness, pH, specific conductivity, TOX, TOC, oil and grease. Remaining three samplings: water level, fuel thickness.

Remarks: Ground-water-monitoring wells should be screened so that the top of the water table intercepts the screen throughout seasonal water-table fluctuations.

3.2.5 Site 6, Runway Apron, NAS Moffett Field.

Ground-water-monitoring wells: None (see remarks).

Type of samples: Ground water.

Number of samples: Four; one sample quarterly from one well (see remarks) for one year.

Test parameters: Water level, pH, specific conductance, TOC, TOX, phenol, methlyene blue active substances (MBAS). Run EPA methods 624 and 625 if TOX is detected.

Remarks: Ground-water-monitoring wells should be screened throughout the thickness of the shallow aquifer. Use existing monitoring well MW-6, MW-7, MW-8, and MW-14 (shown in Figure 3-2). Results of water quality analyses from Site 4 should also be used in evaluating Site 6.

3.2.6 Site 7, Hangars 2 and 3, NAS Moffett Field.

Ground-water-monitoring wells: Two (shown in Figure 3-2).

Types of samples: Ground water.

Number of samples: 32; one sample from each well (see remarks) quarterly for one year.

Test parameters: Water level, pH, specific conductance, TOC, TOX, phenols. Run EPA methods 624 and 625 if TOX is detected.

Remarks: Ground-water-monitoring wells should be screened throughout the thickness of the shallow aquifer. Use existing monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, and MW-20A (see Figure 3-2).

3.2.7 Site 8, Waste Oil Transfer Area, NAS Moffett Field.

Types of samples: Soil cores (shown in Figure 3-3).

Number of samples: Nine.

Test parameter: PCB.

Remarks: The purpose of this sampling is to find the extent of PCB contamination. Take nine samples as shown in Figure 3-3. Cores should be 6 inches deep.

3.2.8 Site 9, Old Fuel Farm, NAS Moffett Field.

Types of samples: Soil borings (shown in Figure 3-4).

Number of samples: 21

Test parameters: Lead and polyaromatic hydrocarbon (PAH) compounds.

Remarks: Make seven soil borings to about two feet below the water table. Take three soil samples from a depth of one foot, three feet and the top of the water table from each boring. Allow the bore hole to fill with water and take a sample to look for free fuel. If fuel is found then the bore hole should be converted to a ground water monitoring well.

3.3 GENERAL RECOMMENDATIONS. Additional samples and monitoring wells may be required if the results of the chemical analyses show contamination is present.

3.3.1 Site 2, Golf Course Landfill. Because the quantities and types of wastes disposed of at Site 2 are similar to those disposed of at Site 1, the survey team recommends that confirmation of Site 2 depend on sampling results from the runway landfill, Site 1. If samples from wells at the runway landfill indicate significant contamination, then a sampling program should be developed for the golf course landfill.

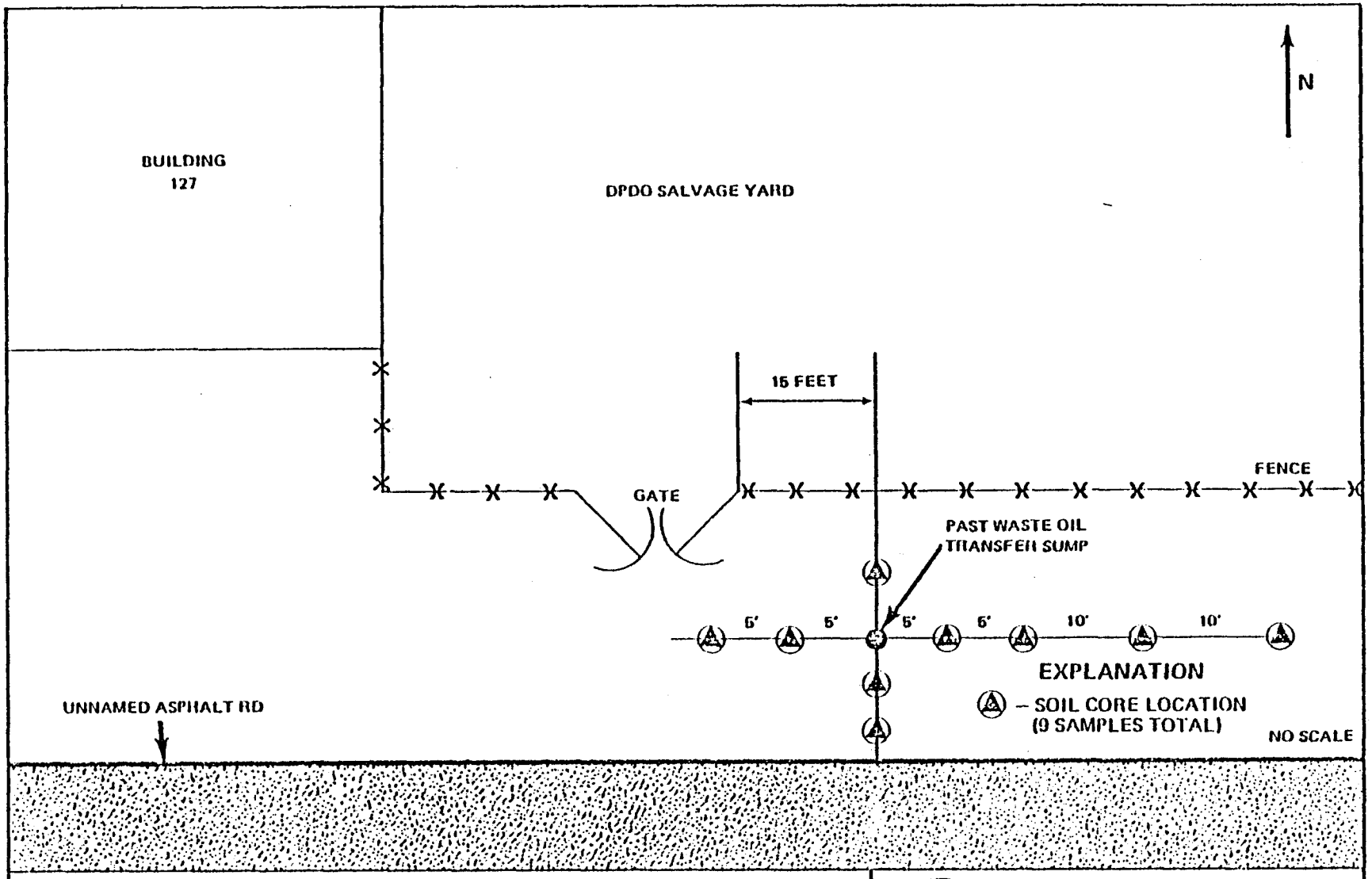

FIGURE 3-3
Locations of Recommend Soil Cores for Site 8, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

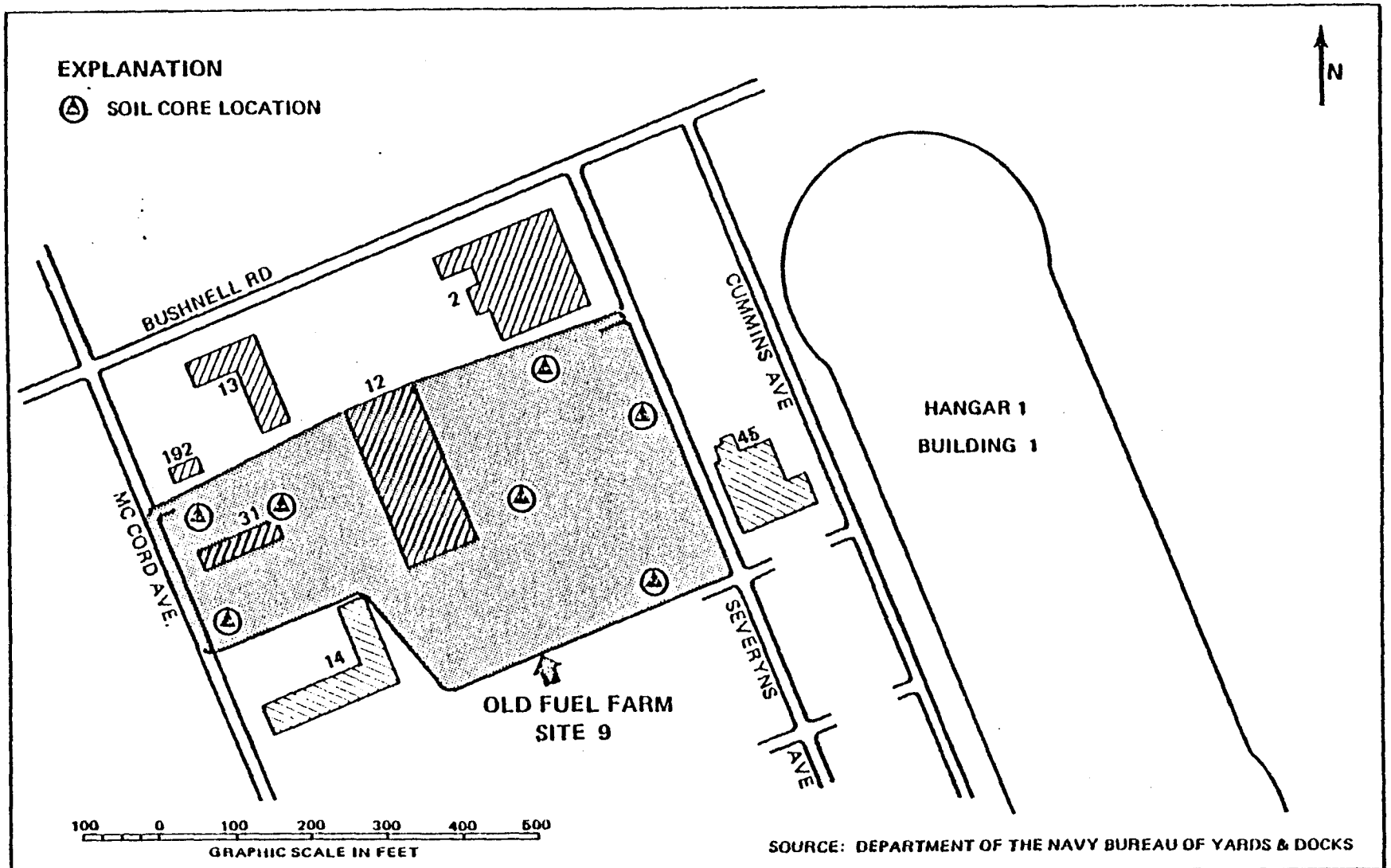

FIGURE 3-4
LOCATIONS OF RECOMMENDED SOIL CORES FOR SITE 9
NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA.

CHAPTER 4. BACKGROUND

4.1 GENERAL. This chapter presents general background information on Naval Air Station (NAS), Moffett Field and Naval Auxiliary Landing Field (NALF) Crows Landing. The general location of these stations is shown in Figure 4-1.

4.1.1 NAS Moffett Field. NAS Moffett Field is located on the southwest edge of San Francisco Bay, 35 miles south of San Francisco, California, and ten miles north of San Jose. The Station covers about 5,000 acres in Santa Clara County, and is bounded on the west by Mountain View on the south by Sunnyvale, on the north by the NASA Ames Research Center, and on the east by the Bay. Plate 1 shows NAS Moffett Field.

Currently, the basic mission of NAS Moffett Field is to support antisubmarine warfare training and patrol squadrons. It has about 5,000 military and civilian employees. NAS Moffett Field houses one major training squadron and seven patrol squadrons, and is headquarters for the Commander Patrol Wings, Pacific Fleet. Other major tenants at NAS Moffett Field include:

- Naval Air Maintenance Training Detachment 1012.
- Naval Aviation Engineering Service Unit.
- Fleet Aviation Specialized Operational Training Group, Pacific, Detachment NAS Moffett Field.
- Explosive Ordnance Disposal Unit, Detachment NAS Moffett Field.
- Branch Dispensary, Naval Regional Medical Center, Oakland.
- Branch Facility, Naval Regional Dental Center, San Francisco.
- Department of Defense Advanced Research Projects Agency (ARPA).

The area surrounding NAS Moffett Field is heavily populated and industrialized.

The weather in the NAS Moffett Field area is excellent for flying 95% of the year. The mean temperature is 57 degrees and annual rainfall averages 15 inches. The Bay Area's fog belt usually stays to the north of the station.

The principal access to NAS Moffett Field is through the Main Gate on the west side of the station, which also serves as the entrance to the Ames Research Center. The majority of the 380 structures at NAS Moffett Field are located on the west side of the base. The older permanent buildings have Spanish architecture, reflecting the history of the region. The Army built many of the temporary wood buildings on the grounds when it used the base in the early 1940s.

Most of the support functions at NAS Moffett Field are located on the west side of the station. The aircraft and training operations are on the east side. The administration building and personnel services are in the west side of the station. Housing is located in three general areas on the west. Supply administration is located in the same building as the Commissary; the warehouse is on Navy land in the NASA complex; and the aviation support division is in Hangar 3 on the east side of the field. The operations and training buildings are east of the administrative area, extending north and south of it. Hangar 1 is on the west side of the runways and hangars 2 and 3 are on the east. The weapons storage area is on the east side, near the Bay.

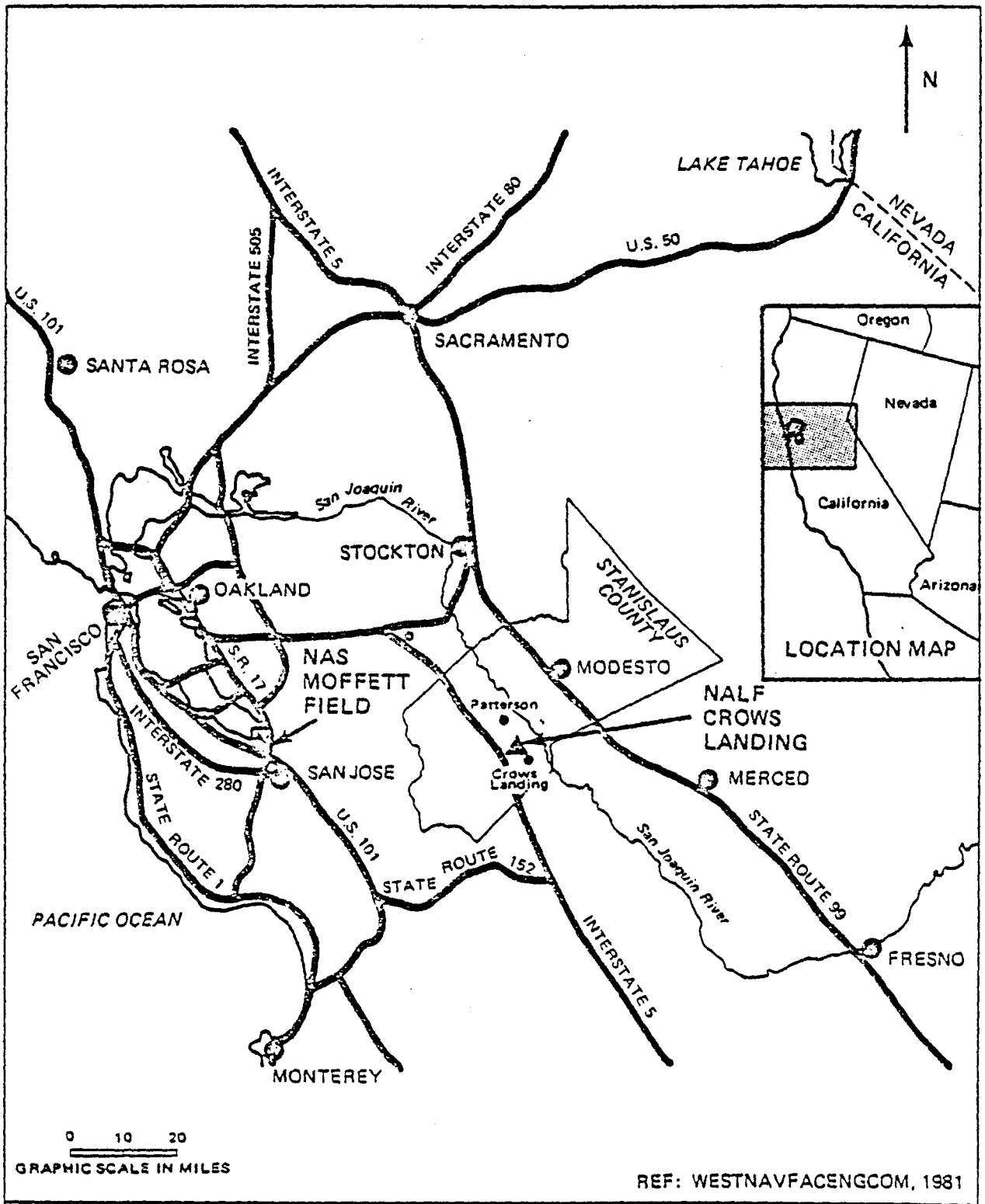

FIGURE 4-1
Location of NAS Moffett Field and NALF Crows Landing

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NAVAL AIR STATION
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Hangar 1 houses the Fleet Aviation Support Organization (FASO), which trains Pacific pilots for the P-3 antisubmarine aircraft. Hangar 1 also contains facilities for the VP-31 replacement squadron and the station's ground electronics operations. Hangers 2 and 3 house eight P-3 squadrons and the California Air National Guard.

The NAS Moffett Field Public Works Department (PWD) is headed by a Civil Engineer Corps Commander. PWD has 160 civilian employees, and a SEABEE detachment of one officer and 11 enlisted. The Department is divided into eight Divisions: Administrative, Maintenance Control, Engineering, Facilities Planning, Transportation, Housing, Maintenance, and Utilities.

4.1.2 NALF Crows Landing. NALF Crows Landing is in Stanislaus County, California, approximately 80 miles southeast of San Francisco. It covers about 1,500 acres on the west side of the San Joaquin River Valley. The station is located between Highway 33 and Interstate 5, two miles north of the town of Crows Landing and four miles south of Patterson. Its elevation is 168 feet above sea level. Figure 4-2 shows NALF Crows Landing.

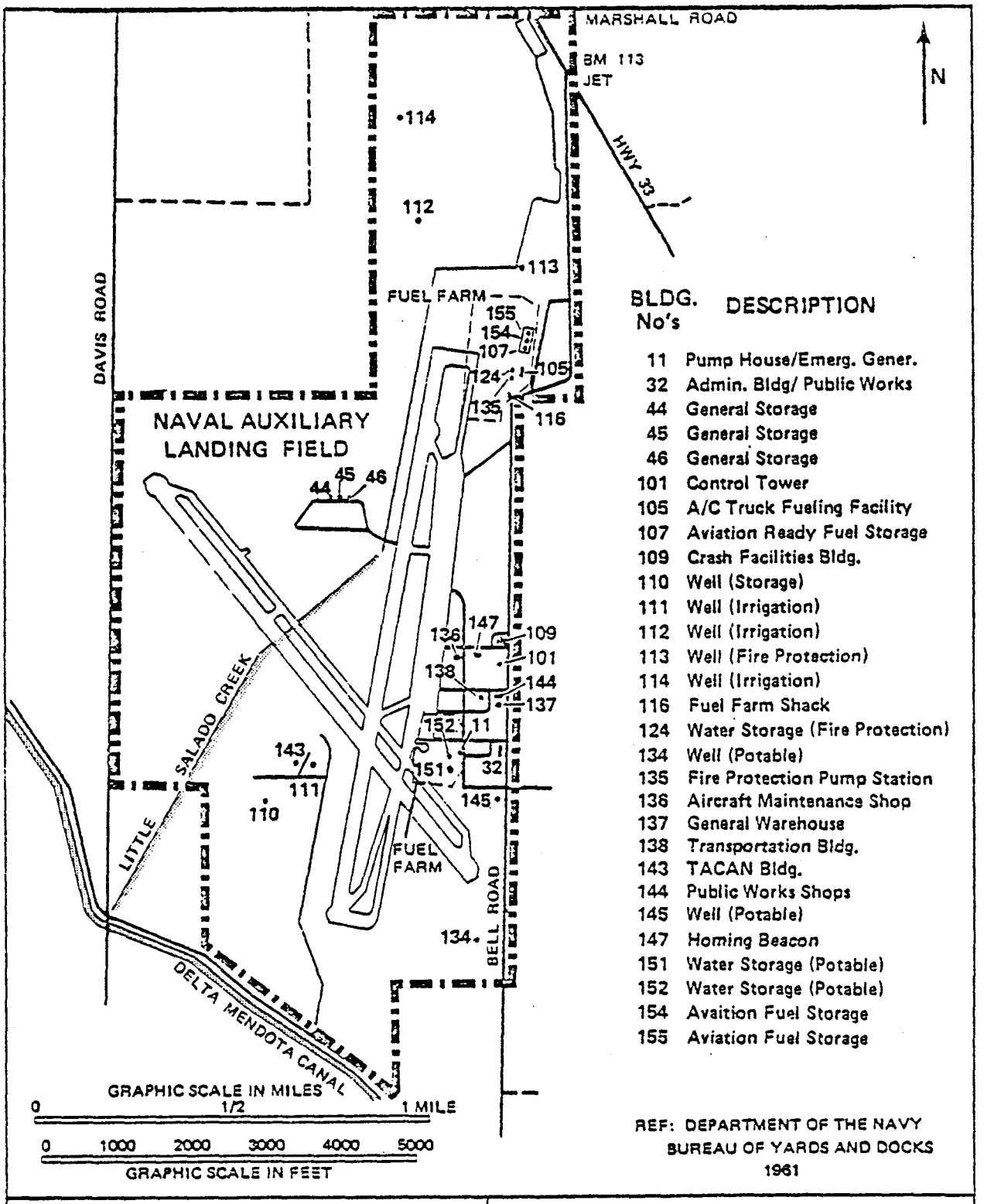
NALF Crows Landing is currently used as a practice field for Navy planes from NAS Moffett Field, NAS Lemoore, and NAS Alameda. NALF Crows Landing is also used by the NASA Ames Laboratory, and by Air Force, Army, Coast Guard, and Air Guard Reserve planes. The area surrounding the station contains row and orchard crops, and much of NALF Crows Landing itself is leased for agriculture. The facilities at the station are limited to the runway system and a small maintenance and support area east of the runway intersection. This area includes the tower, recreation, and administration facilities.

4.2 HISTORY.

4.2.1 NAS Moffett Field. NAS Moffett Field was commissioned in 1933 to support the West Coast dirigibles of the Lighter than Air (LTA) program. Although San Diego's Camp Kearney was the early favorite for West Coast LTA operations, strong community action in the San Francisco area resulted in the donation of 1,000 acres of farmland, worth half a million dollars, to the federal government. In October 1931, construction began on the "Sunnyvale Naval Air Station." Plans called for more than 40 buildings at a total cost of $4.8 million.

On February 12, 1935, while in exercises off Point Sur, the USS Macon, largest ship in the U.S. dirigible fleet, was lost in a storm. The Macon was the last U.S. dirigible of rigid construction and with its loss, the Navy no longer needed a West Coast LTA base. On 25 October 1935, Sunnyvale Naval Air Station was transferred to the War Department and used by the Army for training.

While under the Army, NAS Moffett Field was home base for the 82nd Army Observation and 9th Air Base Material Squadrons. In 1938, elements from the 18th and 20th pursuit squadrons arrived; in 1939 a permit was granted to the Ames Aeronautical Laboratory to use part of the station; and in 1940 NAS Moffett Field became the West Coast Training Center for air cadets. While at NAS Moffett Field, the Army constructed a wooden barracks complex, known as "Splinter City" on the east side of the station. In April 1942, NAS Moffett Field passed back to Navy control as a result of the wartime need for antisubmarine and patrolling units.



BLDG. No's	DESCRIPTION
11	Pump House/Emerg. Gener.
32	Admin. Bldg/ Public Works
44	General Storage
45	General Storage
46	General Storage
101	Control Tower
105	A/C Truck Fueling Facility
107	Aviation Ready Fuel Storage
109	Crash Facilities Bldg.
110	Well (Storage)
111	Well (Irrigation)
112	Well (Irrigation)
113	Well (Fire Protection)
114	Well (Irrigation)
116	Fuel Farm Shack
124	Water Storage (Fire Protection)
134	Well (Potable)
135	Fire Protection Pump Station
136	Aircraft Maintenance Shop
137	General Warehouse
138	Transportation Bldg.
143	TACAN Bldg.
144	Public Works Shops
145	Well (Potable)
147	Homing Beacon
151	Water Storage (Potable)
152	Water Storage (Potable)
154	Avaition Fuel Storage
155	Aviation Fuel Storage

REF: DEPARTMENT OF THE NAVY
BUREAU OF YARDS AND DOCKS
1961

FIGURE 4-2
NALF CROWS LANDING

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During the war, LTA operations became important once more at NAS Moffett Field. In 1942, the first LTA squadron ZP-32 was commissioned. Throughout this period the Naval Airship Training Command trained people for the dirigibles. Also in 1942, hangars 2 and 3 were constructed to house the increased wartime operations. The Navy established the Assembly and Repair Department to build and assemble airships. During this time the Navy converted the Army's "Splinter City" into classrooms.

In mid-1942, NAS Moffett Field was designated a joint LTA and Heavier than Air (HTA) installation, and HTA activities began to take precedence over LTA. In January 1945, the station's first airship squadron was decommissioned, and the Bureau of Aeronautics designated NAS Moffett Field as a major overhaul and repair base. In June 1945, Half Moon Bay Field came under NAS Moffett Field's control for HTA operations. In mid-1945, the NATS VR-4 and its maintenance unit were established at NAS Moffett Field. In early 1946, the Navy closed Half Moon Bay and rebuilt the landing facilities at NAS Moffett Field, signaling a transition to HTA operations. In August 1947, the LTA era at NAS Moffett Field ended with the deflation of the last blimp at the station.

After the war, NAS Moffett Field continued expanding for its role in HTA operations. The Navy modified landing facilities and hangars to accommodate the large R5D transport planes of the NATs. In March 1948, NAS Moffett Field was designated as a Helicopter Overhaul and Repair Base. In October 1949, the Helicopter Overhaul and Repair, NAT, and the NAT Overhaul and Repair Unit were officially closed. In December, Air Transport Squadron Three arrived to become the first Navy operated Military Air Transport Service Squadron stationed at NAS Moffett Field. In 1950, NAS Moffett Field became the largest Naval Air Transport Base on the West Coast, and in February it was designated the first all-weather Naval Air Station.

At the beginning of the Korean War in 1950, NAS Moffett Field began its part of the jet era. The Skynight--first night jet fighter of any service--began test flights there. Two fleet Aircraft Service Squadrons, 8 and 10, were commissioned and $10 million in new landing facilities, barracks, and other supporting structures were built. Also, NAS Moffett Field became home base for the fighters from the Navy's carriers guarding the Pacific. In 1953, the Navy designated NAS Moffett Field as the first Master Jet Station. In 1954, NALF Crows Landing opened under the command of NAS Moffett Field.

In 1955, the number of carrier air groups, air task groups, and support and logistic squadrons attached to NAS Moffett Field reached an all-time high. In 1956, a high speed jet refueling system was completed. In the spring of 1957, two types of supersonic planes were based at NAS Moffett Field, but increasing congestion in NAS Moffett Field airspace caused public pressure for a new air base. In 1961 NAS Lemoore was created and the jet era ended at NAS Moffett Field.

Late in 1962, the Navy chose NAS Moffett Field as the new West Coast home base for the Navy's P-3 Orion antisubmarine aircraft. In January 1964, NAS Moffett Field received its first flag officer, and was made the Pacific headquarters for all P-3 antisubmarine efforts through the establishment of Commander, Fleet Air Wings Pacific. In December 1965, NAS Moffett Field formed a Weapons

Department that included a torpedo shop. In February 1966, NAS Moffett Field reactivated its high-speed refueling facilities. The Aviation Supply Office designated NAS Moffett Field as a Primary Reporting Stock Point for aviation material in July 1966.

In 1973, with reorganization, NAS Moffett Field became the headquarters of the Commander Patrol Wings, U.S. Pacific Fleet. Commander Patrol Wings Pacific is supported at NAS Moffett Field by Patrol Wing TEN and a fleet replacement squadron. In April 1974, NAS Moffett Field broke ground for a $1.4 million AIMD avionics shop, and in December of 1975 a new medical and dental complex was dedicated. Today, NAS Moffett Field is the largest P-3 base in the world and the center of antisubmarine warfare operations in the Pacific.

4.2.2 NALF Crows Landing. Construction was authorized on the NALF Crows Landing in October of 1942. The runways were finished in May 1943 and the station was commissioned on May 25, 1943. Work on buildings, storage, sewage, and rocket loading facilities continued for several years. From 1941 to 1946, NALF Crows Landing had 20 to 30 civilian employees.

On December 15, 1946, NALF Crows Landing was deactivated. NALF Crows Landing was assigned to NAS Moffett Field as an auxiliary landing facility in June 1950. In September 1951, the Chief of Naval Operations assigned NALF Crows Landing to NAS Alameda. In February 1954, CNO then reassigned NALF Crows Landing to NAS Moffett Field. During the Korean War, the base was heavily used, with as many as 1,000 landings taking place each day.

In the early 1950s, NALF Crows Landing built aviation fuel storage facilities. In 1958 and 1959, NALF Crows Landing improved the existing fuel facilities and water supply system. Also, a Tactical Air Navigation Facility, and an Optical Landing system were installed. During this time, NALF Crows Landing had as many as 130 military and civilian personnel.

During 1965, the Navy lowered civilian and enlisted manning levels at NALF Crows Landing, and NAS Lemoore assumed the operational and administrative control of the field. In the late 1960s, an average of 90 people worked at the airfield, which was open 24 hours per day.

In 1973, the bulk of the P-3 antisubmarine aircraft practice missions shifted from NAS Moffett Field to NALF Crows Landing. In 1981, NALF Crows Landing had only six civilian employees. Now the base has about 30 military and civilian personnel. The commanding officer of NAS Moffett Field administers NALF Crows Landing. The daily operation of the station is under the control of the Commander Patrol Wings, U.S. Pacific Fleet.

4.3 BIOLOGICAL FEATURES.

4.3.1 NAS Moffett Field. NAS Moffett Field is located on San Francisco Bay in an urban setting within Santa Clara County (WESTNAVFACENGCOM, 1976). Most of NAS Moffett Field's nearly 3,400 acres is either paved, planted in typical urban ornamental plants, or used for agriculture. The northwestern portion of the station contains some areas where vegetation grows in a wild state. The grassy areas near runways and the berms around the industrial wastewater holding ponds, the ditches areas along the roadways, and the landfill area represent the greatest potential on station for habitat areas for local fauna.

The NAS Moffett Field fuel pier extends into the salt ponds and terminates on the edge of Guadalupe Slough. This wetlands area north of NAS Moffett Field is the most ecologically significant area near NAS Moffett Field. An estuarine wetland is a transition zone between salt and fresh water, and contains a diverse population of fish, benthic (bottom-dwelling) invertebrates, and zooplankton. Such a wetland is particularly significant because it offers protection from deep water predators, therefore serving as a nursery and rearing ground for young fish and other marine and estuarine organisms. The area also provides feeding and nesting areas for a large number of resident and migratory water birds (Ornduff, 1974). Some wetland plant species are highly productive. Cordgrass (Spartina foliosa), a dominant salt marsh species, produces five to ten times as much biomass and oxygen per acre as wheat (Bakker, 1971). Estuarine wetlands support a unique flora of halophytic plants, which are specially adapted to tolerate the high salt content of the estuary (Bakker, 1971). Surface water and ground water flows from NAS Moffett Field into this wetland area. The flora and fauna in the wetlands represent possible receptors for any contaminants migrating from NAS Moffett Field.

4.3.1.1 Wetlands Habitats. San Francisco Bay, California's largest estuary, is an example of a drowned river mouth. An enormous amount of sediment has been deposited on the bay floor which is exposed at low tide. Great expanses of mud flat and marsh gently ease to permanent water (Bakker, 1971).

Historically, tidal salt marsh and mudflat covered extensive areas of the South San Francisco Bay. Most of the marshes and mudflats of the South San Francisco Bay have been eliminated or greatly altered by diking and filling. The only remaining marsh habitat occurs along the margins of major sloughs. Consequently, wildlife use has been concentrated into limited areas (ENVIRON, 1981).

The area just north of NAS Moffett Field is an area that was within the historic margin of San Franciso Bay and was once open to tidal action. Because the area is now bordered by commerical salt evaporator ponds and dikes on the bayside and contains no open slough channels, regular tidal action has been eliminated. The absence of tidal inflow and the use of the site for storage of storm water has resulted in changes to the plant community. Present vegetation types are distributed according to residual salt concentrations in the bay mud soils, hydrologic conditions, and level and salinity of drainage water. Plant distributions also reflect manmade alterations to the area, such as dikes and roads (ENVIRON, 1981).

Major vegetation types found just north of NAS Moffett Field include salt marsh, brackish marsh, fresh water marsh and ruderal vegetation (opportunistic plant species) (ENVIRON, 1981). Figure 4-3 shows the major vegetation types in this area.

The salt marsh community is found in estuaries, bays, and other areas that are protected from wave action and strong winds of the open coast. This community is widely scattered on the Pacific coast; in northern California it occurs at the edges of Humboldt Bay, San Francisco Bay, Tomales Bay, Morro Bay, and a few other areas. The soil is generally very wet and in some areas is periodically inundated with salt water by tidal action (Ornduff, 1974).

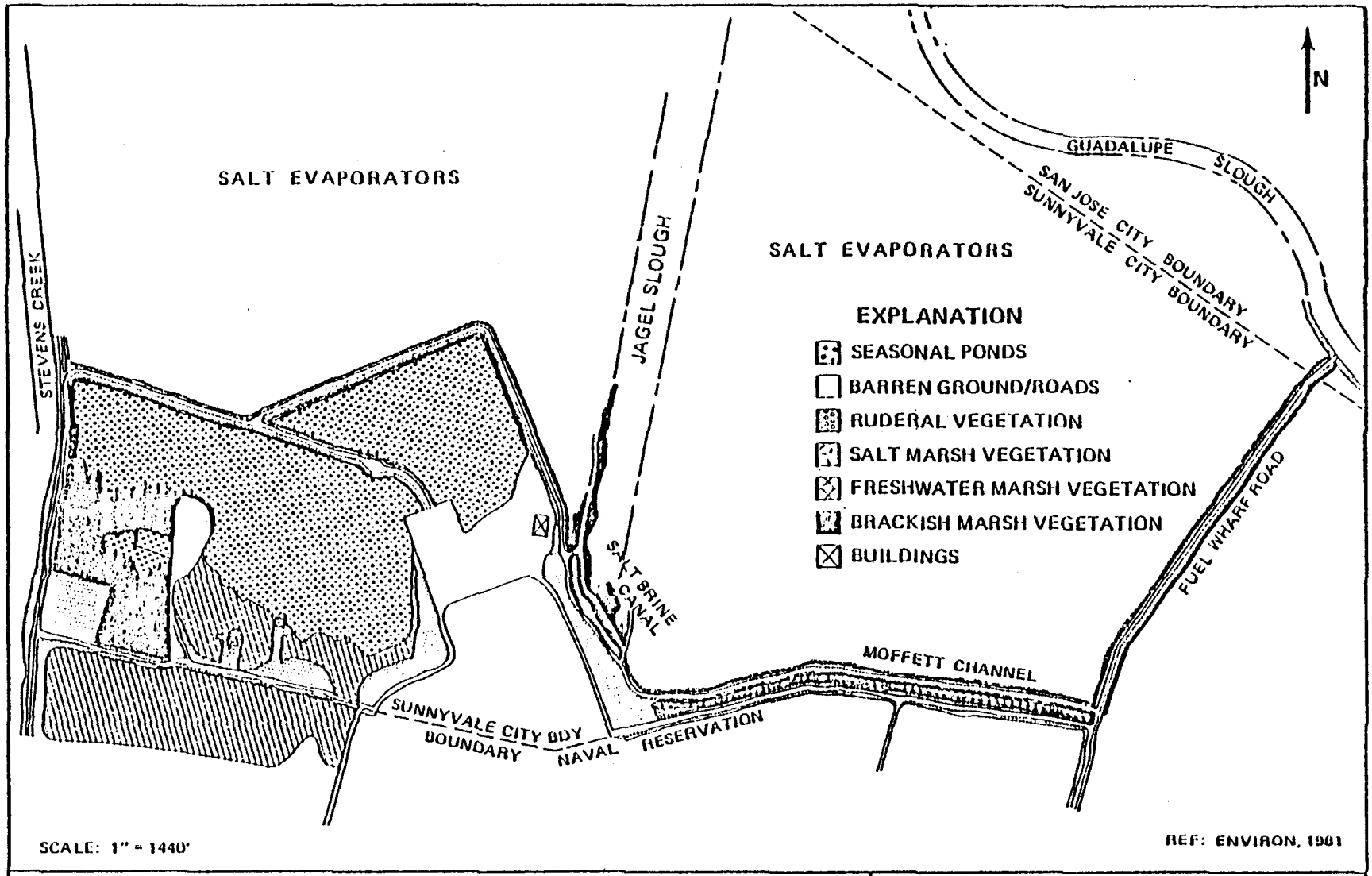

FIGURE 4-3
WETLAND VEGETATION TYPES, NAS Moffett Field

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NAVAL AIR STATION
MOFFETT FIELD, CA

Salt marsh vegetation closest to NAS Moffett Field is found within the edges of Stevens Creek and Guadalupe Slough. Cordgrass, pickleweed (Salicornia spp.), and salt grass (Distichlis spicata) grow at different elevations along with other halophytic species (ENVIRON, 1981).

Brackish marsh vegetation covers a large portion of the area immediately north of NAS Moffett Field. During the winter, this area functions as a storage pond, bordered by wetland vegetation. In the summer and fall months, lower water levels present different conditions, and vegetation, such as annual species, and might cover a larger area of the basin (ENVIRON, 1981).

Freshwater marsh vegetation grows along the southeastern margin of the brackish marsh where salinity levels are lower. Clumps of cattails (Typha spp.), sedges (Carex spp.), and rushes (Juncus spp.) are distributed over a 100-foot wide corridor crossed by several water channels (ENVIRON, 1981).

Ruderal vegetation is evident along Moffett Channel and Stevens Creek, but becomes sparse to nonexistent on the northern border of the brackish marsh, where high soil salinity and fluctuating water levels may prohibit establishment of a ruderal margin. Ruderal vegetation occurs on all levees and roads around the perimeter of the brackish marsh. Low forms such as cranesbill (Geranium dissectum), sweet clover (Melilotus sp.) and Vetch (Vicia sp.) subtend to the hardy annuals, such as mustard (Brassica spp.), thistle (Cirsium sp.) and sweet fennel (Foeniculum vulgare) which provide a thick border along most levee roads. Other abundant species include various grasses (Graminae spp.), curly-leaved dock (Rumex cirspus) and the rare marsh gum plant (Grindelia humilus) (ENVIRON, 1981).

4.3.1.2 Other Habitats. Other habitat areas at NAS Moffett Field include the semi-improved areas near runways, the golf course, and ruderal vegetation. The areas near the runways support a variety of upland grasses. The golf course is covered with cultivated grasses and contains two overflow ponding areas. No fresh water marsh vegetation grows along the banks of these ponds (ENVIRON, 1981). Ruderal vegetation is found along roadsides and at Site 1, Runway Landfill. Species composition is generally the same as was described for ruderal vegetation in the wetlands habitat.

A major natural plant community surrounding the salt marsh in this part of the South San Francisco Bay is the coastal prairie community. This plant community occurs sporadically along the northern California coast from the Oregon border to the San Francisco Bay area. The coastal prairie was originally covered with native perennial bunch grasses mixed with other herbaceous plants. Shrubs and trees were missing. The native species were replaced by introduced annual grasses. The majority of land that once contained coastal prairie vegetation has been subjected to grazing, cultivated for agriculture, or developed for housing, business, or industry (Ornduff, 1974).

4.3.1.3 Fauna. The fauna present near NAS Moffett Field includes a variety of migratory and wintering birds, visiting from the nearby bayfront and open water habitats, and several species of resident birds and small mammals (ENVIRON, 1981).

The brackish marsh provides habitat for shorebirds. The Black-necked stilt (Himantopus mexicana), killdeer (Charadrius vociferus), least sandpiper (Erolia minutilla), and the American avocet (Recurvirostra american) feed in the ponded areas. Other local species associated with salt marshes include the great blue heron (Ardea herodias), the great egret (Casmerodius albus), cinnamon teal (Anas cyanoptera), the American coot (Fulica americana), and the song sparrow (Melospiza melodia) (ENVIRON, 1981).

A variety of waterfowl species frequent both the brackish marsh and the adjacent freshwater marsh. The lesser scaup (Aythya affinis), the canvasback (Aythya valisineria), ruddy duck (Oxyura jamaicensis), and the American wigeon (Anas americana) visit the area to feed and rest. Ducks feeding in the marsh, and possibly nesting there, include the mallard (Anas platyrhynchos), the gadwall (Anas strepera), the pintail (Anas acuta), the northern shoveler (Spatula clypeata), and the cinnamon teal. Other than a small section of Stevens Creek near the NAS Moffett Field boundary, fresh water marshes are uncommon in this region of the South Bay, and this nesting habitat may be of importance to local waterfowl (ENVIRON, 1981).

The numerous salt evaporation ponds bordering the bay provide significant habitat for several species. Dikes around these ponds provide high barren ground that is both isolated from disturbance and adjacent to the abundant food supply of brine shrimp in the salt ponds. Forester's tern (Sterna forsteri) and the endangered California least tern prefer to nest on levees bordering the salt ponds. The ring-billed gull (Larus delawarensis), Bonaparte's gull (Larus philadelphia), western (Aechmophorus occidentalis) and the eared grebe (Podiceps caspicus), and the Forester's tern would be expected to be occasionally present near the brackish marsh. A large breeding colony of Forester's terns is located northeast of NAS Moffett Field (ENVIRON, 1981).

Ruderal vegetation habitat along levees provides foraging and nesting for many birds. The house finch (Carpodacus mexicanus), the western meadowlark (Sturnella neglecta), the white-crowned sparrow (Zonotrichia leucophrys), the savannah sparrow (Passerculus sandwichensis), the horned lark (Eremophila alpestris), the mourning dove (Zenaldura macroura), and the ring-necked pheasant (Phasianus colchicus) feed in the low herbiage and may take cover in the coyote brush (Baccharis pilularis) and thick vegetation. Twenty or more black-crowned night herons (Nycticorax nycticorax) have been observed roosting along Moffett Channel. Several species, including killdeer, American avocet, black-necked stilt, tern, and burrowing owl (Speotyto cunicularia) may nest near the northern boundary of NAS Moffett Field (ENVIRON, 1981).

During the on-site survey, burrowing owls and their burrows were observed near the fuel farm shallow well and on the northeastern edge of the golf course.

The most conspicuous mammal near NAS Moffett Field is the California ground squirrel (Spermophilus beecheyi), whose burrows are numerous along the wetland levees. Other mammals include grey fox (Urocyon cinereoargenteus), raccoon (Procyon lotor), black-tailed hare (Lepus californicus), striped skunk (Metphous mephitus), feral cat (Felis domestica), and California vole (Microtus californicus), as residents or hunters in and around the wetlands area (ENVIRON, 1981).

4.3.1.4 Endangered, Threatened, and Rare Species. The Endangered Species Act of 1973 (Public Law 93-0205) with amendments provides that all federal agencies shall carry out programs for the conservation of listed endangered and threatened species by ensuring that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary of the Interior to be critical (OPNAVINST 5090.1, 1983).

The list of endangered and threatened animal and plant species is published in the Federal Register 50 CFR 17.11-17.12. The official State of California listing of endangered and rare animals is contained in California Administrative Code, Title 14, Section 670.5 (State of California, 1983).

The California Native Plant Protection Act of 1978 assigns primary responsibility to the Department of Fish and Game for determining California plants to be listed as endangered or rare. A species is endangered when its prospects of survival and reproduction are in immediate jeopardy. A species is rare when, although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens. As of 20 November 1979, the State of California has listed 75 endangered and 49 rare plants. (California Native Plant Society, 1980).

The California Department of Fish and game uses the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of Caifornia as their species-of-concern list (California Native Plant Society, 1980).

The following presents information about the endangered, threatened, and rare species that may inhabit areas near NAS Moffett Field.

California least tern (Sterna albifrons browni)

Federal status: endangered

State of California status: endangered

Habitat: beaches, bays, ocean, estuaries.

Food: small fish, marine life, large insects (Peterson, 1961). Preferred prey includes anchovy, shiner perch, topsmelt, killifish, jacksmelt, California grunion, and mosquito fish (NAVFACENGCOM, 1982).

Comments: this species has been observed nesting on levees in Fremont, approximately five miles northeast of NAS Moffett Field, and at other locations in South San Francisco Bay (ENVIRON, 1981).

California clapper rail (Rallus longirostris obsoletus)

Federal status: endangered

State of California status: endangered

Habitat: salt marshes, salicornia beds along the Pacific coast (Peterson, 1961).

Food: aquatic plants, insects, frogs, crustaceans, molluscs, seeds, and buds (Peterson, 1961).

California black rail (Laterallus jamaicensis coturniculus)

Federal status: not listed

State of California status: rare

Habitat: salt marshes, salicornia beds along the Pacific coast (Peterson, 1961).

Food: aquatic plants, insects, frogs, crustaceans, molluscs, seeds, and buds (Peterson, 1961).

Comments: both California clapper rails and California black rails may be present in the salt marsh corridors of Stevens Creek and have been sighted at Guadalupe Slough. Both species may occasionally visit the wetlands adjacent to NAS Moffett Field to forage in the areas of dense tidal marsh vegetation (ENVIRON, 1981).

Brown pelican (Pelecanus occidentalis)

Federal status: endangered

State of California status: endangered

Habitat: salt bays, oceans (Peterson, 1961).

Food: mainly fish, crustaceans (Peterson, 1961). Feeds mostly on anchovies (NAVFAC, 1982).

Comments: abundant in Jagel Slough near NAS Moffett Field from August to October (ENVIRON, 1981).

Salt marsh harvest mouse (Reithrodontomys raviventris)

Federal status: endangered

State of California status: endangered

Habitat: coastal salt marsh. Found only in San Francisco Bay area (Ingles, 1965). These mice prefer dense salt marsh vegetation consisting of pickleweed or a combination of pickleweed and alkali heath with a border of ruderal habitat.

Food: seeds and fruits, prefers wild plants (Ingles, 1965).

Comments: the salt marsh along Stevens Creek is a potential habitat area. At periods of inundation, mice from the Stevens Creek wetlands may invade the nearby ruderal vegetation area (ENVIRON, 1981).

Marsh gum plant (Grindelia humilus)

Federal status: not listed

State of California status: candidate rare species (ENVIRON, 1981)

California Native Plant Society status: rare

Habitat: salt marsh

Comments: two specimens were located on the Stevens Creek levee bordering the brackish marsh (ENVIRON, 1981).

4.3.2 NALF Crows Landing. NALF Crows Landing is located in the San Joaquin River Valley, approximately 50 miles east of NAS Moffett Field. The valley is almost entirely cultivated, with few natural vegetation areas left. The agricultural area around NALF Crows Landing contains row and orchard crops. The main local products are beans, tomatoes, sugar beets, cauliflower, walnuts, almonds, melons, and apricots (WESTNAVFACENGCOM, 1981).

Prior to agricultural development of the area, the valley grassland plant community occupied this area. Originally, this community was composed of various perennial bunch grasses. However, these were replaced by introduced annual grasses such as brome grass (Bromus spp.), wild oats (Avena spp.), and fescue (Festuca spp.) (Ornduff, 1974).

4.3.2.1 Outleases. NALF Crows Landing property has been outleased for agricultural purposes since at least the mid-1950s. The outlease consists of approximately 1,167 acres. Crops include beans, tomatoes, sugar beets, peas, lima beans, spinach, alfalfa, and grain (WESTNAVFACENGCOM, no date).

4.3.2.2 Wildlife Refuge. In January 1982, as a joint project between the Navy and the United States Soil Conservation Service, one and one-half acres of NALF Crows landing was established as a wildlife refuge. The refuge is the third evaporation pond near the Imhoff tank. This pond was never used as an evaporation pond and because the scope of NALF Crows Landing's mission is not anticipated to increase dramatically in the near future, the pond is not planned for use as an evaporation pond.

The U.S. Soil Conservation Service has planted salt bush (Atriplex spp.), blackberry (Rubus spp.), and vetch (Vetch spp.). Willow (Salix spp.) is also growing in the refuge.

Fauna observed at the refuge by the Soil Conservation Service include the following species:

mallard (Anas platyrhynchos)

western kingbird (Tyrannus verticalis)

savannah sparrow (Passerculus sandwichensis)

red-winged blackbird (Agelaius phoneiceus)

American goldfinch (Spinus tristis)

barn swallow (Hirundo rustica)

house finch (Carpodacus mexicanus)

white tailed kite (Elanus leucurus)

Brewer's blackbird (Euphagus cyanocephalus)

killdeer (Chardrius vociferus)

loggerhead shrike (Lanius ludovicianus)

cinnamon teal (Anas cyanoptera)

opossum (Didelphis virginiana)

field mice (Cricetidae)

black tailed hare (Lepus californicus)

coyote (Canis latrans)

4.3.2.3 Endangered, Threatened, and Rare Species. The following presents information about endangered, threatened, and rare species that may occur in the general vicinity of NALF Crows Landing:

Blunt-nosed leopard lizard (Gambelia silus)

Federal status: endangered

State of California status: endangered

Habitat: open areas with low bushes. Such habitat occurs on sparsely vegetated plains, alkali flats, low foothills, canyon floors, large washes, and arroyos.

Food: primarily consumes large insects, small lizards, and juvenile conspecifics. Some insects taken include locusts, cicadas, grasshoppers, crickets, and various beetles and butterflies (NAVFACENGCOM, 1982).

Comments: According to the local office of the Soil Conservation Service, the blunt-nosed leopard lizard was present in the area in the past; however, because of loss of habitat in the valley, the lizard is now more likely to be found near the foothills.

Giant garter snake (Thamnophis couchi gigas)

Federal status: not listed

State of California status: Rare

Habitat: streams and sloughs with mud bottoms.

Food: fish, fish eggs, frogs, toads, tadpoles, salamanders, earthworms, and leeches (Stebbins, 1966).

Comments: no suitable habitat areas for this species occur at NALF Crows Landing.

San Joaquin Kit Fox (Vulpes macrotis mutica)

Federal status: Endangered

State of California status: Rare

Habitat: rough dry valley lands with abundant rodents.

Food: principal prey is rodents, but may survive on insects when rodents are scarce.

Comments: the historic range included all drier portions of the San Joaquin Valley from Tracy south. Tracy is approximately 30 miles north of NALF Crows Landing. However, present distribution is reduced to the western San Joaquin Valley in foothills and areas of native vegetation (NAVFACENGCOM, 1982). The wildlife refuge may represent a potential habitat area, however, the local office of the Soil Conservation Service has not observed the kit fox at the refuge and believes the kit fox does not occur in the vicinity of NALF Crows Landing.

4.4 PHYSICAL FEATURES.

4.4.1 NAS Moffett Field. This section describes the physical features of NAS Moffett Field and vicinity. The physical features include climatology, topography, geology, soils, hydrogeology, and migration potential.

4.4.1.1 Climatology. NAS Moffett Field and vicinity has a Mediterranean or dry summer, sub-tropical type climate. Daily annual temperature range is small. Daily summer temperatures average in the low 70°F range, with high temperatures rarely exceeding 100°F. Minimum temperatures average in the 50°F range and may occasionally drop to freezing in winter.

Mean annual rainfall is 12.8 inches (Naval Weather Service Detachment). Winter rains (November through March) account for about 80 percent of the annual rainfall. Seven to ten days per month have rainfall in the winter. Severe winter thunderstorms occur only occasionally.

Daytime winds are off San Francisco Bay from the north and northwest. Evening winds are more westerly. Average wind velocity is about 7 miles per hour and ranges from 4 miles per hour in the early morning to 12 miles per hour in the afternoon (WESTNAVFACENGCOM, 1976).

4.4.1.2 Topography and Surface Drainage. NAS Moffett Field is situated on nearly flat interfluvial basin deposits. Elevations at NAS Moffett Field range from about 36 feet above mean sea level to one or two feet below mean sea level. Figure 4-4 is a topographic map of NAS Moffett Field and vicinity.

Stevens Creek, which borders the station on the east, is the only stream in the vicinity of NAS Moffett Field. The stream is intermittent. Some runoff from NAS Moffett Field flows to Stevens Creek. A series of storm drains and ditches collects most runoff which flows to a ditch along the north boundary of the station. Water in this ditch is pumped into Guadalupe Slough which drains to San Francisco Bay.

About one half of NAS Moffett Field lies in a flood-prone area that is subject to tidal flooding an average of once in 100 years. This area is shown in Figure 4-4.

4.4.1.3 Soils. The U.S. Soil Conservation Service (1967 and 1968) has identified two different soil associations on NAS Moffett Field. These are the Reyes-Alviso Association (Rm-Ao) and Sunnyvale-Castro Association (Sp-Cv). Figure 4-5 is a map showing the soil associations at NAS Moffett Field and vicinity.

The Reyes-Alviso Association (Rm-Ao) consists of very poorly drained, fine-textured soils developed in gleyed, fine-textured alluvium. The association occupies the level tidal flats of San Francisco Bay. The soils are very deep, slowly permeable, and have high ground water levels. Alviso soils, which comprise about 85 percent of the association, have dark grey surface soils and gleyed, gray silty clay subsoils. Underlying alluvium is stratified with thin lenses of organic matter.

The Sunnyvale-Castro Association (Sp-Cv) consists of poorly drained, fine-textured soils developed on gleyed, noncalcareous, fine-textured alluvium. The association occupies nearly level low positions of interfluvial basin deposits. These soils are very deep, slowly permeable, and have high ground water levels. Sunnyvale soils, which make up about 50 percent of the association, have calcareous, dark gray, granular, silty clay surface soils and have strongly calcareous, gray silty clay subsoils. Castro soils, which make up about 35 percent of the association, have very dark gray, calcareous, clay surface layers and gray, partially lime cemented clay subsoils. Underlying alluvium is gleyed, noncalcareous, and fine grained. Areas of these soils are cultivated at NAS Moffett Field.

4.4.1.4 Geology, Hydrogeology, and Migration Potential. NAS Moffett Field, located adjacent to southwestern San Francisco Bay, lies in the central part of the Santa Clara Valley which is a large structural depression between the Santa Cruz Mountains and the Diablo Range. The valley is filled with alluvium derived from the mountains and with inland sea deposits derived from the bay. The maximum depth to bedrock beneath the valley alluvial fill and sedimentary materials is more than 1,500 feet (Iwamura, 1980).

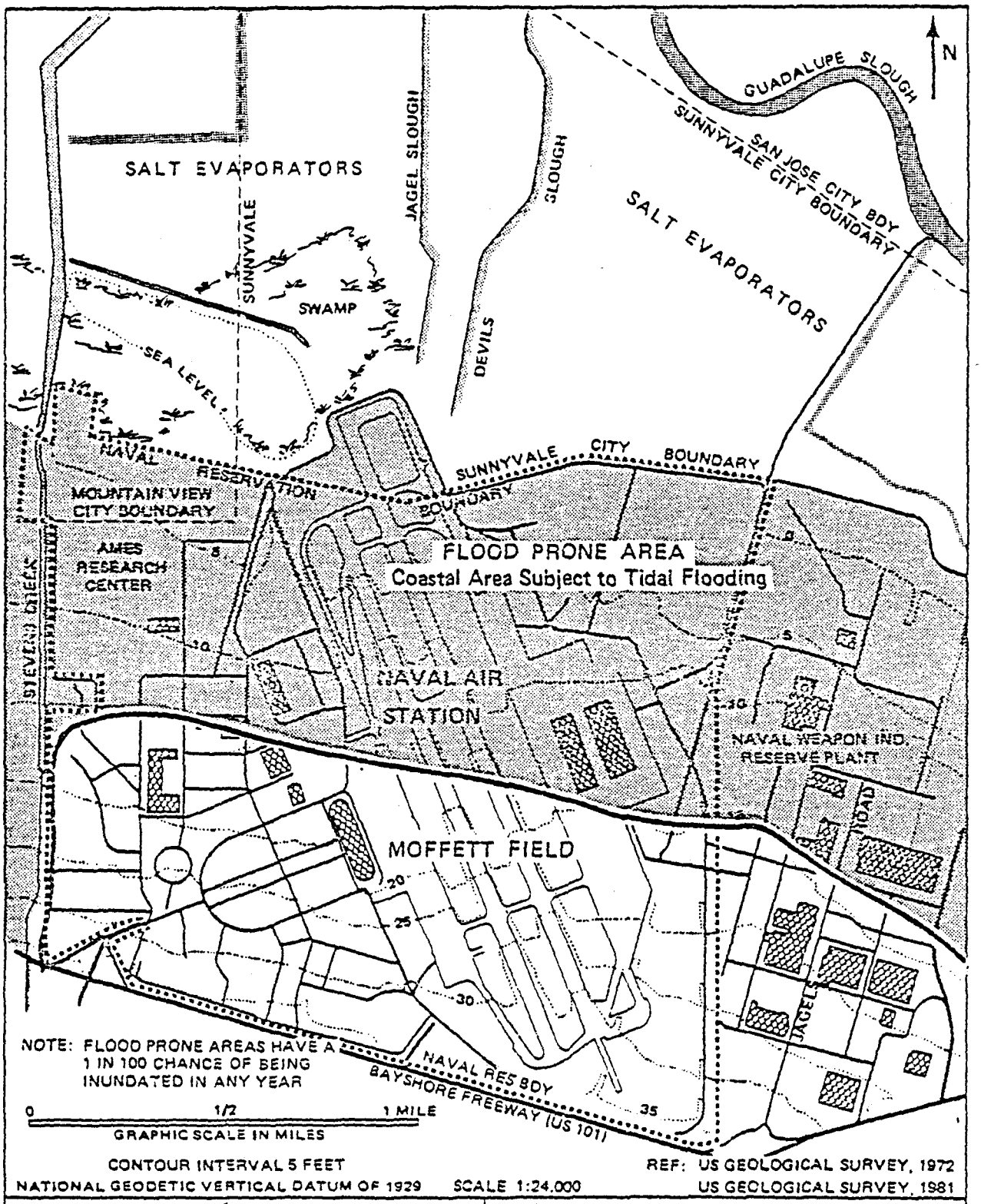
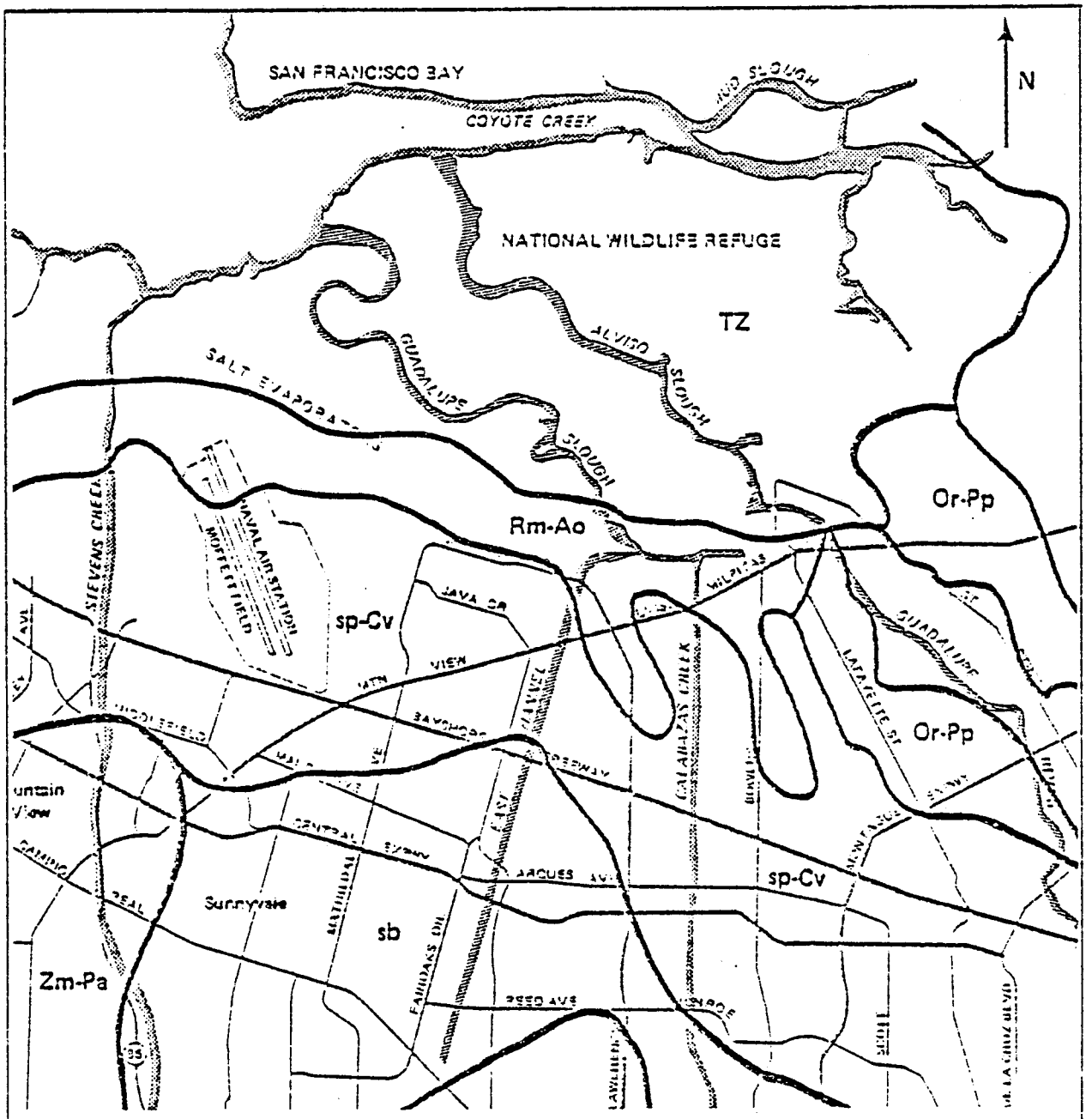


FIGURE 4-4
TOPOGRAPHY AND FLOOD PRONE AREAS
NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA



EXPLANATION

Or-Pp	Orestimba - Pescadero Association	sp-Cv	Sunnyvale - Castro Association
Rm-Ao	Reyes - Alviso Association	TZ	Tidal Flats
sb	Sorrento Association	Zm-PA	Zamora - Pleasanton Association

0 5,000 10,000 15,000

GRAPHIC SCALE IN FEET

REF: FROM US CONSERVATION SERVICE, 1966

FIGURE 4-5
GENERAL SOIL TYPES
NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

4.4.1.4.1 Bedrock Geology. The recent alluvium in the vicinity of NAS Moffett Field is underlain by weakly consolidated, non-marine sedimentary rocks of the Santa Clara Formation. The Santa Clara Formation may be up to 2,000 feet thick. The Santa Clara Formation is underlain by marine sedimentary rocks and igneous rocks. Table 4-1 is a generalized geologic column for the Palo Alto area. Figure 4-6 shows the surface geology in the vicinity of NAS Moffett Field.

4.4.1.4.2 Structural Geology. The Santa Clara Valley is located between two large active faults; the San Andreas Fault to the southwest and the Hayward Fault to the northeast. It is unknown whether faults that occur in the bedrock beneath the valley fill cut the layers of sedimentary fill or have an effect on aquifers in the basin (Iwamura, 1980). The sedimentary fill of the Santa Clara Valley is presumably underformed. Gravity data suggest that the crest of a buried ridge of high density material (presumably Franciscan Formation) extends and deepens southeastward from Redwood City to Palo Alto and Moffett Field (Dibblee, 1966).

4.4.1.4.3 Geologic Hazards. NAS Moffett Field is located in the seismicly active San Francisco Bay Region. Movement along any of the historically active faults in the area (San Andreas Fault, Hayward Fault, and the Calaveras Fault) could cause damage due to ground shaking and, to a lesser extent, soil liquefaction. Movement along smaller and unmapped faults could also cause damage at NAS Moffett Field.

4.4.1.4.4 Hydrogeology. Aquifers in the vicinity of NAS Moffett Field consist of alluvial sand or sand and gravel deposits separated by nearly impermeable silts and clays. In the interior part of the Santa Clara Valley, the numerous aquifers have been divided into two broad units; the upper aquifer zone and the lower aquifer zone. The destinction between the two aquifers is that water in the lower aquifer zone is confined under an extensive clay aquitard, and water in the upper aquifer zone may be either confined or unconfined. The two broad aquifer zones are effectively separated by an extensive aquitard at depths of 100 to 150 feet in the baylands area (Iwamura, 1980). Ground water for irrigation and drinking water is obtained from the lower aquifer zone in the vicinity of NAS Moffett Field. The irrigation well on the south side of the station taps the lower aquifer zone.

Aquifers in the upper zone are generally thin and discontinuous. The top-most aquifer usually occurs at a depth of 15 to 20 feet. Aquifer materials range from silty sand to fine to coarse gravel.

Ground water in the upper aquifer zone is locally perched on clay layers. Two relatively thin (3 to 10 feet thick) aquifers occur in the upper aquifer zone. These aquifers have been called the "20-foot" and the "45-foot" aquifers. Aquifer performance tests show that these aquifers are hydraulically connected. However, aquifer performance tests showed no hydraulic connection between the 45-foot aquifer and the 185-foot aquifer, the uppermost aquifer in the lower aquifer zone (Iwamura, 1980).

In the lower aquifer zone, individual aquifers are not hydraulically connected as shown by the different ground water levels in wells in several different layers of the aquifer.

TABLE 4-1

Generalized Geologic Column for the Vicinity of NAS Moffett Field, California

System		Geologic Units	Informal Unit Name	Lithologic Character
Quarternary	Recent	Surficial Sediments	alluvium (Qb and Qal)	Stream-laid gravel, sand, and silt.
			bay mud and clay (Qobm)	Brackish marine-grey to nearly black, commonly alkaline, in places with small molloscan fossiles.
	Pleistocene	Older Alluvium	alluvium	Stream-laid gravel composed of cobbles and pebbles in a matrix of light brown to reddish-brown sand and silt, derived from adjacent hills. Generally under-formed; dissected where elevated; thickness unknown.
		Santa Clara Formation		Terrestrial sedimentary rocks, weakly consolidated; consisting of stream-laid conglomerate and interbedded soft gritty sandstone, siltstone, and clay; as well as lacustrian clay and sand stone at the base of the section. Northeast of the San Andreas Fault, the formation rests with profound unconformity on the Franciscan Formation and other Tertiary formations.
Tertiary	Pleiocene	Unconformity Merced (?) Formation		Soft yellow fine to medium-grained sand-stone with abundant shallow marine molluscan fossils, less than 150 feet thick.
	Miocene	Unconformity Montery Shale		Marine semisiliceous shale.
		Unnamed Sand Stone		Marine, light gray massive to poorly bedded soft, mostly fine-grained sand stone, in places contains concretions.
		Page Mill Basalt		Extrusive basalt, black, hard, very fine grained, composed mainly of calcic plagioclase, pyroxene, and iron oxides.
		Mindego Basalt		Extrusive basalt submarine flows, flow breccias, agglomerates and tuff breccias.

TABLE 4-1 (continued)

Generalized Geologic Column for the Vicinity of NAS Moffett Field, California

System		Geologic Units	Informal Unit Name	Lithologic Character
Tertiary	Oligicene and (or) Miocene	Basalt and Diabase		Basalt and diabase black, massive forms isolated flows and or sills in San Lorenzo Formation and Lambert Shale.
		Lambert Shale		Marine Shale.
		Vaqueros Sandstone		Marine sandstone, light grey semifriable to hard, bedded to massive.
	Eocene	San Lorenzo Formation		Marine sedimentary rocks, mostly clay, shale, and siltstone.
		Butano Sand-Stone		Marine sedimentary rocks, mostly clay, shale, and siltstone.
Cretaceons		Franciscan Formation		Sequence of intertanguing volcanic and unmetamorphased marine sedimentary rocks. All rocks much shattered, in places brecciated or sheared.

(After Dribblee, 1966)

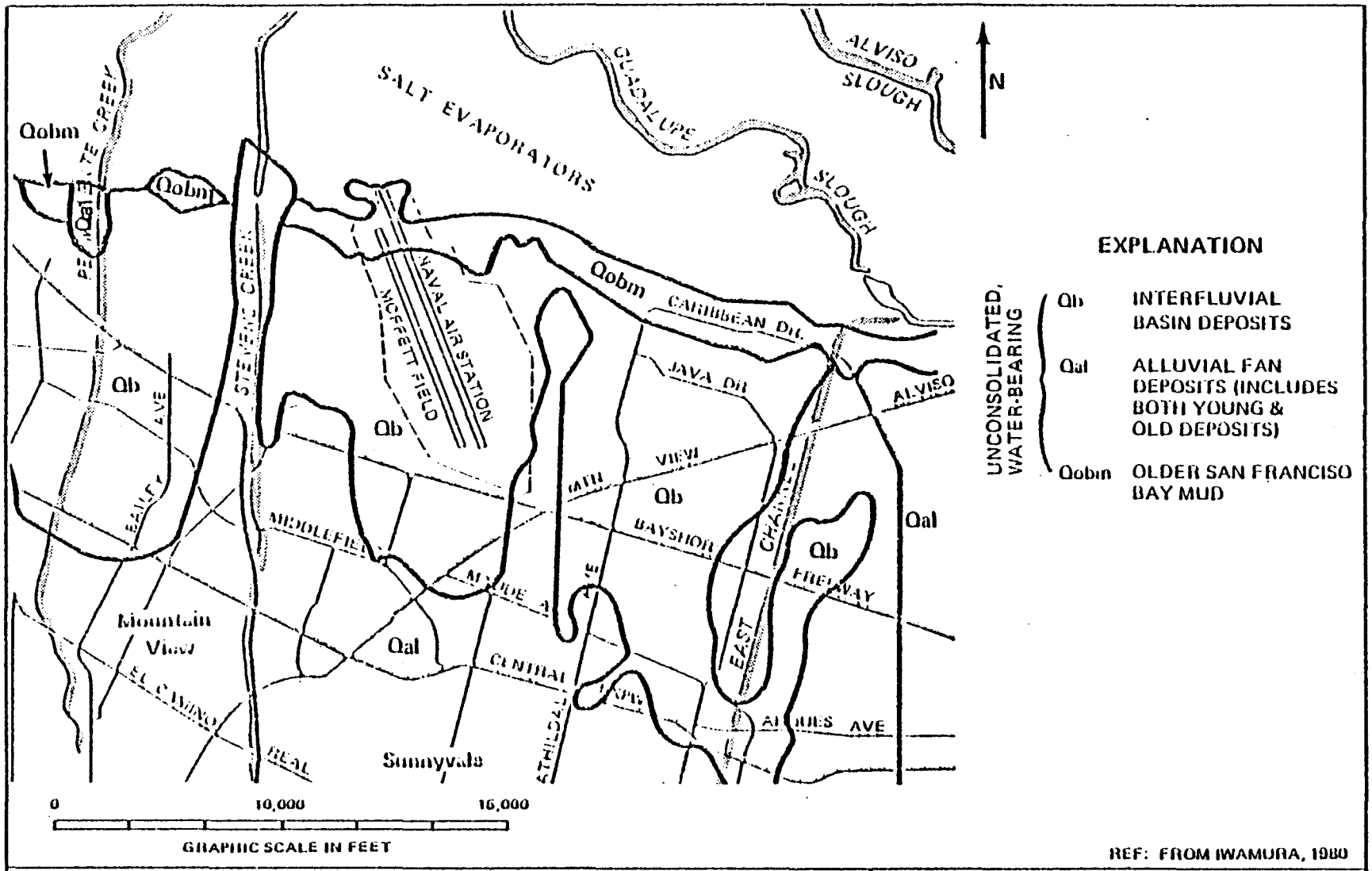


FIGURE 4-6
Generalized Surface Geology in the Vicinity of NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

Recharge to the upper aquifer zone is primarily from percolation of rainfall, streamflow, and excess irrigation water. Recharge to the confined aquifer in the upper aquifer zone and to the lower aquifer zone is from leakage of water from the shallow unconfined aquifer. Also, recharge to the lower aquifer zone occurs from rainfall, streamflow, and excess irrigation water on upgradient alluvial fans. Water-level data (EMCON, Appendix A) from a pair of wells screened in the 20-foot and 45-foot aquifers show that ground water was moving downward on 18 May 1983. The relation of aquifers in the vicinity of NAS Moffett Field is shown in Figure 4-7.

Land subsidence in the area has been caused by ground water withdrawal lowering the pressure in the confined aquifers in the lower aquifer zone. Land subsidence in the NAS Moffett Field area ranges from two feet in the north to eight feet in the southeast part of the station.

Salt water intrusion has occurred in the upper aquifer zone. Concentrations of chloride in water from the upper aquifer zone range from less than 100 milligrams per liter in the south to greater than 5,000 milligrams per liter in the north part of the NAS Moffett Field. Salt water intrusion in the lower aquifer zone is not extensive, and chloride concentrations exceed 100 milligrams per liter only in the north part of NAS Moffett Field. The conditions of salt water intrusion as of 1980 are shown in Figure 4-8.

Lateral ground water movement in the aquifers of moderate to moderately low permeability would be in the order of a few feet to a few tens of feet per year. Few ground water data are available for the NAS Moffett Field area; however, based on results of a ground water study by EMCON Associates (1983), the hydraulic gradient and the hydraulic conductivity in the upper aquifer zone can be estimated. The hydraulic gradient is estimated to be about 19 feet per mile (0.0036), which is the maximum gradient in the upper aquifer zone in NAS Moffett Field. The hydraulic conductivity was estimated from pump-test derived transmisivity data (EMCON Associates, p. 5). The hydraulic conductivity is about 8×10^{-3} centimeters per second and is within the range of hydraulic conductivity for silty sand given by Freeze and Cherry (p. 29). The porosity of silty sands ranges from 0.25 to 0.5 (Freeze and Cherry, p. 37). The rate of ground water movement is calculated from Darcy's law by:

$$V = \frac{KI}{P}$$

where V = average linear velocity, in feet per day

K = hydraulic conductivity, in feet per day

I = hydraulic gradient, dimensionless

P = effective porosity, dimensionless

The conservative values used to calculate a maximum rate of movement at NAS Moffett Field are:

K = 23 feet per day (about 8×10^{-3} centimeters per second)

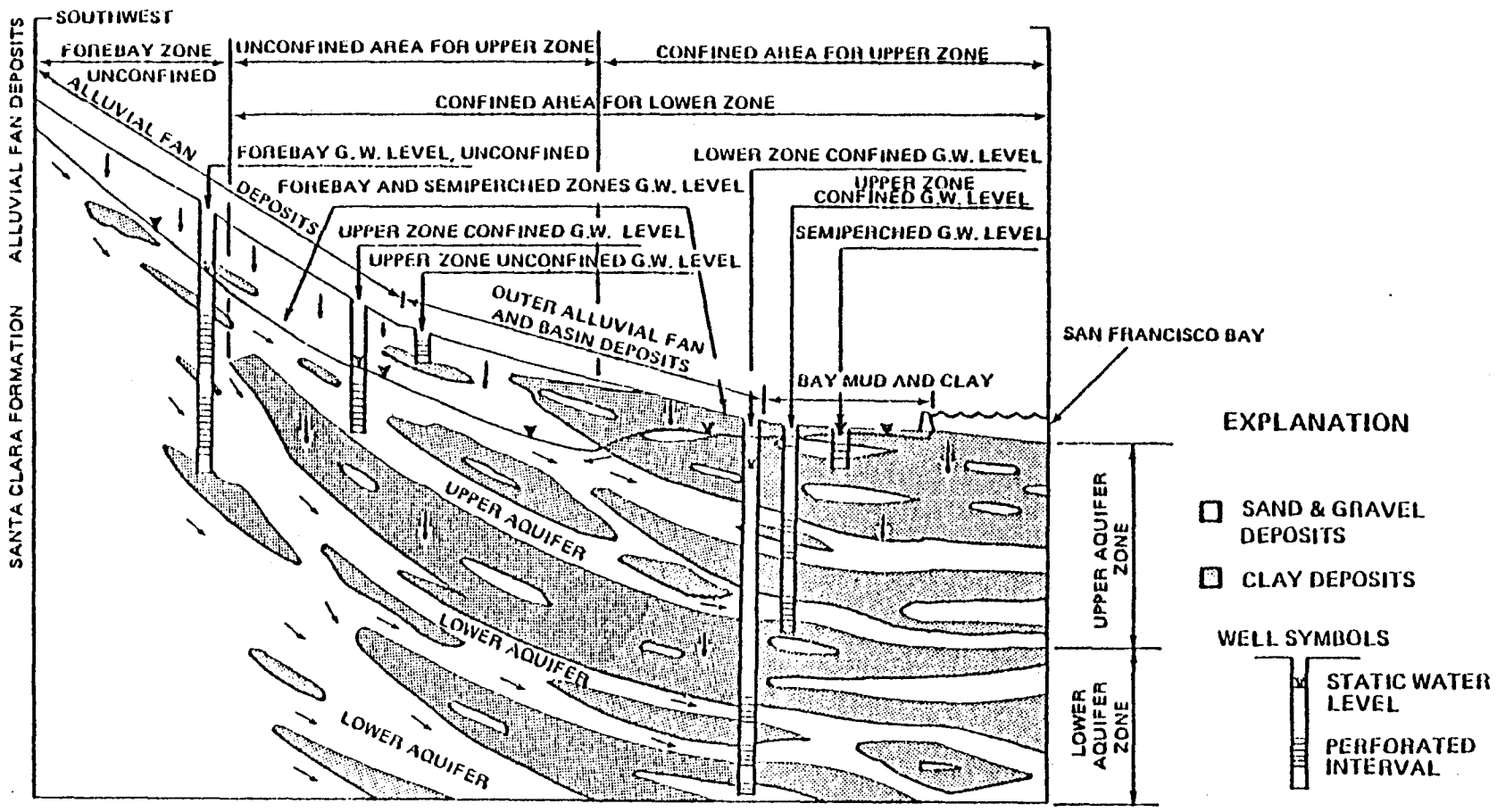


FIGURE 4-7
Generalized Geologic Cross Section Showing Aquifers in the Vicinity of NAS Moffett Field

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NAVAL AIR STATION
MOFFETT FIELD, CA

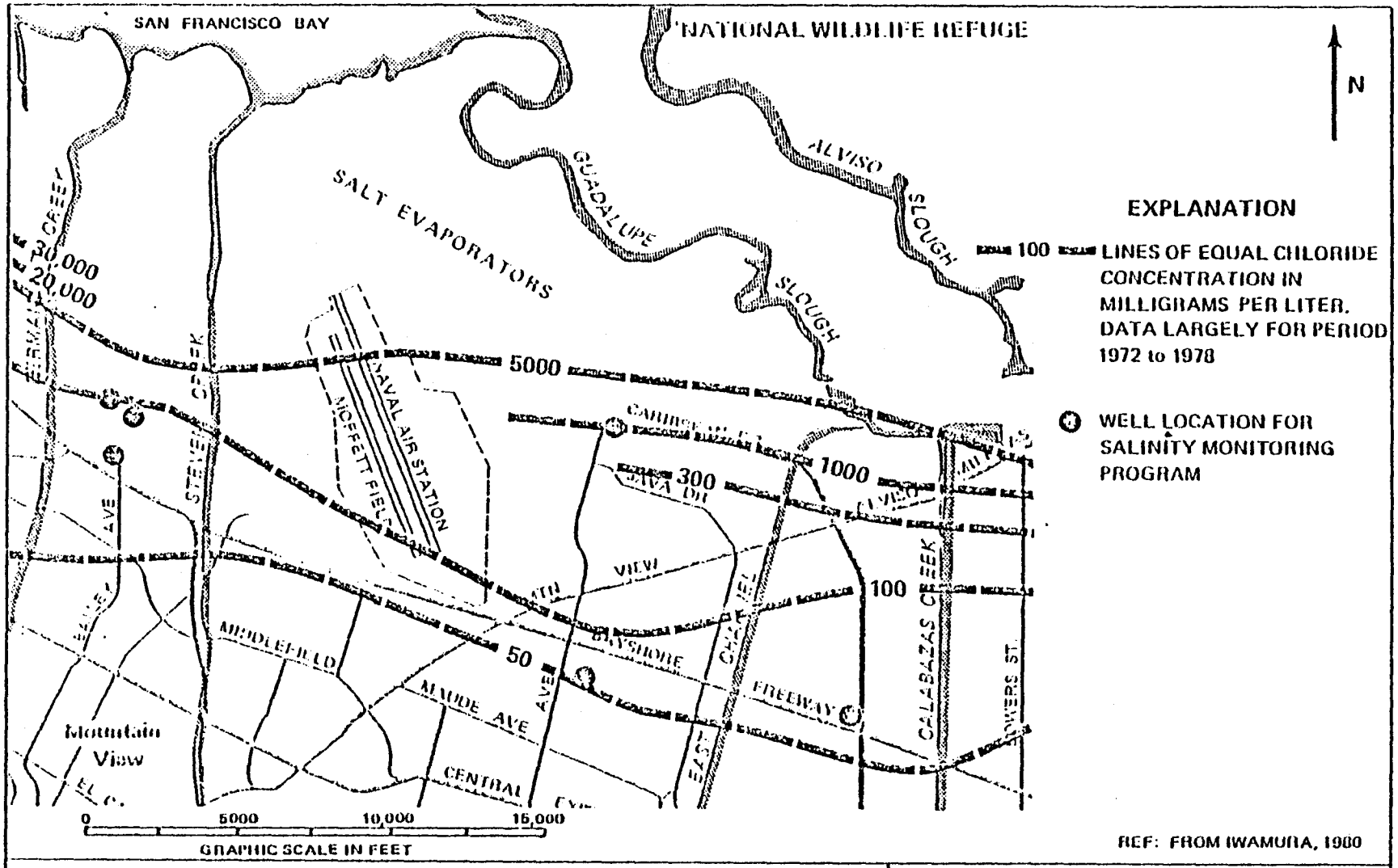


FIGURE 4-8
Saltwater Intrusion in the Upper Aquifer Zone in the Vicinity of NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

$I = 0.0036$

$P = 0.3$

These values give a calculated velocity of 0.27 feet per day.

Thus, conservative constituent traveling with the ground water would be expected to move at a rate of about 100 feet per year. This velocity may be lower in fine-grained materials, such as clay, and may be faster in coarser materials, such as gravel. The upper aquifer zone is heterogeneous and consists of lenses of sand and gravel in alluvial clay.

Migration in the upper aquifer zone on the station would be downward and north towards surface drainage, such as Marriage Road Ditch. Because of subsisdence and salt water intrusion, migration toward San Francisco Bay from the upper aquifer zone is unlikely where the water table is below sea level. However, in filled tidal areas, where the water table may be above sea level, contaminant migration to San Francisco Bay is possible.

The rate of movement in the lower aquifer zone should be similar to rates in the upper aquifer zone. Ground water flow patterns in the lower aquifer zone might be toward pumping the well used for irrigation, but contaminants from NAS Moffett Field would have to move upgradient for a considerable distance to affect water from the well.

Other factors affecting the migration potential and environmental impact of contaminants include soil attenuation, microbial degradation, diffusion, and chemical reaction. All of these factors can decrease the concentrations of contaminants and decrease the effect of the wastes.

4.4.2 NALF Crows Landing. This section describes the physical features of NALF Crows Landing and vicinity. The physical features include climatology, topography, geology, soils, hydrogeology, and migration potential.

4.4.2.1 Climatology. Climatic conditions at NALF Crows Landing area are characterized by foggy winters with light rainfall, and warm to hot, dry summers. Average annual precipitation is between eight and ten inches, with about 85 percent occurring from November to April. Frost may occur from late November to early March. The coast ranges to the west protect the area from temperature extremes. The light annual precipitation makes irrigation essential for cultivation. The prevailing wind direction is from the northwest during most of the year (WESTNAVFACENGCOM, 1981).

4.4.2.2 Topography and Surface Drainage. NALF Crows Landing is situated on the foot of an alluvial fan derived from the Diablo Range. The topography of the base is a nearly flat plain sloping from an elevation of about 175 feet above mean sea level in the southwest to an elevation of about 115 feet in the northeast. Figure 4-9 is a topograhic map of NALF Crows Landing and vicinity.

Surface drainage is by a series of ditches in both agricultural and runway areas. These ditches drain to the siltation pond and to Little Salado Creek, which flows across NALF Crows Landing to the siltation pond. Little Salado

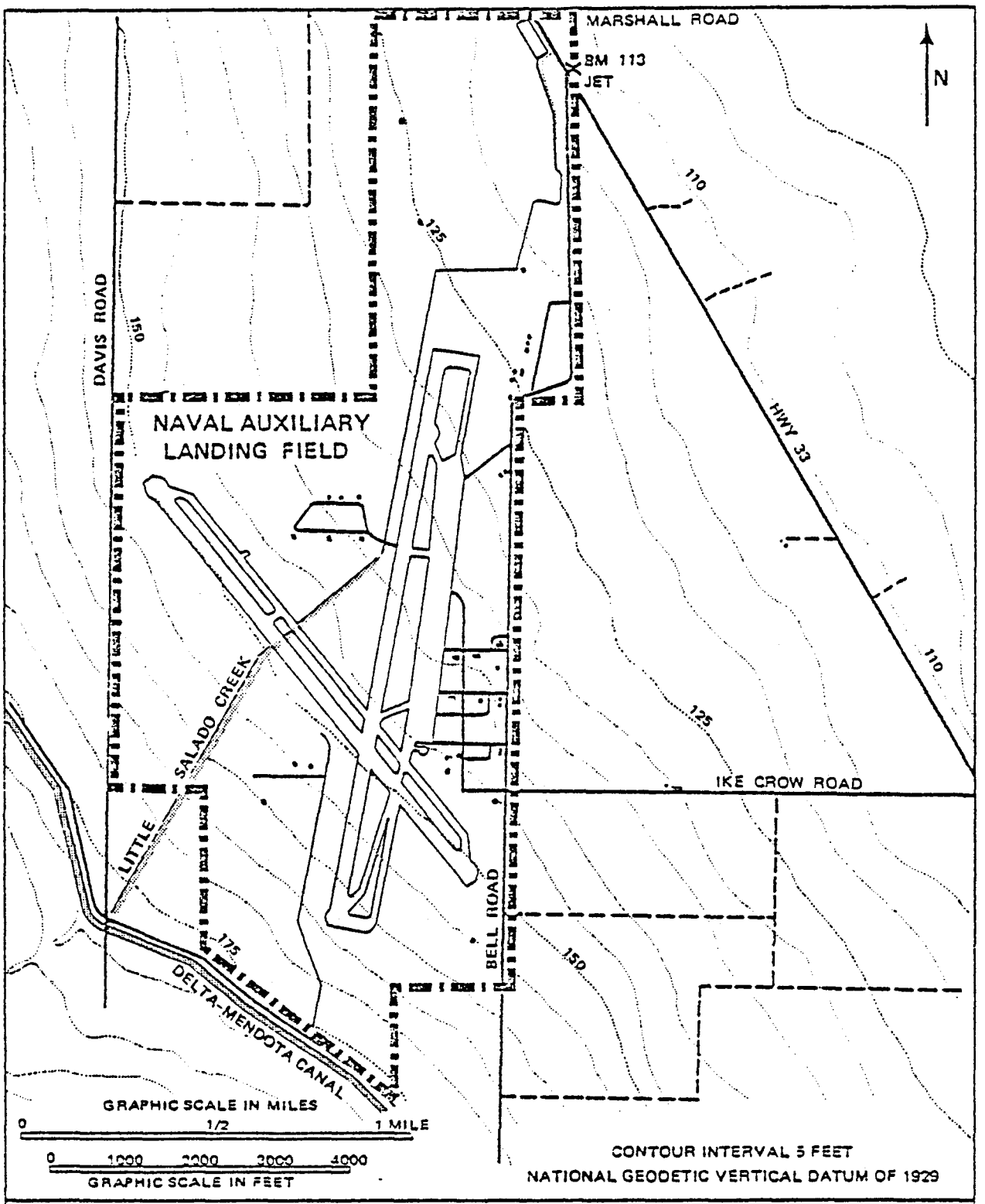


FIGURE 4-9
TOPOGRAPHY OF NALF
Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

Creek drains about 8.6 square miles of foothill land west of Navy property. Culverts that conduct Little Salado Creek beneath the runways are underdesigned so that flooding can occur with a storm of ten-year intensity (WESTNAVFACENGCOM, 1981). The five 30-inch culverts can handle a streamflow of about 200 cubic feet per second, and the ten-year intensity storm is expected to produce a streamflow of 440 cubic feet per second (WESTNAVFACENGCOM, 1967), which exceeds the capacity of the culverts.

The Delta Mendota Canal flows through the southwest part of NALF Crows Landing, however, the canal receives no direct drainage from the station.

4.4.2.3 Soils. NALF Crows Landing is situated on nearly level, good quality agricultural land. Soils are very deep, and textures range from loams to clays. Soils are developed on overlapping alluvial fans that slope gently eastward from the Diablo Range into the San Joaquin River Valley. The heavier soils are easily compacted and slowly permeable with a high water holding capacity. The soils also have a slight erosion hazard. Figure 4-10 is a soils map of NALF Crows Landing and Tables 4-2 and 4-3 summarize soil types and soil survey interpretations.

4.4.2.4 Hydrogeology and Migration Potential. NALF Crows Landing lies in the San Joaquin River Valley. The San Joaquin Valley is part of the Great Valley, which is a large syncline between the Diablo Range to the west and Sierra Nevada to the east. The valley is filled with 8,000 to 10,000 feet of alluvium derived from the mountain ranges. Figure 4-11 shows the surficial geology in the vicinity of NALF Crows Landing. Table 4-4 shows a generalized geologic column for the vicinity of NALF Crows Landing.

The primary geologic hazard in the vicinity of NALF Crows Landing is the Telsa Fault and offshooting faults which lie in the Diablo Range 10 to 15 miles west of the station. Movement along any of the faults could cause damage by ground shaking. Movement along unmapped faults, some of which could exist in the bedrock below the valley fill deposits, could also cause damage.

Aquifers in the San Joaquin Valley have been divided into three water-bearing zones: (1) a lower water-bearing zone that contains confined fresh water in the lower section of the Tulare Formation, (2) an upper water-bearing zone that contains confined, semi-confined, and unconfined water in the upper section of the Tulare Formation and younger deposits exclusive of water within about 25 feet of land surface, and (3) a shallow water-bearing zone that contains unconfined water within about 25 feet of land surface (Hotchkiss and Balding, 1971 p. 37). The lower and upper water-bearing zones are separated by an extensive, thick, and impermeable clay layer, the Corocoran Clay Member of the Tulare Formation. In the vicinity of NALF Crows Landing, the Corocoran Clay lies at a depth of about 250 to 300 feet and is about 40 to 60 feet thick (Hotchkiss, 1972). Several wells at NALF Crows Landing and surrounding area tap the lower water-bearing zone and the remainder tap the upper water-bearing zone. Wells drilled to the lower-water-bearing zone may also tap the upper-water-bearing zone. No wells are known to tap the shallow water-bearing zone in the area of NALF Crows Landing.

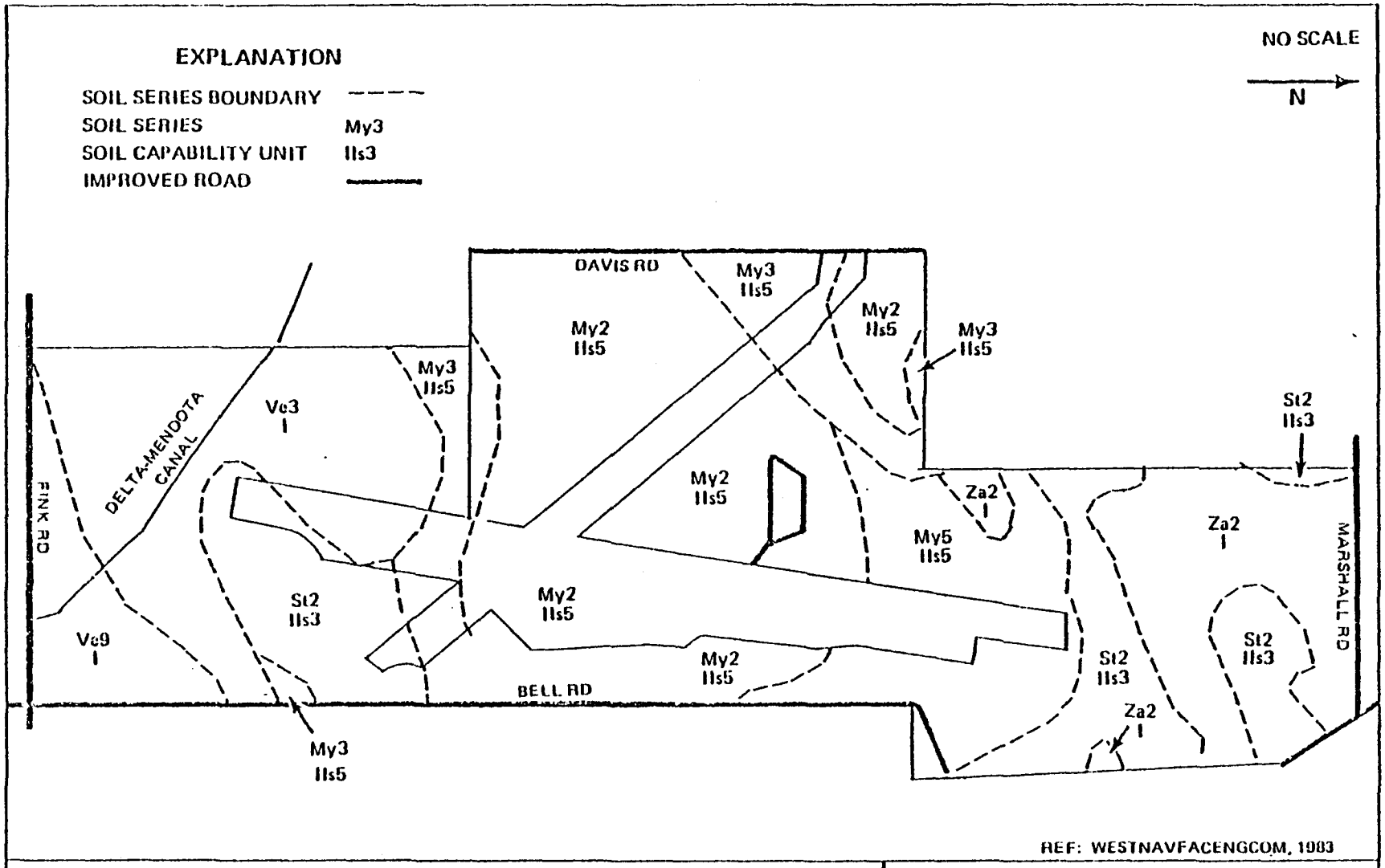


FIGURE 4-10
General Soil Types at NALF Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

LE 4-2

Soil Types at Naval Auxiliary Landing Field, Crows Landing, California

Land Capability Unit	Symbol on Map	Soil Name	Effective Depth (Inches)	SOIL PROFILE Texture: Surface	SOIL PROFILE Texture: Subsoil	A.W.C.* (Inches)	Average Slope in %	Erosion Status	Suitable Land Uses or Crops	Limiting Factors or Remarks
IIs5	My2	Myers Clay	50	Grayish brown clay, mod./granular, hard mod. Alkaline.	Grayish brown clay, coarse angular, blocky very hard, neutral, pH slightly calcareous.	8.5	0-2	Slight	All climatically adapted crops.	Soil limitations due to fine texture, tillage problems. Easily compacted.
IIs5	My3	Myers Clay Loamy Substratum	60	Same as above, but also slightly calcareous	Grayish brown clay loam.	10	0-2	Slight	All climatically adapted crops.	Soil limitations due to fine texture, tillage problems. Easily compacted.
IIs5	My5	Myers Clay Moderately well drained	50	Same as above.	Grayish brown clay, mottely course angular blocky.	8.5	0-2	Slight	Row crops and alfalfa.	Soil limitations due to fine texture, tillage problems. Easily compacted.
IIs3	St2	Stomar Clay Loam	26-60	Clay loam.	Clay	5	0-1	Slight	Orchards and row crops.	Soil limitations due to slowly permeable subsoil
I	Ve3	Vernalis Clay Loam	60+	Clay loam	Heavy loam.	11	0-1	Slight	Row crops, hay and orchards.	Prime agricultural land, no limitations.
I	Ve9	Vernalis Loam	60+	Loam	Heavy loam.	10	0-1	Slight	Row crops, hay and orchards.	Prime agricultural land, no limitations.
I	Za2	Zacharias Clay Loam	60+	Clay loam.	Loam.	10	0-1	Slight	Row crops, hay and orchards.	Prime agricultural land, no limitations.

*A.W.C.--Available Water Holding Capacity for the entire soil profile.

Data from U.S. Department of Agriculture Soil Conservation Service.

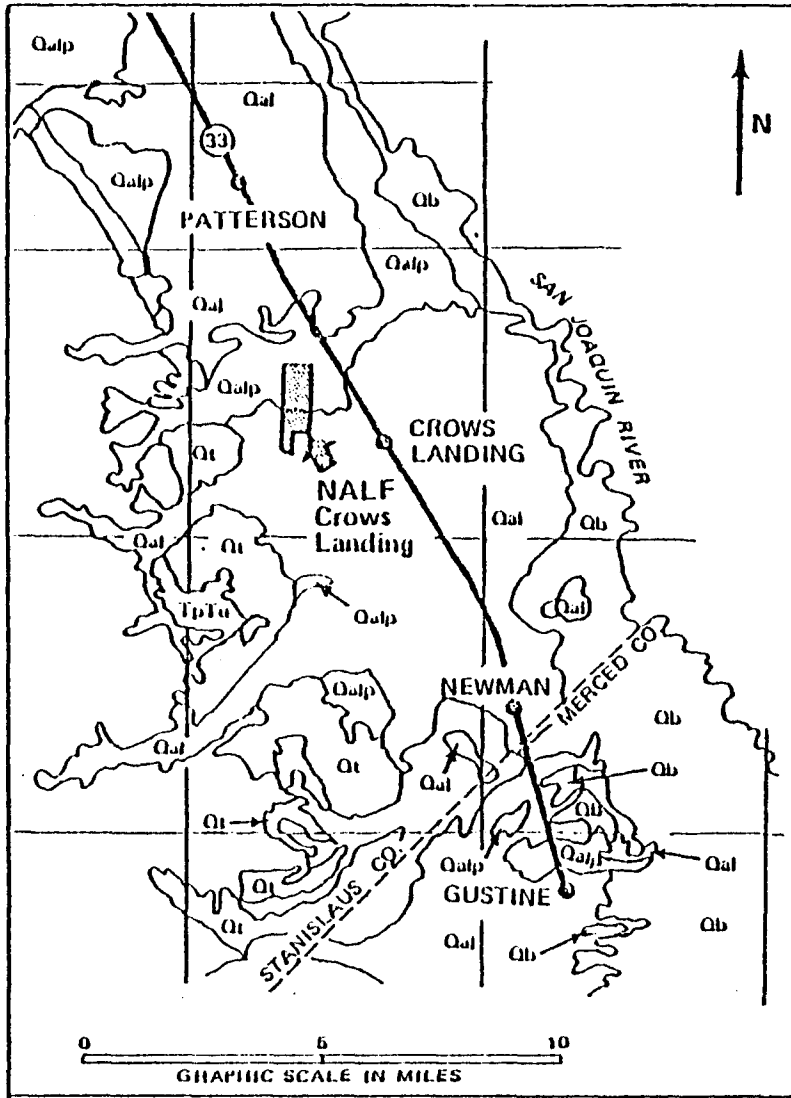
TABLE 4-3

Soil Survey Interpretations

Soil Grouping and Symbol	Depth to: Bed-Rock (Feet)	Depth to: Water Table (Feet)	Typical Profile (Inches)	Permeability (Inches/hour)	A.W.C.[1] of soil (Inches/inch)	pH Salinity
Vernalis Clay Loam (Ve3)	5+	5+	0-62 Clay Loam	0.63-2.00	0.18	7.7-8.3/none
Vernalis Loam (Ve9)	5+	5+	0-60 Loam	0.63-2.00	0.16	7.6-8.0/none
Zacharias Clay Loam (Za2)	5+	5+	0-27 Clay Loam 27-55 Loam 55-72 Fine Sandy Loam	0.63-2.00 0.63-2.00 0.20-0.63	0.16 0.15	6.2-6.7/none 6.8-7.3/none
Myers Clay (My2) & (My5)	5+	5+	0-35 Clay 35-50 Clay Loam	0.06-0.20 0.20-0.63	0.14 0.18	7.0/none 7.7/none
Myers Clay (My3)	5+	5+	0-18 Clay 18-60 Loam	0.06-0.20 0.20-0.63	0.14 0.16	7.0/none 7.7/none
Stomar Clay Loam (S+2)	5+	5+	0-26 Clay Loam 26-38 Clay 38-60 Clay Loam	0.20-0.63 0.06-0.20 0.20-0.63	0.18 0.14 0.18	6.8-7.2/none 7.2-7.7/none 7.6-8.2/none

[1]Available Water Holding capacity.

Data from U.S. Department of Agriculture Soil Conservation Service



EXPLANATION

QUATERNARY	PLEISTOCENE and HOLOCENE	Qal	ALLUVIUM -- UNCONSOLIDATED CLAY, SILT SAND, AND GRAVEL DEPOSITED ON UNDISSECTED ALLUVIAL FANS
		Qalp	ALLUVIUM – UNCONSOLIDATED CLAY, SILT SAND , AND GRAVEL DEPOSITED ON PARTIALLY DISSECTED ALLUVIAL FANS
		Qb	FLOOD BASIN DEPOSITS – UNCONSOLIDATED CLAY, SILT, SAND, AND GRAVEL REWORKED FROM ALLUVIAL FANS
	PLEISTOCENE	Qt	TERRACE DEPOSITS – UNCONSOLIDATED CLAY, SILT, SAND AND GRAVEL OF OLD STREAM TERRACES
TERITARY and QUATERNARY	PLIOCENE and PLEISTOCENE	QTt	TULARE FORMATION – UNCONSOLIDATED AND SEMI-CONSOLIDATED CONTINENTAL DEPOSITS
		UNCONFORMITY	
PRE-TERITARY and TERITARY	PRE-PLIOCENE	TpTu	SEDIMENTARY AND CRYSTALLINE ROCKS, UNDIFFERENTIATED

REF: HODCHKISS AND BALDING, 1972

FIGURE 4-11
Generalized Surface Geology in the Vicinity of NALF Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

TABLE 4-4

Generalized Geologic Column of Rocks and
Their Water-bearing Properties in the Vicinity of NALF Crows Landing, California

System	Geologic Units	Informal Unit Name and Symbol	Lithologic Character	Maximum Thickness (Feet)	Water-bearing Properties
Unconsolidated Deposits					
QUARTERNARY Pleistocene and Holocene	Flood-basin deposits (Qb)		Unconsolidated surficial and nearsurface lenticular deposits of clay, silt, sand, and gravel. Generally reduced, reworked Diablo Range and Sierra material.	50	Moderately to poor permeable. Unconfined. Shallow water-bearing zone.
	Alluvium	Undissected alluvium (Qal)	Unconsolidated clay, silt, sand, and gravel, deposited on undissected alluvial fans of present streams. Generally, oxidized with little soil profile development.	100	Permeable to moderately permeable. Unconfined. Shallow water-bearing zone.
		Partly dissected alluvium (Qalp)	Unconcolidated clay, silt, sand, and gravel deposited on subdued alluvial fans now partially dissected. Generally oxided with soil profile development.	100	Moderately to poorly permeable. Unconfined to semiconfined.
QUARTERNARY Pleistocene	Terrace deposits (Qt)		Unconsolidated clay, silt, sand, and gravel above level of present streams. Oxidized.	120	Highly permeable to permeable. Unconfined generally above the water-table.
TERTIARY AND QUATERNARY Pliocene and Pleistocene	Tulare Formation	Upper Section	Unconsolidated, poorly to locally well-sorted lenticular deposits of clay, silt, sand and gravel. Oxidized and reduced.	200	Highly to variably permeably. Unconfined semiconfined, and confined. Upper water-bearing zone.
	Corocoran Clay Member (Pleistocene)		Sandy clay, silty clay, silt, and clay interbedded with fine-grained sand.	127	Impermeable confining stream.
		Lower Section	Unconsolidated and semiconsolidated, poorly to locally well-sorted lenticular deposits of clay, silt, sand, and gravel. Oxidized and reduced.	650	Highly to variably permeably. Confined. Lower water-bearing zone.
Consolidated Deposits					
PRE-TERTIARY AND TERTIARY Pre-Pliocene	Sedimentary and cystalline rocks, undifferentiated (TpTu)		Intrusive rocks and partially metamorphosed sedimentary rocks, overlain by marine and some continental indurated admixtures of clay, silt, sand, and gravel, siliceous and carbonaceous shale and bentonitic claystone. Oxidized and reduced.	63,000	Variably permeable. Generally yields saline water. Depth of unit exceeds depth of the wells. Confined

(Hotchkiss and Balding, 1972).

Recharge to the shallow water-bearing zone and the upper water bearing zone is by leakage from the Delta-Mendota Canal, rainfall, excessive irrigation water, and streamflow. Recharge to the upper and lower water-bearing zones is by downward percolation of water from overlying aquifers and by rainfall and streamflow on upgradient alluvial fans.

Ground-water flow in the vicinity of NALF Crows Landing is northeast, however extensive pumpage for irrigation water and potable water may cause ground water flow changes locally.

Lateral ground water movement in the permeable course-grained aquifer materials is on the order of tens to hundreds of feet per year. Few ground-water data are available for the NALF Crows Landing area, however, the maximum ground-water-flow velocity can be estimated from data obtained in the San Joaquin Valley and from tables given in Freeze and Cherry (1979). In the confined aquifer, the maximum hydraulic gradient shown on available water-level maps is about 35 feet per mile (0.0066) (California State of, Department of Water Resources Spring 1981). Water-level maps for the confined aquifer in Fall 1981 and Fall 1982 and for the unconfined aquifer for Spring 1981, Spring 1982, and Spring 1983 show a hydraulic gradient that ranges from five to twelve feet per mile in the vicinity of NALF Crows Landing (California State of, Department of Water Resources). Hydraulic conductivity is estimated to range from 10^{-1} to 10^{-2} centimeters per second (Freeze and Cherry, 1979, p. 29) and is higher than date emperical from Hodchkiss and Balding (1972, p. 24) for aquifer materials in other parts of the San Joaquin Valley. These experimental hydraulic conductivity values ranged from about 10^{-2} to 10^{3} centimeters per second. The poriosity of the aquifer materials in the San Joaquin Valley ranges from 40 to 60 percent (Hodchkiss and Balding 1972, p. 16-17). The maximum rate of ground water movement is calculated from Darcy's law by:

$$V = \frac{KI}{P}$$

where V = average linear velocity, in feet per day

K = hydraulic conductivity, in feet per day

I = hydraulic gradient, dimensionless

P = effective porosity, dimensionless

The conservative values used to calculate a maximum rate of movement at NAS Moffett Field are:

K = 280 feet per day (10^{-1} centimeters per second)

I = 0.0066

P = 0.4

These values give a calculated velocity of 4.7 feet per day. Thus, a conservative constituent traveling with the ground water would be expected to move at a maximum rate of about 1,700 feet per year. The velocity of ground water is lower when the hydraulic gradient is lower. The rates of movement should be similar in the upper and lower water-bearing zones, and will probably be lower in the shallow water-bearing zone.

Ground water migration in the upper and lower water-bearing zones would be toward the northeast, except where the aquifer is affected by pumpage. Ground water migration in the shallow aquifer would also be toward the northeast. However, ground water in the shallow aquifer could discharge to Little Salado Creek, the sedimentation pond, or ditches on the station.

Other factors affecting potential contaminant migration include soil attenuation, microbial degradation, diffusion, and chemical reaction. All of these factors can decrease the concentrations of contaminants and decrease the effects of wastes.

4.5 WATER QUALITY AND SUPPLY.

4.5.1 NAS Moffett Field. Water is distributed to NAS Moffett Field by the City of San Francisco Hetch-Hetchy Project. Two main transmission lines with takeoffs for users pass through the Moffett Field Area. Water is of good quality.

One well on the south side of Macon Road at NAS Moffett Field is presently used for irrigation water.

Ground water in the upper aquifer zone has dissolved chloride concentrations ranging from about 100 to greater than 5,000 milligrams per liter, which makes the water generally unsuitable for potable or irrigation supplies. Ground water from the lower aquifer zone is good quality and suitable for irrigation and possible potable water supplies.

4.5.2 NALF Crows Landing. Potable ground water is obtained from wells 1 and 2 (structure numbers 134 and 145 on the station map) at the south end of the station. The potable water is very hard and has high concentrations of chloride and boron. Appendix C shows water quality analyses of water from wells 1 and 2. Water is distributed through a six-inch main line. Three other wells are used for irrigation and one well is used for fire protection. Table 4-5 is a summary of the wells at NALF Crows Landing. Most water for irrigation is obtained from the Delta-Mendota Canal.

4.6 ADJACENT LAND USE.

4.6.1 NAS Moffett Field. Land around NAS Moffett Field is used for industrial, commercial, recreational, and residential purposes. North of NAS Moffett Field are salt evaporation ponds owned by the Leslie Salt Company. West of NAS Moffett Field is the NASA Ames Research Center. East of the station is Lockheed Missile and Sapce Company. South of NAS Moffett Field is the Bayshore Freeway, US 101. South of Bayshore Freeway are several industries, commercial areas, residential areas, and a city golf course.

TABLE 4-5

Wells at Naval Auxiliary Landing Field, Crows Landing, California

Structure Number	Location	Total Depth (Feet)	Use
	(On-Station Map)		
110	3-K	297	Storage
111	4-K	300	Irrigation
112	4-D	300	Irrigation
113	7-D		Fire protection
114	4-B	412	Irrigation
134	6-M	350	Potable
145	6-K	350	Potable

Industries in this area include Fairchild Camera and Instrument Corportation, Intel Corporation, Raytheon Company, Siltec Corporation, and NEC Electronic Arrays.

Ground water contamination has been confirmed south of NAS Moffett Field. One residential water supply well has been closed. Contaminant migration onto NAS Moffett Field from the south has occurred as documented in a report by EMCON. Another potential source of contaminant migration onto NAS Moffett Field property is Lockheed Missile and Space Company, although no evidence of contamination from the property was found during the survey.

4.6.2 NALF Crows Landing. Land adjacent to NALF Crows Landing is used for agriculture, including row crops and orchards.

4.7 LEGAL ACTIONS. No environmentally related legal actions are known to have been taken against NAS Moffett Field or NALF Crows Landing.

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. This chapter describes major waste generators at Naval Air Station (NAS) Moffett Field and Naval Auxiliary Landing Field (NALF) Crows Landing. The chapter describes types of wastes and gives estimated rates of generation from the various sources.

5.2 NAS MOFFETT FIELD.

5.2.1 Public Works Operations. The Public Works Department operates, maintains, and repairs all buildings, structures, and other facilities at NAS Moffett Field.

5.2.1.1 Metal/Welding Shop. The metal/welding shop maintains and repairs mechanical equipment, including necessary fabrication and welding. The metal shop consists of a machine shop, a sheetmetal shop, and a welding shop. This shop has been located in Building 16 since 1933.

Wastes generated are shown on Table 5-1. Liquid wastes were collected in 55-gallon drums, which were picked up by the Public Works Labor Shop and taken to the waste oil holding tank at the fuel farm or to the DPDO yard.

5.2.1.2 Paint Shops. The paint shop has been located in Building 45 since the late 1930s. Wastes from the paint shop have always been placed in four 30-gallon drums and picked up by the Public Works labor shop. These drums are picked up about every three weeks. The wastes included paints, thinners, and toluene. Recently, latex-enamel paint has replaced many oil-base paints, and the use of turpentine has been discontinued. The paint shop has only about one-third the employees it had in the past, and consequently generates less waste. The shop generated about 30 to 50 gallons of waste every two weeks.

The spray painting booth is cleaned about every six months. Cleaning this booth generates about five gallons of waste, which is placed in a 30-gallon barrel and removed by the Public Works Labor Shop.

The paint shop disposed of wastes at both the runway and golf course landfills. An area of the golf course landfill was reserved for paint shop waste. Paints and thinners were disposed of in cans. Reportedly, it was always easier for paint shop employees to dispose of liquid wastes in the barrels at the shop, rather than on the ground. The painters never observed pools of liquid or chemical smells at the landfills.

5.2.1.3 Utilities Shops. The Utilities Branch performs maintenance, repair, and alterations of public utilities at NAS Moffett Field.

5.2.1.3.1 The electrical shop maintains the electrical system at NAS Moffett Field. Operations by the shop that might have generated hazardous waste include: filtering transformers, handling and storing transformers, and cleaning electrical parts with solvent. The electrical shop, originally located in Building 6, moved to its present location in the early 1950s.

TABLE 5-1

Waste Generation from Public Works, NAS Moffett Field, California

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Cutting oil (water soluble)	5 gallons per year	1933-present	Metal trades	16	Holding tank at Fuel Farm and DPDO
Drycleaning solvent and lube oil	100 gallons per year	1933-present	Metal trades	16	Holding tank at Fuel Farm and DPDO
Boiler wastewater	250,000 gallons per year	1933-present	Boiler Plant	10 & 55	Sewer
Asbestos	1,000 pounds per year	1948-1978	Pipe Shop	10	Station landfill
Asbestos	2,000 pounds per year	1978-present	Pipe Shop	10	Off-base disposal
Cutting oil	10 gallons per year	1968-1977	Pipe Shop	10	Flux ponds
Cutting oil	10 gallons per year	1968-present	Pipe Shop	10	Holding tank at Fuel Farm
Stoddard Solvent	6 gallons per year	1948-present	Pipe Shop	10	Mixed with waste cutting oil
Ash	23,000 pounds per year	1959-1978	Incinerator	542	Station landfill
		1978-present	Incinerator	542	Off-station landfill
Paints, Thinners	1,500 gallons per year	1933-present	Paint Shop	45	Station landfill
Transformer Oil Filters	30 gallons per year	1933-early 1970s	Electrical Shop	6	Station landfill
Transformer Oil	100 gallons per year	1933-early 1970s	Electrical Shop	6	DPDO Yard
Battery Electrolyte	90 gallons per year	1933-early 1970s	Transport-ation Shops	146	Storm Drain
Oils, Solvents	220 gallons per year	1933-present	Transport-ation Shops	146	Contractor

Electrical shop personnel used paper elements to filter oil from transformers. These paper elements that were then disposed of at the landfills. The crews used about seven to eight filters in the filter press and filtered about two to three 20 to 30-gallon transformers per month in the summer. The shop generated a few dozen filters a year, as well as small amounts of sawdust used to soak up spilled transformer oil. The filtering was always done on site, and the filters were dried in an oven now contained in Building 6. Reportedly, no major spills occurred during these filtering operations. The electrical shop used the landfills only as storage areas for electrical equipment and supplies, and for disposal of transformer filters.

Until the 1940s, the shop also used 30 to 40 gallons of carbon tetrachloride per year to clean parts. The carbon tetrachloride was applied with rags and always evaporated during use. The shop also used denatured alcohol for cleaning small parts. The denatured alcohol also evaporated during use. For at least the last seven to eight years, the shop has used Kemptol in a 2 foot by 3 foot by 20 inch dip tank to clean small parts. This tank is emptied about twice per year.

In the past, solvents and oils, including transformer oils, were always transferred to the DPDO yard. Some of these materials were stored there in five-gallon cans stacked outside Building 127 and others were stored in an above ground tank. These materials were never disposed of on base. The shop changed about 100 gallons per year of contaminated transformer oils.

The electrical shop did not use mercury.

5.2.1.3.2 The pipe shop maintains, repairs, and install pipe and associated equipment for water distribution, gas distribution, sanitary and storm sewers, and other systems, as required. The pipe shop has been located in the north end of Building 10 since about 1948. From 1933 until 1948, the pipe shop was probably located in Building 1. Wastes generated by the pipe shop are shown in Table 5-1. Liquid wastes were taken to the waste oil holding tank at the fuel farm, to the DPDO yard or to the industrial wastewater holding ponds. Asbestos was disposed of at the station landfill until 1978, after which it was double-bagged and taken to an off-base landfill. Steel scrap was turned over to the Supply Department disposal office.

5.2.1.3.3 Steam plant personnel operate and maintain the central boiler plants, individual package plants, the compressed air distribution system, and the classified document incinerator. Two main steam plants exist at NAS Moffett Field. These are located in buildings 10 and 55. Building 10 produces steam for the "administrative" side of the base, and Building 55 produces steam for the "operational" side. Seventeen package hot water boilers are located in buildings 20, 23, 25, 48, 223, 256, 465, 549, and 300. Water in the main boilers (buildings 10 and 55) is treated using sodium sulfite and phosphate scale control agent. The two main plants use 460 pounds per year sodium sulfite, and 650 pounds per year of phosphate scale control agent. Wastes generated by operation of steam plants are presented in Table 5-1. Waste water from boiler blowdown is disposed of in the sanitary sewer.

Incineration of classified documents has been carried out at the incinerator, Structure 542, from 1973 until the present. Wastes consisting of paper, film, and plastics were burned in this incinerator. Ash from the combustion amounted to 400 to 500 pounds per week. The ash was disposed of in the runway landfill until 1979. Prior to 1973, an incinerator was located at 17-GG on the Station Map, Plate 1. This incinerator was used in a manner similar to Structure Number 542.

5.2.1.4 Building Trades Shop. This shop performs woodworking for minor construction and maintenance of buildings on the station, performs locksmith functions, and performs painting of interior and exterior surfaces.

The Building Trades Shop has operated in Building 16 since 1933. The major waste generated is wood scraps and sawdust. Very few hazardous materials are used. A one-gallon can of copper naphthanate is kept in storage and is used to treat wood for foundation work when redwood is not available.

5.2.1.5 Transportation Division. The Public Works Vehicle Maintenance Shop is responsible for maintaining about 300 vehicles used at NAS Moffett Field and NALF Crows Landing. This shop performs lubrication, battery overhauls, and steam cleaning of parts. Building 146 and the surrounding transportation yard have been in the current location on the southwestern edge of the station since the early 1950s.

The vehicle maintenance shop produces waste oils, hydraulic fluids, solvents, radiator coolant, diesel fuel, battery acid, lacquers, and thinners. In the past, about 60 to 90 gallons per year of spent electrolyte were neutralized with sodium bicarbonate and then flushed down a storm drain behind the battery shop. Soaps and wash water from steam cleaning also went down this storm drain. About 100 drained battery casings per year were taken to DPDO for resale.

In the past, waste oil and solvents were either collected in a barrel that was pumped out by a contractor, or they were taken to the waste oil tank at the DPDO yard. Reportedly, except for battery acid, transportation wastes were never disposed of on the ground at the station. Some wastes were stored in an area behind the shop. No major leaks were reported there. About 55 gallons of waste oils and solvents accumulated every three months. Also, about two barrels of waste lacquer and thinner accumulated every month.

5.2.1.6 Pesticide Shop. The Support Shop, Code 19 of Public Works, provides pest control services for NAS Moffett Field. Types of pesticides used in recent years are listed in Appendix D. Pesticides have been applied with tank sprayers and hand-held sprayers. Usually, all pesticides were used at the job site. The residue in the tank was either left in the tank without rinsing or rinse water was added to the tank sprayer. This water was left in the tank sprayer and used as dilution water for the next pesticide mixture. Occasionally, mixed pesticide was left over after an application job was completed. This mixed pesticide was left in the sprayer until the next use, which usually occurred within three or four days.

Since 1979, hand-held sprayers have been rinsed in the deep sink at the southwest side of Building 251. Reportedly, this deep sink is connected to the sanitary sewer. Prior to 1979, the hand-held sprayers were rinsed out using the hose near Building 251. This rinseate flowed onto the surrounding asphalt. Hand-held sprayers have been rinsed out at least once per week.

In 1979, the asphalt at the south side of Building 251 was removed and a gravel bed with a French drain was installed. The original recommendation called for "a two-foot deep gravel bed, close to the pest control shop for washing out power pesticide sprayers, and to prevent puddling of wash water. Don't use this area for disposing of left over spray material or pesticide concentrates" (WESTNAVFACENGCOM, 1978). Pesticides are mixed in the tank sprayers while the tanks are parked in this gravel area. Occasionally, mixed pesticide runs onto the outside of the tank sprayer, requiring the tanks to be rinsed with water on this gravel area. This occurs approximately once per week.

Between 1958 and 1981, a gravel bed about 50 yards north of Building 379 in the golf course maintenance compound was used about four times per year for pesticide rinseate disposal from the golf course 50-gallon sprayer. Each time the sprayer was rinsed, 10 to 20 gallons of water was used. Since 1981, this area has been used only once. The larger Public Works tank sprayer is now primarily used and it is maintained in the Building 251 compound. Excess pesticides and empty pesticide containers always have been turned into Public Works for disposal.

Reportedly, excess or overage pesticide concentrates always have been disposed of off NAS Moffett Field property. Prior to 1980, some excess pesticides were transferred to other nearby naval activities. The other excess or overage pesticides were removed for proper disposal by contractors.

Empty pesticide containers always have been triple rinsed before disposal. Metal containers were also punched or crushed. Then, the containers were disposed of with regular solid waste or were temporarily stored in the area of Building 251, until they were picked up by contractors for disposal off NAS Moffett Field. The water used to rinse the pesticide containers was put into tank sprayers and used as dilution water for the next pesticide mixing.

The Navy Exchange occasionally had to dispose of pesticides because the containers were damaged. These pesticides have been mixed in a trash can to the approximately recommended application concentration. Then the mixed pesticide has been applied to lawns outside the Navy Exchange.

During the Mediterranean fruit fly incident in the early 1980s, helicopters were loaded with malathion from tank trucks in an area approximately 400 feet east of Building 354.

Much of the unused land at NAS Moffett Field has been outleased for agricultural purposes since at least the 1950s. Pesticide usage on the outleased land is approved through the NAS Moffett Field pest control coordinator. The farmer who has leased the land since 1972, stores pesticides off Navy property. Pesticides are mixed in the tank sprayers at the

washrack. Until 1980, tank sprayers were rinsed out off Navy property. After 1980, rinseate from the tanks has been disposed of on the soil near the fire hydrant next to the paved parking area north of the new Air National Guard buildings. An average of two to three tank sprayers are rinsed every three weeks. Reportedly, one of the main pesticides used is Diazinon.

5.2.2 Squadron Operations.

5.2.2.1 Orion Squadrons. Nine P-3 "Orion Hunter" squadrons are stationed at Moffett Field, of which two squadrons--VP-31 and VP-91--are permanently attached. The seven remaining squadrons are under the command and control of Patrol Wing 10 which flies throughout the Pacific, covering 93 million square miles of ocean. Two of the seven squadrons under Wing 10 are always deployed in the Pacific. The seven squadrons are VP-9, VP-19, VP-40, VP-46, VP-47, VP-48, and VP-50. The two permanently attached squadrons at Moffett are VP-31, a training squadron, and VP-91, a reserve squadron. Orion P-3 aircraft have been home based at NAS Moffett Field since 1962 (1983 Moffett Field Directory, Specialty Graphics, Inc. 1983). Table 5-2 lists the Orion Squadron locations at NAS Moffett Field.

Table 5-3 shows the organization of a typical Orion Squadron. The major departments are shown, of which for the purposes of this study, the Maintenance Department is of prime importance. Seven Orion squadrons are always located at NAS Moffett Field in hangars 1, 2, and 3. For purposes of discussion, the operations, waste generation, and disposal information of one Orion Squadron applies for all other Orion squadrons. Typical generation rates and disposal practices were obtained from interviews.

Orion Maintenance Department personnel maintain, replace, and service Orion the aircraft of their squadron. The maintenance operation level of activity today is much the same today as when the squadrons first came to NAS Moffett Field. The maintenance level for each squadron is conducted up to the intermediate level. Aircraft Intermediate Maintenance Department (AIMD) is located at NAS Moffett Field to conduct higher levels of maintenance. Typical squadron level maintenance operations include draining and replacing fluids, changing filters, cleaning, and replacing parts of the aircraft. Some limited paint stripping and painting is conducted.

The waste generation rates by the Maintenance Department have remained about constant since 1962 when the seven Orion squadrons were stationed at NAS Moffett Field. Typical waste generation rates are shown in Table 5-4, the represented the major waste stream from the early 1960s. Disposal methods of the waste generated from the Orion squadrons varied with the times. In the early 1960s, much of the waste solvents were poured down deck drains, around the hangars, around the aprons, or placed in barrels that were stored around the hangars. According to personnel interviewed, many barrels of waste were stored at each outside corner of hangars 2 and 3. Some of the waste leaked onto the ground. Another storage area of drummed wastes was along the apron to the north and east side of Hangar 3. This area was also used for waste disposal.

In the early 1960s, some of the waste was containerized in 55-gallon barrels was hauled by civilian employees of NAS Moffett Field, to the Runway Landfill, north of Runway 32R (Site 1). The military personnel from the Orion squadrons did not haul off the waste.

TABLE 5-2

P-3 Orion Squadrons at NAS Moffett Field, California

Squadron	Location	Remarks
VP-9	NW Hangar 3	VP-9 through VP-50 are under the control of Wing 10, also located at NAS Moffett Field.
VP-19	SE Hangar 2	
VP-40	Deployed	
VP-46	Deployed	
VP-47	NW Hangar 2	
VP-48	SW Hangar 3	
VP-50	SE Hangar 3	
VP-31	Hangar I	Training Squadron.
VP-91	NE Hangar 2	Reserve Squadron.

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TABLE 5-3

Organization of a Typical Orion Squadron,
NAS Moffett Field

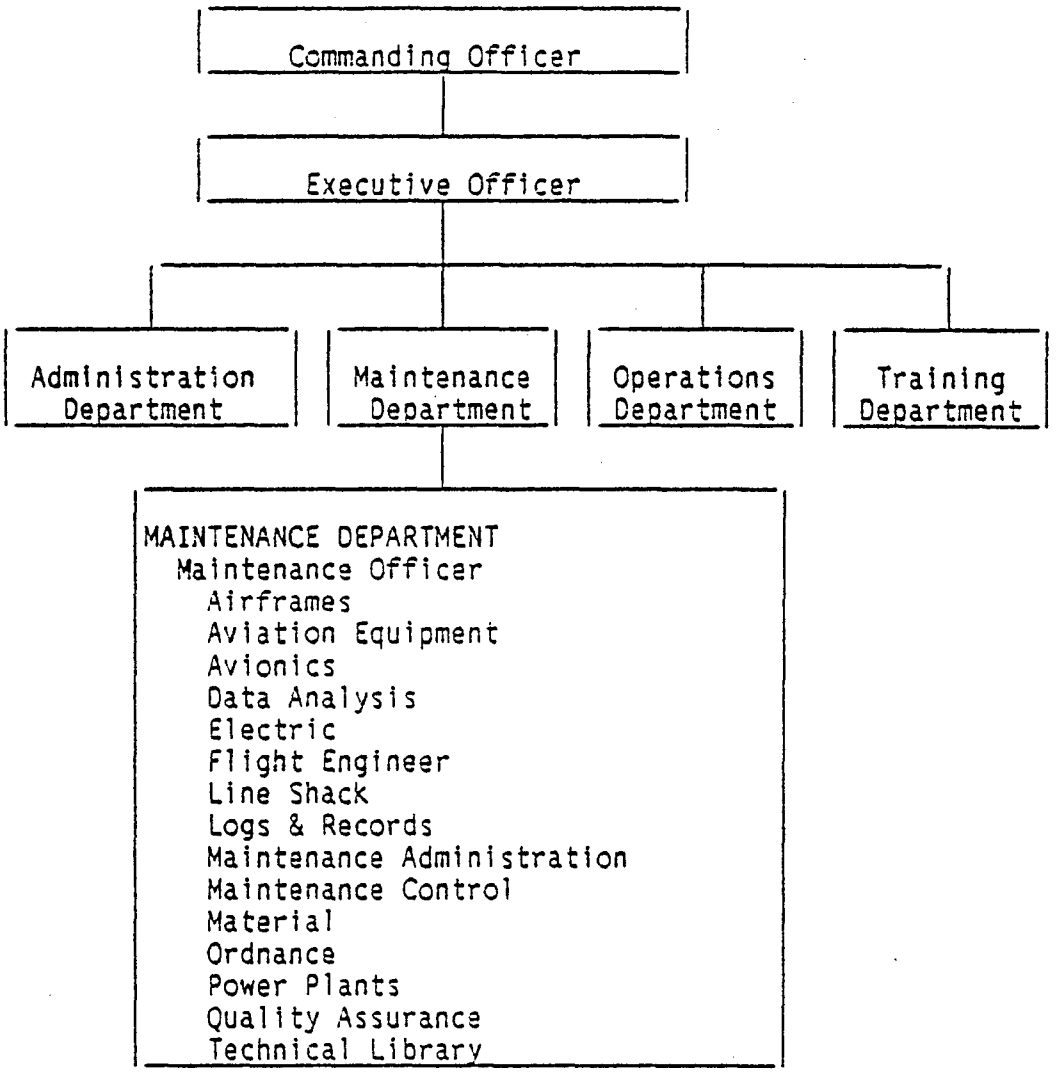

TABLE 5-4

Waste Generation Rates from Orion Squadrons,
NAS Moffett Field, California

Wastes	Generation Rate (gallons per year)	Time Period	Disposal Method
Methyethyle ketone (MEK)	5,000-6,000	1962-1978	Into deck drains, barrels, bowsers, and off aprons around hangars
	5,000-6,000	1978-Present	Collected in drums and bowsers
Toluene	600-700	1962-1978	Into deck drains, bowsers, barrels off aprons and beside hangars into drums and bowsers
Dry cleaning solvents, including PD680	10,000-14,000	1962-1978	Into deck drains, bowsers, barrels, off aprons, and beside hangars
Stoddard solvent	10,000-14,000	1978-Present	Into drums, bowsers
Paint waste and residues	170-260	1962-1978	Into deck drains
	170-260	1978-Present	Drums
Freon 113	4,000-5,000	1970-1978	Into deck drains, bowsers, barrels, off aprons and beside hangars
	4,000-5,000	1978-Present	Into bowsers/drums
JP fuels	16,000-17,000	1962-1978	Into deck drains, bowsers, drums, off aprons, and around hangars
	16,000-17,000	1978-Present	Into fuel bowsers, drums
Other, including chlorinated solvents	Not determined	Until early 1970's	Into deck drains, bowsers, drums, off aprons, and around hangars

This disposal practice, established in the 1960s, continued until about 1978, since 1978, the hazardous waste generated by the Orion Squadrons has been containerized.

A fuel bowser is used to collect waste or contaminated JP fuels. Other bowsers collect waste oils and solvents. These wastes are disposed of through the established waste disposal system at NAS Moffett Field.

The Orion aircraft wash facility or "bird bath," is located to the south of hangars 2 and 3 and east of Runway 32R. Various aircraft washing compounds have been used at this facility. Aircraft washing compounds of the alkaline type manufactured by TURCO Chemical Company were used until about 1978.

The facility has underground rinse water collection system, however, much of the rinse water flows to the nearby ditch. The drainage ditch, located by Patrol Road, flows north and empties into the Moffett Field storm water collection system, which is pumped into Guadalupe Slough. The rinse water collected in the aircraft wash underground system is piped to the industrial wastewater ponds located on the north side of hangars 2 and 3. The operations of these ponds are discussed in more detail in Section 7.1.1 of this report. Washing compounds contained phenol compounds and generated a waste water with high chemical oxygen demand.

5.2.2.2 Jet Aircraft Squadrons. Jet aircraft squadrons operated at NAS Moffett Field from 1950 until 1962. In 1953, Moffett was designated as the first Navy Master Jet Station. Jet aircraft operations continued to increase to their peak in 1955 (Speciality Graphics, 1983, and Moffett Field Directory, 1983). The jet squadrons operated out of hangars 1, 2, and 3. Very little information was gathered from military personnel that were stationed at NAS Moffett Field during these years.

Jet aircraft maintenance is similar to maintenance conducted by Orion squadrons. Maintenance was conducted in the flight modules in hangars 1, 2, and 3. Table 5-5 shows some of the waste generated during the jet era at NAS Moffett Field. According to personnel interviewed, who were stationed in Hangar 1 in the mid-1950s, most of the oily and solvent wastes were collected in 55-gallon barrels and stored beside the hangar. Each outside corner of hangars 1, 2, and 3 contained hundreds of barrels of waste materials. Stoddard solvent was sprayed around the stored barrels to clean up the area for inspection. Waste from this operation was washed to the storm sewer, which drained into Marriage Road Ditch. Clean up or field day normally was scheduled each Thursday.

The barrels stored at each corner of hangars 1, 2, and 3 were hauled to the Runway Landfill (Site 1) by station personnel. Fuels, solvents, and liquid wastes were also disposed of down storm sewers around the hangars and off the edge of the aprons.

During the jet era of 1950-1962, many barrels of waste fuel, solvents, and oils were stored south of Hangar 1 in or near the Ground Support Equipment compound. According to personnel interviewed, the area had hundreds of barrels, many of which leaked. A washrack drain located between Hangar 1 and the ground support equipment compound, was probably used for waste disposal. This washrack drain flowed into Marriage Road Ditch.

TABLE 5-5

Summary of Waste Generated from Jet Aircraft Squadrons at Moffett Field, California

Wastes	Generation Rate (gallons per year)	Time Period	Disposal Method
JP fuels	20,000-24,000	1950-1962	In drums, storm sewers, deck drains, beside hangars, around aprons, and to the landfill at the north end of the runway
Solvents including Stoddards solvent	18,000-20,000	1950-1962	In drums, storm sewers, deck drains, beside hangar, around aprons, and to the landfill at the north end of runway
Paint thinner and paint strippers	No volume estimated	1950-1962	Deck drains
Speedy dry absorbent (to absorb liquid oils and solvents	No volume estimated	1950-1962	Dumpsters with solid waste

5.2.2.3 Other Air Operations. The Naval Air Transport Service Squadron was stationed at NAS Moffett Field from 1945 to 1950. In addition, in 1949, a major overhaul facility was operated at Moffett Field. No one from that time period was interviewed about aircraft maintenance procedures and disposal practices, but the waste generated during that time was probably disposed of by methods similar to those of the 1950s.

No personnel from the LTA operations at NAS Moffett Field were interviewed. If disposal practices during the 1930s and 1940s at Moffett were similar to that at other naval air stations, then solid waste went to the station landfill and most liquid waste went down the storm sewers or was saved for fire fighting training practice.

5.2.3 Aircraft Intermediate Maintenance Department (AIMD). The function of AIMD is to provide intermediate aircraft maintenance in support of the station and fleet aircraft and associated support equipment. AIMD is housed in the "glass house", Building 549 area, in the east side of Hangar 3, in the GSE area around buildings 142 and 541, and in the engine test cell area, north of Runway R32. AIMD organization has ten divisions, however, the power plants, air frames, avionics and support equipment divisions are the only divisions that generate hazardous waste.

5.2.3.1 Power Plant Division. The Power Plants Division is responsible for providing maintenance up to the intermediate level on aircraft engines, propellers, auxiliary power units, and related power equipment. Power Plant Division repairs and maintains the engines for the P3 Orion aircraft. Power Plants Division is located about midway on the east side of Hangar 3. Prior to late 1979, the Power Plant Division occupied the northeast corner of Hangar 3 (the present location of the California Air National Guard).

The following wastes are reportedly generated by the Power Plants Division: oils, hydraulic fluids, methylethyl ketone, JP fuels, B and B cleaner, PD-680 (a solvent), toluene, and stoddard solvent. Personnel interviewed estimated that about 10,000 gallons of waste is generated each year. This rate of generation has remained somewhat constant over the years. Solid waste such as "kitty litter" type absorbents and rags are thrown in the dumpsters. Prior to the early 1970s, trichloroethylene was used as a solvent, but is no longer used.

When the Power Plant Division was located in the northeast corner of Hangar 3, prior to 1980, a washrack located on the north end of Hangar 3 received much of the waste generated by the division. Water from the washrack flowed into Marriage Road Ditch (Site 3). In addition, 55-gallon drums of waste solvents including trichloroethylene were stored over an unpaved area at the corner of Hangar 3. Up until the late 1970s, a common method of disposal utilized by the aircraft squadrons and AIMD was by pouring liquid waste down storm drains, on unpaved areas around the hangars, and off the aircraft parking aprons. Since about 1979, waste generated has been collected in the underground 2,000-gallon tank. The tank is pumped and waste is hauled off station by a licensed hazardous waste hauler. No spills or incidents have been reported since the tanks were installed.

5.2.3.2 Avionics Division. The Avionics Division provides intermediate level maintenance and repair of aircraft electrical components. The Avionics Department is located in Building 549 and has a battery shop in the adjacent building. The waste of concern produced by the Avionics Division are batteries and electrolyte. The electronic technicians reportedly do not produce any hazardous wastes. A former battery shop, Building 79, located between hangars 2 and 3, was operated by AIMD until about 1980. Building 79 is presently being used as a parts issue building.

The present battery shop generates waste batteries of both lead acid and nickel cadmium types and electrolyte. Fifteen to 20 lead acid type batteries and electrolyte are disposed of each month. It is estimated that about 30 to 40 small nickel cadmium cells are disposed of per month.

The present battery shop has an underground tank with a recording pH meter to document that the electrolyte is neutralized prior to discharge into the sanitary sewer. The former battery shop in Building 79 neutralized the lead acid eletrolyte with sodium bicarbonate in the sink prior to discharging into the sanitary sewer. Lead acid battery cases are turned in to DPDO for salvage. Reportedly, the lead acid battery cases have always been turned in to salvage. The nickel cadmium battery cells containing potassium hydroxide are disposed of with the solid waste in the dumpster. Table 5-6 is a summary of waste generation and disposal from the avionics battery shop operations.

5.2.3.3 Airframes Division. The Airframes Division of AIMD provides intermediate maintenance by peforming repair, modification, fabrication, and test of metal, fiberglass, plexiglass, and hydraulic systems. The division performs paint stripping, painting, degreasing, corrosion protection, fiberglassing operations, machining, metal plating, and non-destruct testing. The Airframes Division consists of several different shops located in the AIMD spaces on the east side of Hangar 3.

Table 5-7 summarizes the typical waste generated by the Avionics Division. About 8,000 gallons of mixed waste are generated each year. Since about 1979, an underground tank located on the east side of Hangar 3 has been used to collect much of the waste. According to personnel interviewed, the waste volume generated today represents the amount generated since 1962 when the Orion Squadrons were deployed at NAS Moffett Field.

Since about 1979, the waste generated has been collected either in the 2,000-gallon underground tank or in waste containers for disposal under contract to a licensed hazardous waste hauler. Prior to 1979, waste generated by the Avionics Division was probably disposed of by pouring waste down storm sewers, onto the ground around aprons, and into barrels for disposal by Public Works.

5.2.4 Support Equipment Division. The Support Equipment Division of AIMD provides and maintains aircraft maintenance support equipment to tenant squadrons. This division is located between Macon Road and Hangar 3 in the yard surrounding buildings 142 and 541. In this area are maintenance shops to repair the aircraft ground support equipment (yellow gear) and yard to park the equipment. Maintenance and repair consist of paint stripping, painting, sandblasting, degreasing, washing, overhauling engines, and associated Ground Support Equipment gear.

TABLE 5-6

Summary of Waste Generated by the Avionics Department at NAS Moffett Field, California

Wastes	Generation Rate/Year	Time Period	Source	Building	Disposal
Lead acid type battery cases	180-240	1940s-1980	Avionics Department	No. 79 Battery Shop	DPDO for salvage
Lead acid battery electrolyte	360-480 gallons	1940-Present	Avionics Department	No. 79 Battery Shop	Neutralize with sodium bicarbonate in sink and to sanitary sewer
Lead acid battery electrolyte	360-480 gallons	1980-Present	Avionics Department	New Battery Shop	Neutralize with sodium sesquicarbonate and sewer
Lead acid battery cases	180-240	1980-Present	Avionics Department	New Battery Shop	Turn in to DPDO for salvage
Nickle-cadmium batteries with potassium hydroxide electrolyte	360-480 cells per month	1980-Present	Avionics Department	New Battery Shop	With solid waste in dumpster

TABLE 5-7

Typical Annual Waste Generated by Aircraft Intermediate Maintenance Department

Air Frames Division, NAS Moffett Field, California

Wastes	Amount/year
Freon	1,200 gallons
Trichloroethene	650 gallons
Solvent PD-680	2,600 gallons
Cold carbon remover	1,200 gallons
Paint stripper (TURCO 5878)	650 gallons
Paint spraybooth water/sludge	800 gallons
Waste paint	120 gallons
Methylethyle ketone (MEK)	120 gallons
Toluene	120 gallons
Lacquer thinner	120 gallons
Hydraulic oils/fluids	120 gallons
Asbestos	7-8 cubic feet
Machine cutting oils	Not determined
Penatradent dye	Not determined
Plating wastes	Not determined
Absorbant and rags	Not determined

Table 5-8 summarizes the type and quantity of wastes generated by the Support Division. Reportedly, this generation rate of 6,000 gallons per year has remained at this level over the past ten years and most likely has remained constant since 1962 when the Orion Squadrons were deployed at NAS Moffett Field.

A washrack in the support equipment yard which has a large deck drain, referred to by the personnel as the "biological or ecological drain." This drain received much of the non-oily waste generated and some of the oily waste that is steam cleaned off the equipment at the washrack. Personnel report that some of all the waste listed in Table 5-8 has been disposed of in the drain. However, a waste oil and waste fuel bowser is now used to contain the oily/solvent and fuel waste. The bowsers are emptied at the fuel farm waste oil tank.

5.2.5 California Air National Guard (CANG). CANG has been located at NAS Moffett Field since 1980, when they moved from Hayward Air Force Base. CANG's newly built complex includes buildings 680, 681, 682, 683, and 684 and yard.

CANG also occupies the northeast corner of Hanger 3, which was the former area occupied by the Power Plants Department of AIMD. This corner of Hangar 3 was modified for the CANG aircraft maintenance facilities. A 2,000 gallon underground waste tank was installed to receive solvent and other hazardous waste generated by CANG.

CANG maintains and repairs aircraft both fixed-wing and helicopters. The shops supporting these operations generate waste as shown in Table 5-9. The wastes are typical of those generated during the years CANG has been at NAS Moffett Field.

CANG, has disposed of hazardous waste to bowsers or to an underground 2,000 gallon tank that was installed in 1979. The tank was periodically pumped out by a state-certified hazardous waste hauler and the waste was disposed of off station. Table 5-9 shows generation rates and disposal methods. Oily waste and solvents are disposed of through the Navy Fuel Department and through DPDO.

5.2.6 General Operations.

The photographic laboratory processes film for NAS Moffett Field and its tenants. The lab has operated in Building 19 since about 1963. Wastes produced by the lab are presented in Table 5-10.

A silver recovery unit was installed in 1981. This unit processes all wastes containing silver ions. Silver is recovered as a concentrated solution and is collected in a 25-gallon jug. When full, the jug is taken to the Supply Department disposal office. Bleach and other caustic liquid wastes are collected in a jug and are picked up periodically by the Public Works Department labor shop.

5.2.6.1 Navy Exchange.

The Navy Exchange service station stores and dispenses fuel, and performs automotive repairs and maintenance. The service station has been located in Building 503 since 1967. Prior to 1967, it was located in Building 31, next

TABLE 5-8

Typical Annual Waste Generated by
Aircraft Intermediate Maintenance Department
Support Division, NAS Moffett Field, California

Wastes	Amount Generated Per year
Mixed paint waste, including lacquer thinners and toluene	60 gallons
Paint and lacquer strippers	10-12 gallons
Corrosion removing compounds	60 gallons
Hydraulic fluid	1,200 gallons
Solvent PD-680	1,300 gallons
Aircraft cleanint compound	660 gallons
Waste oils	2,400 gallons
Ethylene glycol (anti-freeze)	200 gallons
Sandblast grit	200 pounds

TABLE 5-9

Waste Generated by California Air National Guard, NAS Moffett Field, California

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Lead acid battery electrolyte	10 gallons per year	1980-1983	Avionics Shop	NE Hangar 3	Neutralized and disposed of into sanitary sewer
Old lead acid batteries	20-25 each per year	1980-1983	Avionics Shop	NE Hangar 3	Taken to Hayward AFB
Waste oils	275-330 gallons per year	1980-1983	Ground Support Equipment Shop	684	Taken to Navy fuel department
Mixed solvents	220-440 gallons per year	1980-1983	Ground Support Equipment Shop	684	Disposal by licensed waste hauler
Paint waste	10-15 gallons per year	1980-1983	Ground Support Equipment Shop	684	Disposal by licensed waste hauler
Methyl ethyl ketone	60 gallons per year	1980-1983	Fuel Shop	681	Waste tank--disposed of by licensed waste hauler
Waste fuel	24,000 pounds per year	1980-1983	Fuel Shop	681	Waste fuel taken for sale through DPDO
Solvent PD680	100 gallons per year	1980-1983	Weapons Shop	NE Hangar 3	Waste solvent tank--disposed of by licensed waste hauler
Methyl ethyl ketone	36-48 gallons per year	1980-1983	Fabrication Shop	NE Hangar 3	Waste solvent tank--disposed of by licensed waste hauler

(continued)

TABLE 5-9 (Continued)

Waste Generated by California Air National Guard,
NAS Moffett Field, California

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Toluene	24 gallons per year	1980-1983	Fabrication Shop	Hangar 3	Bowser, hauled off station by licensed hazardous waste hauler
Solvent PD680	36 gallons per year	1980-1983	Fabrication Shop	Hangar 3	Bowser, hauled off station by licensed hazardous waste hauler
Hydraulic fluid	300 gallons per year	1980-1983	Hydraulic Shop	Hangar 3	Bowser, hauled off station by licensed hazardous waste hauler
Solvent PD680	240 gallons per year	1980-1983	Hydraulic Shop	Hangar 3	Bowser, hauled off station by licensed hazardous waste hauler
Solvent PD680	600 gallons per year	1980-1983	Propulsion Shop	Hangar 3	Bowser, hauled off station by licensed hazardous waste hauler
B&B 3100 cleaner	120 gallons per year	1980-1983	Propulsion Shop	Hangar 3	Holding tank hauled off base by hazardous waste hauler
Hydraulic fluid	290 gallons per year	1980-1983	Propulsion Shop	Hangar 3	Bowser, to Navy fuel tank to DPDO
Engine oil	660 gallons per year	1980-1983	Propulsion Shop	Hangar 3	Bowser, to Navy fuel tank to DPDO

(continued)

TABLE 5-9 (Continued)

Waste Generated by California Air National Guard,
NAS Moffett Field, California

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Solvent PD680	300 gallons per year	1980-1983	Flightline Shop	Hangar 3	Oil and solvent in bowser to Navy Fuel Department
Hydraulic fluid	100 gallons per year	1980-1983	Flightline Shop	Hangar 3	Oil and solvent in bowser to Navy Fuel Department
Engine oil fluid	50 gallons per year	1980-1983	Flightline Shop	Hangar 3	Oil and solvent in bowser to Navy Fuel Department

TABLE 5-10

Waste Generation By Photo Lab, NAS Moffett Field

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Wastewater containing silver ions	100 gallons per year	1981-1983	Photo Lab	19	DPDO
		1963-1981	Photo Lab	19	Sanitary sewer
Caustic solutions	50 gallons per year	1981-1983	Photo Lab	19	Public Works labor shop
Benzyl alcohol	5 gallons per year	1983	Photo Lab	19	Public Works labor shop

to Building 12, the Commissary. Wastes generated by the service station are shown on Table 5-11.

Waste liquids were disposed of in a holding tank located about 500 feet east of the building. This holding tank was pumped out periodically by a local oil refining company.

In the repair shop, until 1978, parts were cleaned in a solvent bath. The waste solvent was disposed of with the waste oil. In 1978, the station contracted the service for parts cleaning. Now the solvent bath is owned by the company that takes care of solvent disposal.

The drycleaning plant cleans clothing for Navy Exchange customers on base. The plant has been located in Building 88 since 1945. Perchloroethylene is used as the drycleaning agent. About 2,400 gallons per year are added to the system as make-up fluid, but no disposal of cleaning fluids occurs because of evaporation. The cleaning fluid is recirculated in the system, and filtered through a diatomaceous earth filter. The filter cake is replaced daily. The filter cake is heated to drive off all remaining fluid, and the fluid is recovered in a condenser. The remaining dry filter cake is disposed of in the dumpster.

5.2.6.2 Fire Department. The NAS Moffett Field Fire Department has always been responsible for fire protection and emergency spill response at NAS Moffett Field and the Ames Research Laboratory.

The fire department has been in its current location (Building 580), at the northwest edge of the runway, since the early 1950s.

The fire department does not generate significant quantities of hazardous waste. The fire fighters respond to small 150 to 200 gallon spills of jet fuel in the runway area. Until about five years ago, these spills were flushed down storm drains that lead to San Francisco Bay. The current practice is to absorb the spill and contract for disposal of the residue off base. Other than these small fuel spills, the fire department has not encountered any major spills or fires that might have left hazardous residues.

5.2.6.3 Fire Fighting Training. As a training program, the fire department routinely ignites waste fuels in a pit and has fire fighters practice putting out the fire.

The present fire fighting training pit is located north of Building 580, the Fire Department. The site also contains an above-ground tank used to store fuels for burning. The pit has been in its present location since the 1950s.

Contaminated JP-4 and JP-5 fuel solvents, and diesel fuel have always been used in the pit. These materials have always come from the contaminated fuel tanks at the fuel farm. In the past, the residue from burning remained in the pit, resulting in some overflow during the rainy winter season. Reportedly, a maximum of 300 gallons washed out of the pit each year, until about 1980. Since then, the fuel farm has pumped out the residue and returned it to the contaminated-fuel tanks.

TABLE 5-11

Waste Generated by Navy Exchange Service Station
NAS Moffett Field

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Used lube oil	2,400 gallons per year	1933-1967	Navy Exchange Service Station	31 and 503	Unknown
Transmission fluid Brake fluid gear oil	2,400 gallons per year	1967-present			Holding tank in front of building
Dry Cleaning Solvent	110 gallons per year	1933-1967	Navy Exchange Service Station	31 and 503	Unknown
	110 gallons per year	1967-1978			Holding tank in front of building

5.2.6.4 Chemical Laboratories. The fuel farm has a laboratory that has never been used because it does not meet testing standards. All major testing is done at NAS Alameda. The fuel personnel use a small, one-machine field lab indoors. All samples are disposed of in a drum which is trucked off station. Before using this field lab, the Fuel Division did not do fuel testing.

5.2.6.5 Regional Medical Center. The Regional Medical Center provides medical care for station personnel. The clinic has operated in Building 546 since 1975. From 1933 until 1975, the clinic operated in Building 23.

Wastes produced included "contaminated" waste-tissue or test specimens. These were autoclaved and thrown in the dumpster. Lab chemicals were disposed of in the lab sink. Waste mercury from spills was turned over to the manufacturer of the equipment that contained the mercury. No disposal on station was reported.

5.2.6.6 Dental Clinic. The dental clinic provides dental care for station personnel. The clinic has operated in Building 546 since 1975, and operated in Building 23 from 1933 to 1975. Wastes generated by the dental clinic are listed in Table 5-12. Dental amalgam was taken to Treasure Island for metals recovery. Fixing solution from x-ray photography processing was taken to Treasure Island for silver recovery.

5.2.6.7 Supply Department Fuel Division. The Fuel Division of the Supply Department purchases and distributes aviation fuels used at NAS Moffett Field, and collects contaminated fuels and oils. The Fuel Division also supplies auto fuel to the Transportation Division of the Public Works Department.

The following five fuel farm facilities were built in the early 1950s:

(1) A fuel-loading pier and pipeline located on leased land in the San Francisco Bay, on the east side of the station.

(2) The main storage area around Building 545.

(3) A filtering area, not currently used, across Macon Road, west of the main storage area.

(4) A day-use facility north of Hangar 3.

(5) The high speed refueling facility next to the runway and west of the day-use facility.

The original fuel facilities for NAS Moffett Field were located west of Hangar 1 near Building 12 and were used from the 1940's to 1964. AvGas was stored in six underground tanks with a capacity of 10,000 gallons each. The AvGas storage tanks are located under the commissary parking lot. MoGas was stored in two underground 5,000 gallon tanks in the original NEX gas station, Building 31. All tanks were made of steel. In 1964, leaks were discovered in two of the AvGas tanks. The tanks were not repaired. All tanks were drained and filled with water.

TABLE 5-12

Table Wastes generated by Dental Clinic
NAS Moffett Field

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Mercury (in amalgam)	8 pounds per year	1933-1983	Dental Clinic	23 and 546	Taken to Treasure Island for salvage
Photo-graphic fixing solution	20 gallons per year	1933-1983	Dental Clinic	23 and 546	Taken to Treasure Island for silver recovery
Waste mercury from spills	0.5 ounces per year	1933-1983	Medical Clinic	23 and 546	Given back to instrument manufacturer for disposal

The Fuel Division collects all the waste oils and contaminated fuels at the station for resale by the local off-site branch of the Alameda Defense Property Disposal Office. The Fuel Division has always handled contaminated fuel at the station. The tank currently used to store waste oils was constructed ten years ago. Before then, DPDO collected all waste oil generated at the station.

The main storage and filtering areas at the fuel farm include underground drainage systems french drains. Until about 15 years ago, these systems were used extensively to dispose of small spills and fuel/water mixtures from fuel dilevered by barge and from bleeding off tanks. Two drains, consisting of pipes leading to unknown underground areas, are still visible. The design drawings for the fuel farm do not show any elements of the piping or underground drainage fields for these systems. No such drains exist at the day-use facility, although a holding tank was located there. This tank was regularly pumped out and the contents hauled off-station.

The fuel discharged into underground drains at the fuel facilities was mostly small amounts of jet fuel. Tank bleeding was performed several times per week. Occasional spills from 10 to 15 gallons went to the underground drains.

No large spills or leaks have occurred at any of the Fuel Division facilities, and no fuel was ever knowingly disposed of at the station landfills. For a short time, fuel samples taken from the bottom of truck tanks were disposed of on the ground at the truck unloading facility. This was discontinued after a few months, and fuel samples were placed in 55 gallon drums. This fuel was placed in the waste oil tank. Because the main storage tanks are submerged in the water table, leaks have always resulted in water entering the fuel, rather than fuel contaminating the ground water. Tank cleaning has always been performed by a contractor obligated to dispose of sludges and other waste off-station.

The fuel filtering facility that operated in the past generated small quantities of waste. About one small truckload of filters went to the landfill each year until the facility stopped operating. These filters contained rust, fuel contaminants, and fuel sludge that could have contained lead compounds. Except for this small quantity of fuel filters sent to the landfill, the Fuel Division has not performed any other on-site disposal.

Reportedly, no major spills have occurred at the auto refueling facilities at the transportation yard on the west side of the station. Neither sampling, or construction of a car wash in the vicinity have revealed any contamination of the soil.

5.2.7 Ordnance Operations. All ordnance operations at NAS Moffett Field have been conducted by the Weapons Department since it was established in 1965. The Weapons Department procures, maintains, and issues all ordnance authorized for used by the activity. Also, the department operates the small-arms firing range.

5.2.7.1 Advanced Undersea Weapons Maintenance. Mark-46 type torpedoes are maintained in the AUW compound. Maintenance is performed in Building 484, the special weapons shop.

Torpedo maintenance has been performed on the station since 1965. Wastes produced by the torpedo maintenance shop are listed in Table 5-13. All wastes produced by this shop since 1975 were taken off base for disposal at a licensed hazardous waste disposal facility. Torpedo shop personnel reported that no on-station disposal of torpedo shop wastes has occurred.

5.2.7.2 Missiles. From 1965 to 1972, Bullpup missiles were stored, handled, maintained, and issued by the Weapons Department. In 1965 and 1966, Bullpup missiles were equipped with rocket motors and liquid fuel. The fuel was amine fuel and the oxidant was inhibited red-fuming nitric acid. The missiles were handled as an "all up round," meaning that they contained the fuel when received. No fueling or handling of fuel or oxidant was done at NAS Moffett Field. From 1966 to 1972, the Bullpup missile was equipped with a solid-fuel rocket motor.

Building 511, the Missile Assembly Building, was built in 1968. Building 511 has been used for assembly of Bullpup missile warheads onto the rocket motors. No spills or on-site disposal were reported during handling of the Bullpup Missile at NAS Moffett Field. The Bullpup missile was phased out by 1976 and was replaced by the harpoon missile (CH2M Hill, Inc., 1976) (Moore, 1974). Information about waste generation from handling harpoon missiles was unavailable.

5.2.8 Radiological Operations. NAS Moffett Field does not have a license for radiological material storage or use. The non-destructive radiography testing at Moffett is with x-rays. Personnel interviewed in the elctronics shops report that they never handled or received radium-containing dials. No sources of radiation other than x-ray units was reported being used at NAS Moffett Field.

5.3 NALF CROWS LANDING.

5.3.1 Public Works Operations.

5.3.1.1 Painting Operations. Reportedly, an average of 100 gallons of paint is used annually at NALF Crows Landing. Empty cans are disposed of with regular solid waste which goes off-station to a municipal landfill. Reportedly, overage paint has always been accepted by DPDO. In previous years, overage paint has gone to the DPDOs at Stockton, Oakland, and NAS Moffett Field.

5.3.1.2 Electrical Operations. The electrical distribution system provides 4,160 volts AC on station from a stepdown transformer located east of Bell Road. High voltage power for all runways and taxiways is distributed from Building 103. Transformers used in the electrical distribution system were reported to be mineral oil type.

5.3.1.3 Transportation Shop. The transportation shop has been located in Building 138 since it was built in 1959 (NFADB, 1983). Station vehicles are maintained at this shop. "A vehicle parts washrack is located outside the Transportation Shop. This washrack is used primarily for steam cleaning with a dry cleaning solvent. The rack drains directly to the ground and wash water percolated into the gravel and soil" (WESTNAVFACENGCOM, 1983). Approximately four 55-gallon drums of stoddard (dry-cleaning solvent) are used annually by the Transportation Shop. Most of this probably evaporates during use.

TABLE 5-13

Wastes Generated by the Weapons Department
NAS Moffett Field

Wastes	Generation Rate	Time Period	Source	Building	Disposal
Otto Fuel II	550 gallons per year	1975-Present	Torpedo Shop	484	Off base
Agitene	100 gallons per year	1975-Present	Torpedo Shop	484	Off base
Oil, grease and otto fuel, contaminated rags	1,100 gallons per year	1975-Present	Torpedo Shop	484	Off base

Until 1982, waste oils and solvents were collected in a stationary bowser outside the northwest corner of Building 138. Some spillage occurred during transfer of wastes. An oily spot on the gravelly soil is still visible. Since 1982, the wastes have been collected in a wheeled bowser, which is parked on the concrete pad immediately north of Building 138. Approximate quantities of wastes currently generated by the Transportation Shop and placed in the bowser are:

30-weight oil, four 55-gallon drums
10 W 30-weight oil, two 55-gallon drums
Automotive transmission fluid, two 55-gallon drums
Oil, one 55-gallon drum

Small quantities of stoddard solvent have been disposed of in the bowser, however, most of the stoddard solvent evaporates during use or is used at the washrack.

The contents of the bowsers always have been used at the fire fighting training pit.

Waste batteries are stacked on pallets on the concrete pad northwest of Building 138 until the batteries are picked up and removed off NALF Crows Landing. The battery acid has been left in the batteries. In recent years, baking soda has been added to the batteries to neutralize the acid.

5.3.2 Storm Water Drainage and the Silt Pond. The storm drainage system at NALF Crows Landing is a series of earth ditches along the roads that collect runoff from building areas, fields, and runways. Most of the runoff consists of agricultural irrigation drainage, which is reclaimed. Drainage is collected in a silt pond located in the northeast portion of NALF Crows Landing. The silt pond collects drainage from the surrounding areas as well as from NALF Crows Landing. Discharge from the silt pond is through a 24-inch pipe to a ditch that flows to the San Joaquin River. Effluent from the pond is monitored for specific conductance and suspended solids by the U.S. Soil Conservation Service in Patterson, California.

The silt pond is dredged each year. Dredge spoils are allowed to dry and then are spread on the farm fields before the next year's dredging.

5.3.3 Pesticide Operations. Each year, pesticides have been applied at NALF Crows Landing from February to May. From the mid-1950s until 1978, pesticides were stored and mixed near the pump house and the water tank (buildings 150 and 151) area. A faucet in the area supplied water for mixing pesticides and for rinsing 200-gallon sprayer tanks. Occasionally during mixing, the mixed pesticide would foam overflow from the tank and about two gallons of foam would drip onto the ground. Tanks were not always rinsed after pesticides were applied. If some mixed pesticide was left over from an application, and if the pesticide was non-corrosive or non-clogging, then the unused pesticide was left in the tank until the next application job. When tanks were rinsed, the rinseate was disposed of near the faucet in the pump house/water tank area, or onto roads on the station. Since 1978, an area near the faucet southwest of Building 138 has been used for mixing pesticides and for rinseate disposal.

The main types of pesticides used over the years included:

Time Period	Pesticide	Approximate quantity used (gallons per year)
1950s	Weed oil, jet fuel, diesel fuel	2,000
1960s, 1970s	2,4-D, Primatol, Aminotrizol, Telvar 25E sterilizer	800
Late 1970, early 1980s	Roundup	200

Empty containers were disposed of at the station landfill during the 1970s. The containers were burned then covered with soil. Since the late 1970s, the containers have been rinsed and flattened then transferred to NAS Moffett Field for disposal.

In the early 1980s, during the Mediterranean fruit fly incident, helicopter spray rigs were filled with mixed malathion at NALF Crows Landing. It was not known to interviewees whether any significant spills occurred.

5.3.4 Fire Fighting Training. The fire fighting training pit is located near water tanks 150-153. The pit used since 1943, is unlined and consists of soil and rocks. Fire fighting training presently takes place once or twice per month. However, from 1943 to 1946, training took place once or twice a week.

Procedures are to block the runoff drain and pour into the pit 200 to 300 gallons of contaminated JP-5 (about 15 percent water) mixed with some waste crankcase oil, solvents, cooking grease, and transmission fluid. The mixture is lighted and extinguished using water. A training exercise takes about 25 minutes.

A 12-inch conduit is used to drain the pit. Water flows from the pit into a small excavated channel that flows to an irrigation ditch. The drain is only plugged during fire fighting training (WESTNAVFACENGCOM, 1983).

5.3.5 Ordnance. The only ordnance-related operations at NALF Crows Landing consisted of burning and burial of debris collected from practice bombing ranges before returning the land to public domain. Practice bombs, explosives, and anything that potentially contained propellant was burned in a pit. The total quantity of debris was about 300 pounds.

5.3.6 Military Operation. A machine-gun range was used in the 1950s during the Korean Conflict. Aircraft taxied to a pit, then shot into a berm. The area is now level. Reportedly, shell casings can still be found in the area.

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 NAS MOFFETT FIELD

6.1.1 Industrial Material Handling

6.1.1.1 Materials Storage: Defense Property Disposal Office (DPDO) storage yard. The DPDO is an off-site branch of the DPDO at NAS Alameda. Its purpose is to sell surplus items. DPDO does not directly dispose of wastes, and will only accept those items that can be resold. DPDO tries to reoffer unattractive items by mixing them in a batch of more attractive ones. Thus, DPDO avoids contracting for direct disposal. Any hazardous waste generated at the DPDO area would have come from accidents or spills, not from disposal operations.

DPDO has always been located in a section of Building 127, at the edge of the NASA Ames compound. Originally, DPDO had the entire building, but now, the western three sections are used by the Supply Department for hazardous materials storage. A Quonset hut to the north of Building 127, in a separate fenced compound, has always been used by the Supply Department and DPDO to store hazardous materials before resale.

Until 1981, a 5,000-gallon above-ground waste oil tank was located just east of Building 127, at the disposal yard gate. The tank was within the disposal yard, but a collection sump was located outside the fence. Trucks would dispose of waste oil to this sump. Oil from the sump was pumped into the tank.

A contractor emptied the 5,000-gallon waste-oil tank about once a month. The tank contained mostly waste oil from vehicles, but reportedly some solvents and about 100 gallons per year of transformer oils were also placed in this tank. No information is available on spill amounts. Some of the ground in the area was discolored when the on-site survey took place.

At times, in the past, DPDO accumulated as much as 200 barrels per month of hazardous materials to be removed by a contractor. Reportedly, no major spills resulted from this storage operation.

DPDO never intentionally disposed of wastes on station. All materials were trucked off NAS Moffett Field by contractor.

6.1.1.2 Supply Storage. The Supply Department at NAS Moffett Field receives, stores, and issues the materials needed to support operations at the base. Originally, Building 13 was used for all paint and oil storage. In 1952, storage of those items moved to the west end of Building 127, the area currently used. Hazardous items with expired shelf-life were moved to the quonset hut north of Building 127 until they could be sold. Reportedly, DPDO was always able to sell these items so that there was no need to dispose of them locally. Building 144, a large warehouse, has always been used for non-hazardous materials storage at NAS Moffett Field.

The Supply Department does not generate hazardous wastes as part of normal operations. The department regularly works with such materials as: paints, acids, cleaning compounds, alcohols, hydraulic fluid, and oils. Reportedly, there have been no major spills at the supply facilities, buildings 127 and 144.

6.1.1.3 Pesticide Storage. Reportedly, pesticides always have been stored in the west end of Building 251. This building was built in 1957 (NFADB, 1983). Two metal storage buildings near the south side of the building have also been used for pesticide storage. Since 1979, only the westernmost of the two buildings has been used for pesticide storage. It contains pesticides for the golf course.

The only large spill reported in the storage area occurred in the early 1970s. About 1/2 to 1 gallon of malathion concentrate spilled onto the floor of Building 251. The spill was contained within the building and cleaned up with absorbant material, soapy water, and bleach. Disposal method of the malathion-containing clean-up supplies could not be determined.

Between 1958 and 1979, a small building in the transportation yard was used for storage of golf course pesticides and other items. The building was metal with a wooden floor. Reportedly, no pesticide spills occurred in this storage location.

6.1.1.4 PCB Storage. A recent survey of NAS Moffett Field showed that 20 transformers and eight capacitors are contaminated with PCB oils. Some of the PCB equipment in this survey dates from 1943. Until several years ago, when the PCB problem become a concern, most transformers were either in service or disposed of, not in storage. Reportedly, a small area north of the transportation yard, where the Air National Guard has recently paved a new lot, was used to temporarily store new transformers. No spills were reported in this area.

In 1981, about 35 drums of PCB-contaminated liquid had accumulated in the Quonset hut north of Building 127. These drums were placed in overpack containers and disposed of by a contractor. Reportedly, the original drums were rusty, but had not begun to leak.

6.1.1.5 Storage Lots and Scrap Yards. General scrap yards or storage areas have been operated north and east of Building 127, and behind the transportation facilities at Building 146.

Reportedly, the Supply Department and DPDO, located at Building 127, did not store hazardous waste or materials in the storage yards. The areas around the transportation building may have been used to temporarily store hazardous waste, including transformer oils. However, the Transportation Department never ran a coordinated collection system for these materials, and therefore, most hazardous waste was probably disposed of directly by the shops and squadrons.

6.1.1.6 Pier Operations: Loading and Unloading Supplies. The only pier facilities at NAS Moffett Field have always been located at the northeast corner of the base on a strip of land leased from the Leslie Salt Company. The pier is used only for unloading fuel from barges in the Southern San Francisco Bay. These barges are unloaded about every ten days. The fuel is piped from the barges through a closed, above-ground system, about one mile to the four main storage tanks at the fuel farm. Reportedly, there have been no significant spills or leaks from this refueling system.

The fuel pier was constructed in the early 1950s, along with the other fuel farm facilities.

6.1.1.7 Materials and Waste Transportation. Until three to four years ago, when NAS Moffett Field created the position of Hazardous Waste Coordinator, the Transportation Division did not coordinate the disposal of hazardous wastes. The transportation yard has been located in the southwest corner of the station, around Building 146, since the early 1950s. In the past most wastes at NAS Moffett Field were disposed of directly, on or off site, by the shops and squadrons.

6.1.2 Ordnance.

6.1.2.1 Storage, Handling, and Transportation. The Weapons Department stores, handles, and transports all ordnance materials on station. In 1973, NAS Moffett Field was one of nine Pacific continental fleet support stations for ordnance storage and operations. At that time, NAS Moffett Field was a secondary ammunition stock point that provided service and training ammunition to a training squadron, seven deployable squadrons, station aircraft, the Marine barracks, the reserve training units, and several tenant activities and commands (Naval Ordnance Systems Command, 1973). Ordnance items in storage were regularly inspected, and any items found to be defective were red-tagged. Class C red-tagged items were disposed of on-station until 1972 (see Section 7.1.4). All other red-tagged items were sent to NWS Concord for rework or disposal. Since 1971, any red-tagged ordnance materials have been disposed of by the EOD at NAS Alameda or taken to NWS Concord by the EOD for rework or disposal. Ordnance materials are stored as shown in Table 6-1. Specific information on quantities, storage, and dates of disposal of ordnance items was not available from the NAS Moffett Field Weapons Department.

6.1.3 Radiological Material. Industrial radiological material was reportedly not stored or handled at NAS Moffett Field.

6.2 NALF CROWS LANDING.

6.2.1 Industrial Material Handling.

6.2.1.1 Supply Storage, Chemical and Hazardous Materials Storage. "NALF Crows Landing stores a small amount of hazardous material on the concrete foundation pad of a removed building. The hazardous material consists of several 55-gallon drums of degreasing solvent, several five or ten-gallon plastic containers of sulfuric acid, and about ten expired batteries awaiting recycling" (WESTNAVFACENGCOM, 1983). The location of the pad is north west of Building 138. The solvent and acid are unused materials.

TABLE 6-1

Storage of Ordnance Materials at
NAS Moffett Field

Ordnance Type	Buildings
Small arms ammunition	27, 28, 508
Fuzes and detonators	70
High explosives	71, 72, 73, 74, 143, 147
Pyrotechnics, CAD cartridges	177, 178, 179, 182, 183, 185, 187, 188, 189
MK-46 torpedoes	486, 487, 488, 489, 490, 491, 492
Missiles	511
Inert practice shapes	69

Most supplies are stored in Building 137. Some items, for example pesticides, are stored in small metal containers near Building 137.

6.2.1.2 Petroleum, Oil, and Lubricants Storage. Two fuel farms, one active and one inactive, are located at NALF Crows Landing. The active fuel farm was built in 1941 and consists of seven tanks: three tanks with a 1,000-barrel capacity; three with a 59.54-barrel capacity; and one with a 500-gallon capacity. The three 1,000-barrel tanks store JP-5 and have stored JP-4 and AVGAS in the past. One of the 59.54 barrel tanks stores contaminated fuel used for fire fighting training. The other two tanks are inactive. In the past, these tanks stored oil for weed control. The 500-gallon tank stores unleaded MOGAS. The inactive fuel farm consists of three tanks, each with a 5,000-barrel capacity. The fuel farm was constructed about 1952 and was used for only a short time. The tanks have been abandoned and filled with water. Table 6-2 is a summary of tanks and locations at NALF Crows Landing.

6.2.2 Ordnance. In 1945, two bomb storage magazines and one small-arms magazine were built at NALF Crows Landing. Records from 1951 state that seven ammunition storage magazines existed on the station.

In 1952, a rocket assembly building was built in the northeast corner of the station between the end of the runway and the sewage treatment facility. A rocket storage facility was also built south of the existing magazine area. No evidence of disposal related to storage, handling, or transportation of ordnance was discovered during the survey.

TABLE 6-2

Fuel Storage Tanks at Naval Auxiliary Landing Field
Crows Landing, California

Structure Number	Location	Size	Year Built	Fuel Stored	Active/ Inactive	Remarks
	General Development Map					
9	6-J	1,000 barrels	1943	AVGAS, JP-5, JP-4	Active	Concrete, epoxy lined
107	7-E	5,000 barrels	1952	AVGAS, JP-4	Inactive	Steel, filled with water
119	6-J	59.54 barrels	1944	Weed oil	?	
148	6-J	1,000 barrels	1943	AVGAS, JP-4, JP-5	Active	Concrete, epoxy lined
149	6-J	1,000 barrels	1943	AVGAS, JP-4, JP-5	Active	Concrete, epoxy lined
154	7-E	5,000 barrels	1952	AVGAS, JP-4	Inactive	Steel, filled with water
155	7-E	5,000 barrels	1952	AVGAS, JP-4	Inactive	Steel, filled with water
159	6-J	59.54 barrels	1944	Weed oil	?	
160	6-J	59.54 barrels	1944	Weed oil	?	
162	6-J	1,050 gallons	1960	MOGAS, Unleaded	Active	
-	6-J	500 gallons	?	MOGAS	Active	

CHAPTER 7. WASTE PROCESSING

7.1 INDUSTRIAL PROCESSES, NAS MOFFETT FIELD

7.1.1 Industrial Wastewater Holding Ponds. Two wastewater holding ponds have been located near the northeast corner of Hangar 3 since 1968. They were designed as equalization basins for a small industrial waste treatment facility, which is located next to the ponds. The ponds, referred to by station employees as "flux ponds," were relocated to the present site in 1978.

7.1.1.1 Former Industrial Wastewater Holding Ponds. The wastewater holding ponds were originally built in 1968 as part of an industrial waste treatment system for NAS Moffett Field (Kennedy-Jenks Engineers, 1982). The sources of wastewater were listed as:

Spray paint booth in Hangar 3.

Grease from sink traps.

Aircraft washrack drains.

Ground support equipment washrack drains.

Rainwater.

The location of old ponds in relation to the existing ponds is shown in Figure 7-1.

The treatment system was designed as an oil-water separator, using the Dissolved Air Flotation (DAF) process. The capacity of the system was rated at about 500 gallons per day. The effluent was treated with alum and pumped to the City of Sunnyvale Sewage Treatment Plant. Oily sludge from the treatment system was discharged into a holding tank, and was periodically pumped from this tank onto nearby lawns for disposal (Guyer Santin, Inc., 1982).

7.1.1.2 Existing Industrial Wastewater-Holding Ponds. The wastewater holding ponds were relocated in 1978 in conjunction with an addition to the aircraft parking apron north of Hangar 3. The ponds are about 60 feet in diameter, about 10 to 12 feet deep, and have a total capacity of about 400,000 gallons. Depth to ground water below the ponds is about four feet (Kennedy-Jenks Engineers, 1982).

In 1982, the industrial waste influent to the treatment system was sampled and found to be within the allowable limits for discharge to the City of Sunnyvale Sewage Treatment Plant. As a result, treatment of the waste water prior to discharge to the City of Sunnyvale was stopped in 1982, with the stipulation that the Public Works Department would continuously monitor the effluent quality.

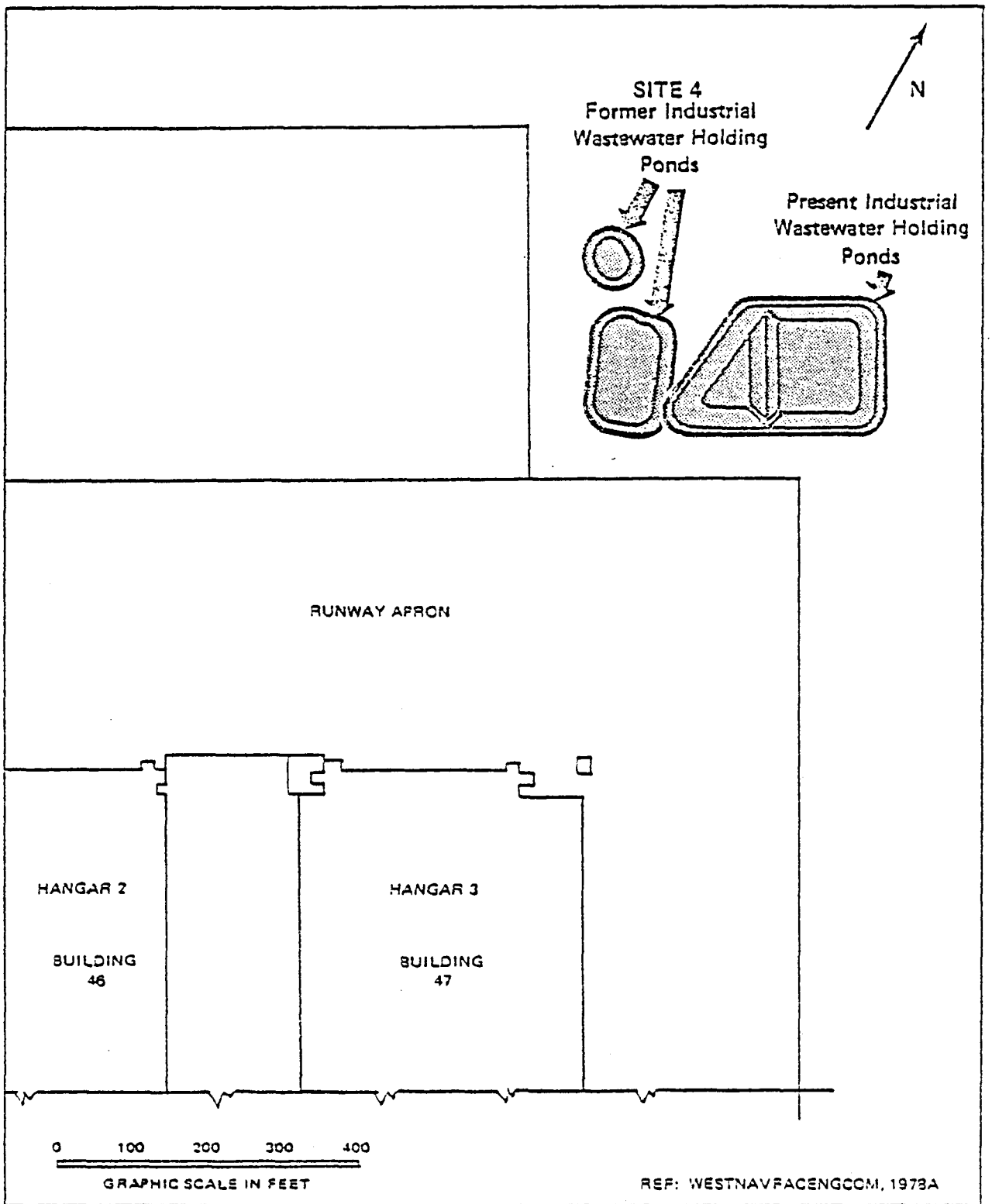

FIGURE 7-1
Former and Present Industrial Wastewater Holding Ponds, NAS Moffett Field

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NAVAL AIR STATION
MOFFETT FIELD, CA

7.1.2 Waste Fuel and Solvent Recycling. No recycling of fuels, oils, or solvents has occurred on site at NAS Moffett Field. All of these waste materials, except small amounts of fuel used for fire fighting training, have been collected by the Fuels Division or DPDO to be trucked off base by a contractor.

7.1.3 Sewage Treatment Plant. A sewage treatment plant was built at Moffett Field in the mid 1940s. The plant was located at 18-GG on the general development map (Plate 1), and consisted of structures 56 and 97. The plant consisted of two Imhoff tanks, sludge drying beds, and associated hardware and plumbing. The effluent was discharged to a ditch at the NAS boundary north of the plant. The wastewater eventually made its way to San Francisco Bay by way of Guadalupe Slough.

In 1972, some specific discharges to the sewer system were (Strother, 1972):

Waste	Quantity	Building
Photo Lab chemicals	1900 gallons/day	19
Laundry Wastewater	7350 gallons/day	88

The treatment plant served the entire station at Moffett Field until 1965, when the Orion Park Housing Area was connected to the City of Mountain View Sewage Treatment Plant.

In 1968, the entire sanitary sewer system at Moffett Field was connected to the City of Sunnyvale Sewage Treatment Plant, using a 10-inch pipe, and having a design peak flow capability of 1.95 million gallons per day. At that time Moffett Field's sewage treatment plant was deactivated.

7.1.4 Explosive Ordnance Disposal (EOD). Until 1971, a disposal pit was operated at NAS Moffett Field by a detachment of the EOD at NAS Alameda. The pit was located where the golf course is now, within an area bounded by Marriage Road on the east, Macon Road on the south and west, and the patrol road on the north. Station personnel reported that only Class "C" ordnance devices were disposed of there. Typical Class "C" devices are flares and cartridges for CADs. Specific information pertaining to quantities and dates of disposal of ordnance items at NAS Moffett Field was not available from the Weapons Department.

7.2 INDUSTRIAL PROCESSES, NALF CROWS LANDING.

7.2.1 Sewage Treatment Plant. The sewage treatment plant consists of an Imhoff tank and three evaporation ponds built in 1952. The Imhoff tank was designed for a much larger population than is presently located at NALF Crows Landing. Two of the evaporation ponds have never been used, and the first pond has only been used intermittently. Sewage is treated in the Imhoff tank where most evaporation takes place. Flow to the Imhoff tank is about 1,600 gallons per day (WESTNAVFACENGCOM, 1978). Reportedly, contents of the Imhoff tank are pumped into the ponds every year and allowed to evaporate.

The sewage collection system is a double eight-inch terra cotta line that parallels Bell Road.

The previous system was used from 1942 to 1946 and consisted of two redwood septic tanks. Effluent from the tanks went to four oxidation ponds. This system became overloaded when NALF Crows Landing housed about 1,000 people. The septic tanks fell apart in 1960 or 1961.

7.2.2 Incinerators. Reportedly in the 1940s, a brick incinerator was used for burning paper wastes. The approximate location of the incinerator was east of the north end of the north-south runway. The ash was disposed of at an off-station municipal landfill. The incinerator was not used very extensively, presumably because of interference with aircraft operations. The incinerator has been dismantled.

A second incinerator was located northwest of Building 138. This incinerator was used intermittently until 1967 for disposal of paper waste. Ash was disposed of at an off-station municipal landfill.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 GENERAL. This chapter contains information on the past waste disposal sites found at NAS Moffett Field and NALF Crows Landing. From the on-site survey, interviews, and record reviews, a total of 13 sites were identified as areas where disposal or spillage of hazardous materials could have occurred in the past. Table 8-1 is a summary of waste disposal sites identified by the IAS team. Figures 8-1 and 8-2 show the locations of the 13 sites.

Some of the waste disposal sites identified date from the 1940s. In general, land disposal of hazardous materials that took place 30 or 40 years ago has only a small potential threat to human health or to the environment because natural processes tend to stabilize and break down hazardous substances. The types of hazardous materials used in the 1940s were generally more innocuous than those used in the 1960s and 1970s, and most liquid waste was disposed of in sewers prior to the early 1970s.

8.2 SITE 1, RUNWAY LANDFILL, NAS MOFFETT FIELD. The runway landfill was originally built by Public Works for disposal of refuse and excess equipment. Various shops used this landfill for disposal of hazardous wastes. During the on-site survey, the part of the site directly west of the pistol range, an area approximately 100 yards by 50 yards, was being used for storage only. Reportedly, NAS Moffett Field has not used the Runway Landfill for any purpose other than storage within the last five years. Figure 8-1 and 8-3 show the location of Site 1.

The Runway Landfill is located at the northeastern edge of the main runway at NAS Moffett Field, next to the pistol range. Aerial photos show that it was at its current location in the early 1960s. Interviews indicate that the runway landfill was not in use during the 1950s. The landfill was once several times larger than its current size, and the pistol range was built on top of a previously used part of the landfill.

In addition to use as a refuse disposal site, the Runway Landfill was also the disposal site for the remains of two plane crashes at NAS Moffett Field. Reportedly, all fuel was removed from these wrecks before they were placed in the landfill.

In the past, the squadrons disposed of toluene, methyl ethyl ketone (MEK), and paints and solvents, including trichloroethylene (TCE) in the landfill. Approximately 1,500,000 gallons of waste could have been generated by the squadrons from the early 1960s to 1978. Assuming five to ten percent of the waste produced by the squadrons went to the landfill, about 75,000 to 150,000 gallons of waste would have been disposed of there. Reportedly, chemicals and oil were disposed of in unlined pits at the landfill in the early 1970s. The fuel farm sent to the landfill about one pickup truck load per year of fuel filters possibly contaminated with fuel or lead compounds. The Public Works paint shop disposed of some paint and laquer there. The Public Works electrical shop disposed of filters and sawdust contaminated with transformer oils possibly containing PCB at the landfill. An unconfirmed report indicates that 50 to 60 barrels of oil may have been buried at the runway landfill by the squadrons or by the transportation division.

TABLE 8

Past Disposal Sites at NAS Moffett Field and NALF Crows Landing

Site Number	Site Description	Site Location	Period of Operation	Waste Types	Total Quantities	Sources
1	Runway Landfill	North end of runways II-JJ, 27-28	1960s to 1978	Toluene, methyl ethyl ketone, trichloroethylene paint, solvents, lacquer, oil, transformer oil possibly containing PCB.	75,000 to 150,000 gallons	Squadrons, Public Works, possibly transportation
2	Golf course Landfill	BB-DD, 20-22	1940s to 1960s	Toluene, methyl ethyl ketone, trichloroethylene, paint	75,000 to 150,000 gallons	Squadrons, Public Works
3	Marriage Road Ditch	BB-20, CC-20 DD-HH-19, HH-18	1940s to 1978	Oils, paint strippers, paint, detergents, hydraulic fluids, fuel, solvents, including trichloroethylene	150,000 to 720,000 gallons	Most of NAS Moffett Field squadrons in hangars 1, 2, 3; washracks and GSE
4	Former Industrial Wastewater Holding Ponds	AA-19	1968 to 1978	Toluene, methyl ethyl ketone drycleaning solvent, paint, freon 113, fuel, trichloroethylene, trichloroethane, carbon remover, paint stripper, oil, ethylene glycol Wastewater	35,000 gallons 15,000,000 gallons	Squadrons in hangars 2 an 3, washracks GSE
5	Fuel Farm French Drains	Y-Z, 16-17	1950s to 1960s	Fuel	28,000 gallons	Fuel tanks
6	Runway Apron	Y-18, Z-18 & 19, AA-19	1940s to 1970s	Solvents, oils, hydraulic fluids, paint wastes	120,000 to 600,000 gallons	Squadrons in hangars 2 and 3 and AIMD

(Continued)

TABLE 8-1 (Continued)

Past Disposal Sites at NAS Moffett Field and NALF Crows Landing

Site Number	Site Description	Site Location	Period of Operation	Waste Types	Total Quantities	Sources
7	Hangars 2 and 3	V-Z, 18-22	1940s to 1970s	Solvents, oil, hydraulic fluids, paint waste, including trichlorethylene	120,000 to 600,000 gallons	Squadrons in hangars 2 and 3
8	Waste Oil Transfer Area	AA-31	1940s to early 1980s	Oil, solvents, transformer oil possibly containing PCB	Unknown	Public Works electrical and transportation shops
9	Old Fuel Farm	U, 29-31	1940s to 1964	AvGas	60,000 gallons	Fuel storage and transfer
NALF Crows Landing						
10	Rubble Disposal Area	L-6	1952-1953	Scrap lumber, dry wall, metal, ash, wire, pipe	Unknown	Building construction and demolition
11	Station Landfill	G-H, 4-S	1960s to 1982	Paper, refuse, scrap metal, empty paint cans, empty pesticide containers, burned ordnance	Unknown refuse 300 pounds of scrap metal	Station and cleaning of bombing range before return to public domain
12	Former oily waste bowser area	J-6	1940s to 1982	Oils, solvents, transmission fluid	Unknown	Transportation shop
13	TACAN Building transformer oil spill	K-4	1962	Transformer oil	Less than 50 gallons	Transformer fire

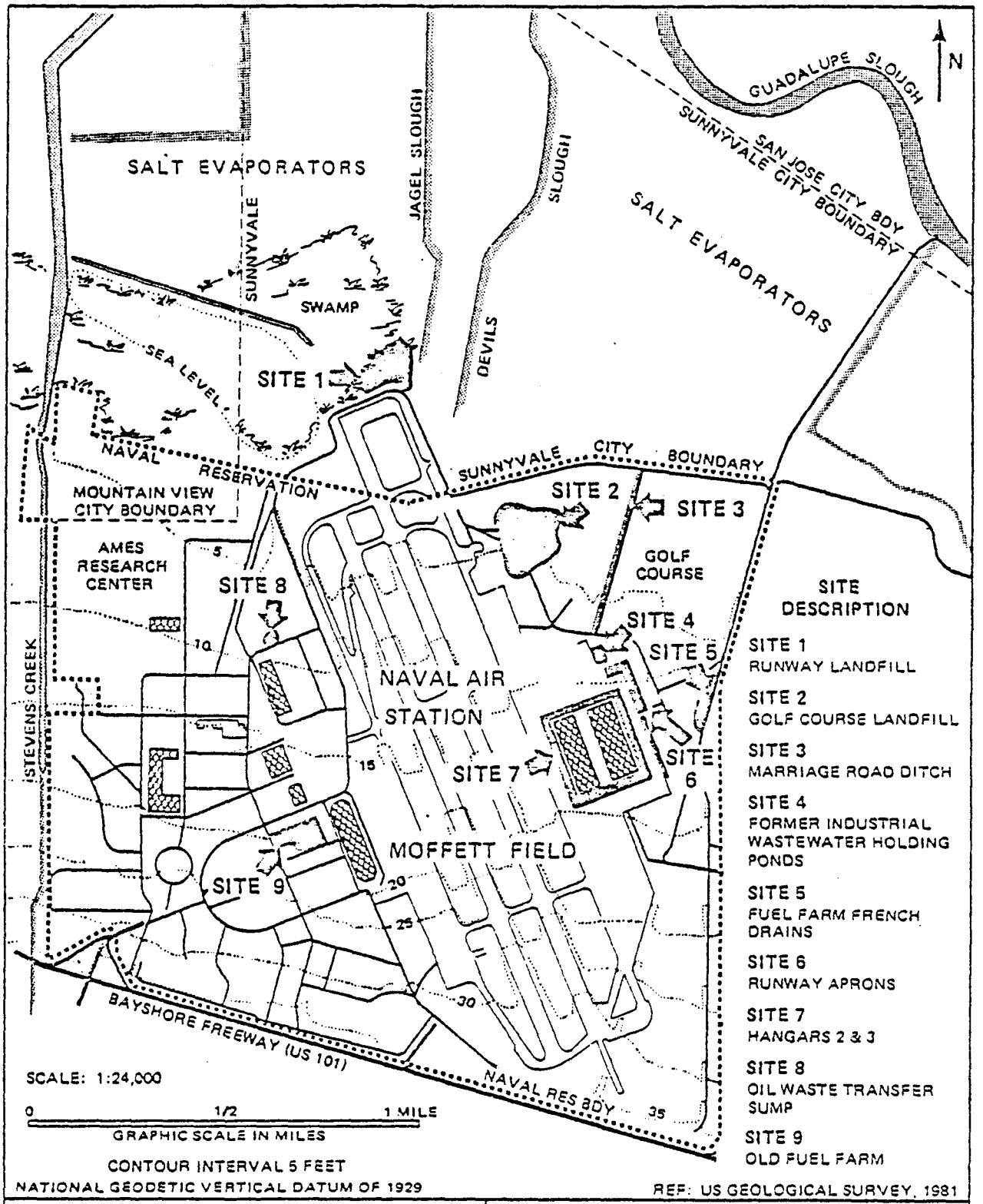

FIGURE 8-1
WASTE DISPOSAL SITES
NAS Moffett Field

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MOFFETT FIELD, CA

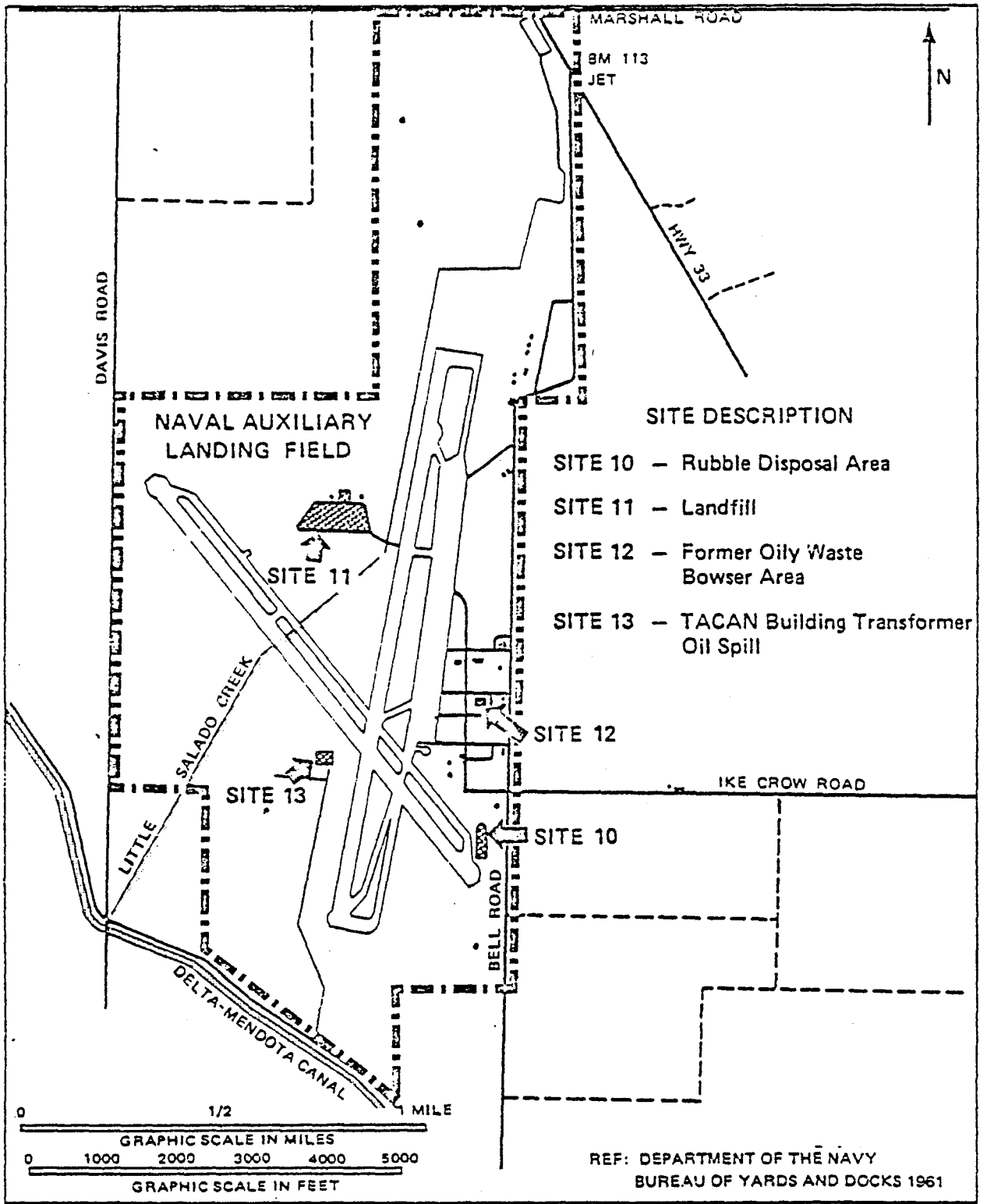

FIGURE 8-2
WASTE DISPOSAL SITES
NALF Crows Landing

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

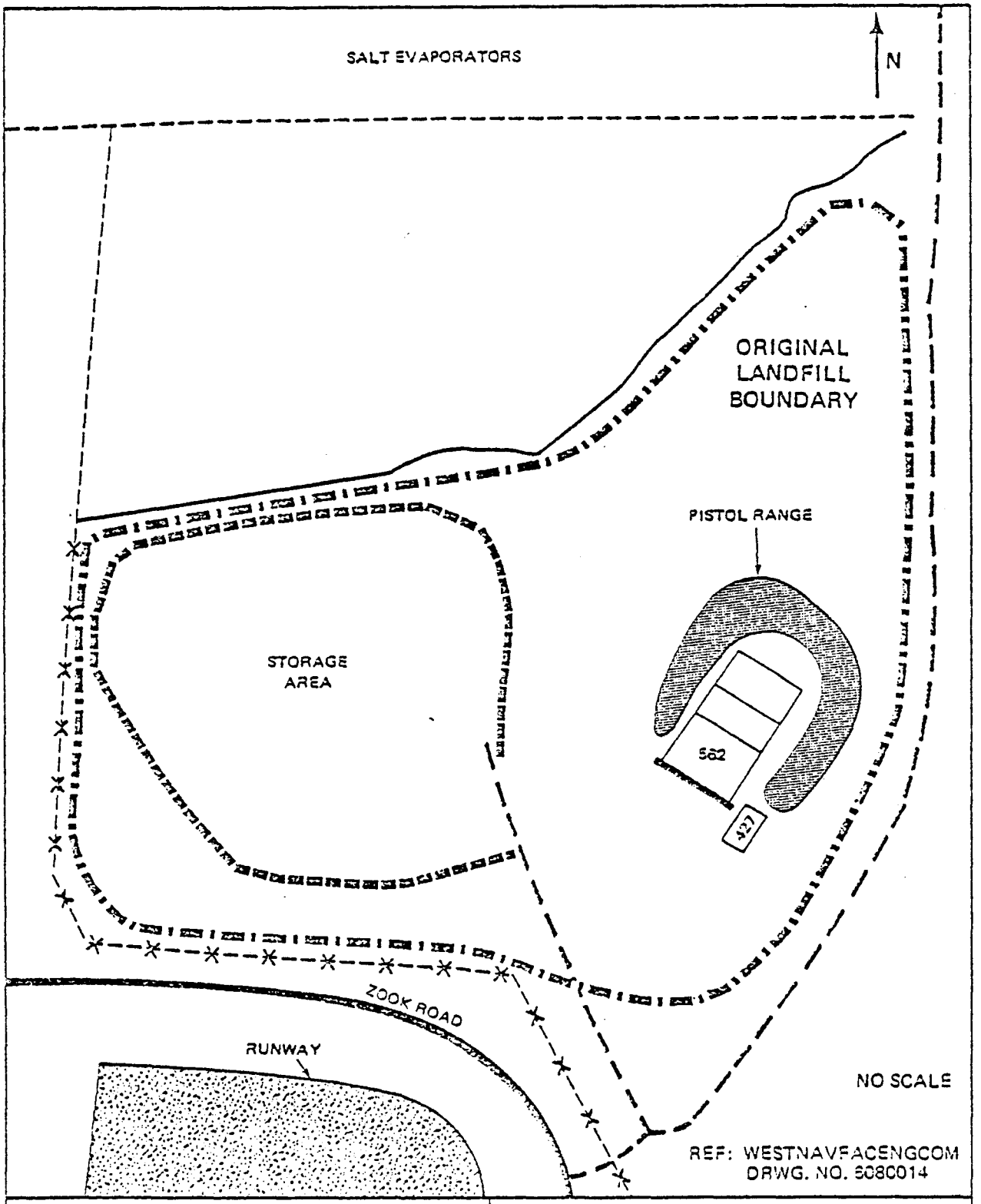

FIGURE 8-3
SITE 1
Runway Landfill, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

8.3 SITE 2, GOLF COURSE LANDFILL, NAS MOFFETT FIELD. The golf course landfill was used for general disposal from at least the mid-1940s until the construction of the golf course in the early 1960s. This landfill was used for refuse, debris, fill, and probably for some hazardous waste. Some hazardous waste may have been included in routine refuse collection. Reportedly, construction debris was incinerated there. All organizations on station, as well as contractors, had access to this landfill. EOD operated a burn pit for disposal of out-dated flares and cartridge-activated divices (CADs) until 1971.

Little information is available on the past location or size of the golf course landfill. It was closed long before most of the present workers came to NAS Moffett Field. Several retired workers confirm that the landfill was located on the western edge of the current golf course. Aerial photos do not clearly show any landfill-type facilities in this area during the past. Thus, parts of the entire area were probably used at different periods. Figures 8-1 and 8-4 show the approximate location of the golf course landfill, Site 2.

Little specific information is available on the exact uses of the golf course landfill. However, several sources indicated that this landfill was used for disposal of hazardous wastes throughout the early history of NAS Moffett Field. About 1,500,000 gallons of waste was generated by the squadrons from the 1940s to the early 1960s. These wastes included toluene, methyl ethyl ketone (MEK) paints, and solvents including trichloroethylene (TCE). Assuming that five to ten percent of the waste produced by the squadrons from the early 1940s to 1960 went to the landfill, as much as 75,000 to 150,000 gallons of industrial waste was disposed of there. Also, Public Works shops disposed of paints, laquer, and materials contaminated with transformer oils at this landfill. Reportedly however, this area never had any strong chemical smells or standing pools of disposed liquids.

8.4 SITE 3, MARRIAGE ROAD DITCH, NAS MOFFETT FIELD. Marriage Road Ditch begins at the intersection of Marriage Road and Macon Road. The site is located in the northeastern quadrant of NAS Moffett Field, next to the golf course. The ditch is on the east side of Marriage Road and is graded so that storm water flows northward to the dike at the north of the station. Figures 8-1 and 8-4 show the location of Site 3.

Storm water runoff around hangars 2 and 3 flows into Marriage Road Ditch. The storm sewers from hangars 1, 2, and 3 also flow into Marriage Road Ditch. From the early 1940s to about 1978, much of the industrial liquid waste generated in hangars 1, 2, and 3 was disposed of in the storm sewers. (Sections 5.2.2 and 5.2.3 list types and volumes of waste generated from these hangars). Wastes were poured down the storm drains which flowed into Marriage Road Ditch. The wastes included solvents, fuels, paints, paint thinners, and surfactants. Assuming that from 5 to 25 percent of the waste generated at hangars 1, 2, and 3 was disposed of in the storm sewer system, an estimate of 150,000 to 720,000 gallons were disposed of over 30 years.

During the winter rainy season, rain water should have helped flush much of the waste further down the ditch. During dry weather, much of the waste could have infiltrated into the soil, under the ditch, rather than flow off-station. The flow from Marriage Road Ditch goes to the northern dike at the station boundary, before flowing to the storm water lift station which pumps the water into Guadalupe Slough.

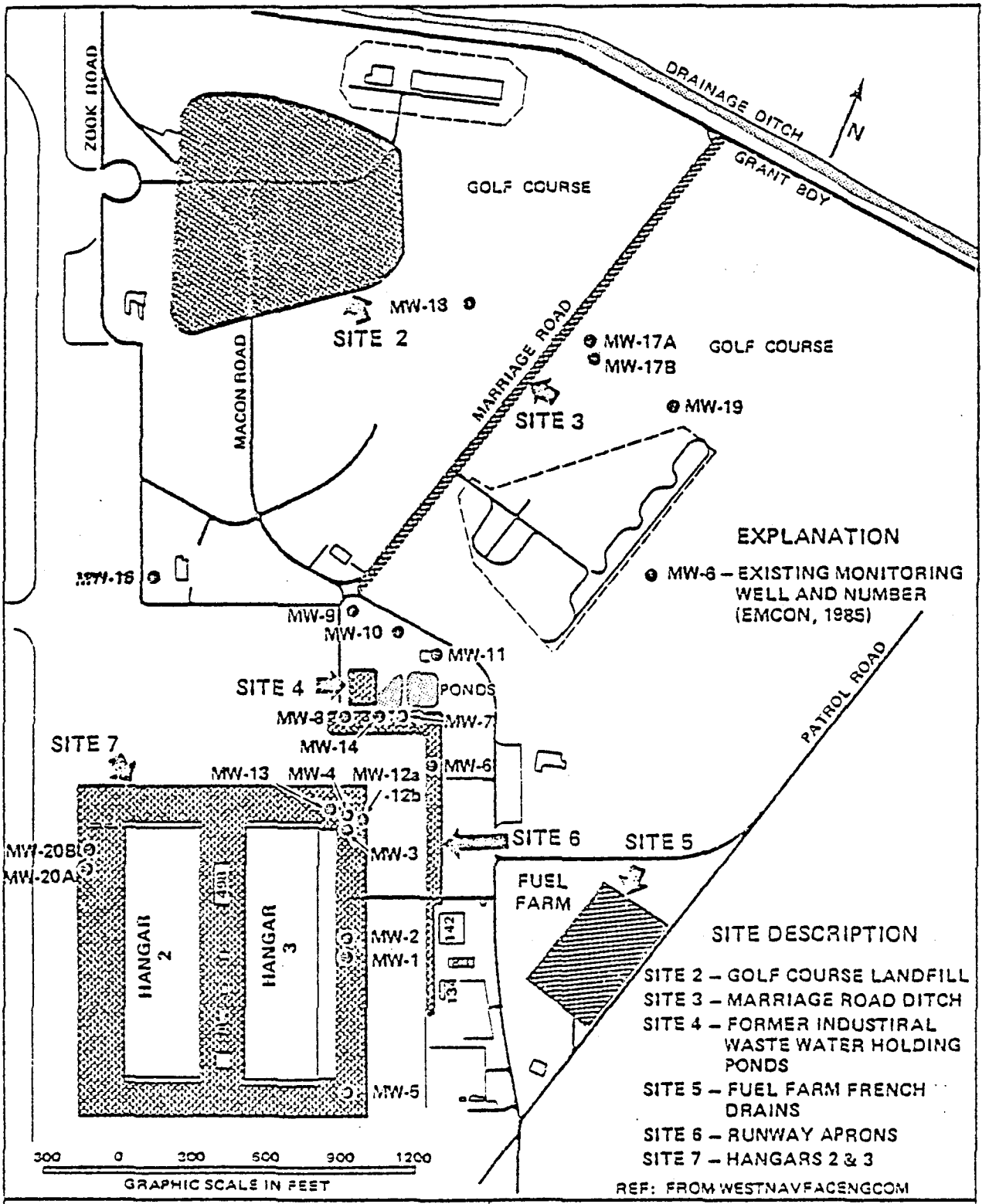

FIGURE 8-4
Locations of Sites 2, 3, 4, 5, 6, 7 and Existing Monitoring Wells, NAS Moffett Field

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NAVAL AIR STATION
MOFFETT FIELD, CA

8.5 SITE 4, FORMER INDUSTRIAL WASTEWATER HOLDING PONDS, NAS MOFFETT FIELD. Site 4 consists of a small industrial wastewater treatment facility and the associated wastewater holding ponds. These ponds were designed as flow equalization basins for industrial waste water from the aircraft and equipment washracks located near Hangar 3 and the ground support equipment division of the AIMD. The ponds were located near the northeast corner of Hangar 3, near Building 69, at coordinates 19-AA on the General Development Map. Figures 8-1 and 8-5 show the location of the former industrial wastewater holding ponds. The treatment system and ponds were first constructed in 1968. The ponds were relocated in 1978 as part of an expansion of the aircraft aprons and taxiways near Hangar 3. The ponds were unlined.

Disposal to Site 4 was from several sources. Wastewater from aircraft washracks and ground support equipment washracks was conveyed to the holding ponds through pipes. Various liquid wastes from several sources were disposed of directly to the ponds. Also, sludge from the treatment process was spread onto the ground near the treatment system. Quantities of wastes disposed of into the ponds were estimated from information on waste generation rates obtained by interviews of station personnel during the on-site survey. The estimates were made by assuming that wastes entering the holding ponds by all disposal methods amounted to approximately 10 percent of the total waste generated. These estimates are presented in Table 8-2.

The amount of wastes actually present at the site is less than the figures presented in Table 8-2, because the degradation within the ponds removed some wastes from the water before the wastes could seep through the bottom of the treatment ponds. Some of the waste evaporated from the surface of the ponds. Also, some wastes were removed by the treatment system and were discharged to the ground nearby as sludge. Some wastes remained in the water and subsequently discharged to the City of Sunnyvale Sewage Treatment Plant. The amount of waste present at the site consists of the waste that percolated into the soil under the ponds and the sludge discharged from the treatment process.

A ground-water sample from well MW-8 (Figure 8-5) contained a soap-like substance that caused the water to froth. The chemical was not identified in the subsequent water quality analysis (EMCON, 1983, page 2). Results of the water quality analyses are shown in Appendix E.

8.6 SITE 5, FUEL FARM FRENCH DRAINS, NAS MOFFETT FIELD. From the early 1950s to the mid 1960s, the fuel farm used an unknown number of underground french drain fields for disposing of small quantities of waste fuel or contaminated fuel at the main storage and filtering areas. Fuel delivered by barge was normally contaminated with water.

Reportedly, the drains were located next to tank valves so that fuel contaminated with water could be easily disposed of. The standard operation was to drain tanks for a set amount of time to draw off water from the fuel. About 500 to 600 gallons of liquid was drawn off at a time. Thus varying quantities of fuel may have been included in the discharged liquid. Figures 8-1 and 8-4 show the location of Site 5.

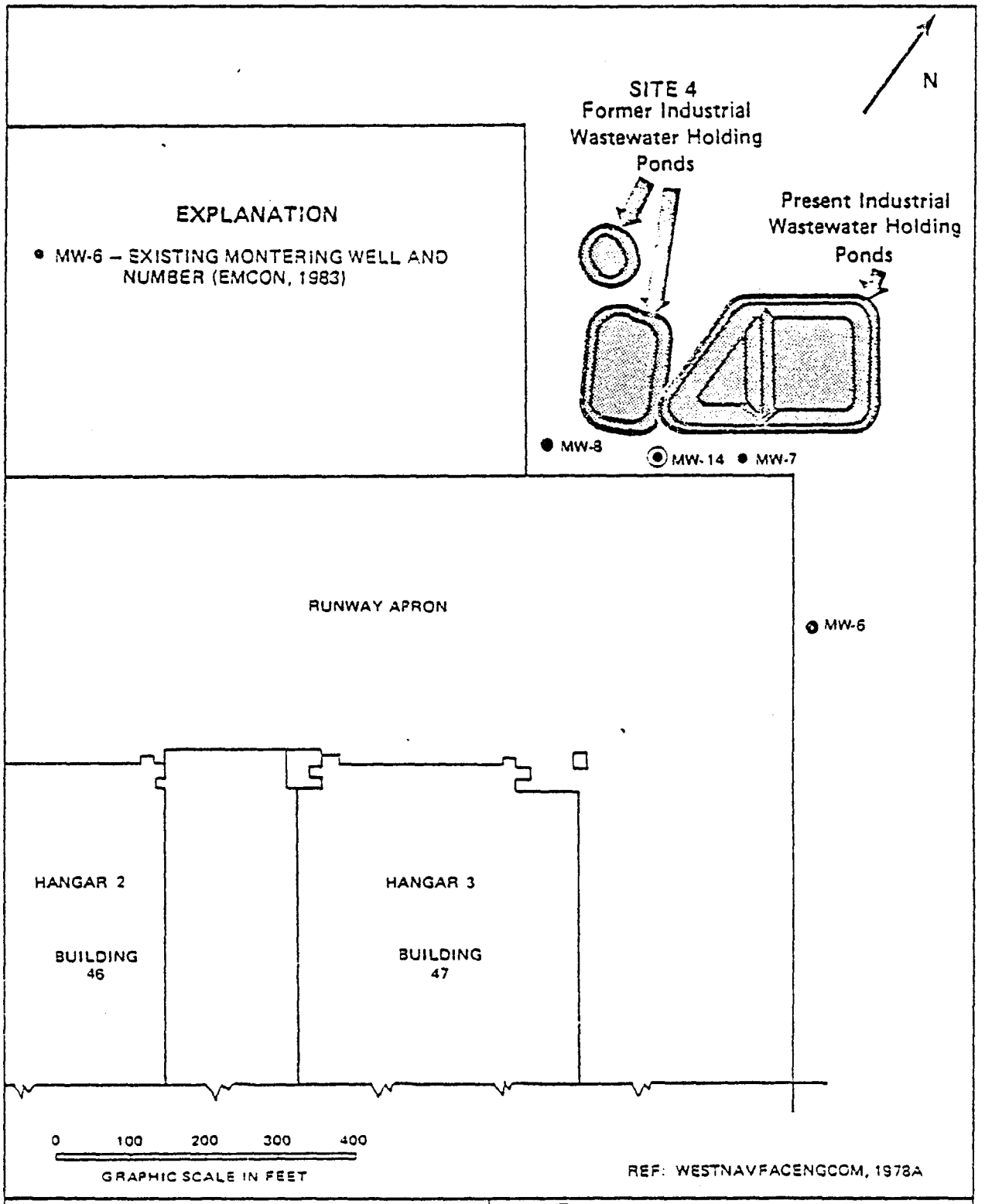

FIGURE 8-5
SITE 4
Former Industrial Wastewater Holding Ponds, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

TABLE 8-2

Waste Disposed of at the Former Industrial Wastewater Holding Ponds
NAS Moffett Field, California

Wastes	Quantity	Time Period	Source
Cutting oil	100 gallons	1968-1977	Pipe shop, Hangar 3
Wastewater	15,000,000 gallons	1968-1977	Aircraft washracks
Grease from sink traps	Unknown	1968-1977	Public Works labor shop
Methylethyl ketone	5,100 gallons	1968-1977	Hangars 2 and 3
Toluene	700 gallons	1968-1977	Buildings 142, 541, hangars 2 and 3
Drycleaning solvent (PD680)	14,000 gallons*	1968-1977	Buildings 142, 541, hangars 2 and 3
Paint waste	2,600 gallons	1968-1977	Buildings 142, 541, hangars 3, paint booth
Freon 113	5,200 gallons	1968-1977	Hangars 2 and 3
Jet fuel	15,000 gallons	1968-1977	Hangars 2 and 3
Trichloro-ethylene (TCE)	Unknown	1968-1977	Hangars 2 and 3
Trichloro-ethane	600 gallons	1968-1977	Hangar 3
Carbon remover	1,100 gallons	1968-1977	Hangar 3
Paint stripper (Turco 5878)	600 gallons	1968-1977	Buildings 142, 541, Hangar 3
Waste paint	100 gallons	1968-1977	Buildings 142, 541, Hangar 3
Lacquer thinner	100 gallons	1968-1977	Buildings 142, 541, Hangar 3

(continued)

*Based on estimate (Kennedy-Jenks Engineers, Inc., 1982)

TABLE 8-2 (Continued)

Waste Disposed of at the Former Industrial Wastewater Holding Ponds
NAS Moffett Field, California

Wastes	Quantity	Time Period	Source
Hydraulic oil	1,100 gallons	1968-1977	Buildings 142, 541, Hangar 3
Dye	Unknown	1968-1977	
Plating waste	Unknown (small quantity)	1968-1977	Hangar 3
Aircraft cleaning compound	600 gallons	1968-1977	Buildings 142, 541
Waste oils	2,200 gallons	1968-1977	Buildings 142, 541
Ethylene glycol	200 gallons	1968-1977	Buildings 142, 541

The fuel facilities where the underground french drains were used are located on the southeastern edge of NAS Moffett Field, to the east of hangars 2 and 3. Two areas, the main storage area and the filtering facility to the west, have underground french drain inlets visible above ground, though they are not used now. More drain inlets may have been used in the past. No information is available on the number, location, or size of the underground french drain fields. The original design drawings for the fuel facilities do not show an underground french drain system. The two facilities having these drains cover a combined area of about 200 by 100 yards.

The underground french drain systems at the main storage and filtering areas received fuel spills from the 1950s through the mid 1960s. Also, the ground surface at the day use facility north of hangars 2 and 3 received some waste fuel. The fuels most widely used at NAS Moffett Field during this time were AvGas and JP-4. Laboratory analysis of a grab sample from a large covered well at the main storage area shows a 2.0 milligrams per liter or less concentration of lead in the organic fraction. Thus, if the fuel in this well represents a larger mass on the water table, the organic fraction must be mostly jet fuels, because aviation gas contains lead compounds. The fuel observed on the ground water surface in the well was less then 0.5 inches thick. If this layer of fuel covers an area of 100,000 square yards, then there could be about 28,000 gallons of fuel in the ground water at this site.

8.7 SITE 6, RUNWAY APRON, NAS MOFFETT FIELD. Site 6 is located north and east of Hangar 3, beside the taxiways or aircraft parking apron. Some of the site was paved during enlargement of the apron on the north side of the hangar. Figure 8-1 and 8-4 show the location of Site 6.

Disposal of solvents to the ground occurred in the area. The area was also used for storage of leaking drums. Personnel from the squadrons and from AIMD reportedly used the area for disposal of chlorinated and non-chlorinated solvents, oils, hydraulic fluids, and paint waste. This area was used from the 1940s to the mid-1970s. Based on estimated generation rates and assuming from 5 to 25 percent of the waste generated was disposed of at this site, 120,000 to 600,000 gallons was disposed of at this area. Surface water flows from this site into the storm water collection system that discharges into Marriage Road Ditch (Site 3). Ground water flow is generally to the north.

8.8 SITE 7, HANGARS 2 And 3, NAS MOFFETT FIELD. Site 7 encompasses hangars 2 and 3 and the surrounding area which are located on the eastern side of the runways. The hangars were built in the mid-1940s during World War II. Deck drains and surface drainage flow from the hangars Marriage Road Ditch (Site 3). The hangars are surrounded by paved aircraft taxiways and parking aprons except some unpaved areas at each corner of hangar 2 and 3. Figures 8-1 and 8-4 show the location of Site 7.

Hangars 2 and 3 have housed aircraft squadrons and the AIMD for about a 30 years. Waste was poured down the deck drains in hangars 2 and 3. Waste was also poured on unpaved areas around hangars 2 and 3. The unpaved areas were also used for storage of barrels of waste awaiting disposal. These barrels of waste were commonly stacked at the corners of the hangars. Reportedly, much of the waste leaked onto the unpaved ground at these storage locations prior to being hauled away.

Waste disposed of at hangars 2 and 3 included solvents, paints, oils, hydraulic fluids, and fuels. The solvent trichloroethylene (TCE) was one of the many solvents disposed of at Site 7. The volume of waste generated at hangars 2 and 3 has been estimated at about 2,400,000 gallons over a thirty-year period. Assuming that 5 to 25 percent of the waste generated was disposed of at Site 7, then 120,000 to 600,000 gallons of waste was disposed of during the 30-year period.

TCE and other compounds have been detected in ground-water samples and soil samples taken from the northeast corner and the east side of Hangar 3. The contamination was discovered during sampling of wells MW-1, MW-2, MW-3 and MW-4 (Figure 8-4).

These wells were installed to monitor potential leaks from the two 2,000 gallon underground waste holding tanks east of hangar 3. The highest TCE concentration, 7.9 parts per million, was found in water from well MW-4. Additional monitoring wells (MW5-14) were installed and subsequent sampling showed a maximum TCE concentration of 0.55 parts per million in water from the new wells. The analytical results of all soil and ground-water samples taken for the study are summarized in Appendix E. The 2,000 gallon waste holding tanks were probably not the source of the contamination because the tanks were installed in 1979 and the use of TCE was discontinued at NAS Moffett Field in the early 1970s (EMCON, 1983).

8.9 SITE 8, WASTE OIL TRANSFER AREA, NAS MOFFETT FIELD. The waste oil transfer area at the NAS Alameda Off Site Branch of the Defense Property Disposal Office (DPDO) was the receiving point for waste oil from all the industrial operations at NAS Moffett Field until the early 1980s. The waste oil transfer sump and storage tank were located immediately to the east of Building 127, to the right of the gate to the salvage yard. The transfer sump was located outside the fence, next to the road. The storage tank was located immediately inside the yard fence. This oil collection facility was used from the 1940s until it was removed in 1981. Figures 8-1 and 8-6 show the location of Site 8.

Trucks pulled up outside the gate to the salvage yard and drained waste oil directly into the sump. The oil was pumped under the fence and into a 5,000-gallon above ground storage tank. The DPDO intended this oil tank to hold only waste lubricating oils. However, the shops reportedly placed other materials such as solvents and transformer oils in the tank. The Public Works electrical shop disposed of about 100 gallons per year of transformer oils contaminated with water into this tank. This practice took place from the 1940s until the early 1980s. The Transportation Division may have placed some oils, solvents, and diesel fuel from their maintenance operations into this tank. The Transportation Division generates about 55 gallons of these waste materials every three months. The waste oil tank was pumped out about once per month, although the tank may not have been full at the time.

During the on-site survey, a few square feet of ground area between the old sump and tank location was currently discolored with an oily substance. However, a larger area of sand around these facilities may have been put down recently, covering the old surface. Laboratory testing of a soil grab sample near the past location of the sump shows a PCB concentration of 7.8 parts per million. The sample was taken from the discolored patch of sand near the sump.

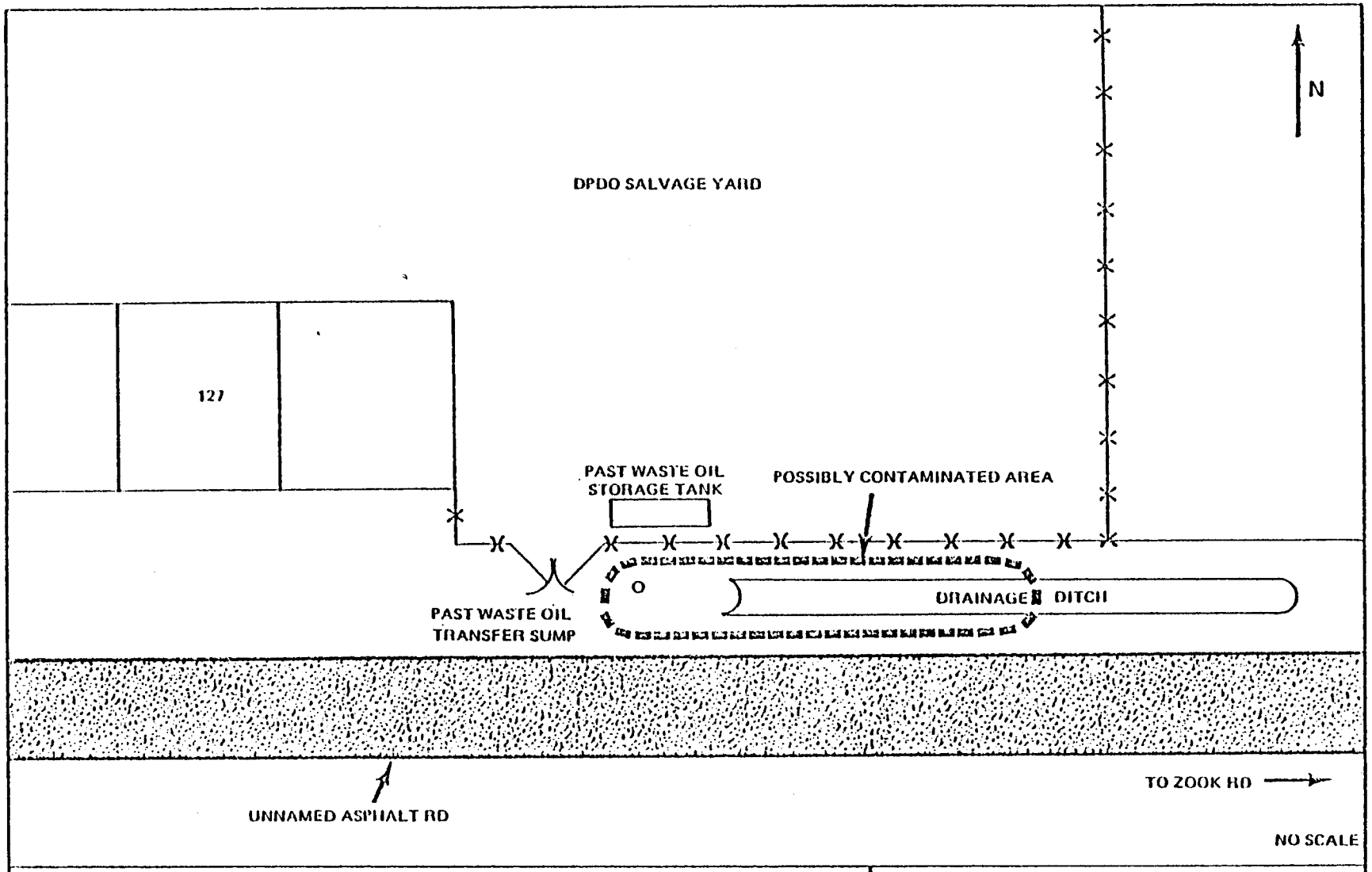

FIGURE 8-6
SITE 8-
Waste Oil Transfer Area, NAS Moffett Field

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA

8.10 SITE 9, OLD FUEL FARM, NAS MOFFETT FIELD. The old fuel farm is located on the west side of Hangar 1 where the parking lot for Building 12 is located. The old NEX gas station is Building 31. The location of Site 9 is shown in Figures 8-1 and 8-7. The fueling area was used from the late 1940's to 1964. All tanks in the area were steel. AvGas was stored in six 10,000 gallon underground tanks in an unpaved area between buildings 12 and 29. The tanks are located in two rows of three tanks each. MoGas was stored in two 5,000 gallon tanks near Building 31. The tanks were not equipped with gauges, so fuel farm personnel would fill a tank until fuel flowed out of the vent onto the ground. AvGas was transfered frequently and three or four tanks were filled each day. Each morning, fuel samples were drained from the tanks of four AvGas trucks and two MoGas trucks. The samples were disposed of on the ground. Over the life of the fuel farm, an estimated 60,000 gallons of AvGas and MoGas was disposed of to the ground. AvGas contains about 7.6 grams per gallon of tetraethyllead, thus about 1,000 pounds of this compound have been disposed at Site 9.

In about 1960, an excavation for a conduit line near the fuel farm filled with fuel. Subsequent tests showed that the fuel was pure AvGas. A suction truck removed about 1,000 gallons of the AvGas, which was used in aircraft. After a week of cleanup, no more fuel could be recovered although a strong odor of fuel was still present.

In the mid 1960's the two center AvGas tanks began leaking. No attempt was made to repair the leaks. In 1964, the old fuel farm was abandoned and all tanks were filled with water. The area has subsequently been paved. Reportedly, fuel odor still occassionally occurs in the area.

8.11 SITE 10, RUBBLE DISPOSAL AREA, NALF CROWS LANDING. In 1952 and 1953, a rubble disposal pit was dug near the end of the northwest-southeast runway (Figure 8-2). Lumber, scrap dry wall, scrap metal, ash, wire, and pipe were placed in the pit and burned. The pit was covered with soil. There was no visible evidence of the location of this pit during the on-site survey. No hazardous waste was reported to have been disposed of at Site 10.

8.12 SITE 11, LANDFILL, NALF CROWS LANDING. The landfill was used for waste disposal from the late 1960s to 1982. Figure 8-2 shows the location of Site 11. A pile of waste was located between two large concrete pads. These pads were the foundations for two small-arms magazines (buildings 44 and 45), reportedly, dismantled in 1967.

The landfill was a burn-and-cover operation. Pits were dug in the open field south of the concrete pads. Paper and other refuse were deposited in the pit. The wastes were then burned. When the pit filled, it was covered over with soil and a new pit was dug. Reportedly, three large pits were used for general waste disposal. During the late 1970s, the pit contents were burned approximately twice per month.

All wastes generated at NALF Crows Landing, except waste oil which was burned in the fire fighting training area, were disposed of at this landfill. The waste generated was non-hazardous general refuse including paper, scrap metal, and putrescible waste from the galley. Reportedly, empty pesticide containers

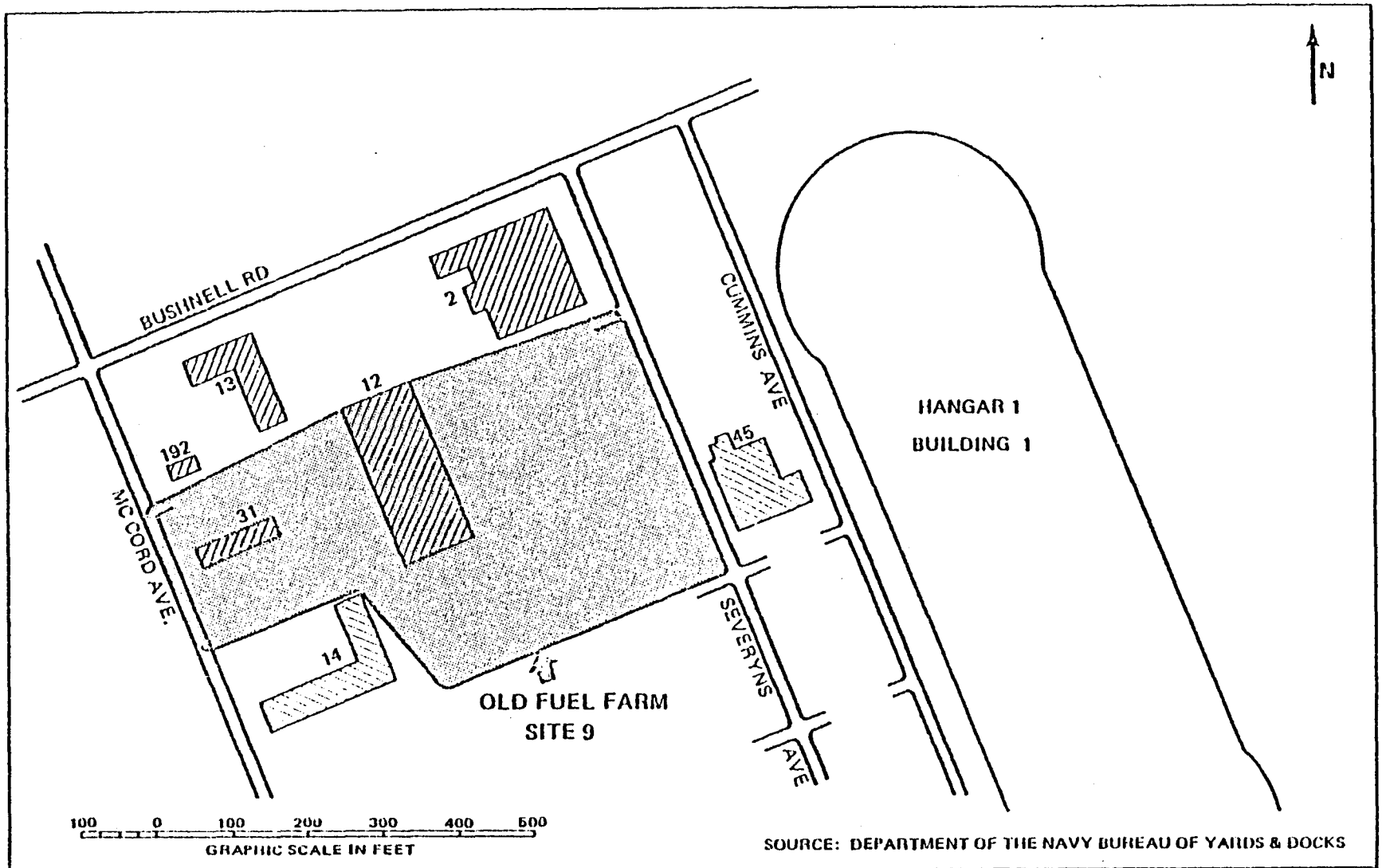

FIGURE 8-7
SITE 9
OLD FUEL FARM, NAS MOFFETT FIELD

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
MOFFETT FIELD, CA.

and empty paint cans (possibly containing residue of their contents) were disposed of in the pits. The empty paint cans could have contained a few gallons of dried paint residue. In the late 1970s, a contract was begun for disposal of refuse off-station to a local municipal landfill. Since then, wastes have been collected from the shops and offices and placed in the large dumpster at the landfill next to Building 46. "The dumpster is picked up on an 'on call' basis, and in the past has been picked up about once every two months. During one period in 1982, the dumpster was not picked up for a period of almost five months" (WESTNAVFACENCCOM, 1983).

Before the two nearby practice bombing ranges were returned to public domain in 1979, approximately 300 pounds of metal debris were collected and taken to this landfill. A pit was dug, reportedly in the middle of the field south of the concrete pads. Anything that potentially contained propellant explosive was placed in the pit and burned. Reportedly, some practice bombs contained small quantities of black powder which were designed to explode on impact to mark the location where the bomb fell. Occasionally, the charge did not explode on impact. After burning, the rest of the metal debris from the target area was placed in the pit and covered over with soil.

In 1983, two or three non-leaking transformers were picked up by NAS Moffett Field personnel. Although it was not known whether they contained PCB, the transformers were handled as if they were PCB transformers.

8.13 SITE 12, FORMER OILY WASTE BOWSER AREA, NALF CROWS LANDING. Until 1982, waste oils and solvents from the transportation shop were collected in a stationary bowser outside the northwest corner of Building 138. Some spillage occurred during transfer of wastes. An oily spot on the gravelly soil was observed during the on-site survey. This oily spot covered approximately 20 square feet of surface area. Types of wastes placed in the bowser included used crankcase oil, automotive transmission fluid, and small quantities of stoddard solvent. Waste oil in the bowser was burned for fire fighting training. Figure 8-2 shows the location of Site 12.

8.14 SITE 13, TACAN BUILDING TRANSFORMER OIL SPILL, NALF CROWS LANDING. The TACAN Building (Building 143) transformers are located on a concrete pad about 900 feet west of the intersection of the runways. In 1962, a new transformer that was installed on the pad caught fire, spilling transformer oil on the ground. It is unknown if the transformer contained PCB. The fire was put out with water and foam. Since the fire, the pad has been enlarged and presently has three transformers. The area around the original pad was excavated and some soil was removed. A composite soil sample collected from the three sides of the transformer pad closest to the original pad had a PCB concentration of less than four parts per million.

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Appendix A

List of Abbreviations

List of Abbreviations

AIMD	Aircraft Intermediate Maintenance Department
AUW	Advanced Undersea Weapons
CAD	Cartridge-activated devices
CANG	California Air National Guard
CNO	Chief of Naval Operations
DAF	Dissolved Air Flotation
DPDO	Defense Property Disposal Office
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
GSE	Ground Support Equipment
HTA	Heavier than air
LTA	Lighter than air
NALF	Naval Auxiliary Landing Field
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NAT	Naval Air Transport Service Squadron
NAVENENVSA	Naval Energy and Environmental Support Activity
NAVFACENGCOM	Naval Facilities Engineering Command
NBC	Nuclear, Biological, Chemical
PWD	Public Works Department
WESTNAVFACENGCOM	Western Division, Naval Facilities Engineering Command

APPENDIX B

List of Government Agencies Contacted for the Initial Assessment Study at Naval Air Station Moffett Field

1. Naval Energy and Environmental Support Activity (NAVENENVSA), Port Hueneme, California

2. Ordnance Environmental Support Office (OESO), Indian Head, Maryland

3. Naval Historical Center, Operational Archives, Washington, D.C.

4. National Archives, Washington, D.C.

   a. Still Pictures Branch

   Dept. of Navy aerial photography

   b. Navy and old Army Branch

   Record Groups:

   Records of Office of Chief of Naval Operations
   Bureau of Aeronautics
   General Records of the Navy
   Records of Office of Naval Research

5. Regional Federal Archives and Records centers at Suitland, Maryland, and San Bruno, California

6. Naval Facilities Engineering Command Historian, CBC Port Hueneme, California

7. Naval Facilities Engineering Command Headquarters, Alexandria, Virginia

8. Western Division, Naval Facilities Engineering Command, San Bruno, California

9. Naval Air Systems Command, Crystal City, Alexandria, Virginia

10. DOD Explosives Safety Board, Alexandria, Virginia

11. United States Geological Survey (USGS) Water Resources Division Library, Sacramento, California

12. Defense Mapping Agency, Office of Distribution Services, Washington, D.C.

13. California Department of Water Resources, Sacramento, California, California Department of Water Resources, San Joaquin District, Fresno, California

14. Federal Property Resource Service of GSA, Arlington, Virginia

Appendix C

Ground Water Quality Analyses
NALF Crows Landing, California

SCIENTIFIC ENVIRONMENTAL

LABORATORIES, INC.

April 04, 1983
Lab.# TF830369

Public Works
Naval Facilities
Crows landing, Ca. 95313

Attn: Mr. Tom Philips

certified analytical report

Sample Received: 3-17-83

Date Collection: 3-17-83

Source: Well Water

Analysis	Results (mg/L) Well #1	Well #2
Arsenic	<0.01	<0.01
Barium	0.02	0.03
Cadmium	0.001	<0.001
Lead	0.02	0.01
Mercury	<0.001	<0.001
Selenium	<0.001	<0.001
Silver	0.02	0.01
Copper	0.2	0.5
Baron	0.02	0.01
Chromium	<0.01	0.01
Sodium	201	160.
Potassium	0.70	0.80
Calcium	144.0	105.6
Magnesium	34.0	33.0
Zinc	0.01	0.02
Iron	0.20	0.15
Nitrate as N	2.1	1.9
Fluoride	0.02	0.01
CHloride	140	92
pH (no unit)	7.40	7.10
Sulfate	416.	320.
Total Hardness as $CaCO_3$	500.	400.
Total Alkalinity as $CaCO_3$	230.	175

State Approved Water Laboratory for Chemical and Biological Examination
924 Industrial Avenue / Palo Alto, California 94303 415 / 856-6011

SCIENTIFIC ENVIRONMENTAL

LABORATORIES, INC.

April 04, 1983
Lab.# TF830369

Public Works
Naval Facilities
Crows Landing, Ca. 95313

Attn: Mr. Tom Philips

certified analytical report

Sample Received: 3-17-83

Date Collection: 3-17-83

Source: Well Water

Analysis	Results (mg/L) Well #1	Well #2
Bicarbonate as $CaCO_3$	230	175.
Carbonate as $CaCO_3$	0	0
Specific Conductance (umho/cm)	1500	1450
Silica as SiO_2	48	62
Odor Threshold unit @20°C	1	1
@40°C	1	1
Color (Pt-Co unit)	1.5	1.8
Turbidity (NTU)	1.8	1.9
Radioactivity		
Gross Alpha (pCi/L)	4±1.0	_____
Gross Beta (pCi/L)	3±1.0	_____

Shui Fong

Shui Fong
Director, Water Laboratory

SF:tf

State Approved Water Laboratory for Chemical and Biological Examination
924 Industrial Avenue / Palo Alto, California 94303 415 / 856-6011

SCIENTIFIC ENVIRONMENTAL

LABORATORIES, INC.

July 6, 1983
Lab.# TF830953

Public Works
Naval Facilities
Crows Landing, Ca. 95313

Attn: Mr. Tom Phillip

certified analytical report

Sample Received: 6-30-83

Date Collection: 6-29-83

Analysis	Results (mg/L) Well #1	Well #2
Manganese	0.03	0.03
Surfactants (MBAS)	<0.01	<0.01
Total Dissolved Solids	1120	770
Sulfate	208	142
Specific Conductance (umho/cm)	1600	1100
Radioactivity		
Gross Alpha (pCi/L)	3±2	
Gross Beta (pCi/L)	4±2	

Shui Fong

Shui Fong
Director, Water Laboratory

SF:tf

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924 Industrial Avenue / Palo Alto, California 94303 415 / 856-6011

Appendix D

Summary of Pesticides Used at Naval Air Station, Moffett Field

Annual Pesticide Usage at NAS Moffett Field

Pesticide	Type	Pounds Active Ingredient FY79	FY80	FY81
Amitrol	Herbicide	319	16	0
Anticoagulant	Rodenticide	<1	<1	<1
Attractant	Pesticide	0	0	<1
Avitrol	Avicide	<1	<1	<1
Baygon	Insecticide	6	22	14
Benomyl	Fungicide	0	144	0
Bromacil	Herbicide	141	0	0
Dalapon	Herbicide	40	20	15
Diazinon	Insecticide	26	54	19
Diquat	Herbicide	4	2	0
Dursban	Insecticide	4	13	9
Fenthion	Insecticide	0	0	<1
Malathion	Insecticide	4	35	<1
Methyl Bromide	Fumiganticide	<1		
Other Carbonant	Insecticide	<1	2	<1
Combination Herbicide	Herbicide	573	1799	385
Inorganic Insecticide	Insecticide	0	0	<1
Other Herbicide	Herbicide	31	325	78
Organic Phosphate Insecticide	Insecticide	0	9	0
Pentachlor. Gel	Fungicide	0	<1	0
Penta. Water Repellant	Fungicide	0	4	10
Pyrethrum	Insecticide	6	31	137
Simazine	Herbicide	15	116	50
Strychrine	Rodenticide	<1	0	<1
Thiram	Fungicide	37,281	0	0
Zinc Phosphate	Rodenticide	<1	<1	0

Source: Navy Pest Management Data System
<is less than

Appendix E

Soil and Ground Water Quality Data in the Vicinity of Hangar 3, NAS Moffett Field, California

ANALYTICAL REPORT

Project 01.02

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

May 31, 1983

By Acurex Corporation

SOIL

PARAMETER	MW-5 5' 5/17/83	MW-6 6.5' 5/17/83	MW-7 7.5' 5/17/83	MW-8 5' 5/17/83	MW-9 5' 5/18/83	MW-10 5' 5/18/83	MW-11 5' 5/18/83
Dichloromethane, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloromethane, ug/kg	< 1.	< 1.	9.	12.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trans-1,2,Dichloroethylene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1,1-Trichloroethane, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Benzene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Toluene, ug/kg	13.	46.	5.	< 1.	6.	4.	8.
Ethylbenzene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/kg	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTIC REPORT

Project 16-01.02

MOFFETT FIELD

June 16, 1983

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

SOIL (U.S. EPA Method 624)

PARAMETER	MW-13 5' 5/23/83	MW-14 5' 5/24/83	MW-14 30' 5/25/83
Dichloromethane, ug/kg	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/kg	< 1.	< 1.	< 1.
Chloroform, ug/kg	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/kg	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/kg	< 1.	< 1.	< 1.
Trans-1,2,Dichloroethylene, ug/kg	< 1.	< 1.	< 1.
1,1,1-Trichloroethane, ug/kg	< 1.	< 1.	< 1.
Trichloroethylene, ug/kg	2.	< 1.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/kg	4.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/kg	< 1.	< 1.	< 1.
Benzene, ug/kg	2.	1.	4.
Toluene, ug/kg	50.	23.	< 1.
Ethylbenzene, ug/kg	< 1.	< 1.	< 1.
Xylene, ug/kg	< 1.	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T.B. Willhite

ANALYTICAL REPORT

Project 416-01.02

MOFFETT FIELD

June 2, 1983

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

SOIL PARAMETER	Excavation near northeast corner Hanger 3 @ 4' 5/17/83	MW-12 44.5' 5/20/83
Dichloromethane, ug/kg	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/kg	< 1.	< 1.
Chloroform, ug/kg	< 1.	< 1.
1,1-Dichloroethylene, ug/kg	< 1.	< 1.
1,1-Dichloroethane, ug/kg	< 1.	< 1.
Trans-1,2,Dichloroethylene, ug/kg	< 1.	< 1.
1,1,1-Trichloroethane, ug/kg	< 1.	< 1.
Trichloroethylene, ug/kg	14.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/kg	28.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/kg	< 1.	< 1.
Benzene, ug/kg	< 1.	< 1.
Toluene, ug/kg	4.	8.
Ethylbenzene, ug/kg	< 1.	< 1.
Xylene, ug/kg	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTICAL REPORT

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

BY ACUREX

Project 416-01.01
Sample E83-0484
Sample E83-0485

April 18, 1983

WATER (U.S. EPA Method 624)

PARAMETER	MW-1 4/15/83	MW-2 4/15/83	MW-3 4/15/83	MW-4 4/15/83
Dichloromethane, ug/l	< 1.	< 1.	< 1.	95.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 5.
Chloroform, ug/l	< 1.	< 1.	< 1.	< 5.
Chloroethane, ug/l	< 1.	< 1.	< 1.	120.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	3.	7.
1,1-Dichloroethane, ug/l	< 1.	< 1.	3.	130.
Trans-1,2-Dichloroethylene, ug/l	< 1.	< 1.	31.	550.
1,1,1-Trichloroethane, ug/l	3.	5.	7.	60.
Trichloroethylene, ug/l	16.	17.	61.	7,900.
Tetrachloroethylene (Perchloroethylene), ug/l	8.	6.	100.	110.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	20.	20.	< 1.	< 5.
1,7,7-Trimethylbicyclo-2,2,1-Heptane-2-one, ug/l	< 1.	< 1.	< 1.	800.
Benzene, ug/l	< 1.	< 1.	< 1.	37.
Toluene, ug/l	< 1.	< 1.	2.	2,200.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.	60.
Xylene, ug/l	< 1.	< 1.	14.	150.
Isopropyl-Alcohol, ug/l	< 1.	< 1.	< 1.	1,800.

ANALYTICAL REPORT

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

BY ACUREX

Project 416-01
Sample E83-0484
Sample E83-0485

April 18, 1983

WATER (U.S. EPA Method 624)

PARAMETER	MW-1 4/15/83	MW-2 4/15/83	MW-3 4/15/83	MW-4 4/15/83
2-Butene-1-ol, ug/l	< 1.	< 1.	< 1.	5,000.
2,3-Diethyloxirane, ug/l	< 1.	< 1.	< 1.	4,000.
Acetone, ug/l	< 1.	< 1.	< 1.	2,000.
3-Methyl-2-Pentanone, ug/l	< 1.	< 1.	< 1.	100.

EMCON Associates

T.B. Willhite, Laboratory Manager T.B. Willhite

ANALYTICAL REPORT

Project 416-01.02

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

June 8, 1983

By Acurex Corporation

WATER (U.S. EPA Method 624)

PARAMETER	MW-5 5/26/83	MW-6 5/26/83	MW-7 5/26/83	MW-8 5/26/83	MW-9 5/26/83	MW-10 5/26/83	MW-11 5/26/83	MW-12A 5/26/83
Dichloromethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	21.
Vinyl Chloride, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/l	< 1.	3.	4.	2.	4.	5.	3.	< 1.
Trans-1,2-Dichloroethylene, ug/l	< 1.	2.	2.	3.	30.	7.	3.	5.
1,1,1-Trichloroethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	< 1.	7.	44.	15.	27.	30.	17.	16.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	26.	< 1.	26.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Toluene, ug/l	< 1.	< 1.	< 1.	2.	< 1.	< 1.	< 1.	< 1.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTICAL REPORT

Project 416-01.02

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

June 15, 1983

By Acurex Corporation

WATER (U.S. EPA Method 624)

PARAMETER	MW-12B 5/31/83	MW-13 5/26/83	MW-14 5/31/83	Irrigation Well 5/31/83	SL-1 Slough 6/14/83
Dichloromethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	1.9	< 1.	1.
Vinyl Chloride, ug/l	< 1.	2.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/l	< 1.	8.	3.4	< 1.	< 1.
Trans-1,2-Dichloroethylene, ug/l	< 1.	6.	1.3	< 1.	< 1.
1,1,1-Trichloroethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	< 1.	5.	55.	< 1.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	7.	< 1.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Dichlorodifluoromethane, ug/l	< 1.	< 1.	6.2	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Toluene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.
1,1,2,2-Tetrachloroethane, ug/l	< 1.	< 1.	< 1.	< 1.	2.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTICAL REPORT

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

Project 416-01.02

May 16, 1983

WATER (U.S. EPA Method 624)

PARAMETER	Tank near northeast corner Hanger 3 4/28/83	PD-680 Solvent 4/28/83
Dichloromethane, ug/l	< 1.	< 10,000.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 10,000.
Chloroform, ug/l	< 1.	< 10,000.
1,1-Dichloroethylene, ug/l	< 1.	< 10,000.
1,1-Dichloroethane, ug/l	< 1.	< 10,000.
Trans-1,2-Dichloroethylene, ug/l	< 1.	< 10,000.
1,1,1-Trichloroethane, ug/l	< 1.	< 10,000.
Trichloroethylene, ug/l	< 1.	< 10,000.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	< 10,000.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 10,000.
Benzene, ug/l	< 1.	< 10,000.
Toluene, ug/l	28.	< 10,000.
Ethylbenzene, ug/l	< 1.	< 10,000.
Xylene, ug/l	< 1.	< 10,000.

ANALYTICAL REPORT

MOFFETT FIELD

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

Project 416-01.02

May 16, 1983

WATER (U.S. EPA Method 624)

PARAMETER	Tank near northeast corner hanger 3 4/28/83	MD-680 Solvent 4/28/83
Cyclohexene, ug/l	ND	520,000,000.
C_3 Alkylbenzene, ug/l	ND	1,600,000.
2-Propylheptanol, ug/l	ND	2,000,000.
Decyne, ug/l	ND	3,200,000.
Methylcyclohexane Methanol, ug/l	ND	5,800,000.
Decahydromethylnaphthane, ug/l	ND	3,200,000.
Total Aliphatic Hydrocarbon, ug/l	ND	460,000,000.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTICAL REPORT

MOFFETT NAVAL AIR STATION

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

Project 416-01.04

December 7, 1983

WATER (U.S. EPA Method 624)

PARAMETER	MW-1 11/15/83	MW-2 11/16/83	MW-3 11/16/83	MW-4 11/17/83	MW-5 11/8/83	MW-6 11/11/83	MW-7 11/11/83	MW-8 11/11/83
Carbontetrachloride, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Dichloromethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Vinyl Chloride, ug/l	< 1.	< 1.	13.	2,800.	< 1.	< 1.	< 1.	4.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	4.	13.	< 1.	< 1.	1.	7.
1,1-Dichloroethane, ug/l	< 1.	< 1.	4.	70.	< 1.	2.	4.	4.
Trans-1,2-Dichloroethylene, ug/l	< 1.	< 1.	8.	2,700.	< 1.	3.	2.	4.
1,1,1-Trichloroethane, ug/l	1.	1.	19.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	8.	18.	58.	5,900.	< 1.	7.	56.	11.
Tetrachloroethylene (Perchloroethylene), ug/l	8.	< 1.	120.	25.	< 1.	< 1.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.	31.	< 1.	< 1.	4.	6.
Toluene, ug/l	< 1.	< 1.	< 1.	1,900.	< 1.	< 1.	< 1.	< 1.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.	90.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	< 1.	< 1.	< 1.	570.	< 1.	< 1.	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T.B. Willhite

ANALYTICAL REPORT

MOFFETT NAVAL AIR STATION

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

Project 416-01.04

December 7, 1983

WATER (U.S. EPA Method 624)

PARAMETER	MW-9 11/15/83	MW-10 11/15/83	MW-11 11/11/83	MW-12A 11/8/83	MW-12B 11/8/83	MW-13 11/8/83	MW-14 11/11/83
Carbontetrachloride, ug/l	< 1.	< 1.	< 1.	14.	2.	< 1.	< 1.
Dichloromethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	< 1.	14.	< 1.	< 1.	1.
Vinyl-Chloride, ug/l	19.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/l	2.	< 1.	< 1.	8.	< 1.	< 1.	2.
1,1-Dichloroethane, ug/l	3.	5.	2.	6.	< 1.	< 1.	6.
Trans-1,2-Dichloroethylene, ug/l	31.	9.	3.	22.	< 1.	< 1.	3.
1,1,1-Trichloroethane, ug/l	< 1.	< 1.	< 1.	11.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	23.	26.	16.	70.	< 1.	7.	70.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	< 1.	< 1.	140.	< 1.	8.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Toluene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.

EMCON Associates

T. B. Willhite, Laboratory Manager T.B. Willhite

ANALYTICAL REPORT

MOFFETT NAVAL AIR STATION

ANALYSIS PERFORMED FOR EMCON ASSOCIATES

By Acurex Corporation

Project 416-01.03

December 7, 1983

WATER (U.S. EPA Method 624)

PARAMETER	MW-15 11/2/83	MW-16 11/2/83	MW-17A 11/2/83	MW-17B 11/17/83	MW-18 11/2/83	MW-19 11/16/83	MW-20A 11/16/83	MW-20B 11/17/83
Dichloromethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trans-1,2-Dichloroethylene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1,1-Trichloroethane, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	121.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Trans-1,3-Dichloropropene	71.	< 1.	48.	< 1.	65.	< 1.	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Toluene, ug/l	17.	< 1.	3.	4.	4.	< 1.	< 1.	< 1.
Ethylbenzene, ug/l	3.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	28.	< 1.	< 1.	40.	16.	< 1.	< 1.	< 1.

EMCON Associates

T. B. Willhite, Laboratory Manager T. B. Willhite

ANALYTICAL REPORT
MOFFETT NAVAL AIR STATION
ANALYSIS PERFORMED FOR EMCON ASSOCIATES
Bu Acurex Corporation

Project 416-01.03
December 8, 1983

SOIL (U.S. EPA Method 624)

PARAMETER	MW-16 5' 11/1/83	MW-17A 5' 11/1/83	MW-18 5' 11/1/83	MW-19	MW-20A 5' 11/2/83	MW-20A 10' 11/2/83	MW-17B 35' 11/7/83	MW-20B 55' 11/4/83
Dichloromethane, ug/l	< 1.	< 1.	< 1.	Sample Destroyed In Sampling	< 1.	< 1.	< 1.	< 1.
Trichlorofluoromethane (Freon 11), ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Chloroform, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethylene, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
1,1-Dichloroethane, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Trans-1,2-Dichloroethylene, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
1,1,1-Trichloroethane, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Trichloroethylene, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Tetrachloroethylene (Perchloroethylene), ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113), ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Benzene, ug/l	< 1.	< 1.	< 1.		< 1.	3.	< 1.	< 1.
Toluene, ug/l	< 1.	< 1.	< 1.		25.	127.	100.	< 1.
Ethylbenzene, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.
Xylene, ug/l	< 1.	< 1.	< 1.		< 1.	< 1.	< 1.	< 1.

EMCON Associates
T. B. Willhite, Laboratory Manager T. B. Willhite

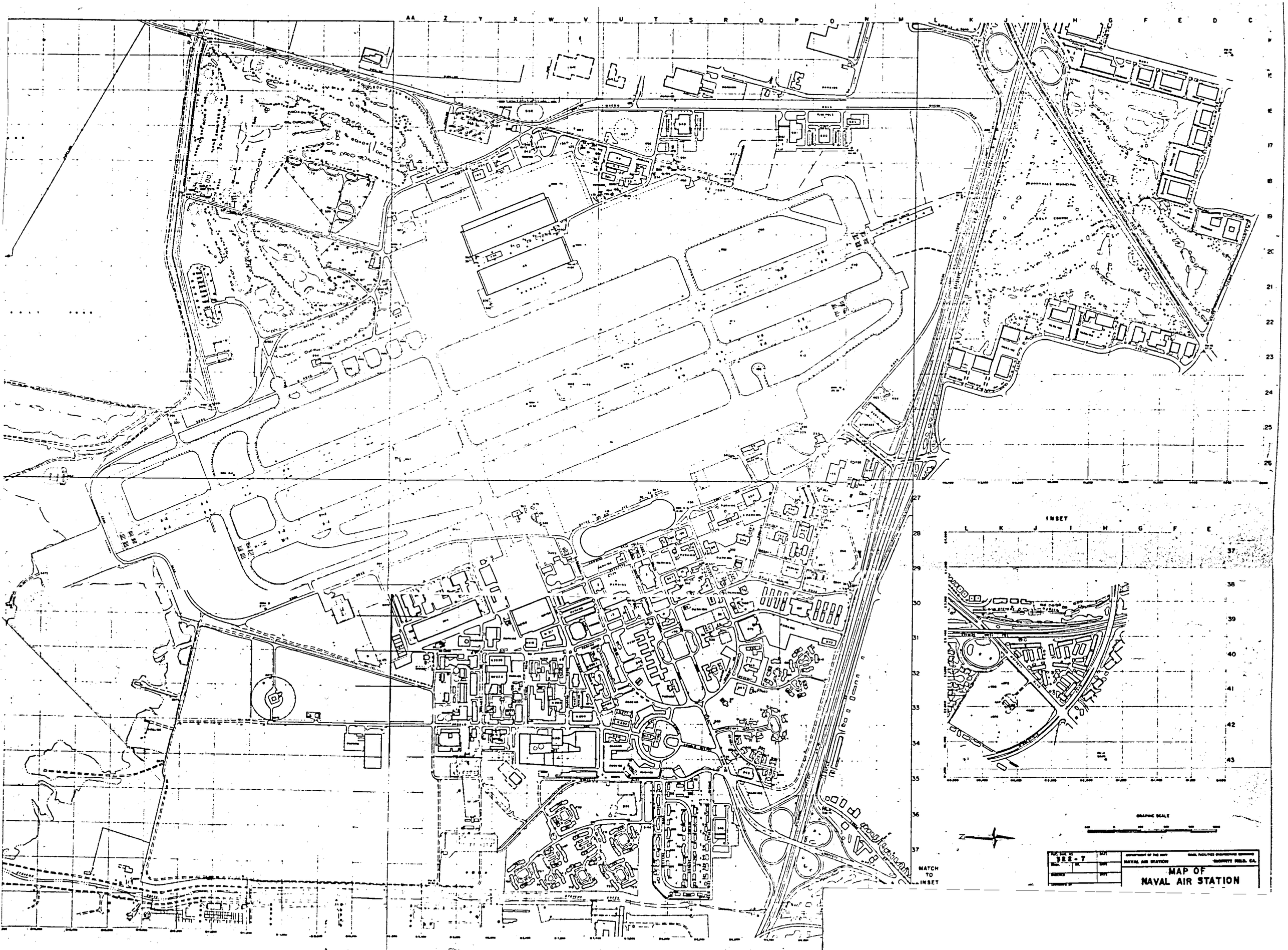
RESULTS OF LABORATORY TESTING

Project 416-01.03
416-01.04

November 15, 1983

Sample Number	Sample Depth	Liquid Limit (%)	Plasticity Index	Unified Soil Classification	Undisturbed Permeability @ 20° (cm/sec)
MW-17B	25	36	19	CL	2.7×10^{-7}
MW-20B	50	42	22	CL	4.3×10^{-8}

Plate B-


INSET
GRAPHIC SCALE
MATCH TO INSET
MAP OF
NAVAL AIR STATION

BUILDING LIST

NO	LOC	USE	CAT CODE
1	26-U	HANGAR NO 1 - TRAINING	
2	30-V	GYMNASIUM	
3	29-T	COMMISSIONED OFFICERS MESS (OPEN)	
4			
5	28-S	WATER TANK 200,000 GALLONS	
6	29-S	STORAGE	
7			
8	29-R		
9			
10	29-S	BOILER PLANT - SWITCHING STATION	
11			
12	30-U	COMMISARY - ADMIN	
13	30-U	COMMISARY - STORAGE	
14	30-T	LIBRARY	
15	30-S	FIRE STATION - PW SHOPS	
16	30-R	PUBLIC WORKS SHOPS	
17	31-T	COMPATWINGSPAC ADMIN BUILDING	
18	31-U	COMMUNICATIONS BUILDING	
19	32-T	E M BARRACKS	
20	31-S	B O Q	
21	31-R	B O Q GARAGE	
22	31-R	B O Q GARAGE	
23	32-R	N A S ADMINISTRATION BUILDING	
24	32-R	STORAGE	
25	32-S	RECREATIONAL SERVICES BUILDING	
26	35-R	MAIN GATEHOUSE - PASS & DECAL OFFICE	
27	20-BB	PYROTECHNIC MAGAZINE	
28	20-CC	SMALL ARMS MAGAZINE	
29	29-U	OFFICE EQUIPMENT REPAIRS	
30			
31	30-U	COMMISARY STORAGE	
32	28-V	NORTH FLOOD LIGHT TOWER	
33	27-T	SOUTH FLOOD LIGHT TOWER	
34	32-T	NAVY EXCHANGE STORAGE	
35			
36	35-R	SENTRY HOUSE - MAIN GATE	
37	30-T	SCALE HOUSE	
38	30-R	TENNIS COURTS	
39			
40	31-S	FLAG POLE	
41			
42			
43			
44	28-U	STORAGE	
45	29-U	PUBLIC WORKS PAINT SHOP	
46	21-X	HANGAR NO 2	
47	19-X	HANGAR NO 3	
48	32-Q	CHAPLAINS OFFICE - RED CROSS - NAVY RF	
49	17-U	TRAINING BUILDING - NAMTD	
50	30-R	HAM RADIO SHACK	
51			
52	33-S	GENERAL HOUSING OFFICE	
53			
54			
55	20-X	BOILER HOUSE (FOR HANGER NO 2 & 3)	
56			
57			
58	18-V	50,000 GAL AIRCRAFT FUEL (UNDERGND)	
59	18-V	50,000 GAL AIRCRAFT FUEL (UNDERGND)	
60	17-V	25,000 GAL AIRCRAFT FUEL (UNDERGND)	
61	17-V	600 BBL BOILER FUEL TANK (OIL)	
62			
63			
64	28-T	REC SERVICES CAMPING GEAR ISSUE	
65			
66			
67	34-T	POST OFFICE	
68			
69	19-AA	INERT AMMUNITION STOREHOUSE	
70	18-BB	FUSE & DETONATOR MAGAZINE	
71	18-CC	HIGH EXPLOSIVE MAGAZINE	
72	18-CC	HIGH EXPLOSIVE MAGAZINE	
73	18-DD	HIGH EXPLOSIVE MAGAZINE	
74	18-DD	HIGH EXPLOSIVE MAGAZINE	
75	27-W	MOFFETT FIELD FLYING CLUB	
76	30-S	PW SELF HELP	
77	25-N	SOUTH GATE SENTRY HOUSE	
78	25-N		
79	20-X	BATTERY SHOP	
80			
81	30-S	MAINT LOX EQUIPMENT	
82	29-N	ATHLETIC EQUIPMENT	
83	27-T	LINE CREW SHELTER	
84			
85	28-S	SAND BLASTING EQUIP (STORAGE)	
86	33-R	CHAPEL	
87	33-R	BOILER HOUSE (FOR CHAPEL)	
88	28-R	LAUNDRY / DRY CLEANING PLANT	
89			
90			
91			
92			
93	20-W	AIRCRAFT WELDING SHOP	
94			
95			
96			
97			
98	19-W	RESERVOIR (120,000 GAL)	
99			
100			
101			
102	41-K	ROAD TRANSMITTER (OFF-STA)	
103			
104	29-R	MAIN ELECTRIC SUBSTATION (12-KV)	
105	27-W	TRANSFORMER VAULT (FIELD LIGHTING)	
106	23-Q	COMPASS CALIBRATION PAD	
107	30-R	SECURITY OFFICE	
108	30-Q	SWIMMING POOL	
109	30-R	DRESSING ROOMS	
110			
111	27-N	RIGGERS LOFT	
112	27-X	CRASH EQUIPMENT STATION	
113	28-Q	REC SERVICES MAINTENANCE SHED	
114			
115	29-S	MASONRY SHOP	
116			
117	29-S	STORAGE (DECONTAMINATION MATERIAL)	
118	27-U	STORAGE (LINE SHACK)	
119	28-V	LINE SHACK	
120			
121			
122			
123	32-BB	STORAGE SUPPLY (ACID & POISONOUS MTL)	
124	18-U	TRAINING BUILDING	
125			
126	28-S	NAVY EXCHANGE RETAIL WAREHOUSE	
127	31-AA	SUPPLY STOREHOUSE	
128			
129	16-U	EAST GATE SENTRY HOUSE	
130			
131			
132			
133	20-Y	HAZARDOUS & FLAMMABLE MAT STORAGE	
134	18-X		
135	17-V	140,000 GAL A/C FUEL TANK (WORKING)	
136	17-W	140,000 GAL A/C FUEL TANK (WORKING)	
137	17-Y	13,500 BBL A/C FUEL TANK (STORAGE U/G)	
138	17-Y	"	
139	17-Y	"	
140	16-Z	13,500 BBL A/C FUEL TANK STORAGE (U/G	
141	17-W	TANK TRUCK FILLING RACK	
142	18-V	GROUND SUPPORT EQUIP - A MU	
143	19-CC	HIGH EXPLOSIVE MAGAZINE	
144	31-Z	SUPPLY STOREHOUSE	
145			
146	26-O	TRANSPORTATION GARAGE	
147	19-CC	HIGH EXPLOSIVE MAGAZINE	
148	30-Q	E M BARRACKS	
149	30-Q	"	
150	30-P	"	
151	30-P	E M BARRACKS	
152	30-P	MAIN GALLEY	
153	30-O	E M BARRACKS	
154	30-O	"	
155	30-O	"	

BUILDING LIST

NO	LOC	USE	CAT CODE
156	30-O	E M BARRACKS	
157			
158	26-W	OPERATIONS BUILDING	
159	36-P	BUS SHELTER	
160	36-O	BUS SHELTER	
161			
162			
163			
164			
165			
166			
167	9-GG	WHARF	
168	12-KK	BRIDGE	
169	14-GG	BRIDGE	
170	17-S	OXYGEN TRANSFER	
171			
172	19-V	LINE SHACK	
173	20-V	"	
174	20-V	"	
175	19-W	"	
176	19-W	LINE SHACK	
177	21-BB	READY ISSUE AMMO LOCKER	
178	20-CC	READY ISSUE AMMO LOCKER	
179	20-CC	CHEMICAL STORAGE	
180			
181			
182	21-CC	READY ISSUE AMMO LOCKER	
183	21-CC	READY ISSUE AMMO LOCKER	
184			
185	21-CC	READY ISSUE AMMO LOCKER	
186	18-V	STORAGE	
187	21-BB	READY ISSUE AMMO LOCKER	
188	21-CC	"	
189	21-CC	READY ISSUE AMMO LOCKER	
190			
191	24-GG	DRAINAGE PUMP HOUSE	
192			
193	18-U	LINE SHACK	
194	18-U		
195			
196			
197	18-U	READY ISSUE AMMO LOCKER	
198	18-U		
199	18-T	READY ISSUE AMMO LOCKER	
200			
201			
202			
203			
204			
205			
207A	33-Q	FAMILY SERVICES CNTR	
207	35-Q	RED CROSS BLDG	
208			
209			
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211			
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219			
220			
221			
222			
223	28-P	CHILD CARE CENTER (NURSERY)	
224			
225			
226			
227			
228			
229			
230			
231			
232			
233			
234	18-AA	GOLF COURSE CLUB HOUSE	
235			
236			
237			
238			
239			
240	29-T	NAVY EXCHANGE OFFICES	
241	29-T	NAVY EXCHANGE OFFICES	
242	28-T	NAVY EXCHANGE OFFICES	
243	35-Q	CHIEF PETTY OFFICERS CLUB	
244	27-P	ENLISTED MENS CLUB	
245	28-Q	ATHLETIC FIELD HOUSE	
246			
247			
248	18-S	READY ISSUE AMMO LOCKER	
249	28-W	READY ISSUE AMMO LOCKER	
250			
251	27-N	PUBLIC WORKS STORAGE (INSECTICIDE)	
252	26-AA	STANDBY GENERATOR	
253	21-BB	05,000 GAL A/C FUEL TANK (WORKING)	
254	23-DD	AIRCRAFT WASTE DISPOSAL	
255	22-GG		
256	25-O	PARACHUTE LOFT	
257	8-OO	FIRE PROTECTION PUMPHOUSE	
258	26-N	TRANS VEHICLE SHED	
259	18-T	LINE SHACK (VP-ORDNANCE)	
260	18-T	" " (" ")	
261	18-T	" " (" ")	
262	18-T	LINE SHACK (VP-ORDNANCE)	
263	33-Q	TENNIS COURTS	
264	29-O	VOLLEYBALL COURT	
265	29-O	VOLLEYBALL COURT	
266	28-O	FOOTBALL FIELD	
267	29-O	BASEBALL FIELD	
268			
269			
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271			
272			
273			
274			
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276			
277	41-K	RADIO XMTR ANTENNA SYSTEM	
278			
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289			
290			
291			
292	27-C	REFUELING VEHICLE SHOP	
293	27-C	BASEBALL DIAMOND (SOFTBALL)	
294			
295	36-U	BASEBALL DIAMOND (SOFTBALL)	
296			
297			
298			
299			
300	18-T	COMFLT AIR WING	
301	8-T	ASCAC / ARPA / ASWOC	
301B	8-U	RESEARCH	
301C	18-U	ACOUSTIC RESEARCH CENTER	
304			
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BUILDING LIST

NO	LOC	USE	CAT CODE
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327			
328	16-Y	576 BBL TANK (ENGINE OIL)	
329	25-P	RECEIVER BUILDING	
330	25-MM	ENGINE TEST PAD	
331	25-P	GEN STORAGE	
332			
333	30-S	COMMISSARY STORAGE (REFRIGERATED)	
334			
335			
336			
337			
338	31-R	GARBAGE STAND-COVERED	
339			
340			
341	27-N	PEST CONTROL STORAGE	
342	17-W	TOOL ROOM (FUEL FARM)	
343	27-N	RIGGERS SHOP	
344			
345	27-X	CRASH SALVAGE OFFICE	
346	20-Y	A/C LINE OPERATIONS A/N EQUPT NO 48	
347	27-T	A/C LINE OPERATIONS	
348	17-X	FUEL FARM OFFICE / STORAGE	
349			
350	20-Y	LINE SHACK (MAINTENANCE)	
351	20-Y	LINE SHACK (MAINT)	
352	28-R	BOY SCOUT TRASH COLL BOX	
353	27-X	CRASH CREW RECREATION BLDG	
354			
355			
356			
357			
358			
359	18-GG	TOOL SHED	
360	16-Y	CONTAMINATED FUEL-STORAGE TANK	
361	16-Y	VEHICLE FUEL STORAGE TANK	
362	16-Y	CONTAMINATED FUEL STORAGE TANK	
363			
364			
365			
366			
367	20-W	NAVY EXCHANGE BRANCH	
368	19-AA	A/C LINE OPERATIONS	
369			
370			
371	27-N		
372	17-W	PUBLIC TOILET	
373			
374			
375			
376	18-GG	GARBAGE INCINERATOR	
377			
378			
379			
380	29-P	BUS WAITING SHELTER	
381	26-R	A/C LINE OPERATIONS	
382	26-R	A/C LINE OPERATIONS	
383	27-O	PAINT STORAGE LOCKER	
384		PYLON AIRCRAFT SUNNYVALE OFF-STA	
385	17-X	TANK CAR UNLOADING FACILITY	
386	17-V	TANK TRUCK UNLOADING FACILITY	
387	17-V	TANK TRUCK UNLOADING FACILITY	
388			
389	35-M	BUS WAITING SHELTER	
390	[illegible]	"	
391			
392	30-S	FIRE HOSE DRYING RACK	
393			
394			
395	25-MM	LINE SHACK MAINTENANCE	
396	20-Y	LINE SHACK MAINTENANCE	
397	27-X	BASEBALL DIAMOND	
398	27-X	FOAMITE STORAGE	
399	8-GG	GOLF COURSE TOOL SHED	
400	25-P	FLAMMABLE STORAGE	
401			
402	8-Y	BUS WAITING SHELTER	
403	16-V	BASEBALL DIAMOND	
404	27-N	BASEBALL DIAMOND	
405	9-OO	WHARF GENERATOR PLANT	
406	14-GG	SENTRY HOUSE WHARF GATE	
407			
408	24-V	AN/FPN 52 SITE	
409	8-GG	STORAGE SHED GOLF COURSE	
410	21-N	WHEEL WATCH SHELTER SOUTH	
411	22-N		
412	23-P	TETRAHEDRON WIND	
413	27-GG	ARRESTING GEAR RUNWAY 14L	
414	27-AA	" " " 14R	
415	22-O	" " " 32L	
416	22-O	ARRESTING GEAR RUNWAY 32R	
417			
418	29-R		
419			
420			
421	25-P	UHF/VHF XMTR & REC ANTENNA SYSTEM	
422	30-S		
423	30-P		
424			
425			
426			
427	27-U	REFUSE DISPOSAL FACILITY	
428			
429			
430			
431	25-N	VEHICLE READY FUEL STORAGE	
432	25-N	VEHICLE READY FUEL STORAGE	
433			
434			
435			
436			
437			
438	27-S	A/C WASH RACK NO 1	
439	20-Z	A/C WASH RACK NO 2	
440	9-W	VP47 LINE SHACK (MAINT)	
441			
442	24-EE	ORDNANCE HANDLING	
443			
444	8-OO	FIRE PROTECTION WHARF	
445	8-OO	CRASH BOAT BERTH	
446	30-LL	TACAN SITE	
447	4-K	SEPTIC TANK (TRANS STATION OFF/STA	
448			
449	[illegible]	WELL (NON POTABLE)	
450			
451			
452			
453			
454	24-M	UHF-VHF XMTR BLDG	
455	8-AA	GOLF CART SHED	
456	33-P	BUS WAITING SHELTER	
457			
458	9-S	A/C WASH RACK NO 4	
459	18-O	ATHLETIC EQUIP STORAGE	
460	30-S	PAINT LOCKER	
461	24-V	AN FPN 52	
462	26-AA	PAR REVETMENT	
463	24-M	UHF-VHF ANTENNA SYSTEM	
464	26-R	BULK STORAGE	
465	[illegible]	[illegible]	

BUILDING LIST

NO	LOC	USE	CAT CODE
466	25-N	SEPTIC TANK	
467			
468	20-R	TRANSMISSIOMETER PROJECTOR	
469	19-O	TRANSMISSIOMETER DETECTOR	
470	18-X	STANDBY GENERATOR BLDG	
471	18-GG	GOLF COURSE EQUIP SHED	
472	18-W	ENGINE X-RAY BLDG	
473	44-K	ANTENNA TOWER BLDG 102 OFF/STA	
474	42-K	ANTENNA TOWER BLDG 102 OFF/STA	
475			
476	31-Q	NAVY EXCHANGE	
477	17-R		
478	32-T		
479	18-R	TRANSFORMER (FOR MAD GENERATOR)	
480	30-U	HANDBALL COURT	
481			
482	29-R	GARBAGE CAN CLEANING	
483	18-Y	GROUND SUPPORT EQUIPMENT BLDG	
484	22-GG	AUW WEAPONS SHOP	
485	22-FF	AUW GUARD TOWER	
486	22-GG	HIGH EXPLOSIVE MAGAZINE	
487	22-GG	" " "	
488	21-GG	" " "	
489	21-GG	" " "	
490	21-GG	" " "	
491	21-GG	" " "	
492	[illegible]-GG	HIGH EXPLOSIVE MAGAZINE	
493	31-R	OFFICERS SWIMMING POOL	
494	OFF STA	TRANSMITTING ANTENNA (MT VIEW)	
495	OFF STA	" " "	
496	11-K	TRANSMITTING ANTENNA (MT VIEW)	
497	17-O	RECEIVING ANTENNA	
498	17-T	RECEIVING ANTENNA	
499	20-X	GROUND SUPPORT EQUIPMENT SHELTER	
500			
501	10-S	FIRE TRAINING CLASSROOM & STORAGE	
502	3-EE	PUBLIC TOILET	
503	18-R	NAVY EXCHANGE SERVICE STATION	
504	18-R	A/C HIGH SPEED RINSE FACILITY	
505	3-KK	PISTOL RANGE	
506	3-FF	BASEBALL BACKSTOP	
507	3-FF	PARK SHELTER/BARBECUE	
508	4-KK	PISTOL RANGE	
509	29-S	NEARLY NEW SHOP (NAVY RELIEF)	
510	29-S	NAVY EXCHANGE SALES/STORAGE	
511	0-BB	MISSILE ASSEMBLY BUILDING	
512	28-P	BEQ W/O MESS	
513	18-U	AIR SYSTEMS TRAINING	
514	36-R	MEQ MOFFETT HOMES	
515	36-R	" " "	
516	36-R	" " "	
517	37-R	" " "	
518	37-R	" " "	
519	37-R	MEQ MOFFETT HOMES	
520	38-R	" " "	
521	38-R	MEQ MOFFETT HOMES	
522	38-R	MEQ MOFFETT HOMES	
523	38-R	AIR SYSTEMS TRAINING	
524	9-AA	OIL FLOTATION FACILITY	
525	28-Q	BOWLING ALLEY	
526	27-P	NAVY EXCHANGE WAREHOUSE	
527	29-S	NAVY EXCHANGE WAREHOUSE	
528	9-CC	NASA MAGAZINE	
529	29-R	NAVY EXCHANGE WAREHOUSE	
530	28-R	NAVY EXCHANGE CLEANING STORAGE	
531	24-V	RADAR TURN TABLE	
532	29-R	PUBLIC WORKS STORAGE	
533	29-O	PUBLIC TOILET	
534	29-O	BARBECUE	
535	27-S	HOLDING TANK SEPERATOR	
536	16-X	CORRAL	
537	9-FF	PUBLIC TOILET	
538			
539	21-Y	LINE SHACK	
540	22-Y	STORAGE FACILITY	
541	18-Y	AIMD CLASSROOM	
542	29-S	INCINERATOR	
543	31-O	CRAFT HOBBY SHOPS	
544	26-N	AUTO HOBBY SHOPS	
545	17-X	FUEL FARM OFFICE	
546	36-R	MEDICAL/DENTAL FACILITY	
547	28-P	BEQ	
548			
549	16-S	AVIONICS BUILDING	
550			
551	17-S	DISH ANTENNA SYSTEM	
552	17-S	MECH SHELTER (AMERICAN SAT CO)	
553	27-S	TANK CAR UNLOADING FACILITY	
554	27-Q	NAVY EXCHANGE (NEX II)	
555	30-Q	BANK OF AMERICA	
556	29-Q	CREDIT UNION	
557	29-R	MOFFETT STATION CAFE	
558	28-MM	ILLUMINATED WIND CONE	
559	21-N	ILLUMINATED WIND CONE	
560			
561	23-FF	MISSILE MAGAZINE	
562	26-KK	PISTOL RANGE BUILDING	
563	9-OO	GENERATOR SHELTER (WHARF)	
564			
565	23-GG		
566	30-R	PUBLIC WORKS ADMINISTRATION BLDG	
567	29-S	PUBLIC WORKS WAREHOUSE	
568			
569	32-T	U.S. ARMY COMM SVS GRP II	
570	29-S	CAUSTIC CHEMICAL STORAGE	
571			
572	27-O	RACQUETBALL COURTS	
573	28-Z	FIRE TRAINING PIT	
574			
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600	34-Q	MOQ - FIELD GRADE	
601	34-R	MOQ FIELD GRADE	
602	34-Q	" " "	
603	34-Q	" " "	
604	34-Q	" " "	
605	34-Q	" " "	
606	35-Q	" " "	
607	35-Q	" " "	
608	35-P	" " "	
609	35-P	MOQ FIELD GRADE	
610	32-P	MOQ COMPANY GRADE	
611	32-P	" " "	
612	32-Q	" " "	
613	32-Q	" " "	
614	33-P	" " "	
615	33-P	" " "	
616	32-P	" " "	
617	32-Q	" " "	
618	32-Q	" " "	
619	[illegible]-Q	" " "	
620	[illegible]-P	" " "	

BUILDING LIST

NO	LOC	USE	CAT CODE
621	32-P	MOQ COMPANY GRADE	
622			
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680	17-O	ANG HDQTRS 129 TH ARRG	
681	6-P	ANG BASE SUPPLY WAREHOUSE	
682	7-R	HAZARDOUS MATERIAL STORAGE	
683	6-N	ANG BASE CIVIL ENGINEERING FACILITY	
684	22-AA	ANG GROUND SUPPORT EQUIPMENT SHOP	
685			
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699			
700	36-W	MEQ - ORION PARK	
701	36-V	" " "	
702	36-V	" " "	
703	36-W	MEQ - ORION PARK	
704	38-X	" " "	
705	38-X	" " "	
706	38-W	" " "	
707	38-W	" " "	
708	38-W	MEQ - ORION PARK	
709	37-V	" " "	
710	37-W	" " "	
711	38-W	" " "	
712	38-W	" " "	
713	38-V	" " "	
714	37-V	" " "	
715	37-V	" " "	
716	37-V	" " "	
717	37-V	" " "	
718	38-V	" " "	
719	38-V	" " "	
720	38-V	MEQ - ORION PARK	
721	38-U	MEQ-ORION PARK	
722	38-U	" " "	
723	38-U	" " "	
724	38-T	" " "	
725	37-U	" " "	
726	36-U	" " "	
727	37-U	" " "	
728	37-U	" " "	
729	36-T	MEQ-ORION PARK	
730			
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751	35-S	MEQ-MOFFETT HOMES	
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774			
775	36-S	MEQ - MOFFETT HOMES	

BUILDING LIST

NO	LOC	USE	CAT CODE
776	36-S	" " "	
777	36-S	" " "	
778	36-S	" " "	
779	36-S	" " "	
780	36-S	" " "	
781	37-S	" " "	
782	37-S	" " "	
783	37-S	MEQ-MOFFETT HOMES	
784	37-S	" " "	
785	37-S	" " "	
786	37-S	" " "	
787	36-S	" " "	
788	36-S	" " "	
789	36-S	" " "	
790	36-S	" " "	
791	36-S	MEQ-MOFFETT HOMES	
792			
793	36-S	MEQ-MOFFETT HOMES	
794			
795			
796			
797			
798			
799			
800	36-S	MEQ - MOFFETT HOMES	
801	36-S	" " "	
802	36-S	" " "	
803	37-S	" " "	
804	36-S	" " "	
805	37-S	" " "	
806	36-S	" " "	
807	37-S	MEQ-MOFFETT HOMES	
808			
809	37-S	MEQ-MOFFETT HOMES	
810			
811	36-S	MEQ-MOFFETT HOMES	
812			
813	36-S	MEQ-MOFFETT HOMES	
814			
815	35-S	MEQ-MOFFETT HOMES	
816			
817	35-S	MEQ-MOFFETT HOMES	
E-43	35-T	MEQ - MOFFETT HOMES	
E-44	36-T	" " "	
E-45	36-T	" " "	
E-46	36-T	" " "	
E-47	37-T	" " "	
E-48	37-T	" " "	
E-49	37-T	" " "	
E-50	38-T	" " "	
E-51	38-T	MEQ - MOFFETT HOMES	
E-52	35-S	HOUSING OFFICE	
A	33-P	MOQ - FLAG OFFICER	
B	33-P	MOQ - SENIOR OFFICER	
C	34-P	" " "	
D	33-Q	" " "	
E	34-P	" " "	
F	33-Q	" " "	
G	34-Q	" " "	
H	33-Q	" " "	
I	34-Q	MOQ - SENIOR OFFICER	
A-1	33-P	DETACHED GARAGE & GUEST HOUSE	
B-1	33-P	" " "	
C-1	34-P	" " "	
D-1	33-Q	" " "	
E-1	34-P	" " "	
F-1	33-Q	" " "	
G-1	34-Q	" " "	
H-1	33-Q	" " "	
I-1	34-Q	DETACHED GARAGE & GUEST HOUSE	