OUTLYING LANDING FIELD IMPERIAL BEACH, CALIFORNIA

INSTALLATION RESTORATION PROGRAM
SITE INSPECTION
DRAFT SOLID WASTE WATER QUALITY ASSESSMENT TEST PROPOSAL AND SITE INSPECTION WORK PLAN INCLUDING THE QUALITY ASSURANCE/PROJECT PLAN AND THE HEALTH AND SAFETY PLAN

5 OCTOBER 1990

VOLUME I

SOUTHWEST DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1220 PACIFIC HIGHWAY
SAN DIEGO, CALIFORNIA 92132-5190

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PREPARED BY:
Southwest Division Naval Facilities
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San Diego, California 92132-5190

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1.0 INTRODUCTION

On 27 February 1990 the Department of the Navy, Naval Facilities Engineering Command, issued Contract Task Order (CTO) #0041 Activity 6 to Jacobs' Project Management Office. This task order requested preparation of a Solid Waste Water Quality Assessment Test (SWAT) Proposal and Site Inspection (SI) Work Plan. The SWAT and SI, which includes the Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HSP), have been prepared in accordance with the Comprehensive Long-Term Environmental Action Navy (CLEAN) program, Contract N68711-89-D9296.

The Initial Assessment Study (IAS) (Ref. 1), completed in February 1986, identified four potentially contaminated sites at the Outlying Landing Field (OLF), Imperial Beach, California. All four of these sites are located on the OLF. These sites include:

- Site 6 - Firefighting Training Area
- Site 7 - Rubble Disposal Area
- Site 8 - Oiled Areas
- Site 9 - Fuel Farm Area

In the IAS (Ref. 1), identification of the potentially contaminated sites was based on information collected by reviewing historical records, aerial photographs, surface and aerial surveys, and by conducting personnel interviews. The IAS, conducted under the Navy's Installation Restoration Program (IRP), is comparable to a Preliminary Assessment, under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA). An SI will be performed for all four sites. The SI effort includes preparation of a work plan, a quality assurance project plan, and a health and safety plan. As described in the work plan, soil and groundwater samples will be collected from the four potentially contaminated sites and analyzed for suspected contaminants. Results of the SI will aid in screening the identified sites that may require further action or investigation under a Remedial Investigation/Feasibility Study (RI/FS) phase.

In addition, for Site 6 - Firefighting Training Area, a SWAT proposal will be performed. The level of effort required for a SWAT is greater than that required for an SI due to the following additional requirements imposed by the San Diego Regional Water Quality Control Board:

- Surface waters shall be sampled and analyzed within a mile of the site, in addition to groundwater.
- The soil-pore liquid shall be chemically characterized in areas likely to be affected by leakage from the waste disposal site, if feasible.

The accomplishment of the more stringent SWAT requirements for Site 6 will serve to accomplish the objectives of the SI for this site.

1.1 Objectives

The objective of the SI is to assess whether or not contamination is present at the sites identified by the IAS. This objective will be achieved by strategically sampling suspected locations of uncontrolled release. Where feasible, a secondary objective is to evaluate potential contaminant migration. Consequently, the objective of the SI Work Plan is to describe the field investigation sampling and analysis activities that will be conducted at each of the four OLF sites during the SI effort.

The primary objective of the SWAT is to assess if contamination is migrating into the surface or groundwater. The SWAT proposal has been prepared to describe those procedures which will be used to accomplish that objective.

1.2 Scope

This document includes a discussion of facility history (Section 2), geology (Section 3), and hydrogeology (Section 4). The field investigation work plan (Section 5) contains the proposed field activities, including field work preparation, geophysical survey, drilling and soil sampling, well installation, aquifer testing, sample handling, and decontamination procedures. Section 6 describes report preparation and Section 7 contains references.

Volume 2 contains the appendices. The QAPP, included in Appendix A, identifies field investigation and sampling procedures, transportation of samples, analytical services, and data evaluation. The Site Health and Safety Plan for CTO #0041, Activity 06, is included in Appendix B. It establishes policies and procedures to protect workers, Navy personnel, and the public from potential hazards at each site. Jacobs Field Standard Operating Procedures are included in Appendix C.

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2.0 GENERAL HISTORY AND DESCRIPTION OF THE OUTLYING LANDING FIELD, IMPERIAL BEACH, CALIFORNIA

The OLF is located within Imperial Beach, California, approximately 14 miles south of the City of San Diego (Figure 2-1). Due south of OLF, less than 2 miles, is the international border with the Republic of Mexico. The OLF is bordered on the southwest by the Tijuana River Slough, on the west by the Oneonta Slough and the Pacific Ocean beyond, on the north and northeast by the City of Imperial Beach, on the east by the City of San Diego, and on the southeast by agricultural land.

Land use surrounding OLF is diverse. The City of Imperial Beach, adjacent to the base, is zoned primarily for residential use. The main thoroughfare through Imperial Beach to the facility is Thirteenth Street. This area is characterized by medium-density residential development. Most of the commercial establishments are located on Palm Avenue. The Tijuana Slough and the Oneonta Slough are part of the Border Field State Park. The agricultural lands are leased from the federal government. Other land uses within the facility include the U.S. Department of Labor Job Corps, U.S. Defense Reutilization and Marketing Organization, SPECWARGRU 1, and Southwest Little League (see Figure 2-2).

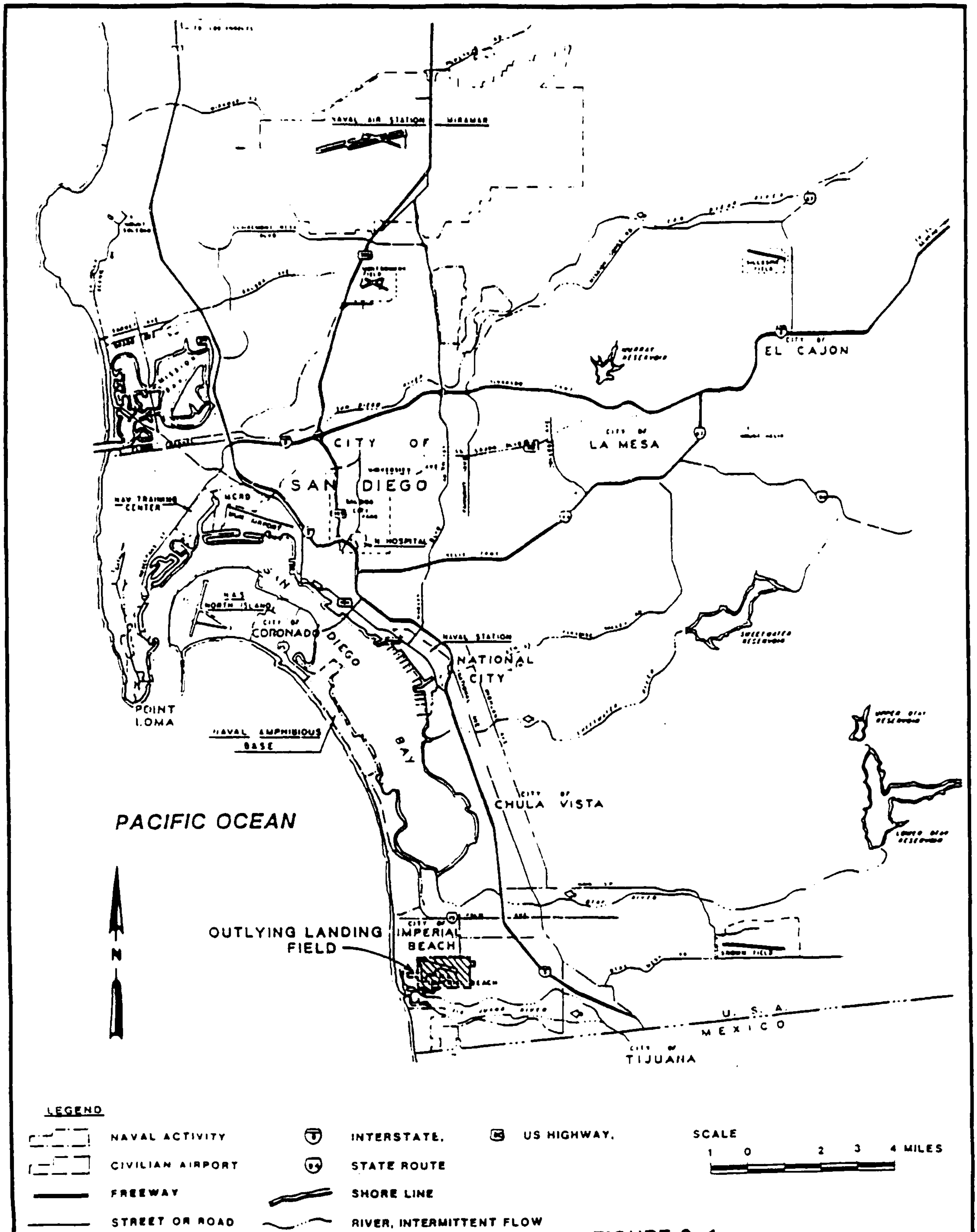
The land to the southwest and west of OLF contains a rich variety of flora and fauna, including some protected species. Currently, the U.S. Department of Interior manages the acreage adjacent to the southwestern and western boundaries, as a wildlife preserve, under a memo of understanding with the Navy. The Tijuana River still retains some of its original riparian vegetation. Closer to the ocean, the river's riparian vegetation changes to a salt marsh habitat. The river and estuary provide forage and shelter for the indigenous wildlife. Avian species, migratory, and rare and endangered species, utilize the river and slough. A total of 298 avian species, 69 species primarily inhabiting the estuary and 144 species primarily inhabiting the riparian area, have been observed (Ref. 1). In addition to the wide variety of birds, many species of invertebrates and fish are found in the estuary. As with most estuaries, this habitat serves as a nesting and nursery area for many aquatic species; therefore, the estuary is a productive habitat necessary for the aquatic life cycle.

Some endangered, threatened, or rare species are listed in Table 2-1.

OLF operates under the auspices of the Naval Air Station, North Island and is under the command authority of the North Island Commanding Officer. The current primary mission of OLF is to support helicopter training operations. These operations include landing practice and lift operations.

2.1 Outlying Landing Field, Imperial Beach - General History

Historically, industrial waste generated at OLF was the result of the operation and maintenance of helicopter squadrons. Today, the facility is relatively inactive; therefore, the amount of waste currently being generated is small.



SOURCE: VERIFICATION STEP WORK PLAN NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY, DECEMBER 1987

FIGURE 2-1
VICINITY MAP OUTLYING LANDING FIELD IMPERIAL BEACH, CALIFORNIA

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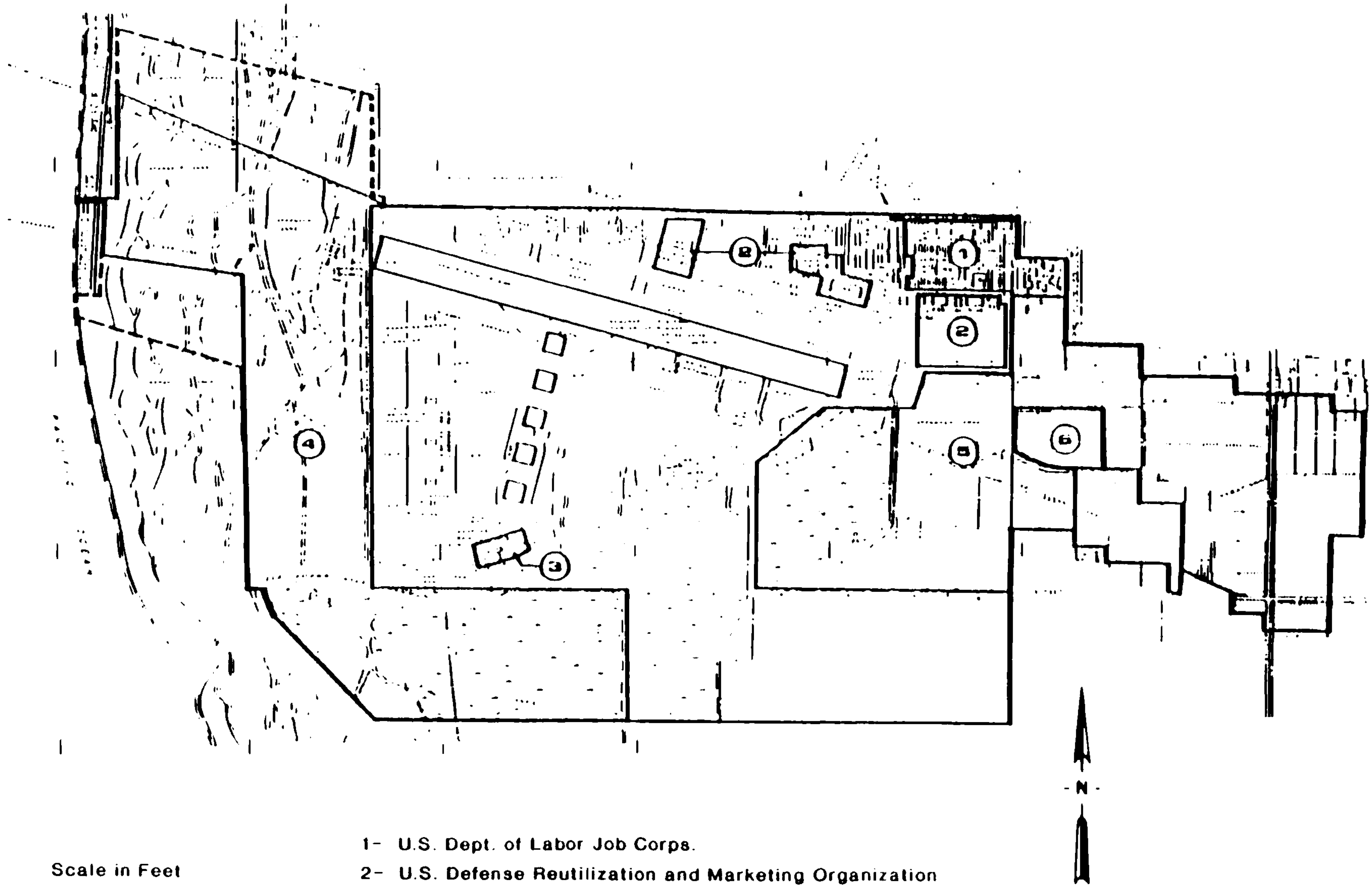

SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986.

FIGURE 2-2
LAND USE WITHIN OUTLYING LANDING FIELD IMPERIAL BEACH, CALIFORNIA

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Table 2-1
Endangered, Threatened, or Rare Species of Outlying Landing Field (OLF), Imperial Beach, California

Sheet 1 of 1

Species	Status[a]	Habitat on or Near the Activity
Plants		
Cordylanthus maritimus ssp. maritimus (Salt marsh bird's beak)	FE/SE	Found in the Tijuana marsh.
Animals		
Charadrius alexandrinus (Snowy plover)	ABL	Migrant commonly seen in Tijuana estuary.
Elanus leucurus (White-tailed kite)	SP	Observed foraging in the Tijuana River Valley.
Falco perigrinus anatum (American peregrine falcon)	FE/SE	Has been seen foraging throughout the Tijuana Estuary and River Valley.
Laterallus jamaicensis coturniculus (California black rail)	SR	Usually resides in marsh habitats. Has not been observed in the estuary for several years and is probably extinct in San Diego County.
Passerculus sandwichensis belding (Belding's savannah sparrow)	SE	Observed throughout the Tijuana estuary and adjacent uplands.
Pelecanus occidentalis californicus (California brown pelican)	FE/SE	Occasionally rests in the estuary between foraging trips to offshore feeding grounds.
Rallus longirostris levipes (Light-footed clapper rail)	FE/SE	Observed throughout the Tijuana estuary.
Sterna albifrons browni (California least tern)	FE/SE	Utilizes the Tijuana estuary as a nesting site.
Vireo bellii pusilus (Least Bell's vireo)	FC	Found in willow thickets throughout the Tijuana River Valley.

[a]FE = USFWS Endangered.
FC = USFWS Candidate for endangered or threatened status.
SE = CDFG Endangered.
SR = CDFG Rare.
SP = CDFG Protected.
ABL = National Audubon Society Blue List.

Source: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

Between 1917 and World War II, OLF generated relatively little waste. However, during World War II, the presumed quantity of waste generation increased. The presumed waste generation increased in the 1950s concurrent with increased facility activities. During the period from 1968 to 1974, waste generation peaked with the stationing of several helicopter squadrons (Ref. 1). During this period, the field reached its present size after construction was completed.

Over the years, waste from OLF resulted from several main operations. These areas are the helicopter squadron training area, the public works center, the fuel farm, the exchange gas station, and transportation.

Wastes from the helicopter squadron training area consist of washrack wastewater, waste lube oils, fuels, hydraulic fluids, and mixed solvents. The washrack wastewater was discharged to storm drains or drainage ditches which in turn, drained to the Tijuana Slough. Aircraft maintenance waste was burned in the firefighting training pits and may have been used for dust control.

Public works waste were from the garage, the paint shop, and the electric shop. The garage wastes consisted of motor oils, fuels, solvents, and hydraulic fluids. Some of these liquids were used for dust control until the late 1950s; after which time the wastes were taken to the fire-fighting training area until 1970. The paint shop generated paint and solvent wastes. Some of these wastes were dumped into Site 7 (Rubble Disposal area). The electric shop generated waste transformer fluid which was disposed of in Site 6 (Firefighting training area).

The fuel farm generated contaminated fuels. On at least one occurrence, water-contaminated fuel was discharged to the storm sewer.

The exchange gas station wastes were used for firefighting training prior to 1980. After 1980, the wastes were disposed offsite. The grease rack rinsate was discharged to the storm sewer.

During the 1940s, to the 1970s, materials handled by transportation operations (refuse demolition debris, paints, old batteries, and rubble) were sent to the disposal site near the southwest end of Runway 27.

In conclusion, the waste from the several main operations may have been disposed in the four potentially contaminated sites that have been identified at OLF. The sites of concern are Firefighting Training Area (Site 6), Rubble Disposal Areas (Site 7), Oiled Areas (Site 8), and Fuel Farm Area (Site 9). These sites and their suspected contaminants are summarized in Table 2-2 and their locations within the OLF are shown in Figure 2-3.

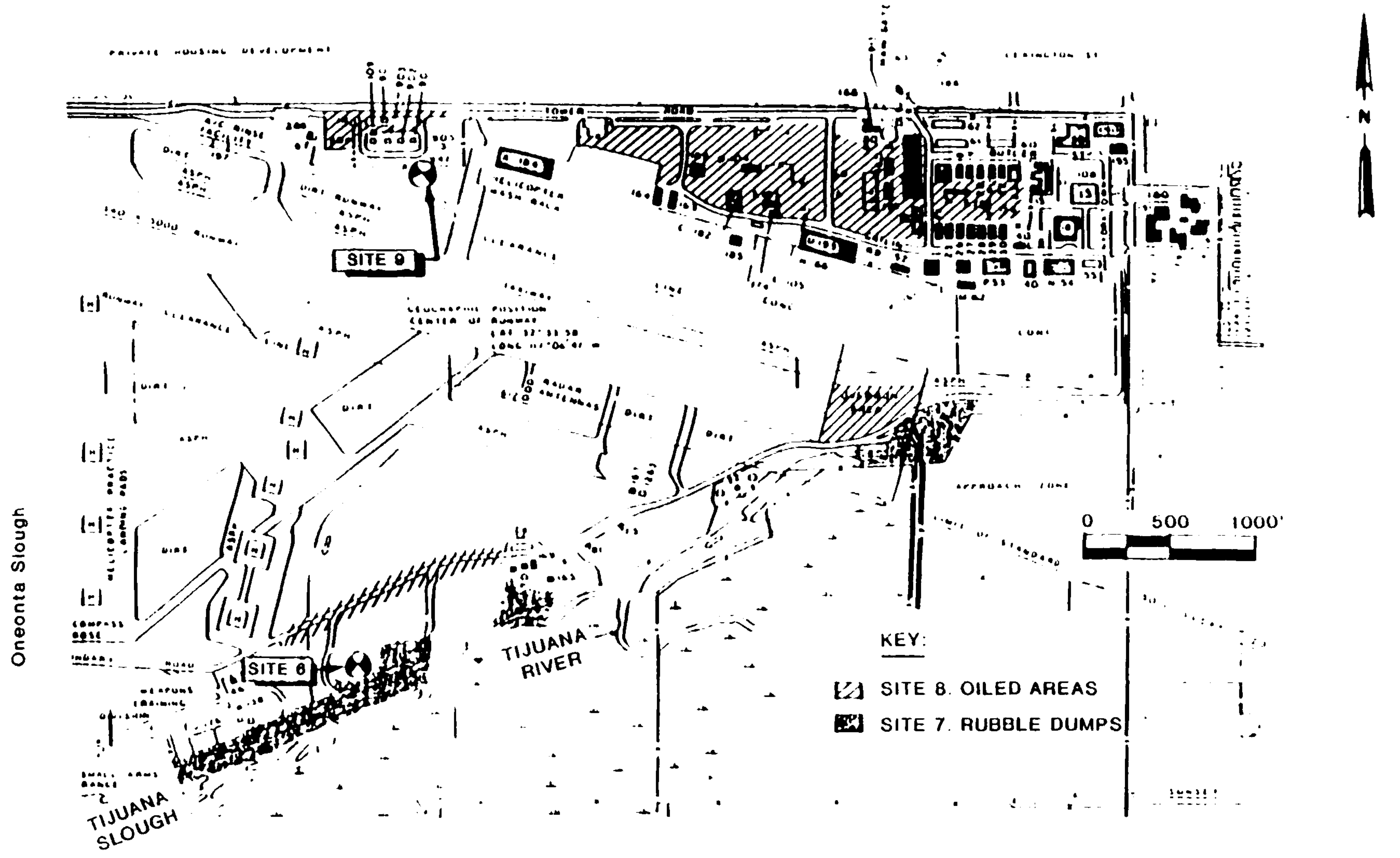
2.2 Site 6 - Firefighting Training Area

The current firefighting training area is located between the southern boundary fence and the Boundary Road, and between the small arms range and recreational park at GDM (NAVFAC Code Identification No. 80091) grid coordinate N-19 (Figure 2-4). This location has been used from the mid-1950s to the present. However, prior to 1970, the training pit was located approximately 50 to 100 feet west of the current pit (Ref. 1).

Table 2-2
Past Disposal Sites at Outlying Landing Field (OLF), Imperial Beach, California

Site No.	Site Name	Period of Operation	Waste Types	Estimated Total Quantities	Sources
6	Firefighting Training Area	Mid-1950s to 1970	JP-5, gasoline, diesel fuel, kerosene, solvents, waste motor oils, hydraulic fluids, transformer fluids	Unknown but considerable	All OLF operations
7	Rubble Disposal Areas	1940s to 1980s	Mainly rubble and demolition debris; some sand-blast grit, oiled soil, and creosoted pilings	Unknown	All OLF operations
8	Oiled Areas	1940s to 1950s	Mostly waste oils and hydraulic fluid; some solvents, kerosene, mineral spirits, and transformer fluids	175,000 to 200,000 gallons	Shop and squadron bowsers
9	Fuel Farm Area	1940s to 1970s	JP-5, gasoline, waste oils, detergents, PD-680, toluene, trichloroethylene, and isopropanol	Unknown	Fuel farm, helicopter maintenance

Source: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

FIGURE 2-3
PAST DISPOSAL SITES AT OUTLYING LANDING FIELD IMPERIAL BEACH, CALIFORNIA

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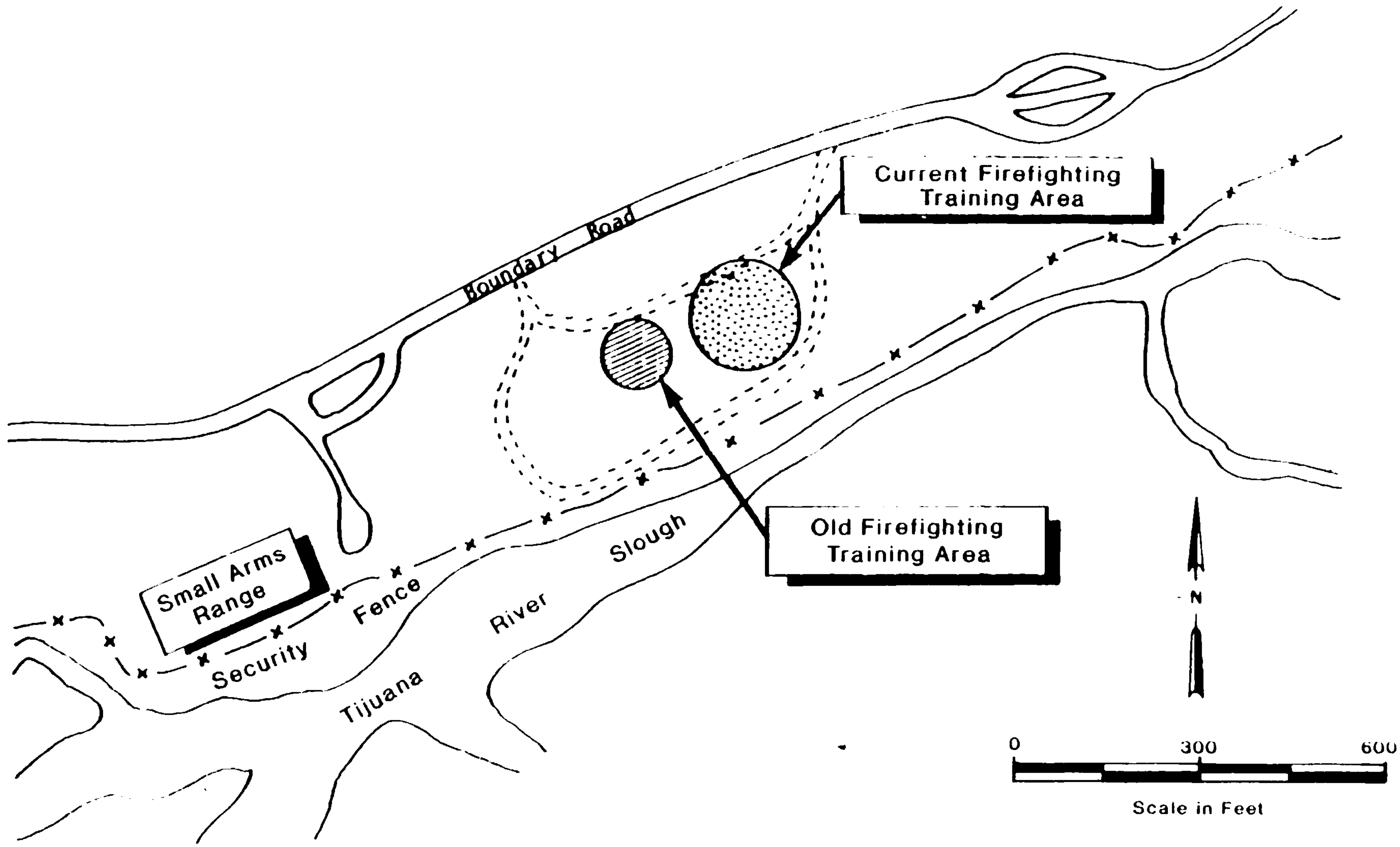

SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

FIGURE 2-4
SITE 6 - FIREFIGHTING TRAINING AREA

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The pre-1970s training pit was unlined and reportedly filled with any available combustible material. The combustibles included diesel, JP-5, gasoline, waste motor oils, hydraulic fluids, PD-680 solvent, kerosene, shop wastes, and transformer dielectric fluids. These materials were discharged into the pit 3 to 4 times a week, up to 1,200 gallons each time, and were ignited approximately once a month. After firefighting training ceased in 1970, the pit was closed and filled. The current ground surface was raised approximately 10 to 15 feet above the original pit due to surface disposal of rubble and demolition waste.

Contaminant pathways potentially include leaching of residual contaminants into the Tijuana River and Oneonta Slough. Furthermore, erosion of the river banks from flooding could release contaminants potentially existing in the vadose zone surrounding the pit. In both scenarios, possible contaminant receptors include the birds, waterfowl, and marine life inhabiting the river and slough. Some of these wildlife are rare, threatened, or endangered species.

2.3 Site 7 - Rubble Disposal Area

The rubble disposal areas are located on the bluffs about 10 to 15 feet above the Tijuana River at the southwestern and southern edge of the OLF between GDM (NAVFAC Code Identification No. 80091) grid coordinates K-26 and Q-16 (Figure 2-5). The site extends approximately 2,400 feet from the southeast edge of Runway 27 to the southwest. The disposal was concentrated in three areas: 1) from the small arms range to the firefighting area, 2) adjacent to, and southwest of, the recreational park, and 3) off the east end of Runway 27 along Boundary Road.

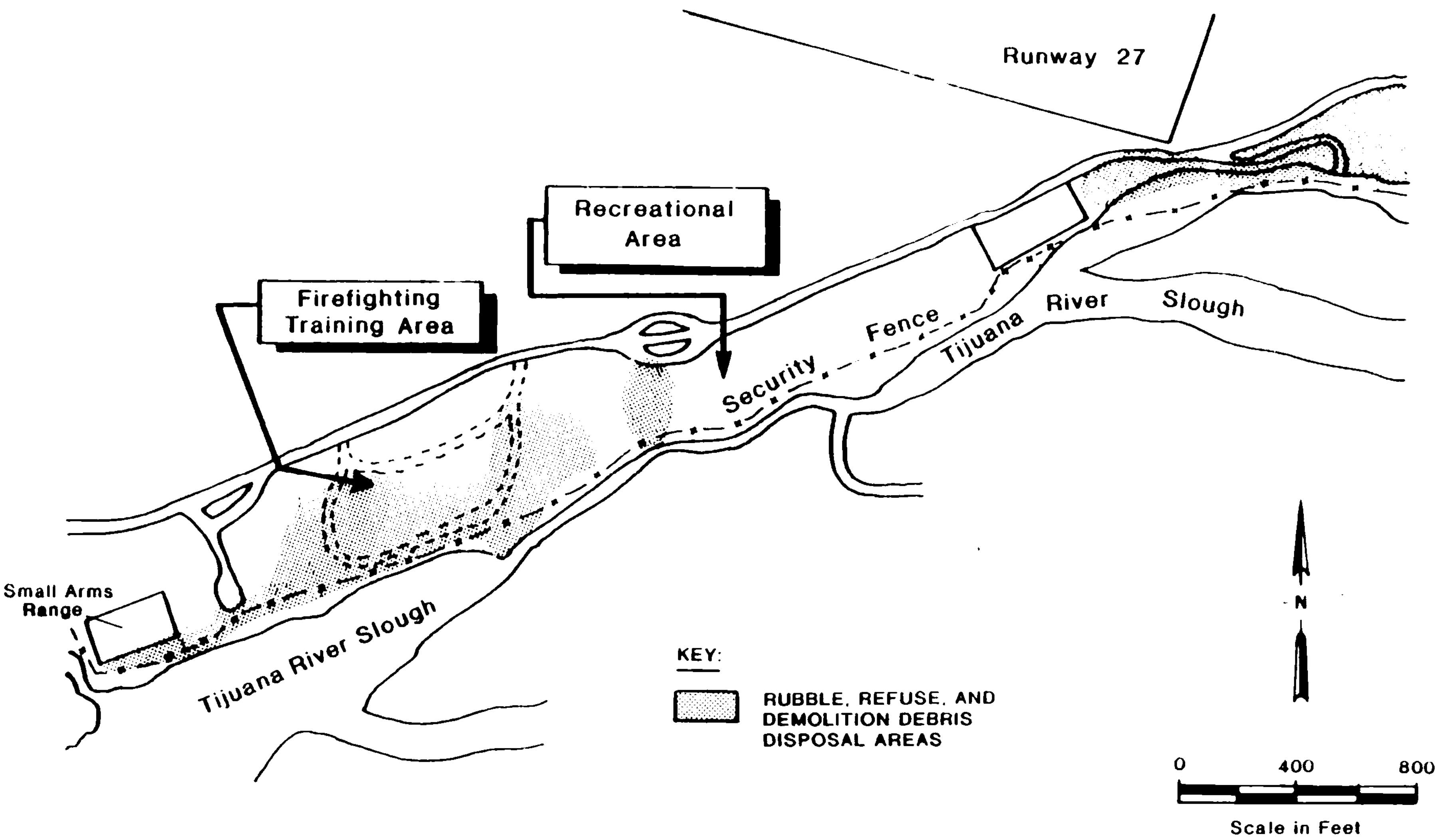
Prior to 10 to 15 years ago, disposal sites were reportedly random. However, since that time, disposal was limited to rubble and demolition debris. In addition, the area contains sandblast grit, oiled soil, and creosoted pilings. No records or knowledge exists of the extent and types of hazardous waste disposal (if any) at this site.

Contamination pathways are similar to the firefighting training area, Site 6. However, the toxicity and mobility of wastes are probably less than those that were disposed of in the firefighting training area.

2.4 Site 8 - Oiled Areas

Since the 1940s, waste oil and other waste hydrocarbons were sprayed on various areas throughout the OLF for dust and weed control. These oiled areas encompass the runway ends, the southern boundary road, and the area north of the runways (Figure 2-6). The bulk of the waste liquids were applied around the complex of buildings located in the northeast section of OLF. The oiling stopped during the late 1950s and early 1960s. Currently, many of these areas are paved. Some of the oily soil has reportedly been removed and placed in the rubble disposal area (Site 7, Ref. 1).

Approximately 300 to 400 gallons of waste hydraulic fluids, oil, and other liquids were sprayed each week. These other liquids, which amounted to less than 5 percent of the entire volume, consisted of kerosene, PD-680 solvents and mineral spirits. Reportedly, dielectric fluids, which may have contained PCBs, were added to the oily mixture on occasion.



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

FIGURE 2-5
SITE 7 - RUBBLE DISPOSAL AREAS

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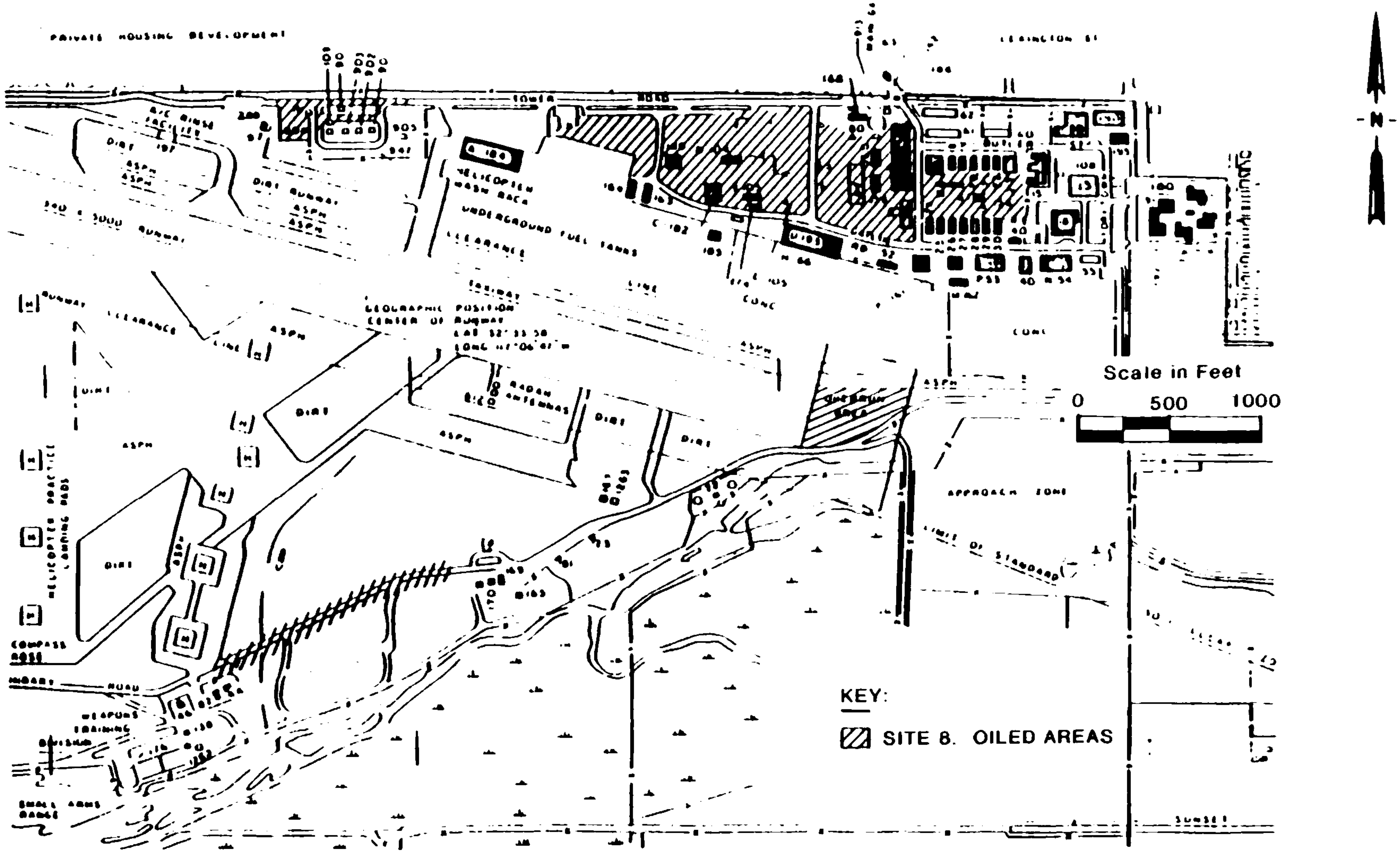

SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986.

FIGURE 2-6
SITE 8 - OILED AREAS

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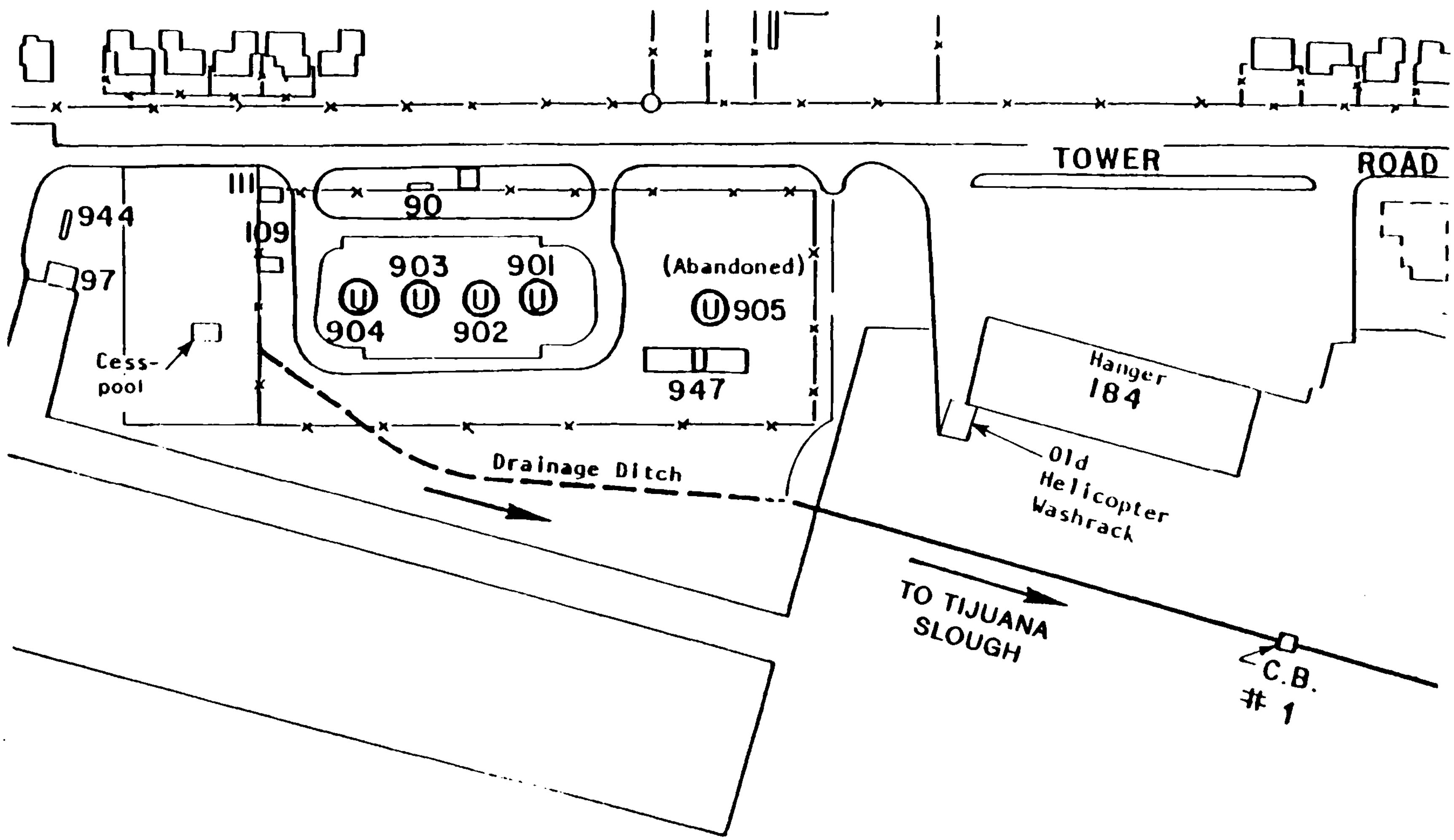
2.5 Site 9 - Fuel Farm Area

The fuel farm area is located along the northern boundary road approximately 800 yards east of the western fence and approximately 1,200 yards west of the main gate between GDM (NAVFAC Code Identification No. 80091) grid coordinates A-5 and A-6 (Figure 2-7). To the west of the fuel farm is a septic tank that did not accept industrial spillage or effluent. However, its location near the fuel farm and helicopter maintenance operations make it suspect to receiving waste materials.

The fuel farm has been in operation since World War II. In the early 1970s, Tank 905 was discovered to be leaking JP-5 fuel through a crack (Ref. 1). The tank had not been emptied in 1976. Random aviation fuel spillage occurred during the filling of underground tanks throughout tank farm operations. In 1972, fuel (JP-5 and MOGAS) contaminated wastewater was discharged into the drainage ditch immediately south of the fuel farm. The removal of water from fuel farm tanks containing small quantities of fuel continued until 1985. Adjacent to the fuel farm operations is Hanger 184, the location of helicopter squadron maintenance operations. These operations discharged helicopter wash wastewaters and other waste materials into the drainage channel south of the fuel farm. This practice continued for approximately 20 to 30 years (from the late 1940s to the early 1970s). The helicopter wash wastewater contained detergents and traces of fuels and oils. The waste materials consisted of JP-5 and MOGAS fuels, waste lube oils, PD-680, toluene, trichloroethylene, and isopropanol.

A potential contaminant pathway includes surface drainage and runoff to the drainage channel south of the fuel farm. This drainage channel flows into the Tijuana River via drainage pipe. Another pathway includes subsurface migration through the vadose zone. The depth to water is 10 to 20 feet below ground surface so that vertical migration to groundwater is likely. Very little aqueous phase transport in the vadose zone should occur. Because groundwater is believed to flow into the Tijuana River, contaminants may migrate towards the river. The potential receptors are the same as in Section 2.2.



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

FIGURE 2-7
SITE 9 - FUEL FARM AREA

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3.0 GEOLOGY

Much of the following geologic information has been taken from the Initial Assessment Study (Ref. 1) and the Verification Step Work Plan (Ref. 2) for OLF Imperial Beach.

The OLF, is located south of San Diego Bay and north of the Tijuana River Valley. The southern portion of the landing field slopes to the Tijuana River Valley which is the dominant topographic feature in the area. To the west of the landing field is the Oneonta Slough, an estuarine tidal salt marsh, and the Pacific Ocean. The estuary and closely associated uplands of the Oneonta Slough encompass approximately 1,180 acres (Ref. 1). Tidal influenced areas include 546 acres of tidal channels, mudflats, and marshlands.

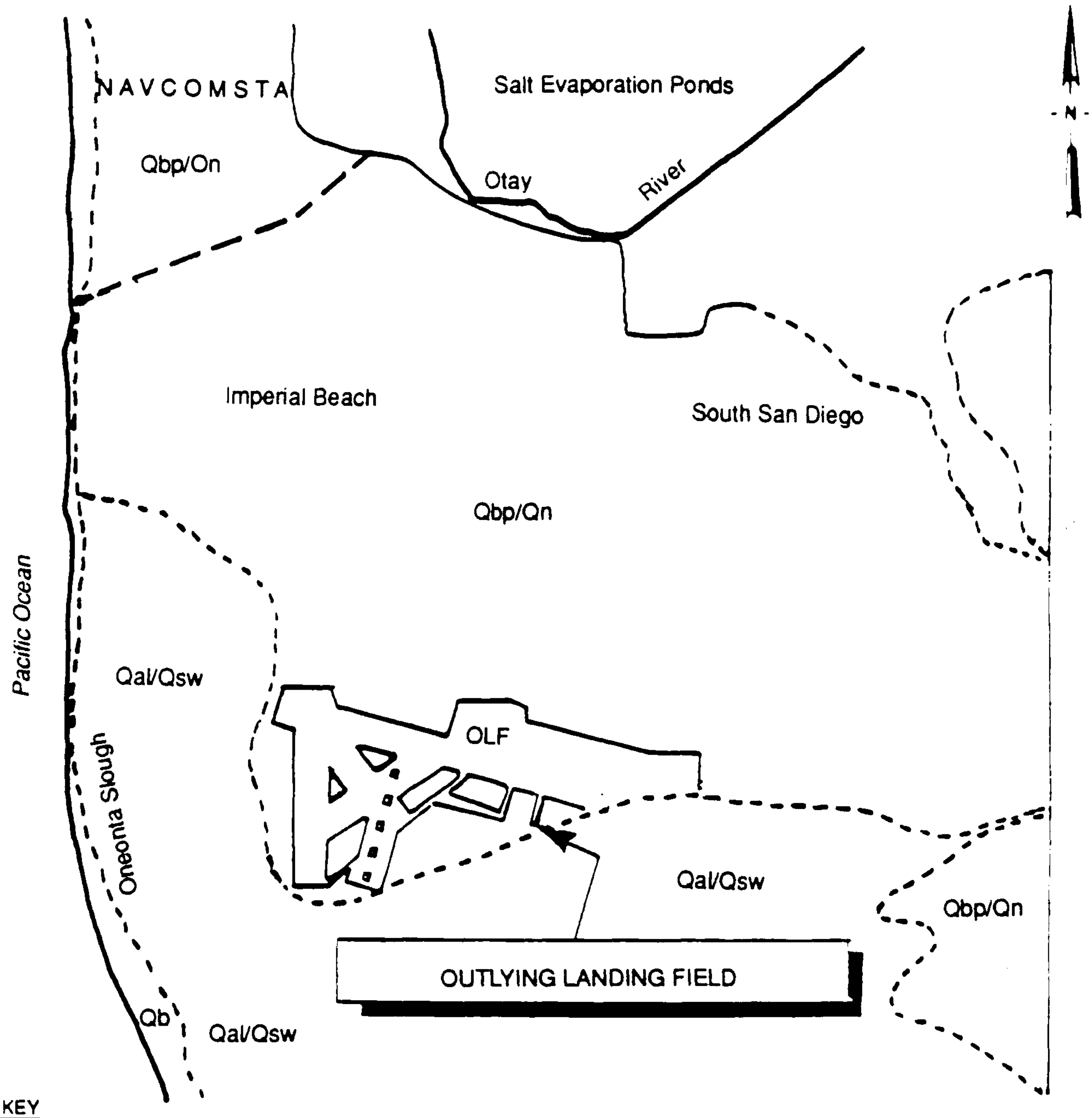
3.1 Stratigraphy

The stratigraphic sequence of the San Diego continental margin is summarized in Table 3-1 (Ref. 3). The table includes the maximum thickness of stratigraphic units and a brief lithologic description. Geologic data which are specific to the OLF, are not available. The surface geology based on regional mapping in the vicinity of OLF, is shown in Figure 3-1. The OLF is located on a marine terrace of Pleistocene sandstones of the Bay Point Formation and unnamed nearshore marine sandstone. The Bay Point formation sediments are poorly consolidated, fossiliferous, fine- to medium-grained sandstones which include marine, lagoonal, and nonmarine slopewash deposits. The unnamed nearshore marine sandstones are fine-grained,

Table 3-1
Stratigraphic Sequence of the San Diego Continental Margin*

Series	Stratigraphic Unit	Maximum Thickness (ft)	Description
Holocene	Beach Deposits	Variable	Unconsolidated shoreline sands and silts.
Pleistocene	Bay Point Formation	50	Predominantly marine, poorly consolidated, fossiliferous, fine- to medium-grained sandstones. Contains non-marine slopewash deposits.
	Lindavista Formation	100	Marine sandstone, siltstone and conglomerate. Contains some nonmarine sediments.
Mio-Pliocene	San Diego Formation (unconformity)	1,400	Marine sandstone, siltstone and conglomerate. Contains some tuff beds.
Eocene	Poway Group	1,000	Continental conglomerate, sandstone and mudstone. Includes Pomerado Conglomerate, Mission Valley Formation and Stadium Conglomerate.
	La Jolla Group (unconformity)	1,200	Marine mudstone, siltstone, shale, sandstone , conglomerate and limestone. Includes Friars Formation, Scripps Formation, Ardath Shale, Torrey Sandstone, Delmar Formation and Mount Soledad Formation.
Cretaceous	Rosario Group (unconformity)	2,000	Marine sandstone, siltstone and conglomerate. Includes Cabrillo Formation, Point Loma Formation and Lusardi Formation.
Jurassic and Cretaceous	Santiago Peak Volcanics	15,000 (Santiago Peak Volcanics)	Metamorphosed lava flows and tuff breccia of andesite, dacite and rhyolite. Also tuffaceous sandstone, shale, quartzite and conglomerate.
	Plutonic Rocks of Southern California Batholith	Unknown (Plutonic)	Plutonic rocks include grandiorites, tonalites, quartz diorites and gabbros.

* After Brown and Caldwell, 1983.



KEY

Qal/Qsw - Quaternary alluvium and Quaternary slope wash
Qb - Quaternary Beach Deposits
Qbp/Qn - Quaternary Bay Point Formation and Quaternary Nearshore Sandstone

GRAPHIC SCALE
0 2,000 4,000 6,000 FEET

SOURCE: INITIAL ASSESMENT STUDY, NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY, FEBRUARY 1986

FIGURE 3-1
GEOLOGIC MAP
OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

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poor and well sorted, light brown sandstones which are undistinguishable from the Bay Point Formation in this area. An unconformity of low relief separates these deposits from the underlying older sediments. The unconformity is usually planar but has up to 30 feet of relief locally (Ref. 5).

The Miocene-Pliocene San Diego Formation has two components, an uppermost conglomerate and a lower sandstone. Both parts crop out east and south of the landing field. The outcrops to the east have a shallow southwestward dip and generally occur further upstream along the northern side of the Tijuana River Valley. Out crops to the south across the Tijuana River Valley are fault related. It is not known whether one or both parts of the formation underlie the landing field.

The late Pliocene (Ref. 4) conglomerate portion of the San Diego Formation is a pebble, cobble, and boulder conglomerate in coarse-grained sandstoned matrix. It is typically poorly sorted, well indurated, cemented with ferruginous cement, and moderately reddish brown in color. Clasts include siliceous metavolcanic tuff of the Eocene Poway Group and Mesozoic granitic and low-grade metamorphic rocks. These strata are very resistant to weathering and crop out in steep exposures.

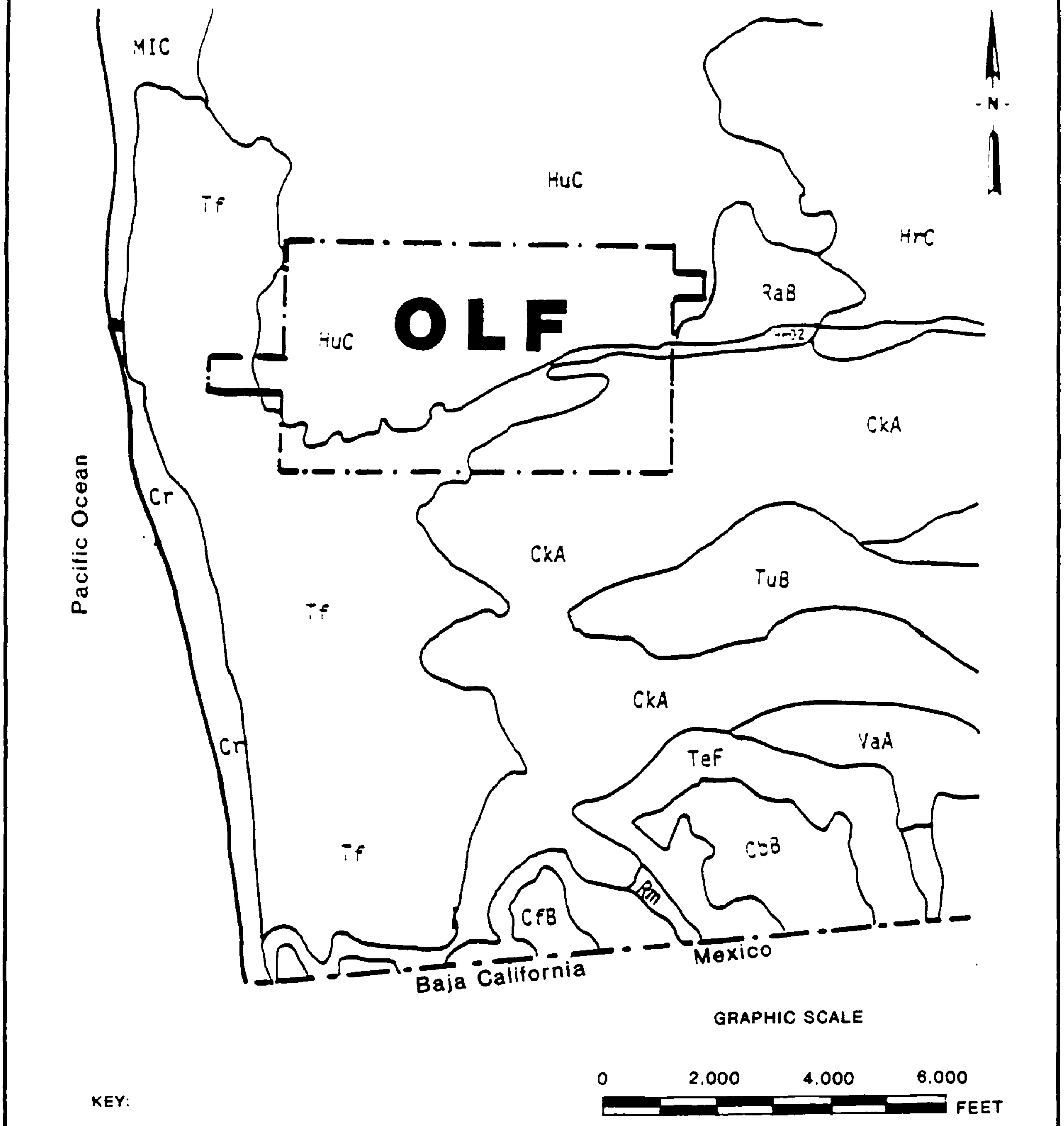
The middle and late Pliocene marine sandstone portion of the San Diego formation is fine- to medium-grained and typically poorly indurated, yellowish-brown, and locally cemented with calcareous cement. These strata are characteristically friable, easily eroded, and of low relief in crop out.

Quaternary alluvial and slopewash deposits cover the Tijuana River Valley and may attain thicknesses of 130 feet. The deposits are generally unconsolidated sands and gravels in the east and silts and clays near the coast. These are underlain by Tertiary conglomerates, sandstones, shales and limestones (Ref. 5).

3.2 Soils

Four different soils have been mapped by the Soil Conservation Service (Ref. 6) at OLF Imperial Beach as shown in Figure 3-2. They are the Huerhuero-Urban land complex, which covers the developed portions of the landing field, the Huerhuero loam, which borders the Tijuana River near the east-central portion of the base, the Chino silt loam in the floodplain of the river, and tidal flats which cover the area to the south and west of the base. Table 3-2 summarizes key soil characteristics. Detailed descriptions of the four soils described in the IAS (Ref. 1) follows:

o Huerhuero-Urban land complex, 2 to 9 percent slopes. This complex occurs on marine terraces at elevations that range from sea level to 400 feet. The landscape has been altered through cut and fill operations and leveling for building sites. Before cut and fill operations and leveling, the slope was 2 to 9 percent. The material exposed in the cuts consists of unconsolidated sandy marine sediments. The material in the fills is a mixture of loam and clay loam and sandy marine sediments. Between the leveled building lots are moderately steep escarpments that are easily eroded.



KEY:

- Hr02 - Huerhuro Loam
- CkA - Chino Salt Loam
- Tf - Tidal Flats
- HuC - Huerhuro Urban Complex

(note: only soils found at OLF shown in this key)

SOURCE: INITIAL ASSESMENT STUDY, NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY, FEBRUARY 1986

FIGURE 3-2
SOILS MAP
OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

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Table 3-2
Characteristics of Outlying Landing Field Imperial Beach Soils[a]

Soil Series/Map Symbol	Thickness (inches)	Composition	USDA Classification	Permeability (inches/hour)	Available Water Capacity (inches/ inches)	Relative Shrink/ Swell Potential	Relative Erodibility
Huerhuero (HrD2)	0-12	Loam	ML	0.63-2.0 4.5×10^{-4}-1.4×10^{-3}cmls	0.16-0.18	High	NL[b]
	12-55	Clay and clay loam	CL	<0.06	0.04-0.06	NL	NL
	55-68	Sandy loam	SM or SC	0.63-2.0	0.11-0.13	NL	NL
Huerhuero (HuC)	NL	NL	NL	NL	NL	High	NL
Chino (CkA)	0-60	Silt loam and loam	ML or CL	0.63-2.0	0.13-0.17	Moderate	Moderate
Tidal Flats (Tf)	NL	NL	NL	NL	NL	High	Severe

a After USDA, 1970.
b NL = Not listed by USDA, 1970

- Huerhuero loam, 9 to 15 percent slopes, eroded. This soil is strongly sloping. The available water capacity is 0.04 to 0.18 inch/inch, with moderate to low permeability (<0.06 to 2.0 inches/hour) and a high shrink/swell potential. In other features, this soil is similar to Huerhuero loam, 5 to 9 percent slopes.

- Chino silt loam, saline, 0 to 2 percent slopes. This soil is slightly saline, and is silt loam to loam throughout the profile. The available water capacity is 0.13 to 0.17 inch/inch, with moderate permeability (0.63 to 2.0 inches/hour), moderate shrink/swell potential, and moderate erodibility.

- Tidal Flats. This soil type occurs as level areas that are periodically covered with tidal water. The areas are essentially barren. The texture ranges from clay to very fine sand. Typically, the material has an excess of soluble salts, a high shrink/swell potential, and severe erodibility. The higher parts that are seldom covered during high tide support a sparse salt-tolerant vegetation.

3.3 Structural Geology

The San Diego Formation strikes northwest-southeast and dips three to five degrees to the west in the outcrops to the east of the OLF, (Ref. 4). The Bay Point and unnamed sandstones likely have similar orientations. To the south of the OLF, on the south side of the Tijuana River Valley, a series of north-south trending, steeply-dipping normal faults offset the Mio-Pliocene San Diego Formation and the Pleistocene Lindavista Formation. If these faults continue northward through the Tijuana River Valley, they could occur in the San Diego Formation beneath the OLF. Two northwest-southeast trending faults offset the Bay Point Formation and possibly Quaternary alluvium southeast of the OLF. The two faults project northwestward near the north and south sides of the OLF. If faults exist at OLF, they may act as pathways to groundwater flow.

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4.0 HYDROGEOLOGY

4.1 Surface Water

The Tijuana River, which originates in Mexico, flows north across the border, meanders northwestward through the river valley, and flows into the Tijuana River Slough coastal estuary as it approaches the Imperial Beach city limits. The river and its tributaries drain an area of approximately 1,731 square miles, 73 percent of which is in Mexico (Ref. 3). Little flow is contributed by the streams of the lower valley area of the basin except during the rainy season in the winter (Ref. 6). Periodic flooding occurs during high-intensity storms of short duration in the mountainous areas of the Tijuana River Basin. The United States side of the border, 4,446 acres, are subject to inundation by 100-year floods (Figure 4-1). The river channels in the lower sections of the Tijuana River Valley are only capable of handling smaller flooding events. During major flooding events, practically the entire valley is inundated with water.

Significant erosion occurs during large flooding events on the Tijuana River. The most recent major flood, which occurred in the winter of 1979-1980, reached the approximate boundaries of the defined 100-year floodplain. The event caused large areas of erosion to a depth of 6 feet followed by deposition of floodwater sand. Historical floods have eroded the banks along the southern edge of the OLF, Imperial Beach. The firefighting training area, Site 6, is located about 350 to 400 feet north of and about 10 feet higher in elevation than the Tijuana River. It is possible that future flooding could cut as far back as the old firefighting training pit.

The major surface drainage feature associated with the fuel farm area, Site 9, is a drainage ditch which flows to a discharge point into the Tijuana River Slough. The flow path across the base is shown in Figure 2-7.

4.2 Groundwater

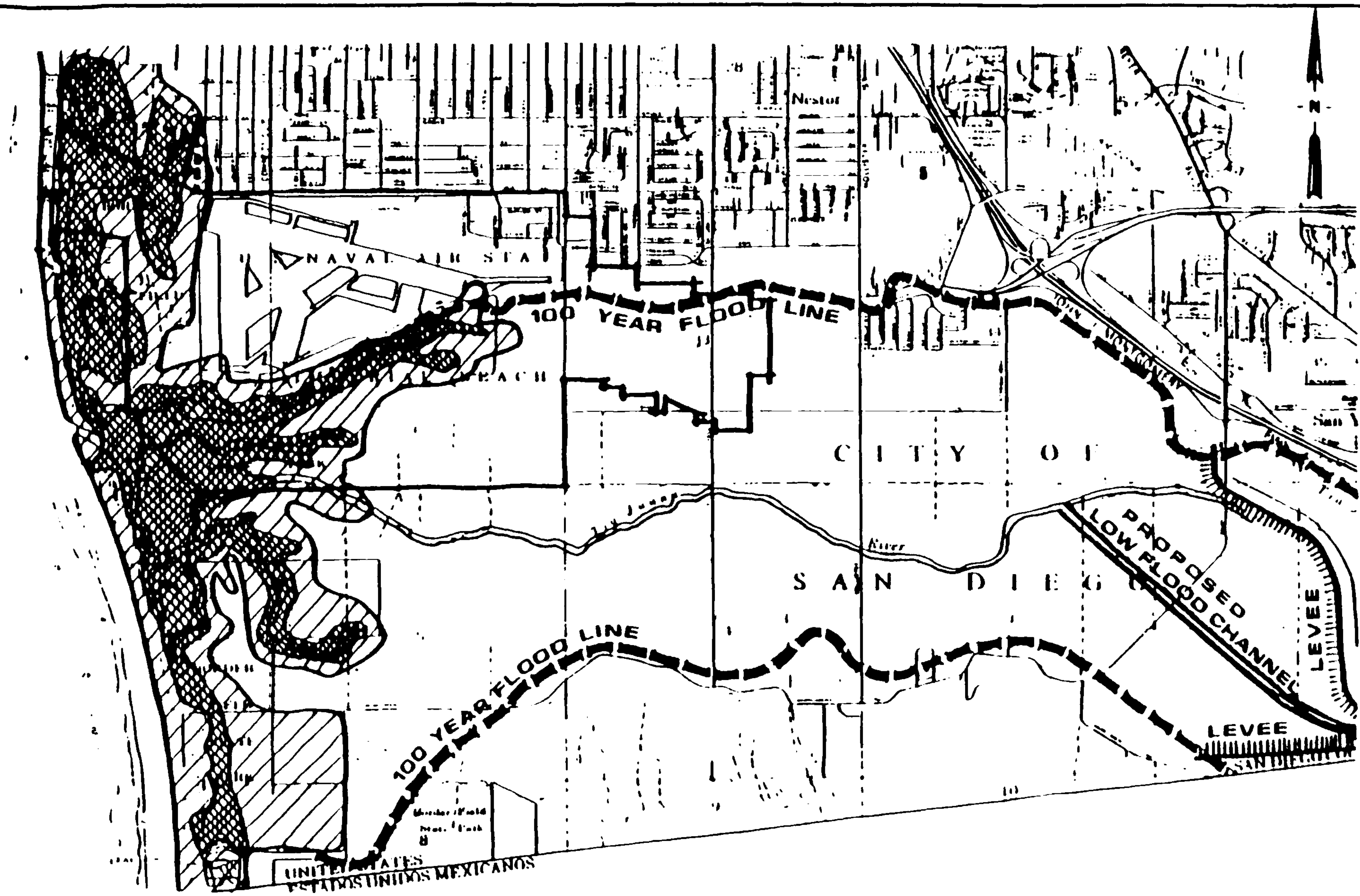
4.2.1 Regional Hydrogeology

4.2.1.1 Wells Within One Mile of OLF, Imperial Beach

Figure 4-2 displays wells within one mile of OLF which are registered with the Department of Water Resources. A record search at the San Diego County Department of Environmental Services yielded only one well log. Most of the wells are agricultural wells located southeast of the OLF in the Tijuana River Valley. Well construction data gathered from the Department of Water Resources for some of these wells are summarized in Table 4-1. Most of the wells are perforated between 80 and 150 feet. These data have not been field checked.

4.2.1.2 Directions of Flow

A map of groundwater elevations in the Tijuana River Valley in 1961 (Figure 4-3, Ref. 8) indicates flow toward the center of the Tijuana River Valley due to agricultural well pumping. These wells are now used much more infrequently due to degradation of



SCALE IN FEET

0 2,000 5,000

SOURCE: INITIAL ASSESSMENT STUDY
NAVAL OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

FIGURE 4-1
100-YEAR FLOOD PLAIN MAP
OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

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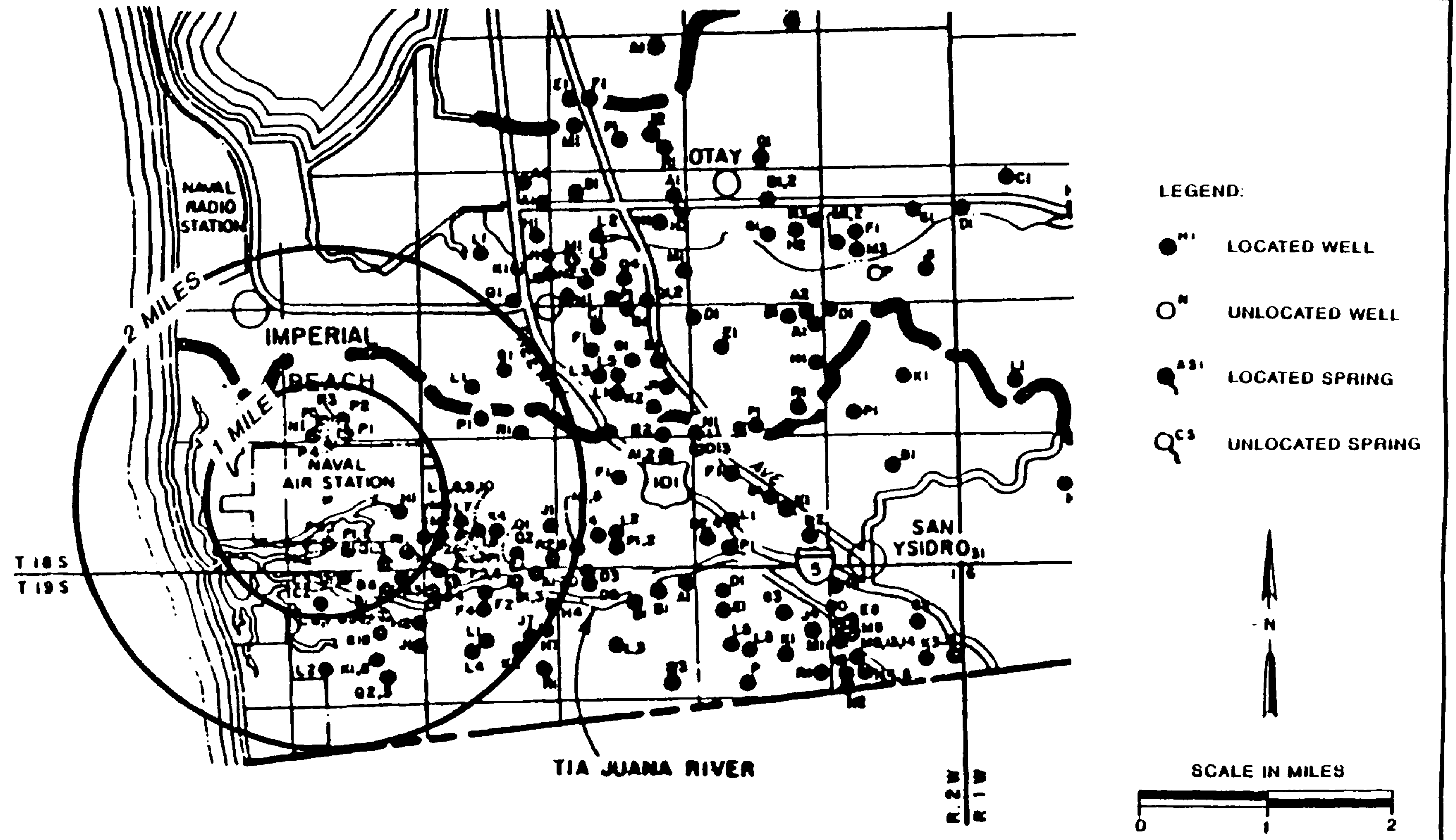

SOURCE: California Department of Water Resources, Bulletin 106-2

FIGURE 4-2
WELLS NEAR THE OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

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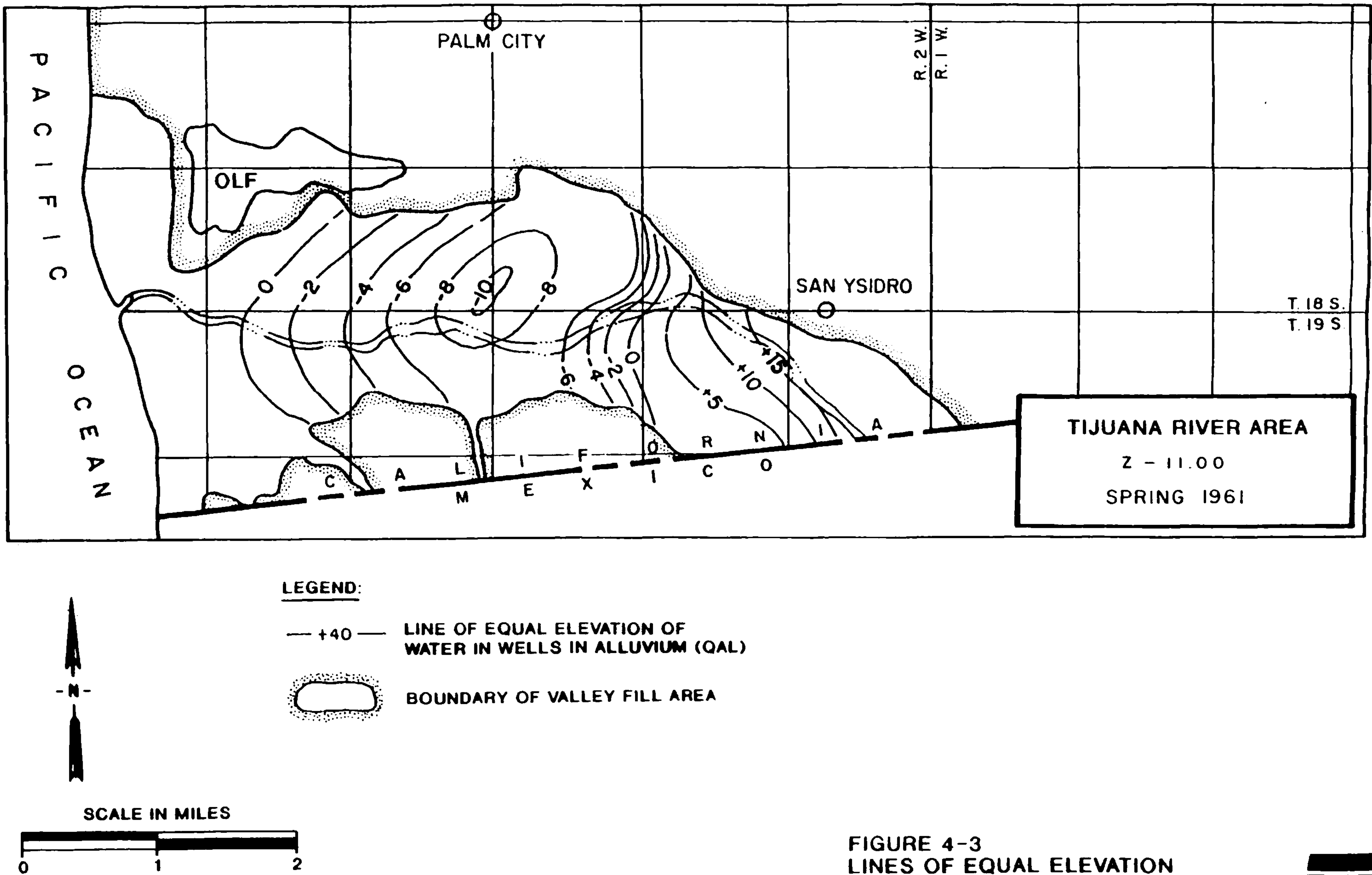
Table 4-1
Wells Near the Outlying Landing Field
Imperial Beach

State Well No.	Well Owner	Depth (feet)	Diameter (inches)	Perforated Interval (feet)	Use	Date Drilled (completion)	Well Log	Comments
18S/2W-32 Q7	George Wetmore	118	12	90-105	Irrigation	01/28/53	Yes	S 1/2 of SW 1/4 of SE 1/4 of Sec 32
18S/2W-33 J1	Fred W. Stafford	255	10	--	Irrigation	--	Yes	Incomplete well log
18S/2W-33 K4	Mr. James Jackson	105	12	76-92	Irrigation	08/54	Yes	SE corner of 19th & Sunset, Nestor, CA
18S/2W-33 LIO	Robert Egger	1,412.5	12	1,379-1,394	---	04/63	Yes	90' N of Sunset Ave, 500' w/o 19th
18S/2W-33 M3	Harry Ito	131.5	12	75-95	Irrigation	04/12/56	Yes	W 1/2 of NE 1/4 of SW 1/4 next to Sunset St.
18S/2W-33 N	R.H. Landgraf	150	8 5/8	35-55 & 110-150	Domestic	06/29/77	Yes	SW 1/4 of SW 1/4
18S/2W 33 Q2	CA Water & Tel. Co.	23	3	---	---	04/05/54	Yes	SW 1/2 of SE 1/4
18S/2W 33 R2	CA Water & Tel. Co.	23.5	3	---	---	04/05/54	Yes	SE 1/4 of SE 1/4
19S/2W 4 A1	C. Rendon	86	10	72-79	Irrigation	03/18/57	Yes	2336 National Ave.
19S/2W 4 B1	CA Water & Tel. Co.	23.3	3	---	---	03/30/54	Yes	NW 1/4 of NE 1/4
19S/2W 4 D4	Hollis Peavey	89	10	70-85	Irrigation	08/21/58	Yes	1695 19th.
19S/2W-4 F3	Hollis Peavey	149	14	130-140	Domestic	10/10/55	Yes	1395 19th St.

Table 4-1
Wells Near the Outlying Landing Field
Imperial Beach

State Well No.	Well Owner	Depth (feet)	Diameter (inches)	Perforated Interval (feet)	Use	Date Drilled (completion)	Well Log	Comments
19S/2W-4 J1	A. Horn	20	3	---	---	04/01/54	Yes	NE 1/4 of SE 1/4
19S/2W-4 M3	Fenton Materials	155	12	117-134	Irrigation	09/30/71	Yes	NW 1/4 of SW 1/4
19S/2W-4	Mrs. Emil Breuhlmeier	240	10	83-95, 115-125	Domestic	12/11/57	Yes	2159 Monument Rd
19S/2W-5 K2	Knox Dairy Products	176	12	83-130	Irrigation	05/19/51	Yes	SE 1/4 of NW 1/4 of SE 1/4
19S/2W-5 1	Claude Kuebler	150	12 3/4	80-107, 141-146, 131-139	Irrigation	--	Yes	200' west of Well 19S/2W-5 K2



SOURCE: California Department of Water Resources Bulletin 106-2

FIGURE 4-3
LINES OF EQUAL ELEVATION OF WATER IN WELLS IN THE TIJUANA RIVER AREA, SPRING, 1961

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water quality. Pumping in the Tijuana River Valley appears to have induced flow southeastward from OLF, towards the wells. Salt water intrusion is likely to have been induced by inland pumping.

4.2.1.3 Groundwater Chemistry

The Tijuana River previously was used for irrigation and limited industrial, domestic, and military uses. The groundwater of the lower Tijuana River Basin is not currently suitable for irrigation, livestock, domestic, industrial, or military use (Ref. 8). Water quality has been adversely affected by salt water intrusion, increases in salt concentrations from recirculation of groundwater, and increases of nitrates and total dissolved solids from fertilization, irrigations returns, and dairy farming (Ref. 8). High sulfates and chloride also limit the use of shallow groundwater. According to the Water Quality Control Plan (Ref. 8), the only designated beneficial groundwater use is for aquifer recharge to flush poor-quality water from the alluvium.

4.2.2 Hydrogeology of the Outlying Landing Field, Imperial Beach

4.2.2.1 Hydrogeologic Units

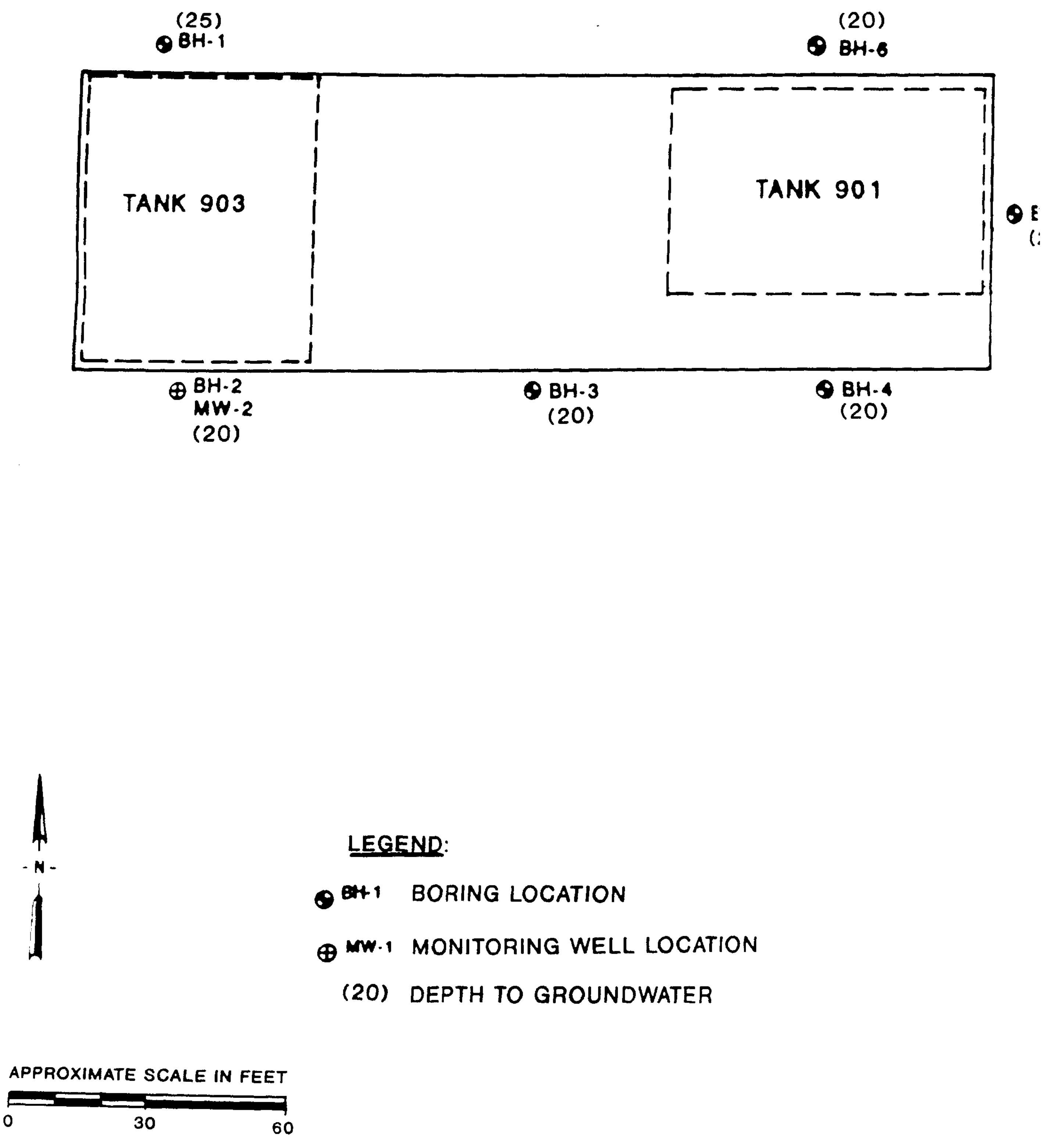
Groundwater at OLF, likely occurs in the Bay Point Formation and the deeper San Diego Formation. Soil borings in the fuel farm area encountered sandy silt and silty sand in the upper 5 to 20 feet (Ref. 9). This may have been soils, fill and/or the Bay Point Formation. The lower 1 to 10 feet was generally coarse sand with some cobbles. This may have been more fill or possibly the San Diego Formation.

4.2.2.2 Directions of Groundwater Flow

Reliable groundwater information specific to OLF is limited to ten soil borings and two groundwater wells recently installed at Site 9, the fuel farm (Ref. 10). The depth to groundwater ranges from 18 to 25 feet below the surface, with most depths at about 20 feet (Figure 4-4). The fuel farm elevation is above the 20 foot contour line of the topographic map (Figure 4-5) indicating a groundwater elevation a few feet above sea level. Assuming the two groundwater monitoring wells, MW-1 and MW-2, are at approximately the same elevation, depth to groundwater indicates an apparent flow direction.

Groundwater systems near rivers generally discharge to the river during normal river flow. Therefore, directions of flow may be controlled by their proximity to the Tijuana River Slough to the south or the Oneonta Slough to the west. Groundwater in the vicinity of these two areas may be expected to flow to the south, west, or southwest. Diurnal tidal influences may occur near both of the sloughs, though influences likely dissipate rapidly away from the tidally influenced portions of the sloughs.

During Tijuana River flood stages, the water level in the river may rise above the water table level. The river would then recharge the shallow aquifers and shift flow away from the river some distance, northward, until floodwater subsides. Flood stages in the semiarid climate of the San Diego area are rare. Hence, normal flow stages and directions of flow towards the Oneonta and Tijuana Slough should prevail.



SOURCE: Draft Site Assessment Report-CTO26, Navy Clean Program, July 1990.

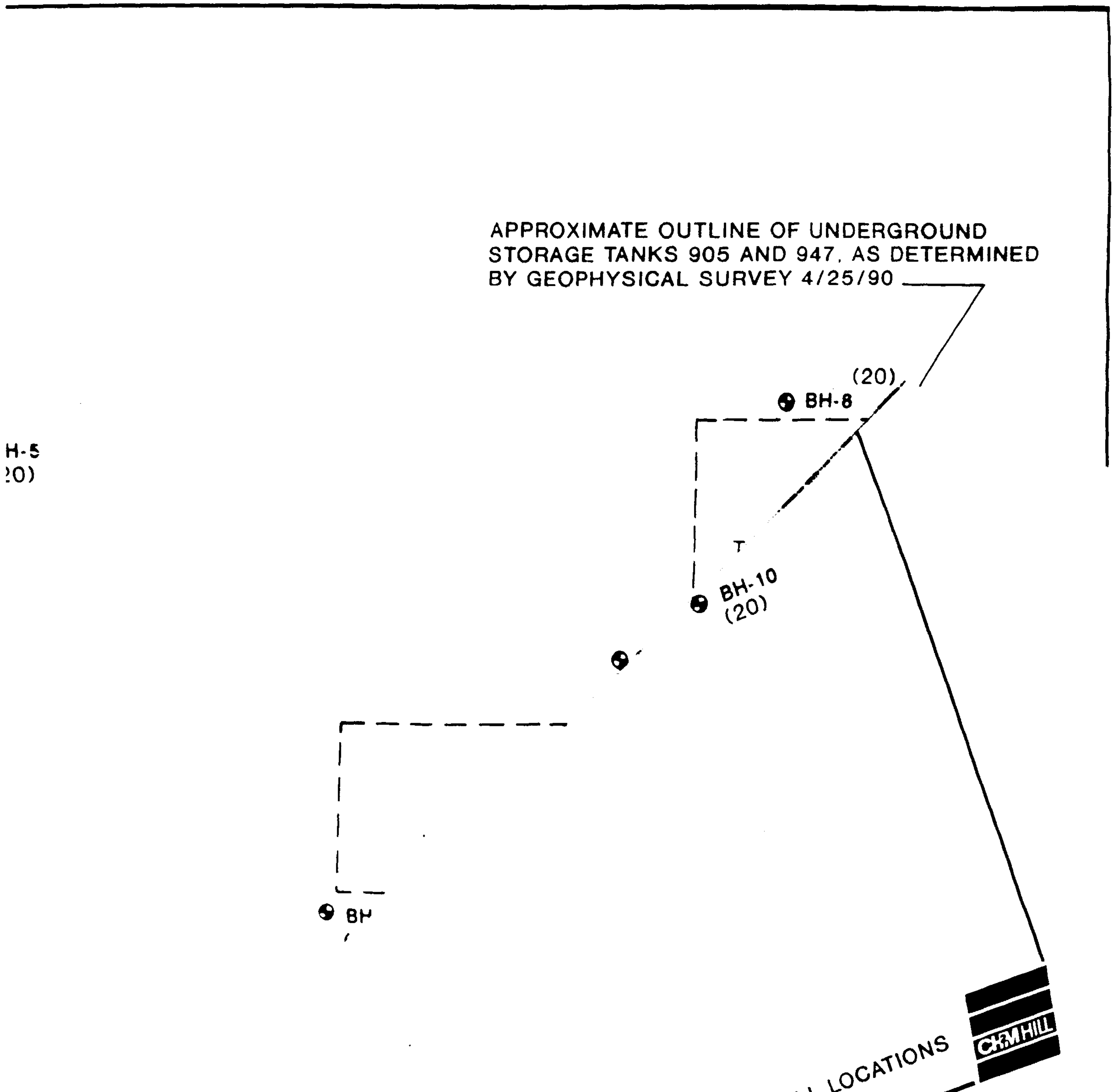


FIGURE 4-4
BORING/MONITORING WELL LOCATIONS
AT THE FUEL FARM, SITE 9

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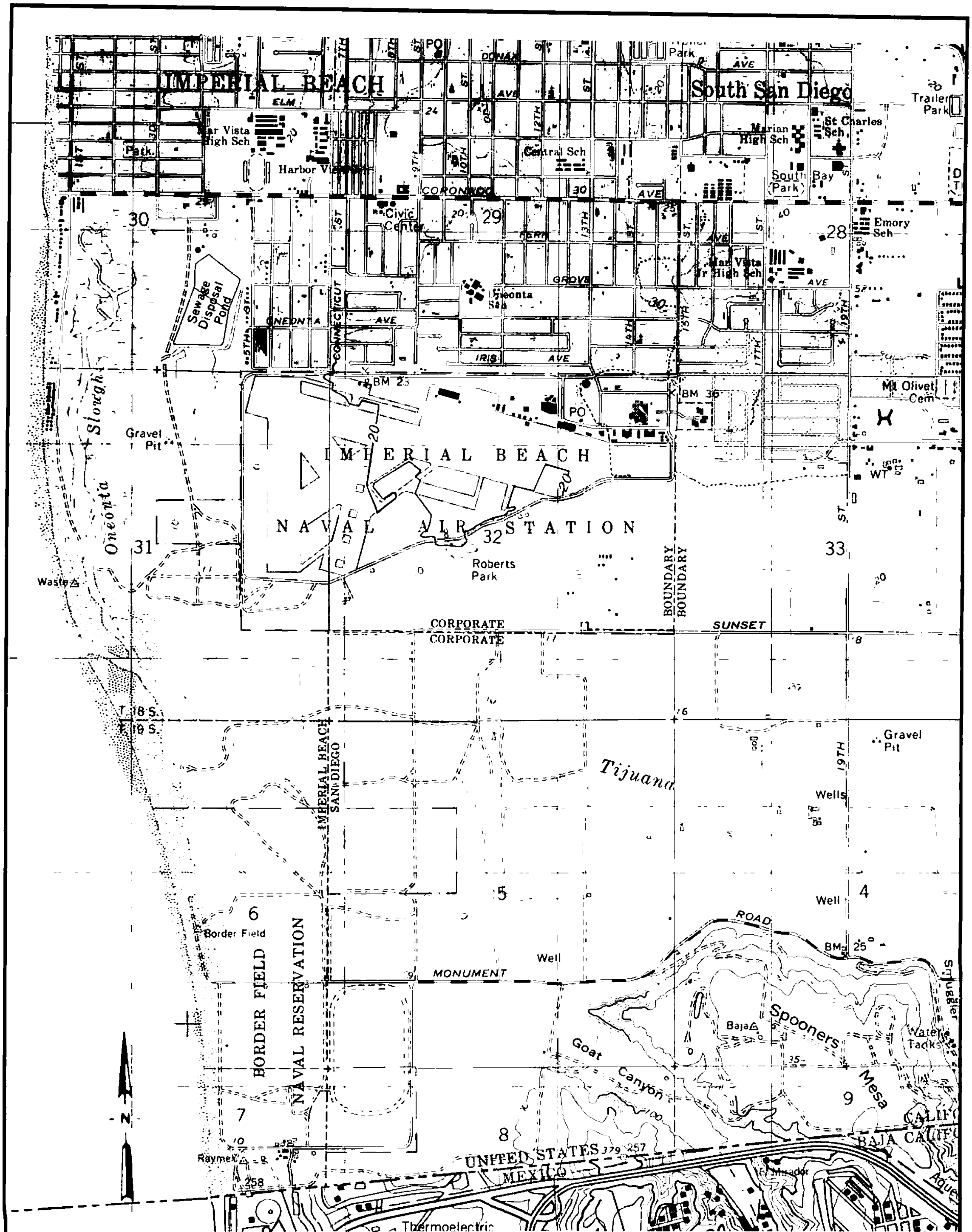

SCALE IN FEET

0 1,000 2,000 3,000

SOURCE: 7.5 Minute USGS Imperial Beach Quadrangle

FIGURE 4-5
TOPOGRAPHIC MAP OUTLYING LANDING FIELD
IMPERIAL BEACH, CALIFORNIA

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4.2.2.3 Aquifer Parameters

Aquifer parameters are not available for geologic materials at OLF since aquifer tests have not been performed. Aquifer parameters will be estimated from aquifer tests subsequent to the installation of monitoring wells.

4.2.3 Contaminant Migration Potential

Contaminants may migrate through the vadose zone to the water table or the potential contaminant source may be in direct contact with the groundwater.

Hydraulic conductivity, groundwater gradients, and aquifer porosity are needed to accurately estimate contaminant migration rates. Hydraulic conductivities and therefore contaminant migration rates are expected to be lower in the silty sand of the Bay Point Formation than the conglomerate of the San Diego formation and in fill material. The SWAT and SI work will provide information to assess migration rates through conduct of aquifer tests, collection of water level elevations, and conduct of soil borings.

Human contact with water may occur in the lower Tijuana River. If contamination discharges to the river along the southern bank of OLF, there is a possibility for direct human skin contact or consumption. Groundwater contamination may also enter the food chain of the Tijuana River, the Oneonta Slough, and the coastal area of the Pacific Ocean.

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5.0 FIELD INVESTIGATION PLAN

The IAS identified the four potentially contaminated sites at the OLF based upon review of historical records, aerial maps, and interviews (Ref. 1). Soil and groundwater quality data collected during the SI will aid in evaluating the threat or potential threat to public health or the environment.

The QA/QC Plan, included in Appendix A, presents details on the following: field measurements, sample collection and shipping, QA/QC, calibration, audits, corrective action, and maintenance of project records. Section 5.0 of Appendix A identifies in detail the data needs and rationale for further investigation of each site on the Outlying Landing Field, Imperial Beach.

5.1 Preparation for Field Work

Additional information which becomes available before the field work begins will be reviewed and pertinent findings will be considered to update the field investigation plan.

5.2 Geophysical Survey

A geophysical survey will be conducted prior to drilling activities. The purpose of this survey will be to identify buried obstructions including underground utilities and water lines that should be avoided during drilling work. The geophysical survey may include ground penetrating radar

(GPR), electromagnetic techniques, and/or other methods determined appropriate by a geophysical surveying subcontractor.

5.3 Drilling and Soil Sampling for the Proposed SWAT

All drilling operations and sample collection will be performed in accordance with Jacobs' Standard Operating Procedures (SOPs). Copies of SOPs relevant to this assignment are included in Appendix C. Field procedures for borehole sample collection are summarized in Section 6.0 of the QA/QC Plan, included in Appendix A.

5.3.1 Technical Approach

At drilling locations selected on concrete or asphalt, a core will be drilled through the surfaces to allow access for a nominal 8-inch-diameter hollow-stem auger drill. Drilling equipment used will depend primarily on site access. Soil borings may be drilled using a truck-mounted auger drill. Soil borings will be advanced to an approximate depth of 30 feet below grade. Soil samples will be collected at the surface and at 2.5, 5, 7.5, 10, 15, 20, 25, and 30 feet in each boring in oiled areas and every 5 feet in other borings. A Modified California Split-Spoon Sampler with brass sleeves will be driven into the soil ahead of the auger to obtain the sample at the first sample interval (2.5 feet). The auger will then be advanced and the sampler extracted.

The contents of the sampler will be inspected visually to detect gross contamination. All visual observations and pH measurements will be logged in the field notebook. Each split-spoon core will be geologically logged and classified in accordance with Unified Soil

Classification System (USCS) standards. The following information will be entered into the field logbook for each soil sample taken:

- o Designated number of the borehole
- o Location of the boring
- o Time the soil sample is taken
- o Sample depth interval
- o Number of blows per 6-inch sample drive
- o Length or percentage of sample recovered
- o Total organic vapor measurements of soil vapor headspace
- o Sample description and USCS classification
- o Name of person collecting the sample
- o Any other relevant observations

The split-spoon sampler will be used with a brass sleeve that is divided into three to four segments. The segments will be used as follows:

1. The deepest segment downhole will be packaged and stored on ice for potential laboratory analysis.

2. The next segment up in the sampler barrel will also be stored on ice and will be used for a co-located laboratory sample (if necessary).

3. The next segment (along with segment 2, when available) will be used for lithologic logging and field screening. The sample will be screened by placing

the segment in a glass jar and monitoring with a photoionization detector (PID) or an organic vapor analyzer (OVA).

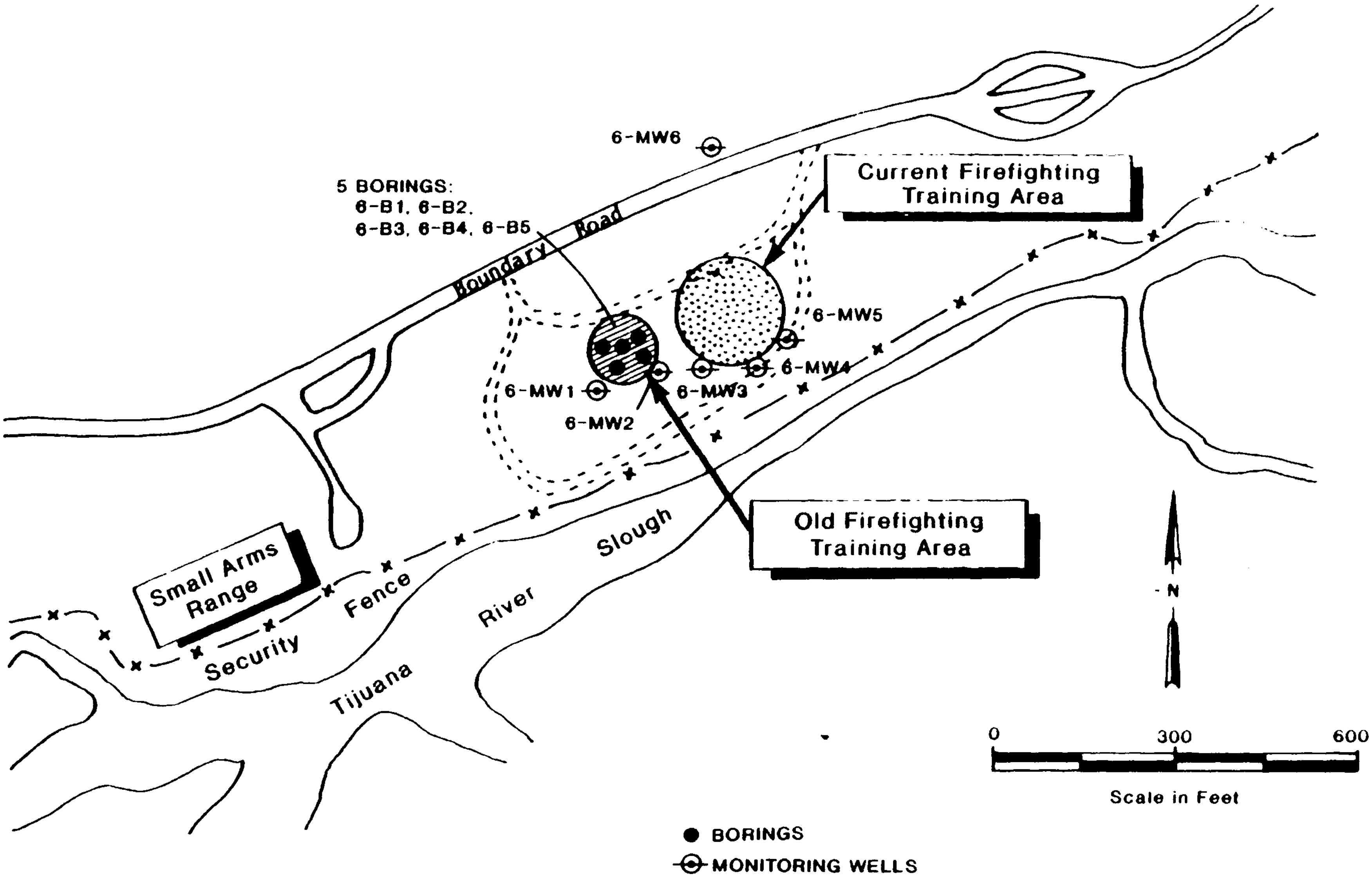
4. The uppermost segment will be observed and discarded.

Soil samples may not be collected below the water table due to sand-heaving problems. At least three soil samples will be collected above the water table in each borehole. The three most contaminated soil samples will be collected from each borehole for laboratory analysis (see Section 4.8).

Drill cuttings, discarded soil samples, or water produced by drilling activities will be contained and stored in appropriately identified drums. Drums will be transported by the drilling subcontractor to a temporary storage location onsite. The temporary storage location will be specified by the Navy. Soil and water waste will be stored onsite until a final disposal or treatment option is determined by the Navy. Jacobs will aid the Navy in determining an appropriate disposal or treatment option for the soil and water wastes. Storage, transport, disposal, or treatment of soil and water waste is the responsibility of the Navy.

5.3.2 Rationale for Location and Depths - Site 6, Firefighting Training Area

The proposed borings and wells for the firefighting training area, Site 6, are shown in Figure 5-1. Six monitoring wells and five soil borings are proposed for the site. The surface is roughly 10 to 15 feet above sea level (Figure 4-5), and water is likely near sea level since the wells are located near the tidally influenced Tijuana Slough.



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986.

FIGURE 5-1
APPROXIMATE LOCATIONS OF PROPOSED BORINGS/MONITORING WELLS FOR SITE 6- FIREFIGHTING TRAINING AREA

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Therefore, depths of 28 feet are proposed for the borings and wells to allow about 10 to 15 feet penetration below the water table.

The proposed well designations, well information, and sampling information for Site 6 are summarized in Table 5-1. The rationale for well locations is based on possible directions of groundwater flow. The direction of groundwater flow cannot be adequately assessed due to the lack of nearby wells. Groundwater flow is likely south towards the Tijuana River Slough, west towards the Pacific Ocean and the Oneonta Slough, or southwest due to a combination both. Less likely, though possible, is flow towards the southeast (as illustrated in Figure 4-3) due to water well pumping in the Tijuana River Valley. Well 6-MW1 is located southwest of the old firefighting area, Well 6-MW2 is located southeast of the old firefighting training area, Well 6-MW3 is located southwest of the current fire-fighting training area, Well 6-MW4 is located south-southeast of the current firefighting training area, and Well 6-MW5 is located southeast of the current firefighting training area. Well 6-MW6 is an upgradient well which will be used to evaluate background water quality, upgradient contamination, or indicate whether tidal influences spread contamination away from the firefighting training area to the north.

Five borings, 6-B1, 6-B2, 6-B3, 6-B4, and 6-B5, will be drilled in the old firefighting training area. These borings will aid in assessing the location of the firefighting training area which has been covered by fill and rubble.

Table 5-1
Proposed Boring/Monitoring Well Information
For SWAT Proposal - Site 6, Firefighting Training Area

Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
	Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
6-B1, 6-B2, 6-B3, 6-B4, 6-B5	--	--	8	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils	Located in old firefighting training area
6-MW1	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Southwest of old firefighting training area
6-MW2	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Southeast of old firefighting training area
6-MW3	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Southwest of current firefighting training area
6-MW4	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	South-southeast of current firefighting training area
6-MW5	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Southeast of current firefighting training area
6-MW6	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Upgradient Well North of firefighting training areas on boundary road, Site 8, Area A (see Table 5-3)

*Lab samples chosen from among all samples by field headspace analysis screening

5.3.2.1 Soil Sampling

Soil samples will be taken every 5 feet for a total of five samples for each well. Three of these samples will be chosen for laboratory analysis based on field screening the headspace of the soil samples with an organic vapor analyzer (OVA). The EPA analysis methods for each sample are discussed in Section 5.6.

The soil boring, 6-B1, is located in what was the old firefighting training area. The old firefighting training area has been subsequently covered by rubble and fill. Soil samples are proposed at the surface and depths of 2.5, 5, 7.5, 10, 15, 20, and 25 feet. Soil samples may not be collected below the water table if sand heaving problems are encountered. More detailed analysis near the surface is proposed since fluids were dumped directly on the surface in this location. Again, three samples will be chosen from the eight samples by field screening soil headspace with an OVA.

5.3.2.2 Monitoring Wells

Monitoring wells will be completed to 25 feet and screened from 8 to 28 feet. This depth and interval should allow for water level fluctuations due to tidal influences and river flow variability. Water levels from the monitoring wells will aid in evaluation of groundwater flow directions near the firefighting training area and in conjunction with data from wells from other nearby areas (Site 7, Area A and Area B). Additionally, aquifer tests will allow evaluation of hydrogeologic properties which are required to assess potential contaminant migration rates.

5.3.2.3 Vadose Zone Monitoring

Vadose zone monitoring is not proposed for the firefighting training area at OLF, Imperial Beach. The solid waste likely extends to within several feet of the water table. Because the water table is less than 20 feet below ground surface, the firefighting training area, vadose zone pore-liquid sampling will be replaced by groundwater sampling at selected sites.

5.4 Drilling and Soil Sampling for Site Inspections

The rubble and oiled areas, Sites 7 and 8, occur over large areas within the OLF. Some of these areas overlap or are directly adjacent to one another. Rather than repeat information, wells or borings which occur on adjacent sites will be referenced during the discussion.

As a general guide, wells or borings were selected for approximately every acre of potentially contaminated area. At least one groundwater well was selected for each separate area of suspected contamination. The location of the well was selected so as to be in the most likely downgradient position.

Drill cuttings, discarded soil samples, or water produced by drilling activities will be contained and stored in drums. Drums will be transported by the drilling subcontractor to a temporary storage location onsite. The temporary storage location will be specified by the Navy. Soil and water waste will be stored onsite until a final disposal or treatment option is determined by the Navy. Jacobs will aid the Navy in determining an appropriate disposal or treatment option for the soil and water wastes. Storage, transport, disposal, or treatment of soil and water waste is the responsibility of the Navy.

5.4.1 Rationale for Locations and Depths - Site 7, Rubble Areas

The rubble disposal areas, Site 7, have been divided into two areas, A and B, for purposes of discussion (Figure 5-2). Area A is located adjacent to the bank of the Tijuana Slough, and stretches from the small arms range on the west to the recreation area on the east. Area B is located south of runway 27, also adjacent to the bank of the Tijuana River Slough.

5.4.1.1 Area A, Firefighting Training and Recreation Area

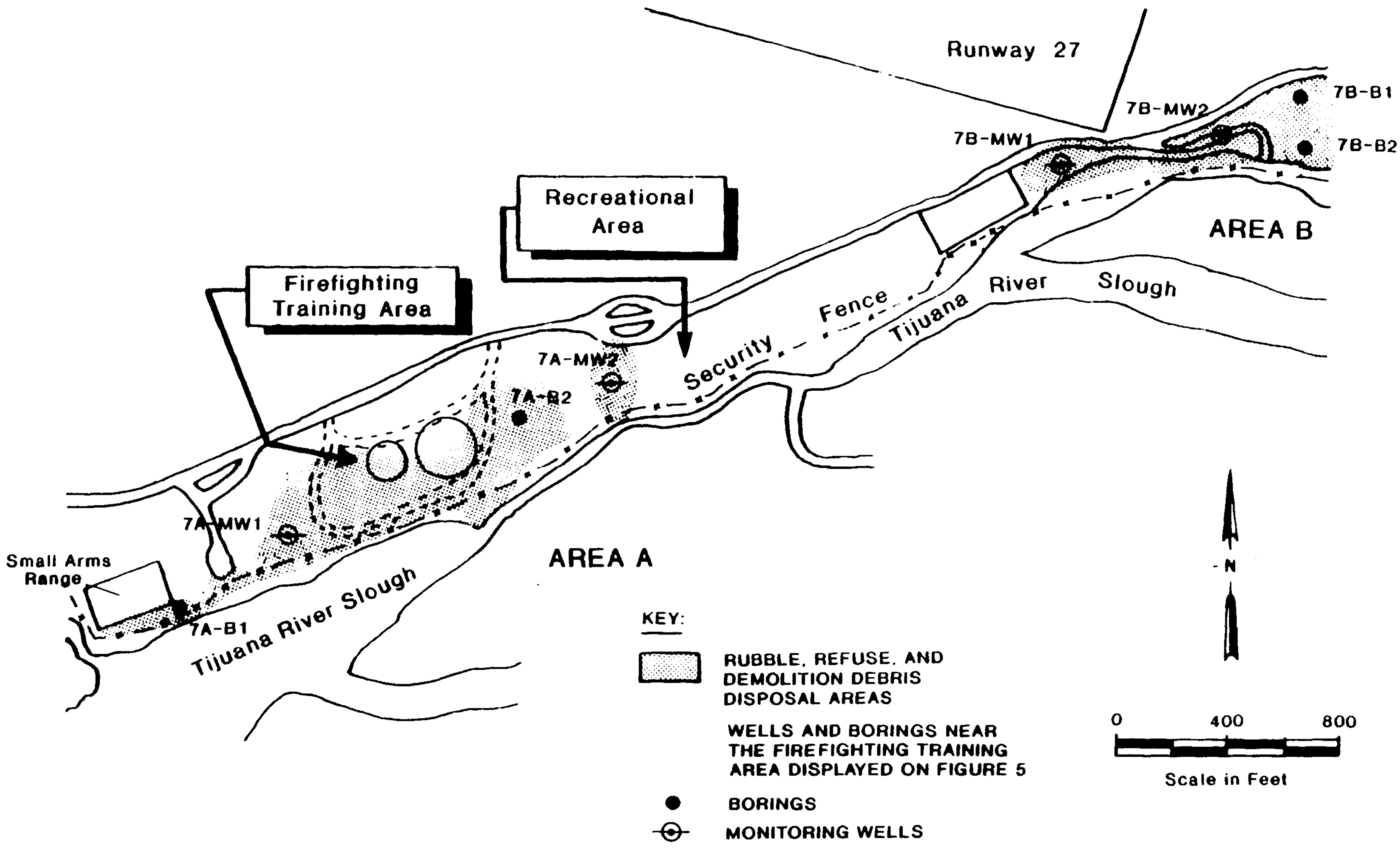
The proposed borings and monitoring wells for Area A, Site 7, are located on Figure 5-2. Two borings and two monitoring wells are recommended for Area A. The locations are evenly distributed to assess whether contamination is associated with the rubble piles. Additionally, five monitoring wells from Site 6 (Figure 5-3), 6-MW1, 6-MW2, 6-MW3, 6-MW4, and 6-MW5 are located between proposed boring 7A-B2 and proposed Well 7A-MW1.

The proposed well designations, well information, and sampling information for Site 7 are summarized in Table 5-2. Depths of 28 feet are recommended for wells and borings.

Table 5-2
Proposed Boring/Monitoring Well Information
For Site Inspection - Site 7, Rubble Areas

Site Number	Area	Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
			Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
7**	A	7A-B1			5	3	5, 10, 15, 20, 25	Soils	Southwest end of rubble, near small arms range
7	A	7A-MW1	28	5-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	West of firefighting training area, Site 6
7	A	7A-B2			5	3	5, 10, 15, 20, 25	Soils	East of firefighting training area, Site 6
7	A	7A-MW2	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	Recreational area
7	B	7B-MW1	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	South of runway
7	B	7B-B1			5	3	5, 10, 15, 20, 25	Soils	East of runway
7	B	7B-B2			5	3	5, 10, 15, 20, 25	Soils	East of runway
7	B	7B-MW2	28	8-28	5 1	3 1	5, 10, 15, 20, 25	Soils Water	East of runway

* Lab samples chosen from among all samples by field headspace analysis screening.
**Proposed boring 6-B1 and monitoring wells 6-MW1, 6-MW2, 6-MW3, and 6-MW4 can also be used for Site 7 Area A analysis (see Table 5-2).



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986

FIGURE 5-2
APPROXIMATE LOCATIONS OF PROPOSED BORINGS/MONITORING WELLS FOR SITE 7- RUBBLE AREAS

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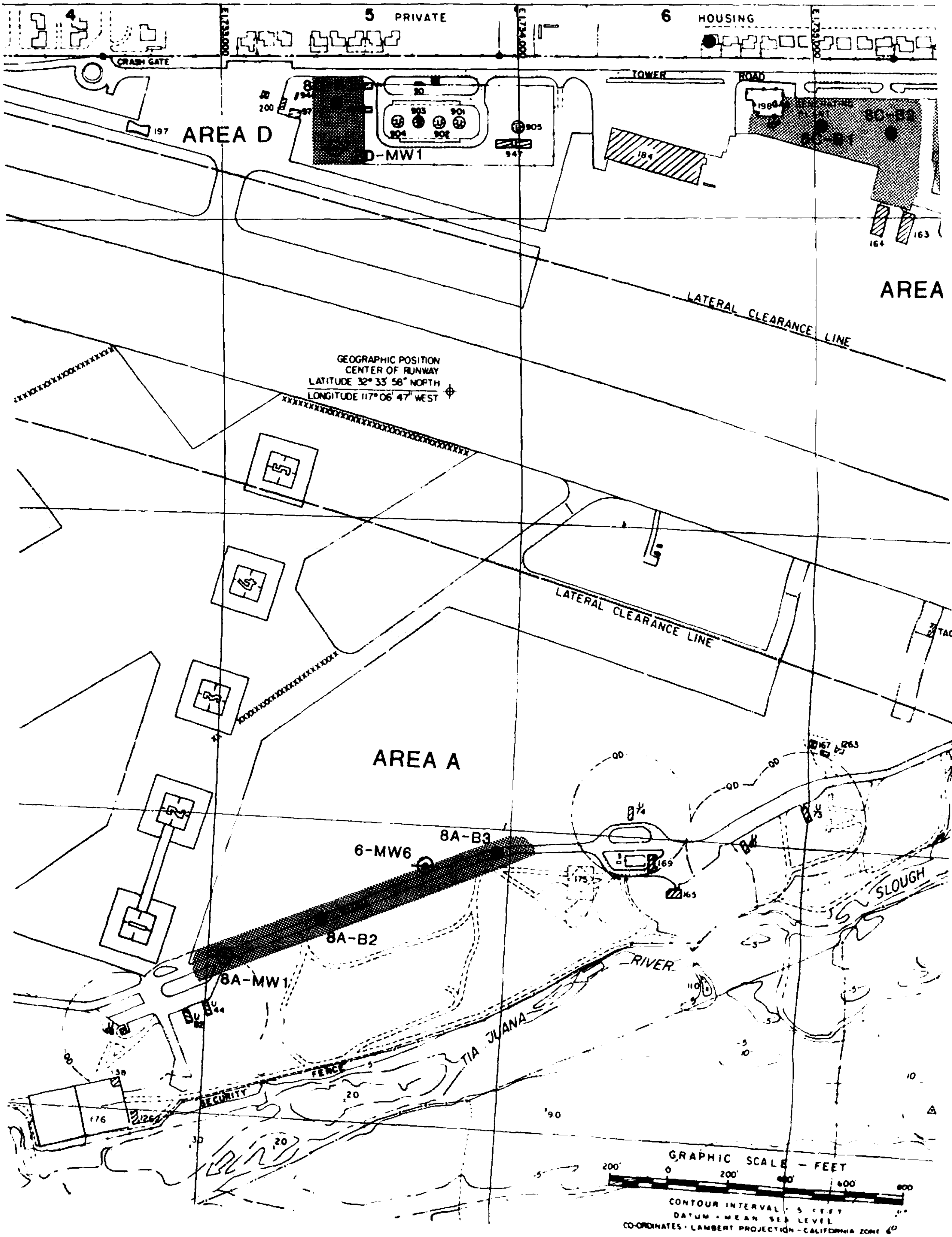

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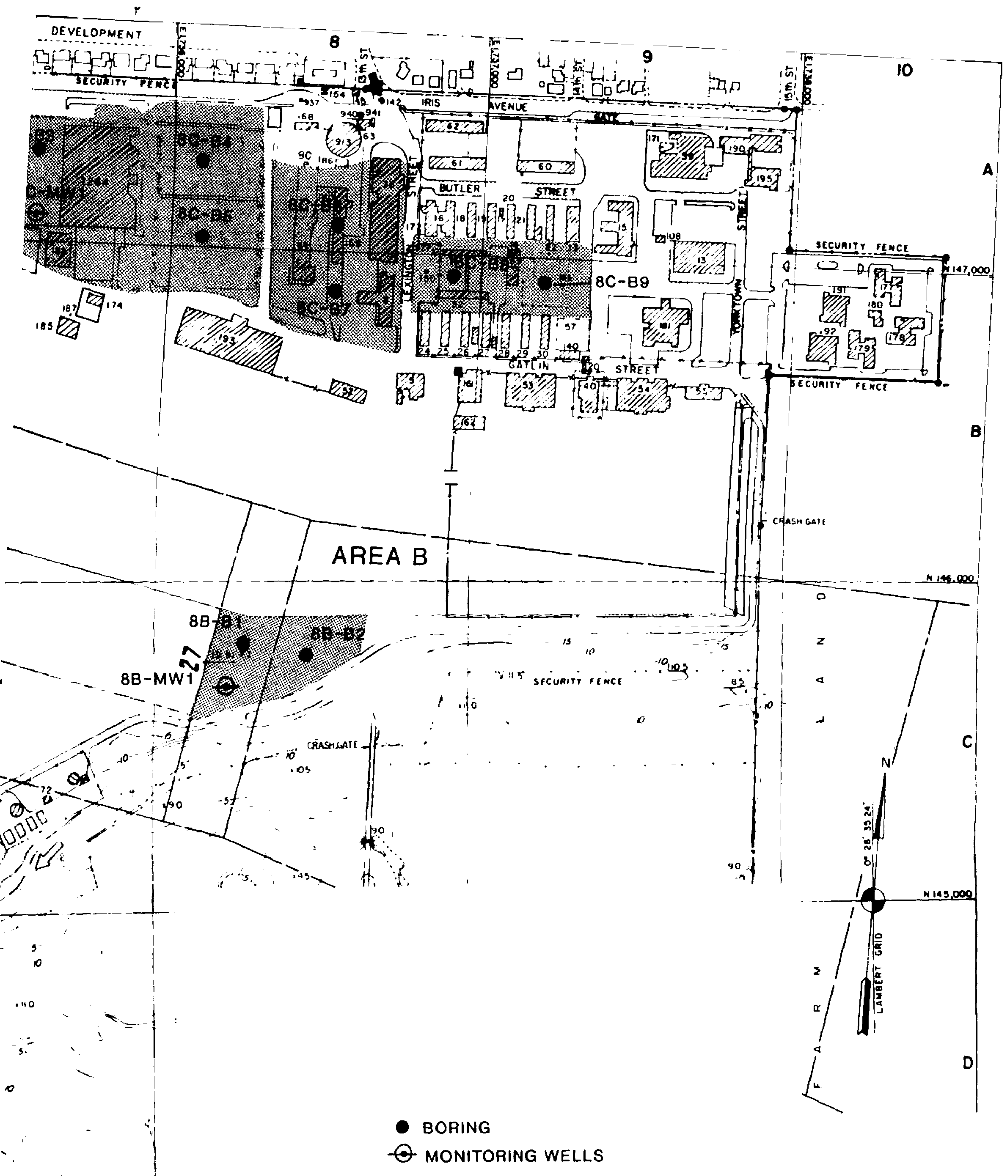


FIGURE 5-3
APPROXIMATE LOCATIONS OF
PROPOSED BORINGS/
MONITORING WELLS FOR
SITE 8 - OILED AREAS A B

Samples should be taken at depths of 5, 10, 15, 20, and 25 feet. The three most contaminated of the five samples will be selected in the field for laboratory analysis by means of visual inspection for gross contamination and/or soil headspace analysis with an organic vapor analyzer (OVA). The OVA analysis may also aid in evaluating whether contamination has migrated from Site 6, the firefighting training area, into the rubble area.

Monitoring wells 7A-MW1 and 7A-MW2 are recommended to be drilled to a depth of 28 feet with a screened interval of 8 to 28 feet. This should allow approximately 10 feet of screened aquifer based on a surface elevation of 10 to 15 feet (Figure 4-5) and a water table near sea level.

5.4.1.2 Area B, Runway Area

The proposed groundwater monitoring wells and borings for Site 7, Area B, are shown in Figure 5-2. The proposed well designations, well information, and sampling information is in Table 5-2. The locations and depths of borings and wells, sampling depths, and field selection of samples for lab analysis are the same as for Area A.

The monitoring well locations were chosen to be in the most likely downgradient location of the main rubble piles in Area B. Additionally, there is an oiled area north of these rubble piles which may potentially contribute contamination to this rubble disposal area.

5.4.2 Rationale for Locations and Depths - Site 8, Oiled Areas

Site 8, the oiled areas, has been subdivided into four areas: A, B, C, and D (Figure 5-3). Area A is along the south Boundary Road, north of Site 6 and Site 7. Area B is located east of Runway 27, north of Site 7, Area B. Area C is located within the group of buildings located at the northeast part of OLF, Imperial Beach. Area D is located west of Site 6, the fuel farm.

Potential contamination in soil samples is likely to be close to the surface because oil was sprayed directly onto the ground. Therefore, for all of the oiled areas, samples will be taken at 0, 2.5, 5, 7.5, and 10 feet with 5-foot sample intervals after that to total depth of 28 to 40 feet. For each boring, three samples will be selected from among all the samples by field screening techniques (OVA and visual examination).

5.4.2.1 Area A, South Boundary Road

Three borings are recommended for Area A as shown in Figure 5-3. The proposed boring designations, well information, and sampling information are summarized in Table 5-3. Boring locations and depths were chosen by the criteria discussed previously for Site 7, Area A.

The upgradient monitoring well for Site 6, Well 6-MW5, is located along Boundary Road, between proposed borings 8A-B2 and 8A-B3.

Table 5-3
Proposed Boring/Monitoring Well Information
For Site Inspection - Site 8, Oiled Areas

Site Number	Area	Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
			Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
8	A	8A-MW1	28	8-28	8 1	3 1	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils Water	Southwest end of boundary road
8	A	8A-B2			8	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils	
8	A	8A-B3			8	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils	Northeast end of boundary road
8	B	8B-B1			8	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils	East of runway
8	B	8B-B2			8	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils	East of runway
8	B	8B-MW1	28	8-28	8 1	3 1	0, 2.5, 5.0, 7.5, 10, 15, 20, 25	Soils Water	East of runway
8	C	8C-B1			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	By gas generating plant, east of Building 198

Table 5-3
Proposed Boring/Monitoring Well Information
For Site Inspection - Site 8, Oiled Areas

Site Number	Area	Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
			Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
8	C	8C-B2			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	
8	C	8C-B3			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	West of Building 1264
8	C	8C-MW1	40	10-40	11 1	3 1	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils Water	Northwest of Building 182
8	C	8C-B4			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	East of Building 1264
8	C	8C-B5			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	East of Building 1264
8	C	8C-B6			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	South of Building 160, north of Building 159

Table 5-3
Proposed Boring/Monitoring Well Information
For Site Inspection - Site 8, Oiled Areas

Site Number	Area	Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
			Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
8	C	8C-B7			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	South of Building 159
8	C	8C-B8			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	South of Building 31, north of Building 32
8	C	8C-B9			11	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30, 35, 40	Soils	On baseball diamond
8	D	8D-MW1	30	10-30	9 1	3 1	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30	Soils Water	West of fuel farm
8	D	8D-B1			9	3	0, 2.5, 5.0, 7.5, 10, 15, 20, 25, 30	Soils	West of fuel farm

*Lab samples chosen from among all samples by field headspace analysis screening.

5.4.2.2 Area B, Runway Area

Two borings and one monitoring well are proposed for Area B, as shown in Figure 5-3. The proposed boring and well designations, well information, and sampling information are summarized in Table 5-3. Boring locations and depths were chosen by the criteria discussed previously for Site 7, Area B. Sample depths and selection of laboratory samples are as discussed in Section 5.4.2.

The monitoring well, Well 8B-MW1, was chosen in the location thought most likely to be in a downgradient location.

5.4.2.3 Area C, Building Area

Eight borings and one monitoring well are proposed for Area C, as displayed in Figure 5-3. The proposed boring and well designations, well information, and sampling information are summarized in Table 5-3.

The surface elevation ranges from about 25 to 35 feet above sea level from the west to east end of Area C (Figure 4-5). The depth to water is likely a few feet above sea level in this location. Therefore, wells depths should be 40 feet in order to sample 5 to 15 feet past the water table. Well location criteria were chosen by the criteria laid out earlier. The monitoring well was chosen so as to be downgradient of the largest oiled area.

As discussed earlier in Section 5.4.2 for the oiled areas, the soil sampling emphasis is near the surface. Again, three samples should be chosen among the total number of samples for lab analysis. Samples should be taken at 0, 2.5, 5, 7.5, and 10 foot depths. Since these borings are deeper than other sites at OLF, Imperial Beach, and in order to avoid unnecessary drilling, a contamination threshold has been developed. At 10 feet, the headspace of the soil sample will be analyze by an OVA. If the sample exceeds an OVA headspace response of 1 part per million, or if there are visual signs of contamination, drilling should continue to 15 feet and the process should be repeated down to 40 feet if necessary.

The monitoring well, 8C-MW1, should be 40 feet deep and be screened from 10 to 40 feet.

5.4.2.4 Area D, Fuel Farm Area

The proposed well and boring locations for Area D, are located in Figures 5-3 and 5-4. The proposed well designations, well information, and sampling information are summarized in Table 5-3.

Well sampling intervals and selection of samples for lab analysis are the same as for Sites 6 and 7; samples every 5 feet, and selection of the three most contaminated samples for laboratory analysis. The depth to water at the fuel farm, as reported in the preliminary assessment (Ref. 9), is about 20 feet below the ground surface. Therefore, it is recommended that borings and wells be completed to 30 feet below the surface. The monitoring well, 8D-MW1 should be slotted from 10 to 30 feet. The monitoring well will also aid in determining if contamination from the fuel farm has migrated westward.

Additionally, this well will allow estimation of the direction of groundwater flow in conjunction with the two existing wells on the fuel farm (Ref. 9).

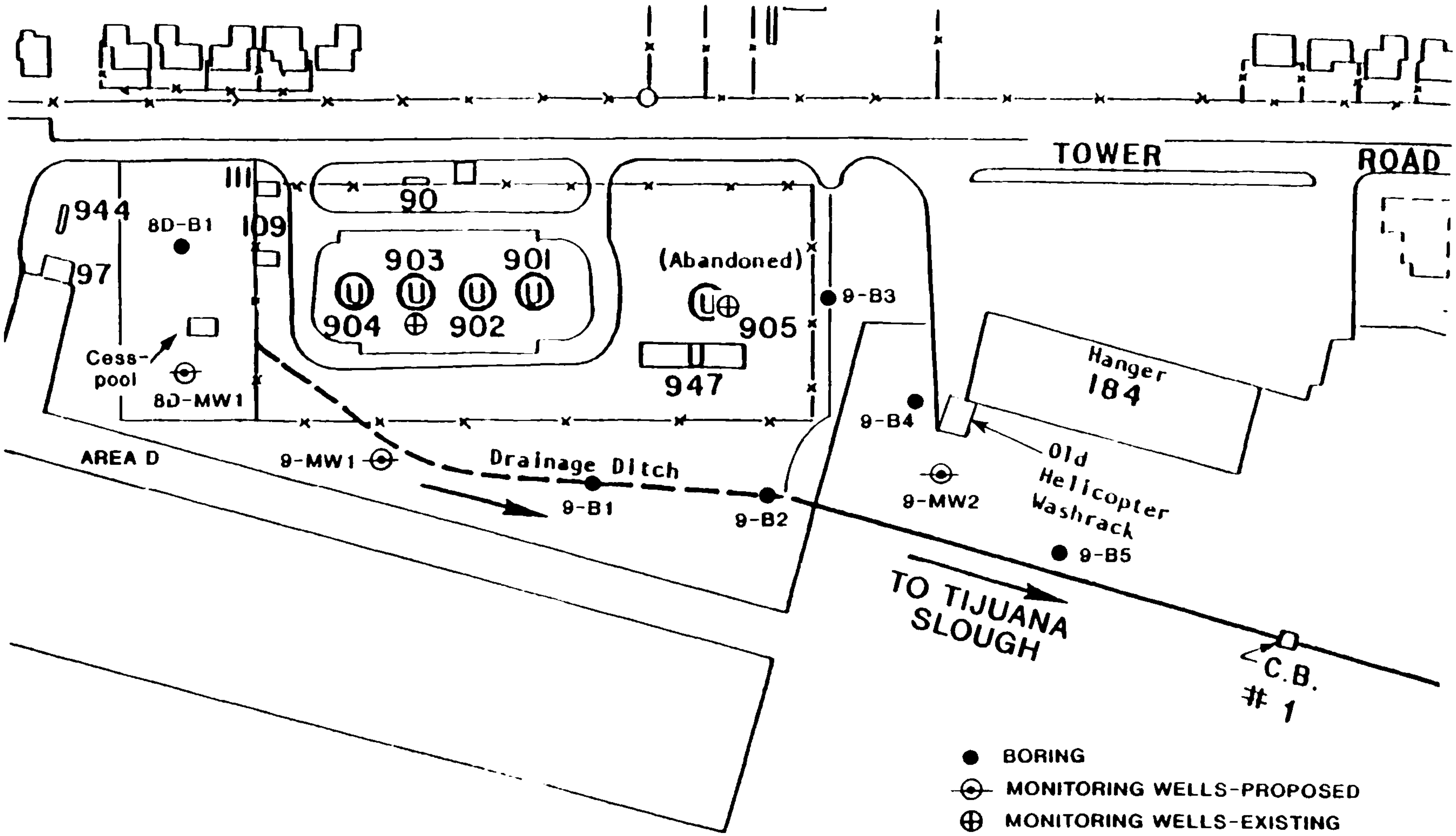
5.4.3 Rationale for Locations and Depths - Site 9, Fuel Farm Area

The proposed boring and well locations for Site 9 are displayed in Figure 5-4. The proposed well and boring designations, well information, and sampling information are summarized in Table 5-4.

5.4.3.1 Drainage Ditches

Three borings and one monitoring well are proposed for the drainage ditches. The southern drainage ditch which runs east west is the main ditch. Samples should be spaced closely near the surface since fluids would have originated from the surface along the ditch. Therefore, sampling intervals of 0, 2.5, 5, 7.5, 10, 15, 20, 25, and 30 feet are recommended with the three most contaminated as indicated by field OVA screening, being sent for laboratory analysis. One boring is also recommended for the north-south trending eastern ditch. Location 9-B2 was chosen because this is the area where the ditch empties into a pipe which goes underground.

The monitoring well should be slotted from 10 to 30 feet so that approximately 10 feet of the aquifer is intercepted by screen. The location of the well is also adequate as a possible downgradient well of the fuel farm, and as another point to define the water table and directions of flow in the fuel farm area.



SOURCE: Initial Assessment Study, Naval Energy and Environmental Support Activity, February 1986.

FIGURE 5-4
APPROXIMATE LOCATIONS OF PROPOSED BORINGS/MONITORING WELLS FOR SITE 9 - FUEL FARM SUPPLEMENTAL BORINGS AND SITE 8- OILED AREA D

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Table 5-4
Proposed Boring/Monitoring Well Information
For Site Inspection - Site 9, Fuel Farm

Site Number	Area	Boring/ Monitoring Well Designation	Well Information		Number of Samples		Depth of Sample Collection	Type of Sample	Comments
			Depth (feet)	Slotting (feet)	Total	Number* For Lab Analyses			
9	—	9-MW1	30	10-30	9 1	3 1	0, 2.5 5, 7.5, 10, 15, 20, 25, 30	Soils Water	West end of south drainage ditch
9	—	9-B1			9	3	0, 2.5, 5, 7.5, 10, 15, 20, 25, 30	Soils	South drainage ditch
9	--	9-B2			9	3	0, 2.5, 5, 7.5, 10, 15, 20, 25, 30	Soils	East end of south drainage ditch before it goes underground
9	--	9-B3			9	3	0, 2.5, 5, 7.5, 10, 15, 20, 25, 30	Soils	East drainage ditch
9	--	9-B4			7	3	0, 5, 10, 15, 20, 25, 30	Soils	Boring between fuel farm and old helicopter washrack
9	--	9-MW2	30	10-30	7 1	3 1	0, 5, 10, 15, 20, 25, 30	Soils Water	South of old helicopter washrack, north of drainage pipe
9	--	9-B5			7	3	0, 5, 10, 15, 20, 25, 30	Soils	Southeast of old helicopter washrack, just north of drainage pipe

*Lab samples chosen from among all samples by field headspace analysis screening.

5.4.3.2 Old Helicopter Washrack Area

Two borings and one monitoring well are proposed for the old helicopter washrack area (Figure 5-4). The well and boring designations, well information, and sampling information are summarized in Table 5-4. Sampling intervals are every 5 feet. The three most contaminated samples in each boring and well, as determined by field OVA screening, will be sent for laboratory analysis.

Boring 9-B4 is located west of the helicopter washrack and east of the fuel farm. Any washrack fluids which may have flowed on the surface to the drainage ditch may have infiltrated the ground in this area. Additionally, fuel farm area contamination may have migrated eastward, and could be potentially detected in this boring. Monitoring well 9-MW2 was selected between the helicopter washrack and the drainage pipe. It will be screened from 10 to 30 feet by the same rationale as above. Boring 9-B5 is located further downflow along the drainage pipe.

5.5 Installation of Groundwater Monitoring Wells

5.5.1 Monitoring Well Installation

The well locations have been proposed based on hydrogeologic conditions, including the estimated direction of groundwater flow. A typical groundwater monitoring well diagram is provided in Figure 5-5.

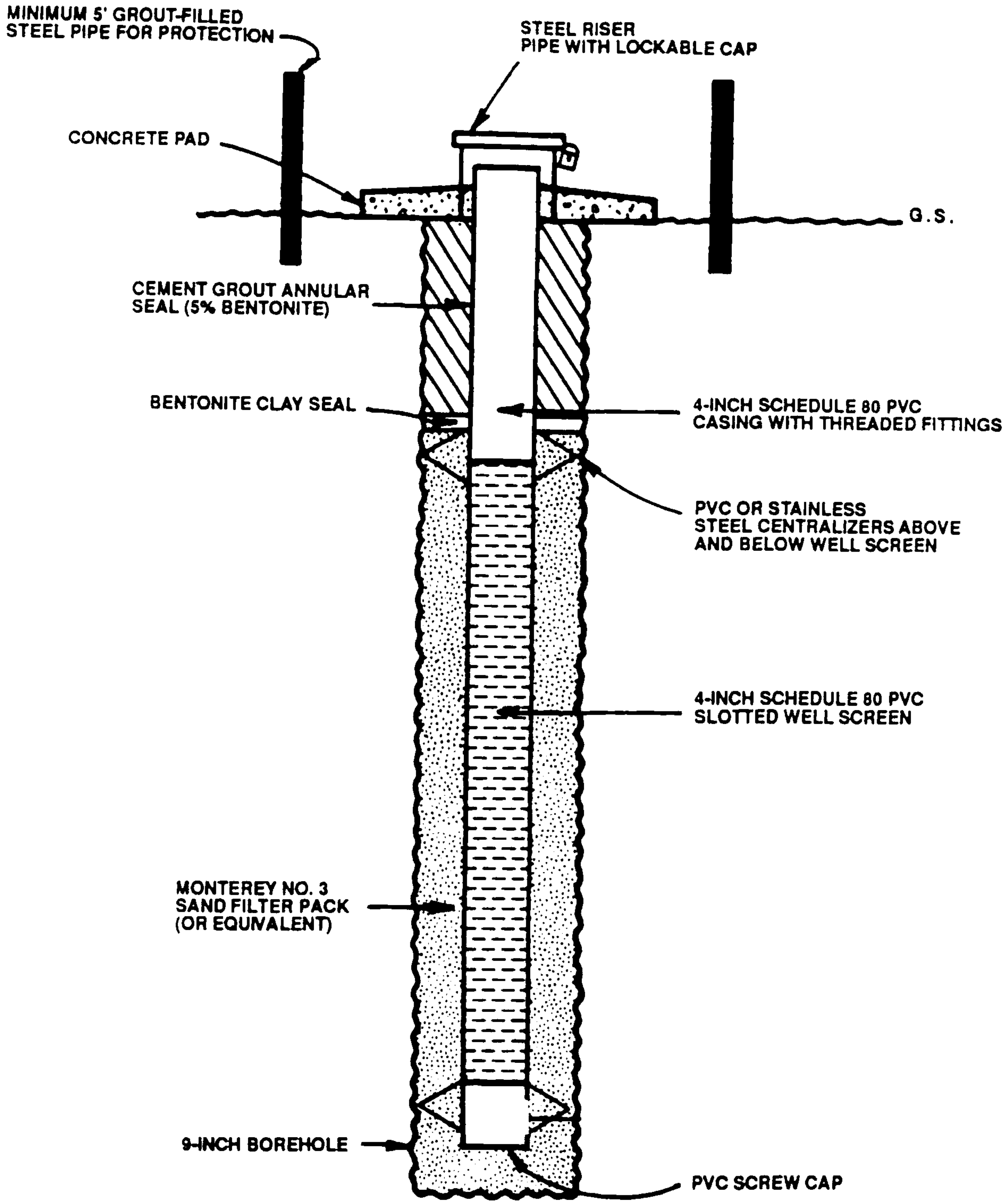

FIGURE 5-5
TYPICAL GROUNDWATER
MONITORING WELL DIAGRAM

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The monitoring wells will be constructed of 2-inch-diameter, flush-threaded, Schedule 40, polyvinyl chloride (PVC) casing with slotted PVC screen placed from a depth of about 5 or 10 feet, as specified for each area, to the total depth of the well. Saline conditions may corrode stainless steel well materials, given sufficient time.

The well screen slot sizes will be selected based on review of site hydrogeologic conditions and on observed geologic conditions. Well screen slot sizes should be selected in accordance with sand pack designed as specified in the California Site Migration Decision Tree Manual (DHS, May 1986, pp. 3-64 to 3-68).

The well casing will be lowered inside the auger stem. Well screen lengths may change according to geologic conditions. The sand pack is anticipated to be No. 16 Monterey Sand. The sand pack will be installed by pouring approximately 1 to 4 feet of the selected filter sand in the annulus between the well casing and the auger stem. The auger stem is then withdrawn until the bottom of the auger is within a few tenths of a foot below the top of the sand pack. This procedure is repeated until the sand is backfilled to approximately 2 feet above the top of the screen. A 2- to 5-foot-plug consisting of medium bentonite chips will be installed above the sand. Installation of the bentonite chips will proceed quickly, and at no time will more than 1 foot of bentonite chips be allowed to accumulate within the auger stem.

Tap water may be added inside the hollow-stem auger flights, if necessary, to provide hydrostatic pressure to aid in reducing sand heaving during well installation. If the addition of water is necessary to keep the boring open for well installation, the quantity should be kept to a minimum (50 gallons or less) and documented in the field notebook.

Each well will be completed with a flush-to-grade heavy-duty traffic-rated well cover set in a 3-foot-deep concrete base.

Following well installation, a measuring point mark will be made in the top of each PVC casing. The total well depth and depth to groundwater will be measured from the measuring point and recorded in the field logbook.

5.5.2 Monitoring Well Development

Each well will be developed to remove fine-grained materials from in and around the sand pack and to remove foreign water introduced during drilling of the borehole. Groundwater monitoring wells will be developed by bailing and surging. If potable (tap) water was added during well construction, this volume of water will be removed from the well prior to routine well development.

At a minimum, three to five borehole volumes should be purged from the well before development is considered complete. In addition to this amount, any water that may have been added during well construction will be purged before development is considered complete. Development should continue until water is clear or a hydrologist considers it developed as well as possible.

5.5.3 Groundwater Sample Collection Techniques

Each monitoring well will be sampled immediately upon completion of development and purging. Groundwater sampling procedures are described in Section 10 of the QAPP.

Groundwater analyses include both field measurements and laboratory analyses, which are discussed in the following section. Groundwater monitoring procedures will include the measurement of water levels and groundwater sampling. Each is described in the following subsections.

5.5.3.1 Measurement of Static Water Levels

The depth to water level (DTW) will be measured to provide data necessary to estimate the volume of water to be purged from each well prior to collecting the groundwater samples. After the measuring point elevation is determined (Section 5.5.4), the water level measurement is also used to contour groundwater surface elevations to estimate groundwater flow directions and average linear groundwater velocity. The DTW is obtained by measuring the distance between the reference point (either the highest point on the casing or notch in casing or other permanent marking present), in the top of the PVC or stainless steel (SS) casing, and the static-water level inside the well casing. The measurement is performed using a water-level indicator and a hand-held pocket tape and is recorded to 0.01 foot.

The total depth (TD) of all wells will be used to compute the volume of water to be purged. In addition to recording the DTW measurement, the time each measurement was made will be recorded.

The water level indicator sounding line will be thoroughly rinsed with distilled water after the measurements are performed.

5.5.3.2 Well Sampling

Three to five borehole volumes of water will be removed from each well prior to collection of samples for field and laboratory analysis. Groundwater samples will be collected using a Teflon® bailer fitted with a bottom emptying device. Purge water from groundwater monitoring wells will be contained in 55-gallon drums and left onsite. Disposal of wastewater will be the responsibility of the Navy. If wells are purged dry, samples should be collected as soon as is practicable after well recovery.

5.5.3.3 Sample Collection

Samples will be collected from the groundwater monitoring well as shown in Tables 4-1 and 4-2. Samples collected for field analyses will be placed in a sample jar and will be refrigerated until analyzed. Samples collected for laboratory analyses will be handled as described in Section 4.9. Measurements of pH and electrical conductivity (EC) will be taken in the field.

5.5.4 Survey of Wellheads

The location of the wellheads will be surveyed to assess water-level elevations.

5.6 Rationale for Analytical Methods

All samples will be collected in accordance with Jacobs' Standard Operating Procedures (SOPs). Copies of SOPs relevant to this assignment are included in Appendix C. Field procedures for surface water sample collection, monitoring well installation, and groundwater evacuation and sampling are summarized in Section 6.0 of the QA/QC Plan, included as Appendix A.

Soil and groundwater samples are proposed to be collected at the Outlying Landing Field, Imperial Beach, Sites 6 through 9. Tables 5-1, 5-2, 5-3, and 5-4 summarize the information on number of samples to be collected, sampling depths, and other relevant information. Figures 5-1, 5-2, 5-3, and 5-4 show the soil boring sample and well locations. The summary of the analytical parameters and methods are shown in Table 5-5.

Surface water samples will be collected one mile up and downstream in the Tijuana River as required in the SWAT guidelines.

Samples collected at the OLF will be analyzed by a Navy certified laboratory. Routine Analytical Services (RAS) will be used. The precision and accuracy of the laboratory will be consistent with contract laboratory protocols and/or Navy guidelines. The minimum quality control requirements of RAS consist of both an initial and ongoing demonstration of laboratory capability to generate acceptable precision and accuracy with contract methods in the analysis of soil and groundwater samples.

Laboratory methods are established for each measurement parameter in accordance with Navy certified protocols, or the methods outlined in SW-846, 'Test Methods for Evaluating Solid Wastes', 3rd Edition. Analytical methods were selected based on an evaluation of substances reportedly disposed at the OLF sites. Soil samples shall be analyzed for one or more of

Table 5-5
Summary of Site-Specific Analytical Parameters and Methods

Site No. and Name	Contaminants of Concern	Analytical Parameter	U.S. EPA Method No.		Comments
			Soil	Water	
6 Firefighting Training Area	Gasoline	BTXE gasoline	CLP[a] CA LUFT[b]	CLP[a] CA LUFT[b]	
	Diesel	Total fuel hydrocarbons as diesel	CA LUFT[b]	CA LUFT[b]	
	Kerosene/JP-5	Total fuel hydrocarbons as kerosene	CA LUFT[b]	CA LUFT[b]	Single point standard
	Waste oil	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Hydraulic fluid	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Transformer fluid	Total recoverable hydrocarbons PCBs	418.1[c] CLP[a]	418.1[c] CLP[a]	
	Solvents	Halocarbon Aromatic hydrocarbon	CLP[a] CLP[a]	CLP[a] CLP[a]	Laboratory will be requested to report all peaks.
	Indicator parameter for landfill leachate	Chemical oxidation demand	--	410.2,[c] 410.3,[c] or 410.4[c]	
	Sandblast grit	Metals and major canions	CLP[a]	CLP[a]	

Table 5-5
Summary of Site-Specific Analytical Parameters and Methods

Site No. and Name	Contaminants of Concern	Analytical Parameter	U.S. EPA Method No.		Comments
			Soil	Water	
	Major anions	Bicarbonate, carbonate chloride, nitrate and nitrite, sulfate	Standard Method 403 300.0 (ion chromato-graphy	Standard Method 403 300.0 (ion chromato-graphy	
	Oils and fuels	Semivolatiles	CLP[a]	CLP[a]	
7 Rubble Disposal Areas	Oiled soil	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Creosoted pilings	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Sandblast grit	Metals	CLP[a]	CLP[a]	
8 Oiled Areas	Waste oils	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Hydraulic fluids	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Mineral spirits	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Transformer fluids	Total recoverable hydrocarbons PCBs	418.1[c] CLPa	418.1[c] CLP[a]	

Table 5-5
Summary of Site-Specific Analytical Parameters and Methods

Site No. and Name	Contaminants of Concern	Analytical Parameter	U.S. EPA Method No.		Comments
			Soil	Water	
	Solvents	Halocarbon Aromatic hydro-carbon	CLP[a] CLP[a]	CLP[a] CLP[a]	Laboratory will be requested to report all peaks.
	Kerosene	Total fuel hydro-carbon as kerosene	CA LUFT[b]	CA LUFT[b]	
9 Fuel Farm Area	Gasoline	BTXE gasoline	CLP[a] CA LUFT[b]	CA LUFT[b]	
	PD-680	BTXE gasoline	CLP[a] CA LUFT[b]	CA LUFT[b]	
	JP-5	Total fuel hydro-carbons as kerosene	CA LUFT[b]	CA LUFT[b]	
	Waste oil	Total recoverable hydrocarbons	418.1[c]	418.1[c]	
	Toluene	Toluene	CLP[a]	CLP[a]	
	Trichloroethylene	Trichloroethylene	CLP[a]	CLP[a]	
	Isopropanol	Isopropanol	CA LUFT[b]	CA LUFT[b]	

[a]Contract Laboratory Program (CLP) procedures and quality control limits are defined in EPA contracts IFBS WA-85-J664/J680 and WP-85-J838/J839 or latest contracts.
[b]California Regional Water Quality Control Board, Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure. December 1987.
[c]QA/QC specifications: 5-point calibration, 10 percent blanks, 10 percent accuracy, 10 percent precision.

the following: purgeable/extractable organics (EPA Method 8240/8270), metals and major cations (EPA Method 6010/7000), major anions (EPA Method 300.0, Standard Method 403), total petroleum hydrocarbons (EPA Method 418.1), pesticides/PCBs (EPA Method 8080), and asbestos. Analytical methods for groundwater samples include purgeable/extractable organics (EPA Method 624/625 - acid and base/neutral fraction), metals and major cations (EPA Method 6010/7000), total petroleum hydrocarbons (EPA Method 418.1), major anions (EPA Method 300.0, Standard Method 403), and PCBs (EPA Method 608). Additional details of analytical services are presented in the QA/QC Plan, included in Appendix A.

The analytical methods chosen are based on the environmental media, such as water and soil, and on the contaminant(s) of concern. Various EPA methods were selected for each site to provide a range of analytical parameter that could address the potential threats arising from each specific site. Therefore, the analytical methods are addressed below for each of the four sites.

A summary of the site-specific analytical methods are provided in Table 5-5. The level of quality assurance/quality control (QA/QC) and the amount and types of samples to provide the appropriate QA/QC for the analytical efforts is addressed in the QAPP located in Appendix A.

Analytical results of soil, surface water, and groundwater samples will be subjected to a two-step evaluation process. First, the validity of the data will be assessed through review of QA/QC measures accomplished during both sample collection and laboratory analysis. Data judged to be invalid will be noted and archived. If holding times have not been exceeded, samples may be re-analyzed. Otherwise, depending on the importance of the observation, new samples shall be collected and analyzed. After this first evaluation process, valid data will be assessed for representativeness and completeness. If the data are insufficient, selected archived samples will be analyzed and, if necessary, new samples will be collected during an additional phase of the investigation.

5.7 Hydrogeologic Testing of Wells

Initial sampling and analysis of the wells at Site 6 will be completed prior to permeability testing. If the water is not contaminated, a 4-hour pumping test of the groundwater monitoring wells will be performed to assess the transmissivity of the shallow water-table aquifer (Appendix C). The other wells will be also monitored during the aquifer test.

If groundwater samples indicate contamination, several alternatives may be pursued. Discharge would be put into a vacuum truck and hauled offsite. Alternatively, if insufficient water is produced, slug tests may be conducted on the wells.

5.8 Sample Handling

All sample containers will be labeled clearly. Sample labels will contain information such as sample identification number, date and time the sample was collected, the analysis requested, and the preservative used, if any. Custody seals will be placed over the cap of each sample container. The custody seals on the volatile organic analysis (VOA) vials will be placed around the lid to prevent covering the septum. Samples in VOA vials (two vials per sample) will be wrapped together securely in bubble pack and secured with tape. Sealed samples shall be placed in individual zip-close style bags labeled with the sample number. Wrapped samples will be placed in coolers.

The filled containers will be cooled to 4°C with double zip-lock bagged ice. Two seals will be placed on each shipping container (cooler), one at the front and one at the back, to allow the recipient of the container to determine whether the container has been opened. Clear tape will be placed over the seals to assure that seals are not accidentally broken during shipment. Each cooler shall weigh less than 125 pounds (including ice), and will be labeled with 'Fragile' and 'This-end-up' labels on all four sides. Chain-of-custody records will be placed in zip-lock bags and taped to the inside of the shipment container, which will be shipped to the designated laboratory via overnight carrier. Samples will be shipped at the end of each day that they are collected.

Chain-of-custody procedures shall be used to maintain and document sample possession. Documents used to identify samples and to document possession include sample labels, chain-of-custody records, air bills (provided the samples are shipped by air to the laboratory), bill of lading, and field notebooks.

5.9 Data Analysis

The data analysis tasks listed below are to be completed to comply with the requirements of the SWAT Report.

5.9.1 Preparation of a Groundwater Elevation Contour Map

A groundwater elevation contour map will be produced for the shallow water-table aquifer. These data are needed to evaluate the hydraulic gradient and groundwater flow direction.

Quarterly water levels will be used to evaluate seasonal variations in the static water level.

5.9.2 Analysis of Aquifer Test and Permeability Test Data

The aquifer test data and permeability test data will be analyzed using appropriate analytical methods to estimate the hydraulic conductivity of the sediments screened by the monitoring wells. These in-situ tests will allow more accurate evaluation of the average linear groundwater velocity.

5.9.3 Analysis of Water Quality Data

The water quality data will be evaluated to assess the types and concentrations of contaminants present in soil and groundwater. Detected contaminants will be compared to appropriate water quality standards and criteria.

5.9.4 Evaluation of Background Water Quality

The background water quality at OLF will be evaluated by the new analyses for the new monitoring wells to be installed. The new analytical data must be evaluated before an estimate of background water quality can be ascertained.

5.9.5 Evaluation of Contaminant Migration from the Landfill

The water quality data will be evaluated to assess if the potential contamination is attributable to leachate migration from the landfill areas. This evaluation will be based on the results of the above analysis.

5.10 Decontamination Procedures

The following personnel decontamination procedure will be used upon exiting disposal areas following sampling activities:

- Outer boot removal
- Outer glove removed
- Hard hat and air purifying respirator removal
- Tyvek removal
- Inner glove removal
- Wash hands, face, and any exposed areas with soap and water

All disposable personnel safety gear will be placed in a large plastic trash bag. The proper storage and disposal of the bag is the responsibility of the Navy.

Reusable safety equipment, such as respirators, will be decontaminated by the following method:

- Wash with respirator cleanser or trisodium phosphate solution

- o Rinse with potable water
- o Dry

Liquids generated from washing and rinsing operations will be contained in a drum for subsequent disposal by the Navy.

The following sampling tool decontamination procedure will be used following sampling activities:

- o Wash sampling tool with laboratory grade detergent
- o Rinse twice with potable water
- o Rinse with deionized water
- o Air dry

6.0 REPORT PREPARATION

Separate SWAT and SI reports will be prepared and provided to the Navy, both in draft and final form. The final SWAT report will be forwarded to the San Diego RWQCB. The SWAT report will be prepared in accordance with the Guidance Document prepared by the State Water Resources Control Board dated August 1988.

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7.0 REFERENCES

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