US Army Corps
of Engineer

FINAL WORK PLAN FOR

- PHASE I SITE INVESTIGATION of the AIRPORT HYDRANT SYSTEM (BUILDING 728) and
- CONFIRMATION SAMPLING and QUARTERLY MONITORING at TWO UST SITES (BUILDINGS 710 and 133)

at

HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA

Contract No. DACA21-93-D-0049
Delivery Order No. 11

January 1995

Submitted to:

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH, GEORGIA

Prepared by:
METCALF & EDDY, INC.
ATLANTA, GEORGIA

DOCUMENT 2

WORK PLAN
SITE INVESTIGATION OF THE AIRPORT HYDRANT SYSTEM
(VICINITY OF BUILDING 728)
AND
COMPLETION OF CONFIRMATORY SAMPLING AND
QUARTERLY MONITORING AT
TWO UST SITES (BUILDINGS 710 AND 133)

HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA

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LIST OF ACRONYMS

AA	Atomic absorption
ACE	Anderson Columbia Environmental, Inc.
ARAR	Applicable or Relevant and Appropriate Requirements
ASCS	Agricultural Stabilization and Conservation Service
ASTM	American Society of Testing and Materials
AT&E	Atlanta Testing & Engineering
bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CADD	Computer-aided drafting design
CAP	Corrective Action Plan
CCW	Constituent Concentration in Waste
CCWE	Constituent Concentration in Waste Extract
CDAP	Chemical Data Acquisition Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehsive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CLP	Contract Lab Program
CME	Central Mine Equipment
COE	Corps of Engineers
CO	Contract Officer
CR	Completion Report
CS	Confirmatory sampling
DIOF	Deionized organic-free
DNR	Department of Natural Resources
DO	Delivery Order
DOD	Department of Defense
DOT	Department of Transportation
DPW	Department of Public Works
DQO	Data Quality Objectives
EIM	Environmental Information Management
EM	Engineer Manual
EPA	Environmental Protection Agency
EPD	Environmental Protection Division (State of Georgia, Department of Natural Resources)
ERNS	Emergency Response Notification System
FID	Flame ionization detector
FINDS	Facility Index System
fpd	feet per day
ft^2/d	square feet per day
fpm	feet per minute
ft/ft	feet per feet
F&R	Froehling & Robertson, Inc.
°F	degrees fahrenheit
GC	Gas chromatograph

GDAP	Geotechnical Data Acquisition Plan
gpm	gallons per minute
GPR	Ground-Penetrating Radar
HAAF	Hunter Army Airfield
HASP	Health and Safety Plan
HP-II	Hydropunch II
HQ	Headquarters
HSA	Hollow Stem Auger
ICP	Inductively coupled argon plasma
ID	Inside diameter
IDW	Investigation-derived waste
IR	Infrared spectroscopy
IRIS	Integrated Risk Information Systems
IRA	Interim Removal Action
IRP	Installation Restoration Program
LOC	Levels of concern
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
M&E	Metcalf & Eddy, Inc.
meg/L	Milliequivalents per liter
mg/L	Milligrams per liter
MS/MSD	Matrix spike/matrix spike duplicate
MW	Monitoring Well
NAVD	North American Vertical Data
NGVD	National Geodetic Vertical Datum
NPL	National Priorities List
NTP	Notice to Proceed
OD	Outside diameter
OVA	Organic Vapor Analyzer
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	Polychlorinated Biphenyl
PID	Photoionization detector
ppb	Parts per billion
PPE	Personal Protective Equipment
ppm	Parts per million
PRP	Potentially Responsible Party
PSI	Professional Services Industries, Inc.
PVC	Polyvinyl chloride
PX	Post Exchange
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCSR	Chemical data invalidation report
QM	Quarterly monitoring

ACRONYMS (Continued)

QMBN	Quartermaster Battalion
QPR	Quarterly Progress Report
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RPD	Relative Percent Difference
SAV	Savannah District
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SI	Site Investigation
S&ME	Soil & Materials Engineers, Inc.
SOW	Scope of Work
SSS	Split Spoon Sample
SPT	Standard Penetration Test
SR	State Route
SVOC	Semivolatile organic compound
TAT	Technical Advisory Team
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Top of Casing
UST	Underground storage tank
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOA	Volatile organic analysis
VOC	Volatile organic compound
WWTF	Wastewater Treatment Facility

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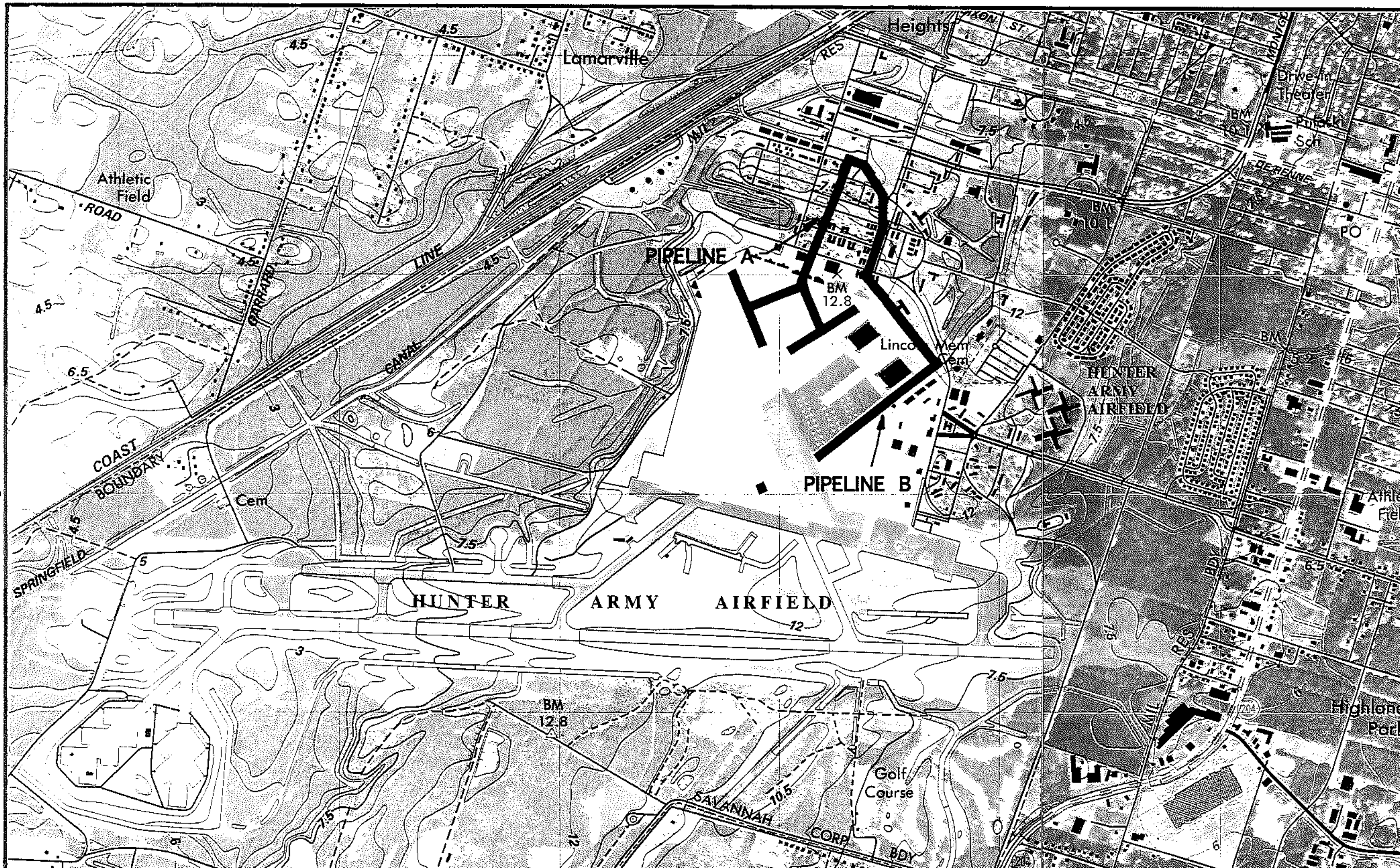
SECTION 1.0
INTRODUCTION

1.1 BACKGROUND

Metcalf & Eddy, Inc. (M&E) has been contracted by the United States Army Corps of Engineers (USACE), Savannah District (SAV), to perform an environmental assessment of three facilities at Hunter Army Airfield (HAAF) in Savannah, Georgia. The assessments include a Phase I Site Investigation (SI) of the Airport hydrant system (in vicinity of Building 728) and confirmatory sampling (CS) at two underground storage tanks (UST) sites (Buildings 710 and 133). The CS will be followed by a 1-year period of quarterly monitoring (QM). Several grades of motor and aviation fuel were stored and dispensed using the systems at these buildings. In addition, the hydrant system contained alcohol mixtures for aircraft deicing operations for a period of time. A site location map is shown in **Figure 1-1**. This effort will be performed under the contract DACA21-93-D-0049, Delivery Order No. 11. The USACE SAV has been assigned responsibility for the environmental assessment under the Installation Restoration Program (IRP).

This document provides a Work Plan to be followed while conducting a Phase I SI, CS, and QM program at HAAF. This Work Plan addresses all project requirements for the field investigation, chemical data acquisition, historical site use review, subsurface investigation, personnel health and safety, and data management. These investigations will be conducted in accordance with federal, state, and local regulations and rules. Specifically, USTs are regulated by 40 Code of Federal Regulations (CFR), Parts 280 and 281. The State of Georgia Department of Natural Resources, Environmental Protection Division (EPD) Rules (Chapter 391-3-15) and requirements are also applicable. Specific guidelines for CS and QM have been outlined in the Corrective Action Plans (CAPs) submitted by Atlanta Testing & Engineering (AT&E) for Buildings 710 and 133.



M&E METCALF & EDDY

SOURCE: GARDEN CITY AND SAVANNAH, GA, USGS QUADRANGLE MAPS

AIRFIELD LOCATION MAP
HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA FIGURE 1-1

1.2 PURPOSE, SCOPE, AND OBJECTIVES

This Work Plan addresses the environmental assessment of three separate facilities at HAAF: Buildings 728, 710, and 133 which are similar in scope. The investigation of the airport hydrant system is henceforth referred to as Building 728. The objectives for the Building 728 Phase I SI include: 1) determine the potential extent of soil and groundwater contamination resulting from possible release(s) of fuel and alcohol mixtures from the USTs and associated pipelines; 2) locate and map approximately 10,800 linear feet of airport hydrant system pipeline (Note, approximately 7,000 feet of pipeline were outlined in the scope of work (SOW), but the historical document review indicated an additional 3,800 feet); 3) determine the locations of access points for future pipeline sampling; 4) conduct an assessment of the overall soil, geologic, pollution susceptibility, and hydrogeologic setting of the Building 728 area; 5) identify state and federal applicable or relevant and appropriate requirements (ARARs) for remediation; and 6) propose additional subsurface sampling if necessary. The subsurface investigation near Building 728 will culminate in a Phase I SI report.

To achieve project objectives for Building 728, M&E will: prepare the appropriate Work Plans and subplans outlined in the SOW; perform a geophysical survey to locate the airport hydrant pipelines; review available aerial photographs; collect soil and groundwater samples to assess subsurface environmental quality; compile a list of ARARs; conduct a survey of points of withdrawal for public and private water systems within 2 miles (public) and 0.5 miles (private) of the hydrant system; and determine the need for potential remedial action to protect human health and the environment.

The objectives for investigations at Buildings 710 and 133 include: 1) determine the contaminant characteristics of soil and groundwater; 2) evaluate the effectiveness of recent interim environmental cleanup activities; 3) conduct an assessment of the overall extent of contamination in soil, groundwater, surface water, and sediment; 4) characterize the geologic and hydrogeologic setting of the sites; and 5) conduct quarterly monitoring to determine if downgradient receptors may be impacted. The investigations for Buildings 710 and 133 will be summarized in Completion Reports as specified in the Corrective Action Plans (CAPs) prepared for each site (AT&E, 1992 and 1993).

The project objectives for Buildings 710 and 133 will be achieved by: collecting confirmatory soil, groundwater, sediment, surface water, and potable wellhead samples as outlined in the CAPs for each site; and performing quarterly monitoring for a 1-year period to assess potential contaminant plume migration and the corresponding impacts to human health and the environment.

Details of each investigation site are provided in the following sections of this work plan. Much of the historical section provided below is from the USACE SOW.

1.3 SITE HISTORY AND SUMMARY OF PREVIOUS INVESTIGATIONS

1.3.1 Airfield History

From the early days of aviation, the area now known as Hunter Army Airfield was used by practice flyers, barnstormers, and aerial circuses. In 1928, the city of Savannah took possession of the field for use as a municipal airport. In the spring of 1940, the property was designated as a military airfield. Except for a short period when military activities were moved to Travis Field west of the city, the Army Air Corps (and later the separately-organized Air Force) made extensive use of the base for approximately two decades. Users included the U.S. Air Force Strategic Air Command and the Military Air Transport Command.

The Air Force ceased using the base in the early 1960's, and deactivation efforts were undertaken. However, the Army acquired the facility in 1967 to support the increased need for helicopter pilot training during the Vietnam conflict. Advanced helicopter training for Vietnamese Air Force flight students was conducted at HAAF from 1970 to 1972. In 1975, the airfield became an important component of nearby Fort Stewart when the 24th Infantry Division was reactivated and stationed at the Fort Stewart/Hunter Army Airfield complex.

1.3.2 Site History at Building 728 and Hydrant System Use

Building 728 site, also referred to as the northern battery, consisted of a group of twelve 25,000-gallon tanks. Tanks were located within a fenced field near Buildings 728 and 723. The tanks were arranged in two parallel rows, each containing six tanks. Eight oil/water separators were also located near the center of the "tank farm." A water control pit was also present at the northern side of the area. Four additional tanks were located next to Building 728 (see **Figure 1-2**). These 12,000-gallon tanks held aviation fuel and appear to have been part of the hydrant system.

During the 1940s, the tanks held aviation fuel which was pumped via Pipeline A to ten fueling pits at the runway. The approximate location of the pipeline is provided on **Figure 1-2**. Pipeline A is a 12-inch line which enters the tank area on the southern side of the tank farm. Truck fill stand No. 2 is located on the opposite side of the railroad track from the northern battery. Communications with HAAF and Fort Stewart personnel indicate that fuel trucks were filled here with fuel brought to this location by rail (USACE, 1994).

Old drawings (1941) show eight fill couplings in the center of the railroad track which runs parallel to the site. Four of the couplings were connected to a pipeline which leads to a transfer pumphouse. Communications with HAAF and Fort Stewart personnel indicate that a pipeline, shown as Pipeline B on **Figure 1-2**, connected the transfer pumphouse to another tank farm (called the eastern battery) near the airfield hangars. The drawings also show 10 fueling pits associated with the eastern battery. The pits were located south of the battery and were apparently oriented in linear fashion. However, no aerial photographs were available to document the exact number of fuel pits or their orientation.

Around 1957, the entire system was converted to store an alcohol/water mixture used as an aircraft de-icer. Later, some of the tanks near Building 728 were used to store waste oil.

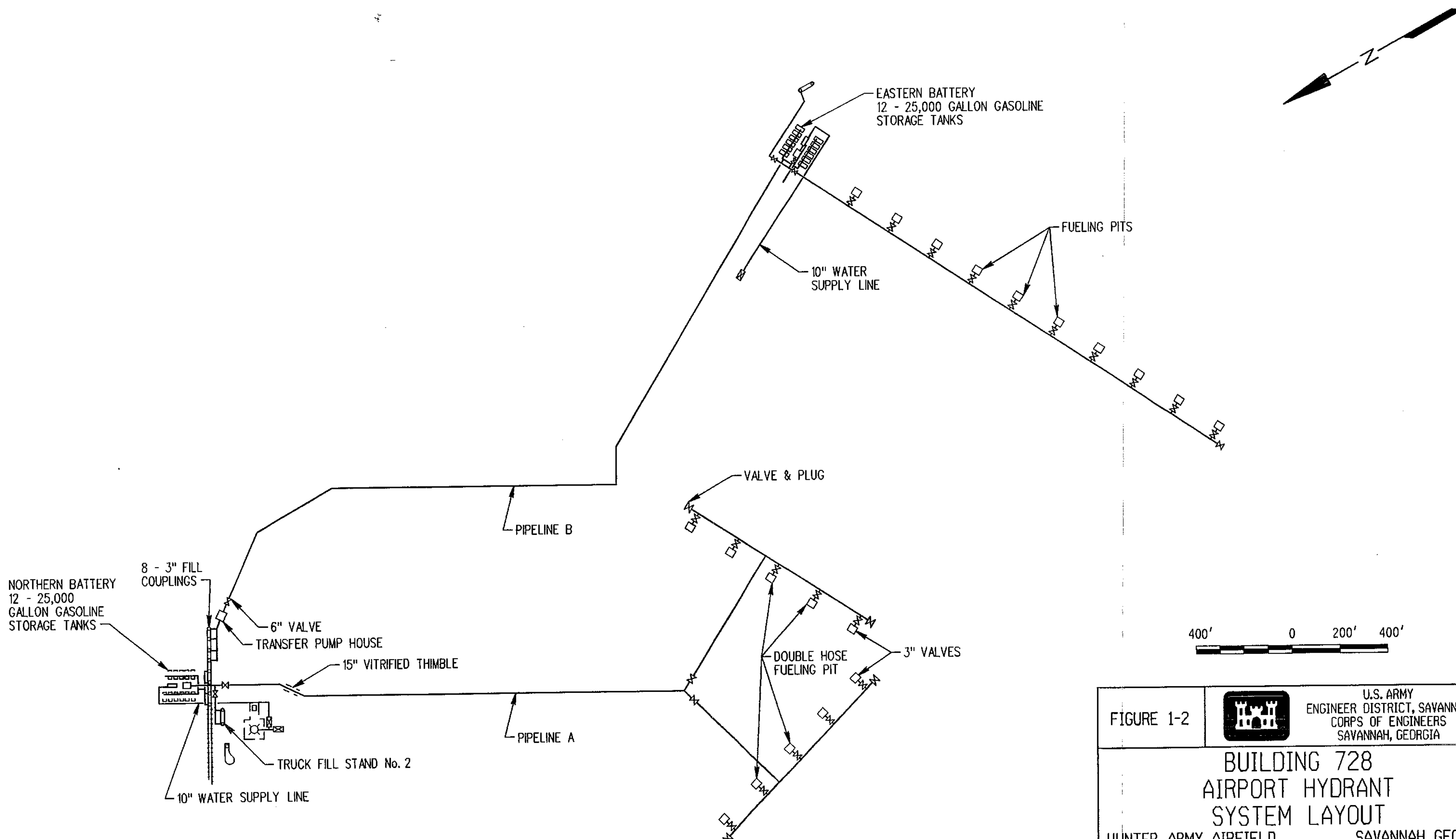


FIGURE 1-2

U.S. ARMY
ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

BUILDING 728 AIRPORT HYDRANT SYSTEM LAYOUT

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

METCALF & EDDY

PLATE:

SOURCE: HAAF MASTER PLAN 1941

SCALE: 1"=400' DATE: 01-23-95

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1.3.3 Previous Investigations at Building 728

UST removals are currently being completed by Anderson Columbia Environmental, Inc. (ACE) in the Building 728 area. Soil and groundwater samples were collected below the tank excavations in accordance with Georgia EPD UST closure requirements. Contamination in soil and groundwater has been confirmed by the sampling. However, no free product was found at this site.

The 12 tanks in the fenced area contained water and petroleum-contaminated water during the tank removal efforts. Two of the tanks next to Building 728 contained water and waste oil, and the other two contained petroleum-contaminated water. No other investigations have been performed at this site. Tank excavations were backfilled with off-site borrow material.

USACE will complete a closure report for the removed tanks. A summary of the UST closure activities will also be presented in the Phase I SI report. The pipelines leading to the airfield will be removed under a separate contract.

1.3.4 Site History at Building 710

Building 710 Area

Building 710 formerly housed the base motor pool. The project site consisted of Building 710 (for operators), four USTs, and three pump islands. The USTs were removed in May 1994. The USTs were approximately 45 years old and were constructed of steel. The two 10,000-gallon tanks, which were installed around 1940, held diesel and gasoline and were managed by the 260th Quartermaster Battalion (QMBN). The two 12,000-gallon tanks, which were installed around 1941, held diesel and gasoline and were managed by the Transportation Motor Pool. **Figure 1-3** provides the location of the tank area building, previously installed soil borings, and groundwater monitoring wells.

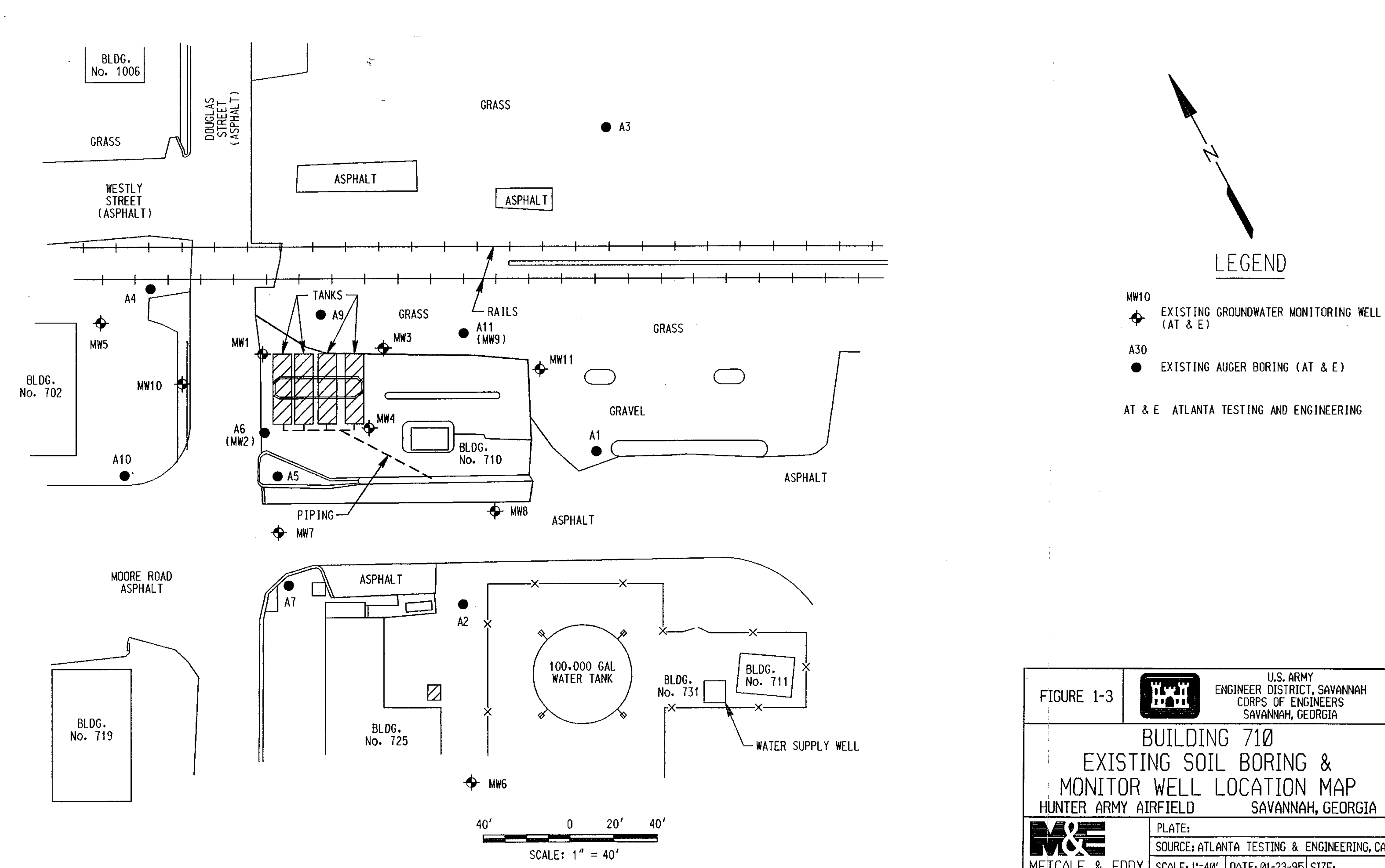

FIGURE 1-3

U.S. ARMY
ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

BUILDING 710
EXISTING SOIL BORING &
MONITOR WELL LOCATION MAP
HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

METCALF & EDDY

PLATE:
SOURCE: ATLANTA TESTING & ENGINEERING, CAP
SCALE: 1"=40' DATE: 01-23-95 SIZE:

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In 1988, the Directorate of Department of Environment and Health (DEH) condemned and prohibited the use of the 260th QMBN 10,000-gallon diesel tank because it contained a large quantity of mud and water. At that time, the 260th QMBN ceased using both 10,000-gallon tanks. The other two tanks were in operation until 1990, when it was determined that the 12,000-gallon diesel tank was leaking. At that time, the Transportation Motor Pool ceased using the other 12,000-gallon tank.

In March 1990, Tracer Research Corporation performed tightness tests on two of the four underground storage tanks located at Building 710. These tests indicated that the 12,000-gallon diesel tank was leaking. Based on this information, a preliminary contamination assessment (a shallow soil gas survey) was conducted by Tracer Research Corporation. Results of this investigation indicated that soils in the vicinity of the USTs had been impacted.

Soil borings and monitor wells were installed to further evaluate the vertical and horizontal extents of contamination. The samples were collected by USACE. Total BTEX (the sum of benzene, toluene, ethyl benzene, and xylene) was identified in 8 of 24 soil samples at concentrations above the method detection limit (MDL). Total petroleum hydrocarbons (TPH) existed in concentrations above the MDL in 23 of 24 soil samples. Lead was also confirmed in soil samples ranging in concentration from 3.4 parts per million (ppm) to 18 ppm. Results of these samples and observations made in the field indicated that approximately 700 cubic yards of soil were contaminated. Phase-separated product was confirmed floating on the groundwater surface at monitoring well MW-1. Dissolved hydrocarbons were also identified in groundwater samples.

During completion of the CAP, a water system survey was conducted by AT&E. In accordance with Rule 391-3-15-09 of the Georgia Rules for UST Management, the extent of corrective action required was based on the location of the hydrocarbon plume with respect to nearby water withdrawal systems and surface water bodies. Based on this survey, it was determined that water withdrawal systems and surface water bodies exist within 3 miles of the site. However, the water withdrawal systems are all wells that receive water from aquifers other than the surficial aquifer, and therefore, they are not hydraulically connected with the contaminant plume (USACE, 1994).

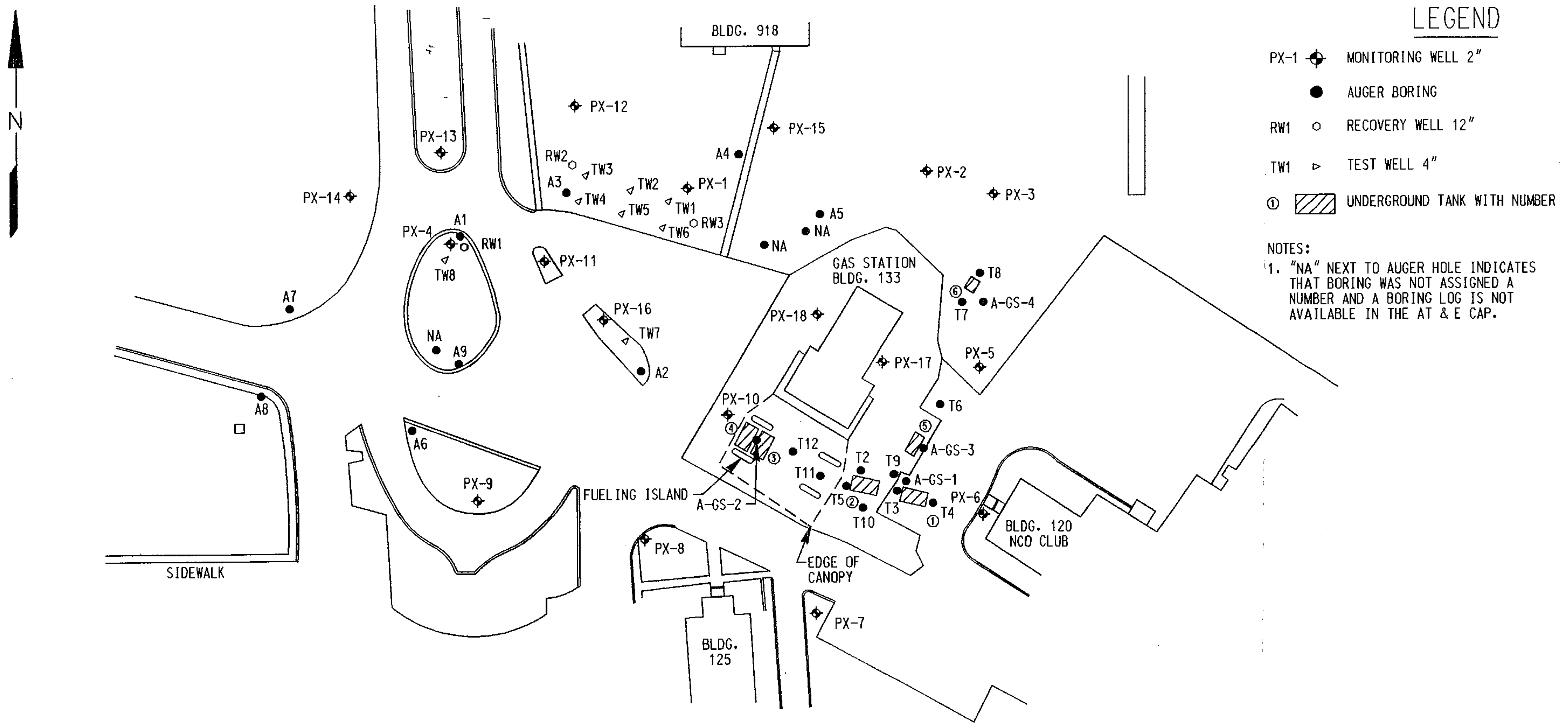
Two lakes and one canal are located near the site. One lake is located just outside the HAAF boundaries approximately 0.5 mile downgradient of the contaminated plume. The other lake is located within HAAF approximately 1,200 feet southwest and crossgradient of the contaminated plume. The drainage canal is located approximately 500 feet north of the site and is the most probable receptor of hydrocarbon-contaminated groundwater. No information on the surface water quality in these lakes or the canal was available during the M&E document search. An inspection of the canal during the work plan scoping meeting identified no visual evidence of petroleum contamination.

1.3.5 Previous Investigations at Building 710

The four tanks at Building 710 were removed by Phoenix Construction Services, Inc. in May 1994. The horizontal extent of free product, soil, and groundwater contamination had been previously delineated during the preparation of the CAP (AT&E, 1993). Initially, the contaminated soil was excavated per CAP requirements. Additional soil was later excavated east of the USTs to remove contamination discovered under the fueling islands. The limits of the excavations will be included in a final report to be prepared by Phoenix Construction Services, Inc. (anticipated December 1994).

1.3.6 Site History at Building 133

Building 133 formerly housed the Post Exchange (PX) Service Station. The site consisted of Building 133 which had an office and garage bays, six USTs, and four pump islands. The USTs were approximately 40 years old and constructed of steel. Four 6,000-gallon USTs and one 4,000-gallon UST held gasoline and diesel fuel. One UST, approximately 1,000 gallons in size, held waste oil. A concrete oil trap was located at the back of the building. An illustration of the facility is provided on **Figure 1-4**. The service station sold fuel until approximately July 1990. Building 133 was recently demolished.



UNDERGROUND TANKS TO BE REMOVED

1. 6000 GALLONS GASOLINE
2. 6000 GALLONS GASOLINE (ABANDONED PRIOR TO 1990)
3. 6000 GALLONS GASOLINE
4. 6000 GALLONS GASOLINE
5. 4000 GALLONS GASOLINE
6. 1000 GALLONS WASTE OIL (APPROXIMATE SIZE)

60' 0 30' 60'

SCALE: 1" = 60'

FIGURE 1-4

U.S. ARMY ENGINEER DISTRICT, SAVANNAH CORPS OF ENGINEERS SAVANNAH, GEORGIA

BUILDING 133 EXISTING SOIL BORING & MONITOR WELL LOCATION MAP

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

METCALF & EDDY

PLATE:

SOURCE: ATLANTA TESTING & ENGINEERING, CAP

SCALE: 1"=60' DATE: 01-23-95 SIZE:

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In the first half of 1990, tightness tests on active underground storage tanks indicated that some of the tanks were leaking. Based on this information, a preliminary contamination assessment (a shallow soil gas survey) was conducted by Tracer Research Corporation. Results of this investigation indicated that soils in the vicinity of the USTs had been impacted by the leaks.

To further evaluate the vertical and horizontal extent of contamination, soil borings and monitor wells were installed, and samples were collected by the USACE. Total BTEX concentrations in soil exceeded the MDL in 29 of 38 samples. TPH concentrations in 35 of 38 soil samples analyzed also exceeded the MDL. Lead was identified in concentrations ranging from 1.8 ppm to 26 ppm. Results of samples collected and observations made indicated that approximately 7,000 cubic yards of soil had possibly been contaminated and that phase-separated product was floating on the groundwater surface. The free product layer was present in 7 of 19 wells and ranged from 0.01 to 2.47 feet thick. Dissolved hydrocarbons were also present in the groundwater.

1.3.7 Previous Investigations at Building 133

A water system survey was conducted by AT&E to determine required Corrective Action. Potable water withdrawal systems and surface water bodies were identified within the boundaries of the airfield at distances less than 3 miles from the site. However, the water withdrawal systems receive their water from aquifers other than the surficial aquifers and, therefore, are not hydraulically connected with the contaminant plume (USACE, 1994).

In the fall of 1990, a Phase I Interim Remediation was implemented. The objective of this remediation was to recover phase-separated product from beneath the site. Skimmers installed in wells were used to recover the phase-separated product. Product recovery continued for a period of 40 days. During that time, 322 gallons of product were recovered.

A Phase II Interim Remediation project was underway during the preparation of this work plan. The objective of the Phase II activity was to remove the contaminant source (contaminated soil and any remaining phase-separated product) and USTs. The contaminated soil will be excavated to a depth approximately 1 foot below the water table and residual free product will be recovered during the tank removal.

The removal of the six USTs and one oil trap at this former gas station is currently under contract with Aneptec Corporation. Tank removal is scheduled to be completed by May 1995. The tank removal project includes remaining free product removal and excavation of the contaminated soil in accordance with the Corrective Action Plan (AT&E, 1992). The excavated area will be backfilled with clean offsite borrow or soil from an onsite source below EPD contamination limits for TPH and BTEX.

1.4 AIRFIELD DESCRIPTION AND LOCATION

The Hunter Army Airfield is located within the Coastal Plain Physiographic Province in the city of Savannah, Chatham County, Georgia. The airfield covers approximately 5,400 acres, and it is bounded on the north by lightly populated areas, on the east and south by residential and light commercial areas, and on the west by the Little Ogeechee River. HAAF is a subinstallation to the Fort Stewart Military Installation, which is located approximately 30 miles southwest.

HAAF is located near the coast toward the north end of the Barrier Island Sequence District. Area topography consists of step-like terraces with decreasing altitudes toward the Atlantic Ocean (Clark and Zisa, 1976). Topographic relief base-wide ranges from approximately 2 to 42 feet above mean sea level (msl). Surface drainage generally occurs towards the northwest.

1.4.1 Setting

The Hunter Army Airfield is located on the south side of Savannah, Georgia. The area surrounding the Airfield consists mainly of commercial and residential properties. Two retail malls, gasoline stations, and service-oriented businesses are situated near the Airfield. The majority of these facilities are located along Abercorn Street.

1.4.2 Demographics

The total population of Chatham County, taken from the 1990 census, is 216,935. This translates to a population density of 335.7 persons per square mile. There are 8,111 houses with approximately 12.5 houses per square mile. However, the area surrounding the Airfield is largely commercial.

1.4.3 Regional Geology/Hydrogeology

1.4.3.1 Regional Geology

The HAAF is located in the Coastal Plain of Georgia and is approximately 20 miles west of the Atlantic Coast. The Coastal Plain is a wedge of sediments ranging in thickness from zero feet at the Fall Line to about 7,000 feet along the Georgia-Florida border. These Cretaceous to Quaternary age clastic and carbonate sediments rest on a basement complex of Mesozoic and Paleozoic sediments, igneous and metamorphic rocks. The geologic formations underlying the Coastal Plain consist of unconsolidated sand and clay, limestone, and dolomite. The Coastal Plain formations generally strike northeast-southwest and dip to the southeast. Specifically, the formations underlying the HAAF area consist of undifferentiated surficial sand, undifferentiated alluvial deposits, Cypresshead Formation, Hawthorn Group, and Suwanee and Ocala Limestone.

The undifferentiated surficial sand is late Pleistocene to Holocene in age and underlies the local soil profiles. These deposits consist of massive-bedded, structureless, well to moderately-sorted, fine- to medium-grained, white to buff colored sand; thickness ranges from 0 to 10 feet (Huddleston, 1988).

The undifferentiated alluvial deposits are Pleistocene in age and occur throughout the drainage systems of the Coastal Plain and consist of floodplain deposits and river terrace deposits. These deposits are predominantly sand with a little clay and range in thickness from 20 to 50 feet (Huddleston, 1988).

The undifferentiated surficial sands and alluvial deposits are underlain by the Cypresshead Formation. The Cypresshead Formation is early Pleistocene in age. The Cypresshead Formation generally consists of quartz sand with prominent clay beds in some down dip areas. Two lithofacies are dominant in this unit. The up dip facies generally consist of fine- to coarse-grained, well to poorly sorted sand with scattered gravel stringers. The down dip facies generally consist of fine-grained, well sorted sand with thin layers of clay. The Cypresshead Formation disconformably overlies the Coosawhatchie Formation of the Hawthorn Group (Huddleston, 1987).

The Cypresshead Formation is underlain by the Hawthorn Group of Miocene age. The Hawthorn Group generally consists of a basal calcareous unit, a middle clastic unit, and an upper unit that is a mixture of clastic and carbonate rocks (Miller, 1986). The Hawthorn Group has been divided into three formations, Coosawhatchie Formation, Markshead Formation, and the Parachula Formation which are listed here from youngest to oldest (Huddleston, 1987).

The Coosawhatchie Formation is composed predominantly of clay, but also has sandy clay, argillaceous sand, and phosphorite units. This formation is approximately 170 feet thick in the Savannah area. This unit disconformably overlies the Markshead Formation and is distinguished from the underlying unit by dark phospathic clays or phosphorite in the lower part and fine-grained sand in the upper part (Huddleston, 1987).

The Markshead Formation is approximately 70 feet thick in the Savannah area and consists of light colored phosphatic, slightly dolomitic, argillaceous sand to fine-grained sandy clay with scattered beds of dolostone, limestone, and siliceous claystone. The Markshead Formation disconformably overlies the Parachula Formation and is distinguished from the underlying unit by being more phosphatic, siliceous, and dolomitic and less calcareous (Huddleston, 1987).

The Parachula Formation consists of sand, clay, limestone and dolomite, and is approximately 10 feet thick in the Savannah area. The Parachula Formation generally overlies the Suwanee Limestone in Georgia (Huddleston, 1987).

The Suwanee Limestone of Oligocene age consists of a cream to tan, crystalline, highly vuggy limestone and is approximately 100 feet thick in the Savannah area (Miller, 1986) and overlies the Ocala Limestone. The Ocala Limestone of late Eocene age is a gray to cream, dense, highly fossiliferous limestone (Furlow, 1969).

1.4.3.2 Regional Hydrogeology

Water in all the Coastal Plain aquifers is present primarily in intergranular pore spaces between sand grains and secondarily in solution cavities in carbonate rocks. Water enters as precipitation and any water not lost to runoff or evapotranspiration percolates downward into the aquifers and generally moves laterally and discharges to streams, springs, or wells in the area. Water may also move vertically into adjacent aquifers.

The principal source of groundwater in the HAAF area is the Upper Floridan aquifer. Other sources of groundwater include the Miocene aquifer system and the surficial aquifer system. The aquifer systems are discussed below.

The surficial aquifer system is a thin, widespread layer of unconsolidated sand beds that commonly contain shells and limestone. In some places, clay beds divide the system into two or three aquifers. In the HAAF area, the surficial aquifer system consists of undifferentiated surficial sand, alluvial deposits, the Cypresshead Formation, and the Coosawhatchie Formation of the Hawthorn Group. A dense phosphatic silty clay of the Coosawhatchie acts as a basal confining unit. Generally, the surficial aquifer system is under unconfined or water-table conditions. Locally, thin beds of clay create confined or semi-confined conditions. Water in the aquifer system flows east to the coast, and the water level near the coast is influenced by tidal changes. The thickness of the aquifer in the HAAF area is about 65 feet.

Wells in the shallow aquifer reportedly yield 2 to 180 gallons per minute (gpm). In Chatham County, wells yield 10 to 40 gpm, and the aquifer has an estimated hydraulic conductivity of 2 to 65 feet per day (fpd) and a transmissivity of 14 to 1,100 square feet per day (ft^2/d) in the unconfined water bearing zone, and a hydraulic conductivity of 40 to 400 fpd and a transmissivity of 150 to 6,000 ft^2/d in the lower semi-confined water bearing zone (Clarke, et al, 1990).

The lower confining unit ranges in thickness from 15 to 90 feet and is approximately 30 feet in the Savannah area. In the Brunswick area, the vertical hydraulic conductivity of this confining unit ranges from 5.3×10^{-5} to 13.0×10^{-5} fpd (Clark, et al, 1990).

The Miocene aquifer system in the HAAF area underlies the surficial aquifer system and consists of the poorly sorted, fine- to coarse-grained, slightly phosphatic and dolomitic quartz sand of the Markshead Formation of the Hawthorn Group. The silty clay and dense, phosphatic dolomite of the Markshead Formation and Parachula Formation acts as a basal confining unit. The Miocene aquifer system is under confined conditions and is recharged where Miocene sediments outcrop northwest of the HAAF area. The thickness of the aquifer ranges from about 20 to 150 feet and is approximately 25 feet in the Savannah area (Clark, et al 1990).

The Upper Floridan aquifer consists of a thick sequence of carbonate rocks belonging to the Suwanee and Ocala Limestone. The upper Floridan is overlain by the Miocene aquifer system. The dense dolomitic limestone of the Ocala Limestone acts as a semi-confining basal unit. The aquifer is under confined conditions and is recharged northwest and west of the coastal area of Georgia. Water levels in this aquifer respond to seasonal climatic changes and in the Savannah area groundwater flows toward the pumping center created by water withdrawal from wells for the City of Savannah. The thickness of the Upper Floridan aquifer ranges from 200 to 700 feet and is approximately 250 feet thick in the Savannah area (Clark, et al, 1990). Withdrawal from the Upper Floridan aquifer during 1986 was approximately 73 million gallons per day. The average transmissivity for the Savannah area ranges from 28,000 to 33,000 ft^2/d (Clark, et al, 1990).

The lower confining unit ranges in thickness from 160 to 280 feet. In the Brunswick area, the vertical hydraulic conductivity ranges from 0.4×10^{-5} to 5.3×10^{-5} fpd. Joints and fractures in this unit have produced zones of higher secondary vertical hydraulic conductivity.

1.4.4 Local Geology

The local geology has been documented by the collection of soil samples from 54 borings drilled to depths ranging from 4.5 to 12.5 feet below ground surface as part of previous investigation activities in the subject site areas. The lithology of the soil samples is described and recorded on boring logs presented in Atlanta Testing and Engineering (AT&E), 1992, Corrective Action Plan, Building No. 133 Area and AT&E, 1993, Corrective Action Plan, Building No. 710 Area.

Lithology beneath the sites consisted predominantly of brown and tan, fine to very fine sand with a little silt (silty sand). Layers of clayey sand and silt were also present. The locations of these finer layers are located to the southeast of the sites. The surficial lithology beneath the site is consistent with undifferentiated alluvial deposits (AT&E, 1992, 1993).

1.4.5 Local Soils

The HAAF is underlain by the following soil associations:

- Chipley-Leon-Ellabelle
- Ogeechee-Ellabelle

- Ocilla-Pelham-Albany
- Pooler-Cape Fear

The three areas to be investigated (Buildings 728, 710, 133) appear to be underlain by soils of the Chipley-Leon-Ellabelle association.

The Chipley-Leon-Ellabelle soil association consists of moderately well drained and poorly drained, sandy soils on broad, low ridges and very poorly drained soils that have loamy underlying layers in depressions and drainageways. Slopes range from about 0 to 2 percent. This association is comprised of about 30 percent Chipley soils, 25 percent Leon soils, 20 percent Ellabelle soils, and 25 percent minor soils (Olustee, Ocilla, Pelham soils).

Specifically, Building 728 Airport Hydrant System, Building 710 Area, and Building 133 Area are underlain by the Chipley-Urban land complex. This complex is about 40 to 70 percent Chipley soils and 20 to 40 percent urban land. The remainder is Lakeland, Kershaw, and Osler soils.

The texture of the Chipley soils is a fine sand to a depth of 6 feet or more. A seasonal high water table is 15 to 36 inches below ground surface. In some places within the investigation areas the soil profile has been altered by cutting, filling, grading, and landscaping. In this urban land, the identification of soils is impractical due to the presence of urban facilities.

A generalized description of the near-surface soils can be found in **Table 1-1.**

TABLE 1-1
NEAR-SURFACE SOIL PROFILE (CHIPLEY-URBAN LAND COMPLEX)

		Percentage Passing Sieve Number			
Depth (in.)	**Soil Description**	**#4**	**#40**	**#200**	**Permeability (in/hr)**
0-65	Find sand (SM, SP-SM)	100	95-100	5-15	6.3-10.0

1.4.6 Local Hydrogeology

The previously described lithologic units form the surficial aquifer at the subject sites. Groundwater beneath the sites ranged in depth from about 5.0 feet to greater than 6.0 feet and generally flowed to the northwest. Hydraulic conductivity of the surficial aquifer ranged from 0.43×10^{-3} to 12.48×10^{-3} feet per minute (fpm) with an average hydraulic conductivity of 6.83×10^{-3} fpm (AT&E 1992, 1993). The measured hydraulic conductivities correspond to silty sand. Results of sieve analyses also indicated the sites were underlain by fine grained sands to silty sands (AT&E, 1992, 1993). An average groundwater seepage velocity of 9.6×10^{-3} fpm for the movement of groundwater across the site has been calculated using the average hydraulic conductivity, a hydraulic gradient of 0.3 feet per feet (ft/ft), and an assumed effective porosity of 0.20 (AT&E, 1992, 1993).

1.4.7 Climate

The climate of Chatham County is warm and humid. Summers are long and hot, and winters are short and mild. The average annual temperature is 66 degrees Fahrenheit (°F), and the rainfall averages 48 inches annually. Average daily maximum temperatures in January and July are 62°F and 90°F, respectively. The average daily temperature is 51°F in January and 81°F in July. Rainfall is fairly uniformly distributed from October through May. The heaviest rainfall normally occurs in June through September, with July and August being the wettest month (6.6 inches on average). The driest months are October and November, with November having a monthly average of 2.0 inches of precipitation.

1.5 SUBCONTRACTORS

M&E intends to use subcontractors to perform drilling, laboratory, topographical surveying, and geophysical surveys on this project. Each subcontractor is listed in M&E's Multidiscipline Indefinite Delivery Type Contract for Hazardous Waste Services Within the South Atlantic Division, No. DACA21-93-D-0049. A brief summary of each subcontractor's responsibilities is provided below:

Savannah Laboratories, Inc. - Provide laboratory analyses of soil and groundwater samples using USEPA-approved testing methods.

Professional Services Industries, Inc. - Provide the drilling services necessary to collect soil and groundwater samples. Technologies to be used during the investigation include: standard penetration testing and hollow stem auger drilling. Permanent groundwater monitoring wells will be installed.

Hoffman and Company - Provide topographical and aerial surveying services for the accurate location of subsurface pipelines, exploration borings, groundwater monitoring wells, roadways, and buildings.

Applied Engineering & Science - Conduct geophysical surveys to locate buried pipelines and subsurface obstructions.

Tracer Research Corporation - Conduct in-field gas chromatograph (GC) analysis of hydropunch water samples.

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SECTION 2.0
CURRENT AND HISTORICAL SITE CONDITIONS

This section provides a summary of information obtained from reports, aerial photographs, and interviews conducted during site visits at HAAF. Available information was reviewed to gain a better understanding of past and present conditions of the study areas. A more detailed summary of documents used in the preparation of the Work Plan is included in the Document Search Report (Appendix A).

2.1 HISTORICAL AERIAL PHOTOGRAPH RESEARCH

A review of aerial photographs was performed on November 16 and 17, 1994. The date and source of the photographs are as follows:

TABLE 2-1
AERIAL PHOTOGRAPH REVIEW

Date	Source
1965 (approx.)	Hunter Army Airfield
1975	Metropolitan Planning Commission
1992	Hunter Army Airfield

Other sources contacted for aerial photographs included the Soil Conservation Service (SCS) and Agricultural Stabilization and Conservation Service (ASCE) for Chatham County, Georgia. Photographs reviewed at the SCS or ASCE did not provide any insights for the investigations. The USGS Savannah and Garden City quadrangle maps were used as references to locate the photographs.

2.2 RECORDS REVIEW AND INTERVIEWS

Telephone interviews and record reviews were performed over the period of November 14 to 17, 1994. Telephone inquiries were used to guide the site visit in the Savannah, Georgia area.

M&E contacted State representatives on November 14, 1994. A review was conducted at the Georgia Department of Natural Resources (DNR) Hazardous Waste Section of RCRA files pertaining to the Hunter Army Airfield. RCRA files did not list violations in the study area. Building 710 was listed in Annex A to the facility SPCC plan, within the checklist of underground tank facilities. Neither Building 133 nor Building 728 were mentioned in the 1983 document.

Telephone interviews of USACE representatives were conducted prior to site visits. Mr. Thomas Houston, Ft. Stewart historian, and Mr. Brent Rose, USACE, were contacted as possible sources. Both indicated that available material was a copy from Hunter archives. Mr. Rose indicated CADD files of the Base were available from the USACE, which would be made available to M&E.

A site visit to Savannah was conducted on November 15 and 16, 1994. The Chatham County Tax Assessor was contacted as a source for maps. The Tax Assessor's office referred M&E to the Metropolitan Planning Commission for aerial photos. Aerial photos from 1975, 1979, and 1992 were reviewed and a copy of the 1975 aerial was obtained.

The Chatham County Soil Conservation Service and Agricultural Stabilization and Conservation Service were also contacted. Aerial photos were not available, but a copy of the Soil Survey of Bryan and Chatham Counties, Georgia was obtained.

A document and aerial photo review was performed at Hunter Army Airfield on November 16, 1994. The site contact, Ms. Angie Eason, referred M&E to Ms. Jean Gay, of Department of Public Works (DPW) Engineering Mapping. A review was performed of all available historical topographic maps, aerial photos, building diagrams, and site utility maps. The available aerials were undated, but only one series was available for the area prior to existing improvements (such as, the swimming pool near Building 710). However, the elevation of the photography did not allow detailed resolution of site features. A copy of a series from approximately 1965 was obtained.

Historical maps and diagrams were then reviewed. A series of 1941 construction diagrams was located in the miscellaneous file area. A diagram of the A. C. Gasoline Fueling System Location and Layout was located and copied. Other diagrams in this area had already been obtained by M&E from the USACE.

A review of Georgia EPD Underground Storage Tank Management Section reports was performed on November 17, 1994. Ms. Tracey Heard, EPD, had directed M&E to two reports located at the EPD's Tradeport office in Atlanta, Georgia. The reports, #9025029 and #9000653, concerned Buildings 710 and 133, respectively. Both reports consisted largely of the Corrective Action Plans already provided to by M&E by the USACE. Other material concerned initial release discovery and notice of violation letters.

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SECTION 3.0
PROJECT DATA QUALITY OBJECTIVES

3.1 INTRODUCTION

The establishment of data quality objectives (DQOs) is an integral part of the scoping process. The establishment of the DQOs ensures that the data collected is defensible and meets the specified quality goals. When this data is evaluated, the DQOs provide assurances that the decisions made will have an acceptable level of certainty. Specific DQOs for field sampling activities, laboratory analyses, and field instrumentation operation are provided in the Chemical Data Acquisition Plan (CDAP, Appendix B). DQOs for geotechnical and related geologic activities are provided in the Geotechnical Data Acquisition Plan (GDAP, Appendix C). A Data Management Plan, presented in Appendix D, has also been prepared as part of the project DQO.

The establishment of DQOs is a three-stage process. Stage 1 consists of identifying the decision types. Stage 2 identifies data uses and data needs. Stage 3 is the design of the data collection program. These stages are discussed in greater detail in the following paragraphs.

3.2 DECISION TYPES

Identifying the decision types is a four-step process. The first step is to identify the data users. The primary data users are: (1) USACE and regulatory agencies which evaluate the potential need for remediation, and (2) M&E, who will:

- Locate underground piping associated with the fuel hydrant system

- Assess the nature and distribution of possible soil and groundwater contamination

- Determine the contaminant characteristics of the soil and groundwater

- Assess the overall soil, geologic, and hydrogeologic setting of the site

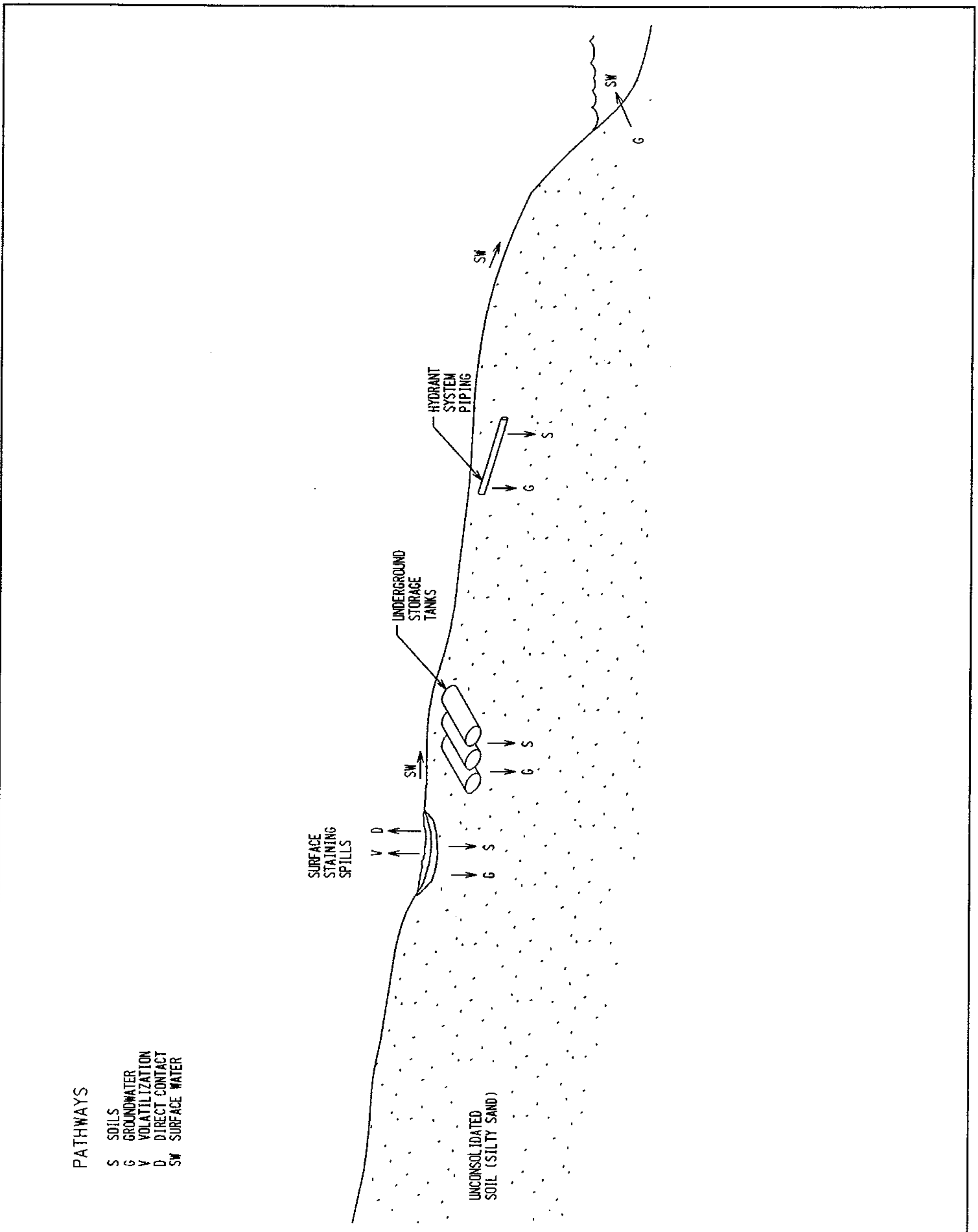
- Identify ARARs of state or federal remediation standards

- Conduct quarterly monitoring to track any plume migration over a 1-year period.

Possible secondary data users include a remediation contractor, who may need to know the extent of soil and/or groundwater contamination, and the general public.

The second step is to evaluate the existing data. Several subsurface investigations and/or interim remedial activities have been performed at Buildings 728, 710, and 133. These involved the installation of monitoring and recovery wells; collection and analysis of groundwater, surface water, and soil samples; recovery of lost fuels, and the removal of USTs and contaminated soil. Data associated with the monitoring wells include boring logs, well construction diagrams, soil quality analyses, and groundwater analyses. All of these data were collected by environmental consulting companies under separate quality assurance/quality control programs (QA/QC) subcontracted to others. The reports indicated that there were no quality problems associated with the data. In review, the data quality is sufficient to act as a basis for preparing the work plan and supporting documents for upcoming environmental investigations.

The third step is the development of a conceptual site model. The model provides a simplified illustration of both confirmed and suspected sources of contamination, the potential receptors of the contamination, and the potential pathways of the contaminant transfer. **Figure 3.1** is a schematic illustration of these sources in their typical setting at the site. The letter designations indicate which pathways are potentially affected. **Figure 3.2** is a flow diagram which shows possible exposure pathways by which the contaminants could migrate to receptors. The sources may have released metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and polynuclear aromatic hydrocarbons (PAHs)



METCALF & EDDY

CONCEPTUAL SITE MODEL
HUNTER ARMY AIRFIELD
FIGURE 3-1

SCALE: NONE

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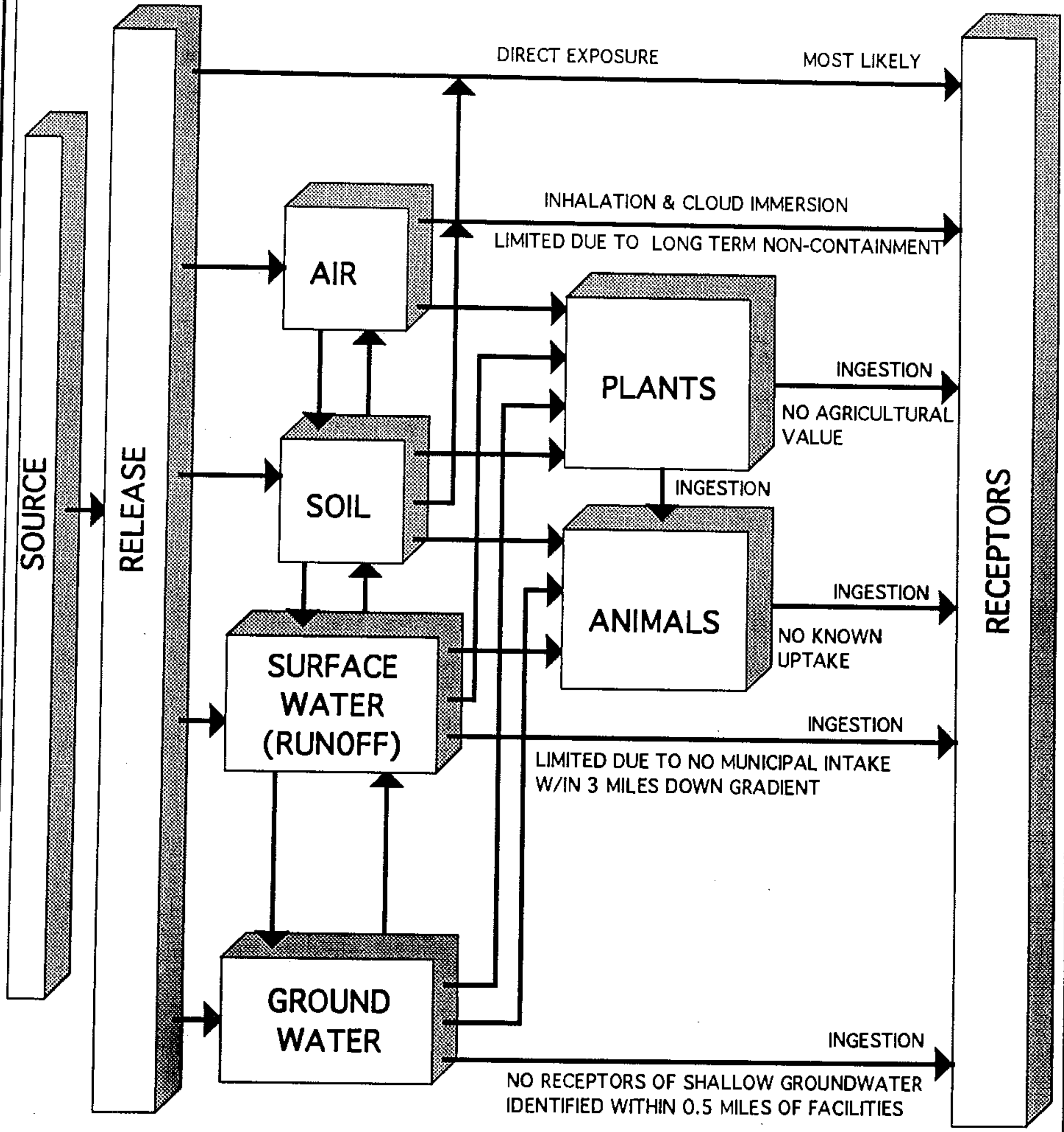


CONCEPTUAL MODEL
FLOW DIAGRAM
HUNTER ARMY AIRFIELD

Metcalf & Eddy

FIGURE 3-2

Although no human exposure is known, potential risk from dermal contact (direct exposure) is considered. Risk due to inhalation of contaminated dust is also considered. Volatilization is expected to be minimal given the depth at which volatile compounds exist and the corresponding human health risk should be low.

Human consumption of surface or groundwater in contact with the shallow aquifer within 1,500 feet of the study areas is unlikely. As indicated in the CAPs prepared for Building 710 and 133 areas, HAAF has 11 groundwater supply wells. Of these 11 wells, 8 are located within 3 miles of Building 710 and 4 of the 8 are used for drinking water. Casing depths of the drinking water wells range from 259 to 324 feet below land surface (bls). Flow rates range from 30 to 1,400 gallons per minute (gpm) (AT&E, 1992, 1993). Although public supply well No. 1 is located approximately 170 feet southeast of Building 710, contamination from the surficial aquifer is unlikely. Two confining units exist between the shallow aquifer and deeper aquifers (Upper Floridan) thereby limiting the vertical migration of contaminants toward the well's production zone. The hydraulic properties of the two confining units are sufficient to isolate the Floridan aquifer from the contaminant plume (AT&E, 1993). Public supply well No. 1 is cased from the surface to approximately 259 feet bls.

The fourth step involves the investigation needed to meet the SOW objectives. The quantity of surface and subsurface samples needed for this investigation was outlined in the SOW. The placement of sampling points will be selected to maximize data useability and satisfy the DQOs.

3.3 DATA USES AND DATA NEEDS

The second stage of the DQO process involves the identification of data uses and data needs. Given that there are various media from which to gather data and numerous uses for each data type, a matrix (**Table 3-1**) comparing those two variables aids at this stage of the DQO process. The data assessment will be used to determine the nature and extent of possible soil and/or groundwater contamination at HAAF or identify data gaps.

TABLE 3-1
DATA USES VS. MEDIA TYPE
HUNTER ARMY AIRFIELD

Media	DATA USES		
	Site Characterization (Including Health & Safety)	Risk Assessment	Evaluation of Alternatives
Soil Sampling	√	√	√
Groundwater Sampling	√	√	√
Sediment Sampling	√	√	√
Potable Well Sampling	√	√	√
Air Sampling	√		
Geotechnical Sampling	√		√
Survey	√		√

3.4 DATA QUALITY CHARACTERISTICS

This project requires that five characteristics of data quality be considered in assessing the data produced during the sampling and analysis activities. These five characteristics--precision, accuracy, completeness, representativeness, and comparability--are discussed in detail in the CDAP (Appendix B). The laboratory will compare precision and accuracy results to their internal acceptance criteria which are recorded and tracked using regularly updated control charts. Numerical control limits for precision and accuracy are also presented in the CDAP.

Geotechnical activities such as standard penetration testing and groundwater monitoring well construction will be evaluated for representativeness and comparability. This data quality monitoring, discussed in the GDAP, will assure data is collected properly and can be used in assessing subsurface conditions across the study area.

SECTION 4.0

FIELD EFFORT OVERVIEW

The sampling activities for the Phase I SI at Building 728 and CS at Buildings 710 and 133 are designed to confirm or deny the presence of contamination and the potential horizontal extent in the sediments, soils, surface water, and groundwater. The sampling approach at Building 728 is intended to determine if contamination exists above regulatory screening criteria, quantify concentrations, and preliminarily assess the potential extent of contamination. The CS at Buildings 710 and 133 will provide data on the extent and magnitude of contamination. This section outlines the number of samples and their proposed locations. A more detailed discussion of sampling procedures is provided in the CDAP and GDAP.

4.1 Geophysical Survey

A geophysical survey will be conducted in conjunction with the Building 728 investigation. A Geonics EM31 line locating system or similar terrain conductivity meter will be used in initial attempts to locate buried pipelines. If this method is unable to locate the lines, a ground penetrating radar (GPR) will be used.

The EM31 survey will be performed on a 25-foot spaced grid system. The GPR survey will be performed using a near continuous tracing method ("zig-zag") to maximize coverage of data. Regardless of the method employed, the location of the line will be marked in the field. Hand auger and hydropunch locations will be staked based on the surveyed pipeline locations.

4.2 Topographic Survey and Aerial Photogrammetry

Both topographic and aerial surveys will be made during the investigation to locate the positions of sampling points, pipelines, buildings, and associated features. Normal topographic surveying will be used to locate sampling points and monitoring wells for Buildings 710 and 133. An aerial photo survey will be used during the Building 728 investigation to identify sampling points because of the increased size of the investigation area. Three separate surveys will take place during the investigation. The methods and objectives for each are provided below:

Aerial Photogrammetry

An aerial survey will be conducted following the completion of the GPR survey, hand augering, and HP-II activities associated with Building 728. The aerial survey will provide locations of proposed sampling points and the hydrant system pipelines. This information will be transferred to computer-aided drafting design (CADD) drawings for use in siting actual hand auger and HP-II/temporary piezometer locations.

Topographic Survey No. 1

This first topographic survey will be used to determine the top of casing (TOC) elevations of temporary piezometers and ground level elevations for hand auger boring locations. This information will be used to determine the shallow groundwater flow direction and to select locations for permanent wells along the hydrant system. The ground elevation of HP-II locations will also be recorded. This data will be incorporated into the CADD file to allow proper positioning of CS permanent monitoring wells. Depth to groundwater measurements in temporary piezometers installed in hydropunch borings at all three sites will be used to establish the local groundwater flow direction.

Topographic Survey No. 2

This final topographic survey will confirm the top of casing and ground elevations at permanently installed monitoring wells for all three investigative areas. This information will be incorporated into CADD files for accurate determination of contaminant plume boundaries and groundwater flow directions.

All topographic surveys will be performed by a Georgia registered surveyor and tied to the State Plane Coordinate System with elevations referenced to the National Geodetic Vertical Datum (NGVD) of 1929.

4.3 Subsurface Investigation

Soil and groundwater samples will be collected at the three study sites to assess the potential extent and magnitude of subsurface contamination. A summary of hand auger borings, HP-II water samples, and permanent monitoring wells scheduled for installation at each facility is provided in **Table 4-1**. One soil sample will be collected from each hand auger, HP-II, and monitoring well location for chemical analysis. This soil sample will be collected from the zone having the highest organic vapor analyzer (OVA) reading. Details for soil sample collection, handling, and analysis are provided in the GDAP, CDAP, and following sections.

Table 4-1
Proposed Subsurface Samples by Site

Study Site	Hand Auger (Soil Sample)	HP-II (Grab Groundwater Sample)	Monitoring Well (Soil and Groundwater Sample)
Building 728	80	50	30
Building 710	8	10	6
Building 133	10	15	6

4.3.1 Hand Augering

Eighty (80) hand auger borings are planned for the Building 728 location and associated pipelines. Soil will be sampled on 0.5 foot intervals to a maximum depth of 7 feet bls. The hand auger borings will extend approximately 0.5 foot into the saturated zone. The soil sample having the highest OVA reading will be retained for analysis from each hand auger boring. The soil sample from the soil/groundwater interface will be analyzed if no elevated OVA readings exist. The hand auger locations will be based on the results of the geophysical survey, the 1941 pipeline location diagram, and the aerial photogrammetry survey. An initial spacing of approximately 100 feet along the hydrant pipelines was selected to comply with EPD line closure guidelines. Soil headspace readings and laboratory results will be used to select HP-II and permanent monitoring well locations.

Eight hand auger borings are planned for the Building 710 location. Ten hand auger borings are planned for the Building 133 location. Hand auger borings will be placed at these buildings to confirm the effectiveness of recent soil removal activities. Final placement of the borings will be at the discretion of the field manager based on site limitations, such as utilities.

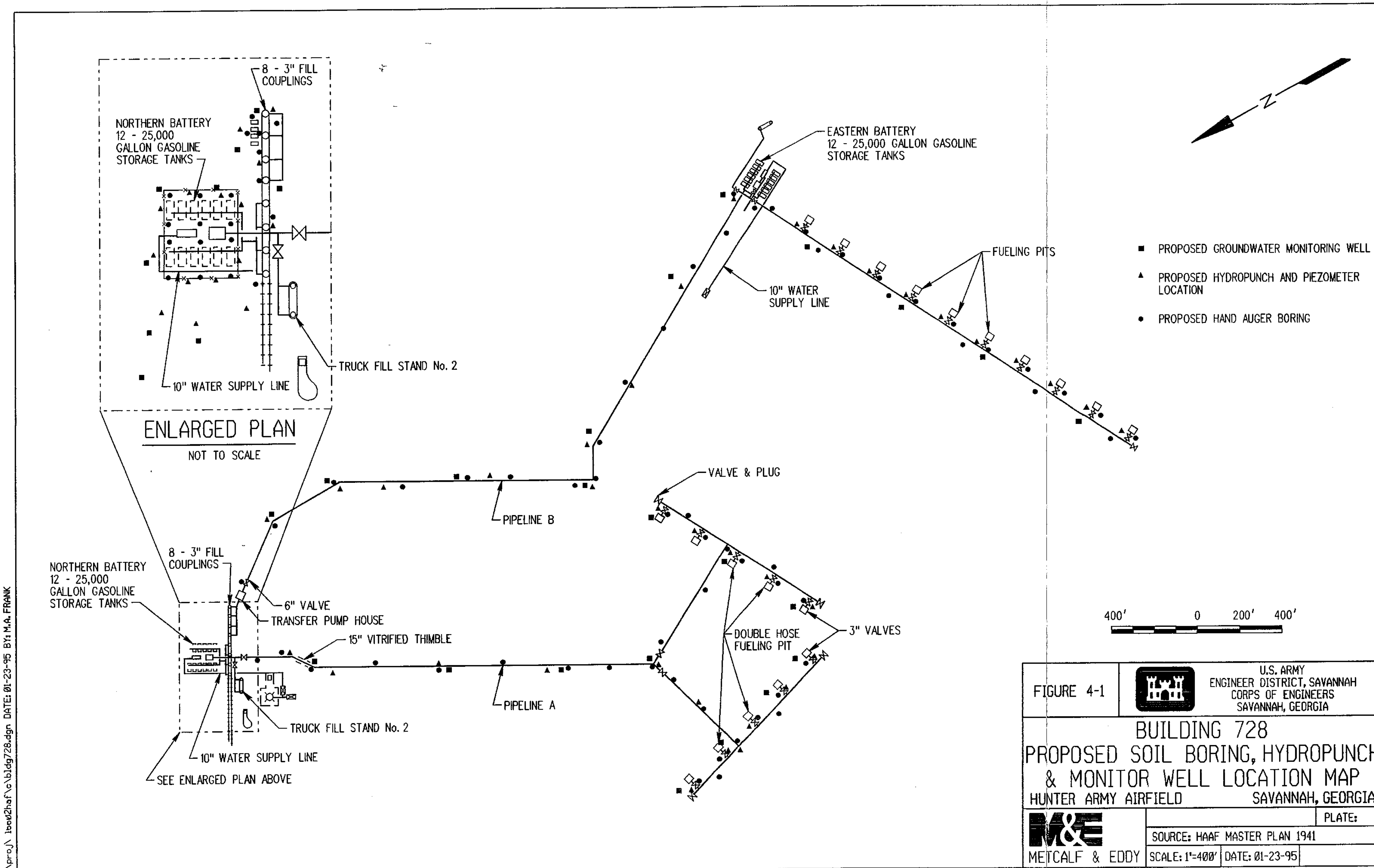
4.3.2 Hydropunch II (HP-II) Water Sample Collection

Fifty HP-II samples are planned for the Building 728 location and associated pipelines. The placement of the sample locations will be based on the results of the GPR survey. Ten HP-II samples are planned for Building 710, and 15 HP-II samples are planned for Building 133. The location of these HP-II samples will be selected to provide maximum areal coverage of the potentially contaminated zone at each site. A temporary piezometer will be installed in each HP-II location for the collection of basic groundwater flow information.

4.3.3 Monitoring Well Installation

Monitoring wells will be placed upgradient, downgradient, and within the limits of contamination at each site. Data obtained from the hand auger borings and HP-II groundwater samples will guide well placement. Final placement of the monitoring wells will be based on field conditions and field gas chromatographic screening of HP-II samples.

Thirty monitoring wells will be installed at the Building 728 location and associated pipelines. Proposed monitoring well locations are shown in **Figure 4-1**. These locations



p:\proj\1bo02haf\c\bldg728.dgn DATE: 01-23-95 BY: M.A. FRANK will provide groundwater quality and groundwater flow direction information. Wells will also be used to assess potential contaminant migration from the couplings and pump systems of the pipelines.

Monitoring wells will also be installed at Buildings 710 and 133 as required for confirmatory sampling. The wells will be placed to assess groundwater quality upgradient and downgradient of the confirmed spill areas. This placement will determine if contamination has migrated beyond previously identified plume boundaries. The proposed monitoring well locations for Buildings 710 and 133 are shown in **Figures 4-2 and 4-3**, respectively.

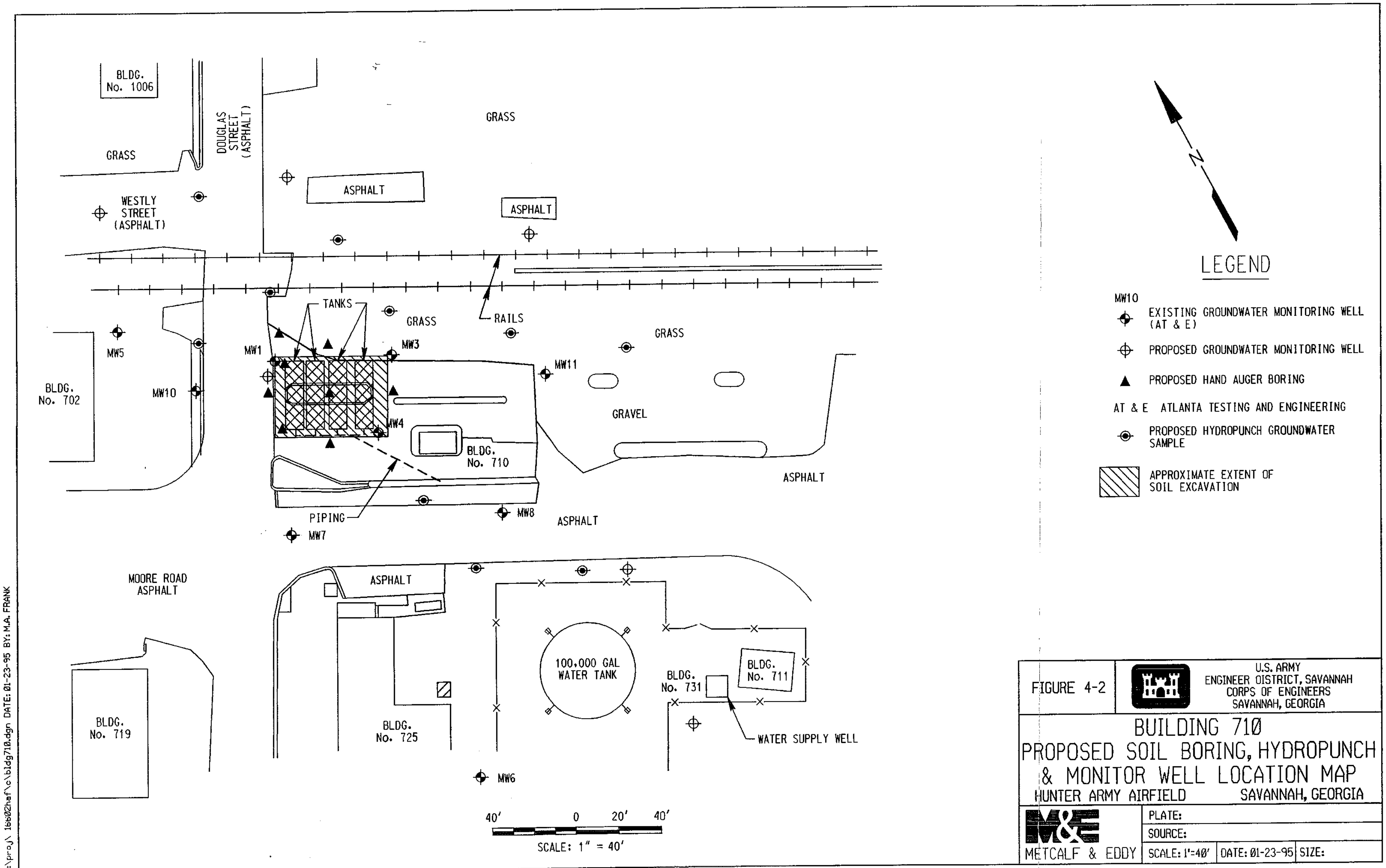
All monitoring wells will be screened in the first water-bearing zone located in the unconfined shallow aquifer. The screened interval will be determined at the time of well installation.

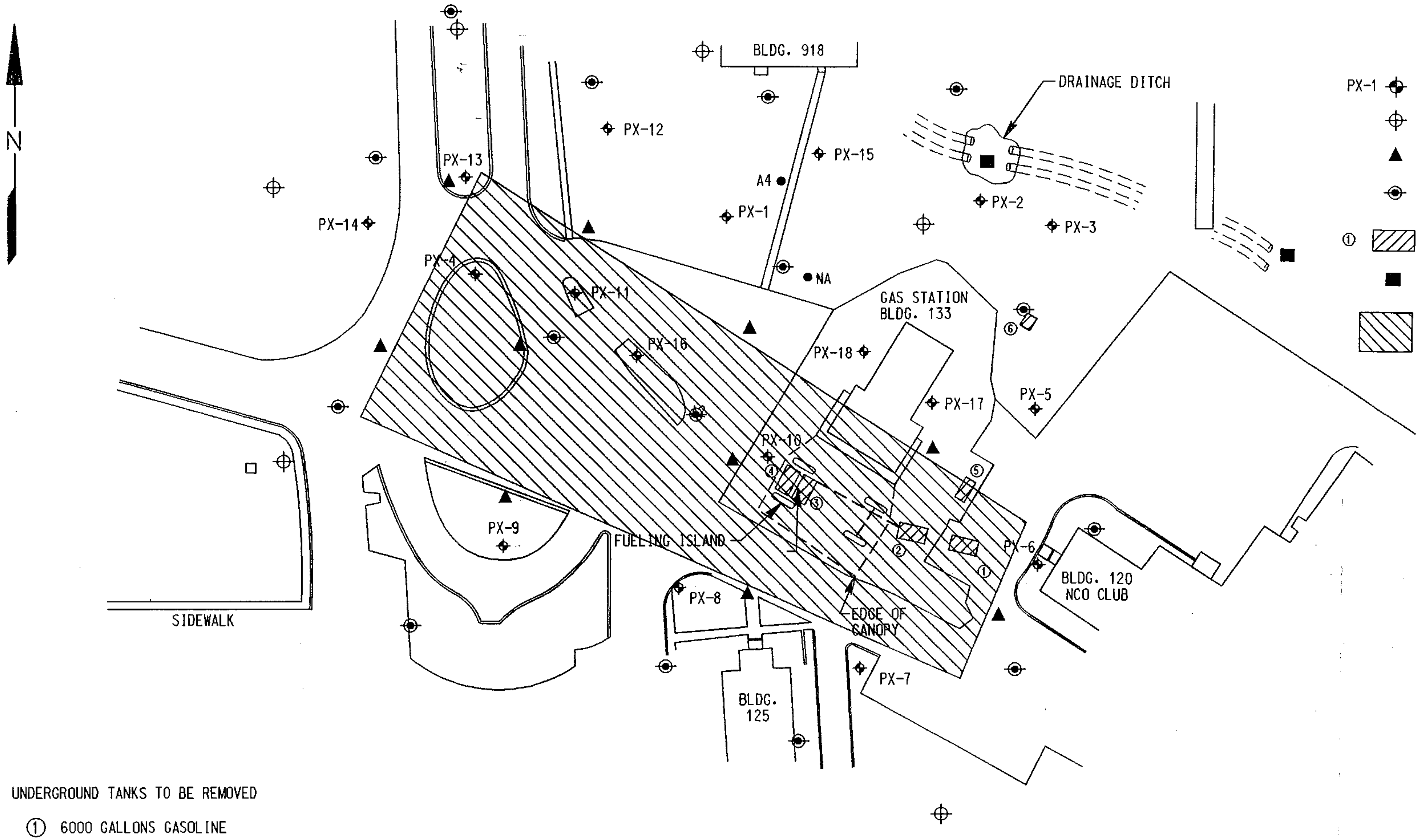
The direction of groundwater flow at each site will be verified following monitoring well installation. The depth to static water level will be measured, and the monitoring wells will be surveyed for both elevation and location. This data will be used to assess the contaminant dispersion in the water table zone and any potential migration to downgradient receptors.

Following the installation of each monitoring well, one groundwater sample will be collected and sent to the laboratory for a full analysis of the suspected contaminants of concern specified in the scope of work. Monitoring well installation procedures, sampling collection techniques, and sample analytical parameters are detailed in the GDAP and/or CDAP.

4.4 Sediment and Surface Water Sampling

Sediment and surface water samples will be collected from the storm drain system located north of Building 133 and analyzed for potential hydrocarbon contaminants. Samples will be collected upstream and Building 133 at the open area located north of the former gas station. The proposed surface water and sediment sampling locations are provided on **Figure 4-3**.


BLDG. No. 1006
GRASS
DOUGLAS STREET (ASPHALT)
WESTLY STREET (ASPHALT)
ASPHALT
ASPHALT
GRASS
TANKS
GRASS
RAILS
GRASS
MW1
MW3
MW5
MW10
MW11
BLDG. No. 702
MW4
GRAVEL
BLDG. No. 710
ASPHALT
PIPING
MW8
ASPHALT
MW7
MOORE ROAD ASPHALT
ASPHALT
100,000 GAL WATER TANK
BLDG. No. 731
BLDG. No. 711
WATER SUPPLY WELL
BLDG. No. 719
BLDG. No. 725
MW6
40' 0 20' 40'
SCALE: 1" = 40'
N
LEGEND
MW10
EXISTING GROUNDWATER MONITORING WELL (AT & E)
PROPOSED GROUNDWATER MONITORING WELL
PROPOSED HAND AUGER BORING
AT & E ATLANTA TESTING AND ENGINEERING
PROPOSED HYDROPUNCH GROUNDWATER SAMPLE
APPROXIMATE EXTENT OF SOIL EXCAVATION
FIGURE 4-2
U.S. ARMY ENGINEER DISTRICT, SAVANNAH CORPS OF ENGINEERS SAVANNAH, GEORGIA
BUILDING 710
PROPOSED SOIL BORING, HYDROPUNCH & MONITOR WELL LOCATION MAP
HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA
METCALF & EDDY
PLATE:
SOURCE:
SCALE: 1"=40'
DATE: 01-23-95
SIZE:
p:\proj\16602haf\c\bldg710.dgn DATE: 01-23-95 BY: M.A. FRANK



LEGEND

- PX-1 MONITORING WELL 2"
- PROPOSED GROUNDWATER MONITORING WELL
- PROPOSED HAND AUGER BORING
- PROPOSED HYDROPUNCH GROUNDWATER SAMPLE
- ① UNDERGROUND TANK WITH NUMBER
- PROPOSED SURFACE WATER AND SEDIMENT SAMPLE
- APPROXIMATE EXTENT OF SOIL EXCAVATION

UNDERGROUND TANKS TO BE REMOVED

① 6000 GALLONS GASOLINE

② 6000 GALLONS GASOLINE (ABANDONED PRIOR TO 1990)

③ 6000 GALLONS GASOLINE

④ 6000 GALLONS GASOLINE

⑤ 4000 GALLONS GASOLINE

⑥ 1000 GALLONS WASTE OIL (APPROXIMATE SIZE)

60' 0 30' 60'

SCALE: 1" = 60'

FIGURE 4-3

U.S. ARMY
ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

BUILDING 133
PROPOSED SOIL BORING, HYDROPUNCH & MONITOR WELL LOCATION MAP

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

METCALF & EDDY

PLATE:

SOURCE:

SCALE: 1"=60' DATE: 01-23-95 SIZE:

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4.5 Water Supply Well Sampling

One water sample shall be collected from the drinking water supply well that is located approximately 170 feet southeast of the former tank location at Building 710. The location of the water supply well is provided on **Figure 4-2**. The water sample will be analyzed for volatile and semi-volatile organic compounds and if concentrations exceed the method detection limits the well will be resampled. The USACE project manager will be notified immediately if contamination is identified in the potable water sample.

4.6 Well Survey

Coordinates and elevations will be established for each monitoring well and borehole by a registered surveyor, licensed in the State of Georgia. The coordinates will be to the closest 1.0 foot and referenced to the State Plane Coordinate System. If the State Plane Coordinate System is not readily available, an existing local grid system will be established. A permanent survey mark (control point) will be scribed on the top of each monitor well riser casing (TOC). Ground elevations to the closest 0.1 foot and an elevation on the top of the well riser casing to the closest 0.01 foot, will be determined for each well. Elevations will be referenced to the NGVD of 1929. The location, identification, coordinates, and elevations of the wells and monuments will be plotted on maps with a scale large enough to show their location with reference to other structures at the individual sites.

4.7 Potable Well Survey

A review of potable well information will be conducted prior to beginning the field work. A drive-by field survey (windshield survey) of each potable well located within 1,500 feet of the study sites will be conducted. Attempt will be made to obtain geologic and well construction logs and yield/supply rate data for each well. This data will be presented in the Phase I RI Report for Building 728.

SECTION 5.0

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The investigation at the HAAF is being conducted in order to assess the potential nature and extent of soil and groundwater contamination related to the three study areas covered in this work plan. The investigations will be conducted in accordance with EPD protocols. The data collected and analyzed will be compared to ARARs. The specific ARARs for compounds detected will be developed after the Phase I SI field activities for Building 728 have been completed and will be presented in the SI report. These ARARs will be used to determine screening criteria, the potential need for remediation and possible cleanup goals. ARARs for Buildings 710 and 133 have been developed based on previous investigative reports and laboratory analyses. The criteria for the development of ARARs for the evaluation of groundwater, surface water, and soils/sediments are presented below.

5.1 Evaluation of Groundwater and Surface Water

Maximum contaminant levels (MCLs) have been federally promulgated under the Safe Drinking Water Act (SDWA). MCLs are enforceable standards which were established for drinking water purposes, and they are applied to contaminants in groundwater as well as surface water. MCLs were derived for protection of public health and consider technical and economic feasibility.

The State of Georgia Department of Natural Resources, Environmental Protection Division (EPD) Health has promulgated in-stream water quality standards. These state surface water standards are health based criteria used to determine if contamination exists and may be applied as cleanup goals. Typically surface water standards are less stringent than the MCLs. For sites with more than one groundwater or surface water contaminant, site-specific risk-based cleanup goals may be derived to account for cumulative effects.

The parameters to be analyzed in groundwater include purgeable organics (EPA Method 8020), polynuclear aromatic hydrocarbons (PAHs, EPA Method 8100), and priority pollutant metals (EPA Methods 6010, 7421, 7740, and 7060). Once data become available, all compounds detected in groundwater and surface water will be compared to MCLs and State groundwater and surface water standards where they exist.

5.2 Evaluation of Soils/Sediments

Soils and sediments will be analyzed for the same constituents as groundwater - purgeables, PAHs, and priority pollutant metals. The EPD has established soil target cleanup levels for total BTEX (the sum of benzene, toluene, ethyl benzene, and xylene) and PAH concentrations in soil at UST locations. The allowable levels are dependent upon the distance between the plume and drinking water withdraw points. In general, enforceable regulatory standards have not been promulgated for these constituents in sediments.

Screening criteria often used by regulatory agencies (federal and state) include 100 times the MCL, 20 times the toxicity characteristic leaching procedure (TCLP) limit, and proposed RCRA action levels for soil. TCLP limits apply to laboratory generated leachate. Applying a factor of 20 times the TCLP limit serves as a guide to determining if the actual soil concentration could potentially leach and exceed extract limits. (This is based on the dry weight of the solid extracted and the amount of the extraction fluid, which is a 1:20 ratio.) Action levels have been proposed for solid waste management units (SWMUs) at hazardous waste management facilities (FR30798, Vol. 55, No. 145, July 27, 1990.), and they are currently scheduled to be finalized in June 1995. These levels may be applied to soil/ sediments. Once data become available, all compounds detected in soils and sediments will be compared to regulatory criteria where available and soil screening levels.

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SECTION 6.0
DRILLING PROGRAM

The purpose of the subsurface investigation is to investigate the nature and extent of soil and groundwater contamination from the USTs and associated pipelines. A drilling program has been designed to fulfill this objective. A Geotechnical Data Acquisition Plan (GDAP) has been prepared as a subplan (Appendix C) to this Work Plan. Details of drilling methods, decontamination procedures, and sampling methods are provided in the GDAP.

6.1 DRILLING METHODS

M&E proposes the use of shallow hand-augered soil borings, HP-II soil borings, and the use of hollow stem auger (HSA) drilling techniques to collect soil and groundwater samples. The specific methods proposed to collect the different media type samples are discussed below.

6.1.1 Hand-Augered Soil Borings

Hand-augered soil borings will be advanced at each site by manually rotating a 3-1/4-inch diameter stainless steel bucket auger to a depth of approximately 0.5 feet below the ground water table. Soil samples will be collected continuously in 0.5-foot increments. Field headspace tests will be conducted on each sample. Selected samples will be retained for chemical analysis. All hand-augered borings will be backfilled with cement grout per Georgia EPD requirements. All surface concrete/asphalt removed to access each location will be replaced during boring abandonment.

Complete hand-augered soil boring methods and chemical analysis requirements are provided in the GDAP and CDAP, respectively.

6.1.2 Hydropunch II (HP-II) Sampling

The Hydropunch II (HP-II) sampling tool is designed to collect discrete groundwater samples without the installation of permanent wells. The HP-II is designed to be pushed or driven into the aquifer either from the ground surface or from the bottom of a drilled borehole. Typically this is accomplished by using a drill rig or a cone penetrometer rig. The HP-II utilizes an air-tight and water-tight sealed intake screen and sample chamber which is isolated from the surrounding environment as the tool is advanced. The HP-II is used in groundwater sampling when a sample can be collected from 5 feet or more below the top of the water table. A lower check valve with an attached filter screen is inserted in the bottom of the tool and an upper check valve is placed in the top of the body. A disposable point is inserted into the drive shoe. The tool is pushed or driven into the undisturbed soil to the desired sampling depth from the surface. The body of the tool is then pulled back about 2 feet. Soil friction holds the drive cone in place. Once the O-ring seal on the cone is broken, groundwater flows into the open end of the HP-II through the intake screen, past the lower check valve, into the sample chamber, and finally out the upper check valve. When open, the HP-II fills from the bottom with no aeration and minimal agitation of the sample. When the tool is full, the sample is collected by pulling the tool toward the surface. This increases the hydrostatic pressure within the tool, closing the two check valves. At the surface, the HP-II is inverted and the sample is decanted through an upper discharge valve and tubing into a sample container. Complete HP-II methods and chemical analysis requirements are provided in the GDAP and CDAP, respectively.

6.1.3 Monitoring Well Drilling

A HSA drill rig will be used to advance soil borings intended to be completed with permanent groundwater monitoring wells. The hollow stem of the auger will be used for continuous sampling of soil material. Field headspace tests will be conducted on each sample and selected samples will be retained for chemical analysis. The casing and screen for the well will be placed through the augers when termination depth is reached. The filter pack, seal, and grout will be placed as the augers are withdrawn. The well will be completed with a well pad and flush mounted, protective cover. Complete details of drilling methods for monitoring well installation are provided in the GDAP.

6.2 SITE SELECTION RATIONALE

The quantity of hand-augered soil borings, HP-II samples, and monitoring wells are detailed in the USACE Scope of Work. The following sections provide rationale for the distribution of each sample type over the investigation area.

6.2.1 Building 728 and Airfield Hydrant System Site Investigation

The proposed hand-augered soil borings, HP-II borings, and monitoring well locations are depicted on **Figure 4-1**. A total of 80 soil borings, 50 HP-II samples, and 30 monitoring wells are planned.

Twenty soil borings will be drilled within the Building 728 site to determine the extent of soil contamination in this area. These borings will be located around the UST farm, near the location of the four tanks next to Building 728, in the truck stand areas located east of the Building 710 site, and along the pipelines. Sixty borings will be completed along the pipelines to determine if contamination exists in that area. The borings will be placed at approximately 100-foot intervals, at couplings or elbows, or at any similar structures in the pipelines where leaks could occur. Based upon the data gathered during the drilling of the soil borings, 50 HP-II samples will be collected for chemical analysis and groundwater depth data.

After interpretation of all data from samples obtained during the soil and HP-II borings, 30 monitoring wells will be installed to determine the nature and extent of groundwater contamination.

6.2.2 Building 710

The proposed hand-augered soil borings, HP-II borings, and monitoring well locations are depicted on **Figure 4-2**. A total of 8 soil borings, 10 HP-II samples, and 6 monitoring wells are planned. Eight soil borings will be drilled to determine the effectiveness of the previous excavation completed during the UST removal. The borings will be located in and around the former location of the four tanks next to Building 710. Based upon the data gathered during drilling of the soil borings, 10 HP-II samples will be collected for chemical analysis and groundwater depth data.

A total of 6 wells will be installed to replace wells destroyed during tank removal. Specifically, one well will be located near the former MW-1 location and one well will be located upgradient for use as a background well. The remaining wells will be located based on data collected in previous investigations to determine the nature and extent of groundwater contamination.

6.2.3 Building 133

The proposed hand-augered soil borings, HP-II borings, and monitoring well locations are depicted on **Figure 4-3**. There are a total of 10 soil borings, 15 HP-II samples, and 6 monitoring wells planned.

Ten soil borings will be drilled to determine the success of the plume excavation completed during the UST removals. The borings will be located within and around the area of excavation at the Building 133 site. Based upon the soil boring data, 15 HP-II samples will be collected for chemical analysis groundwater depth data. After interpretation of all data from samples obtained from the soil borings, HP-II samples, and existing wells, 6 new monitoring wells will be installed to determine the nature and extent of groundwater contamination. Additionally, two surface water and sediment samples will be collected from the storm drain system at the site. One sample will be taken upstream and one at the open area located north of the former gas station.

6.3 GROUNDWATER MONITORING WELLS

Forty-two permanent groundwater monitoring wells will be constructed during these investigations. The wells will be set at approximately 12 to 15 feet below land surface. Each monitoring well location will be used to collect potentiometric surface and chemical quality data. Details of well construction and development procedures are provided in the GDAP. A summary of well construction and development procedures are provided in the following sections.

6.3.1 Well Construction

Each groundwater monitoring well will be constructed of 2-inch inside diameter (ID) PVC. The solid PVC casing will be equipped with flush threads and O-rings, thereby avoiding the use of solvent glues. Each screen section will consist of a 10-foot length of 0.01-inch slotted screen. The well casing and screen sections will be equipped with a centralizer to assure uniform placement of the filter media (fine sand). A 20/30 grade filter sand pack will be placed surrounding the screen section of the well. The filter sand will continue approximately 2 feet above the screen section. A 2-foot thick bentonite pellet seal will be placed above the sand to limit the vertical migration of fluids in the bore hole. A grout slurry containing at least 5 percent bentonite powder will be placed in the borehole using a tremie tube. The grout slurry will extend from the bentonite pellet seal to the surface. Each well will be finished in a flush mounted, steel protective casing and set in a concrete form. Wells installed in paved areas will be designed to bear the load of traffic. Each well will be equipped with a locking, waterproof cap. A tag providing details on its construction, casing elevation, and related data will also be installed within the manhole. Both a well construction log and a geologic log will be prepared for each monitoring well location.

6.3.2 Well Development

Each well will be developed after allowing a period of not less than 48 hours to pass after installation. The wells will be developed by bailing or overpumping to remove sediments from the sand filter pack. Each well will be developed until groundwater removed from the well is essentially free of sediment. Three consecutive temperature, pH, and conductivity readings (within 10 percent of each other) will demonstrate proper development. All development water will be containerized on site for subsequent sampling and disposal. Complete well development procedures are outlined in the GDAP.

6.4 DECONTAMINATION PROCEDURES

Proper field decontamination procedures are essential to assure the safety of on-site personnel and the chemical representativeness of soil and groundwater samples. Complete details of decontamination procedures for drilling equipment and sampling equipment are provided in the GDAP and also in the CDAP. Details of procedures for the decontamination of personnel and monitoring equipment are provided in the Health and Safety Plan. All decontamination fluids will be collected and stored in DOT-approved containers for subsequent sampling and disposal.

6.5 SITE SURVEY

The locations of the pipelines, all borings, HP-II installations, and monitoring wells shall be surveyed by a licensed professional surveyor. Hoffman and Company has been retained to conduct a survey of these locations. This survey will provide coordinates of all sampling locations referenced to the National Plane Coordinate System. Elevations shall be referenced to the NGVD of 1929.

Elevation of natural ground surface shall be surveyed at every sampling location to the closest 0.1 foot. In addition, the top of casing elevation shall be determined to the closest 0.01 foot for each well. Coordinates and elevations shall be surveyed using nearby U.S. Geological Survey benchmarks.

SECTION 7.0
SAMPLING STRATEGY

Ninety-eight soil samples will be obtained from the soil borings, and 75 groundwater samples will be obtained from the hydropunch borings. Forty-two soil and 42 groundwater samples will be obtained from newly installed monitoring locations. One soil sample will be collected from each well boring for geotechnical testing using standard ASTM methods. Soil and groundwater analytical parameters are specified in the CDAP and GDAP.

M&E has prepared a site-specific CDAP in accordance with appropriate provisions of ER 1110-1-263, "Chemical Data Management for Hazardous Waste Remedial Activities," 1 October 1990. The CDAP is submitted as a subplan (Appendix B) of this Work Plan. The CDAP provides a detailed account of soil and groundwater analytical methods, sampling types, sample quantities, and sampling acquisition and handling procedures. Chemical data quality objectives (DQOs) are also provided in the CDAP. Laboratory chemical testing shall meet a minimum of Level III requirements for this investigation. Field measurements will be taken consistent with Level I or II field quality control activities.

7.1 SOIL SAMPLING

Soil samples will be collected from all power rotary borings in accordance with ASTM Method D 1586 (penetration test and split barrel sampling of soils). Soil samples will be obtained continuously and field inspected with an OVA. Each soil sample will be logged consistent with guidance provided in USACE EM 1110-7-XX(FR) (Draft). The USCS will be used to describe physical characteristics of each sample. All logs will be prepared on USACE Form 1836. Approximately six soil samples will be collected from each monitoring well location, assuming an average depth of 15 feet at each well boring and approximately 14 soil samples will be collected from each soil boring, assuming an average depth of 7 feet at each soil boring. Soil samples retrieved from the boring locations will be continuously screened using a FID. The FID will be able to detect parts per million levels of volatile organic compounds (VOCs) in the soil headspace. One sample from each boring will be submitted for laboratory analyses based on FID readings. Samples collected from monitoring well locations will be analyzed for parameters detailed in the CDAP. If no elevated OVA readings are observed from soil headspace sampling, a sample will be obtained at the soil-water table interface. One soil sample will also be collected for geotechnical analysis at each proposed well location. Details of sampling methods are provided in the GDAP. Laboratory analytical parameters and quality assurance/quality control measures are provided in the CDAP.

7.2 GROUNDWATER SAMPLING

A total of 128 groundwater samples will be collected during these investigations. The groundwater samples will be collected from newly-installed permanent groundwater monitoring wells (42), existing groundwater monitoring wells (10), HP-II locations (75), and one water supply well during the investigations. Also quarterly monitoring of wells at the Building 710 and 133 sites will be undertaken at the conclusion of the investigations. Details of the sample collection method are provided in the CDAP. Samples from the groundwater wells and HP-II locations will be analyzed for parameters detailed in the CDAP.

7.3 SURFACE WATER AND SEDIMENT SAMPLING

Two surface water and sediment samples will be collected from the storm drain system at the Building 133 site. The samples will be analyzed for parameters detailed in the CDAP.

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SECTION 8.0
REPORT STRUCTURE

Three separate reports will be required under the performance of this delivery order. These reports will summarize the Site Investigation (SI), Confirmatory Sampling (CS), and Quarterly Monitoring (QM) data collected during the investigations. Data collected in conjunction with the Building 728 investigation will be summarized in a Phase I SI report. Information obtained during the CS at Buildings 710 and 133 will be summarized in site-specific Completion Reports in accordance with the CAPs. Quarterly monitoring reports will also be prepared for a 1-year period at Buildings 710 and 133. The formats of both Completion Reports and Quarterly Monitoring Reports were approved by EPD in the CAPs for these two sites and are summarized herein.

8.1 BUILDING 728 PHASE I SI REPORT

A Phase I SI Report will be prepared in accordance with EPD, USEPA, and USACE requirements upon completing the field investigation. The report will be structured with an executive summary, site background, and environmental setting section which will address general information identified during the field investigation. More detailed hydrant system and UST investigation data associated with Building 728 will be presented. This information will include: descriptions of investigations performed, contaminants identified, laboratory results, potential migration pathways, exposure pathways, action levels where contaminants of concern are identified, possible clean-up standards where applicable, and conclusions and recommendations. Included in the Phase I SI Report will be site maps showing the hydrant and storage tank system and the USACE's QA Lab Report.

Detailed scale site maps showing general topography; hand auger, hydropunch, and monitoring well locations, surface drainage courses, etc. will be provided where appropriate to illustrate site conditions. Potentiometric and contaminant concentration maps will also be prepared to illustrate groundwater flow directions and contaminant gradients at the facility.

Geologic soil boring logs, monitoring well construction logs, and development records will be presented in an appendix to the Report. Geologic cross-sections, where applicable, will be prepared using data collected from this investigation and previous investigations. Soil and groundwater chemical analyses will be presented in tabular form. Photocopies of chemical data reports and data validation summaries will be presented in appendices. Both topographical and aerial photographs will be obtained and presented in appendices to document current and past utilization of the property. Geophysical and topographic survey data will be summarized in the report using appropriate tables and graphs.

In addition to the above-mentioned items, all data collected during the investigation will be evaluated for completeness and usability with respect to the project's DQOs. A determination of how the data validates the conceptual site model in both quality and quantity will be presented. Chemical data invalidation reports (QCSR) will also be submitted in the Phase I SI Report.

Any potential or documented pathways of migration or exposure to human health risk will be identified. A qualitative assessment of the fate and transport of detected contaminants will be presented. The qualitative assessment will include a limited evaluation of the potential for health and environmental impacts at each potential exposure area. Future recommendations for continued assessment required at the site will be presented.

The identification of action levels and media clean-up standards will be based on ARARs and the evaluation of chemical fate, transport, and exposure data. Any media clean-up standards or points of compliance that would require the development of remediation activities for compliance to federal, state, or local statutes will be identified. An evaluation of the action levels and criteria for further action will be prepared.

A recommendations and conclusions section will provide an overall analysis of the data, site characteristics, and probable impacts. Recommendations for each specific area of the hydrant system and associated fuel storage areas will be presented.

8.2 COMPLETION REPORTS, BUILDINGS 710 AND 133

Site-specific completion reports will be prepared and submitted for Buildings 710 and 133 following confirmatory sampling. The CRs will meet the requirements specified in the CAPs (Chapters 7 and 8) for each site. A section of each CR will be a summary of the engineering remediation report that will be prepared by contractors currently working with the USACE. This information will be forwarded to Metcalf & Eddy (M&E) upon the completion of remediation efforts. The draft, pre-final, and final CRs will be prepared and submitted to USACE for review and approval. All M&E responses to USACE review comments will be submitted to the USACE 1 week prior to the pre-final and final CR due dates.

The format of the CRs, adapted from the CAPs for each site, are as follows:

- 1.0 Summary of Remedial Activities
    - 1.1 Tank Removal
    - 1.2 Soil Excavation and Product Removal
    - 1.3 Phase-Separated Product Recovery and Disposal
- 2.0 Confirmatory Sampling and Analysis
    - 2.1 Sample Collection
    - 2.2 Analytical Results
- 3.0 Conclusions
- 4.0 Recommendations

The text of the CRs will be supported by using scaled maps showing the site location, general topography, above- and below-ground utilities, hand auger/HP-II/monitoring well locations, drainage patterns, potentiometric maps with groundwater flow directions, soil contamination and groundwater plume maps, and two geologic cross-sections. All confirmatory sampling locations will be identified on maps. Well development records, boring logs, and monitoring well construction details and logs will be provided in appendices to the CRs. Appropriate tables and graphics will be used to summarize topographic survey and soil and groundwater quality data.

M&E will also conduct a limited Health and Environmental Impact Assessment using data obtained during the confirmatory sampling. A brief assessment of exposure, toxicity, and risk associated with the chemicals identified in samples will be provided. Contaminant fate and transport will also be discussed for each potential pathway identified during the investigation.

All data collected or generated during the investigation will be evaluated for completeness and meeting the requirements of the DQOs. This data will be used to identify action levels and media cleanup standards for contaminants of concern. Any points of compliance identified during the investigation will be summarized in the CR.

8.3 QUARTERLY PROGRESS REPORTS, BUILDINGS 710 and 133

Quarterly progress reports (QPRs) will be prepared following each quarterly monitoring event at Building 710 and Building 133. The table of contents for the QPRs will consist of the following items:

1.0 Summary
- 1.1 Activities
- 1.2 Results

2.0 Liquid Levels and Groundwater Flow

3.0 Groundwater Quality
- 3.1 Sample Collection
- 3.2 Analytical Results

4.0 Planned Actions

The QPRs will contain maps showing water table elevations and contours, sample locations and concentrations, and hydrographs for selected wells. Analytical reports will be provided in appendices with a tabular summary presented in the body of the QPR.

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SECTION 9.0

PROJECT ORGANIZATION AND RESPONSIBILITIES

An organization chart is presented in **Figure 9-1** that shows key personnel and their responsibilities. M&E's technical staff will work under the direct supervision of the USACE-SAV Project Manager. The Project Manager will provide technical coordination with the USACE Project Manager.

The USACE Project Manager, Brent Rose, will be the main USACE contact for the Phase I SI, CR, and QM program and will oversee all contractual matters in consultation with the M&E Project Manager. Toni Nicholson will be the USACE contact person for technical issues. The USACE will coordinate this study with regulatory agencies and will provide right-of-entry for all properties.

The following key M&E personnel will have project responsibilities as outlined below:

The M&E Quality Assurance Officer will be Gregg Mooney, P.E., a senior technical specialist who maintains regional oversight responsibilities. Mr. Mooney will report directly to JC Goldman, Jr., P.E., a senior officer in the Company and South Region Manager.

The M&E Deputy Program Manager, J. E. Bentkowski, P.G. will monitor the entire investigation to assure each deliverable meets the USACE's requirements. His familiarity with the scope of work, USACE personnel, and the study site will be utilized to ensure responsive project completion.

The M&E Project Manager, David Wilderman, P.G. will be responsible for coordinating technical activities, preparing the Work Plan, and planning and implementing the field work. In addition, he will oversee the Phase I SI, CR, and QPR Report preparation and provide monthly progress reports. As M&E's Project Manager, he will ensure that the project meets the technical requirements of the DO.

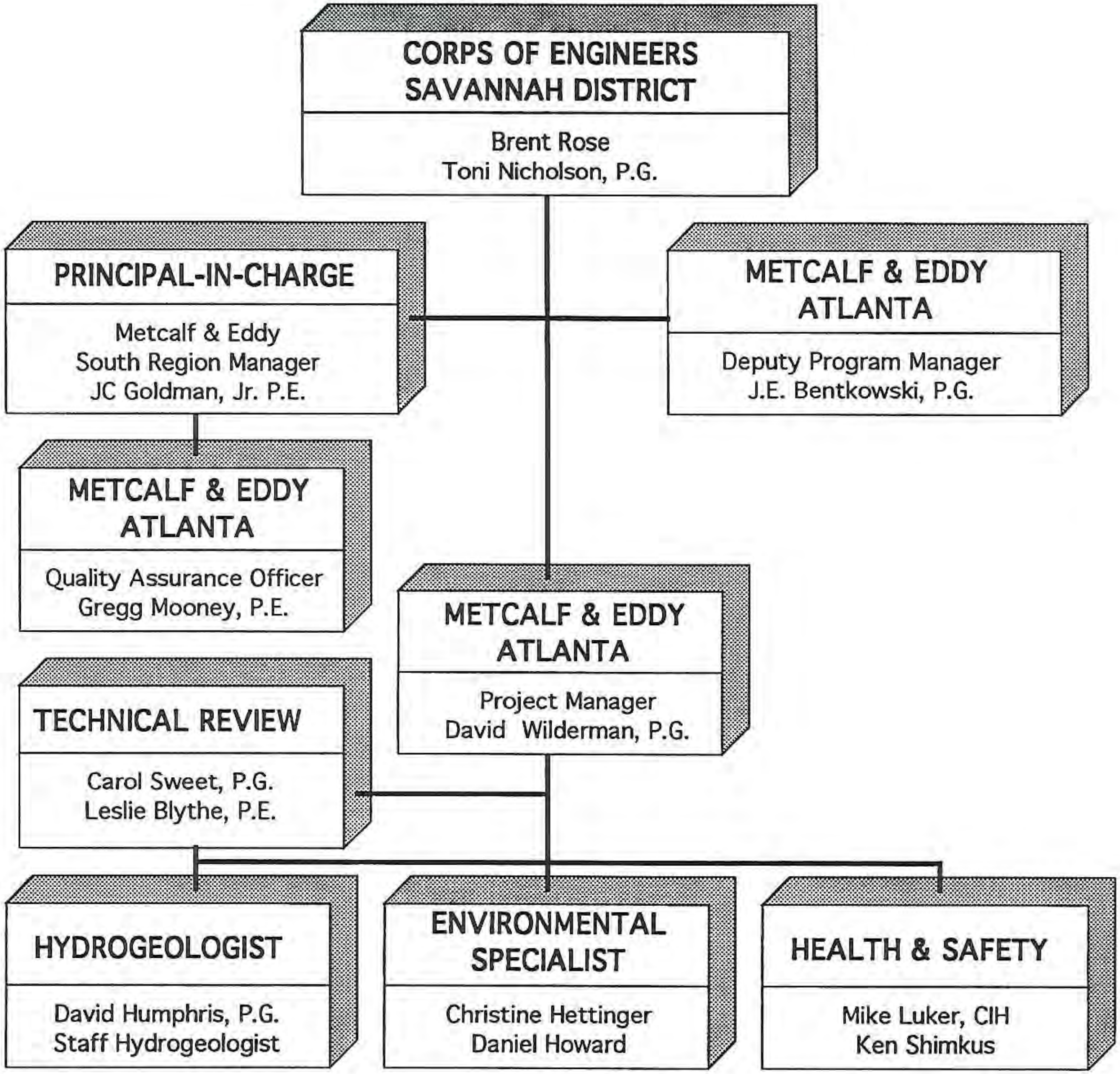

FIGURE 9.1
PROJECT ORGANIZATION CHART
PHASE I SITE INVESTIGATION, CONFIRMATION SAMPLING, AND QUARTERLY MONITORING
HUNTER ARMY AIRFIELD

Technical Review will be provided by a Technical Assistance Team (TAT) chaired by Carol Sweet, P.G. The TAT will review the Work Plan and Final Report to ensure these documents are technically sound and meet the contractual requirements of the DO.

The M&E Environmental Specialist, Christine Hettinger, will prepare the Chemical Data Acquisition Plan (CDAP) and the scope of work for the laboratory subcontract, oversee the validation of analytical data, chemical quality control deliverables, and evaluate analytical data. In addition, she will provide support to the field teams during field sampling activities and coordinate with the subcontractor laboratory.

M&E's Senior Health & Safety Officer, Mike Luker, C.I.H. will review and approve the Health and Safety Plan (HASP) for the SI. Mr. Luker will ensure that an adequate level of personal protection exists for anticipated hazards in the field and will provide daily support to field personnel when required.

The M&E Project Hydrogeologist, David Humphris, P.G. will be responsible for coordinating technical activities, preparing the Work Plan, planning and conducting the field work, and writing the SI report.

Field work for the investigation will be aided by an M&E staff Hydrogeologist and Environmental Scientists and other personnel as required. These staff members will also assist in the SI report preparation.

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SECTION 10.0
REMEDIAL INVESTIGATION SCHEDULE AND PROGRESS CHARTS

10.1 SCHEDULE

A schedule of milestones, calculated as days from receipt of Notice to Proceed (NTP), was specified in the USACEs SOW. Notice to proceed with this project was received September 28, 1994. Milestones which fell on weekends or federal holidays were shifted to the next normal business day. These milestones are presented in **Table 10-1**. A graphic representation (Gantt chart) of the project schedule is provided in **Figure 10-1**. If there are any deviations from the schedule, an updated schedule will be included with the monthly report for that period.

10.2 PROGRESS REPORTS

An alternative way to evaluate the progress of this project is to review the estimated percent complete of the individual tasks. This is done on a monthly basis and outlined in a report submitted to the USACE Project Manager by the 15th of the month. The closing date of the reporting period is Friday of the last complete week of the month.

TABLE 10-1 PROJECT MILESTONE SCHEDULE				
Task No.	**Milestone**	**Estimated Start Date**	**Estimated Completion Date**	**Days After NTP**
1	Description of Current and Historical Conditions	Sept. 28, 1994	Dec. 26, 1994	90
2	SI Work Plan	Sept. 28, 1994	Feb. 14, 1995	140
3	Site Investigation	Feb. 15, 1995	May 15, 1995	230
4	Sample Analysis and Validation	Feb. 16, 1995	June 15, 1995	260
5	Approve Final Reports	Jan. 30, 1996	March 31, 1996	550
6	Meetings and Conferences	Sept. 28, 1994	August 27, 1996	700
7	Disposal of Investigation-Derived Wastes	May 5, 1995	June 10, 1996	633

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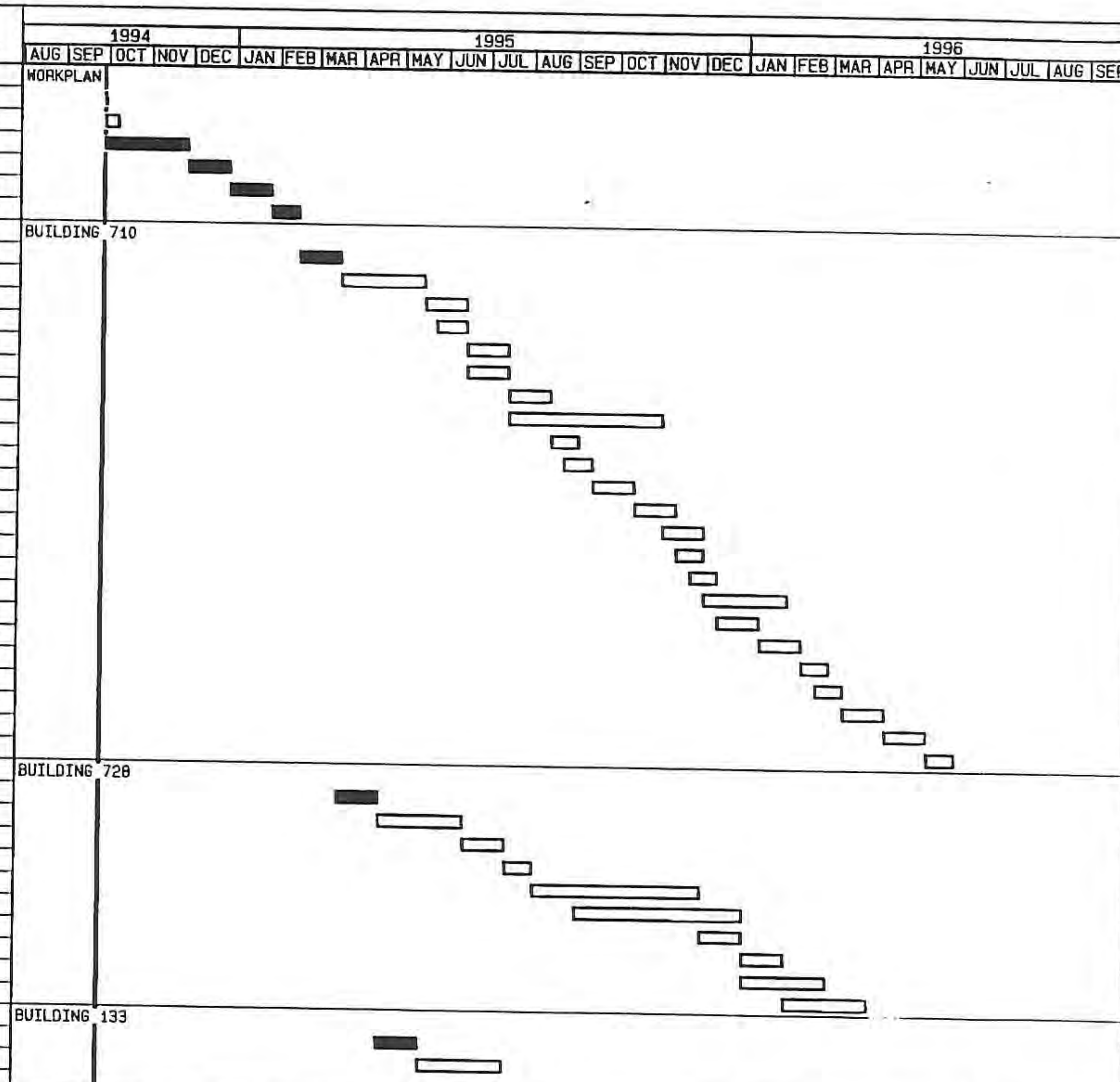
ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	PCT
NOTICE TO PROCEED	28SEP94A	28SEP94A	100
GANTT CHART	28SEP94	7OCT94	0
PRE-FINAL WORKPLAN	28SEP94	26NOV94	0
COE REVIEW PRE-FINAL WORKPLAN	27NOV94	26DEC94	0
FINAL WORKPLAN	27DEC94	25JAN95	0
COE APPROVAL OF FINAL WORKPLAN	26JAN95	14FEB95	0
CS FIELDWORK- BLDG 710	15FEB95	16MAR95	0
DRAFT COMPLETION REPORT-BLDG 710	17MAR95	15MAY95	0
COE REVIEW DRAFT COMPETION REPORT-BLDG 710	16MAY95	14JUN95	0
1ST QTR. MONITORING-BLDG 710	24MAY95	14JUN95	0
DRAFT 1ST QM PROGRESS REPORT (QMPR)-BLDG 710	15JUN95	14JUL95	0
PRE-FINAL COMPLETION REPORT-BLDG 710	15JUN95	14JUL95	0
COE REVIEW 1ST DRAFT QMPR-BLDG 710	15JUL95	13AUG95	0
COE REVIEW PRE-FINAL COMPLETION REPORT-BLDG 710	15JUL95	1NOV95	0
FINAL 1ST QMPR- BLDG 710	14AUG95	2SEP95	0
2ND QTR. MONITORING-BLDG 710	23AUG95	12SEP95	0
DRAFT 2ND QMPR-BLDG 710	13SEP95	12OCT95	0
COE REVIEW DRAFT 2ND QMPR-BLDG 710	13OCT95	11NOV95	0
FINAL COMPLETION REPORT-BLDG 710	2NOV95	1DEC95	0
FINAL 2ND QMPR-BLDG 710	12NOV95	1DEC95	0
3RD QTR.MONITORING-BLDG 710	22NOV95	11DEC95	0
COE APPROVAL FINAL COMPLETION REPORT-BLDG 710	2DEC95	30JAN96	0
DRAFT 3RD QMPR-BLDG 710	12DEC95	10JAN96	0
COE REVIEW 3RD QMPR-BLDG 710	11JAN96	9FEB96	0
FINAL 3RD QMPR-BLDG 710	10FEB96	29FEB96	0
4TH QTR. MONTORING-BLDG 710	20FEB96	10MAR96	0
DRAFT 4TH QMPR-BLDG 710	11MAR96	9APR96	0
COE REVIEW 4TH QMPR-BLDG 710	10APR96	9MAY96	0
FINAL 4TH QMPR-BLDG 710	10MAY96	29MAY96	0
SI FIELDWORK-BLDG 728	17MAR95	15APR95	0
DRAFT SI REPORT-BLDG 728	16APR95	14JUN95	0
COE REVIEW DRAFT SI REPORT-BLDG 728	15JUN95	14JUL95	0
PRE-FINAL SI REPORT-BLDG 728	15JUL95	3AUG95	0
COE REVIEW PRE-FINAL SI-BLDG 728	4AUG95	1DEC95	0
COE REVIEW PRE-FINAL COMPLETION REPORT-BLDG 133	3SEP95	31DEC95	0
FINAL SI REPORT-BLDG 728	2DEC95	31DEC95	0
FINAL COMPLETION REPORT-BLDG 133	1JAN96	30JAN96	0
COE APPROVAL FINAL SI REPORT-BLDG 728	1JAN96	29FEB96	0
COE APPROVAL FINAL COMPLETION REPORT-BLDG 133	31JAN96	30MAR96	0
CS FIELDWORK-BLDG 133	16APR95	15MAY95	0
DRAFT COMPLETION REPORT-BLDG 133	16MAY95	14JUL95	0



Plot Date 8OCT94
Data Date 28SEP94
Project Start 28SEP94
Project Finish 27AUG96

Activity Bar/Early Dates
Critical Activity
Milestone/Flag Activity

HAAF

(c) Primavera Systems, Inc.

COE, SAVANNAH DISTRICT
HUNTER ARMY AIR FIELD
PROJECT SCHEDULE

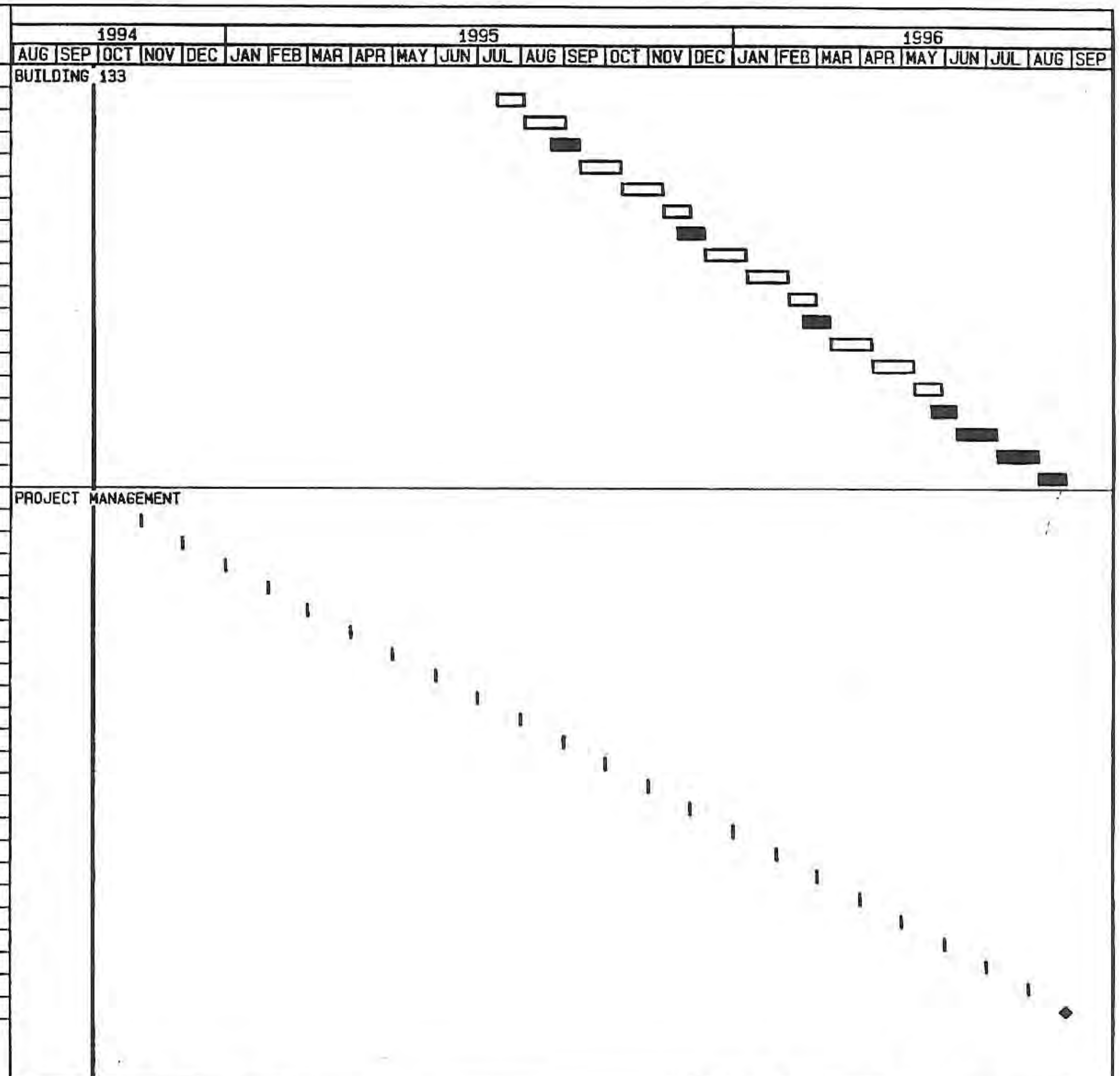
Sheet 1 of 2

METCALF & EDDY

Date	Revision	Checked	Approved

FIGURE 10-1

ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	PCT
BUILDING 133			
COE REVIEW DRAFT COMPLETION REPORT- BLDG 133	15JUL95	3AUG95	0
PRE-FINAL COMPLETION REPORT-BLDG 133	4AUG95	2SEP95	0
1ST QTR. MONITORING-BLDG 133	23AUG95	12SEP95	0
DRAFT 1ST QMPR-BLDG 133	13SEP95	12OCT95	0
COE REVIEW 1ST DRAFT QMPR-BLDG 133	13OCT95	11NOV95	0
FINAL 1ST QMPR-BLDG 133	12NOV95	1DEC95	0
2ND QTR. MONITORING-BLDG 133	22NOV95	11DEC95	0
DRAFT 2ND QMPR-BLDG 133	12DEC95	10JAN96	0
COE REVIEW 2ND DRAFT QMPR-BLDG 133	11JAN96	9FEB96	0
FINAL 2ND QMPR-BLDG 133	10FEB96	29FEB96	0
3RD QTR. MONITORING-BLDG 133	20FEB96	10MAR96	0
DRAFT 3RD QMPR-BLDG 133	11MAR96	9APR96	0
COE REVIEW 3RD QMPR-BLDG 133	10APR96	9MAY96	0
FINAL 3RD QMPR-BLDG 133	10MAY96	29MAY96	0
4TH QTR. MONITORING-BLDG 133	22MAY96	8JUN96	0
DRAFT 4TH QMPR-BLDG 133	9JUN96	8JUL96	0
COE REVIEW DRAFT 4TH QMPR-BLDG 133	9JUL96	7AUG96	0
FINAL 4TH QMPR-BLDG 133	8AUG96	27AUG96	0
PROJECT MANAGEMENT			
DELIVER MONTLY REPORT 11/1/94	1NOV94	1NOV94	0
DELIVER MONTLY REPORT 12/1/94	1DEC94	1DEC94	0
DELIVER MONTLY REPORT 1/1/95	1JAN95	1JAN95	0
DELIVER MONTLY REPORT 2/1/95	1FEB95	1FEB95	0
DELIVER MONTLY REPORT 3/1/95	1MAR95	1MAR95	0
DELIVER MONTLY REPORT 4/1/95	1APR95	1APR95	0
DELIVER MONTLY REPORT 5/1/95	1MAY95	1MAY95	0
DELIVER MONTLY REPORT 6/1/95	1JUN95	1JUN95	0
DELIVER MONTLY REPORT 7/1/95	1JUL95	1JUL95	0
DELIVER MONTLY REPORT 8/1/95	1AUG95	1AUG95	0
DELIVER MONTLY REPORT 9/1/95	1SEP95	1SEP95	0
DELIVER MONTLY REPORT 10/1/95	1OCT95	1OCT95	0
DELIVER MONTLY REPORT 11/1/95	1NOV95	1NOV95	0
DELIVER MONTLY REPORT 12/1/95	1DEC95	1DEC95	0
DELIVER MONTLY REPORT 1/1/96	1JAN96	1JAN96	0
DELIVER MONTLY REPORT 2/1/96	1FEB96	1FEB96	0
DELIVER MONTLY REPORT 3/1/96	1MAR96	1MAR96	0
DELIVER MONTLY REPORT 4/1/96	1APR96	1APR96	0
DELIVER MONTLY REPORT 5/1/96	1MAY96	1MAY96	0
DELIVER MONTLY REPORT 6/1/96	1JUN96	1JUN96	0
DELIVER MONTLY REPORT 7/1/96	1JUL96	1JUL96	0
DELIVER MONTLY REPORT 8/1/96	1AUG96	1AUG96	0
PROJECT COMPLETION (EST.)	28AUG96	27AUG96	0



Plot Date 8OCT94
Data Date 28SEP94
Project Start 28SEP94
Project Finish 27AUG96

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Milestone/Flag Activity

HAAF

COE, SAVANNAH DISTRICT
HUNTER ARMY AIR FIELD
PROJECT SCHEDULE

Sheet 2 of 2

METCALF & EDDY

Date	Revision	Checked	Approved

FIGURE 10-1 (Continued)

SECTION 11.0

MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) generated from the SI may be classified as one of the following: drill cuttings, decontamination fluids and solids, development water, purge water, personal protective equipment (PPE) waste, and general trash.

All of the drill cuttings and water brought to the surface during soil boring and well installation and development will be placed in DOT-approved drums. Decontamination water and purge water from well sampling will also be drummed. Soils and water will be drummed separately for each well or drill site. For a site that generates small amounts of soil, it will be permissible to consolidate the cuttings into one drum. A "waste material" label will be placed on each drum until the waste can be properly classified; an example is provided on **Figure 11-1**. Each drum will be labeled with the boring/well number, a unique drum number, source depth, date, and contents using a permanent pen. Upon completion of field work, a drum list will be prepared incorporating the above information.

The drums will be temporarily stored at each well or drill site or at the decontamination area, as appropriate. Drums will be placed on pallets and covered with plastic sheeting. Soil and groundwater sample analytical results from each boring and/or well will be considered representative of the drummed material. Proper labeling, transportation, and disposal of the material will be arranged upon completion of the waste characterization. If any material is deemed hazardous, it will be disposed of at an offsite Resource Conservation and Recovery Act (RCRA) permitted disposal facility.

WASTE MATERIAL

- Warning: Do not open or move without prior approval from Consultant/Contractor.
- LABORATORY ANALYSIS IN PROGRESS
- Store #: ______________________________
- Address: ______________________________

  ____
- Contents: ______________________________

  ____
- Boring or Well #/depth: ______________________________

  ____
- Operation: ______________________________
- Accumulation Date: ______________________________
- Consultant or Contractor/Phone Number: ______________

  ____

Note: Contents of this container have not yet been classified. This container cannot be shipped until classification is complete (as indicated by either a Hazardous or Non-Hazardous label on the container).

FIGURE 11.1

Hazardous waste disposal will be considered grounds for a change notice. A brief list of possible transporters and landfills is presented below.

Landfills:	Hazardous Laidlaw Environmental Services, Inc. 208 Watlington Industrial Road Reidsville, North Carolina Office (919) 342-6101 EPA ID NCD000648451
Transporters:	Laidlaw Environmental Services, Inc., Reidsville, NC Office (919) 342-6101. EPA ID NCD000648451

Other waste such as PPE or general trash will be disposed of by M&E.

H:016602

APPENDIX A

DOCUMENT SEARCH REPORT

APPENDIX A

HUNTER ARMY AIRFIELD
DOCUMENT SEARCH REPORT

This section outlines the various reports, site diagrams, and aerial photographs reviewed and/or retained for this Work Plan. A document review was conducted in Savannah, Georgia on November 15 and 16, 1994. State files were reviewed on November 14 and 17, 1994.

Sources Investigated:

1. Soil Conservation Service, Chatham County, Georgia.
2. Metropolitan Planning Commission, Savannah, Georgia.
3. Hunter Army Airfield, DPW Environmental and Engineering Mapping.
4. Chatham County Tax Assessor.
5. Georgia DNR Hazardous Waste Section
6. Georgia DNR Underground Storage Tank Program

Items Retained:

1. Soil Conservation Survey, Chatham County, Georgia.
2. 1941 Diagram of Pipeline Locations from Northern Battery, U.S. War Department.
3. 196?? Aerial Photograph of HAAF, USACE.
4. 1965 Soil Boring Log, Beach Associates
5. 1975 Aerial Photograph of HAAF, Metropolitan Planning Commission.
6. 1992 Aerial Photograph of HAAF, USACE
7. Base Site Diagram, USACE.

APPENDIX B

CHEMICAL DATA ACQUISITION PLAN

TABLE OF CONTENTS

CHEMICAL DATA ACQUISITION PLAN
HUNTER ARMY AIRFIELD
PHASE I SITE INVESTIGATION

CONTENTS (Continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ASTM	American Society of Testing Materials
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAP	Corrective Action Plan
CAR	Corrective Action Report
CCS	Calibration Check Sample
CDAP	Chemical Data Acquisition
CLP	Contract Lab Program
CQCR	Chemical Quality Control Reports
CS	Confirmatory Sampling
DO	Delivery Order
DOT	Department of Transportation
DQCR	Daily Quality Control Reports
DQO	Data Quality Objectives
FID	Flame Ionization Detector
GC	Gas Chromatograph
GPR	Ground Penetrating Radar
HAAF	Hunter Army Airfield
HTRW MCX	Hazardous, Toxic, and Radioactive Waste Mandatory Center of Expertise
ID	Identification
LCS	Laboratory Control Sample
M&E	Metcalf & Eddy
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NBS	National Bureau of Standards
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
PARCC	Precision, Accuracy, Representativeness, Comparability and Completeness
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limits
POC	Point of Contact
QA	Quality Assurance
QC	Quality Control
QM	Quarterly Monitoring
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SADL	South Atlantic Division Laboratory
SI	Site Investigation
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOC	Semivolatile Organic Compounds
VOC	Volatile Organic Compounds
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tanks

B.1 INTRODUCTION

Metcalf & Eddy, Inc. (M&E) has been contracted by the United States Army Corps of Engineers (USACE), Savannah District, to perform a Phase I Site Investigation (SI) at one site, and to complete confirmatory sampling (CS) and Quarterly Monitoring (QM) at two other sites at Hunter Army Airfield, Savannah, Chatham County, Georgia. This effort will be performed under the contract DACA21-93-0049, Delivery Order (DO) No. 00011. The Phase I SI is being conducted at Building 728 to determine the nature and extent of hazardous contamination from 16 former underground storage tanks (UST) and two associated pipelines in the surrounding soils, sediments, ground and surface water. The Confirmatory Sampling and Quarterly Monitoring is being conducted at Buildings 710 and 133 in order to determine if the soil excavations completed during the Underground Storage Tank (UST) removals were adequate. These CS and QM plans comply with the Corrective Action Plans (CAPs) for each site. The Chemical Data Acquisition Plan (CDAP) outlines requirements for the quality and integrity of the SI, CS, and QM data, the accuracy and precision of the analyses, representativeness of the results, and the completeness of the information. The CDAP ensures that the data evaluated and samples collected and analyzed are legally and scientifically defensible. The CDAP follows the provisions outlined in ER-1110-1-263, "Chemical Data Management for Hazardous Waste Remediation Activities", October 1990.

B.2 PROJECT DESCRIPTION

Hunter Army Airfield (HAAF) is located in the city of Savannah, Chatham County, Georgia (Figure B2.1). HAAF is a sub-installation to Fort Stewart Military Installation which is located approximately 30 miles southwest of the Airfield. HAAF covers approximately 5,400 acres.

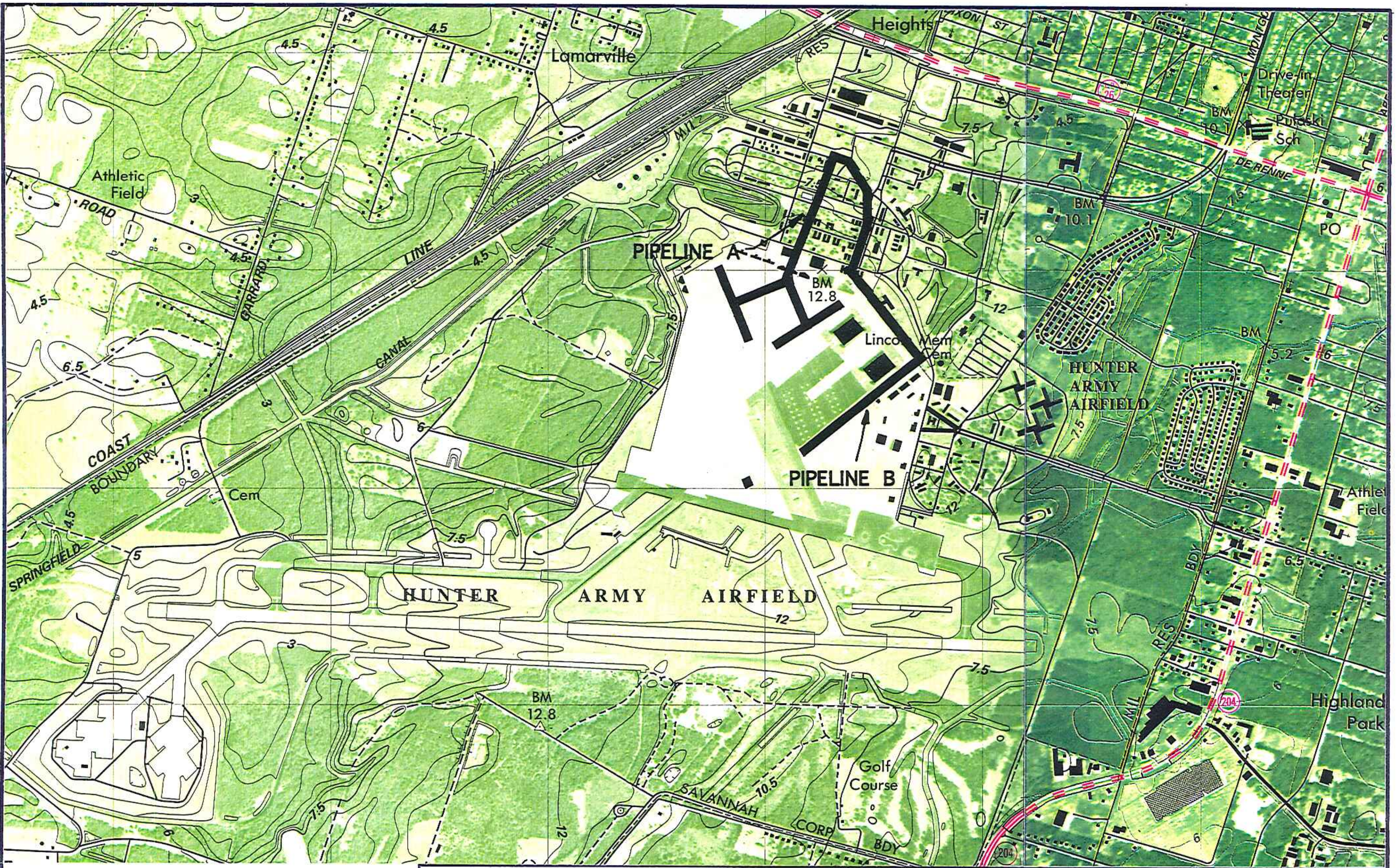
In 1928, the City of Savannah took possession of the field, which was being used by practice flyers, barnstormers, and aerial circuses, for use as a municipal airport. The Army acquired the field in 1940, and from 1940 until 1960, the airfield was used by the Army and then Air Force as a military airbase. In 1967, the Army acquired the facility from the Air Force in order to train helicopter pilots for the Vietnam conflict. In 1975, the airfield became incorporated into Fort Stewart when the 24th Infantry Division was reactivated and stationed at the Fort Stewart/Hunter Army Airfield Complex.

The purpose of this project is to investigate three areas located at HAAF. The Building 728 site contained airport hydrant system USTs including approximately 10,800 linear feet of associated pipeline. The Building 710 and Building 133 sites contained USTs associated with a motor pool and base gas station.

The Site Investigation at Building 728 area is required because contamination was discovered during the removal of 16 USTs. Confirmatory sampling and quarterly monitoring is required by the Corrective Action Plan at Buildings 133 and 710 in order to determine that the UST excavations were adequate.

The project objectives are as follows:

A. Airport Hydrant System (Vicinity of Building 728) -- Determine the extent of the soil and groundwater contamination resulting from release(s) from the USTs and the associated fuel distribution pipelines leading to the fueling pits and to the UST farm near the hangars.



1000′	0	1000′	2000′

SCALE: 1:24000

M&E METCALF & EDDY

SOURCE: GARDEN CITY AND SAVANNAH, GA, USGS QUADRANGLE MAPS

AIRFIELD LOCATION MAP
HUNTER ARMY AIRFIELD
SAVANNAH, GEORGIA

FIGURE B2.1

p:\proj\ 16682haf\o\figure1.dgn

B. Locate and map approximately 7,000 linear feet of airport hydrant system pipelines. Determine locations and types of access points for future pipeline content sampling.

C. Building 710 and Building 133 Sites -- Complete Confirmatory Sampling in accordance with the CAPs (AT&E, 1992 and 1993).

D. Complete Quarterly Monitoring for a period of 1 year at the Building 710 and Building 133 sites.

E. Complete a Site Investigation (SI) Report for the Building 728 Airport Hydrant System.

F. Prepare two Completion Reports (one for the Building 710 Area and one for the Building 133 Area) in accordance with CAP requirements.

G. Prepare Quarterly Progress Reports for the Building 710 and Building 133 sites.

Soil, groundwater, sediment and surface water samples will be analyzed by Savannah Laboratories which has been validated and approved by the USACE Hazardous, Toxic, and Radioactive Waste (HTRW) Mandatory Center of Expertise (MCX). Analysis of environmental samples includes RCRA listed metals, polynuclear aromatic hydrocarbons (PAH), and benzene, toluene, ethylbenzene, and xylene (BTEX). A copy of this CDAP will be sent to Savannah Laboratory prior to the beginning of field work.

B.3 CHEMICAL DATA QUALITY OBJECTIVES

Comprehensive data quality objectives (DQOs) for investigating the potential contamination at the Hunter Army Airfield have been developed to provide guidelines for all field and laboratory procedures. The DQOs are used to ensure that the data collected are of sufficient quantity and quality to be legally defensible under regulatory requirements. The intention of the sampling and analysis effort is to produce data of acceptable quality and allow an accurate evaluation.

The primary Quality Assurance (QA) objective is that all measurements be representative of the actual site conditions and that all laboratory data resulting from sampling and analysis activities be comparable. The use of accepted, published sampling and analysis methods, as well as the use of standard measurement units, will aid in ensuring the comparability of the data.

B.3.1 DATA QUALITY OBJECTIVE LEVELS

Data quality objectives as defined by the USEPA are based on the concept that different data uses may require different data quality. The five categories of data quality include:

- DQO Level I - provides the lowest data quality but the most rapid results, and is used for purposes of site health and safety monitoring and initial site characterization to define areas for further study.

- DQO Level II - provides rapid results but better quality data than Level I. Analysis includes some on-site generated data using a pH meter, conductivity meter and water level indicator.

- DQO Level III - provides laboratory analyses designed to provide identification of compounds, both organic and inorganic, and corresponding quantification in samples of various matrices. This level of analysis provides data to support site characterization, risk assessment, and engineering design development. Laboratory analysis includes fixed lab-generated data and standard commercial laboratory analyses without full Contract Laboratory Program (CLP) documentation.

- DQO Level IV - provides the highest level of data quality and is used for purposes of risk assessment, engineering design, and cost recovery documentation. Confirmational analyses require full CLP analytical and data validation procedures.

- DQO Level V - provides a level of data quality for analysis by non-standard methods.

For the Hunter Army Airfield SI, CS, and QM, DQO Level III will be used for laboratory analysis to confirm the absence or presence of potential COCs and to help assess the nature and the extent of contamination. DQO Level II will be used for field measurement of parameters. DQO Level I will be used for field screening of organic vapors.

B.3.2 DATA QUALITY CHARACTERISTICS

The five major characteristics of laboratory data quality addressed during development of the environmental sampling and analytical plan will be used in assessing the data produced for this project. These five characteristics: precision, accuracy, completeness, representativeness, and comparability (PARCC) are defined below in the following paragraphs. All analytical data will be evaluated for precision, accuracy and completeness. The laboratory will compare precision and accuracy results to their internal acceptance criteria which are recorded and tracked using regularly updated control charts.

Numerical control limits for precision and accuracy for water and soil samples are presented in **Attachment 1**. The DQOs for field measurements performed during sampling are presented in **Table B3-1**.

TABLE B3-1
SUMMARY OF ESTIMATED PRECISION, ACCURACY AND COMPLETENESS OBJECTIVES FOR FIELD MEASUREMENTS

Parameter	Method[1]	Precision[a]	Accuracy[b]	Completeness
Standing Water Levels	Stainless Steel Tape	±0.01 ft	0.01 ft	95%
Temperature	E170.1, Non-Mercury Thermometer	NPM	NPM	95%
pH	E150.1, Electrometric	±0.1 pH units	0.04 pH units	95%
Conductivity	E120.1, Electrometric	±25 μmhos/cm	10 μmhos/cm	95%

NPM - Not part of method.
(1) E100-500 METHODS-METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES. EPA 600/4-79-020, March 1983.
(a) Expressed as Relative Percent Difference of field duplicates
(b) Expected based on equipment manufacturer specifications

Accuracy. Accuracy is defined as the degree of agreement of a measurement (or measurement average) with an accepted reference or true value. It is a measure of system bias and is usually expressed as a percentage of the true value.

Accuracy is determined in the laboratory through the use of matrix spike and matrix spike duplicate (MS/MSD) analyses. At the time of sample collection, when a sample is chosen to serve as a MS, the amount taken will be triple the volume taken for the regular samples. The sample chosen as the MS/MSD is analyzed unspiked and then is analyzed after known quantities of compounds are spiked into the sample. The MSD is used as an indicator of reproducability of the spiking and to determine if the matrix effect is reproducible. The percent recoveries of the target compounds spiked is calculated and used as an indication of the accuracy of the analyses performed. Accuracy may also be determined during initial calibration of compounds and also during continuing calibration sequences.

Sampling accuracy is maintained by the implementation and adherence to strict procedural protocols. Trip blanks and equipment blanks are collected and analyzed to ensure that all samples collected have no cross-contamination due to equipment or laboratory pure water.

Precision. Precision is a measure of agreement among individual measurements of the same property under similar conditions. It is expressed in terms of Relative Percent Difference (RPD) between replicates or in terms of the standard deviation when three or more replicate analyses are performed.

Precision can be determined through the use of MS/MSD replicate spiking analyses and with lab replicates and field duplicates. A sample chosen in the field is taken in duplicate and sent to the laboratory as two separate samples. The agreement between the analyses is a measure of precision of the laboratory and a measure of the variability of the sample. The RPD between the two results is calculated as a measure of analytical precision. Precision may also be measured when comparing percent differences in continuing calibration sequences.

Completeness. Completeness is a measure of the amount of valid data obtained after analysis compared to the amount of samples collected. It is usually expressed as a percentage.

The objective of the field sampling at Hunter Army Airfield is to obtain representative samples for all required analyses. Acceptable procedures for sample collection, storage, and transportation must be followed. The objective of the contract laboratory is to complete all analyses and produce valid data.

Representativeness. Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a data population, a sampling point, or an environment. For this project, grab samples will be taken, and by definition grab samples are representative of conditions at the point in time collected, within sampling and analytical error.

Comparability. Comparability expresses the confidence with which one data set can be compared to another. To achieve comparability in this project, the data generated is reported using units of µg/L, mg/L, µg/kg, or mg/kg. By selecting sampling and analysis procedures which are consistent with protocols used by the U.S. EPA in its CLP, all data sets are comparable within the specific site to ensure that a consistent data base is used. To ensure data comparability, U.S. EPA standard reference materials are analyzed to establish that analytical procedures are indeed generating valid data.

B.3.3 PROCEDURES FOR DATA ASSESSMENT

Data quality objectives for analyses conducted under the scope of this CDAP are presented in **Attachment 1**. Precision values, reported as RPD, are cited from the subcontractor laboratory Comprehensive Quality Assurance Plan (COMQAP) and are evaluated on duplicate matrix spike (MS) or laboratory control sample data (LCS).

The values listed in Attachment 1 for precision and accuracy are goals obtained from the SW 846 Methods and are totally dependent on sample concentrations and matrices. The precision values presented therein represent variability for replicate measurements of the same parameter, and are expressed in terms of relative percent difference for duplicate measurements made on samples. Accuracy values include components of both random error (i.e., variability due to imprecision) and systematic error (i.e., bias), and thus reflect the total error for a given measurement, expressed as a percentage of the true value. The objectives given for precision and accuracy in Attachment 1 are based primarily on performance data derived from method validation studies (performed by the subcontractor laboratory for analyses of compounds in the method). These objectives are not intended to represent validation criteria, rather they represent the performance capability of the methods.

An overview of the procedures to be used in assessing data quality include the following:

- Accuracy
  - Computing percent recoveries for spiked samples
  - Calculating the standard deviation in the overall average recovery value
  - Applying Chauvenet's criterion for detecting bad recovery data

- Determining the range of uncertainty at a given level of confidence
- Flagging the laboratory data to qualify any systematic errors (bias) that are discovered

- Precision

  - Examining split samples and pairs of samples for differences in inter- and intra-sample scatter
  - Determining if sampling error has occurred by comparing inter- and intra-samples
  - Validating data on groups of samples, all of which should have the same composition, by examining the scatter in each group in comparison to the overall scatter (invalid data are discharged)

  - Computing an overall relative standard deviation that is applicable to all the field investigation data from a particular sampling campaign

- Completeness

  - Computing the fraction of QA test data that remains valid after discarding any invalid accuracy or precision data

- Representativeness and Comparability

  - Determining whether these terms have meaning within the project framework
  - Identifying the appropriate statistical methods
  - Correctly applying the statistical methods and reporting the results

B.4 FIELD ACTIVITIES

B.4.1 SUMMARY OF FIELD ACTIVITIES

The field activities at Hunter Army Airfield will involve the investigation of three separate areas. A Phase I SI consisting of sampling surface soils, subsurface soils, and groundwater, will be conducted at the Building 728 site. Confirmatory Sampling and Quarterly Monitoring will be conducted at the Buildings 133 and 710 sites. The number and types of samples proposed for collection were suggested by the USACE and outlined in the scope of work. The proposed sampling locations for Building 728 are depicted in **Figure B4.1**, **Figure B4.2** for Building 133 and **Figure B4.3** for Building 710.

B.4.1.1 Building 728

Hand Auger Borings

Eighty soil borings will be drilled at the Building 728 site. Twenty borings will be drilled within the Building 728 site (around the UST farm, near the four separate USTs, in the truck stand areas, and at the beginning of the pipelines). Sixty borings will be drilled along the pipelines (every 100 feet), once the pipelines and associated appurtenant structures have been located by either the ground-penetrating radar (GPR) survey or pipeline locating devices. Borings will be drilled to approximately 0.5 feet below the saturated zone (no more than 7 feet in depth). A total of 80 samples (one soil sample from each hand auger boring) will be collected at depths associated with the highest contamination, as determined by OVA screening, visual staining, or obvious odor. Soil samples within the Building 728 site will be analyzed for RCRA listed metals, BTEX, and PAH. Samples along the two pipelines will be analyzed for BTEX and PAH.

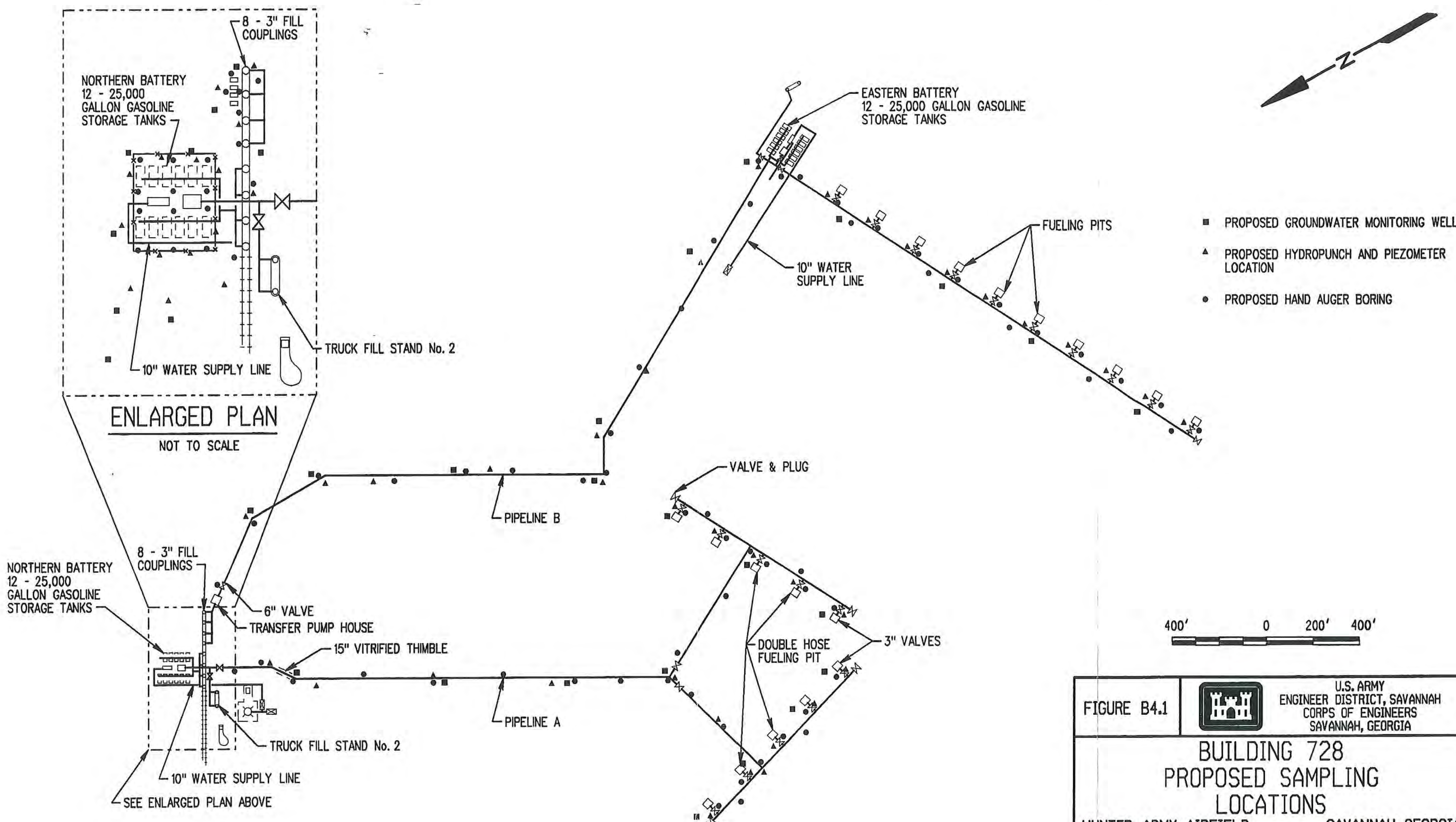


FIGURE B4.1		U.S. ARMY ENGINEER DISTRICT, SAVANNAH CORPS OF ENGINEERS SAVANNAH, GEORGIA

BUILDING 728 PROPOSED SAMPLING LOCATIONS

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

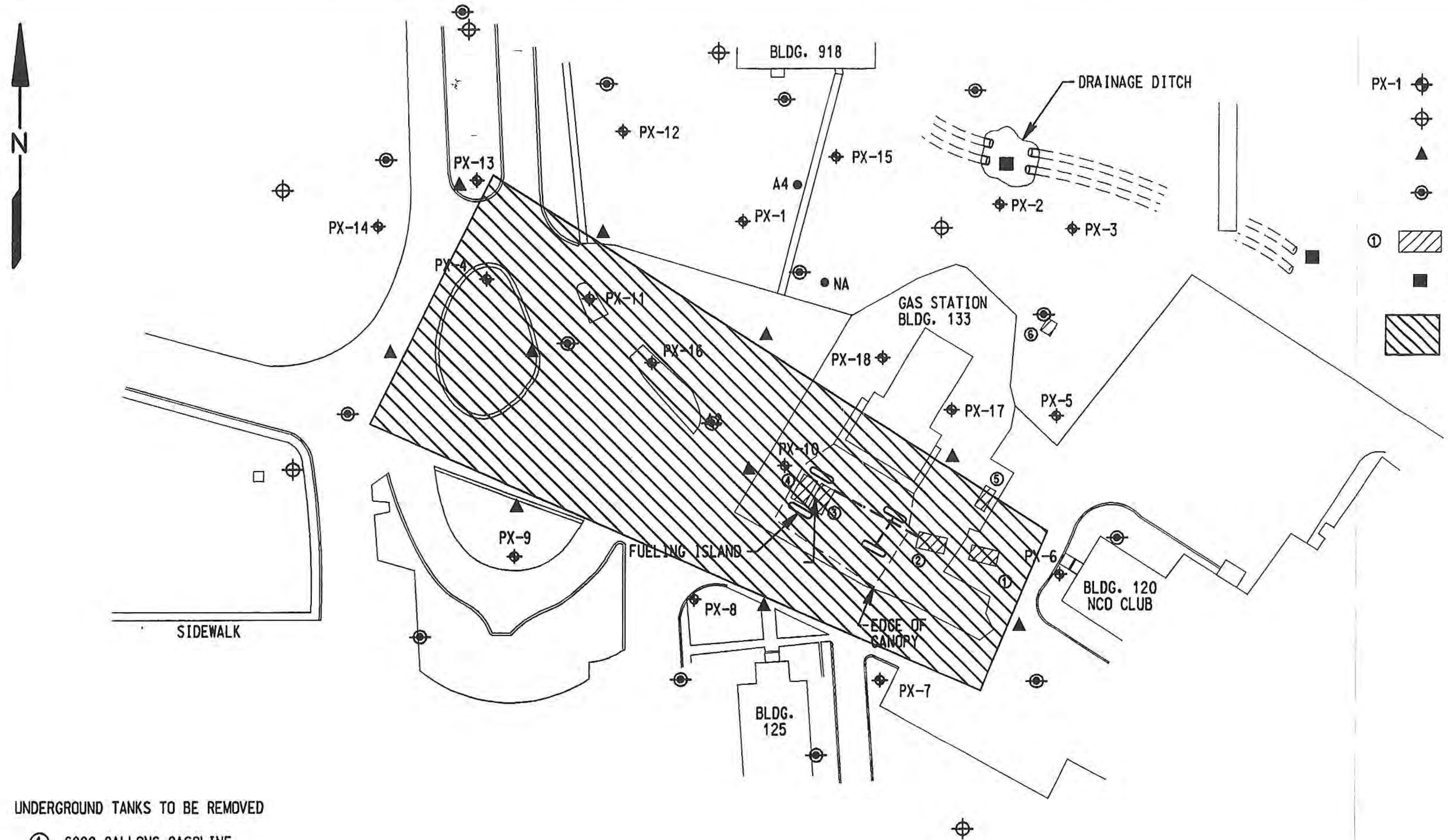
M&E METCALF & EDDY

PLATE:

SOURCE: HAAF MASTER PLAN 1941

SCALE: 1"=400' DATE: 01-23-95

p:\proj\ 16602haf\c\bldg728.dgn DATE: 01-25-95 BY: M.A. FRANK



LEGEND

- PX-1 — MONITORING WELL 2"
- PROPOSED GROUNDWATER MONITORING WELL
- PROPOSED HAND AUGER BORING
- PROPOSED HYDROPUNCH GROUNDWATER SAMPLE
- ① UNDERGROUND TANK WITH NUMBER
- PROPOSED SURFACE WATER AND SEDIMENT SAMPLE
- APPROXIMATE EXTENT OF SOIL EXCAVATION

UNDERGROUND TANKS TO BE REMOVED

1. 6000 GALLONS GASOLINE
2. 6000 GALLONS GASOLINE (ABANDONED PRIOR TO 1990)
3. 6000 GALLONS GASOLINE
4. 6000 GALLONS GASOLINE
5. 4000 GALLONS GASOLINE
6. 1000 GALLONS WASTE OIL (APPROXIMATE SIZE)

60' 0 30' 60'

SCALE: 1" = 60'

FIGURE B4.2

U.S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

BUILDING 133 PROPOSED SAMPLING LOCATIONS

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

M&E METCALF & EDDY

PLATE:		
SOURCE:		
SCALE: 1"=60'	DATE: 01-23-95	SIZE:

p:\pr..., 16602haf\c\bldg133.dgn DATE: 01-25-95 BY: M.A. FRANK

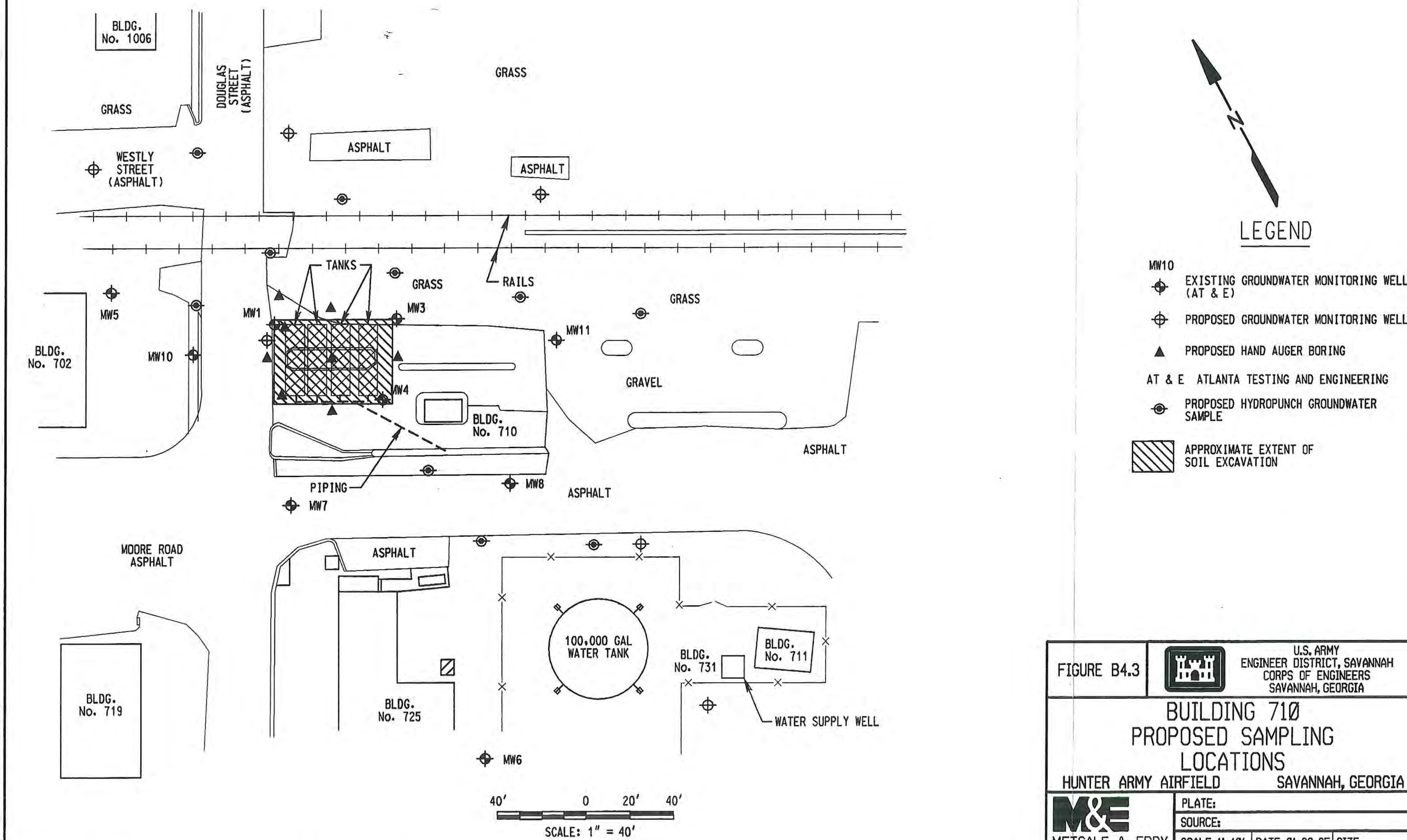


FIGURE B4.3

U.S. ARMY ENGINEER DISTRICT, SAVANNAH CORPS OF ENGINEERS SAVANNAH, GEORGIA

BUILDING 71Ø PROPOSED SAMPLING LOCATIONS

HUNTER ARMY AIRFIELD SAVANNAH, GEORGIA

M&E METCALF & EDDY

PLATE:
SOURCE:
SCALE: 1"=4Ø' DATE: Ø1-23-95 SIZE:

p:\pr .6Ø2hef\c\bldg71Ø.dgn DATE: Ø1-25-95 BY: M.A. FRANK

Hydropunch Borings

Fifty hydropunch borings will be drilled to obtain groundwater samples and groundwater depth data at the areas of highest soil contamination as determined by the hand auger boring sampling results. One groundwater sample from each boring will be analyzed by a portable gas chromatograph (GC) equipped with a flame ionization detector (FID).

Monitoring Wells

After interpretation of the hand auger and hydropunch boring sampling program results, thirty monitoring wells will be installed at areas of the highest soil and groundwater contamination. These wells will be approximately 15 feet below land surface. One soil sample will be collected from each boring at depths of the highest contamination, as determined by organic vapor analyzer (OVA) screening, visual staining, or obvious odor. One water sample will be collected from each monitoring well. Soil samples near the waste oil tanks at Building 728 will be analyzed for RCRA listed metals, BTEX, and PAH. Groundwater near the waste oil tanks at Building 728 will be sampled for RCRA listed metals, BTEX, and PAH. Soil samples along the pipelines will be analyzed for BTEX and PAH, and groundwater samples along the pipelines will be analyzed for BTEX. An additional soil sample will be collected from each monitoring well boring and analyzed for geotechnical design parameters (grain size distribution, moisture content, and Atterberg limits). Groundwater will be sampled using teflon bailers.

B.4.1.2 Building 710

Hand Auger Borings

Eight hand auger borings will be drilled at the Building 710 UST removal site to determine the success of the UST removal and overexcavation procedures. One soil sample (eight total) from each boring will be collected at the depth associated with the highest contamination as determined by OVA screening, visual staining, or obvious odor. The soil samples will be analyzed for BTEX and PAH.

Hydropunch Borings

Ten hydropunch borings will be drilled to obtain groundwater samples and depth data at the areas of highest soil contamination as determined by the hand auger boring sampling results. One groundwater sample from each boring will be analyzed by a portable GC equipped with a FID.

Monitoring Wells

After review of the results of the hand auger and hydropunch boring sampling programs, six monitoring wells will be installed at the areas of highest soil and groundwater contamination at the Building 710 UST removal site. One well should be located near the former MW-1 location as stated in the CAP, and one well should be located upgradient to be used as a background well. One soil sample will be collected from each boring at depths of the highest contamination, as determined by OVA screening, visual staining, or obvious odor. Soil samples will be analyzed for BTEX and PAH. One water sample from each well will be analyzed in the laboratory for BTEX and PAH. Groundwater will be sampled using teflon bailers. An additional soil sample from each well will be analyzed for geotechnical parameters.

Water Supply Well

One water sample will be collected from the drinking water supply well located approximately 150 feet south of the former UST and analyzed for BTEX and PAH. Water will be sampled with teflon bailers.

B.4.1.3 Building 133

Hand Auger Borings

Ten hand auger borings will be drilled at Building 133 UST removal site to determine the success of the excavation procedures. One soil sample (10 total) from each boring will be collected at the depth associated with the highest contamination as determined by OVA screening, visual staining, or obvious odor. The seven soil samples at the mogas and diesel tanks will be analyzed for BTEX and PAH. Three soil samples near the waste oil tanks will be analyzed for BTEX, RCRA listed metals, and PAH.

Hydropunch Borings

Fifteen hydropunch borings will be drilled to obtain groundwater samples and depth data at the areas of highest soil contamination as determined by the hand auger boring sampling results. One groundwater sample from each boring will be analyzed by a portable GC equipped with a FID.

Monitoring Wells

After analyzing the results of the hand auger and hydropunch boring sampling programs, six new monitoring wells will be installed at the areas of highest soil and groundwater contamination at the Building 133 UST removal site. One soil sample will be collected from each boring at depths of the highest contamination, as determined by OVA screening, visual staining, or obvious odor. Soil samples will be analyzed for RCRA listed metals, BTEX, and PAH. One groundwater sample from each new well will be analyzed in the laboratory for BTEX, and PAH. Two water samples will be analyzed for RCRA listed metals. Groundwater will be sampled using teflon bailers. An additional soil sample from each well will be analyzed for geotechnical parameters.

Existing Wells

The 10 existing wells at the Building 133 UST site will be sampled during the hydropunch boring program in order to help determine the new monitoring well locations. The existing wells will be resampled during the new monitoring well installation and sampling program. All water samples will be analyzed for BTEX and PAH. Groundwater samples will be obtained using teflon bailers.

Surface Water and Sediment Samples

Two surface water and two underlying sediment samples will be collected from the storm drain system at the Building 133 site. One soil and water sample will be taken upstream and the other soil and water sample will be collected at the open area north of the former gas station. The soil samples will be analyzed for BTEX and PAH, and the water samples will be analyzed for BTEX and PAH.

B.4.1.4 Quarterly Monitoring

Quarterly groundwater monitoring will begin 3 months after completion of all CS fieldwork at the Building 710 and 133 sites and continue for three more quarters (every 3 months). Quarterly monitoring at the Building 710 site will include sampling 6 wells and a water supply well and the Building 133 site will include 10 existing wells and the 6 new wells. Water levels (and free product, if any) will be measured in all wells. The groundwater samples from both sites will be analyzed for BTEX and PAH. Quarterly monitoring will be conducted in accordance with the field activity procedures outlined for groundwater sampling.

B.4.1.5 Field Sample Types

Table B4-1 summarizes the numbers and types of field samples that will be collected from all three sites at Hunter Army Airfield. **Table B4-2** summarizes the numbers of field

TABLE B4-1
SUMMARY OF FIELD SAMPLES AND ANALYTICAL REQUIREMENTS FOR
HUNTER ARMY AIRFIELD

PARAMETER/ METHOD*	FIELD SAMPLES	FIELD DUPLICATE	EQUIPMENT RINSATES	TRIP BLANKS	TOTAL FIELD SAMPLES	QA SAMPLES		TOTAL QA SAMPLES
						SPLITS	TRIP BLANKS	
AIRPORT HYDRANT SYSTEM VICINITY OF BUILDING 728								
WASTE OIL TANKS:								
Soil (Hand Auger)								
BTEX [1] (8020)	10	1	0	0	11	1	0	1
PAH [2] (8100)	10	1	0	0	11	1	0	1
RCRA Metals [3] (6000/7000)	10	1	0	0	11	1	0	1
Soil (MW Boring)								
BTEX [1] (8020)	4	1	0	0	5	1	0	1
PAH [2] (8100)	4	1	0	0	5	1	0	1
RCRA Metals [3] (6000/7000)	4	1	0	0	5	1	0	1
Groundwater								
BTEX [1] (8020)	4	1	1	1	7	1	1	2
PAH (8310)	4	1	1	0	6	1	0	1
RCRA Metals [3] (6000/7000)	4	1	0	0	5	1	0	1
AV. TANKS & PIPELINES:								
Soil (Hand Auger)								
BTEX [1] (8020)	70	7	0	0	77	7	0	7
PAH [2] (8100)	70	7	0	0	77	7	0	7
Soil (MW Boring)								
BTEX [1] (8020)	26	3	0	0	29	3	0	3
PAH [2] (8100)	26	3	0	0	29	3	0	3
Groundwater								
BTEX [1] (8020)	26	3	1	3	33	3	1	4
BUILDING 710 AREA MOGAS & DIESEL TANKS								
Soil (Hand Auger)								
BTEX [1] (8020)	8	1	0	0	9	1	0	1
PAH [2] (8100)	8	1	0	0	9	1	0	1
Soil (MW Boring)								
BTEX [1] (8020)	6	1	0	0	7	1	0	1
PAH [2] (8100)	6	1	0	0	7	1	0	1
Groundwater (MW)								
BTEX [1] (8020)	6	1	1	1	9	1	1	2
PAH [2] (8310)	6	1	1	0	8	1	0	1
Supply Well water								
BTEX [1] (8020)	1	0	0	0	1	0	0	0
PAH [2] (8310)	1	0	0	0	1	0	0	0

* Methods Referenced in Table B6-1

1) BTEX- Benzene, Toluene, Ethylbenzene, Xylene. Reporting Limits for soil 1 ppm total BTEX, water 1 ppb each compound (4 ppb total volatile organics for method)

2) Polynuclear Aromatic Hydrocarbons. Reporting Limit for soil is 10 ppm total PAH [Benzo(a)anthracene, benzo(a)pyrene, benzo (p)&(k) fluoranthene, dibenz(a,h)anthracene, chrysene, indeno(1,2,3-c,d)pyrene]. Reporting Limit for water 1 ppb each compound in method 8310.

3) RCRA metals; 6010, 7060, 7421, 7740

Trip Blanks sent with each cooler containing VOC analysis in water samples, assume sampling 6 wells per day.

TABLE B4-1, continued
SUMMARY OF FIELD SAMPLES AND ANALYTICAL REQUIREMENTS FOR
HUNTER ARMY AIRFIELD

PARAMETER/ METHOD	FIELD SAMPLES	FIELD DUPLICATE	EQUIPMENT RINSATES	TRIP BLANKS	TOTAL FIELD SAMPLES	SPLITS	TRIP BLANKS	TOTAL QA SAMPLES
BUILDING 133 AREA								
MOGAS & DIESEL TANKS								
Soil (Hand Auger)								
BTEX [1] (8020)	7	1	0	0	8	1	0	1
PAH [2] (8100)	7	1	0	0	8	1	0	1
WASTE OIL TANKS:								
Soil (Hand Auger)								
BTEX [1] (8020)	3	0	0	0	3	0	0	0
PAH [2] (8100)	3	0	0	0	3	0	0	0
RCRA Metals [3] (6000/7000)	3	1	0	0	4	1	0	1
Soil (MW Boring)								
BTEX [1] (8020)	6	1	0	0	7	1	0	1
PAH [2] (8100)	6	1	0	0	7	1	0	1
RCRA Metals [3] (6000/7000)	2	1	0	0	3	1	0	1
SEDIMENT								
BTEX [1] (8020)	2	1	0	0	3	1	0	1
PAH [2] (8100)	2	1	0	0	3	1	0	1
SURFACE WATER								
BTEX [1] (8020)	2	1	0	0	3	1	0	1
PAH [2] (8310)	2	1	0	0	3	1	0	1
Groundwater (Existing MW)								
BTEX [1] (8020)	20	2	1	2	25	2	1	3
PAH [2] (8310)	20	2	1	0	23	2	0	2
Groundwater (New MW)								
BTEX [1] (8020)	6	1	1	1	9	1	0	1
PAH [2] (8310)	6	1	1	0	8	1	0	1
RCRA Metals [3] (6000/7000)	2	1	0	0	3	1	0	1

TABLE B4-2
SUMMARY OF FIELD SAMPLES AND ANALYTICAL REQUIREMENTS FOR
QUARTERLY SAMPLING AT BUILDING 710 AND 133 AREA WELLS
HUNTER ARMY AIRFIELD

PARAMETER/ METHOD	FIELD SAMPLES	FIELD DUPLICATE	EQUIPMENT RINSATES	TRIP BLANKS	TOTAL FIELD SAMPLES	SPLITS	TRIP BLANKS	TOTAL QA SAMPLES
BUILDING 710								
Groundwater from MW & Supply well (1)								
BTEX [1] (8020)	7	1	1	1	10	1	1	2
PAH [2] (8310)	7	1	1	0	9	1	0	1
BUILDING 133								
Groundwater from MW								
BTEX [1] (8020)	16	2	1	2	21	2	1	3
PAH [2] (8310)	16	2	1	0	19	2	0	2

* Methods Referenced in Table B6-1

1) BTEX– Benzene, Toluene, Ethylbenzene, Xylene. Reporting Limits for soil 1 ppm total BTEX, water 1 ppb each compound (4 ppb total volatile organics for method)

2) Polynuclear Aromatic Hydrocarbons. Reporting Limit for soil is 10 ppm total PAH (Benzo(a)anthracene, benzo(a)pyrene, benzo (p)&(k) fluoranthene, dibenz(a,h)anthracene, chrysene, indeno(1,2,3–c,d)pyrene]. Reporting Limit for water 1 ppb each compound in method 8310.

3) RCRA metals; 6010, 7060, 7421, 7740

Trip Blanks sent with each cooler containing VOC analysis in water samples, assume sampling 6 wells per day.

samples that will be collected for the quarterly groundwater monitoring program. The QA and QC samples are included with the appropriate numbers proposed for collection.

B.4.1.6 Field Generated QA and QC Samples

4.1.6.1 General Field Activities

Equipment Rinsates. Equipment rinsate samples will be collected according to the rate which is specified by the USACE. The analysis of these rinsates serves to measure the effectiveness of the decontamination procedures. An equipment rinsate is taken by rinsing the field equipment with American Society of Testing Materials (ASTM) Type-II reagent water (obtained from the laboratory), transferring the water to a sample bottle, and sending the sample for analysis.

Trip Blanks. One trip blank will be submitted to the laboratory for every batch of groundwater VOC samples collected. The results of this blank will serve as a baseline measurement of any contamination that the samples may be exposed to during transport. A trip blank is comprised of a sample bottle filled at the laboratory with ASTM Type-II reagent water or equivalent, transported to the sample collection site, handled like a sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field.

Field Duplicates/Splits. Ten percent, rounded up, of all the samples are collected in duplicate and submitted to the laboratory for analysis. Duplicates are two samples collected independently at a sampling location during a single episode of sampling. Duplicates provide statistical information about sample variability. Field duplicates are indistinguishable from other analytical samples so that personnel performing the analyses are not able to determine which samples are duplicates.

Ten percent, rounded up, of all samples will be collected as QA sample duplicates or split samples. These QA sample splits will be shipped by overnight delivery to USACE South