FINAL REPORT FOR STORAGE SYSTEMS MANAGEMENT PLAN NAS WHITING FIELD FL
1/1/1989
E.C. JORDAN CO

29

FINAL REPORT

STORAGE SYSTEMS MANAGEMENT PLAN FOR NAVAL AIR STATION WHITING FIELD MILTON, FLORIDA

CONTRACT NO. N62467-87-D-0263

PREPARED FOR

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

PREPARED BY

E.C. JORDAN CO
2571 EXECUTIVE CENTER CIRCLE EAST
TALLAHASSEE, FLORIDA

JANUARY 1989

TABLE OF CONTENTS

LIST OF TABLES

1.0 INTRODUCTION

In May 1984, the Florida Department of Environmental Regulation (FDER) adopted Chapter 17-61 of the Florida Administrative Code (FAC) and began regulating stationary storage tanks in the state. The FDER regulations require registration and system compliance for stationary storage tanks that dispense petroleum fuels for transportation use. The U.S. Environmental Protection Agency (EPA) regulations (40 CFR 280 and 281) were finalized in late September 1988 and became effective in late December 1988. The EPA regulations will include all storage tanks including non-transportation tanks (i.e., new oil, waste oil, emergency generator fuel tanks, etc.). FDER is expected to incorporate the EPA regulations into a revision of Chapter 17-61 FAC in mid to late 1989. The EPA regulations are not included in the scope of this project. This Storage Tank Management Plan will address only those tanks that are regulated under the current FDER regulations.

Faced with the task of managing approximately 1,000 storage tank systems at 22 Naval activities in Florida including 300 transportation related tank systems, Southern Division (SDIV) Naval Facilities Engineering Command (NAVFACENGCOM) began an aggressive program to comply with the retrofitting schedule set forth by Chapter 17.61.060 FAC.

In December 1986, a letter was sent to the FDER Solid Waste Section apprising FDER of SDIV's intention to comply with Chapter 17-61 FAC and outlining all actions taken to date. These actions included:

- education of activity personnel responsible for tank compliance;
- compiling an inventory of stationary storage tanks located at each activity;
- registration of transportation related tanks greater than 550 gallons with the state; and
- conducting a preliminary evaluation of measures necessary to achieve compliance with Chapter 17-61 FAC.

Upon completion of these actions and the identification of the Naval group responsible for each storage tank system, funding requests will be submitted for upgrading, replacement or removal of the storage systems to bring them into compliance with the state regulations.

Because funding requests require a period of approximately four years to be processed and approved, the Navy cannot meet FDER's storage system retrofitting schedule for some of their storage systems. To comply with the state regulations during the time period between the required retrofitting schedule and the Navy's funding approval and proposed schedule, SDIV requested interim alternate procedures for those storage systems that would not meet FDER's retrofitting schedule.

A meeting was held at FDER in September 1987, which was attended by representatives of FDER and personnel from SDIV NAVFACENGCOM and E.C. Jordan Co. The purpose of this meeting was to discuss the development of Alternate Procedures, as outlined in Chapter 17-61 FAC, since the Navy was unable to meet compliance deadlines due to budget constraints. It was mutually agreed during the September 1987 meeting that SDIV should submit an Alternate Procedure Request as outlined in Chapter 17-61 FAC which would include specific data on all regulated tanks at each activity and a proposed Alternate Procedure that would be implemented for each tank that is not in compliance. The proposed Alternate Procedure Request would be included with or be followed by a Storage System Management Plan, to be submitted to FDER by July 25, 1988.

In December 1987, SDIV contracted E.C. Jordan Co. (Jordan) to conduct a study of the Navy's petroleum storage systems in the State of Florida and in cooperation with SDIV and the various activities, develop a Storage System Management Plan.

The formal Alternate Procedure Request for all Naval activities in the State of Florida was submitted by SDIV and received by FDER in February 1988. The Storage system Management Plans were submitted by SDIV and received by FDER in July 1988. The alternate procedure measures that will be implemented at the activity during the interim compliance period are addressed in this Final Storage System Management Plan.

1.1 Purpose and Scope

SDIV NAVFACENGCOM, acting on behalf of the various Naval activities, has been working with the FDER for the past two years to develop a Storage Tank Management Plan which will ultimately produce an environmentally sound program in full compliance with Chapter 17-61 FAC.

The purpose of this Storage System Management Plan is to:

1) Identify all existing storage systems located at Naval activities in Florida;

2) Recommend environmentally sound Alternate Procedures for regulated tanks as specified in Chapter 17-61.08 FAC that would be implemented until such time as the systems are brought into compliance; and

3) Develop recommendations for final compliance action by removing, replacing or upgrading existing regulated storage systems.

The scope of services performed by Jordan as part of the development of this Storage System Management Plan for each activity consisted of the following:

1. Available information on underground and above ground storage systems was compiled by SDIV and the various activities and reviewed by Jordan personnel. This information included but was not limited to a review of all previously submitted tank registration forms, as-built plans and previous inventory studies of storage tank systems.

2. Site visits were conducted by Jordan and SDIV personnel at ten major activities in Florida that included:

   - Key West Naval Air Station
   - Pensacola Naval Air Station
   - Pensacola Public Works Center
   - Pensacola Naval Supply Center
   - Whiting Field Naval Air Station
   - Jacksonville Naval Air Station
   - Jacksonville Naval Fuel Depot
   - Mayport Naval Station
   - Cecil Field Naval Air Station
   - Orlando Naval Training Center

These activities dispense large quantities of transportation fuels. The site visits provided an opportunity to verify previously compiled information with activity personnel, inspect storage systems, review current tank inventory and maintenance operations and discuss various management options and proposed action dates with activity personnel.

Because of the close proximity of the major activities to other activities that dispense small quantities of fuel, site visits were also conducted at:

- Pensacola Naval Aviation Depot
- Saufley Field, Pensacola
- Corry Field, Pensacola
- Jacksonville Naval Aviation Depot
- Detachment Astor, Pinecastle
- Orlando Naval and Marine Corps Reserve Center

- o Orlando Naval Research Laboratory

Site visitation reports were prepared after each visit. These reports summarized the visit and listed any planning or management action items that were discussed and agreed upon with activity personnel. A copy of the site visitation report is presented in Appendix A. At activities where site visits were not conducted, a telephone conference with base personnel was performed to verify existing information and to develop Alternate Procedures, establish target dates and update management plans.

3. A Tank Inventory and Management System (TIMS) was developed to store data on existing and proposed tank and piping construction along with interim-compliance alternate procedures that should be carried out until such time that systems can be brought into compliance. TIMS will allow SDIV to accurately track interim compliance and changes in various storage systems at each activity.

4. Based on information compiled during the review and site visits, this Storage System Management Plan was developed. It presents proposed system changes, target dates, costs and alternate procedures that should be implemented until such time that final compliance action is taken. Draft Storage System Management Plans were distributed to each activity for review and their comments and recommendations have been incorporated in the final Storage System Management Plan.

This document represents the Storage System Management Plan and includes the following information:

- o A description of the Tank Inventory and Management System (TIMS) data base developed for each facility and an explanation of data contained in the data base;
- o A brief description of each activity, its mission and physical layout including a discussion of the hydrogeologic setting and the use of various aquifers as water supply sources;
- o Presentation of the facility specific TIMS data base; and
- o A discussion of regulated transportation systems at each activity that includes a brief description of the storage system, the recommended or approved Alternate Procedure, and a brief discussion of the proposed action for each storage system.

2.0 TANK INVENTORY AND MANAGEMENT SYSTEM (TIMS)

2.1 Description of TIMS

With the large number of storage tank systems located at the 22 Naval activities in Florida, a data base system is needed to:

- o locate and identify each storage tank system;
- o provide information on activity location and activity contact; and
- o provide information on inventory procedures, spill history and proposed system changes and schedules.

TIMS was developed for SDIV on a PC-based computer utilizing the DBase III Plus software package. The TIMS data base will assist SDIV and the activities in managing various testing, construction and remedial programs associated with the storage systems. It also provides ease in accessing, storing and reporting data for each activity and each tank system.

TIMS is designed to incorporate information from FDER's tank registration program and presents this information in a similar but expanded format. This design provides continuity with FDER's tank registration in one data base.

2.2 TIMS Information Sources

The information contained in TIMS for each activity was obtained from the following sources:

- o Activity reports relating to petroleum storage systems previously prepared for SDIV by McClelland Engineers, Inc. (1985-1987);
- o Tank Registration Forms previously prepared and submitted to FDER for all tanks greater than 550 gallons; and
- o Information, including as-built plans and contract specifications for storage tank systems, provided by activity personnel during the site visit.

Transportation tank systems which are currently regulated under Chapter 17-61 FAC were visited by Jordan and SDIV personnel at the major Naval activities that dispense large quantities of transportation fuel. These visits occurred between March and May 1988. Information on these storage systems was verified for those components of the system that could be observed.

Because of the large number and diversity of the non-transportation related storage tank systems, information on these systems could not be verified.

2.3 Information Contained in the TIMS Data Base

TIMS contains information on three areas of Storage Tank Management. These three areas include Naval activity information, physical information on the storage systems, and management and planning information.

2.3.1 Naval Activity Information

This section of TIMS provides physical information on each Naval activity that includes:

- o activity name and location by city and county;
- o FDER tank registration identification number;
- o activity contact for storage tank information;
- o phone number of the contact; and
- o coded activity identification number.

The coded activity identification number, called the ECJID number, is a means of describing the location and description of an activity into a 10 digit coded name. For example, the ECJID number for the Jacksonville Naval Air Station is FL16JAXNAS. Broken into its separate components it describes the activity as follows:

FL16JAXNAS

State	County No.	Nearest City	Activity Description
FL	16	JAX	NAS

The ECJID number provides the user with the flexibility to retrieve information in TIMS by Region, State, County, City or activity type.

2.3.2 Physical Information On the Storage Tank Systems

The physical information on the storage tank system in TIMS is presented in this report. This information includes:

- o tank number;
- o date of the tank installation;

- contents of tank;
- whether the storage tank system is transportation related as defined by Chapter 17-61 FAC;
- storage tank capacity in gallons;
- above ground or underground tank;
- construction material of tank;
- construction material of piping;
- types of leak detection systems;
- current status of the tank system;
- date of last tank testing or inspection; and
- proposed interim compliance measures.

Table 2-1 presents the key to the coded physical information.

The letter codes presented in Table 2-1 were largely derived from the FDER's Tank Registration Form, previously submitted to FDER by SDIV. Consequently the letter codes in Table 2-1 are the same as those used by FDER on the Tank Registration Form. However, due to the diversity of storage systems utilized by the Navy, it was necessary to add codes in some sections to more accurately describe the physical characteristics of certain storage systems. Those items in Table 2-1 (TIMS Key) that are the same as those used by FDER in the Tank Registration Form are identified by an asterisk.

2.3.3 Management and Planning Information

Management and planning information for each storage tank system contained in TIMS is presented as follows:

- tank number;
- environmental risk rating;
- target date when proposed action will take place;
- proposed action for tank system;
- cost estimate;
- date when action was completed;
- inventory records, method and frequency;
- spill or leak history of tank systems; and
- general remarks and recommendations.

2.3.3.1 Tank Number. The tank number identifies the storage tank system and usually corresponds to an adjacent building number at each activity. The tank number is the coordinating parameter when viewing the TIMS data base. The tank systems presented in the data base tables will always be listed in the same order.

2.3.3.2 Environmental Risk Rating. The goal of the risk rating is to prioritize a population of storage systems in order to differentiate those systems which have a high

TABLE 2-1 - TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE

Tank Contents

*A. leaded gasoline
*B. unleaded gasoline
*C. alcohol enriched gas
*D. diesel fuel
E. AVGAS
F. MOGAS
G. JP-4
H. JP-5
I. empty
J. water
K. kerosene
L. waste oil
M. heating/fuel oil
N. boiler/generator diesel
O. new oil
P. solvents
Q. unknown
*R. other ________

TANK CONSTRUCTION

Underground Tanks

*A. has overfill protection
*B. is interior lined
*C. is painted/asphalted steel
*D. is of unknown type
*E. is fiberglass type
*F. is fiberglass-clad steel
*G. is sacrificial anode type
*H. is impressed current type
*I. is double walled
*J. is concrete
*K. is in secondary containment
M. is unlined steel
N. is single walled
O. other ________

Above Ground Tanks

*O. has overfill protection
*P. is surrounded by impervious dike
*Q. is surrounded by earth dike
*R. rests on an impervious base
*S. rests on earth/gravel base
*T. has interior lined bottom
*U. is cathodically protected
*V. is built of/coated with corrosion resistant materials
*W. is supported above the soil
AA. is fiberglass type
BB. is steel type
CC. is concrete
DD. is single walled
EE. is double walled
FF. other ________

Piping Construction

*A. has no parts in contract with the soil

has parts contacting the soil which are:

*B. unprotected metal
*C. built of corrosion resistant materials
*D. corrosion resistant coated
*E. cathodically protected
*F. double walled
*G. within a secondary containment
*H. interior lined
*I. continuously in-line monitored
K. galvanized steel
L. steel w/cathodic protection
M. black iron
N. copper
O. fiberglass
P. unknown
Q. other ________

Leak Detection Type

*A. automatically sampled well(s)
*B. manually sampled well(s)
*C. groundwater monitoring plan
*D. SPCC plan
*E. well/detection in secondary containment
*F. in-ground detector
*G. within walls of double-walled tank
H. inventory control
I. pressurized-lined leak detector (red jacket)
J. high level alarm
K. none
L. other ________

Tank Status

A. active
B. out of service
C. abandoned/properly disposed
D abandoned/not properly disposed
E. removed

ALTERNATE PROCEDURES

Underground Tanks < 20,000 gallons

A. annual tank testing
B. biennial tank testing
C. installation of line leak detector (pressurized piping systems)
D. installation of compliance monitoring wells
E. installation of overfill protection
F. inventory reconciliation
K. being investigated under other programs
L. scheduled for removal/abandonment in 1988

Underground Tanks > 20,000 Gallons and Above Ground Tanks

G. SPCC plan
H. groundwater monitoring plan
I. tracer tests
J. draining, inspection, cleaning and repair every 3 years
D. installation of compliance monitoring wells
K. being investigated under other programs
F. inventory reconciliation (marginal)

* - From FDER Tank Registration Form

potential to cause serious environmental or financial problems from those with a low potential. By addressing storage systems identified as high risk first, the total liability posed by the tank population can be reduced most efficiently and cost effectively.

The risk rating used for this program is divided into two categories:

- o Specific storage system factors which affect the likelihood of a storage system leak (i.e., tank and piping construction materials) and the likelihood that a leak will be detected if it occurs (i.e., leak detection device); and

- o Site specific factors that will influence the impact potential to human health and the environment in the event of a leak (i.e., nearby water supply wells, buried utilities, nearby surface waters, basements, etc.).

A number was assigned to the storage tank systems for each of the 16 factors of the risk rating; the higher the number, the higher the environmental risk. A distribution curve was made of the summation of the factor numbers for each storage tank system. Grouping separations between a low, moderate or high risk were made at distinctive areas along the distribution curve. A more detailed description of the risk rating system and a copy of the risk rating worksheet are presented in Appendix B.

Limitations. Because of the subjectivity and limitations of the risk factors, the prioritization scale was designed to remain relatively indefinite (high, moderate, low). The risk ranking includes a number of assumptions:

- o that the environmental risk factor assigned assures uniform surface and subsurface conditions;

- o that installation practices for all storage systems were uniform; and

- o that storage tank systems are well maintained (i.e., cathodic protection systems) and leak detection practices are executed (i.e., inventory control).

2.3.3.3 Proposed Target Date. The proposed target date presents a date scheduled by activity planning on which a proposed action on a storage tank system will be completed. The target date is dependent on the length of time estimated to solicit the Department of Defense and receive funding. For special projects or Military Construction (MILCON) projects that have been requested, a 4 to 6 year lead time may be required.

2.3.3.4 Proposed Action for a Storage System. The proposed action for a storage system is an action planned by the activity that will upgrade the storage system for the purpose of modernizing or improving the existing system or to bring it into compliance with existing state and federal regulations. The proposed action may include such items as storage system removals, replacement or retrofits.

2.3.3.5 Cost Estimates. The estimated budget to perform a proposed action is an estimate of the total cost for executing the proposed action. It can also be the amount budgeted in a special MILCON project for performing the proposed action.

2.3.3.6 Action Completion Date. The action completion date is the actual date that the proposed action was completed. For example, if a tank system was removed in June 1985, the proposed action would state "removal" and the action completion date would be June 31, 1985.

2.3.3.7 Inventory Records, Method and Frequency. This section presents information on the methodology and frequency of tank inventory. The information will state whether or not storage tanks are gauged, how often, and other pertinent information.

2.3.3.8 Spill or Leak History of Tank System. This section presents any available information obtained from the activity on past spills or leaks that may have occurred in association with the tank system. The recorded information may contain the date of the spill or leak, the amount of product lost and the cause of the mishap (i.e., broken pipe, overfill, leaky tank, etc.).

2.3.3.9 General Remarks and Recommendations. The general remarks and recommendations section indicates the type of action proposed or implemented for the tank system and future recommendations. This includes additional information to clarify an action (i.e., tank filled with sand, system replaced with double walled fiberglass tank, etc.).

3.0 NAVAL AIR STATION WHITING FIELD STORAGE SYSTEMS MANAGEMENT PLAN

This section contains information on the naval activity, environmental conditions, a discussion of each regulated transportation related storage tank system and a general discussion of the non-transportation storage systems. The TIMS data base for the activity is also presented in this section in a table format. These tables represent the Storage Tank Management Plan for the activity. The regulated tanks are discussed individually; however, all the information is contained in the TIMS data base tables.

3.1 Activity Description

NAS Whiting Field was originally commissioned as a Naval Auxiliary Air Station in 1943. The mission of the station was to provide training to Naval aviators for the fleet. For a period from 1945 to 1948 the station was used as a Prisoner-of-War camp for German soldiers. NAS Whiting Field is presently the home base of Training Air Wing Five (TRAWING FIVE) whose mission is to administer, coordinate and supervise flight and academic training. TRAWING FIVE includes both fixed-wing and helicopter training squadrons. NAS Whiting Field presently occupies a 3,490-acre tract of land, with easement rights to an additional 457 acres. The station is divided into a North Field, where fixed-wing training takes place, and a South Field which is used for helicopter training. Support facilities are located between the two fields.

3.1.1 Hydrogeologic Setting

Data on the hydrogeologic setting of the site is used as a parameter in the development of an environmental risk rating (see Section 2.3.3.2 and Appendix B) and in determining an appropriate interim alternate procedure for a storage tank system. For example if a storage tank system is located in a hydrogeologic setting underlain by a shallow aquifer containing potable water, annual precision tank testing would be proposed. However, if the water quality of the shallow aquifer is not acceptable and the potable water source is from a deep confined aquifer, then biennial precision tank testing would be proposed.

NAS Whiting Field is underlain by three water-bearing zones. These include:

Sand and Gravel Aquifer. The Sand and Gravel aquifer extends to a depth of approximately 300 feet below land surface (Geraghty and Miller, 1984). It is comprised predominantly of terrace deposits and the Citronelle Formation of Pleistocene age and Miocene coarse clastics that are described as poorly-sorted fine to coarse sands with numerous lenses and layers of clay and gravel (up to 60 feet thick). The clay lenses are responsible for the occurrence of perched water tables and artesian conditions in the aquifer (Henningson, Durham and Richardson, 1975). In the Whiting Field area, major clay lenses occur in the uppermost 30 feet of the aquifer and within the depth interval of approximately 110 to 170 feet. These clay lenses appear to be continuous, but may contain permeable zones (Geraghty and Miller, 1984). Groundwater levels in the Sand and Gravel aquifer at Whiting Field range from 30 to 70 feet mean sea level (MSL). Groundwater flow is generally topographically controlled with flow directions toward the west and south toward Clear Creek and to the east toward Big Coldwater Creek. Virtually all groundwater usage in the area comes from the Sand and Gravel aquifer.

The Upper Floridan Aquifer. The upper Floridan aquifer is approximately 125 feet thick and is separated from the overlying Sand and Gravel aquifer by the rather impermeable Pensacola clay of Miocene age and from the underlying lower Floridan aquifer by the middle Oligocene Bucatunna clay. The formations within the upper Floridan aquifer are characterized typically as a brown to light gray, hard, dolomitic limestone or dolomite with a distinctive spongy looking texture and containing abundant shell fragments. The aquifer includes the lower Miocene to upper Oigocene Chickasawhay and Tampa formations. The overlying Pensacola clay is approximately 400 feet thick and forms an effective confining unit between the Sand and Gravel aquifer and the upper Floridan aquifer. The upper Floridan aquifer is recharged by rainfall were it outcrops in Conecuh, Escambia, and Monroe counties (Alabama). General groundwater flow in the aquifer is to the south and southeast toward the Gulf of Mexico (Musgrove et al., 1965). The groundwater in the upper Floridan aquifer is mineralized in this area and is not used as a water supply.

The Lower Floridan Aquifer. The Lower Floridan aquifer ranges in thickness from about 360 feet in central Escambia County to as much as 1,200 feet in northern Santa Rosa County. The aquifer consists of the Ocala Limestone and other limestones of Eocene age. The formations within the Lower Floridan aquifer are characterized as a white to grayish cream, soft and chalky limestone. The aquifer is confined from above by the Bucatunna Clay member of the Byram formation of Middle Oligocene age and from below by gray shale and clay of Middle Eocene age. The Bucatunna clay is approximately 170 feet thick in the area of Whiting Field (Geraghty and Miller, 1984). Groundwater flow in the aquifer is to the south and southeast toward the Gulf of Mexico (Musgrove et al., 1965). The water quality is poor because of high mineralization.

The first groundwater encounter beneath NAS Whiting Field is found within the Sand and Gravel aquifer. Virtually all potable water usage in the area comes from the Sand and Gravel aquifer. Therefore, the proposed interim compliance for tank testing of underground storage systems less than 20,000 gallons will be on an annual schedule.

3.2 Regulated Transportation Tank Systems and Proposed Action

Currently there are 18 underground and 2 above ground tanks that are regulated by FDER at NAS Whiting Field. Regulated tanks include 3 tanks at the Base Exchange Service Station, 1 tank at the ground maintenance facility and 16 other storage systems at NAS Whiting Field. There are two additional underground transportation tank systems at Outlying Landing Field - Site 8. This site, however, is located in Alabama and is not regulated by FDER.

Proposed actions for replacement or upgrading any of these regulated tanks will comply with the requirements of Chapter 17-61 FAC presented in Appendix C. For above ground tank systems, this includes:

- impervious containment must be equivalent to the capacity of the largest tank with appropriate controls for drainage of precipitation within diked areas by January 1, 1990;
- proper inventory and reconciliation;
- proper record keeping as described in Chapter 17-61.050(4)(a) FAC;
- metal tanks shall not be in contact with the soil without corrosion protection or interior lined with a material impervious to the product to be stored or have monitoring wells or be included in the Spill Prevention Control and Countermeasure (SPCC) plan.

For underground tank systems defined by Chapter 17-61.020 FAC compliance measures include:

- proper product inventory and reconciliation, and gauging for water in the tank;
- proper record keeping as described in Chapter 17-61.050(4)(a) FAC;
- acceptable designs for tank and piping materials and construction as defined under Chapter 17-61.060(2)(b)1 FAC;

- tank protection according to FDER's retrofit schedule; and

- proper cathodic protection systems for metal tanks and associated metal piping.

3.2.1 TIMS Data Base for NAS Whiting Field

The TIMS data base for the storage tank systems at NAS Whiting Field is shown on Tables 3-1 and 3-2. Table 3-1 presents the physical information for the storage systems. Table 3-2 presents management and planning information for the systems. Additionally a TIMS key to the coded data is presented on Table 2-1. A discussion of each transportation related storage tank system is presented in the following section. A general discussion of the non-transportation storage systems is presented in Section 3.3. A general development map of NAS Whiting Field highlighting the location of all the storage tank systems is presented in Appendix D.

3.2.2 Storage System Summaries and Management Plan

The information on each of the regulated transportation tank systems presented in Tables 3-1 and 3-2 is summarized and the management plan is discussed in this section. The tank system description, proposed interim compliance measure and proposed action are presented for each storage system or group of related storage systems.

Tanks 1429I and 1429J

Tank System Description. Tank numbers 1429I and 1429J were respectively, 5,000 and 2,000 gallon, coated steel, underground tanks installed in 1952 that contained MOGAS and diesel. The associated piping was of unknown construction. The tanks were properly abandoned (filled with sand) in June 1986.

Interim Compliance and Proposed Action. There is no proposed interim compliance or proposed action for tank numbers 1429I and 1429J. These tanks should be removed from the FDER tank registration list.

Tanks 1438 and 1439

Tank System Description. Tank numbers 1438 and 1439 were 218,000 gallon, concrete, underground tanks. The associated piping was of unknown construction. The date of installation for these tanks is unknown. The tank systems were removed in December 1986.

TABLE 2-1 - TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE

TANK CONSTRUCTION

Tank Contents

- *A. leaded gasoline
- *B. unleaded gasoline
- *C. alcohol enriched gas
- *D. diesel fuel
- E. AVGAS
- F. MOGAS
- G. JP-4
- H. JP-5
- I. empty
- J. water
- K. kerosene
- L. waste oil
- M. heating/fuel oil
- N. boiler/generator diesel
- O. new oil
- P. solvents
- Q. unknown
- *R. other ________

Underground Tanks

- *A. has overfill protection
- *B. is interior lined
- *C. is painted/asphalted steel
- *D. is of unknown type
- *E. is fiberglass type
- *F. is fiberglass-clad steel
- *G. is sacrificial anode type
- *H. is impressed current type
- *I. is double walled
- *J. is concrete
- *K. is in secondary containment
- M. is unlined steel
- N. is single walled
- O. other ________

Above Ground Tanks

- *O. has overfill protection
- *P. is surrounded by impervious dike
- *Q. is surrounded by earth dike
- *R. rests on an impervious base
- *S. rests on earth/gravel base
- *T. has interior lined bottom
- *U. is cathodically protected
- *V. is built of/coated with corrosion resistant materials
- *W. is supported above the soil
- AA. is fiberglass type
- BB. is steel type
- CC. is concrete
- DD. is single walled
- EE. is double walled
- FF. other ________

Piping Construction

- *A. has no parts in contract with the soil

  has parts contacting the soil which are:
- *B. unprotected metal
- *C. built of corrosion resistant materials
- *D. corrosion resistant coated
- *E. cathodically protected
- *F. double walled
- *G. within a secondary containment
- *H. interior lined
- *I. continuously in-line monitored
- K. galvanized steel
- L. steel w/cathodic protection
- M. black iron
- N. copper
- O. fiberglass
- P. unknown
- Q. other ________

Leak Detection Type

- *A. automatically sampled well(s)
- *B. manually sampled well(s)
- *C. groundwater monitoring plan
- *D. SPCC plan
- *E. well/detection in secondary containment
- *F. in-ground detector
- *G. within walls of double-walled tank
- H. inventory control
- I. pressurized-lined leak detector (red jacket)
- J. high level alarm
- K. none
- L. other ________

* - From FDER Tank Registration Form

Tank Status

- A. active
- B. out of service
- C. abandoned/properly disposed
- D abandoned/not properly disposed
- E. removed

ALTERNATE PROCEDURES

Underground Tanks < 20,000 gallons

- A. annual tank testing
- B. biennial tank testing
- C. installation of line leak detector (pressurized piping systems)
- D. installation of compliance monitoring wells
- E. installation of overfill protection
- F. inventory reconciliation
- K. being investigated under other programs
- L. scheduled for removal/abandonment in 1988

Underground Tanks > 20,000 Gallons and Above Ground Tanks

- G. SPCC plan
- H. groundwater monitoring plan
- I. tracer tests
- J. draining, inspection, cleaning and repair every 3 years
- D. installation of compliance monitoring wells
- K. being investigated under other programs
- F. inventory reconciliation (marginal)

TABLE 3-1
PHYSICAL INFORMATION ON STORAGE SYSTEMS
TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE
U.S. NAVY STORAGE SYSTEMS MANAGEMENT PLAN

TANK NO.	YEAR	CONTENTS	TRANSPORT	TANK SIZE	ABOVE/ UNDER	TANK CONST.	PIPE CONST	LD TYPE	STATUS	LAST TEST DATE	PROPOSED INTERIM COMPLIANCE MEASURES
** ECJID: FL57MILNAS			NAVAL AIR STATION				DANNY LOCKLEAR			(904)623-7181	
1429I	52	F	Y	5000	U	C	P	D	C	/ /	N/A
1429J	52	D	Y	2000	U	C	P	D	C	/ /	N/A
1438	43	I	Y	218000	U	J	P	K	E	/ /	N/A
1439	43	I	Y	218000	U	J	P	K	E	/ /	N/A
1466-D	43	J	Y	25000	U	AC	D	D	D	/ /	N/A
1466-E	43	J	Y	25000	U	AC	D	D	D	/ /	N/A
1466-F	43	J	Y	25000	U	AC	D	D	D	/ /	N/A
1466-G	43	J	Y	25000	U	AC	D	D	D	/ /	N/A
1467-A	43	J	Y	25000	U	CA	K	D	D	/ /	N/A
1467-B	43	J	Y	25000	U	CA	K	D	D	/ /	N/A
1467-C	43	J	Y	25000	U	CA	K	D	D	/ /	N/A
1467-D	43	J	Y	25000	U	CA	K	D	D	/ /	N/A
1467-E	43	J	Y	25000	U	CA	K	D	D	/ /	N/A
1467-F	43	D	Y	25000	U	CA	K	DH	A	/ /	J
1467-G	43	B	Y	25000	U	CA	K	DH	A	/ /	J
2851	59	F	Y	2000	U	C	P	D	C	/ /	N/A
2866-A	59	B	Y	10000	U	C	K	DH	A	/ /	A
2866-B	59	B	Y	10000	U	C	K	DH	A	/ /	A
2866-C	59	A	Y	10000	U	C	K	DH	A	/ /	A
2877	82	A	Y	500	U	C	P	D	A	/ /	N/A
2891	61	H	Y	218000	A	RQWBB	B	DH	A	/ /	J
2892	61	H	Y	218000	A	RQWBB	B	DH	A	/ /	J
OLF-1	82	H	Y	10000	U	ABE	A	DH	A	/ /	D
OLF-2	82	H	Y	10000	U	ABE	A	DH	A	/ /	D
1404A	52	L	N	500	U	C	P	D	C	/ /	
1406F	52	L	N	846	U	C	P	D	C	/ /	
1406G	52	L	N	846	U	C	P	D	C	/ /	
1406H	52	L	N	1868	U	C	P	D	C	/ /	
1406I	52	L	N	1008	U	C	P	D	C	/ /	
1424E	52	L	N	846	U	C	P	D	C	/ /	
1424F	52	L	N	1008	U	C	P	D	C	/ /	
1424G	52	L	N	1868	U	C	P	D	C	/ /	
1429-A	43	D	N	10000	U	AC	P	D	A	/ /	
1429-B	43	M	N	25000	U	AC	P	D	A	/ /	
1429-C	43	M	N	25000	U	AC	P	D	A	/ /	
1429-D	43	M	N	25000	U	AC	P	D	A	/ /	
1429-E	43	M	N	25000	U	AC	P	D	A	/ /	
1444	78	D	N	500	A	BB	P	D	A	/ /	
1454A	52	L	N	846	U	C	P	D	C	/ /	
1466	43	M	N	25000	U	C	P	D	A	/ /	
1466-A	43	M	N	25000	U	AC	D	DH	A	/ /	
1466-B	43	M	N	25000	U	AC	D	DH	A	/ /	
1466-C	43	M	N	25000	U	AC	D	DH	A	/ /	
1466-H	43	M	N	15000	U	AC	D	DH	D	/ /	

TABLE 3-1
PHYSICAL INFORMATION ON STORAGE SYSTEMS
TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE
U.S. NAVY STORAGE SYSTEMS MANAGEMENT PLAN

TANK NO.	YEAR	CONTENTS	TRANSPORT	TANK SIZE	ABOVE/ UNDER	TANK CONST.	PIPE CONST	LD TYPE	STATUS	LAST TEST DATE	PROPOSED INTERIM COMPLIANCE MEASURES
1467-H	43	L	N	15000	U	CA	CK	D	A	/ /	
1467	43	J	N	25000	U	C	P	D	D	/ /	
1480	78	D	N	500	U	C	P	D	A	/ /	
2985	75	D	N	1000	U	C	P	D	A	/ /	
2996	0	D	N	500	U	C	P	D	A	/ /	
3037	86	D	N	500	U	C	P	D	D	/ /	
3037A	86	D	N	500	U	C	P	D	A	/ /	

TABLE 3-2
MANAGEMENT AND PLANNING INFORMATION
TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE
U.S. NAVY STORAGE SYSTEMS MANAGEMENT PLAN

TANK NO.	RISK RATING	TARGET DATE	PROPOSED ACTION	ESTIMATED BUDGET	ACTION COMPL.	INVENTORY RECORDING	SPILL HISTORY	REMARKS
** ECJID: FL57MILNAS			NAVAL AIR STATION			DANNY LOCKLEAR		(904)623-7181
1429I		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1429J		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1438		/ /	REMOVED	0	12/31/86		NONE	TANK HAS BEEN REMOVED
1439		/ /	REMOVED	0	12/31/86		NONE	TANK HAS BEEN REMOVED
1466-D	HI	12/31/92	REMOVE	0	/ /			ABANDONED - REMOVE TANK
1466-E	HI	12/31/92	REMOVE	0	/ /			ABANDONED - REMOVE TANK
1466-F	HI	12/31/92	REMOVE	0	/ /			ABANDONED - REMOVE TANK
1466-G	HI	12/31/92	REMOVE	0	/ /			ABANDONED - REMOVE TANK
1467-A	HI	12/31/92	REMOVAL	0	/ /	GAUGED DAILY	NONE	REMOVE TANK
1467-B	HI	12/31/92	REMOVAL	0	/ /	GAUGED DAILY	NONE	REMOVE TANK
1467-C	HI	12/31/92	REMOVAL	0	/ /	GAUGED DAILY	NONE	REMOVE TANK
1467-D	HI	12/31/92	REMOVAL	0	/ /	GAUGED DAILY	NONE	REMOVE TANK
1467-E	HI	12/31/92	REMOVAL	0	/ /	GAUGED DAILY	NONE	REMOVE TANK
1467-F	MOD	12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
1467-G	MOD	12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
2851		/ /	ABANDON	0	12/31/86			PROPERLY ABANDONED 1986
2866-A	MOD	12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
2866-B	MOD	12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
2866-C	MOD	12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
2877	HI	/ /		0	/ /			LO VOL USAGE, BETTER INVEN
2891	MOD	12/31/92	UPGRADE	0	/ /	GAUGED DAILY	NONE	INSTALL IMPERVIOUS CONTAINM.
2892	MOD	12/31/92	UPGRADE	0	/ /	GAUGED DAILY	NONE	INSTALL IMPERVIOUS CONTAINM.
OLF-1	LOW	12/31/92	UPGRADE	0	/ /	GAUGED DAILY	NONE	UPGRADE-INSTALL MONITOR WELLS
OLF-2	LOW	12/31/92	UPGRADE	0	/ /	GAUGED DAILY	NONE	UPGRADE-INSTALL MONITOR WELLS
1404A		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1406F		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1406G		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1406H		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1406I		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1424E		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1424F		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1424G		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1429-A		12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLC W/ABV GRD OR DBL WALLED
1429-B		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1429-C		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1429-D		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1429-E		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1444		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1454A		/ /	ABANDONED	0	06/30/86		NONE	ABANDONED - FILLED WITH SAND
1466		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1466-A		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1466-B		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1466-C		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
1466-H		12/31/92	REMOVE	0	/ /			ABANDONED - REMOVE TANK
1467-H		12/31/92	REPLACE	0	/ /	GAUGED DAILY	NONE	REPLACE W/ABV GRD TANK W/CONTM
1467		12/31/92	REMOVE	0	06/30/86		NONE	ABANDONED - REMOVE TANK

TABLE 3-2
MANAGEMENT AND PLANNING INFORMATION
TANK INVENTORY AND MANAGEMENT SYSTEM DATA BASE
U.S. NAVY STORAGE SYSTEMS MANAGEMENT PLAN

TANK NO.	RISK RATING	TARGET DATE	PROPOSED ACTION	ESTIMATED BUDGET	ACTION COMPL.	INVENTORY RECORDING	SPILL HISTORY	REMARKS
1480		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
2985		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
2996		/ /		0	/ /			GEN NON-TRANS TANK SUGGESTIONS
3037		12/31/92	REMOVAL	0	/ /		NONE	SCHEDULED FOR REMOVAL
3037A		12/31/92	REMOVAL	0	/ /			SCHEDULED FOR REMOVAL

Interim Compliance and Proposed Action. There is no proposed interim compliance or proposed action for tank numbers 1438 and 1439. These tanks should be removed from the FDER tank registration list.

Facility 1466

Tank System Description. Tank numbers 1466-D through 1466-G are located at the South Field Fuel Farm and are 25,000 gallon, coated steel, underground tanks installed in 1943. The associated piping is corrosion resistant coated steel. All the systems have overfill protection. The tanks once stored JP-5 but have been abandoned and currently are filled with water.

Interim Compliance and Proposed Action. No interim compliance is proposed for tanks 1466-D through 1466-G because of their out of service status. It is recommended that these tanks be removed or properly abandoned by a target date of December 31, 1992. FDER should be notified of the out of service status of these tanks by a target date of December 31, 1988.

Facility 1467

Tank System Description. Tank numbers 1467-A through 1467-G are located at the North Field Fuel Farm and are 25,000 gallon, coated steel, underground tanks installed in 1943. The associated piping is galvanized steel. The tanks are gauged daily. All the systems have overfill protection. Tanks 1467-A through 1467-E once stored JP-5 but have been abandoned and currently are filled with water. Tank 1467-F contains diesel and tank 1467-G contains unleaded gasoline.

Interim Compliance. The proposed interim compliance for tank numbers 1467-F and 1467-G are to drain, inspect, clean and repair the systems every 3 years because the tanks are greater than 20,000 gallons. No interim compliance is proposed for tanks 1467-A through 1467-E because of their out of service status.

Proposed Action. The proposed interim compliance measures will be implemented until such time as the construction standards of the storage systems comply with Chapter 17-61 FAC. Recommendations for upgrading the storage tank systems are to remove tank systems 1467-A through 1467-E by a target date of December 31, 1992. However, FDER must be notified of the out of service status of those tanks by a target date of December 31, 0988. The proposed action for tanks 1467-F and 1467-G is to replace these tanks with an above ground storage system with impervious containment and proper protection devices. The target date for completing this action is December 31, 1992.

Tank 2851

Tank System Description. Tank number 2851 was a 2,000 gallon, steel, underground tank installed in 1959 that contained MOGAS. The associated piping was unknown. The system was contained in the SPCC Plan. Tank 2851 was properly abandoned in 1986.

Interim Compliance and Proposed Action. There is no proposed interim compliance on proposed action for tank number 2851. The tank system was properly abandoned in 1986 and should be removed from the FDER tank registration list.

Base Exchange Service Station

Tank System Description. Tank numbers 2866-A, 2866-B, and 2866-C are 10,000 gallon, coated steel, underground tanks installed in 1959 that contain gasoline. The associated piping is galvanized steel. The tanks are gauged daily and are contained in the SPCC Plan.

Interim Compliance. The proposed interim compliance for tank numbers 2866-A, 2866-B and 2866-C is annual precision tank testing because the first encountered groundwater beneath the site is of sufficient quality to be used as a possible potable water source.

Proposed Action. The proposed interim compliance measures will be implemented until such time as the construction standards of the storage systems comply with Chapter 17-61 FAC. Recommendations for upgrading the storage tank systems are to replace them with double walled underground tanks with proper protection, double walled piping and leak detection devices. The target date for completing this action is December 31, 1992.

Grounds Maintenance Yard

Tank System Description. Tank number 2877 is a 500 gallon, coated steel, underground tank installed in 1982 that contains gasoline. The associated piping is of unknown construction. The tank is gauged on an infrequent basis. The tank is used for refueling lawnmowers and tractors. It is a converted propane pressure tank. The system dispenses less than 1,000 gallons per month.

Interim Compliance and Proposed Action. There in no proposed interim compliance for tank number 2877 because it is less than 550 gallons and has low volume usage and is therefore, not regulated by FDER. It is recommended that proper inventory and reconciliation procedures be used for the system.

Tanks 2891 and 2892

Tank System Description. Tank numbers 2891 and 2892 are 218,000 gallon, steel, above ground tanks installed in 1961 that contain JP-5 jet fuel. The associated piping is unprotected metal. The tanks are gauged daily and reconciled weekly. They rest on an impervious base supported above the soil and are surrounded by earthen dikes. The tanks are listed in the SPCC Plan.

Interim Compliance. The proposed interim compliance for tank numbers 2891 and 2892 is to drain, inspect, clean and repair the tanks every 3 years.

Proposed Action. The proposed interim compliance measures will be implemented until such time as the construction standards of the storage systems comply with Chapter 17-61 FAC. Recommendations for upgrading the storage tank systems are to install an impervious dike around the tanks. The target date for completing this action is December 31, 1992.

Outlying Landing Field - Site 8

Tank System Description. Tank numbers OLF-1 and OLF-2 are 10,000 gallon, interior lined, fiberglass, underground tanks installed in 1982 that contain JP-5 jet fuel. The associated piping has no parts in contact with the soil. The tanks are gauged daily. The tanks have overfill protection and are listed in the SPCC Plan. Outlying Landing Field - Site 8 is located in Escambia County.

Interim Compliance and Proposed Action. The interim compliance and proposed action for tank numbers OLF-1 and OLF-2 is to install compliance monitoring wells around the tanks by the target date of December 31, 1992.

3.3 Non-Transportation Tank Systems and Proposed Action

Currently there are 27 known non-transportation tanks at NAS Whiting Field of which 26 are underground and 1 is above ground. These tanks include 9 storage tanks for fuel oil/heating oil, 7 diesel tanks for emergency generators, 10 waste oil tanks or waste oil separators and 1 tank containing water. The non-transportation tank systems are not currently regulated by FDER guidelines; however, new state, federal and/or local regulations may change their status by 1989.

Federal regulations under the Environmental Protection Agency (EPA) 40 CFR 280 regulate most underground storage systems containing petroleum products, solvents and chemicals. The federal regulations will not apply to those systems that store heating oil for consumptive use on the premises.

Under 40 CFR 280 the underground storage tanks and their associated piping must be cathodically protected against corrosion, constructed of non-corrosive materials or steel clad with a non-corrosive material. The storage system construction materials and linings must be compatible with the substance stored in the tank. In addition, the underground storage system must have acceptable overfill protection, leak detection systems and an acceptable record keeping (inventory) and systems maintenance (calibration, maintenance and repair) program.

Non-transportation storage systems at the activity that will be regulated under the EPA regulations include the emergency generator fuel tanks and the waste oil tanks. The tanks presently containing water and the tank whose contents are unknown may also be regulated but more information is needed about the past and present stored contents of the tanks to make this determination.

Although the non-transportation tanks are not currently regulated by Chapter 17-61 FAC, FDER will report any non-compliance of 40 CFR 280 regarding underground non-transportation tanks to the EPA. The non-transportation tanks at the activity that must comply with the federal regulations for tank construction materials and cathodic protection are most tanks containing petroleum products except for those that store heating oil.

It is suggested that activity personnel keep abreast of changes to the federal and state tank regulatory programs and be aware of the implementation of any local (county, city) programs.

The non-transportation tanks are of varying sizes and installation dates. The existence of several of these tanks was determined from property records yet little or no data exists at the activity to provide a physical description of these tanks. The inventory recording methods and frequency for these systems are highly variable. General suggestions for non-transportation storage systems are:

- If the tank is not necessary, remove it.
- If the tank is necessary, place it above ground if possible or replace it with a double walled tank.
- It is suggested that proper inventory and reconciliation be conducted for all tank systems, and gauging for water be performed for underground tanks.

The following criteria should be applied to non-transportation related above ground tanks:

- containment must be equivalent to the capacity of the largest tank;
- keep piping above ground or where it can be visually inspected; and
- determine if any additional federal, state or local requirements apply.

The following criteria should be applied to non-transportation related underground tanks:

- acceptable tank and piping materials and construction standards must be met as stated in EPA 40 CFR 280;
- a strike plate must exist beneath the fill pipe and gauge opening;
- there must be a tank leak detection system;
- there must be a proper cathodic protection system for metal tanks and associated metal piping in contact with soil;
- proper overfill protection is required; and
- there must be a line leak detection system for associated piping.

4.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

This Storage Tank Management Plan, as presented in the TIMS data base, represents a dynamic management tool that will provide the activity and SDIV with the most current data on the physical information and proposed plans for the storage systems at the activity. The plan also recommends environmentally sound Alternate Procedures for regulated tanks as specified in Chapter 17-61.08 FAC that, once approved by FDER, should be implemented until such time as the systems are brought into compliance. Finally, the Storage Tank Management Plan has developed recommendations for final compliance actions for each regulated storage system, presented target dates for implementing the proposed actions and developed a management tool (risk rating) for prioritizing the proposed actions on the storage systems.

REFERENCES

Henningson, Durham and Richardson, 1975, Water Quality Management Plan for Escambia and Santa Rosa Counties, May.

Geraghty and Miller, June 1984, Hydrogeologic Assessment and Ground Water Monitoring Plan NAS Whiting Field, Florida, June.

Musgrove, R.H., J.T. Barraclough, and R.G. Granthan, Water Resources of Escambia and Santa Rosa Counties, Florida: U.S. Geological Survey, Florida Geological Survey, Report of Investigations, No. 40, 102 p.

APPENDIX A

FACILITY VISITATION REPORT

E.C.JORDAN CO. ENGINEERS & SCIENTISTS

1311 Executive Center Drive/Suite 231
Tallahassee, Florida 32301
(904) 656-1293

5400-02

April 13, 1988

DISTRIBUTION:

E.C. Jordan Co.	SDiv	NAS
D. Troutman	J. Albrecht	D. Ray
K. Busen		
M. Moreau		
T. Allen		
K. Eason-Busen		

FACILITY VISITATION REPORT
STATIONARY TANKS

DATES: March 21-23, 1988

PLACE: NAS Pensacola (NSC, PWC, NADEP, Corry Field, Saufley Field, Whiting Field)

PERSONS ATTENDING:
Ken Busen - ECJ - Project Manager
Marcel Moreau - ECJ - Tanks Specialist
John Albrecht - SDiv - Project Manager
DeWayne Ray - NAS - Environmental Engineer
Greg Campbell - PWC - Environmental Engineer
Syd Mix - NSC - Facilities Director
Bruce Tanner - NAS - Environmental Coordinator
Danny Freeman - NADEP - Environmental Engineer
Frank Stuart - NADEP - Director
Lt. Eilert - Saufley - Environmental Contact
Dave Clay - Corry - Environmental Contact
Danny Locklear - Whiting - Environmental Contact

SUMMARY

Personnel from E.C. Jordan Co. (ECJ), Southern Division (SDiv) Naval Facilities Engineering Command (NAVFAC), and Naval Air Station (NAS) Pensacola conducted an inspection of the underground and above ground stationary storage tanks at the NAS, Public Works Center (PWC), Naval Air Depot (NADEP), Naval Supply Center (NSC), Corry Field, Saufley Field, and Whiting Field on March 21-23, 1988. The objectives of the facility visits were to:

1. Meet with base personnel to verify and update earlier information provided to SDiv in a 1986 McClelland Engineering Report;

2. Visually observe underground and above ground stationary tanks to determine the accuracy of McClelland's data and develop recommendations for upgrading transportation tank systems to comply with Florida Administration Code (FAC) 17-61;

3. Determine proposed future construction-related activities and provide general recommendations for assuring compliance with existing and proposed state and federal regulations; and

4. Based on the information obtained from the facility visit, finalize recommendations for transportation tanks for an interim compliance program with the Alternative Procedure provisions of 17-61.08, and develop a Storage Tank Management Plan for NAS Pensacola and the associated facilities.

Because of time constraints, visual inspections were limited to only the transportation tanks. Additional information necessary to complete Phase I and Phase II was collected for all the tank storage systems, including those at Choctaw Field. The majority of the tanks located at NAS Pensacola and its associated facilities are included on a data base system located at the Public Works Center. This information was collected and will be incorporated into the SDiv data base. Information was gathered on pending projects that each activity had for removal, replacement, or upgrades to existing tanks. This information will be incorporated into the final activity Tank Management Plan.

MEETINGS

March 21 - An initial briefing was provided to base personnel to explain the nature of the work being conducted under SDiv's tank program and to reinforce that ECJ/SDiv was here to assist the facility with a Tank Management Plan.

March 21-23 - Additional information and contacts were made with Mr. Greg Campbell - PWC, Lt. Eileit - Saufley Field, Mr. Danny Locklear - Whiting Field, Mr. David Clay - Corry Field, Mr. Frank Stuart - NADEP, and Mr. Bruce Tanner - NAS during our site visit.

March 23 - An outbriefing was held at the Public Works Center. The proposed Storage Tank Management Plan, Alternate Procedures, and Schedule were discussed and finalized.

E.C.JORDAN CO. ENGINEERS & SCIENTISTS

ACTION ITEMS

1. DeWayne Ray should contact John Albrecht with information on the tanks from the abandoned Bronson Field and Chevalier Field so they can be entered into the SDiv data base system.

2. DeWayne Ray should keep John Albrecht informed on any changes to the proposed tank removal and replacement project schedule.

3. On the basis of the facility visit, ECJ will finalize the Alternate Procedures for these activities, submit drafts for activity and SDiv review and, based on the comments, finalize for FDER review.

RECOMMENDATIONS

For the non-transportation tanks that are not scheduled for removal or replacement, the following recommendations for these tanks will appear in the NAS Pensacola and associated Activities Storage Tank Management Plan.

- If the tank is not necessary, remove it;
- If the tank is necessary, locate it above ground if possible or use a double walled tank;
- The following criteria applies to above ground tanks:
  - containment must be equivalent to 110 percent of capacity
  - no containment is required on double-walled tanks, but these must be equipped with overfill protection;
- Keep piping above ground or inspectable; and
- Determine the SPCC requirements.

Any change or additions to this report should be directed to the attention of Ken Busen, E.C. Jordan Co., 2571 Executive Center Circle East, Suite 100, Tallahassee, Florida, 32301-5001, (904) 656-1293.

Kenneth L. Busen
Project Manager

KLB/dmw

APPENDIX B

ENVIRONMENTAL RISK RATING SYSTEM

The information contained in this Appendix presents the structure, calculations and worksheets of the environmental risk rating system.

The risk rating used in the management plan is divided into two categories:

- o Storage system specific factors which affect the likelihood of a storage system leak (i.e., tank and piping construction materials). and the likelihood that a leak will be detected if it occurred (i.e., leak detection device); and

- o Site specific factors that will influence the impact potential to human health and the environment in the event of a leak (i.e., nearby water supply wells, buried utilities, nearby surface waters, basements, etc.).

A number was assigned to the storage tank systems for each of the 16 factors of the risk rating; the higher the number, the higher the environmental risk. A summation of each of the factors was calculated (except for those factors where multiplication is called for) and a final numerical score was determined. A listing of the storage system factors, the site risk factor, their associated risk scores and notes on calculating the final risk rating is presented below.

STORAGE SYSTEM LEAK FACTORS

System Factor	Information	Risk Score
a. Tank Construction	steel	2
	steel w/cathod	1
	fiberglass	1
	concrete w/no lining	2
	concrete w/lining	1
	unknown	2
b. Tank Design	single wall (SW)	1
	double wall	0
	SW w/imper. dike and base	0
	SW w/imper. dike or base but not both	1
	SW w/no containment	2
	unknown	1

NOTE: Multiply tank construction by tank design

STORAGE SYSTEM LEAK FACTORS (Cont.)

System Factor	Information	Risk Score
c. Piping Construction	galv. steel	2
	steel w/coating	1.5
	steel w/cathod.	1
	black iron	2
	copper	2
	fiberglass	1
	pvc	3
	unknown	2
d. Piping Design	single wall	1
	double wall	0
	no parts in contact w/soil	0
	unknown	1

NOTE: Multiply piping construction by piping design

System Factor	Information	Risk Score
e. Tank Leak Detection	inventory	2
	monitoring wells	2
	double walled w/monitor	1
	SPCC plan	4
	none	4
f. Piping Leak Detection	pressurized line detect	1
	inventory	2
	monitoring well	3
	none	4
g. Pumping System	submerged	3
	suction	1
	oil burner/emer. generator	2

NOTE: Multiply pumping system by piping leak detection

System Factor	Information	Risk Score
h. Tank contents	gasoline, AVGAS, MOGAS, JP-4	3
	other JP jet fuels	2
	diesel, marine diesel	2
	lubrication oil, motor oil	1
	waste oil	1
	heating oil, fuel oil	2
	solvents	4
	empty, water	0

STORAGE SYSTEM LEAK FACTORS (Cont.)

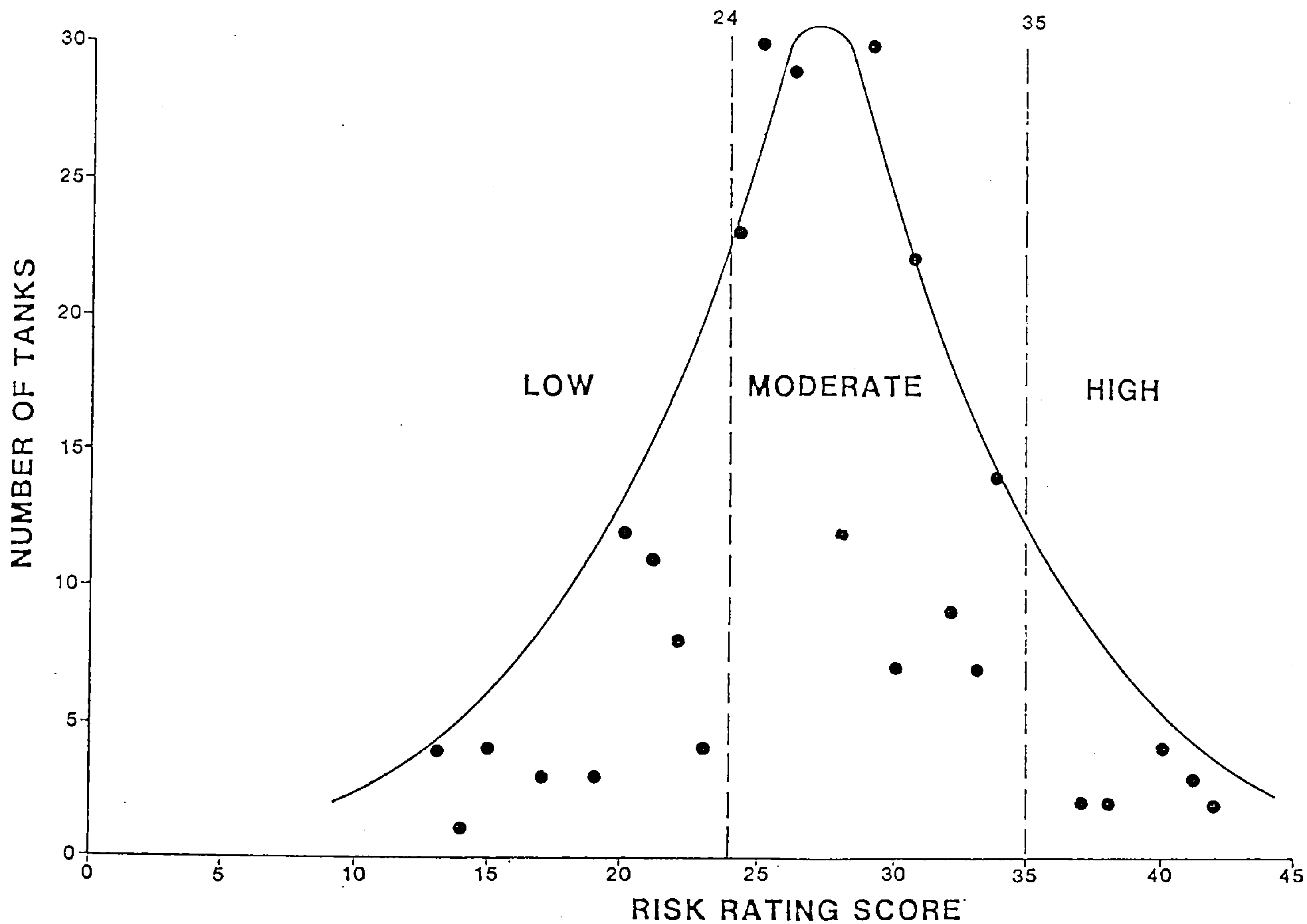
System Factor	Information	Risk Score
i. Known Release	yes	1
	no	0
j. Location	rural	1
	urban	2
	industrial park	1
	military base	1
	suburb/residential	2
k. Water Wells Present	no	0
	yes 0-99 ft.	10
	yes 100-499 ft.	6
	yes 500-1,000 ft.	4
	if downslope x-2	20, 12, 8
l. Underground Utilities Present	no	0
	yes 0-99 ft.	3 pts. each
	yes 100-499 ft.	2 pts. each
	yes 500-1,000 ft.	1 pt. each
m. Surface Water Present	no	0
	yes 0-99 ft.	3 pts. each
	yes 100-499 ft.	2 pts. each
	yes 500-1,000 ft.	1 pt. each
n. Groundwater	shallow and potable	5
	deep and potable	3
	deep, confined, potable	1
	no potable sources	0
o. Number of buildings w/basements		0
	0-49 within 1,000 ft.	5 pts.
	50-99 within 1,000 ft.	10 pts.
	100+ within 1,000 ft.	20 pts.

A final numerical score was determined for each storage system using the formula:

(axb)+(cxd)+e+(fxg)+h+i+j+k+l+m+n+o = final numerical risk score

A distribution curve was made of the final numerical score for each of the storage systems at the Naval activities in Florida. Grouping separations of relatively indefinite low, moderate, or high risk were made between distinctive groupings along the distribution curve. The distribution curve for all the transportation related storage systems and the assigned group separation points are presented in Figure B-1.

Risk assessment worksheets presenting the risk scores given each of the factors, the calculated final numerical score and the assigned risk rating for each of the regulated storage systems the Naval activity(s) discussed in this Storage Tank Management Plan are presented below.



E.C.JORDAN CO.

U.S. DEPARTMENT OF THE NAVY

STORAGE SYSTEMS LOCATIONS

DISTRIBUTION OF RISK RATING SCORES FOR TRANSPORTATION RELATED STORAGE SYSTEMS AT FLORIDA NAVAL ACTIVITIES

DATE:

FIGURE: B-1

RISK ASSESSMENT

FACILITY: NAVAL AIR STATION - MILTON
I.D. NUMBER: FL57MILNAS

TANK NUMBER	a TANK CONSTRUCT	b TANK DESIGN	c PIPE CONSTRUCT	d PIPE DESIGN	e TANK LD	f PIPE LD	g PUMP SYSTEM	h TANK CONTENT	i KNOWN RELEASE	j LOCATION	k WATER WELLS	l U/G UTILITIES	m SURFACE WATER	n GROUND WATER	o BASE-MENTS	FINAL NUMERICAL SCORE	RISK RATING
1429I	2	1	2	1	4	4	3	2	0	1	10	6	0	3	0	42	
1429J	2	1	2	1	4	4	3	2	0	1	10	6	0	3	0	42	
1438	2	1	2	1	4	4											
1439	2	1	2	1	4	4											
1466-D	2	1	1.5	1	4	4	3	0		1	6	6	0	3	0	35.5	HIGH
1466-E	2	1	1.5	1	4	4	3	0		1	6	6	0	3	0	35.5	HIGH
1466-F	2	1	1.5	1	4	4	3	0		1	6	6	0	3	0	35.5	HIGH
1466-G	2	1	1.5	1	4	4	3	0		1	6	6	0	3	0	35.5	HIGH
1467-A	2	1	2	1	4	4	3	0	0	1	6	6	0	3	0	36	HIGH
1467-B	2	1	2	1	4	4	3	0	0	1	6	6	0	3	0	36	HIGH
1467-C	2	1	2	1	4	4	3	0	0	1	6	6	0	3	0	36	HIGH
1467-D	2	1	2	1	4	4	3	0	0	1	6	6	0	3	0	36	HIGH
1467-E	2	1	2	1	4	4	3	0	0	1	6	6	0	3	0	36	HIGH
1467-F	2	1	2	1	2	2	3	2	0	1	6	6	0	3	0	30	MOD
1467-G	2	1	2	1	2	2	3	3	0	1	6	4	0	3	0	29	MOD
2851	2	1	2	1	4	4	3	3									
2866-A	2	1	2	1	2	2	3	3	0	1	6	4	0	3	0	29	MOD
2866-B	2	1	2	1	2	2	3	3	0	1	6	4	0	3	0	29	MOD
2866-C	2	1	2	1	2	2	3	3	0	1	6	4	0	3	0	29	MOD
2877	2	1	2	1	4	4	3	3		1	6	4	0	3	0	37	HIGH

NOTE: FINAL NUMERICAL SCORE= (axb)+(cxd)+e+(fxg)+h+i+j+k+l+m+n+o

RISK ASSESSMENT

FACILITY: NAVAL AIR STATION - MILTON
I.D. NUMBER: FL57MILNAS

TANK NUMBER	a TANK CONSTRUCT	b TANK DESIGN	c PIPE CONSTRUCT	d PIPE DESIGN	e TANK LD	f PIPE LD	g PUMP SYSTEM	h TANK CONTENT	i KNOWN RELEASE	j LOCATION	k WATER WELLS	l U/G UTILITIES	m SURFACE WATER	n GROUND WATER	o BASE-MENTS	FINAL NUMERICAL SCORE	RISK RATING
2892	2	1	2	1	2	2	3	2	0	1	6	4	0	3	0	28	MOD
OLF-1	1	1	0	1	2	2	3	2	0	1	6	2	0	3	0	23	LOW
OLF-2	1	1	0	1	2	2	3	2	0	1	6	2	0	3	0	23	LOW

NOTE: FINAL NUMERICAL SCORE= (axb)+(cxd)+e+(fxg)+h+i+j+k+l+m+n+o

APPENDIX C

CHAPTER 17-61

CHAPTER 17-61
STATIONARY TANKS

17-61.001 Introduction and Scope.

(1) In Section 376.30, Florida Statutes, the Legislature finds and declares that:

(a) the storage of pollutants within the state is a hazardous undertaking and that the discharge of pollutants poses a great threat to the environment and the citizens of Florida, and

(b) the preservation of surface water and groundwater quality is a primary public concern and the benefit of regulating the storage of pollutants outweighs the burden imposed on facilities by these rules.

(2) This chapter establishes rules regulating underground and aboveground pollutant storage facilities. In addition to the requirements of this chapter, facilities may be subject to the groundwater requirements of Chapters 17-3 and 17-4, FAC.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.01.

17-61.020 Definitions.

(1) "Abandoned" means a storage system which:

(a) is not intended to be returned to service, or

(b) has been out of service for over three (3) years, or

(c) cannot be tested in accordance with the requirements of this Chapter.

(2) "Aboveground tank" means that more than ninety percent (90%) of the tank volume is not buried below the ground surface. An aboveground tank may either be in contact with the ground, or elevated above it.

(3) "API" means American Petroleum Institute.

(4) "ASTM" means American Society for Testing and Materials.

(5) "Department" means the Department of Environmental Regulation.

(6) "Discharge" shall include, but not be limited to, any spilling, leaking, seeping, pouring, emitting, emptying, or dumping of any pollutant which occurs and affects lands and the surface waters and groundwaters of the state not regulated by Sections 376.011-376.21, Florida Statutes.

(7) "Discovery" means either actual discovery or knowledge of the existence of the abandoned facility or discharge.

(8) "Emergency replacement" means the replacement of the damaged parts of a storage system when that storage system is leaking and cannot be repaired to meet the standards contained in Sections 17-61.050 and 17-61.060.

(9) "Existing" means a facility or tank for which installation of a tank began prior to September 1, 1984.

(10) "Facility" means any nonresidential location or part thereof containing a stationary storage system or systems which contain pollutants, which have an individual storage capacity greater than 550 gallons, and which are not regulated by Sections 376.011 - 376.21, Florida Statutes.

(11) "Impervious material" means a material of sufficient thickness, density and composition (e.g., concrete, metal, plastic, clay) that will prevent the discharge to the lands, ground waters, or surface waters of the state of any pollutant for a period at least as long as the maximum anticipated time during which the pollutant will be in contact with the material.

(12) "In service" means a storage system which contains pollutants and has pollutants regularly added or withdrawn.

(13) "Integral piping system" means continuous on-site wetted pipes within the facility used in the transfer or transmission of pollutant to and from a storage tank.

(14) "NACE" means National Association of Corrosion Engineers.

(15) "New" means a facility or tank for which the installation of a tank began on or after September 1, 1984.

(16) "NFPA" means National Fire Protection Association, Inc.

(17) "Non-residential" means the primary purpose of the tank is the operation of a business rather than domestic use such as home heating at the facility.

(18) "Operator" means any person operating a facility whether by lease, contract, or other form of agreement.

(19) "Out of service" means a storage system which:

(a) is not in use; that is, which does not have pollutants regularly added to or withdrawn from the storage system; and

(b) is intended to be placed in service.

(20) "Owner" means any person owning a storage system or part thereof.

(21) "Person" means any individual, partner, joint venture, corporation; any group of the foregoing, organized or united for a business purpose; or any governmental entity.

(22) "Pipe" means any hollow cylinder or tubular conveyance which is constructed of non-earthen materials (e.g., concrete, metal, plastic, glass) and is designed to transport pollutant.

(23) "Pollutant" in accordance with Section 376.32(6) is interpreted to mean:

(a) "oil of any kind and in any form" and "derivatives thereof" to include, but not be limited to, crude petroleum or liquid products that are derived from crude petroleum by distillation, cracking, hydroforming, and/or other petroleum refinery processes to include "gasoline";

(b) "pesticides" means all preparations intended for use as insecticides, rodenticides, nematocides, fungicides, herbicides, amphibian and reptile poisons or repellents, fish poisons or repellents, mammal poisons or repellents, invertebrate animal poisons or repellents, plant regulators, plant defoliants, and plant desiccants. A product shall be deemed to be a pesticide regardless of whether intended for use as packaged or after dilution or mixture with other substances, such as carriers of baits. Products intended only for use after further processing or manufacturing, such as grinding to dust or more extensive operations, shall not be deemed to be pesticides. Substances which have recognized commercial uses other than uses as pesticides shall not be deemed to be pesticides unless such substances are:

1. specially prepared for use as pesticides, or
2. labeled, represented, or intended for use as pesticides;

(c) "ammonia" and "derivatives thereof" include, but are not limited to, anhydrous liquid ammonia (NH_3), ammonia in aqueous solution (NH_4OH), ammonium salts or other liquid chemical preparations which when discharged release free ammonia (NH_3), or ammonium ion (NH_{4+});

(d) "chlorine" and "derivatives thereof" include, but are not limited to, anhydrous liquid chlorine (Cl_2), chlorine in aqueous solution ($H+ HOClCl^-$), compounds containing hypochlorite (ClO^-), chlorite (ClO_2^-), chlorate (ClO_3^-), perchlorate (ClO_4^-) ions, and other liquid preparations which, when discharged, release free chlorine (Cl or Cl_2) or any of the above chlorine-containing ions.

(24) "Pollutant-tight" means a material which is not subject to significant chemical or physical deterioration by the pollutant which is or could be contained therein so as to prevent discharge of the pollutant.

(25) "Retrofit" means to modify a storage system to meet standards contained in this Chapter.

(26) "Secretary" means the secretary of the Department of Environmental Regulation.

(27) "Significant loss or gain" means a loss or gain of pollutant in a storage system over five (5) consecutive inventory periods which exceeds one percent (1%) of the storage system capacity, or one percent (1%) of the output, or 50 gallons, whichever is greater.

(28) "Stationary" means a tank or tanks not meant for multiple site use or a tank or tanks which remain at the facility site for a period of 180 days or longer.

(29) "Storage system" means a storage tank and all associated integral piping, excluding aboveground dispensing units.

(30) "Substantial modifications" shall mean the construction of any additions to an existing storage system or restoration, refurbishment or renovation which significantly impairs or affects the physical integrity of the storage system or its monitoring system.

(31) "Tank" means an enclosed stationary device which is constructed primarily of non-earthen materials (e.g., concrete, metal, plastic, glass) and which is designed for the primary purpose of storing pollutants.

(32) "UL" means Underwriters Laboratories, Inc.

(33) "Underground tank" means that ten percent (10%) or more of the tank volume is buried below the ground surface.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.02.

17-61.030 Referenced Standards.

(1) Referenced standards are available for inspection at the Department of Environmental Regulation's District and Tallahassee Offices and from the following sources:

(a) American Petroleum Institute (API), 1220 L Street, N.W., Washington, D.C. 20005;

(b) National Association of Corrosion Engineers (NACE), P.O. Box 218340, Houston, Texas 77218;

(c) National Fire Protection Association (NFPA), Batterymarch Park, Quincy, Massachusetts 02269;

(d) American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, Pennsylvania 19103; and

(e) Underwriters Laboratories (UL), 333 Pfingston Road, Northbrook, Illinois 60062.

(2) Titles of documents.

Specific references to documents listed in (a) through (e) below are made throughout this Chapter. Each of these documents or parts thereof are adopted and incorporated as standards only to the extent that they are specifically referenced in this Chapter.

(a) National Fire Protection Association Standards.

1. Standard Number 30, 1981, "Flammable and Combustible Liquids Code";
2. Standard Number 329, 1983, "Underground Leakage of Flammable and Combustible Liquids".

(b) American Petroleum Institute Standards.

1. Standard Number 650, 1980, "Welded Steel Tanks for Oil Storage," Seventh Edition;
2. Standard Number 620, 1982, "Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks," Seventh Edition;
3. Publication 1110, 1981, "Recommended Practice for the Pressure Testing of Liquid Petroleum Pipelines";
4. Specification Number 12B, 1977 (and Supplement 1, 1982), "Specification for Bolted Tanks for Storage of Production Liquids," Twelfth Edition;
5. Specification Number 12D, 1982 (and Supplement 1, 1983), "Specification for Field Welded Tanks for Storage of Production Liquids," Ninth Edition;
6. Specification Number 12F, 1982 (and Supplement 1, 1983) "Specification for Shop Welded Tanks for Storage of Production Liquids," Eighth Edition;

7. Bulletin 1615, 1979, "Installation of Underground Petroleum Storage Systems";

8. Publication 1632, 1983, "Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems," First Edition;

9. Publication 1604, 1981, "Recommended Practice for Abandonment or Removal of Used Underground Service Station Tanks";

10. Publication 1631, 1983, "Recommended Practice for the Interior Lining of Existing Steel Underground Storage Tanks"; and

11. Publication 1621, 1977, "Recommended Practice for Bulk Liquid Stock Control at Retail Outlets".

(c) National Association of Corrosion Engineers Standard Number RP-01-69 "Control of External Corrosion on Underground or Submerged Metallic Piping Systems" (1976).

(d) Underwriters Laboratories standards.

1. Specification 58 "Steel Underground Tanks for Flammable and Combustible Liquids" (1981);

2. Specification 1316, "Standard for Glass Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products"; and

3. Specification 142 "Steel Aboveground Tanks For Flammable and Combustible Liquids" (1982).

(e) American Society for Testing and Materials Specification D4021-81, "Standard Specification for Glass-Fiber-Reinforced Polyester Underground Petroleum Storage Tanks".

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.03.

17-61.040 Applicability.

(1) Standards contained in this Chapter shall apply only to those facilities which receive, store, or use petroleum products which are distributed from such facilities for use as fuel in vehicles, including, but not limited to, those used on and off roads, aircraft, watercraft, and rail, and which receive, store, or use either more than 1,000 gallons in any one calendar month, or more than 10,000 gallons in any calendar year. The above described facilities which do not receive, store, or use more than 1,000 gallons in any one calendar month, or more than 10,000 gallons in any calendar year shall only meet the requirements in 17-61.060(1)(b)1. or 17-61.060(2)(b)1. for new tank construction standards.

(2) Exemptions.

The following are exempt from the requirements of this Chapter:

(a) Stationary storage systems which contain liquefied petroleum (lp) gas;

(b) Stationary storage systems whose contents have a softening point above 100°F.

(c) Aboveground tanks which are elevated above the soil and comply with subparagraph 17-61.060(1)(c)2. shall comply only with the requirements of paragraph 17-61.050(4)(b) concerning discharges, subsection 17-61.050(1) concerning registration and notification, and subparagraphs 17-61.060(1)(d)2. and 3. concerning repair.

(3) This rule shall not apply to new large petroleum storage facilities (often known as tank farms) which have more than five (5) above-ground storage tanks whose total combined storage capacity exceeds 500,000 gallons of stored petroleum product at any one time. The department will regulate these new large petroleum storage facilities on a case-by-case basis until such time as specific rules governing such facilities are adopted.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.04.

17-61.050 General Provisions.

(1) Registration and Notification Requirements.

(a) Each owner or operator shall register the following on forms provided by the department:

1. All existing facilities by December 31, 1984.

2. All new storage systems or facilities at least ten (10) days prior to start of installation of tanks except in cases of emergency replacement.

3. A non-pollutant containing installation which is to be converted to a facility, at least ten (10) days prior to the placement of pollutants in such a facility.

(b) Each owner or operator shall make notification of the following on forms provided by the department.

1. All storage systems within ten (10) days of abandonment.

2. Facility sale within ten (10) days of the sale. Notice shall be made by the seller.

3. Retrofitting of existing facilities within ten (10) days of completion.

4. Results of tank testing which reveals a discharge within three (3) working days of testing.

5. Discharges exceeding 100 gallons on pervious surfaces as described in Section 17-61.050(4)(b) within three (3) working days of discovery.

6. Positive response of a detection device, monitoring well test or sample or laboratory report within three (3) working days of discovery.

(2) Overfill protection.

No person shall construct, install, use, or maintain any new facility without providing a reliable means of detecting and preventing an overfilling condition of a storage system before any discharge can occur. Overfill protection may consist of:

(a) an impervious containment system, or

(b) a tight fill device, or

(c) another equivalent design approved by the department.

(3) Storage system status.

A facility may contain storage systems which are:

(a) In-service storage systems.

Any pollutant may be placed in an in-service storage system if the storage system is pollutant-tight and meets the requirements of this Chapter.

(b) Out-of-service storage systems.

1. An out-of-service storage system shall have recorded a weekly inventory of contents and the results of monthly leak detection and monitoring system examinations unless the storage system contains no free liquid pollutant or vapors. An out-of-service storage system which contains no pollutant shall be secured against tampering and unauthorized filling and inspected monthly for signs of damage to the security system. The storage system may be filled with water for ballasting. The water shall be disposed of in an environmentally sound manner consistent with department rules when pumped out of the system.

2. A storage system may be kept in the out-of-service status for more than three (3) years and not deemed abandoned if approved by the department.

(c) Abandoned storage systems.

1. The owner of an abandoned storage system must within 90 days after discovery, pump the system clean of free liquid, and remove the storage system in a safe manner, except that underground tanks may be filled with sand, concrete, or other inert material in lieu of removal, in accordance with the requirements in API Bulletin 1604, 1981, Chapter 2.

2. The owner or operator of an abandoned tank shall not dispose of it unless he meets the requirements of API 1604, Chapters 3 and 6, and:

a. the tank is removed for sale or use elsewhere, in which case it must be permanently labeled "Not For Food Use" if it has at any time contained leaded fuel, cleaned, and made vapor free to be safe in transit; or

b. the tank is disposed of as junk by rendering it vapor free, and dismantling or perforating it in a safe manner so as to render it unfit for further use.

3. An abandoned storage system may be brought into service only if it has been completely retrofitted in compliance with the applicable requirements in Section 17-61.060.

4. No person shall place pollutants in an abandoned storage system.

(4) Record Keeping, Discharge Reporting and Contamination Cleanup

(a) Records required in Sections 17-61.050, and 17-61.060 shall be maintained in permanent form for two (2) years and shall be available for inspection by the department at the facility. If records are not kept at the facility they shall be available at the facility or other location approved by the department upon two (2) working days notice. Records of the following are required as a minimum.

1. Measurements taken and reconciliations of inventory.

2. Results of examinations of monitoring wells and other leak detection systems.

3. Dates of retrofitting of existing storage systems.

4. Results of maintenance examinations of storage systems.

5. Results of interior examinations of aboveground tanks.

6. Results of all NFPA 329 tests of underground tanks.

7. Results of tests of pipes.

8. Descriptions of repairs.

(b) Any person discharging pollutants from a facility described in Section 17-61.040(1) shall:

1. immediately undertake to contain, remove, and abate the discharge; and

2. in the case of a discharge to the groundwater in violation of applicable standards, as soon as possible institute such further corrective action as necessary under the provisions of Section 17-4.245(7), FAC.

(c) Leak Detection Systems, Inventory Schedules and Loss Investigation.

1. Leak detection devices.

a. All continuously operating leak detection systems or devices shall be installed, maintained, and operated in accordance with manufacturer's requirements, and shall include a warning device to indicate the presence of a leak of pollutant or other failure or breach of integrity. A leak detection device shall be inspected at least once a month to determine that the device is functioning.

b. All monitoring wells for which manual test devices or methods are used shall be tested at least once a month in a manner which will indicate the presence of a pollutant leak or other failure or breach of integrity..

c. All monitoring wells not tested with automatic or manual detection devices or methods shall be tested at least once a month in accordance with the requirements in 17-61.050(5)(b) below.

d. A monitoring well which contains less than one (1) foot of water may not be tested by removal of a sample as described in Section 17-61.050(5)(b) below, but must be tested with a manual or automatic detection method.

2. Inventory records.

a. All facilities shall maintain inventory records for each pollutant-containing tank as required in Section 17-61.060. The data required shall be accumulated for each day a tank has pollutants added or withdrawn, but not less frequently than once a week.

b. Losses or gains from each day's inventory shall be averaged for each five (5) consecutive readings or once a week. For any average which is a significant loss or gain, the investigation procedure below shall be followed.

3. Investigation procedure.

The investigation shall not stop until the source of the discrepancy has been found, the tank has been tested, repaired, or replaced, or the entire procedure has been completed.

a. Inventory, input, and output records shall be checked for arithmetical error.

b. Inventory shall be checked for error in measurement.

c. If the significant loss or gain is not reconcilable by steps a. and b., or cannot be affirmatively demonstrated to be the result of theft, the accessible parts of the storage system shall be checked for damage or leaks.

d. Monitoring wells and leak detection systems shall be checked for signs of a discharge.

e. Calibration of the inventory measuring system and any dispensers shall be checked.

f. The entire storage system, excluding the vent but including joints and remote fill lines, shall be tested in accordance with the applicable portions of Section 17-61.060.

g. If a discharge or leak is discovered, the requirements of applicable Sections 17-61.060(1)(d), (2)(d), or (3)(d) shall be met.

(5) Monitoring wells.

(a) Monitoring wells used to meet the requirements of Section 17-61.060 shall be designed to meet the following specifications, or shall be a part of an approved groundwater monitoring plan for the pollutant storage facility pursuant to 17-4.245. Monitoring wells installed before the effective date of this Chapter may be used as a part of a monitoring system as approved by the department. The well casing shall:

1. be a minimum of two (2) inches in diameter;

2. be slotted from the bottom to at least two (2) feet above the normal annual high water table;

3. have a minimum slot size of .010 inches;

4. be completed by backfilling with appropriate clean filter pack or wrapping in an appropriate filter cloth to prevent clogging under soil conditions where silty fines will blind the minimum slot size;

5. be constructed of schedule 40 PVC or other material which is impervious to the pollutant stored;

6. be sealed into the bore hole at the surface with an impervious barrier designed to prevent contamination of the well by surface pollutants and damage to the well;

7. be equipped with a watertight cap; and

8. be of sufficient length that:

a. the bottom of the casing shall be at least five (5) feet below the water level at the time of drilling but no deeper than twenty-five (25) feet; or

b. the casing shall extend to within six (6) inches of the bottom of a secondary containment, but shall not contact the containment.

(b) All monitoring wells shall:

1. be placed as required in Section 17-61.060; and

2. if water enters the well, be developed upon drilling until the water is clear and relatively sand free by overpumping, bailing, surging with compressed air, backwashing, a combination of the above, or other methods approved by the department; and

3. if not equipped with a continuously functioning detection device, or tested with a portable device inserted into the well, be sampled by the removal of at least one (1) cup of fluid from the well, using a Kemmerer-type sampler, bailer, or a sampler of similar design. The fluid shall be taken from the surface of the water table. The fluid shall:

a. be poured into a clean, clear glass container kept for the purpose, and examined for signs of an oily layer or odor of pollutant; or

b. be tested at the site; or

c. be sent to a laboratory and tested.

(c) The positive response of a detection device, the presence of a layer or odor of pollutant, or the positive report of a laboratory that the sample contains pollutant shall be treated as a discharge unless the owner or operator affirmatively demonstrates that no discharge has occurred.

(d) All wells shall be kept capped when not being tested.

(6) Required testing.

(a) In addition to the testing requirements of Section 17-61.050(4)(c)3.f., the owner or operator of a storage system shall test the entire storage system whenever the department has ordered that such a test is necessary to protect the lands, ground waters, or surface waters of the state. The department may order a test if:

1. the operator of a storage system has failed to comply with the provisions of Section 17-61.060; or

2. a discharge detection device or monitoring well indicates that pollutant has been or is being discharged; or

3. groundwater contamination exists in the vicinity and the facility is reasonably likely to be a source of the contamination.

(b) Testing shall be conducted in accordance with the requirements of Sections 17-61.060(1)(d)4., 17-61.060(2)(d)4., and 17-61.060(3)(a)4.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.05.

17-61.060 Facility Construction, Operation and Repair Standards.

(1) Aboveground Facilities

(a) All storage tanks.

Inventory records as required by subparagraph 17-61.050(4)(c)2. shall be maintained for all aboveground tanks and shall include:

1. pollutant contained,
2. physical inventory,
3. inputs and outputs of pollutant, and
4. reconciliation of the above.

(b) New storage tanks.

1. No person shall install, use or maintain any new aboveground storage system in a manner which will allow the discharge of a pollutant to the lands, groundwaters, or surface waters of the state, and without meeting the requirements contained in NFPA 30, Chapters 2-1, 2-2, 2-5, and 2-7; API Standards 650, 620, 12B and Supplement 1, 12D and Supplement 1, 12F and Supplement 1, and UL 142, as applicable.

2. No person shall use or maintain any new aboveground storage system without having constructed around and under it an impervious containment system, including a dike enclosing the tank or tanks, conforming to the requirements of NFPA 30, Chapter 2-2.3, regardless of whether or not the tank is in contact with the containment or supported above it.

a. The dikes and the entire areas enclosed by the dikes including the area under the tanks shall be made impervious to the types of pollutants stored in the tanks.

b. Drainage of precipitation from within the diked area shall be controlled in a manner that will prevent pollutants from entering the lands, groundwaters or surface waters of the state in excess of water quality standards established by department rule.

3. No person shall construct, install, use or maintain any new aboveground metal tank making contact with the soil unless portions in contact with the soil are corrosion protected. Such corrosion protection shall be in accordance with NACE Standard Number RP-01-69.

(c) Existing storage tanks.

1. Commencing January 1, 1990, no person shall use, maintain or fill with pollutants any existing in-service aboveground storage system without conforming to all of the requirements of Section 17-61.060(1)(a) and (b) above, except that impervious barriers are not required under existing field-erected tanks in contact with the soil. In lieu of the impervious barrier, existing field-erected tanks in contact with the soil shall have:

a. the interior bottom and at least 18 inches of the interior sides joining the bottom of the tank coated with a glass fiber-reinforced epoxy coating or other suitable material which is impervious to the pollutant to be stored; or

b. a network of monitoring wells installed outside of and around the dike surrounding the tank or tanks. There shall be at least four wells in each network, with no two consecutive wells farther apart than 150 feet. Each well shall be within 25 feet of the dike, and may be part of more than one network; or

c. a groundwater monitoring plan submitted and implemented for the pollutant storage facility in accordance with the requirements in Chapter 17-4.245, FAC, or

d. a copy of a Spill Prevention Control and Countermeasure plan for the pollutant storage facility as required by 40 CFR Part 112, submitted to the department; or

e. the portions of the tank in contact with the soil corrosion protected in accordance with NACE RP-01-69.

2. Commencing January 1, 1990, no person shall use, maintain or fill any existing tank elevated above the soil without placing an impervious containment system under and around it and sealed to its supports in accordance with NFPA 30, Section 2-2.3.3.

(d) Pollutant leaks, maintenance, and repairs.

1. The owner or operator of an aboveground facility shall at least once a month inspect the exterior of each pollutant-containing tank and the dike and impervious containment surrounding the tank for wetting, discoloration, blistering, corrosion, cracks, or other signs of structural damage, paying particular attention to the condition of the containment at the base of the tank.

2. Any aboveground tank which shows signs of damage which could impair the ability of the tank to retain pollutants shall, as soon as practicable, be drained of sufficient contents to permit repair.

3. When an aboveground tank is found to be leaking, the leak shall be contained as soon as practicable or the tank must be drained of sufficient contents to prevent further leakage and allow repair.

4. When the inventory records of an aboveground tank show a significant loss or gain of pollutant and tank testing is required, the tank shall be emptied, cleaned, and visually and mechanically or electronically examined on the interior and bottom, or tested by other means approved by the department.

5. No person shall use or repair an aboveground tank which is leaking or which has leaked without:

a. containing the leak;

b. performing or having the repairs performed in a manner which restores the structural integrity of the tank, except that temporary repairs may be made to lesser standards and may remain in place for up to six (6) months.

6. Any dike or impervious containment which shows damage which could impair its ability to retain pollutants shall be repaired.

(2) Underground Facilities.

(a) All storage tanks.

1. Inventory records as required by subparagraph 17-61.050(4)(c)2. shall be maintained for all underground tanks in a manner equivalent to that shown in API 1621, Appendices A, D, and E, and shall include as a minimum:

a. pollutant contained,

b. physical inventory,

c. inputs and outputs of pollutant,

d. amount of water in tank, and

e. reconciliation of the above.

2. Where a tank has pollutants added and withdrawn for 24 hours per day, physical inventory shall be measured at least every 24 hours.

(b) New storage tanks.

1. All new tanks installed for the underground storage of pollutants shall be designed and constructed in a manner which will prevent discharges of pollutant to the land, groundwaters, or surface waters of the state. Acceptable designs for tank construction include cathodically protected steel, glass fiber-reinforced plastic, steel clad with glass fiber-reinforced plastic, double-walled steel or plastic, or other equivalent design approved by the department. Design, construction and installation of new underground tanks shall be in accordance with standards contained in NFPA 30, Chapters 2-1 and 2-3, API 1615, Chapters 3(3) and 3(4), and UL 58 or UL 1316, and manufacturers' requirements. The design of double-walled tanks shall be approved by the department on a case-by-case basis.

2. All new tanks shall be equipped with a strike plate beneath the fill pipe and gauge opening.

3. All new tanks must be provided with a means of monitoring for any leakage and spillage of the stored pollutant at the time of installation. The monitoring system may consist of:

a. a continuous leak detection system in between the walls of a double-walled tank; or

b. a single monitoring well or detector located in an impervious secondary containment; or

c. a continuously operating leak detection system placed around a tank in an excavation or secondary containment in accordance with the manufacturer's requirements; or

d. a network of at least four monitoring wells placed in the excavation around a tank or tanks in compliance with the requirements of Section 17-61.050; or

e. a groundwater monitoring plan submitted to and approved by the department for the pollutant storage facility pursuant to Chapter 17-4.245; or

f. a Spill Prevention Control and Countermeasure plan for the pollutant storage facility as required by 40 CFR Part 112, submitted to the department; or

g. another alternative approved by the department.

4. A cathodically protected tank shall meet the specifications in API 1632, be coated in accordance with NACE RP-01-69, and shall meet the following requirements.

a. A sacrificial anode-type tank shall be electrically isolated.

b. A tank protected by an impressed current system shall:

i. be designed so that the impressed current source cannot be de-energized at any time, including during closure of the facility, except during power failures or to perform service work on the storage system or the impressed current cathodic protection system; and

ii. include a continuously operating meter to show that the system is working.

5. A glass fiber-reinforced plastic tank shall:

a. be tested in accordance with ASTM Specification D4021-81; and

b. be labeled on the tank and fill cap "Non-metallic Underground Tank for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures", or "Non-metallic Underground Tank for Petroleum Products Only".

6. A glass fiber-reinforced plastic-clad steel tank shall as a minimum:

a. be cleaned by sandblasting to SSPC6;

b. be clad with a mixture of isophthalic resin and fiberglass 100 mils thick;

c. be tested by a 10,000 volt holiday test performed over 100 percent of the surface; and

d. be electrically isolated.

17-61.060(2)(b)2. -- 17-61.060(2)(b)6.d.

(c) Existing storage tanks.

1. Commencing January 1, 1999, no person shall use, maintain, or fill any in-service existing undergound storage system without retrofitting the system so as to comply with all of the provisions of 17-61.060(2)(b), except that:

a. strike plates are not required to be retrofitted; and

b. tanks which are other than the approved types must either be lined in accordance with the recommendations in API 1631, or replaced with an approved type tank. A tank which has been lined shall be tightness tested before being put into service.

2. In achieving the above compliance, retrofitting shall be completed by December 31 of the appropriate year shown in the table below. If the age of the tank cannot be determined, retrofitting shall be completed by the earliest date shown.

	Year Retrofitting Required						
Year Tank Installed	1986	1987	1988	1989	1992	1995	1998
Prior to 1970	MO			LR			
1970 - 1975		MO			LR		
1976 - 1980			MO			LR	
1981 - Sept. 1, 1984				MO			LR

MO = Installation of Monitoring system and devices and Overfill protection.

LR = Lining or Replacement of Non-Approved-Type Tanks.

17-61.060(2)(c) -- 17-61.060(c)2.

(d) Pollutant leaks, maintenance and repairs.

1. All underground tanks shall be maintained in the following manner.

a. A sacrificial anode type tank shall have the structure-to-soil potential tested six (6) weeks after installation or construction in the area, at the end of the first year, and every five (5) years thereafter. If the cathodic protection system is not operating in accordance with manufacturer's requirements, the cause shall be determined and the necessary repairs made within 60 days of the test.

b. An impressed current type tank shall be inspected monthly, and if the protective system is not operating in accordance with manufacturer's requirements, the cause shall be determined and the necessary repairs made within 60 days of the test.

c. A glass fiber reinforced tank shall be tested for deflection in accordance with manufacturer's requirements at the time of installation.

2. When an underground tank is found to be leaking, the tank must be emptied of all free liquid and meet the requirements of Section 17-61.050(4).

3. No person shall put back into service any underground tank which has leaked or has otherwise failed, for the purpose of reusing the facility, without:

a. containing the leak;

b. performing or having the repairs performed in a manner which restores the structural integrity of the tank or meets the specifications in API 1631; and

c. testing or having the tank tested.

4. Testing and inspection.

a. All testing of underground tanks shall be done by the precision test of NFPA 329, Chapter 4-3.10 or other test of equivalent or superior accuracy.

b. Such tests shall be conducted by a person trained and certified by the manufacturer of the test equipment or his agent in the correct use of the necessary equipment, and shall be performed in accordance with the testing procedures and requirements of the test system manufacturer.

c. If for any reason testing required by this Chapter cannot be performed, the tank shall be deemed abandoned.

(3) Integral Piping Systems

(a) All systems.

1. All integral piping systems shall be installed, used, and maintained in a manner which will prevent the discharge of pollutants to the lands, groundwaters and surface waters of the state.

2. All integral piping systems shall be constructed in accordance with accepted engineering practices, and NFPA 30, Chapter 3.

3. All integral piping systems shall be designed, constructed and installed in a manner which will permit periodic testing of the entire system.

4. Each owner or operator of any integral piping system shall test the piping whenever the associated tank is tested. All tests shall be conducted in accordance with API 1110, or other equivalent methods approved by the department.

(b) Systems in contact with the ground.

1. New systems.

a. All integral piping systems shall:

i. be constructed of corrosion resistant materials; or

ii. for metal integral piping systems be protected against corrosion by the use of double-walled piping or cathodic protection in accordance with API 1632, NACE RP-01-69, or an equivalent system.

b. Cathodically protected piping systems of the sacrificial anode type shall:

i. be designed and installed to permit measurement of structure to soil potential, and be tested six (6) weeks after installation or construction in the area, at the end of the first year, and every five (5) years thereafter; and

ii. if inadequate cathodic protection is indicated, the cause determined, and necessary repairs made to meet manufacturer's requirements within 60 days of the test.

c. Cathodically protected integral piping systems of the impressed current type shall:

i. be designed so that the impressed current source cannot be de-energized at any time including during closure of the facility, except during power failures or to perform service work on the storage system or the impressed current cathodic protection system; and

ii. be equipped with a continuously operating meter to show that the system is working. The system shall be inspected monthly, and if any test indicates that the system is not functioning in accordance with manufacturer's requirements, the cause shall be determined and the necessary repairs made within 60 days of the test.

d. All integral piping systems shall be equipped with a leak detection system which may consist of:

i. a network of monitoring wells; or

ii. a continuously operating leak detector in the excavation along the piping, between the walls of double-walled piping or in a secondary containment in which the piping lies; or

iii. a single monitoring well or detector in an impervious underground catchment basin where piping is installed so that all leaks will enter the basin; or

iv. a groundwater monitoring plan submitted to and approved by the department for the pollutant storage facility subsequent to Chapter 17-4.245;

v. a Spill Prevention Control and Countermeasure plan for the pollutant storage facility as required by 40 CFR 112, submitted to the department; or

vi. another alternative approved by the department.

e. Where monitoring wells are used, they shall:

i. be installed in the excavation beside the integral piping system and shall be located along its entire length, with one well within 100 feet of each end of the excavation; and

ii. be located so that no two (2) consecutive wells are more than 250 feet apart.

2. Existing systems.

Commencing January 1, 1999, no person shall use or maintain any existing in-service integral piping system in association with any facility unless the existing system complies with all of the provisions of 17-61.060(3)(a) and (b)1. An integral piping system shall be retrofitted on the same schedule as the associated tank.

(c) Systems not in contact with the ground.

All new and existing systems.

1. All integral piping systems shall be inspected at least once a month for wetting, discoloration, blistering, corrosion, cracks or other signs of surface or structural damage.

2. Any integral piping system which shows signs of damage which could impair its ability to retain pollutants shall, as soon as practicable, be drained of sufficient contents to permit repair, and be repaired in a manner which restores the structural integrity of the system.

3. Commencing January 1, 1990, no person shall use or maintain any existing in-service integral piping system which does not meet the requirements in 17-61.06(3)(a). An integral piping system shall be retrofitted on the same schedule as the associated tank.

(d) Product leaks and repairs.

1. When an integral piping system is found to be leaking, the leak must be contained as soon as practicable or the system must be drained of sufficient contents to prevent further leakage and allow repair.

2. No person shall use or repair an integral piping system which is leaking or which has leaked without:

a. containing the leak;

b. performing or having the repairs performed in a manner which restores the structural integrity of the storage system and is in accordance with accepted engineering practices; and

c. testing the integral piping system.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.06.

17-61.070 Financial Responsibility. (Reserved)

17-61.080 Approval of Alternative Procedures and Requirements.

(1) The owner or operator of a facility subject to the provisions of this Chapter may request in writing a determination by the Secretary or his designee that any requirement of this Chapter shall not apply to such facility, and shall request approval of alternate procedures as requirements.

(2) The request shall set forth at a minimum the following information:

(a) Specific facility for which an exception is sought.

(b) The specific provision of Chapter 17-61 from which an exception is sought. Any provisions which reference this section are subject to the approval procedures set forth herein.

(c) The basis for the exception including, but not limited to, the hardship which would result from compliance with the established provision.

(d) The alternate procedure or requirement for which approval is sought and a demonstration that the alternate procedure or requirement provides a substantially equivalent degree of protection for the lands, surface waters, or groundwaters of the state as the established requirement.

(e) A demonstration that the alternate procedure or requirement is at least as effective as the established procedure or requirement.

(3) The Secretary or his designee shall specify by order each alternate procedure or requirement approved for an individual facility in accordance with this section or shall issue an order denying the request for such approval. The department's order shall be final agency action, reviewable in accordance with Section 120.57, Florida Statutes.

Specific Authority: 376.303, F.S.
Law Implemented: 376.303, F.S.
History: New 5-21-84, Previously numbered 17-61.08.

17-61.090 Stationary Tank Forms.

The forms used by the Department in the Hazardous Waste Management Program are adopted and incorporated by reference in this section. The forms are listed by rule number, which is also the form number and with the subject title and effective date. Copies of forms may be obtained by writing to the Director, Division of Environmental Programs, Department of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.

(1) Stationary Tank Registration/Notification Form, September 1, 1984.
(2) Discharge Notification Form, September 1, 1984.
(3) Storage Tank Notification Form, (November 29, 1987).
(4) Post Card Notification Form, (November 29, 1987).
(5) Storage Tank Installation Form (September 14, 1987).
(6) Local Government Tank Installation Program Application Form (September 14, 1987).

Specific Authority: 376.303, 376.307, 489.113(9), F.S.
Law Implemented: 376.303, 376.307(5), 489.113(9), F.S.
History: New 9-28-86, Previously numbered 17-61.009, Amended 9-14-87, 11-29-87.

APPENDIX D

STORAGE SYSTEM LOCATION MAPS

Geraghty & Miller, Inc.

HYDROGEOLOGIC ASSESSMENT AND GROUND-WATER MONITORING PLAN, U.S. NAVAL AIR STATION, WHITING FIELD, FLORIDA

Prepared for

SOUTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND
Charleston, South Carolina

June 26, 1984

GERAGHTY & MILLER, INC.
Ground-Water Consultants
13902 North Dale Mabry Hwy, Suite 150
Tampa, Florida 33618

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Whiting Field Naval Air Station is a pilot training facility located 5 miles north of Milton, Florida. Wastes generated at the station have been disposed of at a number of locations on base. In accordance with Chapter 17.4, FAC (Florida Administrative Code), Section 17-4.245(6)(d), a ground-water monitoring plan must be submitted to the FDER (Florida Department of Environmental Regulation) for these sites. Presented herein is the hydrogeologic setting of the area, locations and construction details of proposed monitor wells, and a water-quality sampling and analysis plan.

BACKGROUND

Relatively little hazardous waste is generated at Whiting Field. Source activities include:

aircraft and vehicle maintenance,
POL (petroleum, oils & lubricants) storage,
painting and paint stripping,
pest control,
photo processing,
battery repair
fire-fighting training.

Waste from these sources has in the past been disposed of at various places on base. In an initial assessment by the Navy in 1983 of disposal sites at Whiting Field, six landfill areas were identified as possibly containing hazardous waste. These six sites as well as a seventh landfill, a battery acid disposal site and a waste solvents underground storage site, are recommended for further study to determine if they have caused ground-water contamination. Three additional sites, an AVGAS spill area and two crash crew fire fighting training areas, were considered and found to have a small potential for ground-water contamination. Locations of these sites are shown in Figure 1 and a summary of the sites recommended for further study is presented in Table 1.

Landfills

There has been little control or accounting of the types of waste which have been disposed of at the landfills; although, landfill #1 was dug specifically for disposal of residue sludge from fuel tanks and filters. Landfills #3, #6, and #7 are known to occupy former borrow pits; however, the origins, operations, and contents of most are uncertain. Landfills #1, #2, #3, #4, and #5 have been closed and covered; #6 currently receives domestic waste and #7 receives construction debris.

Battery Shop

At the battery shop, waste acid or electrolyte solution had until recently been poured down the drain of a sink which discharged to a dry well just west of the building. The dry well consists of a section of 60-inch-diameter concrete culvert set vertically in the ground and filled with gravel. This disposal system was used from 1967 until 1984 when the drain was disconnected. A 4-inch-diameter vitrified clay tile line leads from the east end of the battery shop to

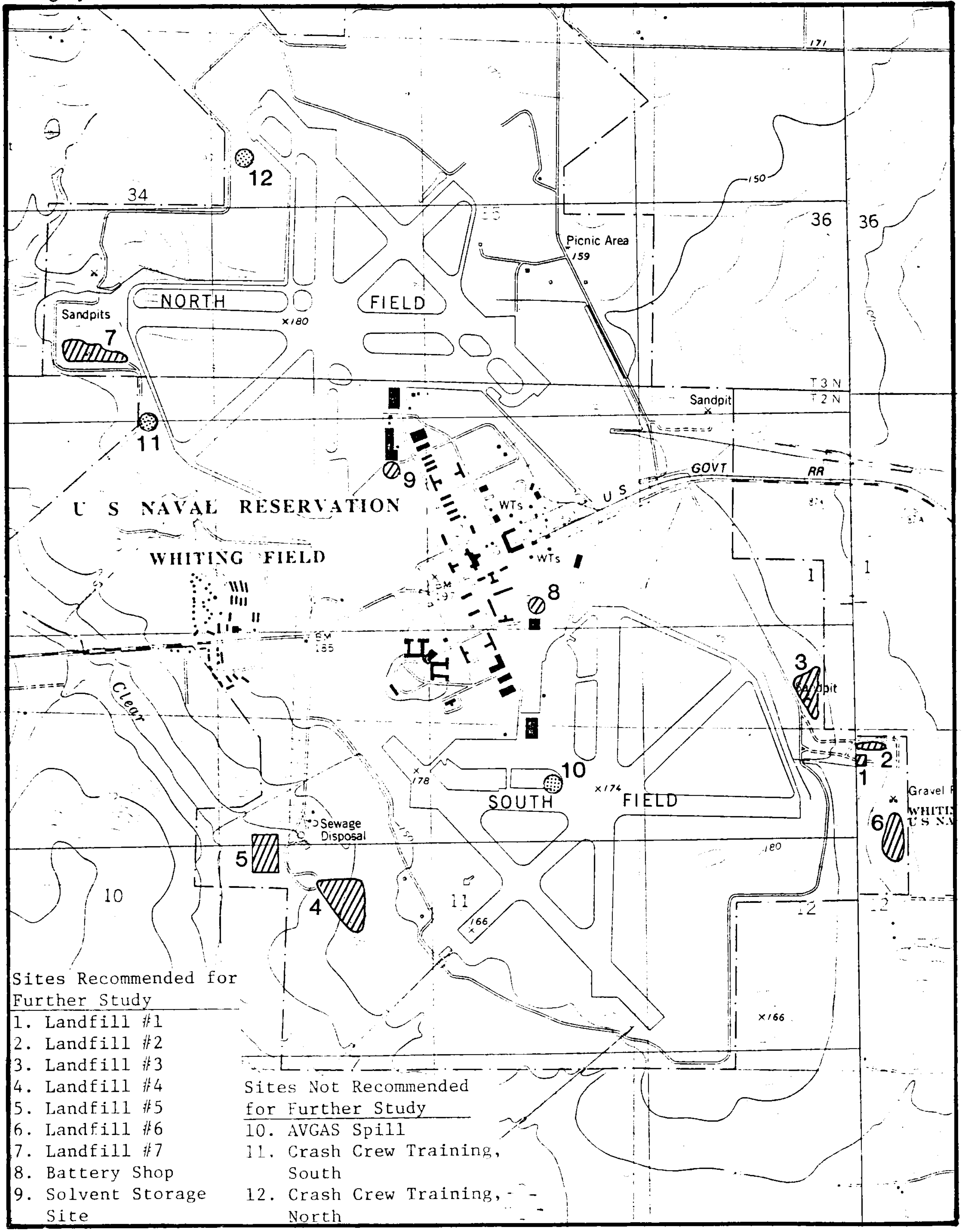


Figure 1. Locations of Disposal and Storage Sites Considered For Further Study.

Table 1. Summary of Waste Disposal and Storage Sites Recommended for Further Study

Site	Operative Dates	Area (ft^2)	Volume (ft^2)	Type of Waste
Landfill #1	1945-1965	1900	4,000	Fuel tank sludge, tetraethyl lead
Landfill #2	1943-1970	200,000	Unknown	Municipal, construction, solvents, paint thinner, waste oil
Landfill #3	1965-1973	160,000	Unknown	Construction, possibly Pesticides
Landfill #4	1965-1979	1,700,000	Unknown	Municipal, paint stripping waste, oil residue
Landfill #5	1943-1965	260,000	Unknown	Municipal, construction, waste oil
Landfill #6	1979-present	260,000	300,000	Municipal
Landfill #7	? -present	250,000	Unknown	Municipal, construction
Battery Rework Shop (Site #8)	1964-1984	20	Unknown	Battery acid
Solvents Storage Tanks (Site #9)	1980-1984	400	Unknown	Solvents and paint stripping waste

a paved ditch. It is not known what, if anything, may have been discharged through this line. This site is of particular concern because the dry well is located only 110 ft (feet) from the south production well. Water from the south well has recently been sampled for chemical analysis, the partial results of which are presented in Table B-1 of Appendix B. Metals concentrations were found to be below primary drinking water standards; the analysis for organic compounds is not yet complete.

Waste Solvents Storage Site

Waste solvents and residue from paint-stripping operations at Building 2941 have been stored in two 500 gallon underground metal tanks, from which the contents were periodically pumped for off-site disposal. The tanks were installed in 1980 and were removed in April of 1984. During removal, one of the tanks was punctured by a backhoe and an estimated 120 gallons of the liquid content spilled onto the ground. About 50 gallons of the liquid was immediately pumped from the ground and approximately 6 cubic yards of contaminated soil was excavated and taken off-site. Subsequent examination of the tanks revealed additional holes, as much as 1/2 inch in diameter, corroded through the sides. A partial chemical analysis of waste from the paint stripping rinse tank is presented in Table 2.

Table 2. Chemical Analysis of Water From the Paint Stripping Rinse Tank at Building 2941.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
105 STOCKTON STREET — P.O. BOX 52329
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 40946

June 16, 1981

Sample of Paint Stripping Waste

Date Received May 22, 1981

For OFFICER IN CHARGE OF CONSTRUCTION, Building 1429, Naval Air Stati
Whiting Field, Milton, Florida 32570

Marks: PO#N62467-80-C-0464, Industrial Waste from Aircraft Maintenance Dept,N
Whiting Field, Milton, Florida

CERTIFICATE OF ANALYSIS OR TESTS

Ignitability:	Non-flammable
Corrosivity:	pH 7.40, nct corrosive based on pH corrosivity characteristic.
Reactivity:	Non-reactive (by definition)
Total Phenols	1866 mg/l
Total Suspended Solids	184 mg/l
Total Organic Carbon	2140 mg/l
E.P.TOXICITY:	
Arsenic, mg/l	< 0.001
Barium, mg/l	0.20
Cadmium, mg/l	0.10
Chromium, mg/l	36.2
Lead, mg/l	0.093
Mercury, mg/l	< 0.0004
Selenium, mg/l	< 0.01
Silver, mg/l	< 0.0007

NOTE: Paint stripper waste not expected to contain any pesticide residues.

cc: Mr. Laurens Pitts
SOUTHERN DIVISION
Naval Facilities Engineering Command
P.O. Box 10068
Charleston, S.C. 29411
ATTN: Mr. Joe McCulley

Respectfully submitted.

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

AVGAS Spill Area

Approximately 25,000 gallons of high octane aviation fuel was spilled at the South Field in the summer of 1972. The leakage occurred when a rubber fueling hose was accidentally cut and leaked unnoticed over a 3-day weekend. The fuel flowed about 200 feet across a concrete apron and onto a low grassed area where it was ponded and caused the vegetation to be killed in an area of approximately 2 acres.

As a volume of petroleum product moves downward through unsaturated soil, thin films of the product are strongly held on the soil particles through which it passes. Downward migration will continue until the product is thus exhausted and immobilized or until it reaches the water table. The volume of soil required to immobilize the spilled fuel can be calculated from the equation (API, 1972):

$$V_s = \frac{0.20V_f}{P\ Sr} \quad \text{in which}$$

V_s = volume of soil (yd^3)
V_f = volume of fuel (barrels)
P = porosity of soil (dimensionless)
S_r = residual saturation of the fuel (dimensionless)

Assuming:

V_f = 25,000 gal = 595 bls
P = 0.30
S_r for light fuels = 0.10

Then: V_s = 3967 yd^3

Assuming the area of infiltration to be 2 acres (9680 yd^2), the product would have penetrated to a depth of 0.4 yd (1.2

ft) before being immobilized. The water table at this site is estimated to be about 100 feet below the surface.

This calculation is very conservative because it assumes no evaporation loss. It is likely that evaporation was substantial from a stream of highly volatile gasoline spread over a 200-ft long strip of pavement and a ponded area of 2 acres. In the 12 years since the spill, bacterial action should have decomposed essentially all of the fuel held in the soil and therefore no further action is recommended for this site.

Crash Crew Training Areas

During the last 25 years, the general area on the west side of North Field has been used for training in fire fighting. Presently, the two sites shown in Figure 1 are being used; however, the specific training sites have periodically been relocated. During a training session, approximately 110 gallons of JP-4 fuel is poured into shallow surface depressions, ignited and then extinguished using AFFF (aqueous film forming foam). According to records, 6285 gallons of fuel and 3148 gallons of foaming agent were used during the last year. The particular foaming agent most recently used, AOW-6, has the properties and contents given in Table 3.

Surficial soils at these sites have relatively low permeabilities and therefore, it is likely that a high

Table 3. Properties and Contents of Foaming Agent AOW-6.

Specific gravity	1.031
pH	7.9
COD (mg/l)	350,000
BOD (mg/l)	135,000 (5 day), 300,000 (30 day)
Surfactants (mg/l as MBAS)	80,000 (as active agents)
Fluoride (mg/l)	2,500
Ethylene glycol	10%
Diethylene glycol monobutyl ether	10%
Water	72%

proportion of any unburned fuel evaporates rather than infiltrating the ground. Fuel which does infiltrate would be immobilized in the upper part of the unsaturated zone and is not likely to reach the water table at an estimated depth of 80 feet. Because of the relatively small amounts of fuel and foam used and the large area over which they have been applied during the 25-year use, it is recommended that no further study be done at these sites.

WELL INVENTORY

Essentially, all potable and industrial water supplies in the Whiting Field vicinity are obtained from surficial sands known collectively as the sand and gravel aquifer, which extends from the surface to an approximate elevation of -150 ft msl (feet mean sea level). Screen settings are at depths of about 150 to 350 ft depending on surface elevation and the occurrence of clay lenses which lie at somewhat erratic depths. An inventory of wells within one mile of the waste disposal sites is presented in Table 4 and the locations of the wells are shown in Figure 2. The area includes most of Whiting Field and small residential neighborhoods south and east of the base.

Potable water on base is currently supplied by 3 wells, the north (W-N4), south (W-S3), and west (W-W3) wells; however, these are only the latest in a sequence of wells which have been replaced because of insufficient capacity or poor water quuality. When the base was built in 1943, 3

Table 4. Inventory of Wells Within One Mile of Disposal Sites.

Well Designation	Owner	Date Installed	Casing Diameter (inches)	Surface Elevation (ft msl)	Total Depth (ft msl)	Screened Interval (ft msl)	Gravel Pack Interval (ft msl)	Status
W-N1	Navy	1943						Abandoned 1951
W-N2	Navy	1951	16	168.1	(-256.4)	(-1.4)-(-31.4)	60-(-31)	Not in use
W-N3	Navy	1975		171.5	(-58.5)	36.5-(-23.5)		Abandoned 1975
W-N4	Navy	1975	16/12	180.0	(-38)			In use
W-W1	Navy	1943						Abandoned 1951
W-W2	Navy	1951		197.6	(-157.4)	14.1-(-47.0)		Abandoned 1965
W-W3	Navy	1965		180.0	(-35.0)	10.0-(-30.0)	80-(-30)	In use
W-S1	Navy	1943						Abandoned 1951
W-S2	Navy	1951		181.5	(-159.5)	12.0-(-33.0)	17-(-33)*	In use
P-3	Point Baker Water System	1978		200**	(-20)**			In use
P-4	Point Baker Water System	1983						In use
USGS	U.S. Geological Survey	1974	6	125.0	(-1165)	Cased to (-860)		Monitor well

* Assumed
** Estimated

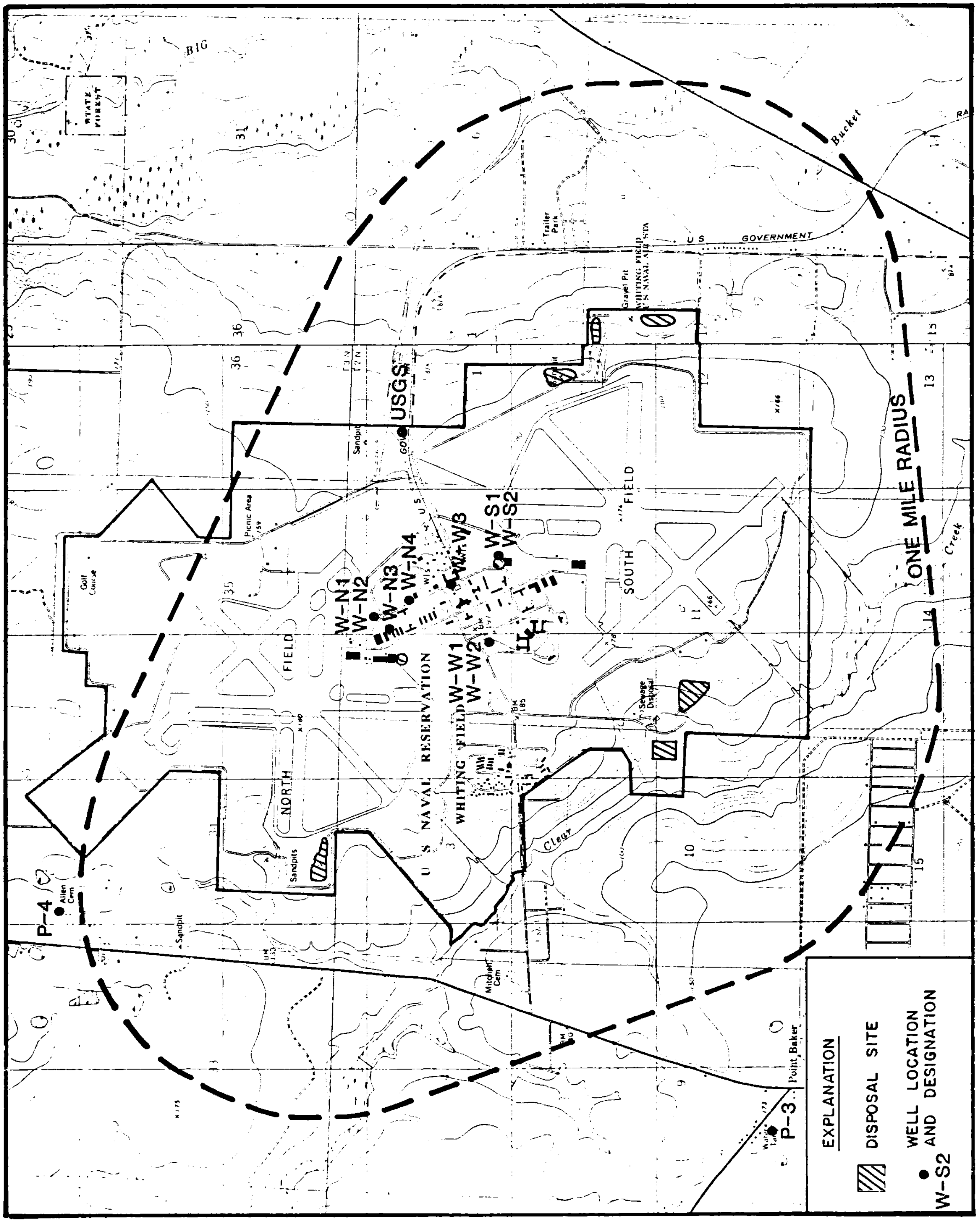


Figure 2. Locations of Wells Within One Mile of Disposal Sites.

wells were drilled, the original north (W-N1), south (W-S1), and west (W-W1) wells. In 1951 these wells were abandoned and replaced by new wells (W-N2, W-S2, and W-W2, respectively) within 75 ft of the original wells. The new wells were probably constructed to deliver increased yields. The west and north wells, however, contained objectionable levels of iron and were replaced by W-W3 in 1965 and W-N3 in 1975, respectively. The replacement north well, which was drilled as a test well, was also found to have an unacceptable iron concentration and was subsequently abandoned and replaced by the currently used north well (W-N4). Locations of the Navy wells are shown in Figure 3. Current average pumpage from the wells at Whiting Field is: North well, 438 gpm (gallons per minute); West well, 479 gpm; and South well, 474 gpm. Flow from the three (3) active supply wells is combined before entering the distribution system.

Water for the City of Milton is supplied by five (5) wells, for East Milton by two (2) wells, and for the Point Baker-Allentown area by three (3) wells, all of which are screened in the sand and gravel aquifer and all of which are outside of the one-mile radius; however, two of the Point Baker wells (P-3 and P-4) are so close that they are included in the inventory. Average pumpage from these two wells is: P-3, 500 gpm; and P-4, 200 gpm. Water from the Point Baker system is available to residences west and north of Whiting Field, and water from the Milton system is available to those

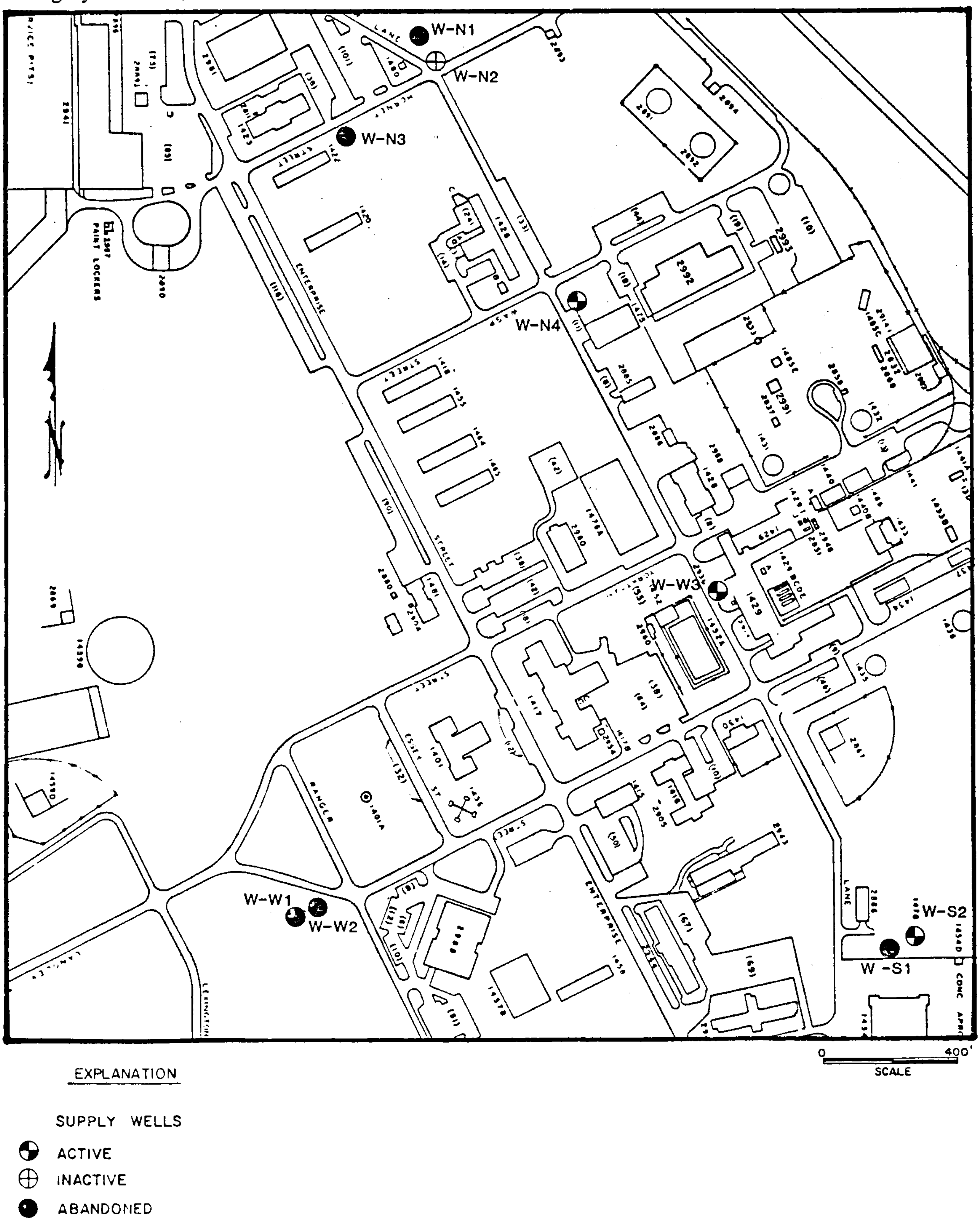


Figure 3. Locations of NAS Supply Wells

east and south of Whiting Field. It is believed that few if any private wells in these areas are still used.

HYDROGEOLOGIC SETTING

Topography and Drainage

Whiting Field is located on an upland area isolated on three sides by the erosion of the deep valleys of Clear Creek on the south and west, and Big Coldwater Creek on the east, both of which are tributary to Blackwater River to the south. Topographic relief from the highest part of Whiting Field to Blackwater River is almost 200 ft. Ancient marine terraces can be seen in the nearly level upland surface and on the valley slopes southeast of the base at elevations of 70 and 30 ft msl.

Because of the relatively steep valley walls, erosion became a serious problem when the land was disturbed for construction of the base. Soil conservation measures in the form of extensive contouring and construction of large paved ditches were instituted to transmit surface runoff down the slopes with minimal erosion. A system of ditches and storm sewers was also constructed to drain the upland area of the base. These and other surface-water drainage lines are shown in Figure 4.

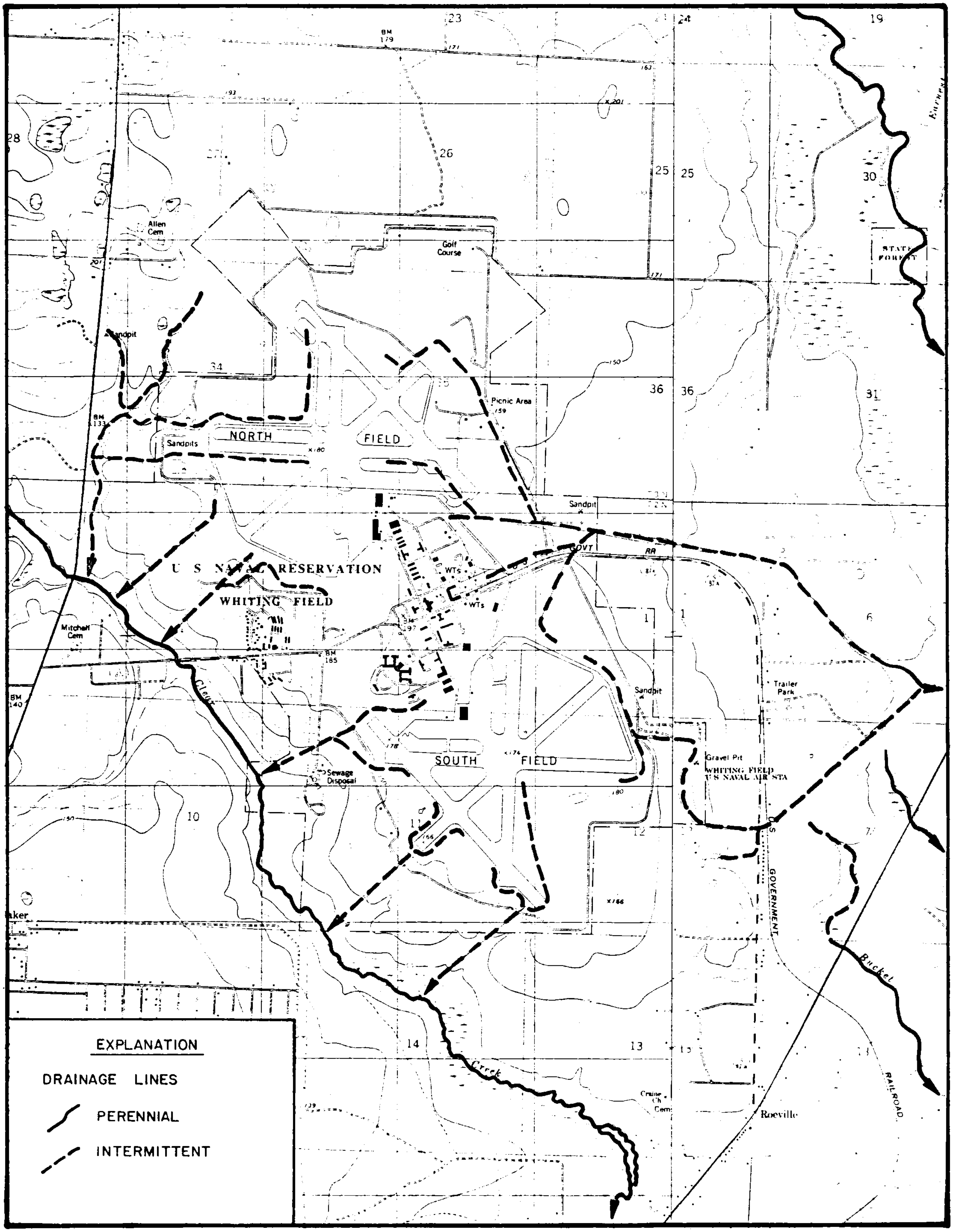


Figure 4. Locations of Surface Drainage Lines.

Geologic Framework

The geologic sequence of layers underlying Whiting Field is illustrated in Figure 5, a composite geologic column constructed from published data and logs of wells in the area. Lithologic logs of borings and wells in the Whiting Field area and their locations are included in Appendix A.

The uppermost sediments extending to a depth of about 350 ft comprise the so-called sand and gravel aquifer. It is underlain by the relatively impermeable Pensacola clay, below which are thick layers of limestone and shale to a depth of nearly 2,000 ft.

Sand and Gravel Aquifer

The sand and gravel aquifer includes the upper Miocene coarse clastics, the Citronelle formation, and marine terrace deposits, three units which have similar hydraulic properties and sometimes are indistinguishable. The aquifer consists of poorly-sorted, fine to coarse sands with gravel and lenses of clay which may be as much as 60 ft thick. In some areas, the formation also contains wood fragments of all sizes, including whole tree trunks, occurring mostly in layers which may be as much as 25 feet thick (Marsh, 1966); however, logs of wells drilled on base do not indicate the presence of wood fragments in the immediate area.

The formation contains lensatic zones within the sand which are cemented by iron oxide minerals. These lenses,

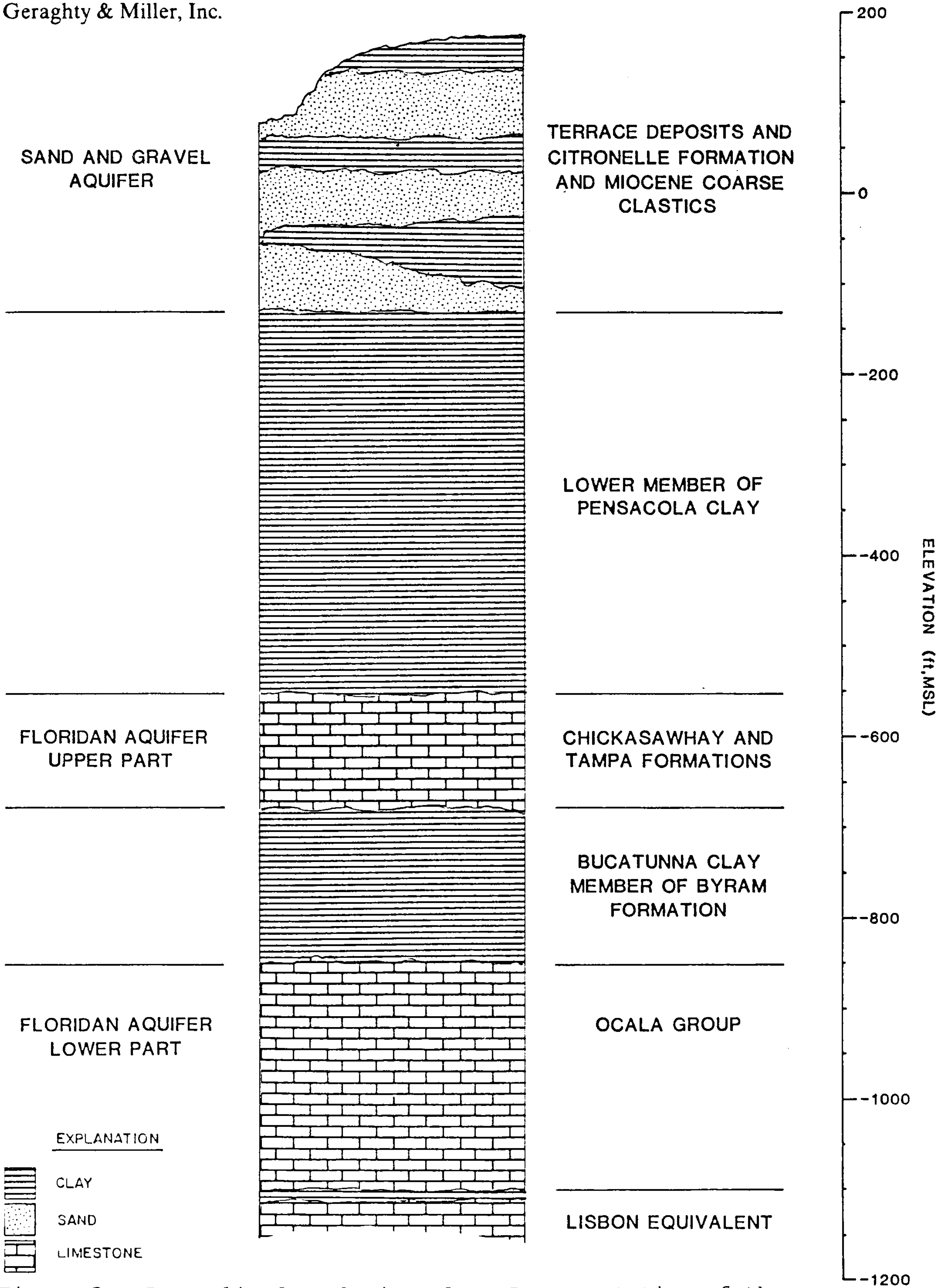


Figure 5. Generalized Geologic Column Representative of the Whiting Field Area.

known locally as "hardpan", have low permeabilities, and along with the clay lenses, are responsible for the occurrence of perched water tables and artesian conditions in the aquifer. In the Whiting Field area, major clay lenses occur in the uppermost 30 ft and in the depth interval of approximately 110 to 170 ft (elevation 10-70 ft msl). The vertical positions of these clay lenses in relation to the screened intervals of the NAS supply wells is shown in Figure 6. Although the clays appear to be continuous, they may contain permeable zones.

Floridan Aquifer

The limestone layers constitute the regionally extensive Floridan aquifer, which in this area is divided into an upper and lower part separated by the Bucatunna clay. The upper Floridan aquifer is an important source of water in areas east of Santa Rosa County; however, toward the west, it is increasingly mineralized and is generally not used as a water supply. The lower Floridan aquifer is highly mineralized in the Whiting Field area and is, in fact, designated for use as a waste-disposal injection zone. Chemical analyses of water from the upper and lower parts of the Floridan aquifer are included in Appendix B, Table B-2.

Subsurface Hydrology

The potentiometric surface of the upper Floridan aquifer at Whiting Field is approximately 50 ft msl and has been

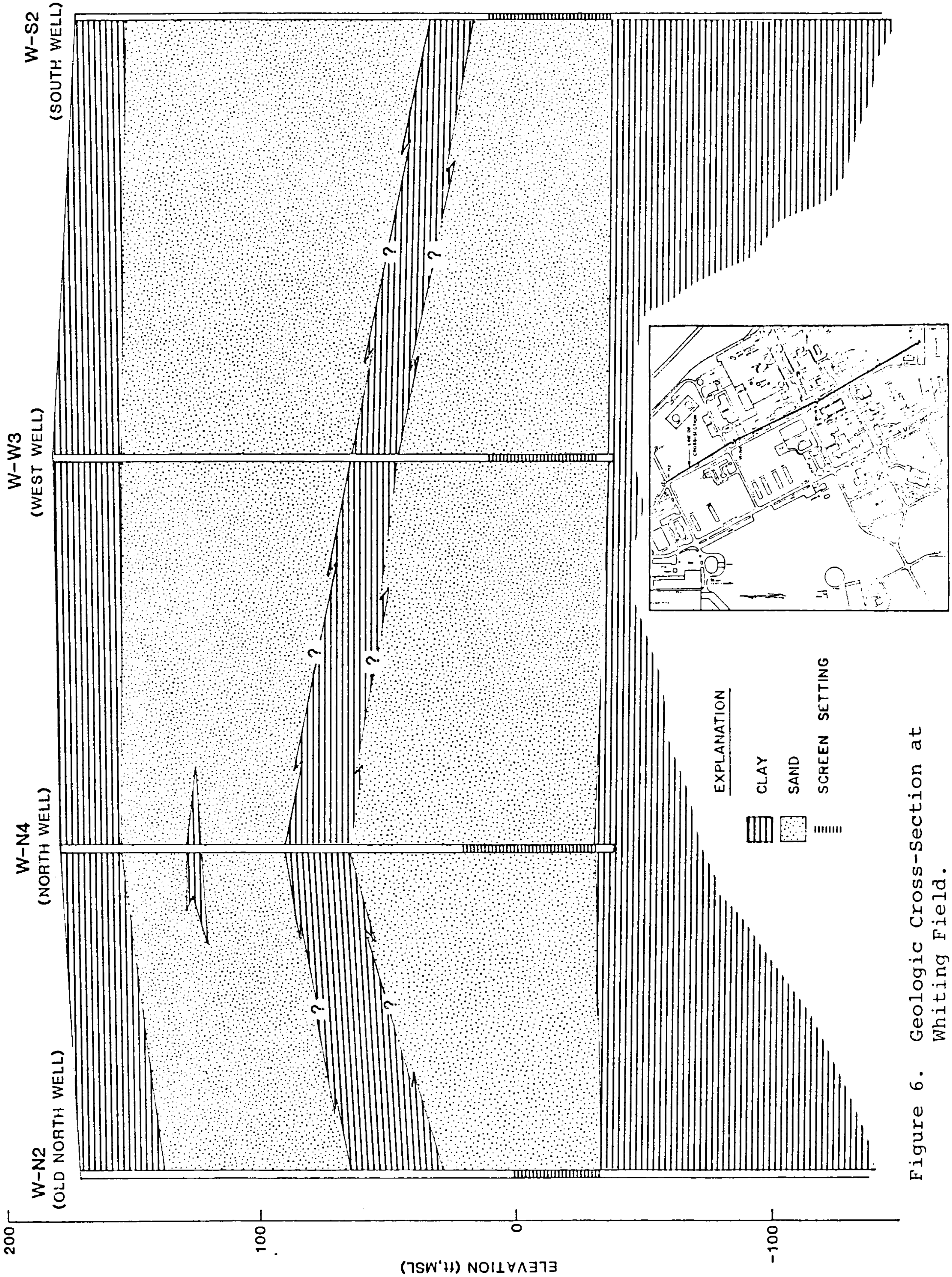


Figure 6. Geologic Cross-Section at Whiting Field.

declining because of heavy pumpage from the aquifer at Fort Walton Beach. Ground-water movement in the aquifer is toward the southeast as can be seen in the potentiometric surface map of Figure 7. The potentiometric surface of the lower Floridan aquifer has increased by several feet to approximately 130 ft msl since 1974 because of waste injection at nearby industrial plants (J.B. Martin, USGS, 1984, oral communication). There is, therefore, a potential for upward movement of water from the lower to the upper Floridan; however, the intervening Bucatunna clay has a low permeability and allows essentially no flow between the two aquifers. Recharge to the upper Floridan occurs primarily in northern Santa Rosa County and southern Alabama, where the aquifer is at or near the surface.

In the sand and gravel aquifer, static water levels at Whiting Field range from approximately 70 ft msl in the center of the station to about 30 ft msl along Clear Creek and Big Coldwater Creek. This, along with the low permeability of the confining deposits (Pensacola clay), indicates little potential for movement of ground water vertically between the Floridan and the sand and gravel aquifers.

Ground-water flow in the saturated portion of the sand and gravel aquifer is nearly horizontal. Shallow ground water normally moves from topographic highs to areas of discharge, such as streams. Figure 8, which was prepared

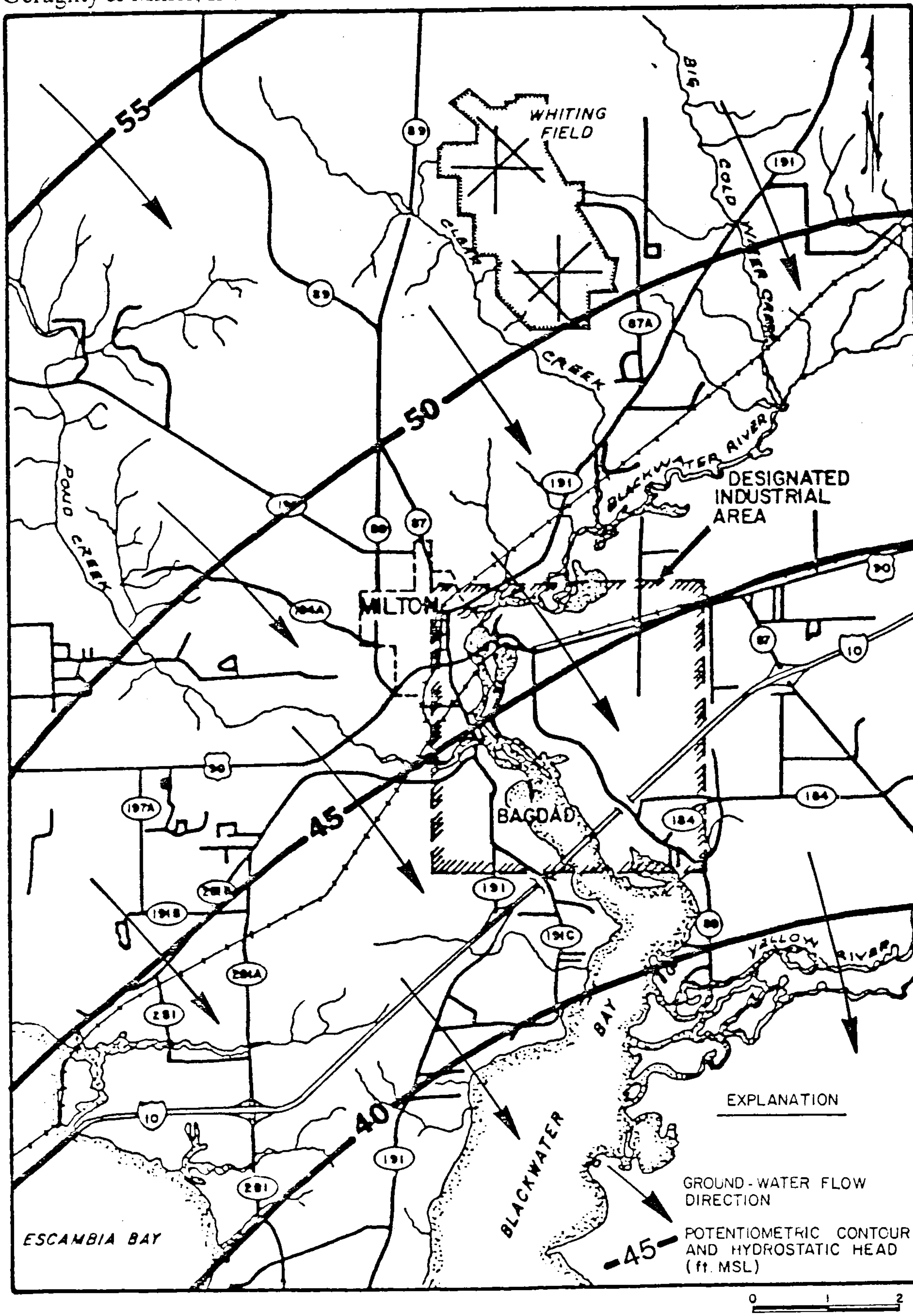


Figure 7. Contour Map of the Potentiometric Surface of the Upper Floridan Aquifer in the Whiting Field Area, 1980.

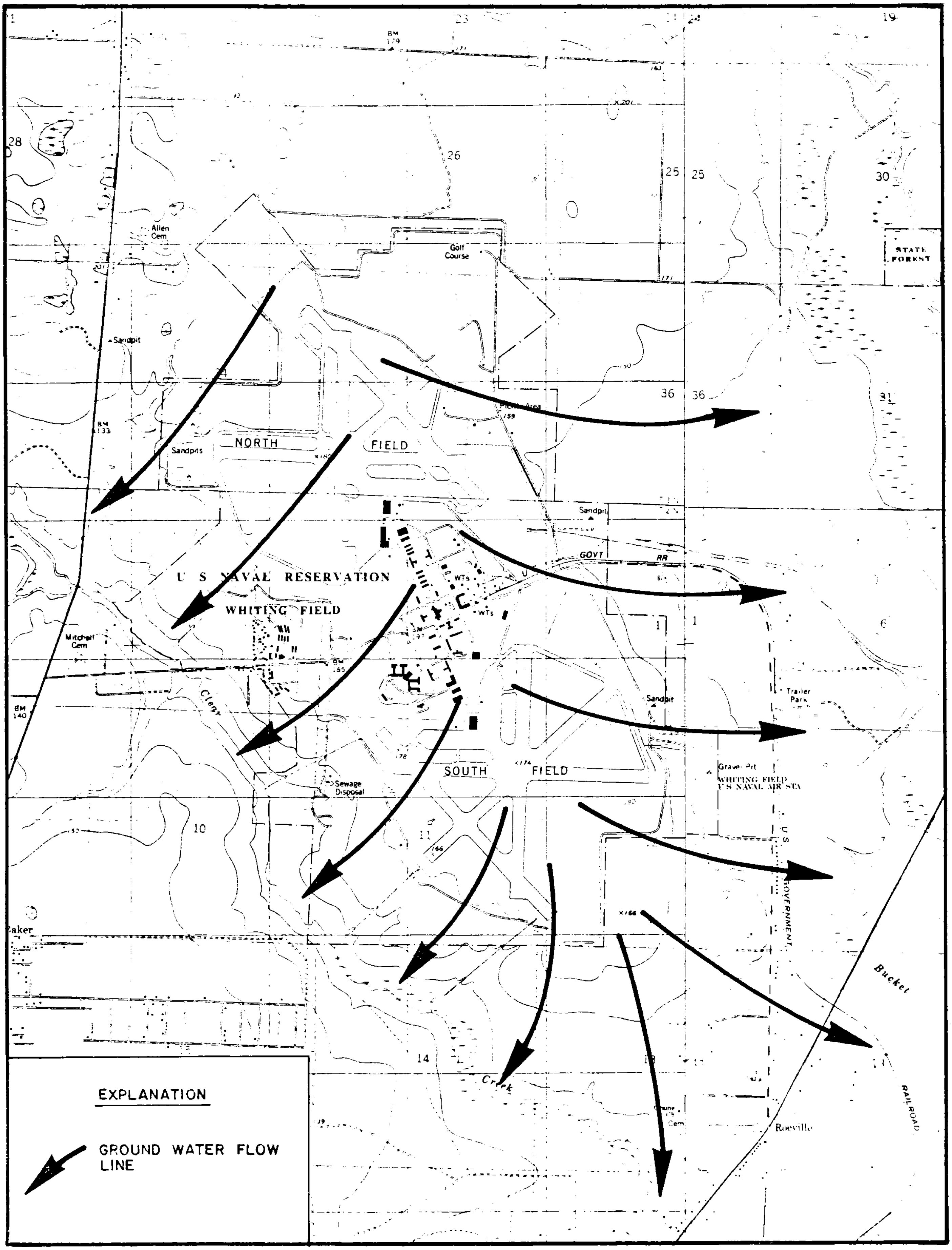


Figure 8. Inferred Directions of Ground-Water Movement in the Sand and Gravel Aquifer.

using the surface topography, shows inferred directions of ground-water flow within the sand and gravel aquifer. These flow lines do not, however, reflect the influence of cones of depression which occur around the three Navy production wells.

The sand and gravel aquifer is recharged by infiltration of rainwater at the surface. The downward movement of water through the unsaturated zone is interrupted at clay layers, above which perched water tables may exist. Flow in the perched saturated zones is primarily horizontal with some downward leakage through the clay, depending upon its vertical permeability.

The following specific capacities were determined from test pumping of the 1951 NAS wells:

W-N2	16.7 gpm/ft (gallons per minute per foot of drawdown)
W-W2	23.0 gpm/ft
W-S2	21.7 gpm/ft

From these values, an average transmissivity for the pumped zone of the sand and gravel aquifer is estimated to be about 37,000 gpd/ft (gallons per day per foot). This agrees rather well with a transmissivity of 54,600 gpd/ft determined from a pumping test at Milton (NWFWMD, 1980).

WATER QUALITY

As noted above, the upper and lower Floridan aquifers are highly mineralized whereas the sand and gravel aquifer contains water of generally good quality, as do Big Coldwater Creek and Blackwater River, the baseflows of which are maintained by discharge from the sand and gravel aquifer.

Total dissolved solids and total hardness of water in the sand and gravel aquifer generally are less than 50 ppm (parts per million) and nitrate is about 1 ppm. However, because of high levels of dissolved carbon dioxide, the water is acidic with a pH of 5.0 to 5.5 and locally high concentrations of iron are found. Results of chemical analyses of ground water and surface water are contained in Appendix B.

GROUND-WATER MONITORING PLAN

Extent of Zone of Discharge

A ground-water monitoring plan has been prepared in accordance with Chapter 17-4.245(6)(d) FAC to detect the potential movement of constituents from nine disposal and/or storage sites. These nine sites are considered to be "existing installations" since each was utilized, and therefore potentially discharging to ground water, prior to July 1, 1982. In accordance with Section 17-4.245(3)(d) FAC, "existing installations" shall have a zone of discharge extending to the property line. Therefore, it is assumed that for Whiting Field the point of compliance for constituents other than "free froms" will be at the edge of the zone of discharge or the property line. No zone of discharge is allowed for those constituents referred to as "free froms" as defined in Section 17-3.402(1) FAC.

Background Ground-Water Quality Conditions

Background water quality will be established from analyses made on water samples from the north supply well (W-N4). The north well, was selected because it is hydraulically upgradient from the sites and is representative of the water-quality characteristics of the sand and gravel aquifer at Whiting Field; this well was recently sampled for EPA's list of organic priority pollutants and none were found (see Table B-5 in Appendix B).

After approval of the ground-water monitoring plan, a water sample will be collected from well W-N4 and analyzed for a partial list of the FDER's primary and secondary drinking-water constituents as identified in Table 5. The collected data will then be utilized to characterize the natural ground-water quality characteristics of the sand and gravel aquifer at Whiting Field.

Locations and Construction Details of Proposed Monitor Wells

Nine monitor wells, screened in the shallowest permeable, saturated zone, will be installed hydraulically downgradient from the nine designated disposal and storage sites. The locations of the proposed monitor wells and estimated depths to water are shown in Figures 9 through 13. Each proposed monitor well has been located immediately downgradient from its respective disposal site in order that possible contaminants migrating from these sites can be detected as early as possible.

The monitor wells will be either 2-inches or 4-inches in diameter, depending upon the anticipated depth to water. In areas where static water level exceeds a depth of 20 ft, the monitor wells will consist of 4-inch-diameter PVC casing and screen and will be equipped with submersible pumps for obtaining water samples. A schematic diagram illustrating the construction details of a typical 4-inch-diameter monitor well is presented in Figure 14. Where the water table is

Table 5. Ground-Water Quality Parameters and Frequency of Sample Collection

Constituent	Sites: Background (North well)	Landfills	Battery Shop	Solvents Storage
Arsenic	1	1,2,3,4	1	1
Barium	1	1,2,3,4	1	1
Cadmium	1	1,2,3,4	1,2,3,4	1,2,3,4
Chromium (Hexavalent)	1	1,2,3,4	1,2,3,4	1,2,3,4
Fluoride	1	1	1	1
Lead	1	1,2,3,4	1,2,3,4	1,2,3,4
Mercury	1	1	1	1
Nitrate (as N)	1	1	1	1
Selenium	1	1	1	1
Silver	1	1	1	1
Endrin	1	1	1	1
Lindane	1	1	1	1
Methoxychlor	1	1	1	1
Toxaphene	1	1	1	1
2,4-D	1	1	1	1
2,4,5-TP Silvex	1	1	1	1
Turbidity	1	1	1	1
Chloride	1	1	1	1
Copper	1	1	1	1
Foaming Agents	1	1	1	1
Hydrogen Sulfide	1	1	1	1
Iron	1	1	1	1
Manganese	1	1	1	1
Sulfate	1	1	1	1
TDS	1	1	1	1
Zinc	1	1,2,3,4	1,2,3,4	1
Color	1	1	1	1
Odor	1	1	1	1
pH (field)	1	1,2,3,4	1,2,3,4	1,2,3,4
Specific Conductance (field)	1	1,2,3,4	1,2,3,4	1,2,3,4
VOC (volatile organics-Method 601)	*	1,2,3,4	1	1,2,3,4

Note: Numbers refer to quarterly sampling periods during the first monitoring year.

* Analysis for EPA organic priority pollutants was made in April, 1984 (See Appendix B).

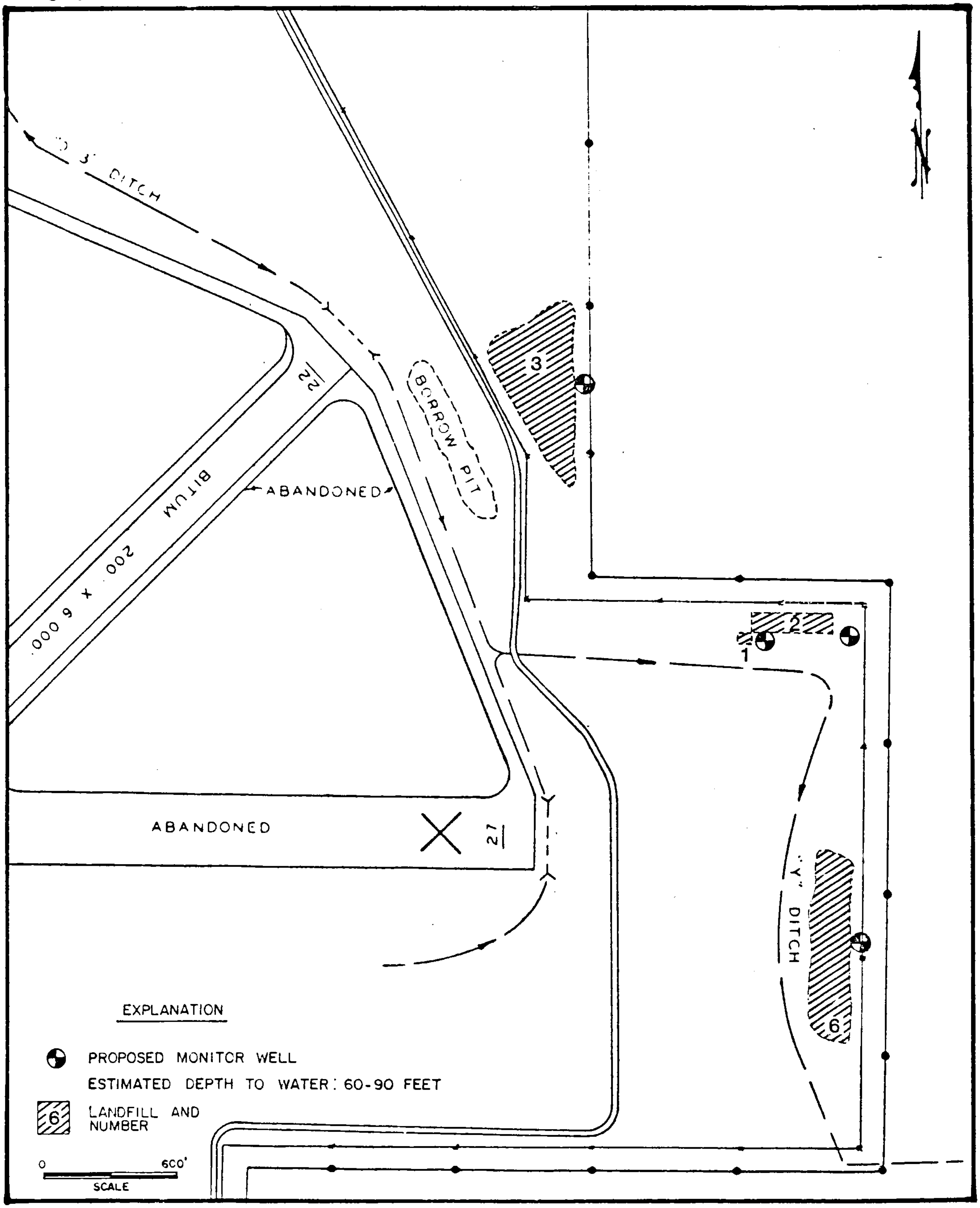


Figure 9. Locations of Proposed Monitor Wells For Landfills No. 1, 2, 3 and 6.

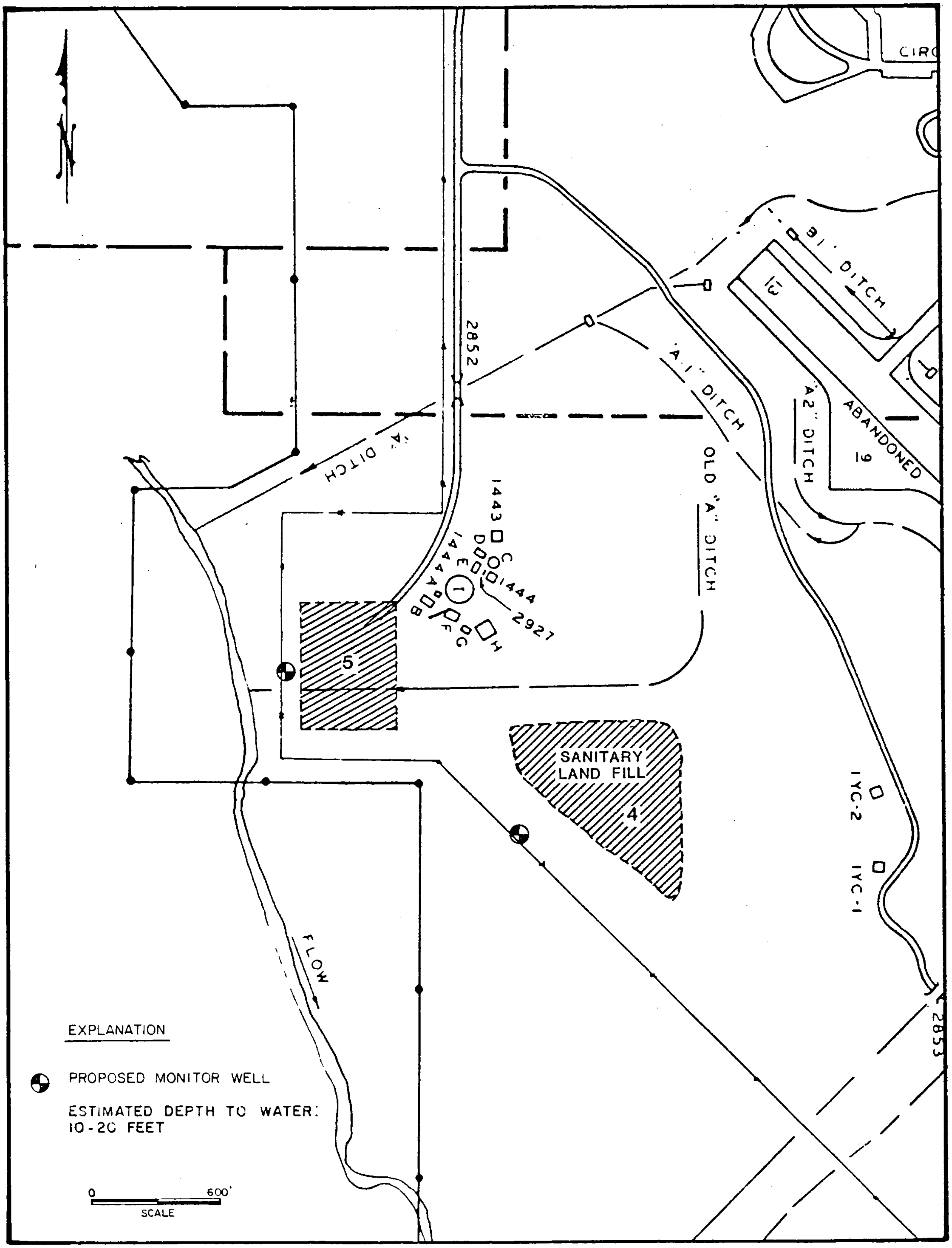


Figure 10. Locations of Proposed Monitor Wells for Landfills No. 4 and 5.

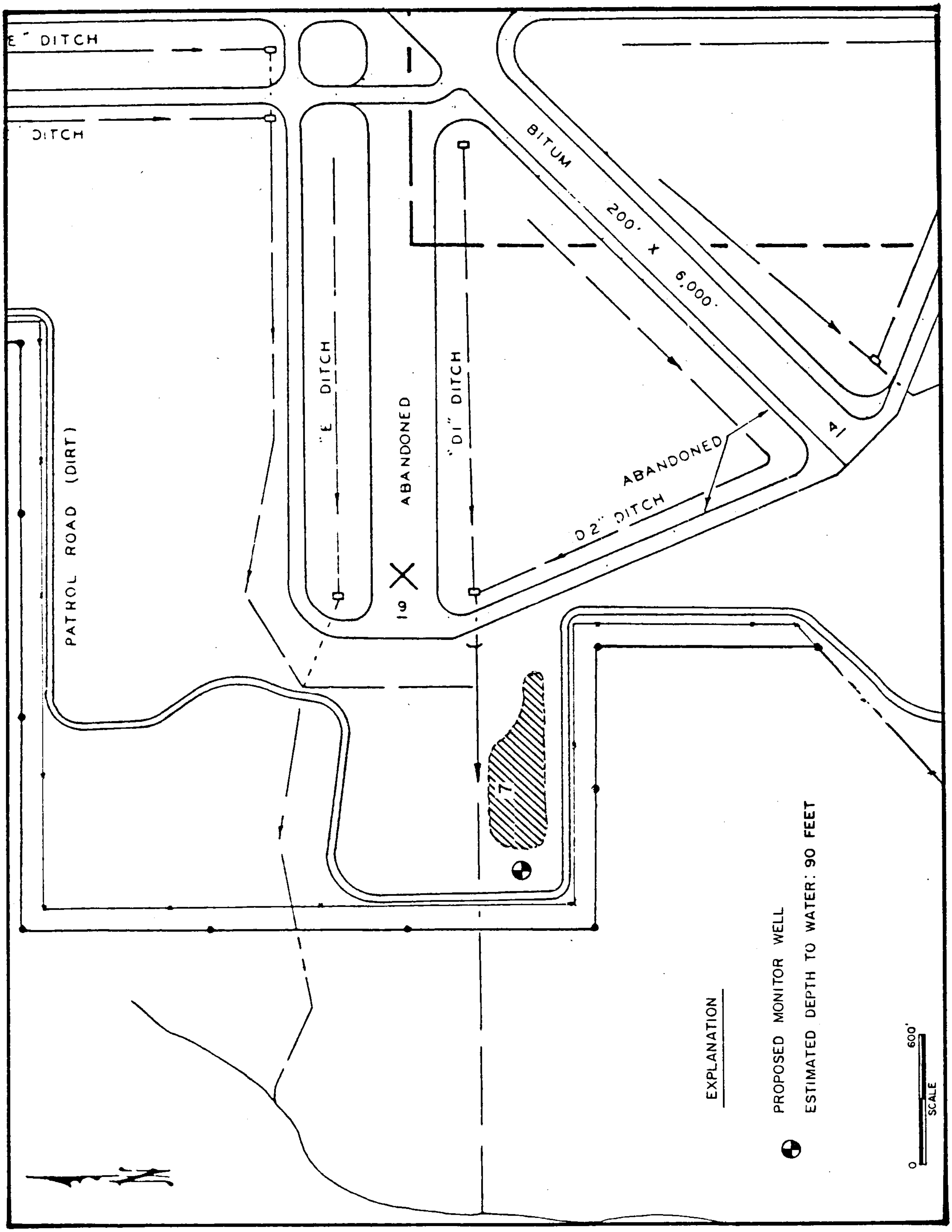


Figure 11. Location of Proposed Monitor Well For Landfill No. 7.

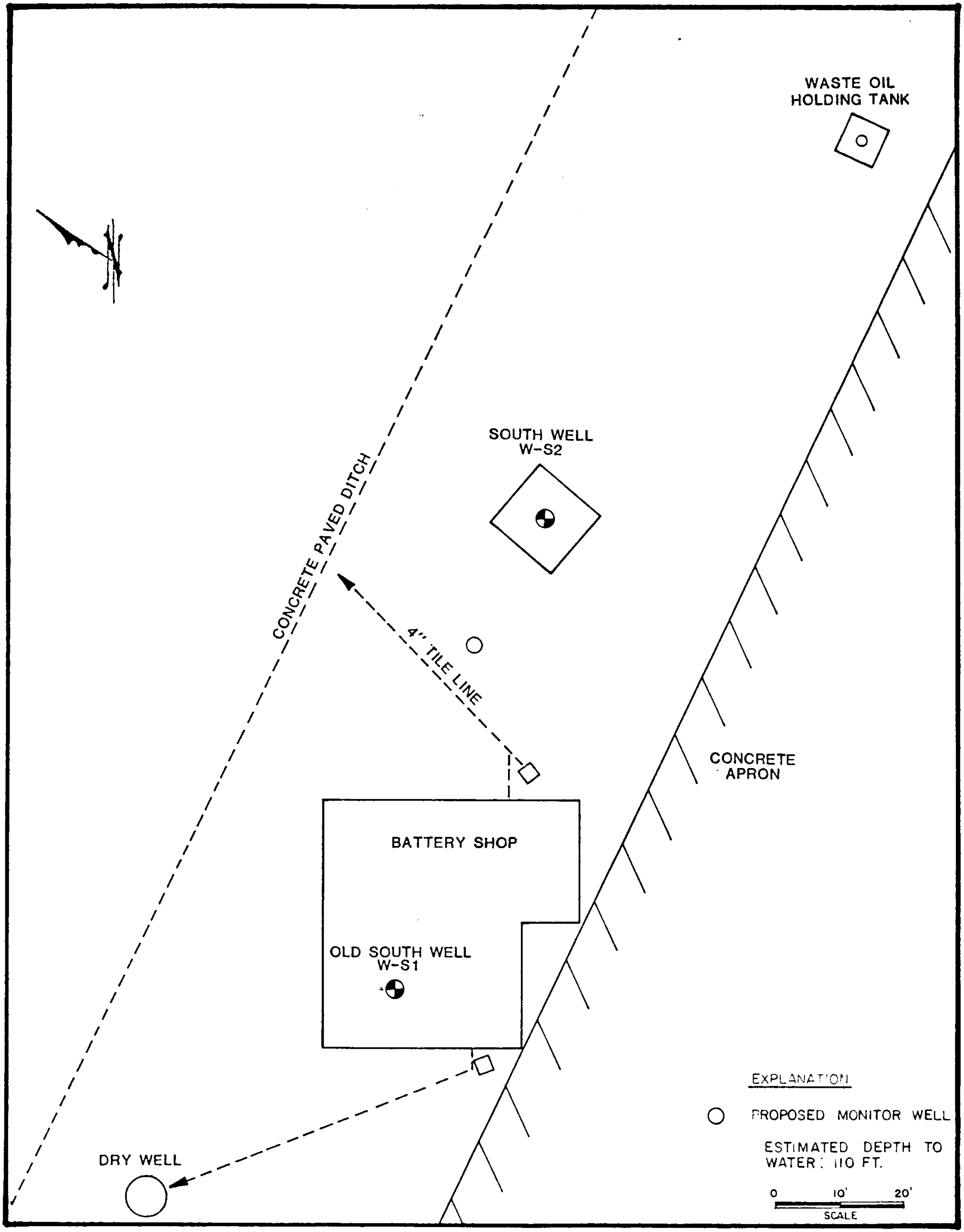


Figure 12. Location of Proposed Monitor Well for Battery Shop Site.

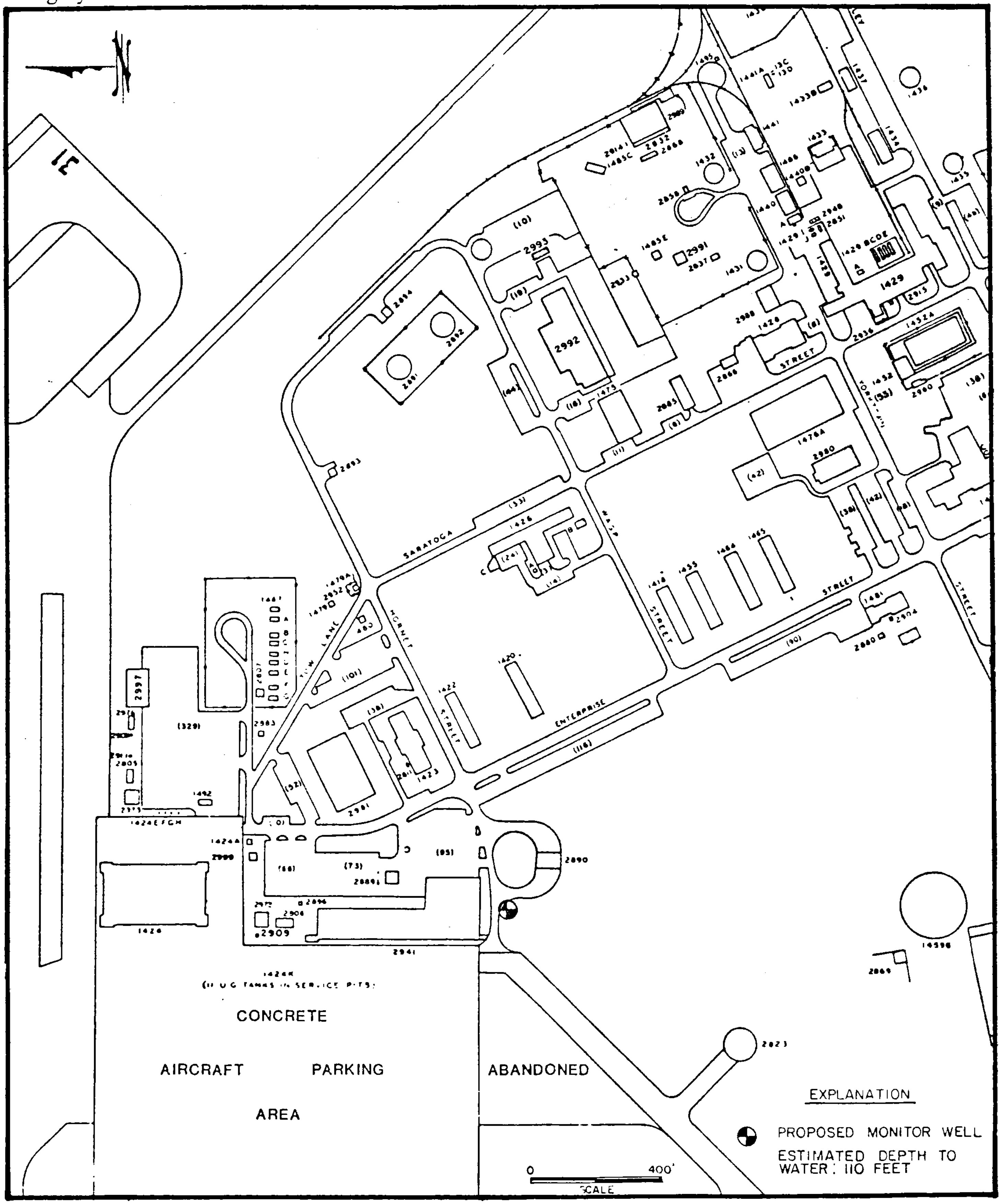


Figure 13. Location of Proposed Monitor Well for Waste Solvent Underground Storage Site.

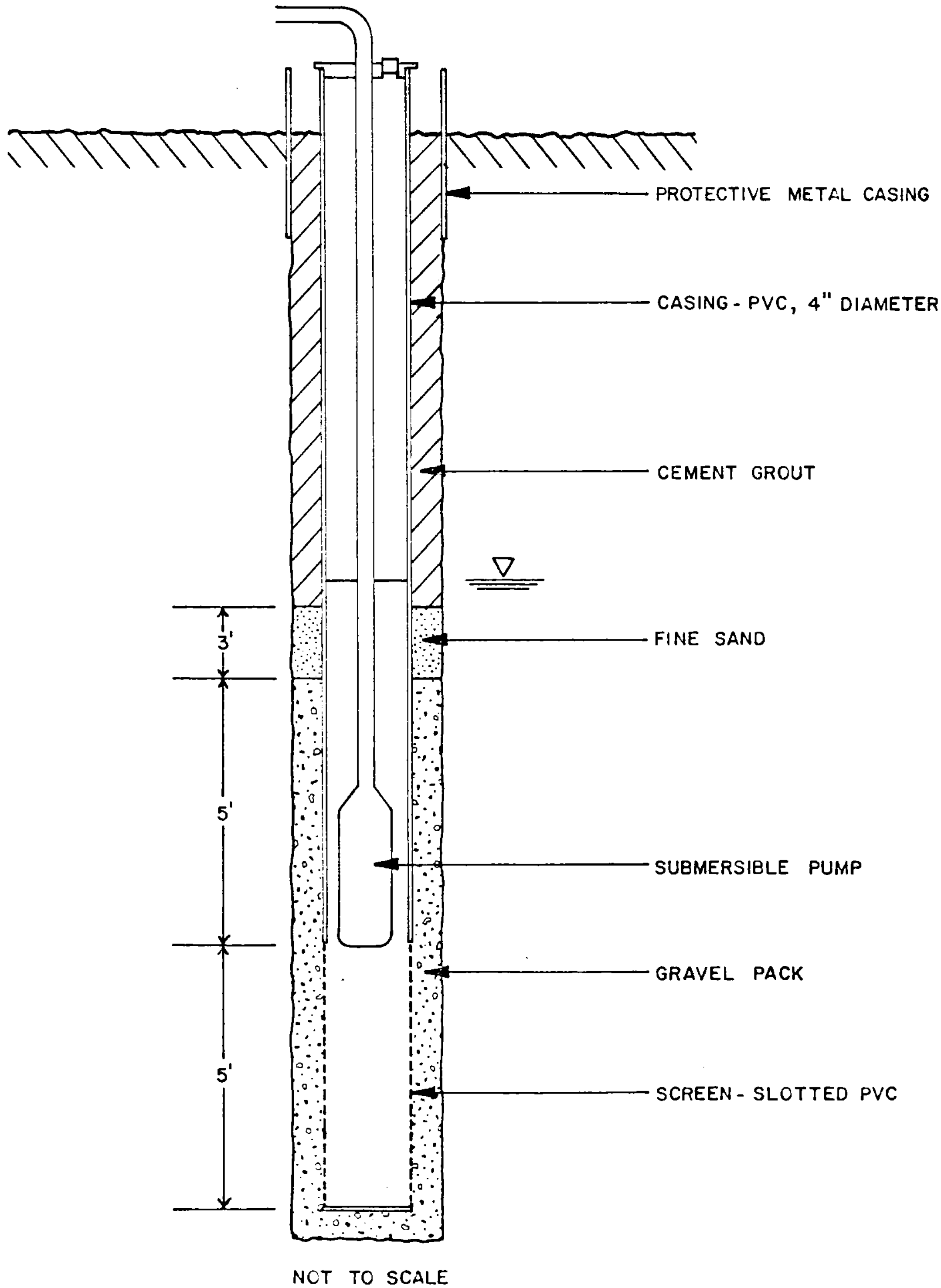


Figure 14. Schematic Diagram Showing Construction of Deep Monitor Well.

shallower than 20 ft, wells can be evacuated by suction pumping; therefore, in these areas the monitor wells will consist of 2-inch-diameter PVC casing and screen. A schematic diagram illustrating the construction details of a typical 2-inch-diameter monitor well is presented in Figure 15.

The monitor wells will be constructed by the mud-rotary method of drilling. During the drilling, representatives from Geraghty & Miller, Inc., will oversee the work. Soil samples will be collected every 5 ft and their mineral and physical characteristics will be described by the Geraghty & Miller, Inc., representative. After the borehole is drilled to its total depth, the well casing and attached well screen will be inserted into the borehole and the annulus around the well screen will be gravel packed by the tremie method. The annulus above the gravel pack will be grouted, using a neat cement grout by the tremie method, up to land surface. Upon completion, each monitor well will be adequately developed and will be protected at land surface by a metal protective casing. Sections of casing and screen will be joined by threaded couplings without the use of PVC bonding cement and the drilling equipment will be thoroughly cleaned before drilling each well in order to avoid cross contamination.

After completion of all of the monitor wells, the first quarter water samples will be collected from each and analyzed for the constituents itemized in Table 5.

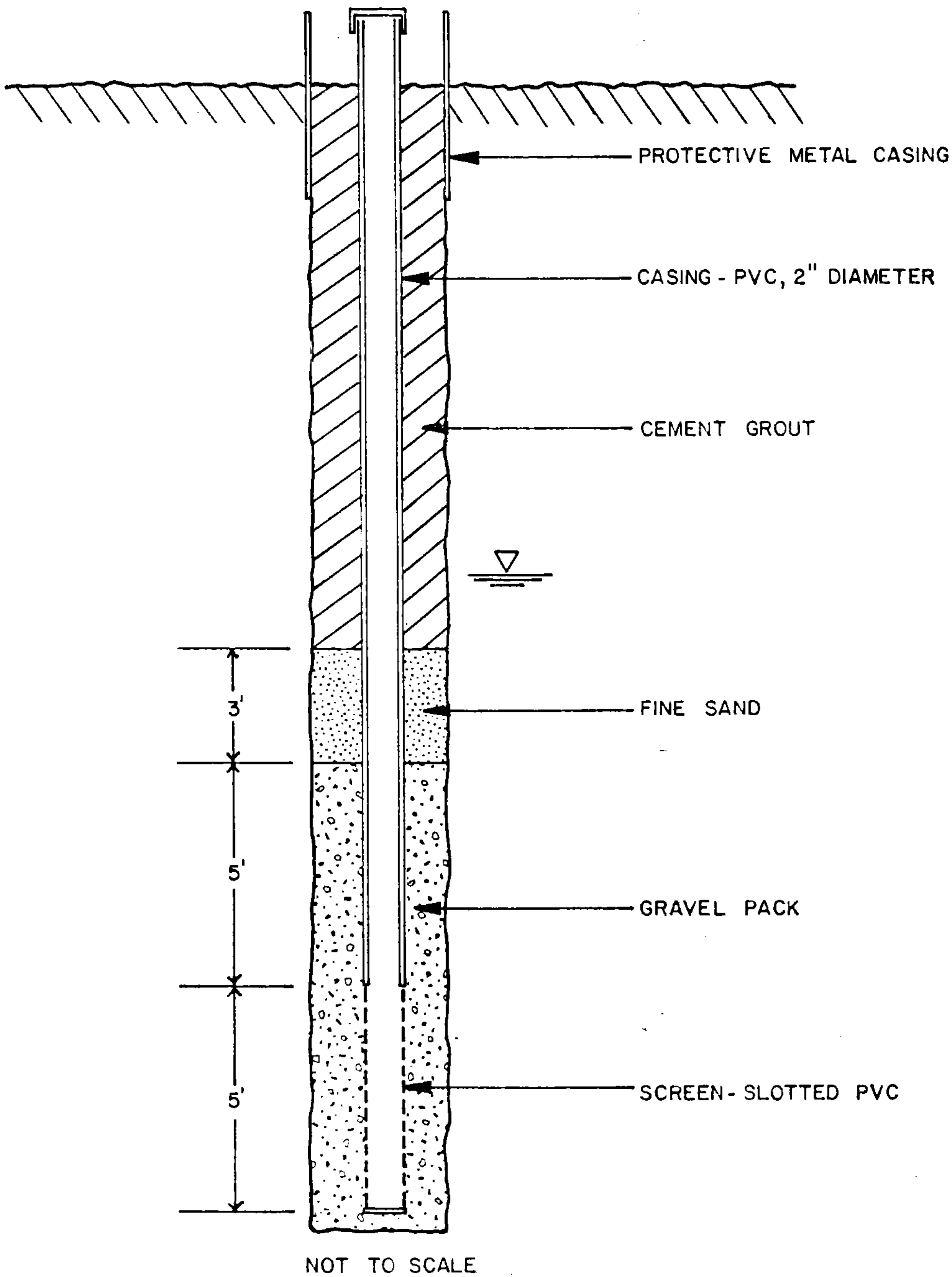


Figure 15. Schematic Diagram Showing Construction of Shallow Monitor Well.

Thereafter, quarterly sampling will continue for one year (second through fourth quarter) and analyses will be conducted for the constituents also shown in Table 4. Additional constituents may be analyzed for based upon the results of the first quarter sampling.

Sampling and Chemical Analysis Protocol

In conformance with 17-4.245(6)(d) FAC, a ground-water sampling and analysis plan has been prepared for Whiting Field. The detailed plan is presented in Appendix C of this report.

REFERENCES

American Petroleum Institute, 1972, The Migration of Petroleum Products in Soil and Ground Water: Committee on Environmental Affairs, Amer. Petrol. Inst., Washinton, D.C.

Barraclough, J.T., 1967, Ground-water features in Escambia and Santa Rosa Counties, Florida: Fla. Geol. Survey, Map Ser. 26.

Hayes, Larry R., and Barr, Douglas E., 1983, Hydrology of the Sand and Gravel Aquifer, Southern Okaloosa and Walton Counties, Northwest Florida: U.S. Geol. Survey, Water-Resources Investigations Report 82-4110.

Marsh, O.T., 1962, Relation of Bucatunna Clay Formation to geology and ground water of westernmost Florida: Geol. Soc. Amer. Bull., V. 73, P. 243-252.

Marsh, O.T., 1966, Geology of Escambia and Santa Rosa Counties, Western Florida Panhandle: Florida Geol. Survey Bull. 46.

Musgrove, R.H., 1966, Water resources records of Escambia and Santa Rosa Counties, Florida: Fla. Geol. Surv., Inf. Circ. 50.

Musgrove, R.H., Barraclough, J.T., and Marsh, O.T., 1961, Interim Report on the water resources of Escambia and Santa Rosa Counties, Florida: Fla. Geol. Survey, Inf. Circ. 30.

Northwest Florida Water Management District, 1980, Evaluation of Industrial Water Availability, Milton Florida: NWFWMD Water Resources Assessment 80-1.

Trapp, Henry, Jr., 1972, Availability of Ground Water for Public-Water Supply in the Pensacola Area, Florida: U.S. Geol. Survey, Open File Report 72002.

Trapp, Henry Jr., 1975, Hydrology of the sand and gravel aquifer in central and southern Escambia County, Florida: U.S. Geol. Survey, Open File Report FL-74-74027.

Trapp, Henry Jr., 1978, Preliminary hydrologic budget of the sand and gravel aquifer under unstressed conditions, with a section on water-quality monitoring, Pensacola, Florida: U.S. Geol. Surv., Water-Resources Inv. 77-96.

Trapp, Henry Jr., Pascale, C.A., and Foster, J.B., 1977, Water resources of Okaloosa County and adjacent areas, Florida: U.S.G.S. Water Res. Inv. 77-9.

U.S. Geological Survey, 1978, Water resources data for Florida, V.4, Northwest Florida, Water-Data Report FL-78-4, Tallahassee, Florida.

Wagner, J.R., Lewis C., Hayes, L.R., and Barr, D.E., 1980, Hydrologic data for Okaloosa, Walton and southeastern Santa Rosa Counties, Florida: U.S. Geol. Surv. Open-File Rept. 80-741.

APPENDIX A

LITHOLOGIC LOGS

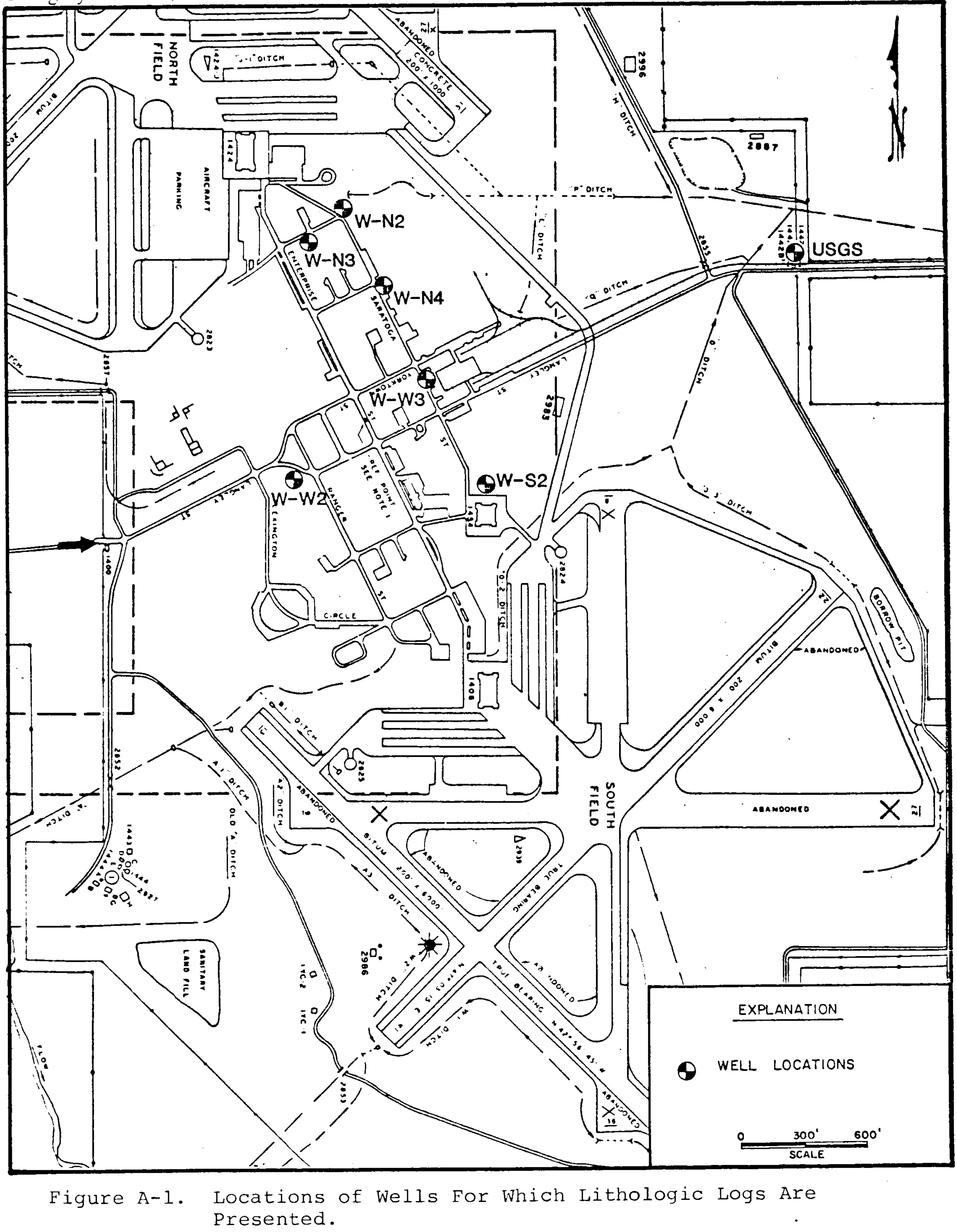


Figure A-1. Locations of Wells For Which Lithologic Logs Are Presented.

TABLE A-1. LITHOLOGIC LOG OF NAS OLD NORTH SUPPLY WELL

Well designation: W-N2
Surface Elevation: 168.1 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 30	Sandy clay	168 - 138
30 - 44	Loose muddy sand and gravel	138 - 124
44 - 66	White sand with clay streaks	124 - 102
66 - 89	White sand with clay balls	102 - 79
89 - 102	Muddy sand	79 - 66
102 - 113	Clay	66 - 55
113 - 135	Yellow sandy clay	55 - 33
135 - 140	Clay	33 - 28
140 - 140.4	Rock	28 - 27.6
140.4 - 156	Muddy Sand	27.6 - 12
156 - 183	Pack sand, clay streaks	12 - (-15)
183 - 200	Brown pack sand with loose streaks	(-15) - (-32)
200 - 237	Sandy clay	(-32) - (-69)
237 - 254	Soft yellow clay	(-69) - (-86)
254 - 275	Muddy sand	(-86) - (-107)
275 - 304	Pack sand	(-107) - (-136)
304 - 312	Sandy shale	(-136) - (-144)
312 - 365	Hard sandy shale	(-144) - (-197)
365 - 424	Clay	(-197) - (-256)

TABLE A-2. LITHOLOGIC LOG OF NAS TEST WELL

Well designation: W-N3
Surface elevation: 171.5 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 2	Topsoil	171 - 169
2 - 9	Sandy	169 - 162
9 - 22	Red clay to yellow chalk	162 - 149
22 - 27	Yellow sand, clay streaks	149 - 144
27 - 39	Clay	144 - 132
39 - 42	Coarse sand, clay stringers	132 - 129
42 - 52	Coarse sand, clay stringers, loose	129 - 119
52 - 62	Coarse sand, clay stringers, tight	119 - 109
62 - 75	Sand, cut well	109 - 96
75 - 80	Sand, tight	96 - 91
80 - 90	Sand, loose	91 - 81
90 - 100	Sand	81 - 71
100 - 119	Yellow clay	71 - 52
119 - 125	Sand	52 - 46
125 - 137	Muddy sand	46 - 34
137 - 145	Sand, cut well	34 - 26
145 - 165	Sand	26 - 6
165 - 176	Sand, small clay strings	6 - (-5)
176 - 198	Sand; iron minerals at 23-27 ft	(-5) - (-27)
198 - 217	Muddy sand	(-27) - (-46)
217 - 222	Black chalk	(-46) - (-51)
222 - 229	Sandy, bad looking	(-51) - (-58)

TABLE A-3. LITHOLOGIC LOG OF NAS NORTH SUPPLY WELL

Well designation: W-N4
Surface elevation: 180 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 15	Sandy clay	180 - 165
15 - 25	Pink chalk	165 - 155
25 - 40	Fine muddy sand	155 - 140
40 - 50	Muddy sand	140 - 130
50 - 54	Clay	130 - 126
54 - 65	Muddy sand	126 - 115
65 - 85	Fine muddy sand	115 - 95
85 - 90	Fine packed sand	95 - 90
90 - 114	Clay	90 - 66
114 - 125	Muddy sand	66 - 55
125 - 137	Fine packed sand	55 - 43
137 - 157	Muddy sand with mud balls	43 - 23
157 - 167	Sand (coarse good) some gravel	23 - 13
167 - 177	Sand (good)	13 - 3
177 - 195	Sand	3 - (-15)
195 - 203	Sand (red)	(-15) - (-23)
203 - 210	Sand	(-23) - (-30)
210 - 218	Clay and mud	(-30) - (-38)

TABLE A-4. LITHOLOGIC LOG OF NAS ABANDONED WEST WELL

Well designation: W-W2
Surface elevation: 197.6 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 9	Sand	198 - 189
9 - 22	Clay	189 - 176
22 - 32	Muddy sand	176 - 166
32 - 35	Clay	166 - 163
35 - 74	Sandy clay	163 - 124
74 - 124	Coarse pack sand	124 - 74
124 - 120	Soft yellow muddy sand	74 - 70
120 - 158	Sandy clay	70 - 40
158 - 178	Coarse pack sand	40 - 20
178 - 199	Coarse to fine pack sand	20 - (-1)
199 - 221	Coarse pack sand	(-1) - (-23)
221 - 244	Pack sand, streak	(-23) - (-46)
244 - 245	Rock	(-46) - (-47)
245 - 260	Soft sand and clay	(-47) - (-62)
260 - 270	Pack sand	(-62) - (-52)
270 - 294	Hard fine sand	(-52) - (-96)
294 - 355	Hard and soft blue sandy shale	(-96) - (-157)

TABLE A-5. LITHOLOGIC LOG OF NAS WEST SUPPLY WELL

Well designation: W-W3
Surface elevation: 180 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 23	Red sandy clay	180 - 157
23 - 50	Fine sand and white clay	157 - 130
50 - 73	Sand and white clay balls	130 - 107
73 - 76	Sand and gravel	107 - 104
76 - 88	Fine sand	104 - 92
88 - 90	Fine sand and clay	92 - 90
90 - 105	Medium sand	90 - 75
105 - 113	Loose medium sand	75 - 67
113 - 132	Pink and yellow clay	67 - 48
132 - 150	Medium sand	48 - 30
150 - 153	Loose sand	30 - 27
153 - 156	Yellow clay	27 - 24
156 - 165	Loose sand	24 - 15
165 - 175	Medium sand	15 - 5
175 - 195	Sand and gravel	5 - (-15)
195 - 215	Loose sand and gravel	(-15) - (-35)
215 - 220	Yellow clay and iron rock	(-35) - (-40)

TABLE A-6. LITHOLOGIC LOG OF NAS SOUTH SUPPLY WELL

Well designation: W-S2
Surface elevation: 181.5 ft msl

Depth (ft)	Description	Elevation (ft msl)
0 - 27	Red sandy clay	181 - 154
27 - 66	Sand and clay balls	154 - 115
66 - 88	Sand	115 - 93
88 - 110	Pack sand	93 - 71
110 - 121	Sand and clay balls	71 - 60
121 - 133	Fine pack sand	60 - 48
133 - 146	Pack sand	48 - 35
146 - 148	Clay	35 - 33
148 - 155	Loose sand and gravel	33 - 26
155 - 173	Soft sandy clay	26 - 8
173 - 197	Pack sand and soft streaks	8 - (-16)
197 - 215	Pack sand	(-16) - (-34)
215 - 245	Yellow clay	(-34) - (-64)
245 - 251	Rock	(-64) - (-70)
251 - 255	Clay	(-70) - (-74)
255 - 273	Red sandy clay	(-74) - (-92)
273 - 340	Sandy shale	(-92) - (-159)

TABLE A-7. LITHOLOGIC LOG OF USGS DEEP MONITOR WELL.

Well designation: USGS
Surface elevation: 125.0 ft msl

Lithology	Thickness (feet)	Depth (feet)
Clay, white to brown, sticky; sand, white to clear quartz, medium.	20	20
Sand, clear to white quartz, medium; clay, brown to red.	20	40
Sand, clear to white, medium to coarse; gravel, white to yellow, very coarse to pea size; clay, brown.	20	60
Sand, clear to white, medium to coarse, subrounded to rounded; gravel, clear to white, very coarse; clay, light brown.	90	150
Clay, yellow to brown, sticky; gravel, very coarse to small pebbles; sand, medium, clear to white.	10	160
Sand, clear to white, medium to coarse, subrounded to angular; gravel--very coarse to pebble; clay, light brown.	50	210
Clay, green-gray to red, sticky; gravel, very coarse to pea size; sand, clear to white medium.	10	220
Sand, white to clear, medium to coarse; gravel, white to clear, very coarse to pebbles; clay, yellow brown to green, sticky.	30	250

TABLE A-7. (Continued)

Lithology	Thickness (feet)	Depth (feet)
Sand, clear to purple, medium to coarse, subrounded to subangular; clay, brown; gravel, clear to rose, very coarse to pea size.	40	290
Clay, gray brown to yellow brown; sand, clear to white, medium to coarse; gravel, clear to red, very coarse; black phosphorite grains.	40	330
Clay, dark green, sticky; sand, clear to white, subangular to subrounded; shell fragments; black phosphorite grains.	120	450
Sand, clear to white, medium; clay, dark green, soft; shell fragments; black phosphorite grains.	80	530
Clay, dark gray, soft, sticky; sand, white to clear, angular to subangular; shell fragments.	110	640
Limestone, gray, finely crystalline, porous; sand, clear to white, medium; clay, dark gray, soft, sticky; black phosphorite grains; pyrite; shell fragments.	30	670

TABLE A-7 (Continued)

Lithology	Thickness (feet)	Depth (feet)
Limestone, light gray, fine; sand, clear to white, medium; clay, gray to green, brittle, soft; black phosphorite grains; pyrite; shell fragments.	120	790
Sand, clear to white, medium; limestone, gray, fine; shell fragments; black phosphorite grains.	40	830
Clay, dark green, soft, sticky; sand, white to yellow, angular to subangular; limestone, gray, fine; shell fragments.	50	880
Clay, dark green, soft, very dense, waxy; sand, clear to white, medium.	100	980
Limestone, white, finely crystalline; sand, clear to white, medium; black phosphorite grains.	30	1010
Limestone, white, finely crystalline; pyrite; green glauconite; black phosphorite grains; shell fragments.	50	1060
Limestone, white to tan, limonite stains on limestone, finely crystalline; green glauconite; sand, clear quartz.	30	1090
Clay, light gray, soft, waxy; limestone, white to tan, finely crystalline.	20	1110

TABLE A-7 (Continued)

Lithology	Thickness (feet)	Depth (feet)
Limestone, white, finely crystalline; black phosphorite grains; pyrite; trace of clay.	20	1130
Limestone, white, finely crystalline; shell fragments; phosphorite; green glauconite; sand, clear qhartz, medium.	20	1150
Limestone, white to tan to gray; shell fragments; foraminifers; limonite clay, white; clay, gray, silty.	40	1190
Sand, clear quartz; medium, subangular; limestone, white to tan, crystalline.	40	1230
Limestone, white to tan, finely crystalline; shell fragments; sand, clear quartz, medium; limonite clay.	30	1260
Limestone, white to tan; sand, clear quartz, medium; shell fragments; clay, light gray, soft; black phosphorite, black.	20	1280
Clay, gray, soft; black phosphorite grains, abundant; sand, clear quartz, medium; limestone fragments.	10	1290

APPENDIX B

WATER-QUALITY ANALYSES

Pioneer Laboratories [illegible]
11 EAST OLIVE ROAD PHONE (904) 474-[illegible]
PENSACOLA, FLORIDA 32514

TABLE B-1. CHEMICAL ANALYSIS OF SOUTH WELL.

DRINKING WATER CHEMICAL ANALYSIS

System Name: RCA Base Support Services NAS Whiting Field
County: Santa Rosa Collector: ______
Address: Receiving Dept., Bldg. 2832, Milton, Florida 32570
System I.D. No. ______ DER District ______
Sample Site: South Well
Raw or Treated: Raw Temperature ______
Date and Time Collected: March 2, 1984
Field Chlorine, mg/1: ______ Field pH ______

Circle one: 40. Community public water system 41. Non-community public water system 42. Other public water system 43. Private water system

Circle one: 1. Compliance 2. Recheck 3. Other (indicate below parameters to be tested for items 2 or 3).

PRIMARY STANDARDS			SECONDARY STANDARDS			GENERAL	
PARAMETER	METHOD	RESULT**	PARAMETER	METHOD*	RESULT**	PARAMETER	RESULT**
Arsenic as As		<0.001	Chloride as Cl			Total Hardness as $CaCO_3$ (c)	
Barium as Ba		<0.1	Color*			Total Alkalinity as $CaCO_3$	
Cadmium as Cd		0.004	Copper as Cu			N.C.H. as $CaCO_3$ (c)	
Chromium as Cr		0.004	Corrosivity*			Bicarbonate as HCO_3	
Lead as Pb		<0.01	Foaming Agents			Calcium as Ca	
Mercury as Hg		<0.0001	H_2S			Magnesium as Mg	
Selenium as Se		<0.001	Iron as Fe			Carbon Dioxide as CO_2 (c)	
Silver as Ag		<0.001	Manganese as Mn			Bicarbonate as $CaCO_3$ (c)	
Nitrate as N		0.44	Odor*			Carbonate as $CaCO_3$ (c)	
Fluoride as F		0.12	pH*			Hydroxide as $CaCO_3$ (c)	
Turbidity, *NTU		0.10	Sulfate as SO_4			Sodium as Na	
			TDS				
Endrin			Zinc as Zn			pHs* (c)	
Lindane						Stability Index* 2pHs-pH (c)	
Methoxychlor						Saturation Index* pH-pHs (c)	
Toxaphene						INTERPRETATION: Stable	
2,4-D						Corrosive	
2,4,5-TP Silvex						Scale Forming	
Trihalomethanes							

DER reviewer ______
Action required ______

Note: [illegible] results in mg/liter except those so noted [illegible] Table [illegible] methods available on request.

(c) = Calculated value
**BDL = Below detection limit (see reverse side)

Date and Time Received: March 2, 1984
Laboratory I.D. No.: 81142
Date Reported: March 13, 1984
Remarks: ______
Analysts: [illegible]

RECEIVED
MAR 14 1984
F. G. HEALY

Approved by W. F. Bowers, Laboratory Director

TABLE B-2. CHEMICAL ANALYSES OF WATER FROM THE FLORIDAN AND SAND AND GRAVEL AQUIFERS.

	CONCENTRATIONS			
	SAND-AND-GRAVEL AQUIFER[1]	FLORIDAN AQUIFER UPPER LIMESTONE[2]	FLORIDAN AQUIFER LOWER LIMESTONE[3]	
	August 1976	July 1975	Jan. 1974	Sept. 1977
alkalinity as $CaCO_3$	2	576	323	303
*aluminum, dissolved	-	20	50	-
*arsenic, dissolved	0	0	0	-
bicarbonate HCO_3	2	613	370	368
*boron, dissolved	-	740	600	-
*cadmium, dissolved	4	-	-	-
calcium, dissolved	.08	2.2	5.0	4.1
carbon, organic total	-	3.0	2.0	-
carbonate	-	44	12	-
chemical oxygen demand	-	26	12	-
chloride, dissolved	2.7	86	330	400
*chromium, dissolved	10	0	0	-
*chromium, hexavalent	-	0	0	-
*cobalt, dissolved	-	1	1	-
color (platinum cobalt scale)	5	100	8	0
*copper, dissolved	-	-	1	-
dissolved solids, residue at 180°C	12	840	870	998
fluoride, dissolved	.0	3.8	3.0	2.2
hardness, as $CACO_3$	4	8	21	22
hardness, noncarbonate	2	0	0	0
*iron, dissolved	.00	170	100	20
*lead, dissolved	14	8	0	-
magnesium, dissolved	-	.7	2.0	2.7
*manganese, dissolved	-	0	17	-
*mercury, dissolved	.0	.0	0.0	-
nitrate, NO_3 as N	.50	.00	.00	.01
nitrite, NO_2 as N	.00	.00	.01	-
nitrogen, NH_3 as N	-	1.0	.74	.74
nitrogen, total organic as N	-	.60	.30	.08
nitrogen, total as N	-	1.6	1.0	-
pH	5.1	8.8	8.7	8.4
phosphorus, total ortho as P	.00	.00	.03	.03
phosphorus, total as P	.01	.08	.03	.03
potassium, dissolved	.4	5.6	9.7	11
silica, dissolved	6.4	14	34	34
sodium, dissolved	2.3	330	320	380
specific conductivity (umhos at 25°C)	20	1,190	1,560	1,890
*strontium, dissolved	-	60	0	350
turbidity (NTU)	1	6	8	16
water temperature (°C)	23.5	24.0	30.0	27.5
*zinc, dissolved	-	3	10.0	-

1 Sample from Milton municipal well No. 4
2 Sample from USGS shallow monitor well 15 miles south of Whiting Field
3 Sample from USGS monitor well at Whiting Field.
* Concentrations in ug/l; other concentrations in mg/l

From NWFWMD, 1980

TABLE B-3. Chemical Analysis of Whiting Field Water Supply.

Pioneer
LABORATORY, INC.

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

To: RCA Base Support Services, NAS Whiting Dield, Receiving Dept. Bldg. 283
Milton, Florida 32570, Date of Order: 2/3/84, Lab I.D. # 204.

DRINKING WATER PRIORITY POLLUTANT ANALYSIS

Purgeables:

Acrolein	< 10
Acrylonitrile	< 10
Benzene	< 1
Bromodichloromethane	< 1
Bromoform	< 1
Bromomethane	< 1
Carbon-tetrachloride	< 1
Chlorobenzene	< 1
Chloroethane	< 1
2-Chloroethylvinyl ether	< 1
Chloroform	< 1
Chloromethane	< 1
Dibromochloromethane	< 1
Dichlorodifluoromethane	< 1
1,1-Dichloroethane	< 1
1,2-Dichloroethane	< 1
1,1-Dichloroethene	< 1
1,2-Dichloroethene	< 1
1,2-Dichloropropane	< 1
cis-1,3-Dichloropropene	< 1
trans-1,3-Dichloropropene	< 1
Ethylbenzene	< 1
Methylene Chloride	< 1
Tetrachloroethane	< 1
1,1,1-Trichloroethane	< 1
1,1,2-Trichloroethane	< 1
Trichloroethene	< 1
Trichlorofluoromethane	< 1
Toluene	< 1
Vinyl Chloride	< 1
Xylene	< 1
Styrene	< 1
Dichlorobenzene	< 1
1,2-Dibromoethane(EDB)	< 0.05
N-hexane	< 1
1,2-Dichlorcpropene	< 1
1,2-Dibromo-3-Chloropropane	< 1

NOTE: All results reported in parts per billion.
< = less than
Florida Certification #81142

NOTE: Sample taken from combined stream from all three supply wells.

RECEIVE
MAR 14 1984
F. G. HEAL

W. F. Bowers
Approved by W. F. Bowers
Laboratory Director

TABLE B-3 (Continued)

Pioneer
LABORATORY, INC.

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

To: RCA Base Support Services, NAS Whiting Field, Receiving Dept. Bldg. 2832, Milton, Florida 32570, Date of Order: 2/3/84, Lab I.D. # 204.

DRINKING WATER PRIORITY POLLUTANT ANALYSIS

Pesticides:

Aldrin	<0.05
a-BHC	<0.05
b-BHC	<0.05
g-BHC	<0.05
d-BHC	<0.05
Chlordane	<0.05
4,4'-DDD	<0.05
4,4'-DDE	<0.05
4,4'-DDT	<0.05
Dieldrin	<0.05
Endosulfan I	<0.05
Endosulfan II	<0.05
Endosulfan Sulfate	<0.05
Ethion	<0.05
Trithion	<0.05
o,p-DDT, DDE and DDD	<0.05
Tedion	<0.05
Endrin Aldehyde	<0.05
Heptachlor	<0.05
Heptachlor Epoxide	<0.05
Toxaphene	<0.3
PCB-1016	<0.2
PCB-1221	<0.2
PCB-1232	<0.2
PCB-1242	<0.2
PCB-1248	<0.2
PCB-1254	<0.2
PCB-1260	<0.2
Aldicarb (non extractable)	<25
Diazinon	<1
Malathion	<1
Parathion	<1
Guthion	<1
Kelthane(Dicofal)	<1

NOTE: All results are reported in parts per billion.
< = less than
Florida Certification #81142

W. F. Bowers

Approved by W. F. Bowers
Laboratory Director

RECEIVED
MAR 14 1984
F. G. HEALY

TABLE B-3 (Continued)

Pioneer LABORATORY, INC.

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

To: RCA Base Support Services, NAS Whiting Field, Receiving Dept. Bldg. 2832, Milton Florida. 32570, Date of Order: 2/3/84, Lab I.D. #204.

DRINKING WATER PRIORITY POLLUTANT ANALYSIS

Base Neutral Extractables:

Acenaphthene	<5
Acenaphthylene	<5
Anthracene	<5
Benzo(a)anthracene	<5
Benzo(b)fluoranthene	<5
Benzo(k)fluoranthene	<5
Benzo(a)pyrene	<5
Diethylphthalate	<5
Dimethylphthalate	<5
2,4-Dinitrotoluene	<5
2,6-Dinitrotoluene	<5
Dioctylphthalate	<5
1,2-Diphylhydrazine	<5
Fluoranthene	<5
Benzo(g,h,i)perylene	<5
Benzidine	<5
Bis(2-chloroethyl)ether	<5
Bis(2-chloroethoxy)methane	<5
Bis(2-ethylhexyl)phthalate	<5
Bis(2-chloroisopropyl)ether	<5
4-Bromophenyl phenyl ether	<5
Butyl benzyl phthalate	<5
2-Chloronaphthalene	<5
4-Chlorophenyl phenyl ether	<5
Chrysene	<5
Dibenzo(a,h)anthracene	<5
Di-n-butylphthalate	<5
1,3-Dichlorobenzene	<5
1,4-Dichlorobenzene	<5
1,2-Dichlorobenzene	<5
3,3'-Dichlorobenzidine	<5
Fluorene	<5
Hexachlorobenzene	<5
Haxachlorobutadiene	<5
Hexachloroethane	<5
Hexachlorocyclopentadiene	<5
Indeno(1,2,3-cd)pyrene	<5
Isophorone	<5
Naphthalene	<5
Nitrobenzene	<5
N-Nitrosodimethylamine	<5
N-Nitrosodi-n-propylamine	<5
N-Nitrosodiphenylamine	<5
Phenanthrene	<5
Pyrene	<5
2,3,7,8-Tetrachlorodibenzo-p-dioxin(Dioxin)	<5
1,2,4-Trichlorobenzene	<5

Approved by W. F. Bowers
Laboratory Director

RECEIVED
MAR 14 1984
F. G. HEALY

NOTE: Results are reported in parts per billion. < = less than
Florida Certification #81142.

Pioneer LABORATORY, INC.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA FLORIDA 32514

To: RCA Base Support Services, NAS Whiting Field, Receiving Dept. Bldg. 283
Milton, Florida 32570, Date of Order: 2/3/84, Lab I.D. # 204.

DRINKING WATER PRIORITY POLLUTANT ANALYSIS

Acid Extractables:

2-Chlorophenol	<5
2,4-Dichlorophenol	<5
2,4-Dimethylphenol	<5
2,4-Dinitrophenol	<5
2-Methyl-4,6-Dinitrophenol	<5
2-Nitrophenol	<5
4-Nitrophenol	<5
Pentachlorophenol	<5
Phenol	<5
2,4,6-Trichlorophenol	<5

NOTE: All results reported in parts per billion.
< = less than
Florida Certification #81142

W. F. Bowers

Approved by W. F. Bowers
Laboratory Director

RECEIV
MAR 14
F. G. HEA

TABLE B-4. Surface Water Chemical Analyses

RANGE OF CHEMICAL ANALYSIS FOR BLACKWATER RIVER, BIG COLDWATER CREEK, AND POND CREEK.

SITE	Range	Discharge (ft^3/s)	Specific conductance (umho/cm at 25°C)	pH (units)	Color (Platinum-Cobalt units)	Temperature (°C)	Iron (Fe) in ug/L	Alkalinity as $CaCO_3$, in mg/L	Bicarbonate (HCO_3), in mg/L	Calcium (Ca), in mg/L	Chloride (Cl), in mg/L	Fluoride (F), in mg/L	Hardness, noncarbonate, in mg/L	Hardness, total (Ca, Mg), in mg/L	Magnesium (Mg), in mg/L	Nitrate as (NO_3), in mg/L	Phosphate (PO_4), in mg/L	Potassium (K), in mg/L	Dissolved solids (sum), in mg/L	Silica (SiO_2), in mg/L	Sodium (Na), in mg/L	Sulfate (SO_4), in mg/L	Dissolved Oxygen (DO), in mg/L
Big Coldwater Creek near Milton, FL (1/59-7/75)	HIGH	2465	150	7.5	60	27.8	220	28	34	5.6	8.0	0.4	6.0	18	1.5	1.9	.05	0.7	28	34.0	21.0	2.4	9.2
	LOW	298	15	5.3	2	13.3	0	0	0	0.5	1.0	0	0	2	0.1	0	0	0	11	1.9	0.4	0	6.2
Pond Creek near Milton, FL (1/58-8/74)	HIGH	60	22	6.2	45	23.5	60	3	4	1.8	3.8	0.1	2	6	0.9	.09	.04	0.4	18	8.4	2.5	1.2	8.9
	LOW	32	15	5.2	0	11.7	10	2	2	0.4	1.8	0	0	2	0.1	.0	.01	0	10	3.7	1.6	0	6.9
Blackwater River near Baker, FL (1977 water year)	HIGH	1270	25	5.7	50	24	370	0	0	1.1	3.9	0.1	5	5	0.6	0	0	0.7	17	6.3	3.5	9.3	0
	LOW	119	21	4.6	40	20	120	0	0	1.0	2.8	0	4	4	0.4	0	0	0.3	16	5.8	1.9	0.3	0

From: NWFWMD, 1980.

Table B-5. Results of the Analyses for EPA's Organic Priority Pollutants From the North Supply Well, W-N4.

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] Whiting North Well 8401255
(2v) acrolein		
(3v) acrylonitrile		
(4v) benzene		
(6v) carbon tetrachloride		
(7v) chlorobenzene		
(10v) 1,2-dichloroethane		
(11v) 1,1,1,-trichloroethane		
(13v) 1,1-dichloroethane		
(14v) 1,1,2-trichloroethane		
(15v) 1,1,2,2-tetrachloroethane		
(16v) chloroethane		
(19v) 2-chloroethylvinyl ether		
(23v) chloroform		
(29v) 1,1-dichloroethylene		
(30v) trans-1,2-dichloroethylene		
(32v) 1,2-dichloropropane		
(33v) trans-1,3-dichloropropene		
cis-1,3-dichloropropene		
(38v) ethylbenzene		
(44v) methylene chloride		
(45v) chloromethane		
(46v) bromomethane		
(47v) bromoform		
(48v) bromodichloromethane		
(49v) fluorotrichloromethane		
(50v) dichlorodifluoromethane		
(51v) chlorodibromomethane		
(85v) tetrachloroethylene		
(86v) toluene		
(87v) trichloroethylene		
(88v) vinyl chloride		
Detection Limit		1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the detection limit are listed as trace levels (TR). Acrolein and acrylonitrile are 100 and 10 timex the detection limit respectively.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3A (cont'd.). Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller Report No.: 84-297

Compound		Concentration - ug/l (ppb)[2]
	Sample ID:	Whiting North Well
	CAA ID:	8401255
ACID COMPOUNDS		
(21A) 2,4,6-trichlorophenol		
(22A) p-chloro-m-cresol		
(24A) 2-chlorophenol		
(31A) 2,4-dichlorophenol		
(34A) 2,4-dimethylphenol		
(57A) 2-nitrophenol		
(58A) 4-nitrophenol		
(59A) 2,4-dinitrophenol		
(60A) 4,6-dinitro-2-methylphenol		
(64A) pentachlorophenol		
(65A) phenol		
Detection Limit		2
BASE/NEUTRAL COMPOUNDS		
(1B) acenaphthene		
(5B) benzidine		
(8B) 1,2,4-trichlorobenzene		
(9B) hexachlorobenzene		
(12B) hexachloroethane		
(18B) bis (2-chloroethyl) ether		
(20B) 2-chloronaphthalene		
(25B) 1,2-dichlorobenzene		
(26B) 1,3-dichlorobenzene		
(27B) 1,4-dichlorobenzene		
(28B) 3,3'-dichlorobenzidine		
(35B) 2,4-dinitrotoluene		
(36B) 2,6-dinitrotoluene		
(37B) 1,2-diphenylhydrazine		
(39B) fluoranthene		
(40B) 4-chlorophenyl phenyl ether		
(41B) 4-bromophenyl phenyl ether		

Table B-5 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3B (cont'd). Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller | Report No.: 84-297

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] Whiting North Well 8401255
BASE NEUTRAL COMPOUNDS (cont'd)		
(42B) bis (2-chloroisopropyl) ether		
(43B) bis (2-chloroethoxy) methane		
(52B) hexachlorobutadiene		
(53B) hexachlorocyclopentadiene		
(54B) isophorone		
(55B) naphthalene		
(56B) nitrobenzene		
(62B) N-nitrosodiphenylamine		
(63B) N-nitrosodipropylamine		
(66B) bis (2-ethylhexyl) phthalate		
(67B) benzyl butyl phthalate		
(68B) di-n-butyl phthalate		
(69B) di-n-octyl phthalate		
(70B) diethyl phthalate		
(71B) dimethyl phthalate		
(72B) benzo(a)anthracene		
(73B) benzo(a)pyrene		
(74B) benzo(b)fluoroanthene		
(75B) benzo(k)fluoroanthene		
(76B) chrysene		
(77B) acenaphthylene		
(78B) anthracene		
(79B) benzo(ghi)perylene		
(80B) fluorene		
(81B) phenanthrene		
(82B) dibenzo(a,h)anthracene		
(83B) ideno(1,2,3-cd)pyrene		
(84B) pyrene		
Detection Limit		2

[1] U.S. EPA, 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

Table B-5 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 4 (cont'd.). Concentration of Pesticides and PCBs (Method 608[1])

Client: Geraghty and Miller — Report No.: 84-297

Compound		Concentration - ug/l (ppb)[2]
	Sample ID:	Whiting North Well
	CAA ID:	8401255
PESTICIDES AND PCBs		
(89P) aldrin		
(90P) dieldrin		
(91P) chlordane		
(92P) 4,4'-DDT		
(93P) 4,4'-DDE		
(94P) 4,4'-DDD		
(95P) endosulfan-alpha		
(96P) endosulfan-beta		
(97P) endosulfan sulfate		
(98P) endrin		
(99P) endrin aldehyde		
(100P) heptachlor		
(101P) heptachlor epoxide		
(102P) BHC-alpha		
(103P) BHC-beta		
(104P) BHC-delta		
(105P) BHC-gamma (lindane)		
(106P) PCB - 1242		
(107P) PCB - 1254		
(108P) PCB - 1221		
(109P) PCB - 1232		
(110P) PCB - 1248		
(111P) PCB - 1260		
(112P) PCB - 1016		
(113P) toxaphene		
Detection Limit		.01

[1] U.S. EPA, 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times detection limit are listed as trace levels (TR).

APPENDIX C

PROPOSED GROUND-WATER SAMPLING AND
ANALYSIS PLAN FOR U.S. NAVAL AIR STATION,
WHITING FIELD

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Chapter 17-4.6(d) of the Florida Administrative Code requires owners and operators of facilities that discharge into the ground water to obtain and analyze samples from a ground-water monitoring system. The requirement includes the development and implementation of a ground-water sampling and analysis plan which must include procedures and techniques for sample collection.

To comply with these requirements at the U.S. Naval Air Station, Whiting Field, Florida, the following "Sampling and Analysis Plan" has been prepared.

2.0 SAMPLE COLLECTION AND SHIPMENT

2.1 Frequency of Sample Collection

Table 2.1 presents the water-quality parameters which should be monitored at the NAS Whiting Field on a quarterly basis during the first year of monitoring and semi-annually in succeeding years. Maps showing locations of the proposed monitor wells are presented in Figures C-1, C-2, C-3, C-4, and C-5.

2.2 Equipment

Sampling equipment needed for collecting representative samples of ground water are presented below.

(1) 200-ft fiberglass or plastic measuring tape with weighted bottom (or) water-level indicator ("m-scope") consisting of an ammeter, electrode, and 200-ft cable;
(2) Several gallons of distilled water and wash bottle;
(3) Clean rags;
(4) Plastic sheeting or large size garbage bags;
(5) Bottom filling PVC bailer and 120-ft nautical rope, peristaltic pump, or submersible pump;
(6) Graduated bucket;
(7) Sample bottles;
(8) Sample bottle labels, waterproof marking pen;
(9) pH meter
(10) Thermometer;
(11) Specific conductivity meter;
(12) Preservatives for water samples;
(13) Field data and chain-of-custody forms, clipboard, pen; and
(14) Optional: ice chest and ice or freezer packs.

Table 2.1. Ground-Water Quality Parameters and Frequency of Sample Collection

Constituent	Sites: Background (North well)	Landfills	Battery Shop	Solvents Storage
Arsenic	1	1,2,3,4	1	1
Barium	1	1,2,3,4	1	1
Cadmium	1	1,2,3,4	1,2,3,4	1,2,3,4
Chromium (Hexavalent)	1	1,2,3,4	1,2,3,4	1,2,3,4
Fluoride	1	1	1	1
Lead	1	1,2,3,4	1,2,3,4	1,2,3,4
Mercury	1	1	1	1
Nitrate (as N)	1	1	1	1
Selenium	1	1	1	1
Silver	1	1	1	1
Endrin	1	1	1	1
Lindane	1	1	1	1
Methoxychlor	1	1	1	1
Toxaphene	1	1	1	1
2,4-D	1	1	1	1
2,4,5-TP Silvex	1	1	1	1
Turbidity	1	1	1	1
Chloride	1	1	1	1
Copper	1	1	1	1
Foaming Agents	1	1	1	1
Hydrogen Sulfide	1	1	1	1
Iron	1	1	1	1
Manganese	1	1	1	1
Sulfate	1	1	1	1
TDS	1	1	1	1
Zinc	1	1,2,3,4	1,2,3,4	1
Color	1	1	1	1
Odor	1	1	1	1
pH (field)	1	1,2,3,4	1,2,3,4	1,2,3,4
Specific Conductance (field)	1	1,2,3,4	1,2,3,4	1,2,3,4
VOC (volatile organics-Method 601)		1,2,3,4	1	1,2,3,4

Note: Numbers refer to quarterly sampling periods during the first monitoring year.

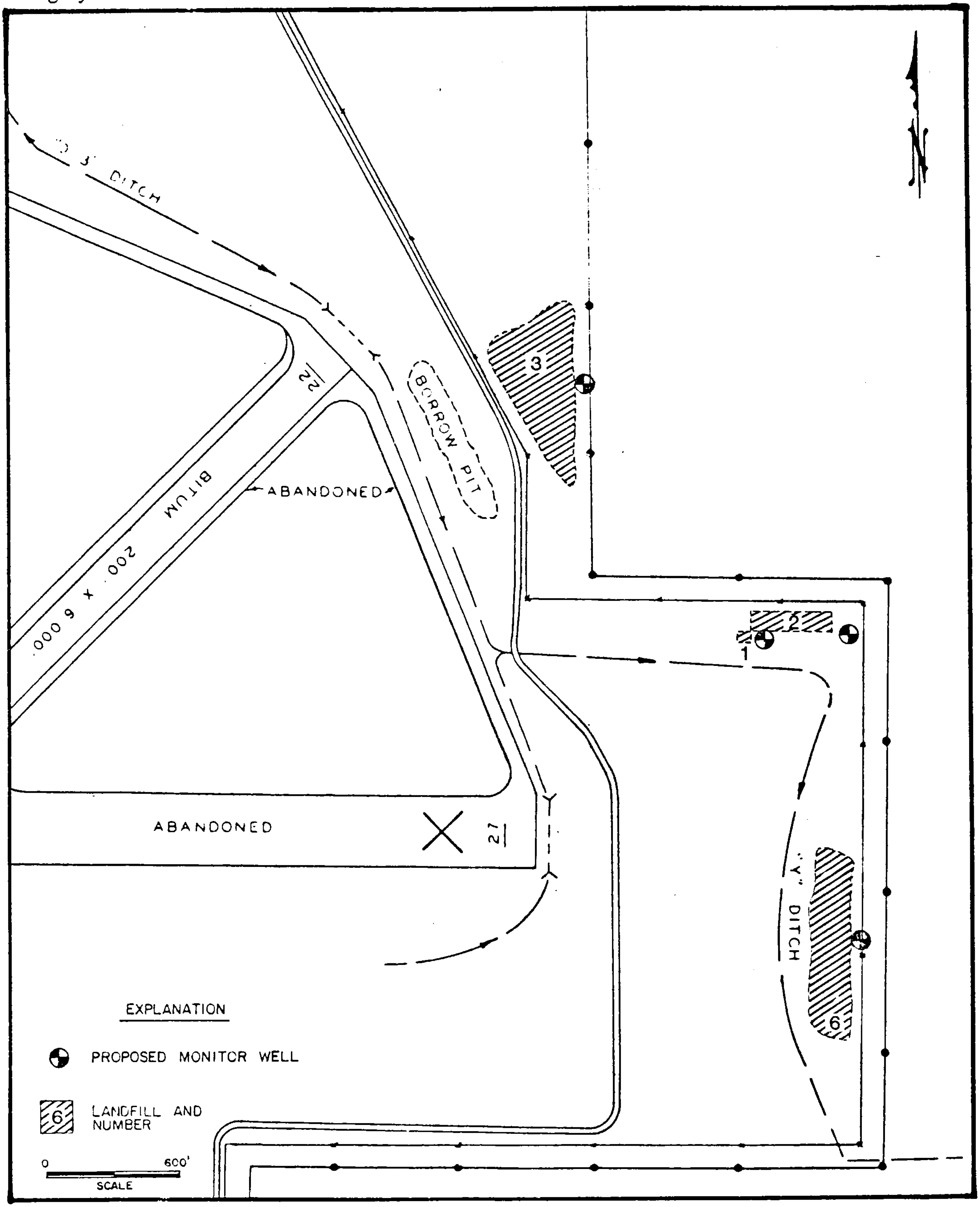


Figure C-1. Proposed Locations of Monitor Wells for Landfill Sites #1, #2, #3, and #6.

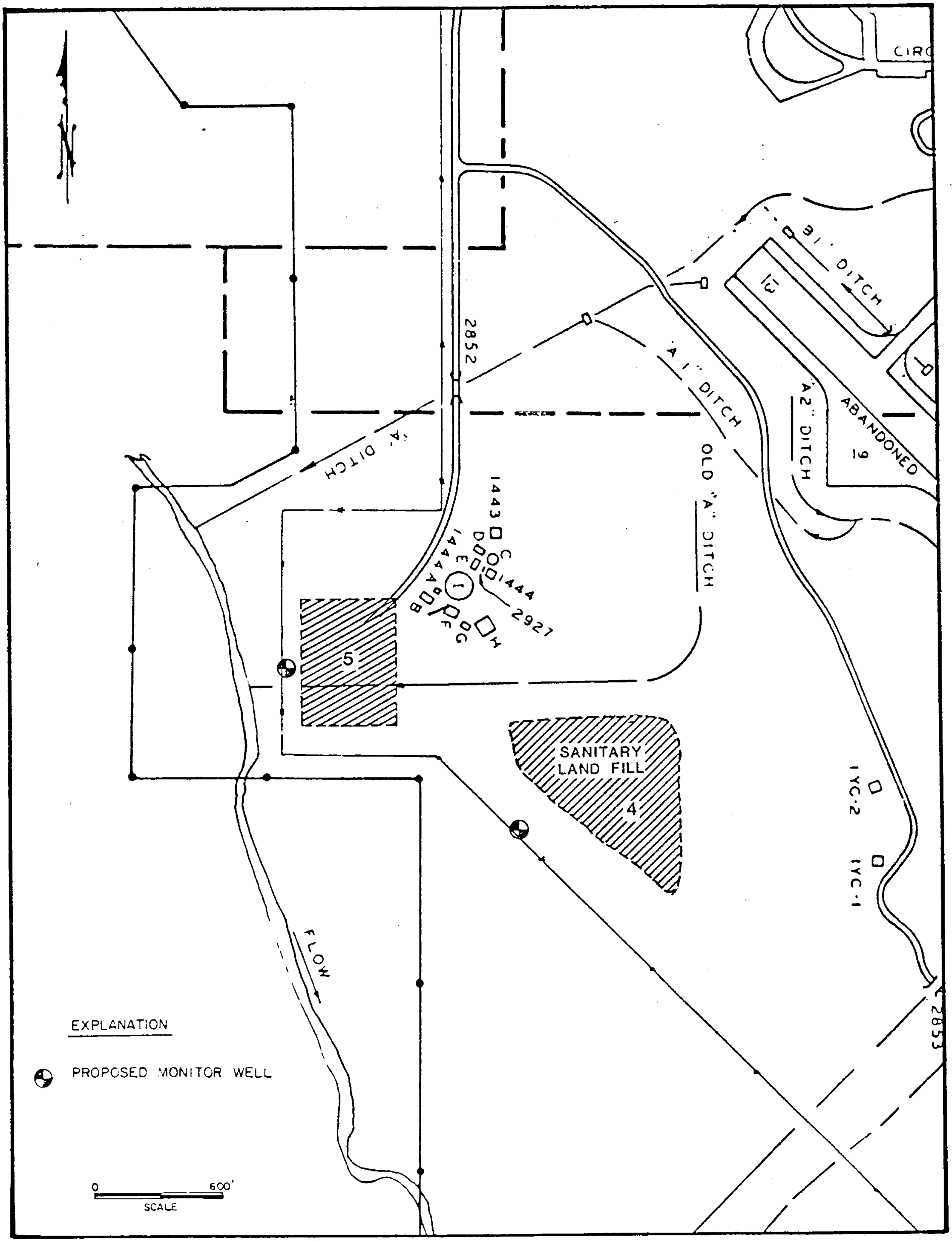


Figure C-2. Proposed Location of Monitor Wells for Landfill Sites #4 and #5.

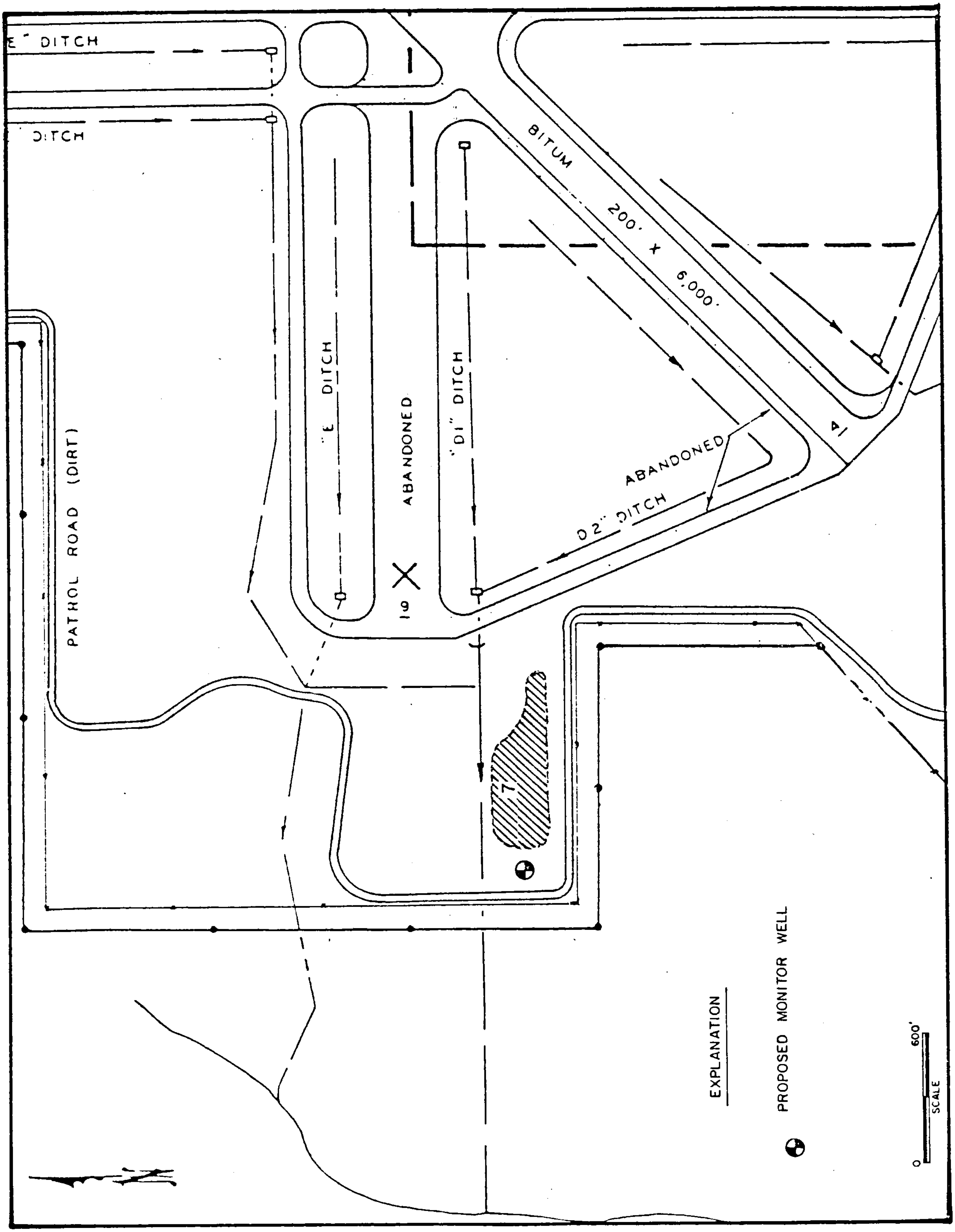


Figure C-3. Proposed Location of Monitor Well for Landfill #7.

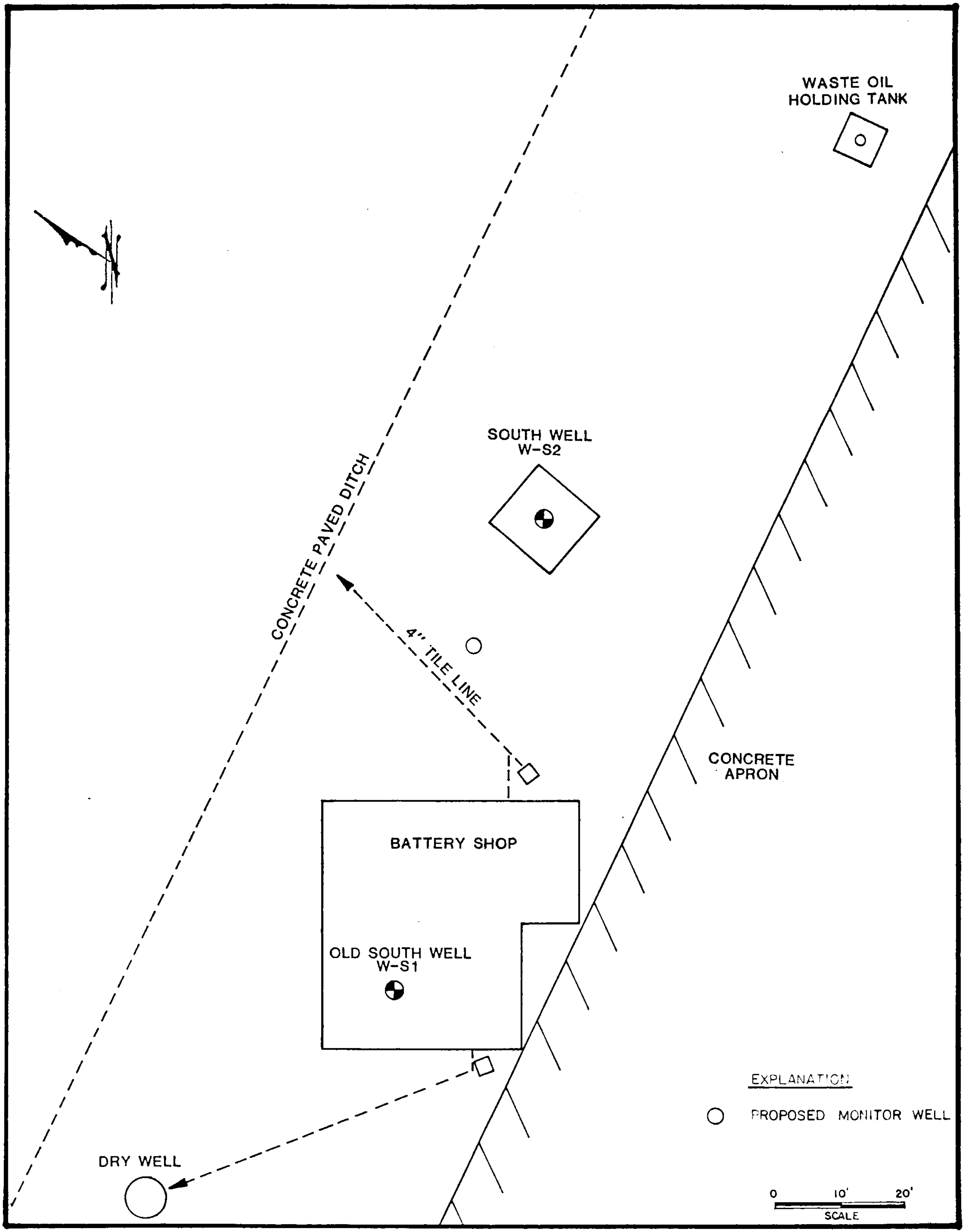


Figure C-4. Proposed Location of Monitor Well for Battery Shop Site.

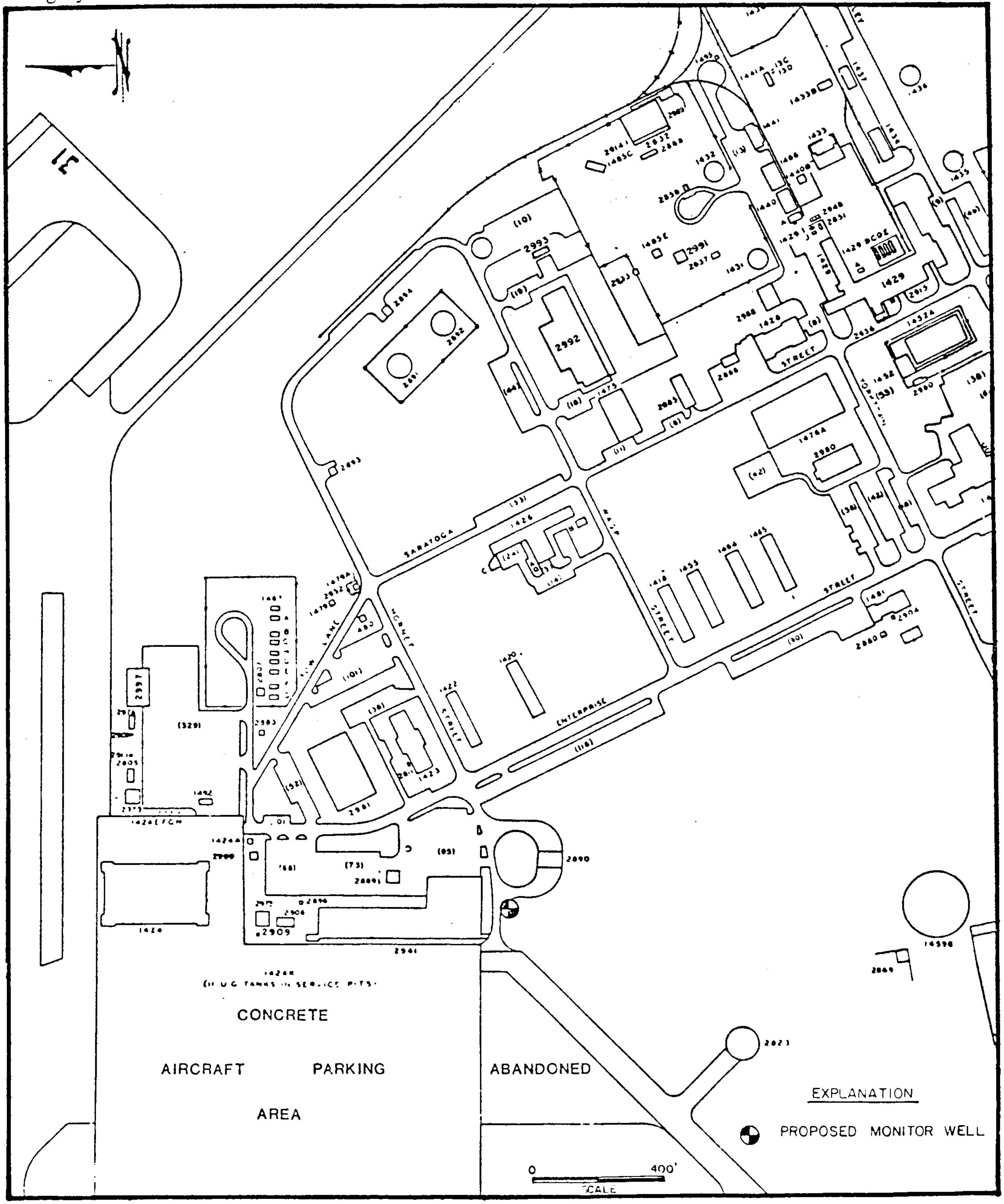


Figure C-5. Location of Proposed Monitor Well for Solvents Storage Site.

2.3 Sample Collection Method

2.3.1 Procedures for Measuring Water Levels

(a) Place plastic sheeting around well to protect sampling equipment for potential contamination.

(b) After unscrewing casing cap or access plug, measure the depth to water in the well. All measurements are made from top of PVC casing.

- Using the M-scope, drop the probe down the center of the casing and allow cord to go untangled down the well. When ammeter indicates a closed electrical circuit, determine depth to water from top of PVC casing. Record depth to water on field data form (Figure C-6). Subtract this value from elevation at top of PVC casing to find elevation of water level (see Figures C-7 and C-8 for elevation of top of casing),

  (or)

- Using a fiberglass or plastic 200-ft tape with sandpaper backing on first five feet, drop weighted tape down center of casing. After water is encountered in well, record measurement of tape at top of casing, wind up tape and record the measurement where tape is wet. Subtract the "wet" measurement from the "held" measurement to determine the depth to water. Subtract this value from the elevation at top of PVC casing to find elevation of water level.

- The water-level measurements must be obtained at each sampling point every time water samples are collected.

(c) Clean M-scope or tape bottom with distilled water and wipe dry with clean rag.

Figure C-6. Ground-Water Sampling Data Form

Spring/Well Number: ____________

Sampled by: ____________

Date: ____________

Time: ____________ to ____________

Weather: ____________

GROUND-WATER ELEVATION

A. (1) Length of Tape Held at Top of Outer Casing: ____________ (or) m-scope reading: ____________

(2) Length of Tape Wet: ____________

(3) Depth to Water (1 minus 2): ____________

Water Level Elevation - Subtract Depth to Water from Elevation of Outer Casing: ____________

Depth to Well Bottom: ____________

Height of Water Column (h) = ____________

WATER SAMPLING DATA

Volume of water in well:

$\pi r^2 h$ ____________

____

Amount of water removed from well: ____________

Method of water removal: ____________

Was well pumped dry? ____________

FIELD ANALYSES AND REMARKS

Temperature: ____________

Specific Conductance: ____________

pH: ____________

Physical Appearance: ____________

Number & Type of Samples Collected: ____________

____

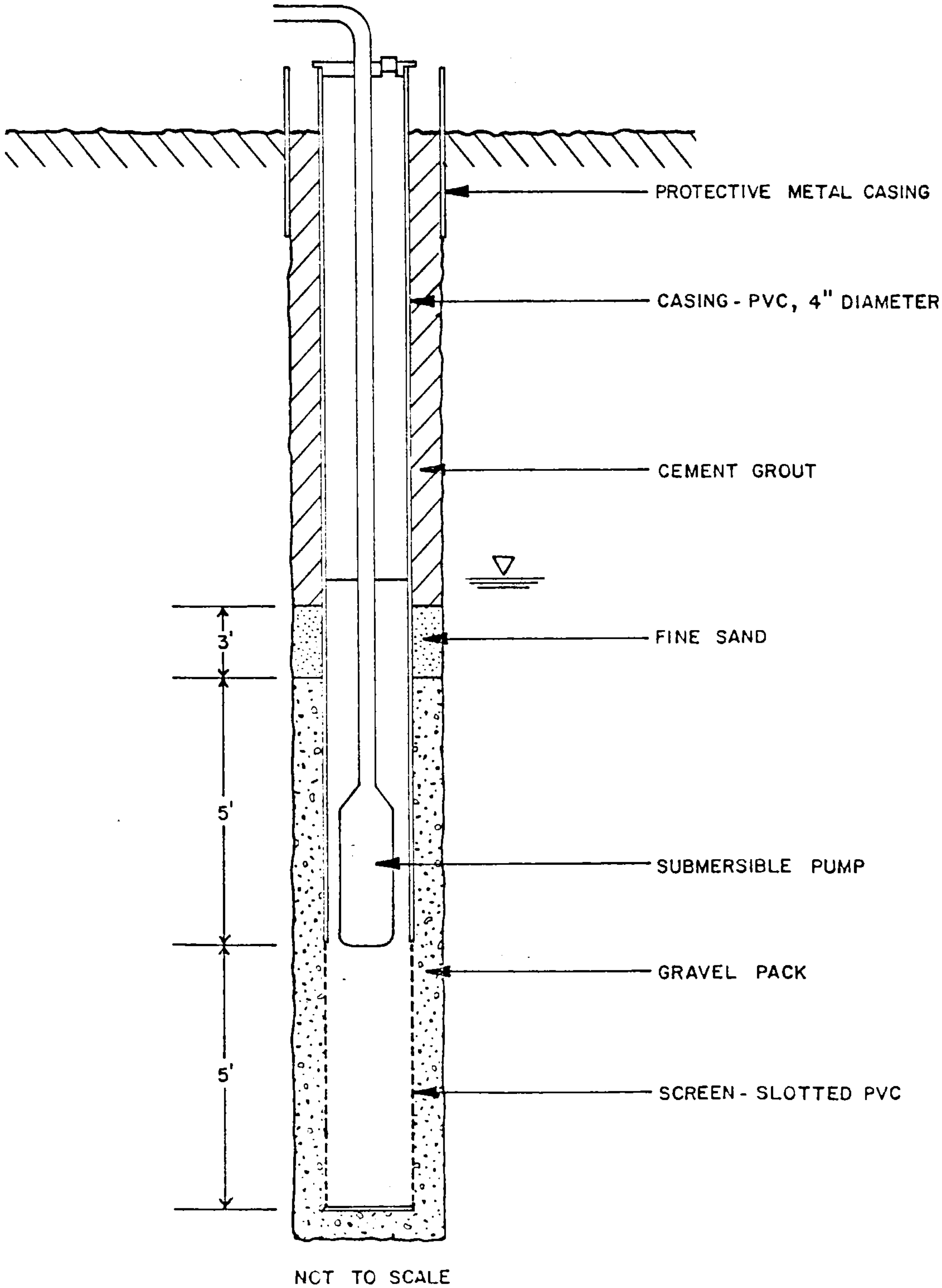


Figure C-7. Schematic Diagram Showing Construction of Deep Monitor Well.

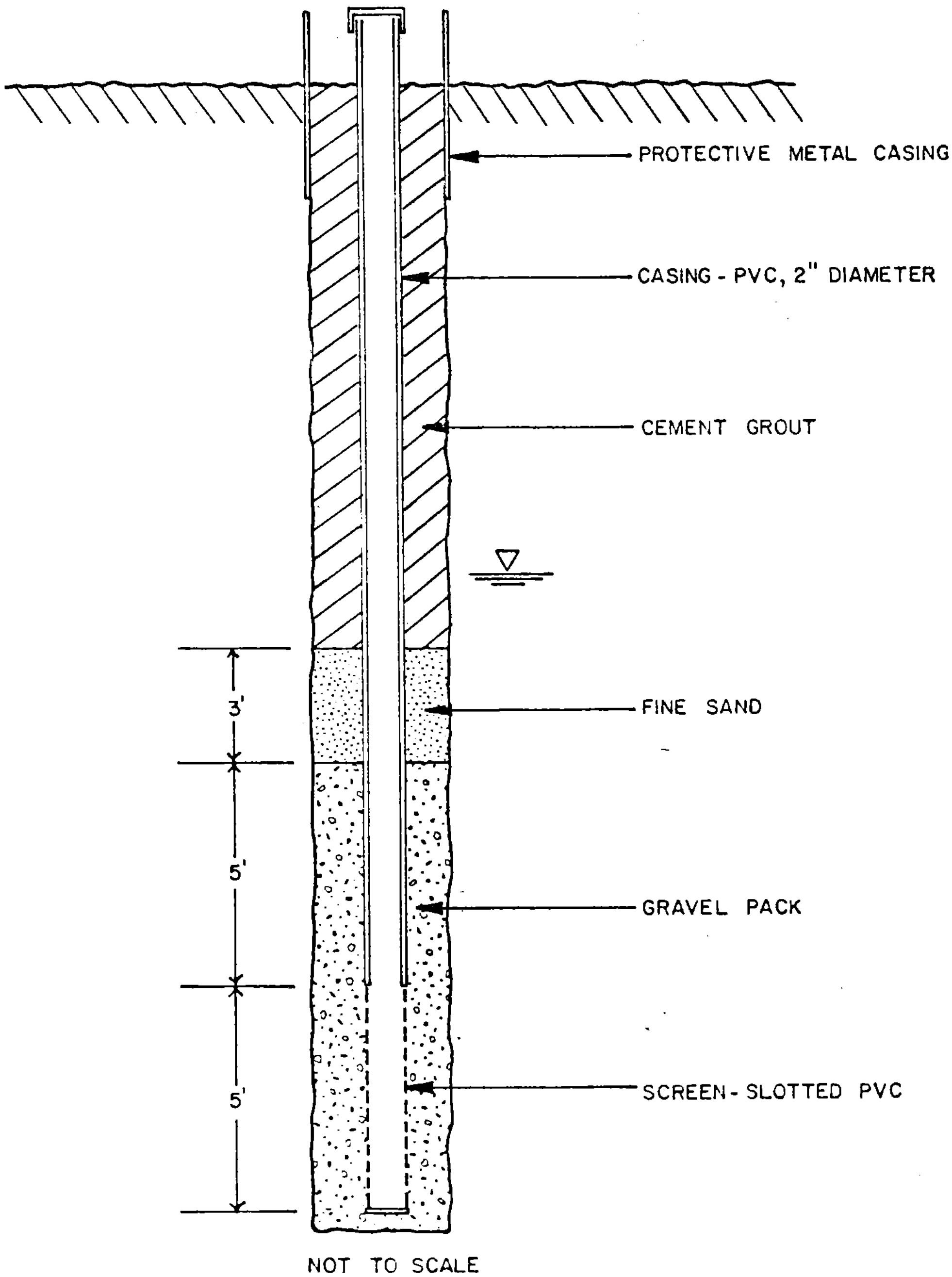


Figure C-8. Schematic Diagram Showing Construction of Shallow Monitor Well.

2.3.2 Procedures for Removing Standing Water in Wells

(a) Remove at least one well volume of standing water using either the peristaltic pump, submersible pump, or a hand bailer.

- To find the volume of standing water in the well, use the following calculation:

$$V = 3.14\ r^2h$$

where V = volume (ft^3)

r = radius of monitor well casing (ft)

h = height of standing water in well (ft)

- The height of standing water in the well is found by subtracting the depth to water measurement from the total depth of the well (refer to Figure C-7 for depth of monitor wells).

- It is generally recommended to remove three to five well volumes of water from the well to insure an accurate sample of ground-water quality but this may not be possible if the wells are low yielding. At the least, the well should be pumped or bailed to dryness before sampling. Use graduated bucket to measure volume of water removed from the well.

- The "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities", pp 220 to 270, should be consulted for further information concerning the amount of water to evacuate from the well, types of pumps or bailers to use in sampling ground water, and procedures to follow for using pumps or bailers. Another reference source is the U.S. Geological Survey (USGS) publication, "Guidelines for

Collection and Field Analysis of Ground-Water Samples for Selected Unstable Constituents" pp 3 to 9.

(b) Clean bailer or pump with distilled water before use in other wells to prevent possible cross contamination of ground water in the monitor wells.

2.3.3 Procedures for Sample Collection and Field Analyses

(a) Allow well to recharge sufficiently to obtain samples. In some wells, this may require waiting a few minutes to a few hours.

(b) Analyses of pH, temperature, and specific conductance should be made in the field at the time of sampling because these parameters change rapidly and a laboratory analysis might not be representative of the true ground-water quality. Remove enough water from well to determine temperature of water, specific conductivity, and pH. Record values on field data sheet and discard water in a manner so as to avoid potential contamination.

(c) Rinse sample bottle with sampled ground water except when bottle is fixed with a preservative.

(d) Transfer water from well sampling device to sample bottles provided by the laboratory. Care should be taken not to agitate sample in order to limit amount of added oxygen to water sample. Minimize the number of containers used in order to limit the addition of outside contaminants. Sample bottles should be prepared as specified by the 1974 and 1979 EPA "Manual of Methods for Chemical Analysis of Water and Wastes" (EPA 625/6-74-003 and EPA 600/4-79-020).

(e) If there is insufficient water in the well to supply the necessary volumes for samples specified above, the sample collector should fill up as many bottles as possible, preserve and label as required, and continue sampling daily until the remaining bottles are filled.

3.0 ANALYTICAL PROCEDURES

Analysis of water samples collected from monitor wells will be performed by an approved laboratory.

Bibliography

Johnson, Thomas M., and Keras Cartwright, 1980, Monitoring of Leachate Migration in the Unsaturated Zone in the Vicinity of Sanitary Landfills, Illinois State Geological Survey Circular 514, 82 p.

Moser, J.H., and K.R. Huibregtse, 1976, Handbook for Sampling and Sample Preservation of Water and Wastewater, EPA-600/4-76-049, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, 257 p.

Scalf, Marion R., James F. McNabb, William J. Dunlap, Roger L. Cosby, and John S. Fryberger, 1981, Manual of Ground-Water Sampling Procedures, NWWA/EPA Series, National Water Well Association, Worthington, Ohio, 93 p.

Taras, Michael J., Arnold E. Greenberg, R.D. Hoak, and M.C. Rand, 1971, Standard Methods for the Examination of Water and Wastewater, American Public Health Association, Washington, D.C., 874 p.

Todd, David K., et al., 1976, Monitoring Groundwater Quality: Monitoring Methodology, EPA 600/4-76-026, U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 172 p.

U.S. Environmental Protection Agency, 1979, Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Environmental Monitoring and Support Laboratory, Office of Research and Development, Cincinnati, Ohio 460 p.

U.S. Environmental Protection Agency, 1980, Federal Register, Volume 45, No. 98, Monday, May 19, 1980, 33154 Part VII, Subpart F, 265.90-265.94, "Ground-Water Monitoring."

U.S. Environmental Protection Agency, 1980, Standard Operating Procedures and Quality Assurance Manual, EPA Region IV, Surveillance and Analysis Division, Athens, Georgia.

Wood, Warren W., 1976, Guidelines for Collection and Field Analysis of Ground-Water Samples for Selected Unstable Constituents, U.S. Department of the Interior, U.S. Geological Survey, 24 p.